Advanced Visualization Using Power BI

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Technical Report

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Introduction

Visualization Project Overview: In Canada's dynamic retail sector, "24Seven" stands out with its commitment to providing around-the-clock service to meet various customer needs. Having established ten stores across the country, 24Seven is now looking to broaden its presence with an eleventh location. The key goal is to identify the best location for this new store through detailed analysis and sharp business intelligence.

Problem Statement: The expansion strategy for 24Seven hinges on a data-driven approach to identify the most advantageous location for a new store. The challenge lies in integrating diverse datasets, including transactional sales data, customer demographics, product categories, and store geography, complemented by open-source datasets offering demographic, economic, and location-based insights. Students must navigate through various analytics and visualization techniques to craft a persuasive narrative, demonstrating where and why the new store should be established, thereby directly influencing the company's growth trajectory.

Objectives: Our main goal is to create a user-friendly Power BI dashboard that will be a key resource for our leaders and strategists. This dashboard will not just display past sales data but will also predict future trends. It's designed to provide our decision-makers with the clear, actionable insights they need to guide our company's growth.

Our main goals are defined as follows:

- **GOAL 1:** Develop a Power BI dashboard to clearly display key sales, demographic, and territorial metrics & enable informed decision-making through real-time data insights.
- **GOAL 2:** Strengthen 24Seven's market position and customer reach which is critical for establishing brand dominance and customer retention.
- **GOAL 3:** Predict the expected sales of the new store location, an essential step for evaluating investment potential and guiding 24Seven's strategic growth.

External Tables

External sources used include Statistics Canada and City of Ottawa. Government data usually has high data quality and is publicly accessible. Detailed preprocessing steps through Power Query and DAX can be found in Appendix 7. Appendix 8 shows the model and the relationships between the tables. Relationships are formed for slicers to be responsive.

AVERAGE EXPENDITURE PER HOUSEHOLD.csv shows the expenditure by province and by category type. We customized the row and column selection to include relevant categories like beverages, health care, snacks, magazines, and newspapers.

PROVINCE ABBREVIATIONS.csv is created manually and is used to match location data on the visuals.

POPULATION BY PROVINCE (2021 Q1 - 2023 Q4).csv contains population data and growth rates

HOUSEHOLD INCOME AND NET SAVINGS.csv stores data on household disposable income and net savings by province.

parking_lots_clean.csv has addresses, coordinates, and capacity of parking lots in Ottawa.

POPULATION_SHORTLISTED.csv contains population data for the seven selected cities in Ontario.

MONTREAL SALES FOR SCALING.csv this table is exported from the historical sales to only show sales data for Montreal and is used to model sales projections.

Dashboard Features

In the following section, we will explore and discuss the various features of the dashboard, including analysis on sales performance, territory, customer demographics, and projections to determine the new store's location.

1. Sales Performance Analysis

The Sales Performance dashboard of 24Seven provides a comprehensive view into the company's sales dynamics. Key performance indicators on display include Net Sales, which show an increase from $150.85K in the current period, up from the starting benchmark of $0K. This upward trend is essential for evaluating past performance and forecasting future trends.

The dashboard also features a slider that captures the spectrum of Annual Sales Revenue Growth, signifying an average growth rate of 0.05 over the last two years, despite a dip to -0.73 in the most recent year. This fluctuation underscores the importance of agile business strategies responsive to changing market conditions.

Moreover, the dashboard examines profitability across product categories. For instance, the bar chart visualization demonstrates that Product Category 3 leads with $33K in sales, compared to the lowest in Category 1 at $28K and, Category 2 leading at $21K, while Category 5 lags at $17K. This insight aids in fine-tuning stock levels and promotional efforts to maximize margins. This disparity in category sales underscores the need to evaluate product demand and customer preferences, possibly adjusting marketing focus or inventory investments accordingly.

The effectiveness of customer acquisition is quantified at 1.96%, an indicator of market penetration and the success of marketing initiatives. This metric, coupled with the Year-Over-Year Sales Revenue Trend, illustrates the critical relationship between customer engagement and sales performance, providing a roadmap for the continued profitability of 24Seven's current stores. When we apply the "Age" filter, particularly focusing on the 50-59 age group, we can observe nuanced purchasing patterns that can inform targeted marketing and sales initiatives. This demographic, as represented by the top spenders, tends to make more significant individual purchases, as evidenced by the sales basket size highlighted in the dashboard. Customers from cities like Montreal and Calgary are not only among the highest spenders but also demonstrate the diverse geographic reach of 24Seven's market appeal.

By examining the "Top 10 Customers" table, we notice that cities such as Montreal, Ottawa, North York, and Calgary, despite their different market dynamics, contribute significantly to the sales volume, suggesting a well-established brand presence in these areas. This data can empower 24Seven to tailor its customer engagement strategies, optimizing the product mix offered in these cities to further drive sales performance. Further, the company's financial landscape over a two-year period from 2022 to 2023 indicates a current period net sales amount of $95.6K, a

substantial increase from the previous period's $20.23K. This significant jump suggests a positive shift in sales activities or a successful implementation of strategic initiatives. Additionally, the Year-Over-Year Sales Revenue Trend indicators suggest a mixed scenario with a slight increase of 0.02 in one period and no growth (0.00) in another, signaling a need for strategic reassessment to boost long-term sales performance.

Overall, the sales page highlights growth and potential by connecting sales figures with business goals. It emphasizes how product trends and customer engagement drive profitability across 24Seven's current stores. Integrating customer demographics with sales data allows for better customer segmentation and increased revenue from key segments.

2. Territory Analysis

For the Territory analysis, we decided to center our analysis on an ArcGIS Map with a ribbon chart and a clustered bar chart visualization around it. The map showcases the location of the actual stores across Canada with bubbles varying size based on the total sales. The map also provides a base layer with the population density of the various areas. We used the built-in function in the ArcGIS map to display it. Our ribbon chart shows the evolution of sales per year based on provinces. Finally, our bar chart allows for granularity as it displays the total sales per region, then by city, and finally, by store by using the drill-down function.

Based on our territory page, we can notice that many high-density areas do not possess a store yet, and that Ontario was the biggest region in 2023 in terms of total sales and has been growing over the past 3 years.

3. Demographic Analysis

The Demographic Analysis Dashboard offers an intricate view of our existing stores. Firstly, we presented two key visualizations: one showcasing the average sale amount and the other revealing the average customer age. These cards can be dynamically adjusted using slicers for store, age, gender, date, product, and province—allowing for a more tailored understanding of customer insights: the typical customer age is around 44 years old, and on average, customers spend $50.28 per transaction in our store.

Next, we employed a donut chart to depict the gender distribution. Interestingly, we found minimal disparities between male, female, and not specific customers. Delving deeper, we applied age slicers, and we discovered middle-aged customers (between 50 and 70+) exhibit a strong preference for health and wellness products. The elderly age group (60+) tends to avoid purchasing snacks and beverages.

Finally, we generated vertical bar charts to uncover insights related to products and provinces. We find customer frequency across stores remain consistently around 300. The 51-60 age group constitutes the largest customer segment in our current stores. Ontario boasts the highest customer count across all three years (2021-2023). Household income data is explained more in detail in the projections section, and it can be observed that Ontario has higher household income compared to Quebec, Alberta, and British Columbia.

4. Projection Analysis

A projection dashboard is built for Ottawa. Historical sales data from Montreal is used as a basis to estimate Ottawa's sales. Figures are adjusted based on ratios. The formula to calculate sales in Ottawa is:

$$\textit{Ottawa Sales} = (0.4 \times \textit{Montreal sales} \times \textit{Ottawa Montreal population ratio}) + (0.6 \times \textit{Montreal sales} \times \textit{Ottawa Montreal income ratio})$$

The ratio of Ottawa's population to Montreal's and the ratio of Ottawa's income to Montreal's are determined by dividing Ottawa's respective figures by those of Montreal's. Assuming 24Seven prioritizes income over population, weights of 0.4 are assigned to population and 0.6 are assigned to income. This approach ensures that Montreal's sales serve as the benchmark for modeling Ottawa's sales, while holding all other variables constant.

To execute this calculation, "AAA MEASURES" table was created to maintain organizational clarity for all metrics. For the complete DAX formulas, please refer to Appendix 7. Naming it with 3 A's was done on purpose to have it appearing on top of the tables list.

The goal of the projection dashboard is to let 24Seven estimate sales if they were to open a store in Ottawa. The user can regulate the discount and demand rates and they can see the changes on sales projections.

The projection dashboard has toggles to select date range and zoom in/out of the x and y axis on the line chart. A clear all filter button is places on the top right-hand side as a user-friendly design to clear all filters that are applied on the page. A refreshed-on date and time is shown to ensure the user when the data was refreshed.

Dashboard Insights

Store Selection

To select 24Seven's 11th store the following criteria was applied:

- Top 4 by registered customers by province
- At least in Top 3 city within the province
- Top 4 by population
- Above average household income and net savings
- High traffic area

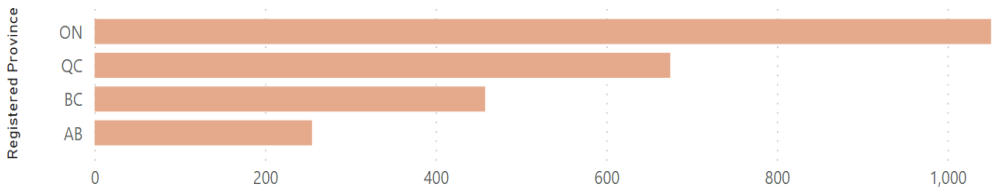

Figure 1: Number of registered customers by province

Provinces with the highest number of registrants are Ontario, Quebec, British Columbia, and Alberta. Opening in a city where there is awareness and registered users can increase 24Seven's sales. Within these provinces, cities with the highest number of registered customers are: Etobicoke ON, North York ON, Ottawa ON, Montreal QC (second store), Surrey BC, Calgary AB (second store), and Edmonton AB.

Comparing the population size by city, Montreal, North York, Calgary and Ottawa rank higher.

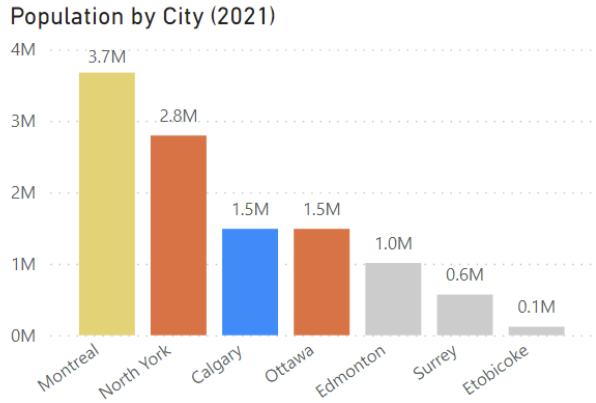

Figure 2: Population Size by Shortlisted City

After assessing the potential market size, one can gauge the affluence of these cities by examining their household income and net savings. Generally, individuals with higher disposable incomes are inclined to spend more freely and exhibit less sensitivity to prices. Notably, Ontario has consistently boasted the highest income levels since 2018, as illustrated below.

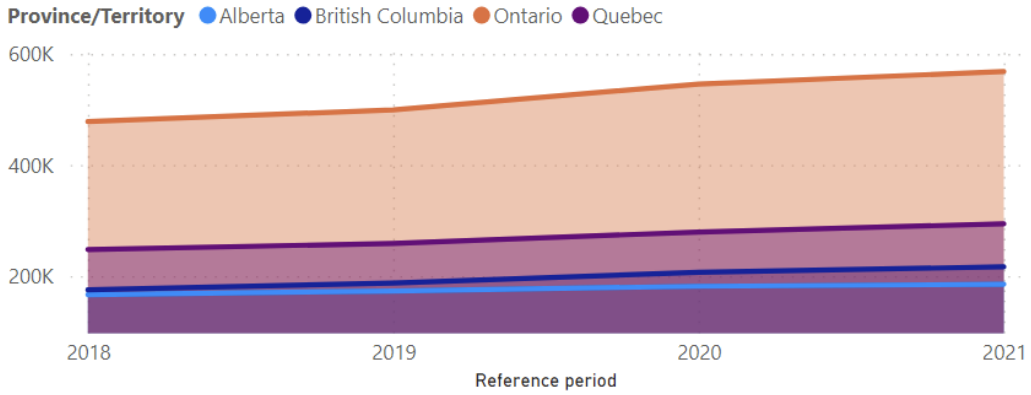

Figure 3: Household Disposable Income by Year

Ontario has the highest household income and net savings across Canada. household income for Ontarians is $568,268 on average and net savings is $70,646 on average (Statistics Canada, 2023).

From the cities still under consideration in this phase—Montreal, Ottawa, and North York—the ultimate choice is Ottawa. This decision is based on several factors: Ottawa is a new market for 24Seven, and as the capital

city of Canada, it offers unique opportunities for brand expansion, and Ottawa's population grew by 8.5% from 2016 to 2020 (Statistics Canada, 2023). Therefore, Ottawa emerges as the optimal location for 24Seven to enhance its brand visibility and reach.

Target Audience

The audience 24Seven would target are commuters in high traffic areas in Ottawa. To find the ideal location, parking lots are used to infer traffic. For instance, a postal code address with a high number of parking spaces means that there are more people in the area. Data on parking lots and space availability is available on the City of Ottawa's website; we used python to read the json file and export the coordinates into a csv file.

Parking Address	Postal code	Capacity
110 Laurier Ave.	K1P 1J1	850
141 Clarence St.	K1N 5P9	461
70 Clarence St.	K1N 9B8	289
789 Trim Rd.	K4A 3N3	274
210 Gloucester St.	K2P 2K4	213
2950 Riverside Dr.	K1V 6M8	186
170 Second Ave.	K1S 2H6	146
400 North River Rd.	K1L 8C2	79
234-250 Slater St.	K1P 1C2	65
301 Preston St.	K1R 7R6	62
687 Somerset St. W	K1R 6P3	46
283 Cyr Ave.	K1L 7N6	25
366 Parkdale Ave.	K1Y 1G6	20
574 Bank St.	K1S 3T3	19
422 Slater St.	K1R 5Y9	10

Figure 4: Traffic in Ottawa Dashboard

The Traffic dashboard shows the parking capacity by parking lot in Ottawa. The ArcGIS map shows the parking lots. A table is used to show the address, postal code, and capacity of each parking lot. We then chose a horizontal bar chart to show the Top 5 parking lots by location. The higher the number of parking space, the higher the traffic.

To select the final location by postal code, we went on Google Maps to see the surroundings. Appendix 9 shows pictures of the other candidate locations.

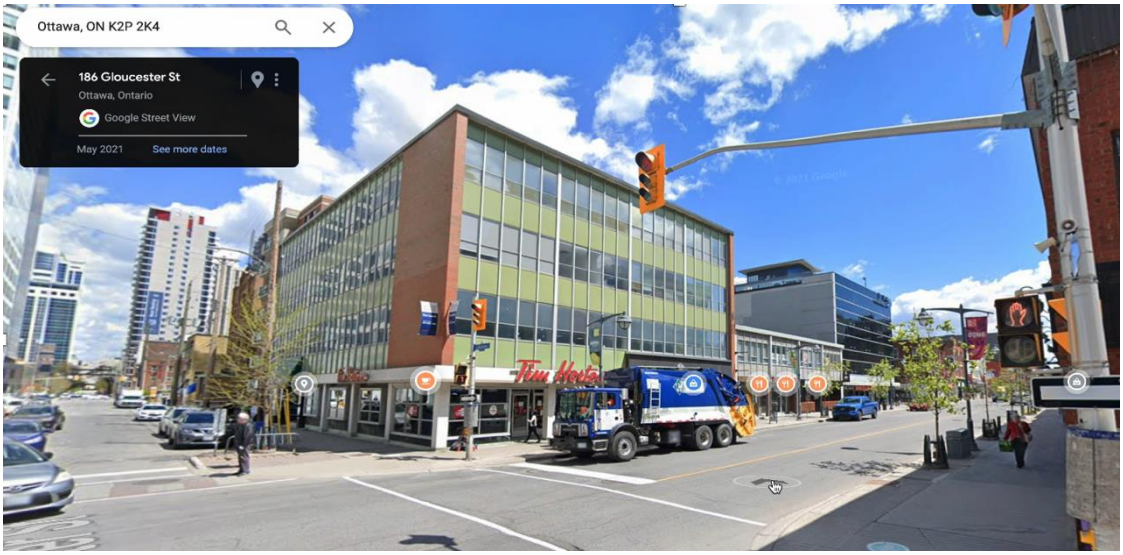

Figure 5: Centretown, in Ottawa ON

The final chosen postal code is K2P 2K4. The respective area is Centretown; target audience in this area range from professionals, tourists, and residents in the area. Centretown, situated near downtown Ottawa, features a bustling network of streets such as Somerset St., Gloucester St., and Kent St., adorned with an array of restaurants and boutiques. Amidst the frequent presence of convenience stores every few blocks, 24Seven can distinguish itself through its sophisticated brand image cultivated by its successful chain establishments across Canada.

Recommendations

1. Brand Differentiation

While exploring Google Maps, we noticed a trend: there's a convenience store roughly every two blocks in Centretown. This prevalence suggests both intense competition and significant demand in the area. Typically, these stores close between 8 and 10 PM, but only Circle K and another smaller convenience store remain open 24/7. This constant availability sets 24Seven apart from the rest. Additionally, with 10 chains spread across Canada, 24Seven enjoys heightened visibility and recognition. Leveraging this widespread presence, 24Seven could position itself as a refined and sophisticated brand within the convenience store market.

2. Segment and Product Category Analysis

Through the utilization of the sales and demographic dashboard, 24Seven can engage in user persona and segmentation analysis. This involves dissecting the data to understand the diverse characteristics and preferences of different customer segments. By identifying distinct user personas and segments based on factors such as age, location, buying behavior, and preferences, 24Seven can tailor its offerings and marketing strategies to cater specifically to each group's needs.

This targeted approach ensures more personalized interactions with customers, leading to increased satisfaction and loyalty. Additionally, by aligning restocking strategies, product placement, and promotional efforts with the unique preferences of each segment, 24Seven can optimize its operations and drive higher sales.

Conclusion

The comprehensive analysis conducted through our visualization project provides invaluable insights for 24Seven as it embarks on the crucial task of selecting the optimal location for its eleventh store. By leveraging a robust combination of sales data, demographic information, territory analysis, and projection modeling, we have equipped 24Seven with the tools necessary to make informed decisions that align with its strategic growth objectives.

Our Power BI dashboard not only illuminates past sales performance but also offers predictive capabilities to anticipate future trends. Through detailed examination of sales dynamics, territory coverage, customer demographics, and projected sales figures, we have outlined a clear pathway for 24Seven to enhance its market position and customer reach.

After careful consideration of various factors including population size, household income, traffic patterns, and competitive landscape, **Ottawa** emerges as the prime location for 24Seven's expansion efforts. As the capital city of Canada with a growing population and diverse demographic profile, Ottawa presents unique opportunities for brand visibility and market penetration.

To ensure success in this new venture, we recommend that 24Seven focuses on brand differentiation and targeted marketing strategies. By positioning itself as a refined and sophisticated brand within the convenience store market and tailoring its offerings to meet the specific needs of different customer segments, 24Seven can drive customer engagement, satisfaction, and loyalty.

In conclusion, our visualization project provides 24Seven with actionable insights to guide its strategic decision-making process, laying the foundation for sustainable growth and success in the dynamic retail sector of Canada.

References

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Appendices

Appendix 1. *KPI Development and Visualization Selection Process*

This appendix documents the strategic development of KPIs and the selection of visualization techniques that were instrumental in constructing the Power BI dashboard for 24Seven. The KPIs and visualizations were deliberately chosen to align with the company's strategic goals of enhancing targeted marketing, penetrating a new market, and forecasting sales performance of the 11th store. Below is an overview of the considered* KPIs and visualizations related to the three principal objectives:

- **GOAL 1 KPIs:** Customer Segmentation, Purchase Frequency, Average Transaction Value, Sales Performance by Product Category, Location Analysis, etc.
- **GOAL 2 KPIs:** New Customer Acquisition Rate, Regional Sales Performance, etc.
- **GOAL 3 KPIs:** Predicted Sales Revenue, Trend Analysis, Expected Customer Conversion Rate, etc.

Each KPI was examined for its alignment with business objectives, data availability, and relevance to decision-making processes. The KPIs that made it to the final dashboard were those that provided the most significant insights into sales performance, customer behavior, and market expansion opportunities.

Note: For a detailed understanding of the implemented KPIs and their corresponding visualizations, please refer to our final dashboard.

Appendix 2. *Dashboard Development Framework for Strategic Sales and Marketing Insights*

Functional Requirements Document (Affordance) The FRD will serve as a guide for the dashboard development process, ensuring alignment with the company's strategic goals and user requirements.	
Dashboard's Purpose	The goal is to create a dynamic and interactive dashboard that provides insights into the best location for a new 24Seven store, leveraging historical sales, customer demographics, product categories, and store geographic data.
Stakeholder Analysis	Key stakeholders include 24Seven's business strategy team, store executives, and frontline decision-makers who will utilize the dashboard to drive expansion efforts.
Data Requirements	Harness historical sales records, customer demographics, product categories, and store locations, along with external datasets like census data, economic indicators, and foot traffic information.
Functional Requirements (UCs)	• Data integration - automated ingestion and transformation of data sources • Visualizations - interactive charts, maps, and tables to visualize sales trends, demographic profiles, and geographic distribution. • Dashboard interactivity - enable users to filter, sort, and drill down into data for nuanced analysis. • Design & layout - to ensure the dashboard is user-friendly, with a logical flow and a focus on the most impactful data visualizations.
Acceptance Criteria	Dashboard load times should not exceed 10 seconds for initial load and 5 seconds for data refresh or filtering actions, ensuring a smooth user experience even with large datasets. Performance benchmarks can be established using Power BI's performance analyzer tool.
Assumptions	Underlying assumptions, such as the availability and reliability of data sources, and dependencies that could impact dashboard functionality, are documented.

Appendix 3. *Comprehensive Data Dictionary (Internal Data)*

Customers

Variable	Description	Data Type
Age	Customer age	Whole number
Age Bin	Age bracket of the customer	Text
Customer Key	Unique identifier of each customer	Whole number
First Name	Customer's name	Text
Gender	Customer's gender	Text
Last name	Customer's last name	Text
Postal Code	Postal code of where the customer registered	Text
Registered City	City where the customer registered	Text
Registered Province	Province abbreviation of where the customer registered	Text

Historical Sales

Variable	Description	Data Type
Sale date	Year, month, and day the sale was executed	Date
Customer Key	Unique identifier of each customer	Whole number
Store Key	Unique identifier of each store	Whole number
Product Category Key	Unique identifier of each product category	Whole number
Total Amount	Dollar amount spent	Currency

Product Category

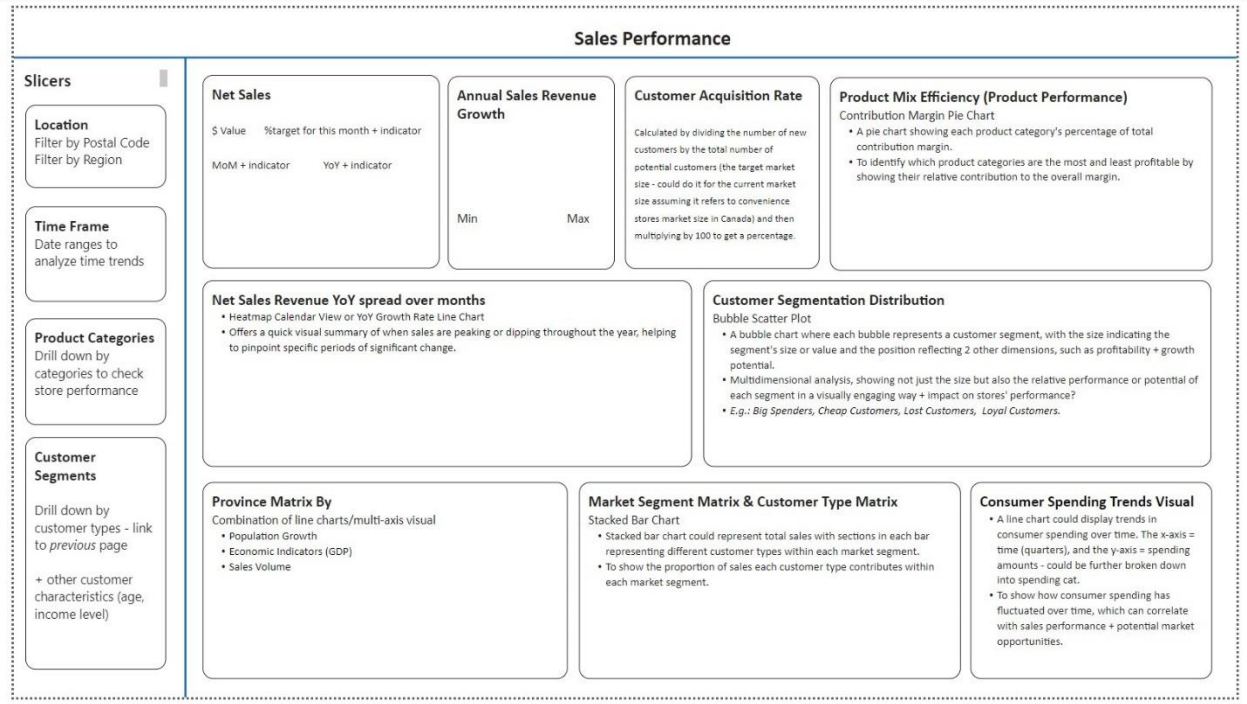
Variable	Description	Data Type
Product Category Key	Unique identifier of each product category	Whole number
Product Category	Name of Product Category	Text

Stores

Variable	Description	Data Type
Store Key	Unique identifier of each store	Whole number
StoreName	City where the store is in	Whole number
Postal Code	Postal code of where the customer registered	Text

Appendix 4. *Some Dashboard Wireframes*

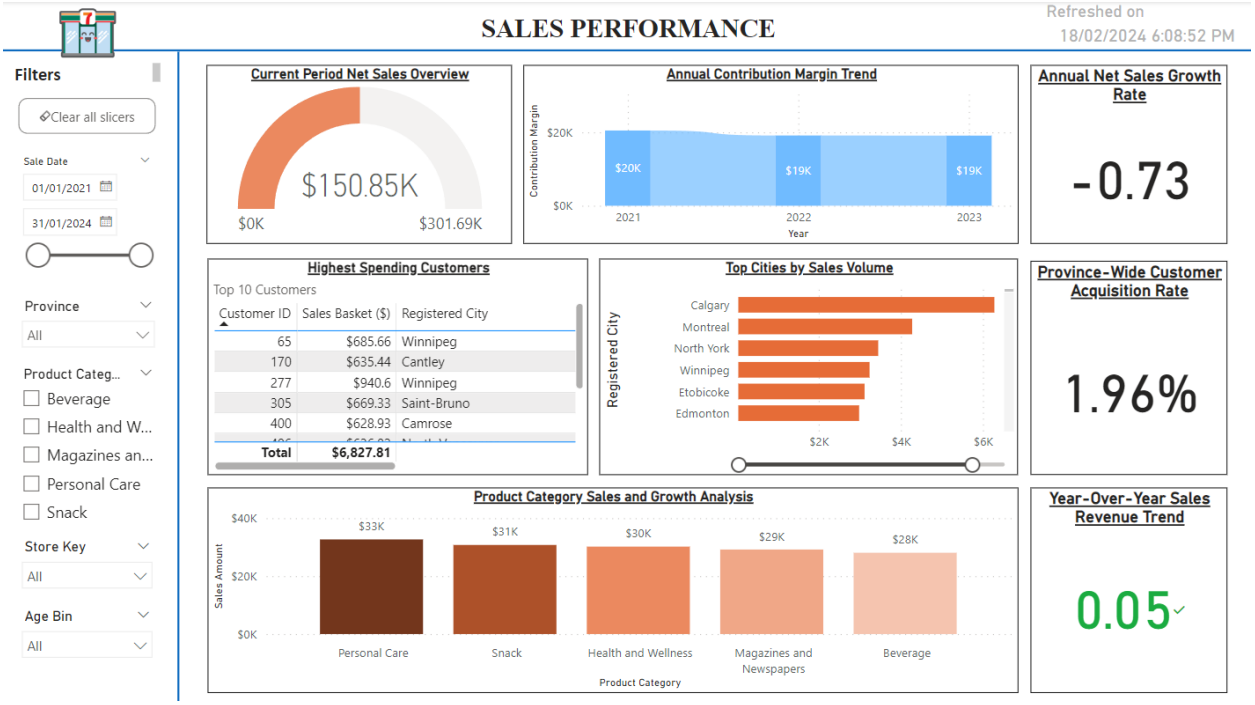
Appendix 4.1. *Preliminary Design of the Sales Performance Dashboard Page*



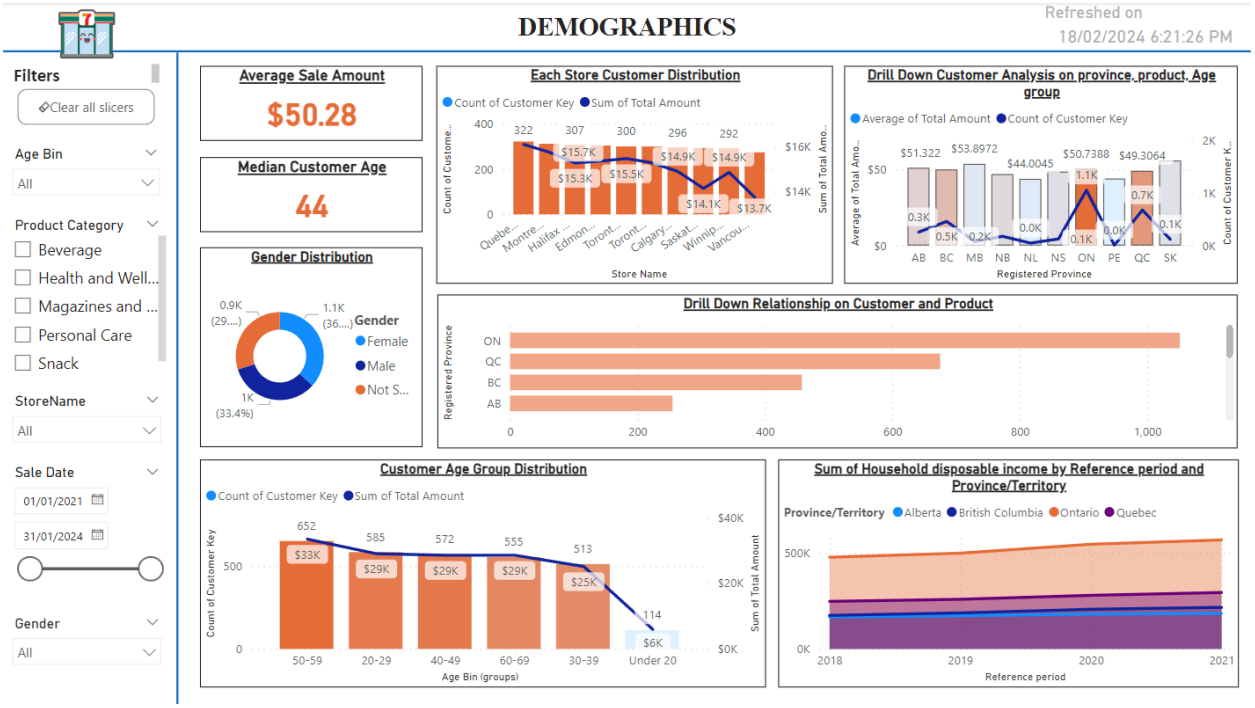
Included here is the initial wireframe for the Sales Performance dashboard page, which played a pivotal role in the design thinking process for the creation of the final dashboard. This preliminary sketch serves illustrative purposes only, documenting the evolution of our dashboard design. It is important to note that the final dashboard layout differs from this early version, as it underwent multiple iterations to refine and enhance the data visualizations and interactivity based on stakeholder feedback and user testing. Each iteration brought us closer to a dashboard that not only meets but exceeds the analytical needs of 24Seven, ensuring a robust platform for data-driven decision-making.

Appendix 5. Overview of Final Dashboard – Report View

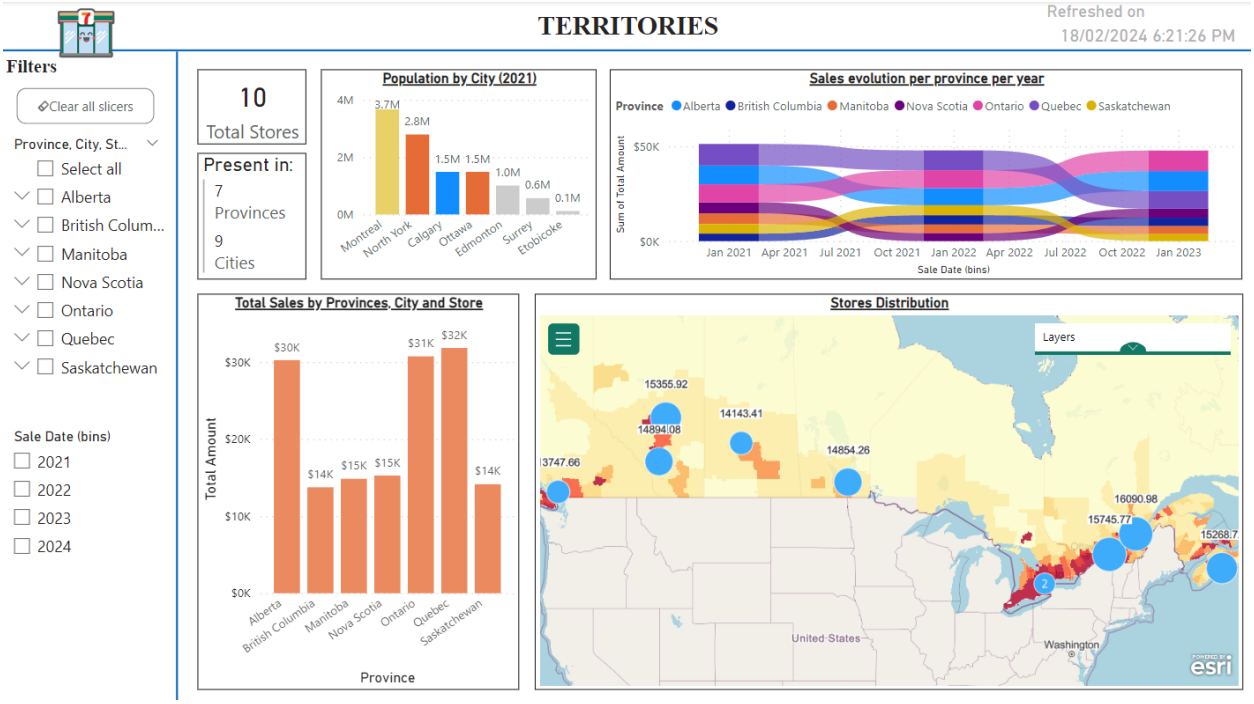
Page 1: Sales Performance



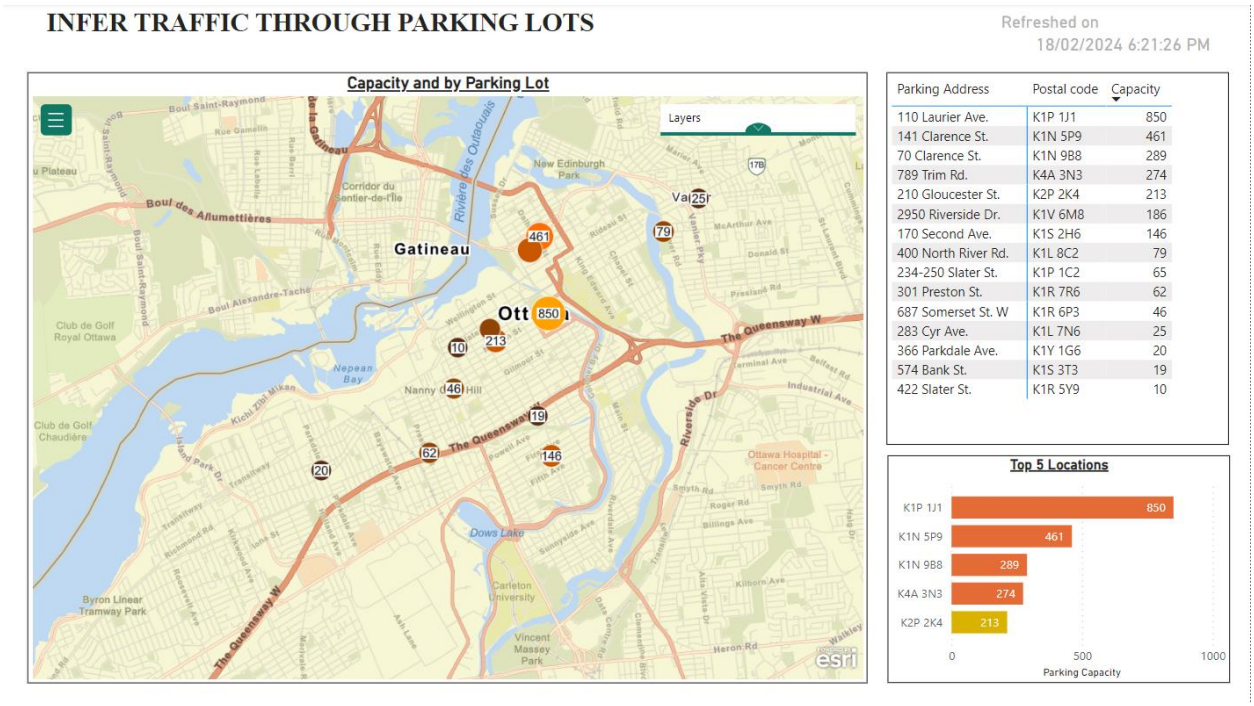
Page 2: Demographics



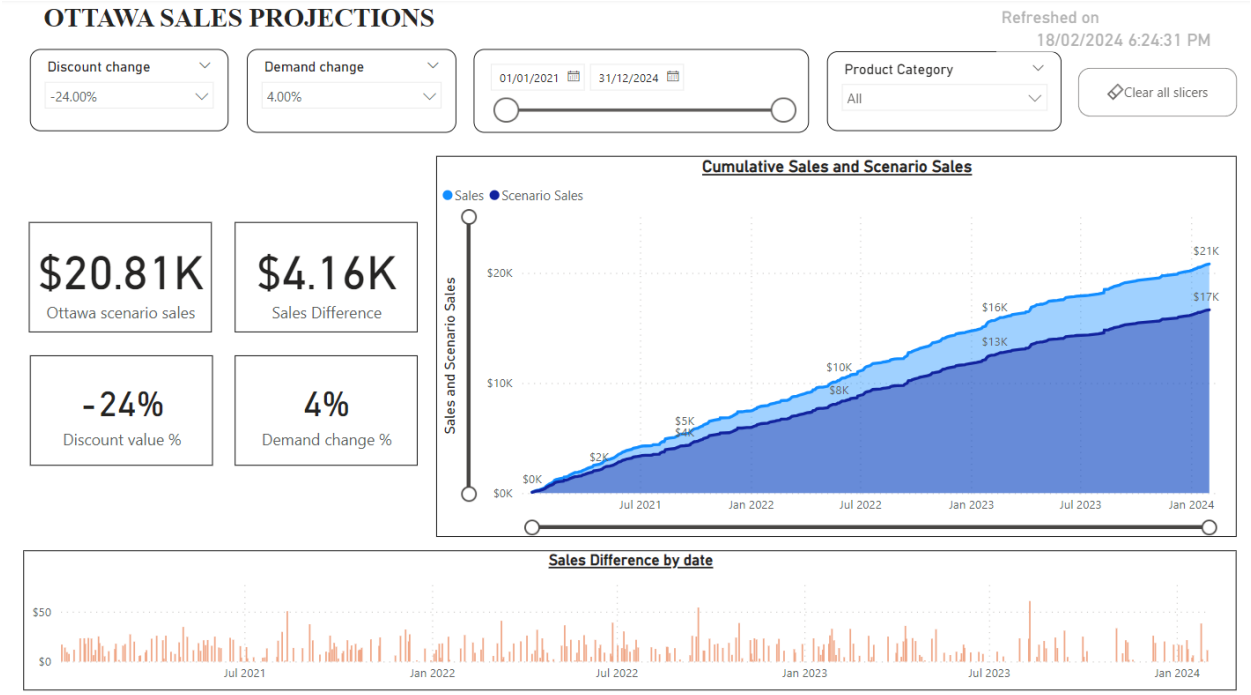
Page 3: Territories



Page 4: Traffic



Page 5: Sales Projections



Appendix 6. Preprocessing Steps

Appendix 6.1. Preprocessing Steps for Internal Data Tables

"Customers" Table

---

1. Removed duplicates. Shape changed from (11, 500) to (11, 499)
2. Deleted columns: "Registered City", "Phone", "Email" because they do not contain information
3. Replaced values in Gender column. Replaced M, F, and "Not specified" with "Male", "Female" respectively
4. Changed Age to whole number
5. In DAX, created new column called "Age Bin" to group customers in 10 years old age bins

```
Age Bin = IF(
    Customers[Age] < 20, "Under 20",
    IF(
        Customers[Age] < 30, "20-29",
        IF(
            Customers[Age] < 40, "30-39",
            IF(
                Customers[Age] < 50, "40-49",
                IF(
                    Customers[Age] < 60, "50-59",
                    IF(
                        Customers[Age] < 70, "60-69",
                        IF(
                            Customers[Age] < 80, "70-79",
                            IF(
                                Customers[Age] < 90, "80-89",
                                IF(
                                    Customers[Age] < 100, "90-99",
                                    IF(
                                        Customers[Age] <= 120, "100-120",
                                        "Invalid Age Range"
                                    )
                                )
                            )
                        )
                    )
                )
            )
        )
    )
)
```

6. Trimmed “Postal Code” to match format in *Stores* table

“Historical Sales” Table

---

1. In Table View, Displayed “Total Amount” as $ value

“Stores” Table

---

1. Deleted “Address” because it contains no information
2. Trimmed “PostalCode” to remove trailing blank space

Appendix 6.2. Preprocessing Steps for External Data Tables

- AVERAGE EXPENDITURE PER HOUSEHOLD.csv [Access Link]
  - There is no standard for the size of the household. Larger families tend to have higher expenditure.

- PROVINCE ABBREVIATIONS.csv
  - Use first row as headers
  - Connect with tables containing full province names, like TAX RATE

POPULATION BY PROVINCE (2021 Q1 - 2023 Q4).csv [Access Link]
  - Connected "GEO" to "Province/Territory" in the abbreviations table
  - Renamed "GEO" as "Province/Territory" for consistency

- HOUSEHOLD INCOME AND NET SAVINGS.csv [Access Link]

Period is from 2018-2021 (2022 and later was not available)
  - Removed empty rows
  - Removed top 5 rows containing metadata
  - Removed bottom 4 rows containing footnotes
  - Promoted first row as headers
  - Changed column name from "Geography" to "Province/Territory" matching other columns

- parking_lots_clean.csv [Access Link]
  - Parking Data in Ottawa to infer traffic level
  - Changed data types for latitude and longitude

- POPULATION_SHORTLISTED.csv [Access Link]
  - Within bar chart, apply filter to only select "feature" containing "Population in 2021"

- MONTREAL SALES FOR SCALING.csv
  - Used table to get historical sales
  - Applied filter to only show Montreal sales
  - Exported table
  - Imported table
  - Renamed "Amount" to "Montreal Amount"
  - Created "Ottawa scenario amount"

```
Ottawa scenario amount = (0.4*'MONTREAL
SALES FOR SCALING'[Montreal Amount] *
[OTTAWA_MONTREAL_POPULATION_RATIO]) + (0.6*
'MONTREAL SALES FOR SCALING'[Montreal
Amount] *[OTTAWA_MONTREAL_INCOME_RATIO])
```

Sales Performance page

Net Sales

```
Net Sales = SUM('Historical Sales'[Total Amount])
```

Description: *The 'Net Sales' metric represents the total revenue generated from all transactions recorded in the 'Historical Sales' dataset. This measure aggregates the 'Total Amount' column, which contains the sales figures for each transaction, to provide a comprehensive sum. It serves as a foundational figure from which various other analyses and comparisons can be drawn, offering a snapshot of the company's sales performance over the entire data set. It is a crucial indicator of overall business health and is typically used as a baseline metric in sales trend analyses and performance dashboards.*

MoM Growth (Month-over-Month Growth):

```
MoM Growth =
VAR CurrentMonthSales = CALCULATE([Net Sales], DATESMTD('Historical Sales'[Sale Date]))
VAR PreviousMonthSales = CALCULATE([Net Sales], DATEADD(DATESMTD('Historical Sales'[Sale Date]), -1,
MONTH))
RETURN
IF(
    NOT ISBLANK(CurrentMonthSales),
    (CurrentMonthSales - PreviousMonthSales) / PreviousMonthSales,
    BLANK()
)
```

Description: *The 'MoM Growth' metric calculates the percentage change in 'Net Sales' from the previous month to the current month. This is achieved by first determining the current month's sales and then calculating the sales for the preceding month. The growth rate is expressed as a percentage, providing a quick indicator of short-term sales trends and monthly performance fluctuations. It is particularly useful for detecting seasonal patterns or the impact of marketing campaigns and other monthly events on sales.*

YoY Growth (Year-over-Year Growth):

```
YoY Growth =
VAR CurrentYearSales = CALCULATE([Net Sales], DATESYTD('Historical Sales'[Sale Date]))
VAR PreviousYearSales = CALCULATE([Net Sales], DATEADD(DATESYTD('Historical Sales'[Sale Date]), -1, YEAR))
RETURN
IF(
    NOT ISBLANK(CurrentYearSales),
    (CurrentYearSales - PreviousYearSales) / PreviousYearSales,
    BLANK()
```

```
)
```

Description: *The 'YoY Growth' metric is designed to measure the growth of 'Net Sales' over the same period in the previous year. By comparing the total sales from the start of the current year to the same date, against the total sales for the equivalent period in the previous year, this metric provides a percentage that highlights year-over-year growth. This long-term growth indicator is crucial for understanding overall business trajectory and for making year-to-year strategic comparisons and planning.*

Annual Sales Revenue Growth

```
Annual Sales Revenue Growth =
VAR MaxDate = MAX('Historical Sales'[Sale Date])
VAR MinDate = MIN('Historical Sales'[Sale Date])
RETURN
DIVIDE(
    CALCULATE([Net Sales], FILTER(ALL('Historical Sales'[Sale Date]), 'Historical Sales'[Sale Date] =
MaxDate)) -
    CALCULATE([Net Sales], FILTER(ALL('Historical Sales'[Sale Date]), 'Historical Sales'[Sale Date] =
MinDate)),
    CALCULATE([Net Sales], FILTER(ALL('Historical Sales'[Sale Date]), 'Historical Sales'[Sale Date] =
MinDate))
)
```

Description: *The 'Annual Sales Revenue Growth' measure evaluates the growth in net sales from the earliest to the latest date in the 'Historical Sales' dataset. By determining the net sales at the start and end of the available data range, this metric reflects the overall increase or decrease in revenue during the entire period captured in the dataset. It is a vital indicator of the business's progression over time and is often used to assess the effectiveness of long-term sales strategies and business development efforts.*

Total Potential Customers by Province

```
Total Potential Customers by Province =
SUMX(
    VALUES('POPULATION'[GEO]), // Unique list of provinces
    CALCULATE(
        MAX('POPULATION'[POPULATION]), // Assuming we take the most recent population figure per province
        LASTDATE('POPULATION'[REF_DATE]) // The most recent date for the population data
    ) * SWITCH(
        TRUE(),
        'POPULATION'[GEO] = "Ontario", 0.07, // Assuming 7% for Ontario
        'POPULATION'[GEO] = "Quebec", 0.065, // Assuming 6.5% for Quebec
        'POPULATION'[GEO] = "British Columbia", 0.06, // BC
        'POPULATION'[GEO] = "Alberta", 0.055, // Alberta
        'POPULATION'[GEO] = "Manitoba", 0.05, // Manitoba
        'POPULATION'[GEO] = "Saskatchewan", 0.05, // Saskatchewan
        'POPULATION'[GEO] = "Nova Scotia", 0.05, // Nova Scotia
        'POPULATION'[GEO] = "New Brunswick", 0.045, // New Brunswick
        'POPULATION'[GEO] = "Newfoundland and Labrador", 0.045, // Newfoundland and Labrador
        'POPULATION'[GEO] = "Prince Edward Island", 0.04, // Prince Edward Island
        'POPULATION'[GEO] = "Northwest Territories", 0.035, // Northwest Territories
```

```
        'POPULATION'[GEO] = "Yukon", 0.035, // Yukon
        'POPULATION'[GEO] = "Nunavut", 0.035, // Nunavut
        0.04 // Default for any other or unspecified province
    )
)
```

Description: *This measure estimates the total number of potential customers in each Canadian province by applying specific percentages to the latest available population figures, reflecting varying market penetrations. For example, 7% of Ontario's population is considered potential customers, acknowledging the province's high urbanization and economic activity. This measure allows for a targeted analysis of market size and is pivotal for strategic planning in customer acquisition campaigns.*

Customer Acquisition Rate by Province

```
Customer Acquisition Rate by Province =
CALCULATE(
    DIVIDE(
        DISTINCTCOUNT('Customers'[Customer Key]),
        [Total Potential Customers by Province],
        0
    ) * 100,
    ALL('Customers')
)
```

Description: *The 'Customer Acquisition Rate by Province' is a critical measure that represents the ratio of acquired customers to the estimated total market potential within each province. It multiplies the distinct count of customers by 100 to express this ratio as a percentage, providing a clear benchmark of the company's market penetration and the effectiveness of its customer acquisition strategies at the provincial level.*

Product Mix Efficiency:

```
Product Mix Efficiency =
CALCULATE(
    SUM('Historical Sales'[Total Amount]),
    ALL('Product Category')
) / SUM('Historical Sales'[Total Amount])
```

Description: *The 'Product Mix Efficiency' metric evaluates the relative contribution of each product category to the total sales volume. By calculating the total sales amount for each category and dividing it by the total sales amount across all categories, this measure provides insight into which categories are performing best. It helps in understanding the sales distribution across different product lines, facilitating strategic decisions regarding product focus and inventory management.*

Contribution Margin

```
Contribution Margin =
SUM('Historical Sales'[Total Amount]) * (1 - 0.60)
```

1. Used the 'Income & Savings' data to determine an average profit margin for the industry or for similar products.
2. Estimated the average profit margin – assuming the cost is 60% of the selling price.
3. Calculated the contribution margin for each product by subtracting the estimated cost from the selling price.

Description: *The 'Contribution Margin' metric is derived by applying an assumed cost percentage (in this case, 60%) to the total sales amount, effectively estimating the profit contribution of sales before fixed costs. This approach uses industry or similar product data to infer an average profit margin, where the cost is presumed to be 60% of the selling price. The resulting figure represents the margin that contributes towards covering fixed expenses and generating profit, crucial for assessing product profitability and guiding pricing strategies.*

Average Transaction Value

```
Average Transaction Value =
AVERAGEX(
    'Historical Sales',
    'Historical Sales'[Total Amount]
)
```

Description: *The 'Average Transaction Value' metric quantifies the mean sales amount per transaction across all sales recorded in the 'Historical Sales' dataset. This calculation is performed by taking the average of the 'Total Amount' field for each sale, providing a straightforward measure of how much, on average, customers spend per purchase. This insight is invaluable for understanding spending behavior, optimizing product pricing strategies, and identifying opportunities to increase sales through upselling or cross-selling.*

Additional Metrics Considered but Not Implemented:

Net Sales Before Tax =

```
SUM('Historical Sales'[Total Amount]) / (1 + RELATED('TAX RATE'[Tax Rate]))
```

Purchasing Power Adjusted Sales =

```
CALCULATE(
    [Net Sales],
    FILTER(
        ALL('Income & Savings'),
        RELATED('Stores'[PostalCode]) = 'Income & Savings'[PostalCode]
    )
) * RELATED('Income & Savings'[Average Income + Savings])
```

Considering: Average Income + Savings

```
Average Income + Savings =
AVERAGEX(
    'Income & Savings',
    'Income & Savings'[Household Disposable Income] + 'Income & Savings'[Household Net Saving]
)
```

"AAA MEASURES" table

---

1. Created Ottawa Population measure "OTTAWA_POPULATION_21"

```
OTTAWA_POPULATION_21 =
CALCULATE (
    VALUES ( POPULATION_SHORTLISTED[Population] ),
    FILTER (
        POPULATION_SHORTLISTED,
        POPULATION_SHORTLISTED[Feature] = "Population, 2021"
            && POPULATION_SHORTLISTED[City] = "Ottawa"
    )
)
```

2. Created Montreal Population measure "MONTREAL_POPULATION_21"

```
MONTREAL_POPULATION_21 =
CALCULATE (
    VALUES ( POPULATION_SHORTLISTED[Population] ),
    FILTER (
        POPULATION_SHORTLISTED,
        POPULATION_SHORTLISTED[Feature] = "Population, 2021"
            && POPULATION_SHORTLISTED[City] = "Montreal"
    )
)
```

3. Created new measure called "OTTAWA_MONTREAL_POPULATION_RATIO" by dividing Ottawa to Montreal population

```
OTTAWA_MONTREAL_POPULATION_RATIO = [OTTAWA_POPULATION_21]/[MONTREAL_POPULATION_21]
```

4. Created measure called "OTTAWA_INCOME_21" to get the household income of Ontario in 2021

```
OTTAWA_INCOME_21 =
CALCULATE (
    VALUES ( 'HOUSEHOLD INCOME AND NET SAVINGS'[Household disposable income]),
    FILTER (
```

```
        'HOUSEHOLD INCOME AND NET SAVINGS', 'HOUSEHOLD INCOME AND NET SAVINGS'[Province/Territory] =
"Ontario"
        && 'HOUSEHOLD INCOME AND NET SAVINGS'[Reference period] = 2021
    )
)
```

5. Created measure called “MONTREAL_INCOME_21” to get the household income of Quebec in 2021

```
MONTREAL_INCOME_21 =
CALCULATE (
    VALUES ( 'HOUSEHOLD INCOME AND NET SAVINGS'[Household disposable income]),
    FILTER (
        'HOUSEHOLD INCOME AND NET SAVINGS', 'HOUSEHOLD INCOME AND NET SAVINGS'[Province/Territory] =
"Quebec"
        && 'HOUSEHOLD INCOME AND NET SAVINGS'[Reference period] = 2021
    )
)
```

6. Created new measure called “OTTAWA_MONTREAL_INCOME_RATIO” by dividing Ottawa to Montreal population

```
OTTAWA_MONTREAL_INCOME_RATIO = [OTTAWA_INCOME_21]/[MONTREAL_INCOME_21]
```

7. Created “OTTAWA_SCENARIO_TOTAL_SALES” by summing Ottawa’s scenario sales from the Montreal sales table

```
OTTAWA_SCENARIO_TOTAL_SALES = SUM('MONTREAL SALES FOR SCALING'[Ottawa scenario amount])
```

8. Created “CUMULATIVE_OTTAWA_SCENARIO_SALES” by adding the sales by each date in the Montreal sales table

```
CUMULATIVE_OTTAWA_SCENARIO_SALES =
CALCULATE(
    [OTTAWA SCENARIO TOTAL SALES],
    FILTER(
        ALLSELECTED( 'MONTREAL SALES FOR SCALING' ),
        'MONTREAL SALES FOR SCALING'[Sale Date] <= MAX( 'MONTREAL SALES FOR SCALING'[Sale Date] )
    )
)
```

9. Created “ADJUSTED_OTTAWA_SCENARIO_TOTAL_SALES”

```
ADJUSTED_OTTAWA_SCENARIO_TOTAL_SALES =
SUMX (
    'MONTREAL SALES FOR SCALING',
    (
        'MONTREAL SALES FOR SCALING'[Ottawa scenario amount] +
        'MONTREAL SALES FOR SCALING'[Ottawa scenario amount] * [Discount value %] +
        'MONTREAL SALES FOR SCALING'[Ottawa scenario amount] * 'Demand change'[Demand change %]
    )
```

```
)
```

10. Created “CUMULATIVE_ADJUSTED_OTTAWA_SCENARIO_SALES” by adding the sales by each date in the Montreal sales table

```
CUMULATIVE_ADJUSTED_OTTAWA_SCENARIO_SALES =
CALCULATE(
    [ADJUSTED_OTTAWA_SCENARIO_TOTAL_SALES],
    FILTER(
        ALLSELECTED( 'MONTREAL SALES FOR SCALING' ),
        'MONTREAL SALES FOR SCALING'[Sale Date] <= MAX( 'MONTREAL SALES FOR SCALING'[Sale Date] )
    )
)
```

11. Created “REFRESHER” to show data refresh time

```
REFRESHER = NOW()
```

“CALENDAR” table

---

1. Used AUTOCALENDAR() to generate a calendar to use as slicer
2. Connected “Date” to “Sales Date” in MONTREAL SALES FOR SCALING table for slicer to be responsive

---

“Demand change” table

---

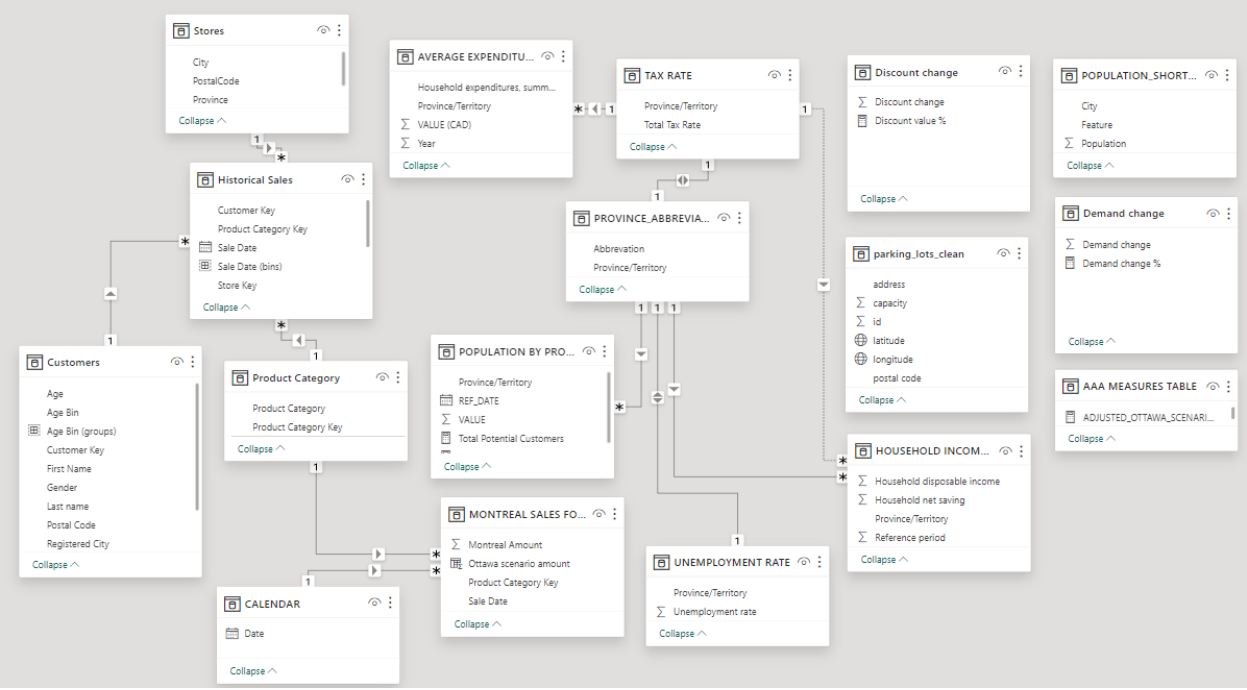
1. Created an empty table
2. Created a new column with series from -30% to 70%, with steps of 2%
3. Applied percentage to column

“Discount change” table

---

1. Created an empty table
2. Created a new column with series from -30% to 0, with steps of 2%
3. Applied percentage to column

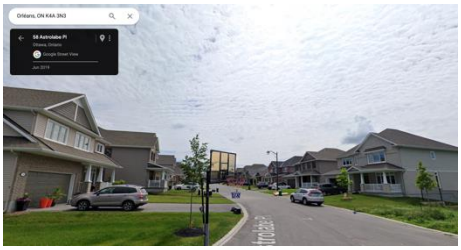
Appendix 8. *Overview of Final Data Model*



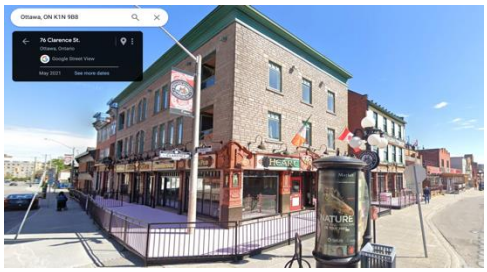
Main Relationships Description:

- Stores to Historical Sales: Each store can have multiple historical sales records, but each historical sale is associated with one store.
- Product Category to Historical Sales: Each product category can include many historical sales, while each historical sale involves one product category.
- Customers to Historical Sales: A customer can be associated with many historical sales, but each historical sale is linked to one customer.
- Customers to Product Category: There is no direct relationship shown between customers and product categories in the data model.
- Calendar to Historical Sales: The calendar appears to be related to historical sales, likely providing a date dimension, where each sale date in historical sales corresponds to a single date in the calendar, but the calendar date can be linked to many sales records.
- Province Abbreviations to Tax Rate: Each province/territory abbreviation is associated with one tax rate entry, suggesting a one-to-one relationship.
- Province/Territory to Population by Province: Each province/territory has one population entry, indicating a one-to-one relationship.
- Province/Territory to Unemployment Rate: Each province/territory has one unemployment rate entry, also indicating a one-to-one relationship.
- Province/Territory to Household Income: Each province/territory is associated with household income data, likely a one-to-one relationship.
- Montreal Sales to Calendar: Sales data for Montreal has a date dimension provided by the calendar, so each sale record is associated with one date, and each date may have many sales records.
- Parking Lots to Demand Change: There is no direct relationship shown between parking lots and demand change in the data model.

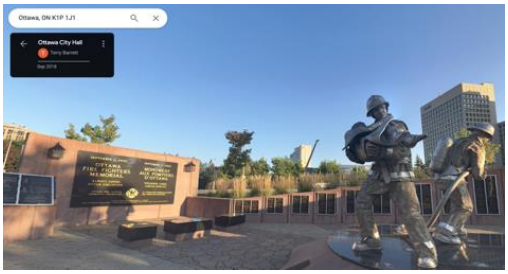
Appendix 9. *Google Maps Results for Locations in Ottawa*



K4A 3N3 (rank 4th) and K1N 5P9 (rank 2nd) are residential district, therefore they are not suitable for convenience stores.



K1N 9B8 (rank 3rd) is near the train station and has walking-friendly streets!



K1P 1J1 (rank 1st) has the City Hall