Business Intelligence Project

Power BI Project: Auto Insurance Analysis

Dataset Information:

United State Auto Insurance survey data is collected from Kaggle.com.

Data Source Link: https://www.kaggle.com/code/madhushreesannigrahi/jenks-natural-breaks-and-k-means-clustering/input

Summary:

In my project, I conducted a comprehensive analysis of customer tenure within the auto insurance industry using 12 months of survey data sourced from Kaggle.com. The aim was to identify the key factors influencing customer tenure over multiple years. Using Power BI Desktop, I created an in-depth dashboard report based on the provided dataset. This involved loading the datasets, performing essential data cleaning and transformation tasks, and leveraging Power BI DAX to generate necessary tables and metrics.

I built a strong data model by establishing relationships based on key attributes, facilitating insightful analysis. Multiple report pages (dashboards) were designed to visualize key performance indicators (KPIs), with varied formatting options applied for enhanced clarity and aesthetics. After completion, the report was published to Power BI services and configured for auto-refresh to ensure the data remains current. A dashboard was then created in Power BI services based on the published report, providing users with an intuitive and interactive interface for exploring insights derived from the data.

My findings provide valuable strategic insights for auto insurance companies seeking to enhance customer loyalty and optimize their business strategies.

Load Data to PowerBi:

The project kicked off with the crucial step of loading the dataset into Power BI Desktop. I promptly addressed any null values and standardized data types across columns, ensuring dataintegrity and consistency. This initial data cleaning process set the stage for my subsequent analysis and dashboard creation, enabling me to derive meaningful insights with confidence.

Customer	State	Customer Lifetime Value	Response	Coverage	Education	Effective To Date	EmploymentStatus	Gender	Income	Location Code	Marital Status
TE34064	California	2168.523464	No	Basic	High School or Below	20 June 2001	Unemployed	M	0	Suburban	Single
NI117718	California	2150.178588	No	Basic	High School or Below	20 September 2002	Unemployed	F	0	Suburban	Single
JK32620	Nevada	2224.768	No	Basic	College	20 January 2022	Unemployed	M	0	Suburban	Single
QZ42725	Washington	2310.882998	No	Basic	Bachelor	20 January 2001	Unemployed	F	0	Suburban	Single
GB33195	Washington	2275.363967	No	Basic	High School or Below	20 December 2001	Unemployed	M	0	Suburban	Single
WL65572	California	2064.458781	No	Basic	College	20 August 2001	Unemployed	M	0	Suburban	Single
GT38956	California	2441.394244	No	Basic	College	20 February 2013	Unemployed	F	0	Suburban	Married
ZO83562	Nevada	2379.741171	No	Basic	Bachelor	20 June 2002	Unemployed	F	0	Suburban	Single
OE19087	California	2243.473907	No	Basic	High School or Below	20 February 2024	Unemployed	F	0	Suburban	Single
LY97989	Oregon	2894.243869	No	Extended	Bachelor	20 February 2017	Unemployed	F	0	Suburban	Single
GG68407	Washington	2321.88367	No	Basic	High School or Below	20 February 2022	Unemployed	F	0	Suburban	Single
LE43061	California	3728.83013	No	Premium	High School or Below	20 February 2020	Unemployed	M	0	Suburban	Single
HM20544	Washington	2175.740021	No	Basic	College	20 May 2002	Unemployed	F	0	Suburban	Single
XR97812	California	2345.084479	No	Basic	College	20 February 2022	Unemployed	M	0	Suburban	Single
UW98698	California	2269.841123	No	Basic	College	20 August 2002	Unemployed	M	0	Suburban	Single
CI24326	Oregon	3591.066675	No	Extended	Bachelor	20 January 2023	Unemployed	M	0	Suburban	Married
YL72747	California	2265.318569	No	Basic	High School or Below	20 January 2025	Unemployed	M	0	Suburban	Divorced
WU86174	California	2677.279707	No	Basic	Bachelor	20 February 2024	Unemployed	F	0	Suburban	Married
HE84643	California	2175.624856	No	Basic	High School or Below	20 January 2002	Unemployed	F	0	Suburban	Single
NW41789	Oregon	2746.90319	No	Extended	Bachelor	20 January 2024	Unemployed	M	0	Suburban	Single
HZ62410	Oregon	2771.963072	No	Extended	Bachelor	20 March 2001	Unemployed	M	0	Suburban	Single
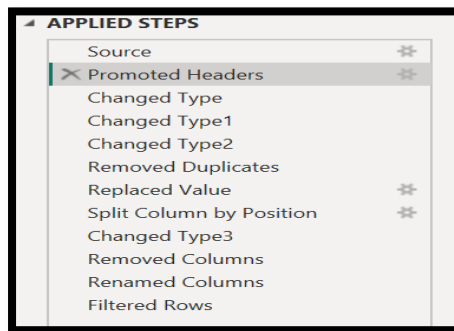
- = Table.TransformColumnTypes(#"Changed Type",{{"Customer Lifetime Value", Currency.Type}, {"Effective To Date", type date}})
- = Table.TransformColumnTypes(#"Changed Type1",{{"Total Claim Amount", Currency.Type}})
- = Table.Distinct(#"Changed Type2", {"Customer"})
- = Table.ReplaceValue(#"Removed Duplicates","Medsize","Medium",Replacer.ReplaceText,{"Vehicle Size"})
- = Table.SplitColumn(#"Replaced Value", "Renew Offer Type", Splitter.SplitTextByPositions({0, 1}, true), {"Renew Offer Type.1", "Renew Offer Type.2"})
- = Table.SelectRows(#"Renamed Columns", each true)

Creating the required table Using Power BI DAX

This Power BI DAX code creates a Date table spanning from January 7, 2001, to December 31, 2031, and augments it with columns for formatted dates, months, years, quarters, and days. The CALENDAR function generates the date range, while ADDCOLUMNS appends new columns to the table. These added columns use various DAX functions like FORMAT, YEAR, and DAY to extract and format date-related information such as month names, years,quarters, and days. This resulting Date table serves as a fundamental component in data modeling for time-based analysis and visualization within Power BI.

```
1  DateTable =
2  VAR MinDate = MIN(AutoInsurance[Effective To Date])
3  VAR MaxDate = MAX(AutoInsurance[Effective To Date])
4  RETURN
5  ADDCOLUMNS(
6      CALENDAR(MinDate, MaxDate),
7      "Month", FORMAT([Date], "MMM"),
8      "Year", YEAR([Date]),
9      "Quarter", "Q" & FORMAT([Date], "Q"),
10     "Day", DAY([Date])
11  )
```

Date	Month	Year	Quarter	Day
2001-07-01 12:00:00 AM	Jul	2001	Q3	1
2001-07-02 12:00:00 AM	Jul	2001	Q3	2
2001-07-03 12:00:00 AM	Jul	2001	Q3	3
2001-07-04 12:00:00 AM	Jul	2001	Q3	4
2001-07-05 12:00:00 AM	Jul	2001	Q3	5
2001-07-06 12:00:00 AM	Jul	2001	Q3	6
2001-07-07 12:00:00 AM	Jul	2001	Q3	7
2001-07-08 12:00:00 AM	Jul	2001	Q3	8
2001-07-09 12:00:00 AM	Jul	2001	Q3	9
2001-07-10 12:00:00 AM	Jul	2001	Q3	10
2001-07-11 12:00:00 AM	Jul	2001	Q3	11
2001-07-12 12:00:00 AM	Jul	2001	Q3	12
2001-07-13 12:00:00 AM	Jul	2001	Q3	13

Building the data model and creating the relationship based on the key attribute

I constructed a data model by linking datasets through key attributes in Power BI. This facilitated coherent analysis across tables, ensuring data integrity and enabling insightful visualization in reports and dashboards.
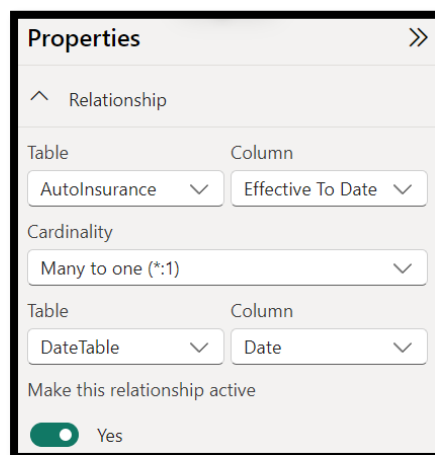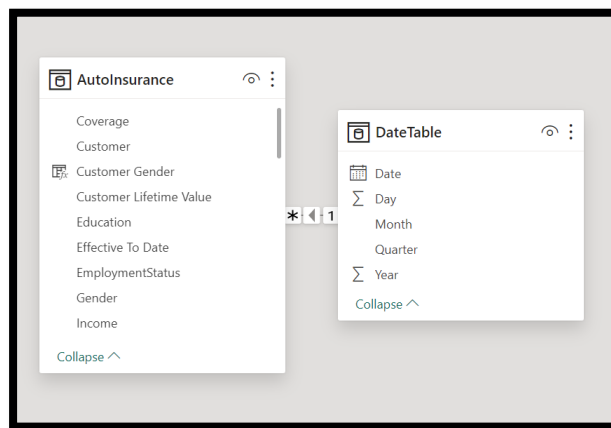
Landing Page:

Navigation Button:

After constructing my data model, I proceeded to enhance user experience by creating a navigation button. This button, integrated into my Power BI report, allows seamless movement between different sections or sheets. By implementing this feature, users can effortlessly explore various aspects of the data, such as transitioning from the landing page to specific sheets like "Insurance by Coverage."
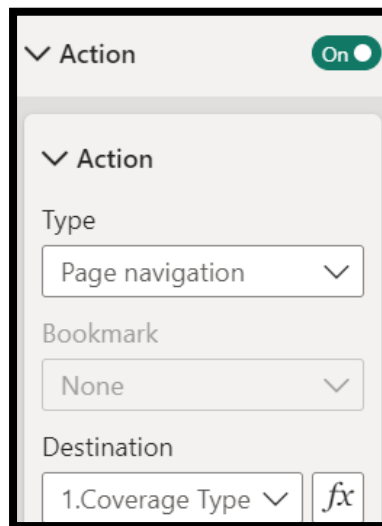
I enhanced my Power BI report by creating navigation buttons for key sections such as "Insurance by Customer Type," "Insurance by Policy Type," "Insurance by Sales Channel," and "Insurance by Vehicle." Each button is designed as a clickable element, seamlessly guiding users to their desired sections within the report. This intuitive navigation design fosters a user-friendly experience, facilitating efficient exploration of various data dimensions.

Insurance By Coverage:
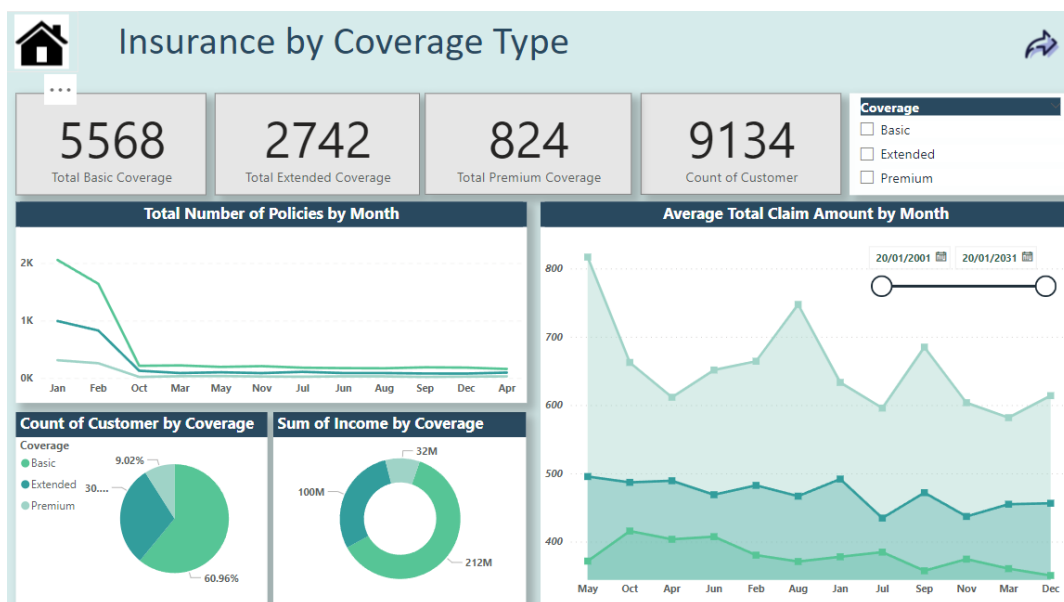
The Power BI sheet provides comprehensive insights into insurance coverage data, with key metrics organized for analysis: Customer coverage is depicted via a pie chart, while average total claim amount over time is illustrated through an area chart, Income total is depicted via donut chart, and line graph specifies Count of Policies by Month, offering insights into distribution and trends respectively.

Key Performance Indicators (KPIs):

-Total Number of Customers: Count of Customer from AutoInsurance table.

- **Total Basic Coverage**: Sum of coverage for basic plans, representing essential protections.

```
= CALCULATE(COUNTROWS('AutoInsurance'), 'AutoInsurance'[Coverage] = "Basic")
```

- **Total Extended Coverage**: Sum of coverage for extended plans, including additionalprotections.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Coverage] = "Extended")
```

- **Total Premium Coverage**: Sum of coverage for premium plans, providing the highest levelof protection.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Coverage] = "Premium")
```

These metrics collectively facilitate informed decision-making by presenting a comprehensive overview of insurance coverage performance and distribution. Power BI's visualization tools enhance data interpretation and analysis.

Insurance By Customer type:
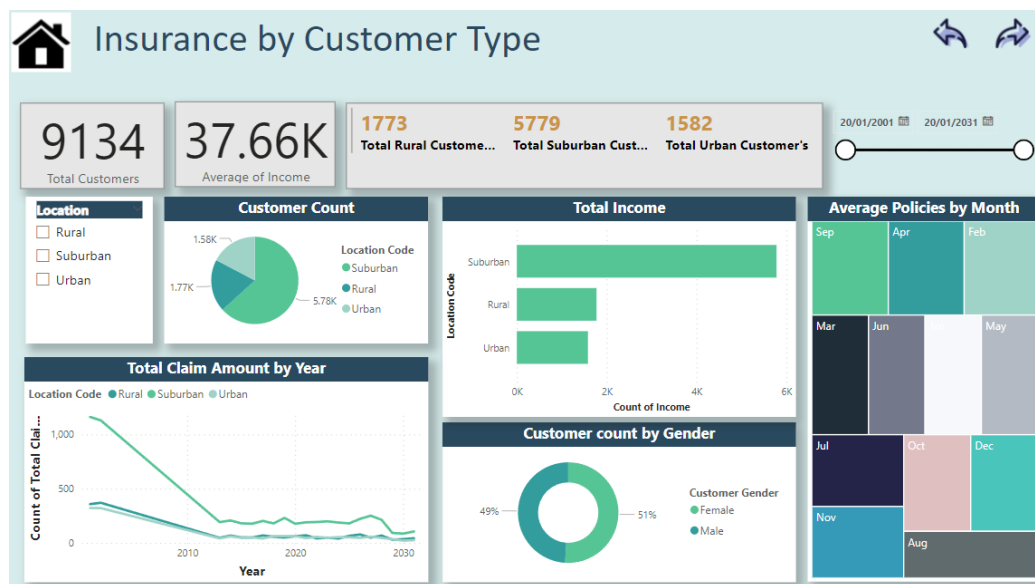
1. Donut chart: Total Number of Customers by Customer Gender.

2. Pie Chart: Total Number of Customers by Customer Type.

3. Bar Chart: Total Revenue Generated by Customer Type.

4. Tree Map: Average Policy Sold by Customer.

5. Line Chart: Total Claim Amount by Customer Type across each Date (Year/Qtr/Month/Day).

KPIs:

- **Average Customer Income**: Provides the mean income level of insurance customers, offering insights into the financial demographics of the customer base.

- **Total Rural Customers**: Sum of customers residing in rural areas, indicating the extent of coverage penetration in rural regions.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Rural")
```

- **Total Suburban Customers**: Sum of customers residing in suburban areas, offering insights into coverage distribution in suburban locations.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Suburban")
```

- **Total Urban Customers**: Sum of customers residing in urban areas, highlighting theconcentration of coverage in urban settings.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Urban")
```

These components collectively provide a comprehensive view of insurance coverage distribution, customer demographics, and performance metrics, facilitating informed decision- making and strategic planning within the insurance domain.

Insurance By Policy type:
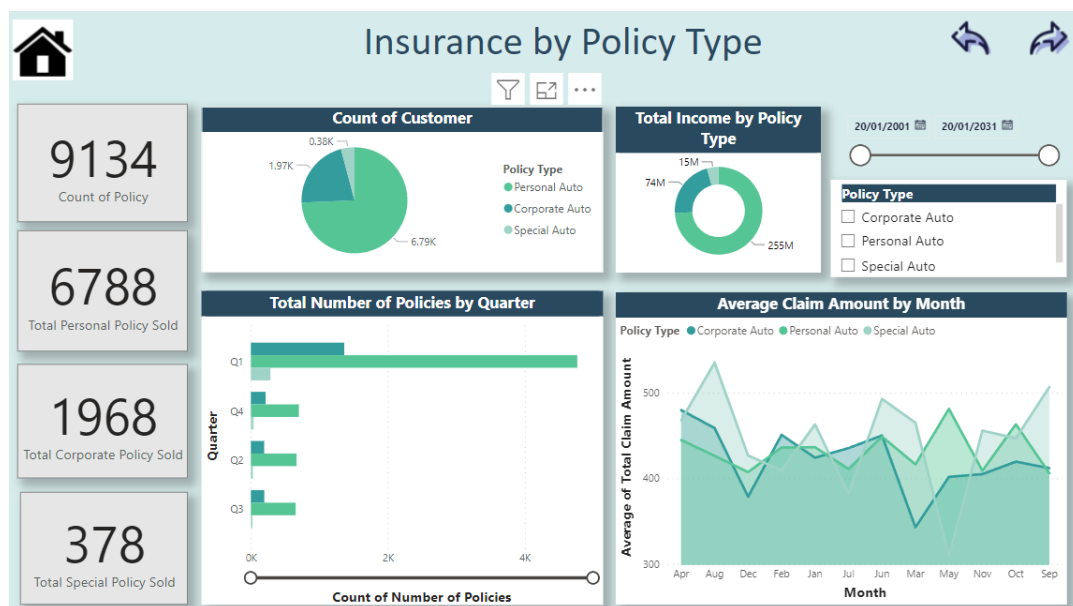
1. **Pie Chart:** Total Number of Customers by Policy type.

2. **Donut Chart:** Total Revenue Generated by Policy Type.

3. **Bar Chart**: Total Policy Sold by Policy Type across each Quarter.

4. **Area Chart:** Average Claim Amount by Policy type across each Month-Year.

   KPIs:

- **Total Personal Policies Sold:** Sum of personal policies sold, providing an overview of salesvolume for policies catering to individual customers.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Policy Type] = "Personal Auto")
```

- **Total Special Policies Sold:** Sum of special policies sold, indicating the sales volume for policies offering unique or specialized coverage options.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Policy Type] = "Special Auto")
```

- **Total Corporate Policies Sold:** Sum of corporate policies sold, which indicates the sales volume for policies offered to corporate clients.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Policy Type] = "Corporate Auto")
```

These components collectively offer valuable insights into policy sales trends, customer preferences, and performance metrics, aiding in decision-making within the insurance industry.

Insurance By Sales Channel:
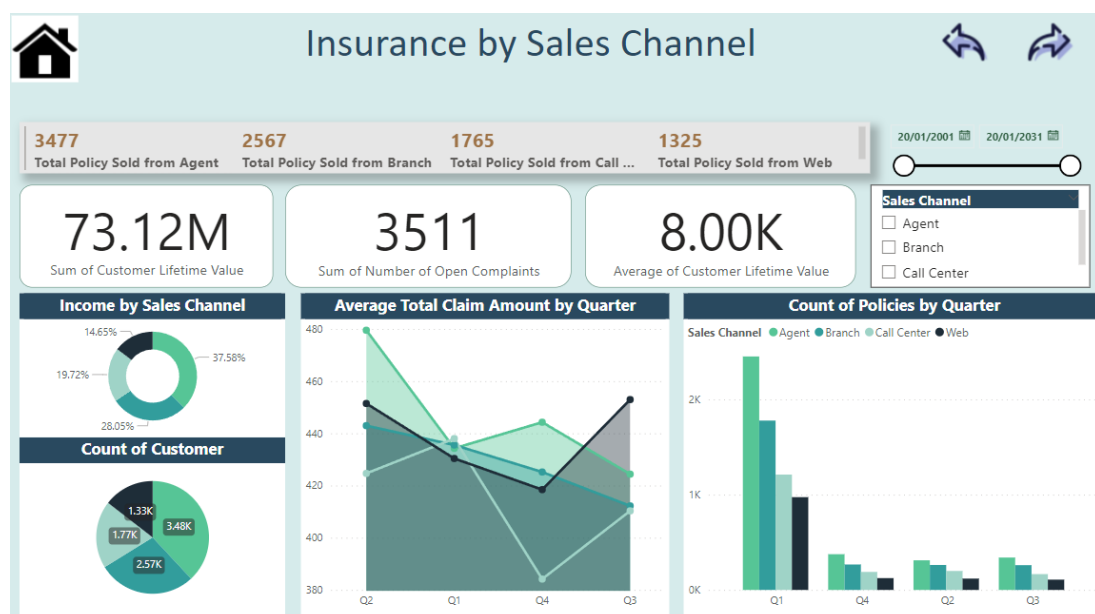
1. **Donut Chart:** Total Revenue by Sales Channel.

2. **Pie Chart:** Total Number of Customers by Sales Channel.

3. **Area Chart:** Average Claim Amount by Sales Channel across each Month/Year

4. **Column Chart:** Total Policy Sold by Sales Channel across each Quarter.

Key Performance Indicators (KPIs):

- **Total Policy Sold by Agent:** Sum of policies sold by agents, indicating the sales volume attributed to agent-mediated transactions.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Agent")
```

- **Total Policy Sold from Branch:** Sum of policies sold through branch offices, reflecting the sales volume generated from branch-based transactions.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Branch")
```

 -**Total Policy Sold from Web:** Sum of policies sold through online channels, showcasing the sales volume from web-based transactions.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Web")
```

- **Total Policy Sold from Call Centers**: Sum of policies sold through call center operations, highlighting the sales volume from call center-mediated transactions.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Call Center")
```

These components collectively provide insights into sales performance, customer demographics, claim amounts, and income trends across different sales channels and quarters, aiding in decision making and strategic planning within the insurance domain.

Insurance By Vehicles:
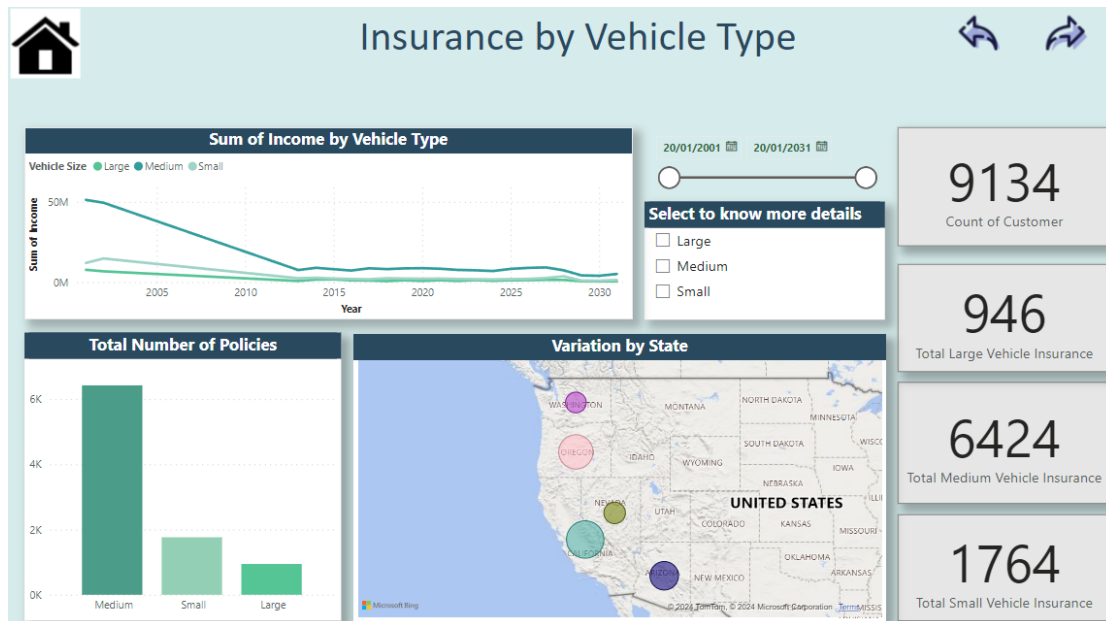
1. Bar Chart: Total Policy Sold by Vehicle Type.

2. Line Chart: Total Revenue Generated by Vehicle Type across each Date.

3. Map Visual: Display State wise Total Number of Customers, Total Revenue generated, Total Number of Policy Sold, and Total Amount Covered.

Key Performance Indicators (KPIs):

- **Total Large Vehicle Insurance**: Sum of insurance policies for large vehicles, indicating the overall sales volume for this vehicle category.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Vehicle Size] = "Large")
```

- **Total Medium Vehicle Insurance**: Sum of insurance policies for medium vehicles, indicating the overall sales volume for this vehicle category.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Vehicle Size] = "Medium")
```

- **Total Small Vehicle Insurance**: Sum of insurance policies for small vehicles, indicating the overall sales volume for this vehicle category.

```
= CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Vehicle Size] = "Small")
```

These components collectively provide insights into policy sales, customer demographics, and insurance coverage distribution across different vehicle sizes and geographic areas, aiding in decision-making within the insurance industry.

Project Link

https://app.powerbi.com/links/JbWUisoiTK?ctid=da9a94b6-4681-49bc-bd7c-bab9eac0ad3c&pbi_source=linkShare

Conclusion

Through this project, I have learned how to effectively use Power BI to load and clean data, create complex DAX formulas, build data models, and design interactive dashboards. These skills are essential for conducting comprehensive data analysis and presenting actionable insights in a clear and accessible manner.