Telecom Customer Churn Analysis

Power BI Dashboard Project

Index

0.1 Project Overview

In this project, you will build an **interactive Power BI dashboard** to analyze **customer churn in a telecom company**.

Customer churn refers to customers who stop using a telecom service. Since acquiring new customers is usually more expensive than retaining existing ones, churn analysis is a critical business problem in the telecom industry.

This dashboard focuses on questions such as:

- How many customers have churned?
- Which subscription plans are more prone to churn?
- Does contract length influence customer behavior?
- How does customer spending vary across plans and demographics?

By the end of this project, you will have a **complete telecom churn dashboard** similar to those used in real-world analytics teams.

0.2 Learning Objectives

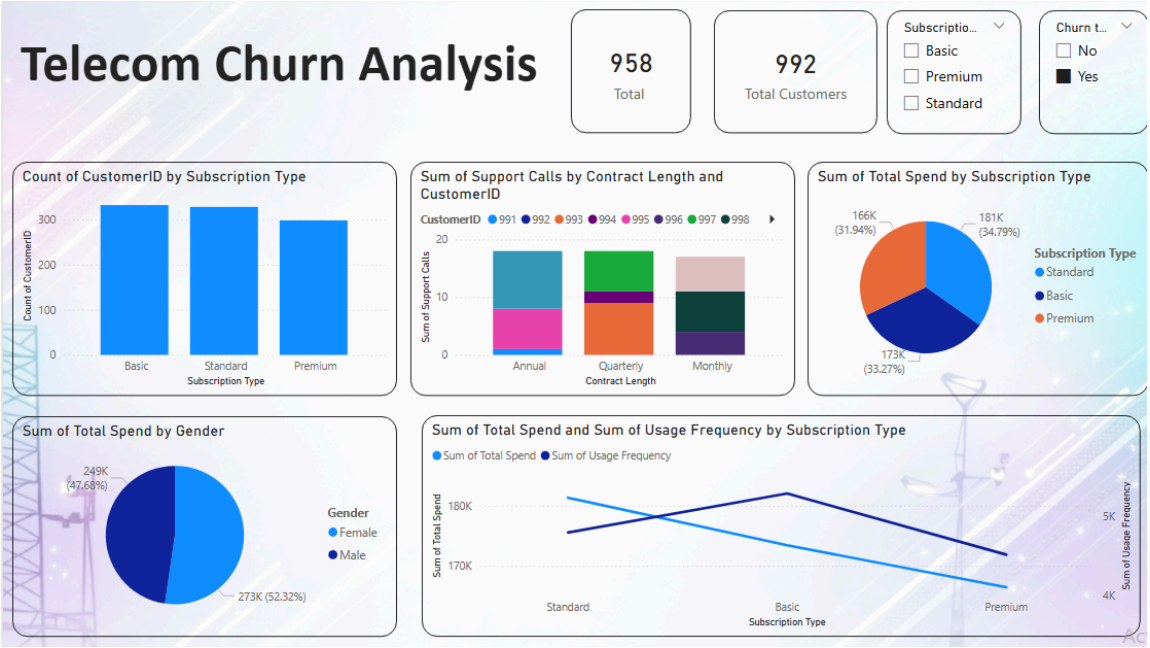
After completing this project, you will be able to:

- Load and clean data using **Power Query**
- Prepare data for analysis in Power BI
- Create KPIs using **Card visuals**
- Build common business charts (bar, pie, line)
- Write and understand **basic DAX measures**
- Add **slicers** for interactivity
- Design a clean and structured dashboard
- Interpret business insights from data

This project is designed for **beginners** and can be completed independently by following each step.

0.3 Final Dashboard Preview

The image below shows the **final dashboard** you will recreate by following this notebook.



> Do not worry if this looks complex now.
> You will build it step by step.

0.4 Tools Used

- **Power BI Desktop**
- **Excel / CSV telecom dataset**
- **Jupyter Notebook (`.ipynb`)** for guided documentation

No prior Power BI experience is required.

0.5 How to Use This Notebook

- Read the notebook **in order**
- Perform steps in **Power BI Desktop** alongside this guide
- Do not skip **Power Query** steps
- If results differ, review the previous section

This notebook is structured to help you:

- Learn Power BI fundamentals
- Build confidence
- Create a practical business dashboard

Section 1 — Business Understanding

Before building charts in Power BI, it is important to understand **the business problem** we are solving.

Dashboards are not created just for visuals — they are built to **answer business questions**.

1.1 What is Customer Churn?

Customer churn means a customer **stops using a company's service**.

In the telecom industry, a customer is considered churned when they:

- Cancel their mobile or internet service, or
- Switch to another telecom provider

In this dataset:

- **Yes** → Customer has churned
- **No** → Customer is still active

This simple Yes/No value helps track customer loss.

1.2 Why Churn Analysis Matters in Telecom

Telecom is a **highly competitive industry**. Customers can easily switch providers due to:

- High prices
- Poor network quality
- Unsatisfactory customer support
- Inflexible contracts

Churn analysis helps companies:

- Identify customers at risk of leaving
- Understand customer behavior patterns
- Improve retention strategies
- Reduce revenue loss

> Retaining an existing customer is usually cheaper than acquiring a new one.

1.3 Business Questions This Dashboard Answers

This dashboard is built to answer the following questions:

- How many total customers are there?
- How many customers have churned?
- Which subscription plans have more customers?
- Does contract length affect customer support calls?
- How does spending vary by subscription type and gender?
- How does usage frequency relate to spending?
- How does churn change when filters are applied?

Each visual in the dashboard is linked to one or more of these questions.

1.4 How Business Understanding Shapes the Dashboard

Business understanding helps decide:

- Which KPIs appear at the top
- Which charts are required
- Which slicers are needed for interaction

For example:

- Churn is shown using a **number card**
- Plans are compared using **bar and pie charts**
- Usage and spend are analyzed together
- Filters are added to allow interactive analysis

Every visual in the dashboard serves a **clear business purpose**.

Section 2 — Dataset Overview

In this section, you will understand the **telecom dataset** used to build the churn dashboard.

Each row in the dataset represents **one telecom customer**.

2.1 Dataset Source

- Format: Excel / CSV
- Data type: Tabular customer-level data

- Use case: Customer churn analysis in telecom

The dataset contains information about:

- Customer details
- Subscription and contract information
- Usage and spending behavior
- Churn status

2.2 Dataset Structure

The dataset includes columns related to:

- Customer identification
- Subscription plans
- Contracts and usage
- Spending
- Churn (Yes / No)

Understanding these columns is important before cleaning and visualization.

2.3 Column Dictionary and Usage

Column Name	What it Represents	Used For in Dashboard
CustomerID	Unique customer identifier	Counting total customers
Gender	Gender of the customer	Spend comparison by gender
Subscription Type	Customer's plan type	Bar charts, pie charts, slicers
Contract Length	Contract duration	Support calls comparison
Monthly Charges	Monthly bill amount	Spending analysis
Total Spend	Total amount spent by customer	Pie charts, line charts
Usage Frequency	How often services are used	Spend vs usage analysis
Support Calls	Number of support calls made	Contract vs support analysis
Churn	Whether customer left (Yes/No)	Churn KPI, slicer

> Data types (text, number, decimal) will be corrected in **Power Query** in the next sections.

2.4 Why This Dataset Matters

This dataset allows us to:

- Measure customer churn
- Compare plans and contracts
- Analyze spending and usage behavior
- Build a realistic telecom business dashboard

Section 3 — Power BI File Setup

In this section, you will create a new Power BI file and load the telecom churn dataset.

3.1 Create a New Power BI File

1. Open **Power BI Desktop**
2. Click **File** → **New**
3. Save the file with a clear name, for example:
   `Telecom_Customer_Churn.pbix`

Saving early helps prevent data loss and keeps your project organized.

3.2 Load the Dataset into Power BI

1. In Power BI Desktop, click **Home** → **Get Data**
2. Select **Excel** (or **Text/CSV**, depending on your file)
3. Browse and select the telecom churn dataset
4. Click **Open**

A **Navigator** window will appear showing available tables or sheets.

3.3 Select the Data Table

1. In the Navigator window:
   - Select the relevant sheet or table
2. Click **Transform Data** (not Load)

> Choosing **Transform Data** opens Power Query, where we will clean and prepare the dataset before analysis.

3.4 What Happens Next

After clicking **Transform Data**:

- Power BI opens the **Power Query Editor**
- This is where data cleaning and preparation is done
- No changes are applied to the model until you click **Close & Apply**

In the next section, you will clean and prepare the dataset step by step.

Section 4 — Data Cleaning in Power Query

In this section, you will clean and prepare the dataset using **Power Query**.
Clean data is essential for correct visuals and accurate DAX calculations.

4.1 Open Power Query Editor

If you followed the previous section correctly, Power Query should already be open.

If not:

1. Go to **Home** → **Transform Data**
2. Power Query Editor will open in a new window

4.2 Rename the Table (Query)

1. In the left **Queries** pane
2. Right-click the table name (for example, `Sheet1`)
3. Click **Rename**
4. Rename it to:
   `Telecom_Churn_Data`

Clear names make models easier to understand.

4.3 Check and Set Data Types

Incorrect data types can cause wrong calculations and broken visuals.

For each column:

1. Click the column header
2. Go to **Transform → Data Type**
3. Select the correct type

Recommended data types:

Column	Data Type
CustomerID	Whole Number / Text
Gender	Text
Subscription Type	Text
Contract Length	Text
Monthly Charges	Decimal Number
Total Spend	Decimal Number
Usage Frequency	Text
Support Calls	Whole Number
Churn	Text

> Power BI may auto-detect types, but always verify them manually.

4.4 Check for Missing or Incorrect Values

1. Scan each column for:
   - Blank cells
   - Incorrect spellings (e.g., Yes / yes / YES)
2. If needed:
   - Use **Transform → Replace Values**
   - Ensure consistency (for example, only `Yes` and `No` for Churn)

Consistent values ensure slicers and filters work correctly.

4.5 Verify Column Names

- Column names should be:
  - Clear
  - Human-readable
  - Free from unnecessary symbols

If required:

1. Double-click the column name
2. Rename it appropriately

4.6 Create Churn Yes/No Column

To use churn cleanly later, create a **text-based Yes/No column**.

Steps

1. In **Power Query Editor**, select the **Churn** column
2. Go to **Add Column → Conditional Column**
3. Set:
   - New column name: `Churn_txt`
   - If Churn = `Yes` → Output `Yes`
   - Else → Output `No`
     (If numeric: 1 → Yes, 0 → No)
4. Click **OK**

4.7 Apply Changes

1. Once all checks are complete
2. Click **Home → Close & Apply**

Power BI will now:

- Apply all cleaning steps
- Load the clean data into the data model

Section 5 — Data Model Check

In this section, you will quickly verify that the data model is correct before creating visuals.

5.1 Open Model View

1. In Power BI Desktop, look at the left sidebar
2. Click the **Model view** icon (diagram symbol)

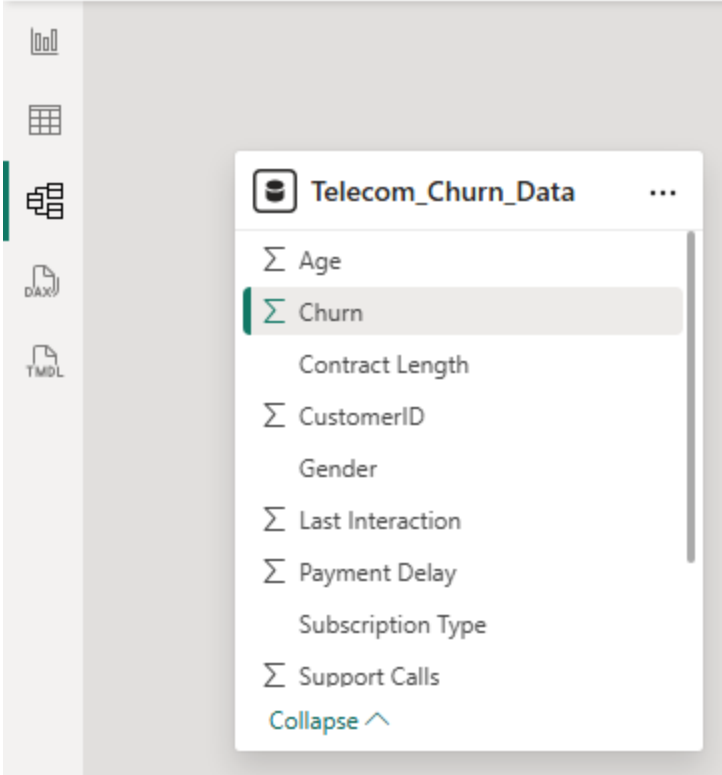
You should see **one table** loaded into the model.

5.2 Verify the Table

Check the following:

- Only one table is present (`Telecom_Churn_Data`)
- No relationships are required for this project
- All columns are visible and correctly named

This project uses a **single-table model**, which is common for beginner dashboards.



5.3 Check Column Formatting

Some columns need formatting for correct display in visuals.

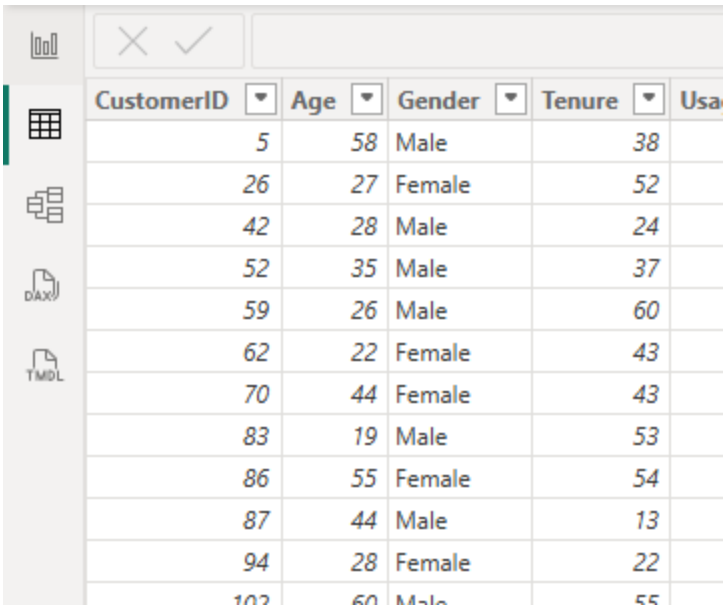
1. Click **Table view**
2. Select each column and verify:

Column	Recommended Format
Monthly Charges	Decimal Number
Total Spend	Currency or Decimal

Column	Recommended Format
Support Calls	Whole Number
CustomerID	Do Not Summarize

Formatting ensures:

- Numbers aggregate correctly
- Values display properly in cards and charts



CustomerID	Age	Gender	Tenure	Usa
5	58	Male	38	
26	27	Female	52	
42	28	Male	24	
52	35	Male	37	
59	26	Male	60	
62	22	Female	43	
70	44	Female	43	
83	19	Male	53	
86	55	Female	54	
87	44	Male	13	
94	28	Female	22	

5.4 Why This Step Matters

A clean data model ensures:

- Accurate calculations
- Correct aggregations
- Fewer issues when writing DAX
- Smooth interaction between visuals

Once the model is verified, you are ready to build the dashboard.

Section 6 — Dashboard Layout & Design Setup

In this section, you will set up the **dashboard canvas**, apply the background image, and understand the **visual layout plan** you will follow while building the dashboard.

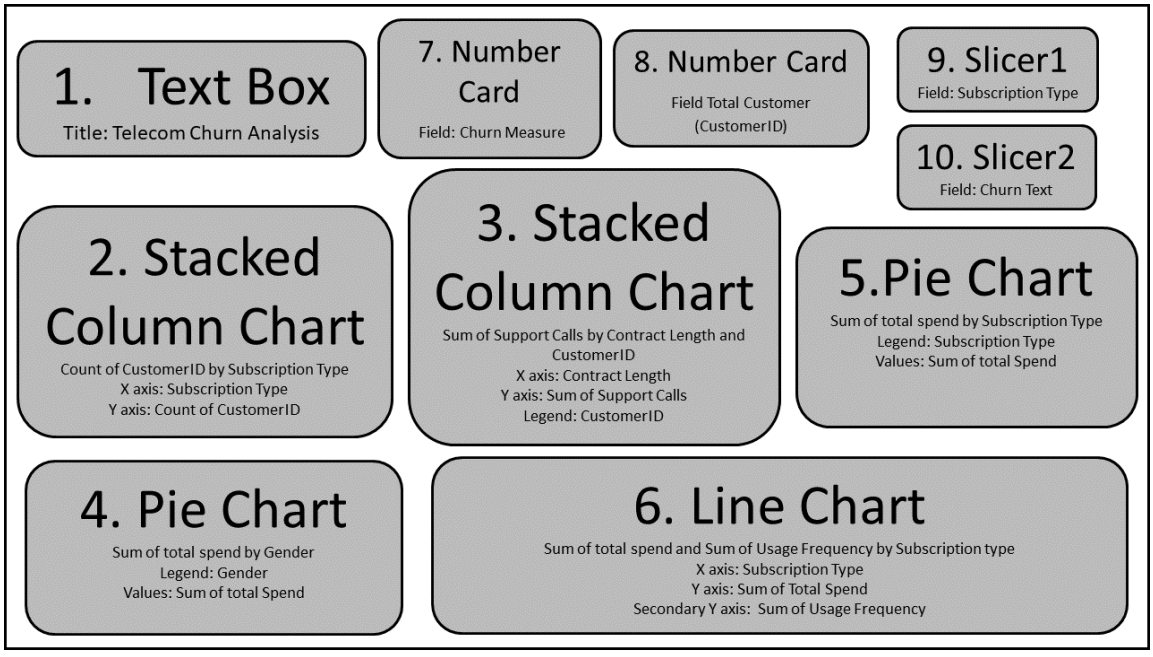
6.1 Set the Canvas Size

1. Go to **Report view**
2. Click on an empty area of the canvas
3. In the **Format** pane:
    - Expand **Canvas settings**
    - Set **Page size** to `16:9`

This ensures the dashboard fits standard laptop and presentation screens.

6.2 Dashboard Layout Reference

The image below shows the **dashboard layout structure** you will follow while placing visuals.



Layout reference URL:
https://tinyurl.com/PowerBI-Layout

Use this image as a **placement guide**, not as a fixed rule.
Exact alignment is not required, but visual grouping should be similar.

6.3 Apply Dashboard Background Image

1. Click on an empty area of the canvas
2. In the **Format** pane, expand **Canvas background**

3. Paste or browse the background image using the URL below:

   Background URL:
   https://tinyurl.com/PowerBI-Background

4. Set **Transparency** to a low value (recommended: `0–10%`)

5. Image fit to `Fill`

The background improves visual clarity without interfering with charts.

6.4 Understand the Layout Zones

Based on the layout image:

- **Top row**: KPI and number cards
- **Center area**: Main comparison charts
- **Lower section**: Trend and behavior analysis
- **Side section**: Slicers and filters

This structure helps users quickly interpret the dashboard.

6.5 Design Guidelines

- Keep visuals aligned and evenly spaced
- Avoid overcrowding the canvas
- Use consistent colors and fonts
- Keep text minimal and readable

A clean layout makes insights easier to understand.

6.6 Add Dashboard Title (Text Box)

In this step, you will add a **title to the dashboard** using a **Text Box**. Titles provide context and make dashboards easier to understand.

Steps

1. Go to **Insert** → **Text box**
2. Type the title:
   Telecom Churn Analysis
3. Resize and place the text box at the **top of the dashboard**

4. Format the text:
    - Increase font size
    - Use bold
    - Choose a clean, readable font

Keep the title simple and clearly visible.

Section 7 — KPI & Number Cards

In this section, you will create **KPI number cards** that summarize key metrics at a glance.

Number cards are usually placed at the **top of the dashboard**.

7.1 KPI 1 — Total Customers

This card shows the total number of customers in the dataset.

Steps

1. Go to **Report view**
2. From **Visualizations**, select **Card**
3. Drag the card to the top of the canvas
4. From **Data**, Drag **CustomerID** into the **Fields** area
5. Set aggregation to **Count**
6. Change in **Visualization→Fields**, `Count of CustomerID` to `Total Customers`

Why this works

- Each row represents one customer
- Counting CustomerID gives total customers

7.2 KPI 2 — Churned Customers

This card shows the number of customers who have churned.

Step A — Create a DAX Measure

1. From the top ribbon, Go to **Modeling → New Measure**
2. Enter the following DAX:

```
Churn Measure =
IF(ISFILTERED(Telecom_Churn_Data[Churn]),COUNTROWS(Telecom_Churn_Data),0)
```

3. Press Enter

Step B — Create the Card

1. Select Card visual
2. Drag Churn Measure into Fields
3. Place the card next to Total Customers

7.3 Understanding the DAX Logic (Beginner Explanation)

- `COUNTROWS()` counts how many rows are currently visible
- `ISFILTERED()` checks whether a filter (like Churn = Yes) is applied
- If `Churn` = `Yes` is selected in a slicer:
  - The card shows churned customers
- If no churn filter is applied:
  - The card shows 0, avoiding confusion

This teaches an important concept:

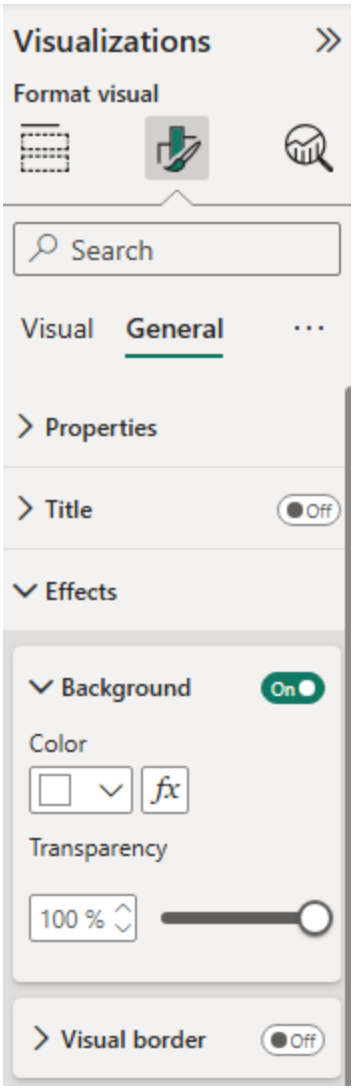
> **DAX measures react to filters and slicers**

7.4 Formatting the KPI Cards

For each card:

1. Select the card
2. Open the **Visualization→Format your visual**
3. Adjust:
   - Data label size
   - Title (optional)
   - Alignment
   - Background (keep clean and simple)

To change background transperancy:
Visualization→Format your visual→General→Effects→Background→Transparency



Keep formatting consistent across all KPI cards.

7.5 Placement Reminder

- Place KPI cards in the top row
- Align them evenly
- Keep enough spacing for readability

These KPIs give users a quick summary before exploring detailed charts.

Section 8 — Charts and Visuals

In this section, you will create the **main charts** used to analyze customer behavior and churn-related patterns.

Each chart answers a specific business question.

8.1 Chart 1 — Customers by Subscription Type

(Stacked Column Chart)

Purpose

To compare how customers are distributed across different subscription plans.

Steps

1. Select **Stacked Column Chart** from Visualizations
2. Drag **Subscription Type** to the **X-axis**
3. Drag **CustomerID** to the **Y-axis**
4. Set aggregation to **Count**

Why this chart

- Shows plan-wise customer distribution clearly
- Easy to compare volumes across plans

8.2 Chart 2 — Support Calls by Contract Length

(Stacked Column Chart)

Purpose

To analyze whether contract length impacts customer support usage.

Steps

1. Select **Stacked Column Chart**
2. Drag **Contract Length** to the **X-axis**
3. Drag **Support Calls** to the **Y-axis**
4. Set aggregation to **Sum**
5. Drag **CustomerID** to the **Legend**

Why this chart

- Highlights support behavior across contract types
- Useful for identifying high-maintenance customers

8.3 Chart 3 — Total Spend by Subscription Type

(Pie Chart)

Purpose

To understand which subscription plans contribute most to revenue.

Steps

1. Select **Pie Chart**
2. Drag **Subscription Type** to **Legend**
3. Drag **Total Spend** to **Values**
4. Set aggregation to **Sum**

Why this chart

- Shows revenue contribution share
- Easy for business users to interpret

8.4 Chart 4 — Total Spend by Gender

(Pie Chart)

Purpose

To compare spending patterns across genders.

Steps

1. Select **Pie Chart**
2. Drag **Gender** to **Legend**
3. Drag **Total Spend** to **Values**
4. Set aggregation to **Sum**

Why this chart

- Useful demographic comparison
- Simple and clear visualization

8.5 Chart 5 — Spend vs Usage Frequency

(Line Chart with Secondary Axis)

Purpose

To analyze how usage frequency relates to customer spending.

Steps

1. Select **Line Chart**
2. Drag **Subscription Type** to the **X-axis**
3. Drag **Total Spend** to the **Y-axis**
4. Set aggregation to **Sum**
5. Add **Usage Frequency** as a **secondary Y-axis**
6. Set aggregation to **Sum**

Why this chart

- Shows trends rather than totals
- Helps understand customer behavior patterns

8.6 Formatting Tips for All Charts

- Keep titles short and meaningful
- Avoid unnecessary legends
- Use consistent colors
- Align visuals neatly on the canvas

Clean charts make insights easier to understand.

Section 9 — Slicers and Interactivity

In this section, you will add **slicers** to make the dashboard interactive.

Slicers allow users to filter the entire dashboard using simple selections.

9.1 Slicer 1 — Subscription Type

Purpose

To filter all visuals based on the selected subscription plan.

Steps

1. Select **Slicer** from Visualizations
2. Drag **Subscription Type** into the **Field**
3. Place the slicer on the side of the dashboard

9.2 Slicer 2 — Churn Status

Purpose

To filter visuals by churned and active customers.

Steps

1. Select **Slicer**
2. Drag **Churn_txt** into the **Field**
3. Place it below the Subscription Type slicer
4. Ensure values show only **Yes** and **No**

This slicer works directly with the **Churn Measure** created earlier.

9.3 How Slicers Affect the Dashboard

- Selecting a slicer value filters:
  - KPI cards
  - Charts
  - Other slicers
- Multiple slicers can be applied together
- DAX measures automatically react to slicer selections

This interactivity allows users to explore data from different perspectives.

9.4 Slicer Formatting Tips

- Keep slicers aligned vertically
- Use consistent font size
- Avoid unnecessary borders
- Do not overcrowd the dashboard

Clean slicers improve usability.

Section 10 — Detailed Customer-Level View (Table Visual)

In this section, you will add a **Table visual** to display **customer-level details**.

While charts show summaries, tables allow users to:

- Inspect individual customers
- Validate aggregated numbers
- Perform detailed analysis

10.1 Purpose of the Table Visual

This table helps answer questions such as:

- Which specific customers have churned?
- How much has each customer spent?
- How many support calls has a customer made?
- How does tenure vary across customers?

This is especially useful for **operations and support teams**.

10.2 Create the Table Visual

Steps

1. Go to **Report view**
2. Add **New Page**, rename to **Detailed View**
3. From **Visualizations**, select **Table**
4. Resize the table to fit the lower or secondary page area

10.3 Add Fields to the Table

Drag the following fields into the **Columns** area (in order):

- **CustomerID**
- **Support Calls** → Aggregation: *Sum*
- **Total Spend** → Aggregation: *Sum*
- **Contract Length**

- **Churn**
- **Tenure** → Aggregation: *Sum*

This creates a detailed customer-level table similar to real business reports.

10.4 Verify Table Behavior with Slicers

After creating the table: Add new slicers

1. Use the **Subscription Type** slicer
2. Use the **Churn** slicer

Confirm that:

- The table updates dynamically
- Only relevant customers are displayed
- Totals at the bottom change correctly

This confirms the table is correctly connected to the data model.

10.5 Formatting Tips for the Table

- Keep column names clear and readable
- Avoid unnecessary gridlines
- Enable totals only if meaningful
- Do not overcrowd the table with too many columns

The table should support analysis, not overwhelm the user.

Section 11 — Dashboard Validation & Insights

In this section, you will **validate** that the dashboard works correctly and understand the **key insights** it provides.

11.1 Validate Dashboard Functionality

Before sharing or presenting the dashboard, check the following:

1. Apply the **Subscription Type** slicer

- KPI values should change
- Charts should update automatically

2. Apply the **Churn** slicer
    - Churn KPI should reflect selected status
    - Other visuals should filter accordingly
3. Clear all slicers
    - Dashboard should return to original values

If visuals do not respond correctly, revisit:

- Data cleaning
- Data types
- Measure logic

11.2 Basic Insights from the Dashboard

Using the dashboard, you should be able to observe:

- Which subscription plans have the most customers
- Which plans contribute the most to total spending
- Whether certain contract lengths generate more support calls
- How usage frequency relates to customer spending
- How churn impacts overall customer counts

These insights help telecom companies make data-driven decisions.

11.3 Why Validation Matters

Validating the dashboard ensures:

- Numbers are accurate
- Filters behave correctly
- Business conclusions are reliable

A dashboard is only useful if it responds correctly to user interaction.

Section 12 — Student Practice Tasks

This section is for practice and reinforcement.
Complete the tasks below to strengthen your Power BI skills.

12.1 Modify an Existing Visual

- Change one chart type (for example, column → bar)
- Observe how the insight presentation changes
- Decide which visual works better and why

12.2 Create a New KPI

- Create a KPI for **Active Customers**
- Hint: Use the Churn field with appropriate filtering
- Display the KPI using a **Card** visual

12.3 Add a New Slicer

- Add a slicer for **Contract Length**
- Place it near the existing slicers
- Check how it affects all visuals

12.4 Improve Dashboard Design

- Adjust spacing and alignment
- Improve readability of labels
- Ensure consistent formatting across visuals

12.5 Reflection Questions

Answer the following:

- Which visual helped you understand churn the most?
- Which slicer was most useful?
- What would you add to this dashboard for business users?

Section 13 — Conclusion & Next Steps

You have successfully built a **Telecom Customer Churn Analysis Dashboard** using Power BI.

13.1 What You Have Learned

By completing this project, you have learned how to:

- Load and clean data using **Power Query**
- Prepare data for analysis in Power BI
- Build KPI cards and charts
- Write and understand **basic DAX measures**
- Use **slicers** to add interactivity
- Design a structured and readable dashboard
- Validate insights using filters

These skills form the foundation of real-world Power BI projects.

13.2 How This Applies to Real Projects

In real business scenarios, dashboards like this are used to:

- Monitor customer churn regularly
- Identify high-risk customer segments
- Support data-driven decision-making
- Communicate insights to non-technical stakeholders

The workflow you followed here is commonly used in industry.

13.3 Suggested Next Steps

To continue learning, you can try:

- Adding a **Churn Percentage** KPI
- Creating additional DAX measures
- Applying conditional formatting
- Connecting Power BI to live data sources
- Exploring predictive churn models

13.4 Final Note

This notebook was designed so you can:

- Build the dashboard independently
- Understand each step clearly
- Gain confidence using Power BI

You are encouraged to revisit sections and experiment further.

🎉 Project Complete