Project 3
Data Science PGC

Initial Stage: Importing Excel Files into Power BI

Step 1: Open Power BI

1. Launch **Power BI Desktop**.
2. Click **File > New** to start a blank project.

Step 2: Import the Dataset

1. Go to the **Home** tab and click **Get Data**.
2. Select **Excel** and click **Connect**.
3. Browse and open:
    a. **Flight_Information.xlsx** (Flight details)
    b. **Passenger_Information.xlsx** (Passenger records)
    c. **Ticket_Information.xlsx** (Booking data)

Step 3: Load Data

1. Select the sheets to import.
2. Click **Load** to import or **Transform Data** to clean before loading.

Step 4: Verify Data

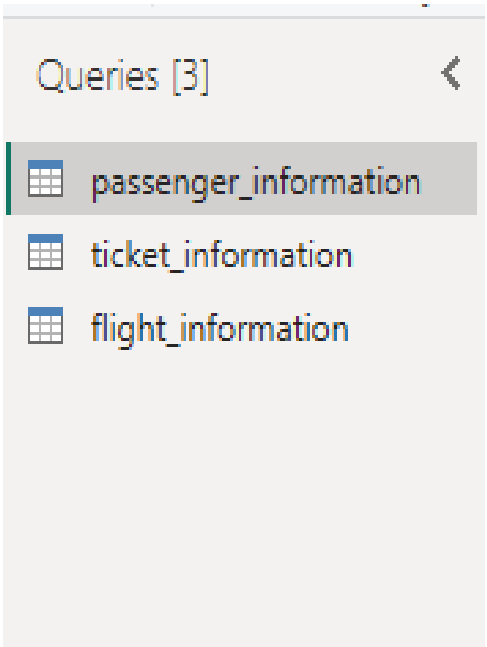
1. Check the **Fields** pane for imported tables.
2. Click the **Data** view to preview and confirm the data.

Task 1: Data Preparation & Cleaning

This task focuses on using **Power Query Editor** in Power BI to clean and transform data for analysis. Follow these steps:

Step 1: Extract and Load Data into Power Query

1. **Open Power Query Editor**:
    - Click **"Transform Data"** after importing datasets.
2. **Select Datasets**:
    - Choose the required datasets:
        - ✅ **Flight_Information**
        - ✅ **Passenger_Information**
        - ✅ **Ticket_Information**

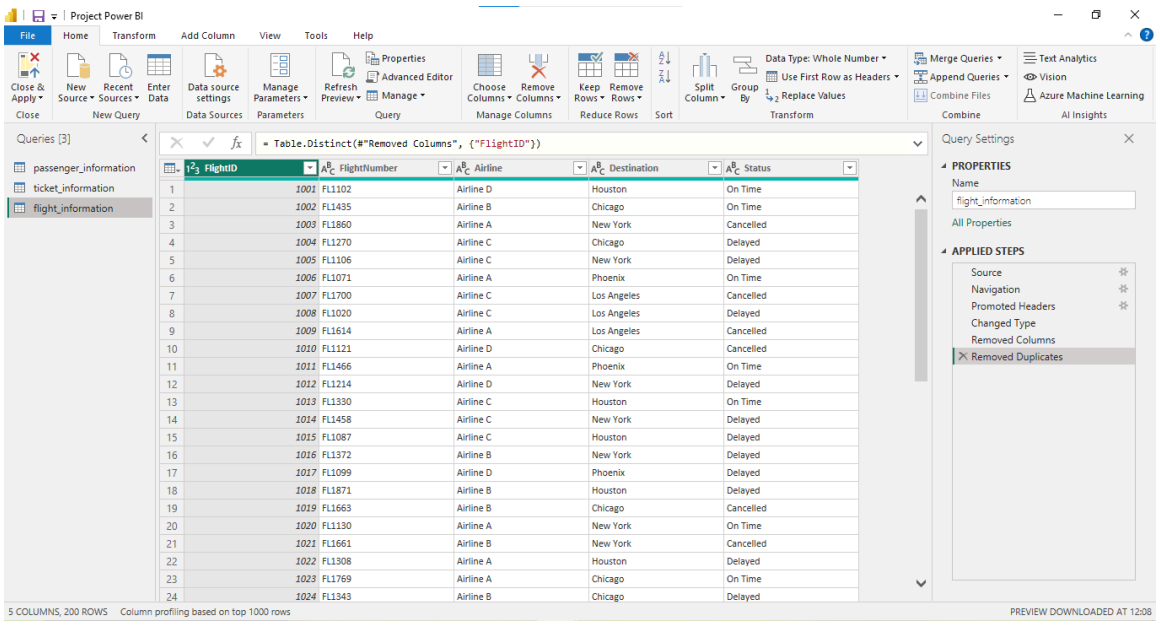


Step 2: Remove Unnecessary Columns

1. **Select Dataset**:
    a. In the **Queries** pane, choose the dataset to clean:
        ✅ **Flight_Information**
        ✅ **Passenger_Information**
        ✅ **Ticket_Information**

2. **Select Required Columns**:
    a. Hold **Ctrl** and click on the columns you want to keep.

3. **Remove Other Columns**:
    a. Right-click on a selected column and choose **"Remove Other Columns"**, or
    b. Go to **Home > Choose Columns > Remove Other Columns**.



Step 3: Data Cleaning and Transformation

A. Removing Duplicates

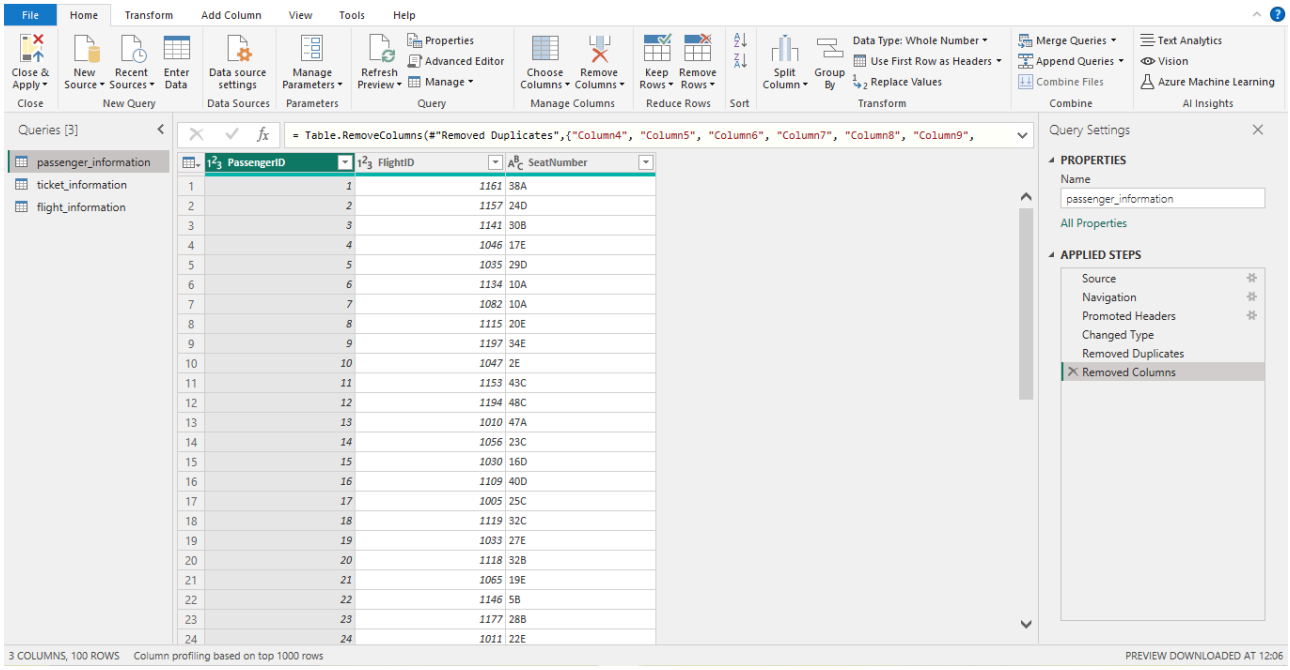
1. **Select Relevant Columns** in Power Query.
2. Click **"Remove Duplicates"** from the **Home** tab.
3. Confirm to eliminate duplicate records.

B. Handling Missing Values

1. **Identify columns** with missing values.
2. Choose an appropriate action:
    a. Use **"Replace Values"** to fill in missing data.
    b. Use **"Remove Rows"** to delete incomplete records.
3. For **numerical columns**, replace nulls with default values (e.g., 0 or average).

C. Check and Update Data Types

1. **Open Power Query Editor**:
    a. Click **"Transform Data"** in Power BI.
    b. Select the required dataset from the **Queries** pane.
2. **Select All Columns**:
    a. Press **Ctrl + A** to highlight all columns.
3. **Detect & Update Data Types**:
    a. Go to the **Transform** tab.
    b. Click **"Detect Data Type"** to let Power Query automatically update column types.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Data Type: Whole Number
Use First Row as Headers
Replace Values
Merge Queries
Append Queries
Combine Files
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AI Insights
Queries [3]
passenger_information
ticket_information
flight_information
= Table.RemoveColumns(#"Removed Duplicates",{"Column4", "Column5", "Column6", "Column7", "Column8", "Column9",
PassengerID
FlightID
SeatNumber
1 1 1161 38A
2 2 1157 24D
3 3 1141 30B
4 4 1046 17E
5 5 1035 29D
6 6 1134 10A
7 7 1082 10A
8 8 1115 20E
9 9 1197 34E
10 10 1047 2E
11 11 1153 43C
12 12 1194 48C
13 13 1010 47A
14 14 1056 23C
15 15 1030 16D
16 16 1109 40D
17 17 1005 25C
18 18 1119 32C
19 19 1033 27E
20 20 1118 32B
21 21 1065 19E
22 22 1146 5B
23 23 1177 28B
24 24 1011 22E
Query Settings
PROPERTIES
Name
passenger_information
All Properties
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Promoted Headers
Changed Type
Removed Duplicates
Removed Columns
3 COLUMNS, 100 ROWS
Column profiling based on top 1000 rows
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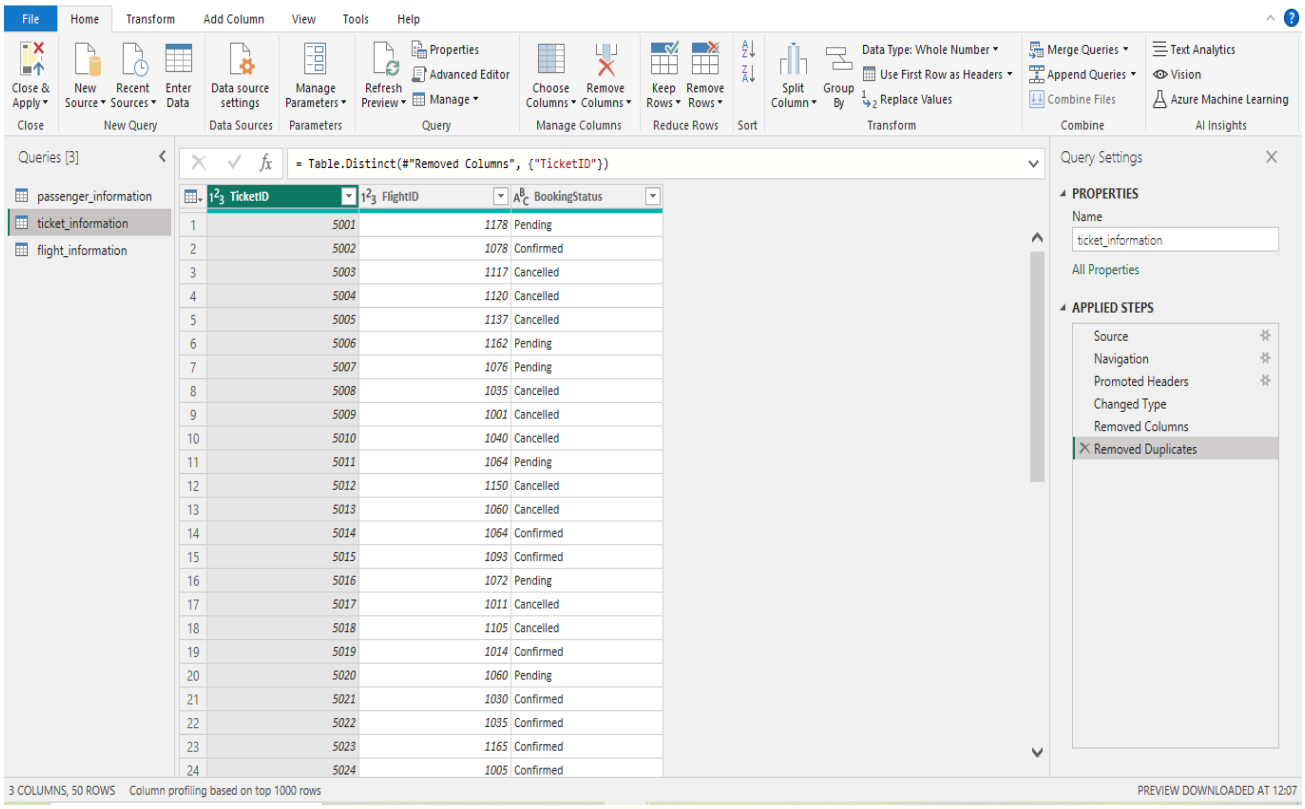
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Group By
Data Type: Whole Number
Use First Row as Headers
Replace Values
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Combine
AI Insights
Queries [3]
passenger_information
ticket_information
flight_information
= Table.Distinct(#"Removed Columns", {"TicketID"})
TicketID
FlightID
BookingStatus
1 5001 1178 Pending
2 5002 1078 Confirmed
3 5003 1117 Cancelled
4 5004 1120 Cancelled
5 5005 1137 Cancelled
6 5006 1162 Pending
7 5007 1076 Pending
8 5008 1035 Cancelled
9 5009 1001 Cancelled
10 5010 1040 Cancelled
11 5011 1064 Pending
12 5012 1150 Cancelled
13 5013 1060 Cancelled
14 5014 1064 Confirmed
15 5015 1093 Confirmed
16 5016 1072 Pending
17 5017 1011 Cancelled
18 5018 1105 Cancelled
19 5019 1014 Confirmed
20 5020 1060 Pending
21 5021 1030 Confirmed
22 5022 1035 Confirmed
23 5023 1165 Confirmed
24 5024 1005 Confirmed
Query Settings
PROPERTIES
Name
ticket_information
All Properties
APPLIED STEPS
Source
Navigation
Promoted Headers
Changed Type
Removed Columns
Removed Duplicates
3 COLUMNS, 50 ROWS
Column profiling based on top 1000 rows
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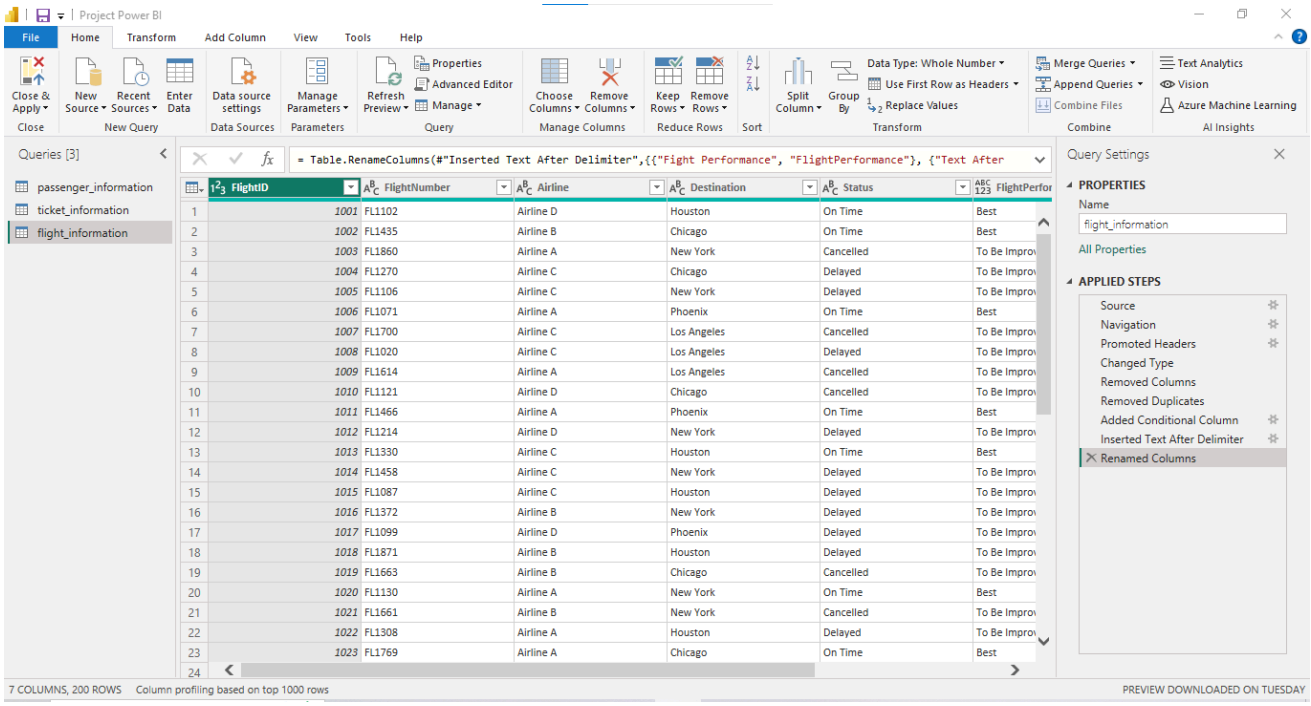
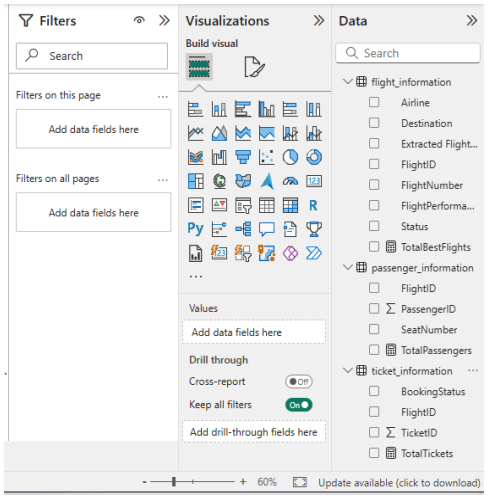


Step 4: Apply and Load Cleaned Data

1. **Apply Changes**:
    a. Click **"Close & Apply"** to load the cleaned data into Power BI.
2. **Verify Data**:
    a. Check the **Data View** pane to ensure the cleaned data is correctly reflected.



Task 2: Data Modeling

Step 1: Define Relationships

✅ Relationship 1:

- **Tables:** Flight_Information ➡️ Passenger_Information
- **Key:** FlightID
- **Cardinality:** One-to-Many (1:*)
    - One flight has multiple passengers.
    - Each passenger is linked to a specific flight.

✅ Relationship 2:

- **Tables:** Flight_Information ➡️ Ticket_Information
- **Key:** FlightID
- **Cardinality:** One-to-Many (1:*)
    - One flight has multiple ticket bookings.
    - Each ticket is associated with a flight.

Step 2: Create Relationships in Power BI

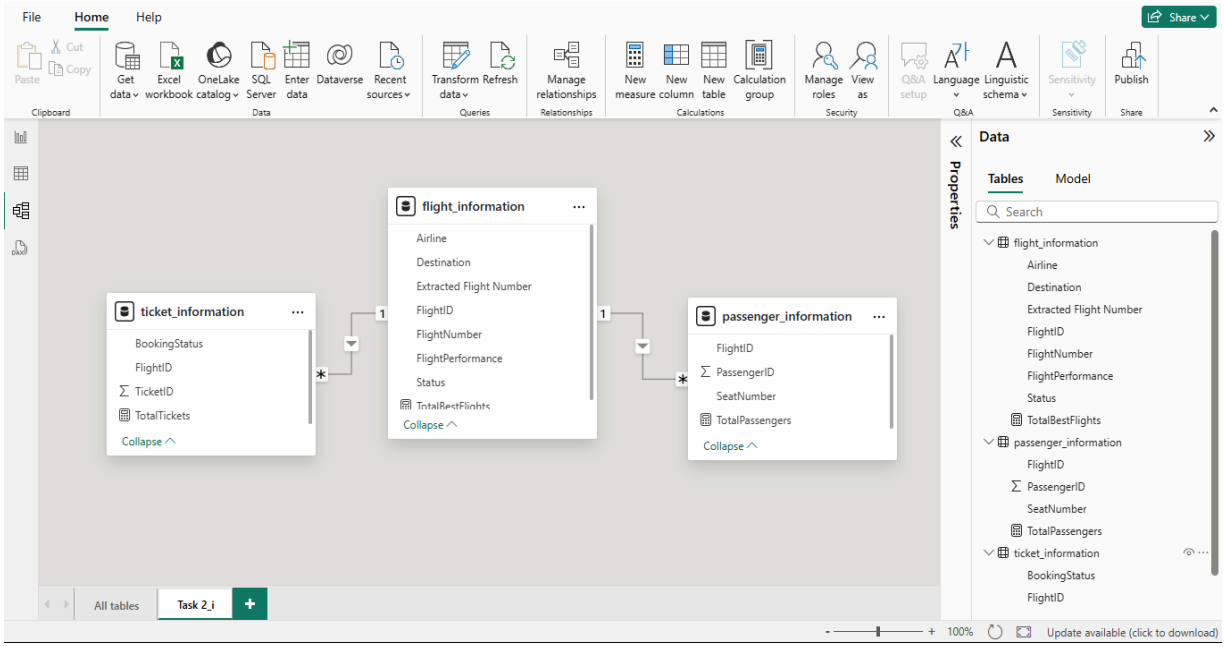
1. **Open Power BI Desktop**
    a. Click on **Model View** (diagram icon on the left).
2. **Drag and Drop to Create Relationships**
    a. Drag **FlightID** from **Flight_Information** to **FlightID** in **Passenger_Information**.
    b. Drag **FlightID** from **Flight_Information** to **FlightID** in **Ticket_Information**.
3. **Set Cardinality**
    a. Ensure **One-to-Many (1:*)** cardinality.
    b. Set the **relationship direction to Single** for better data integrity.

Step 3: Configure and Validate Relationships

1. **Cardinality Check**
    a. Verify relationships follow **One-to-Many (1:*)** structure.
    b. Set **cross-filter direction to Single** for better performance.
2. **Referential Integrity**
    a. Ensure there are no orphaned records in **Passenger_Information** and **Ticket_Information**.

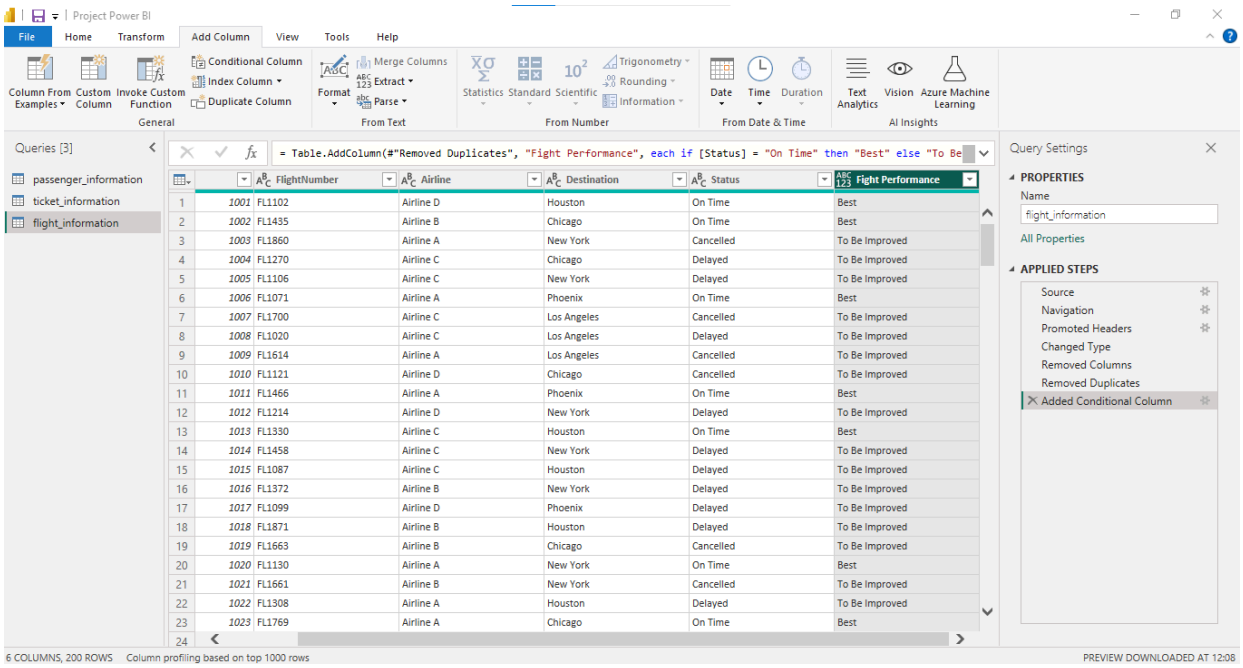
Step 4: Visualizing Data Model

1. **Switch to Model View**
    a. Open **Model View** to check if relationships are correctly displayed.
2. **Organize Tables**
    a. Arrange tables for better visibility and a clean layout.
3. **Add Annotations (Optional)**
    a. Label relationships to describe the links between datasets.



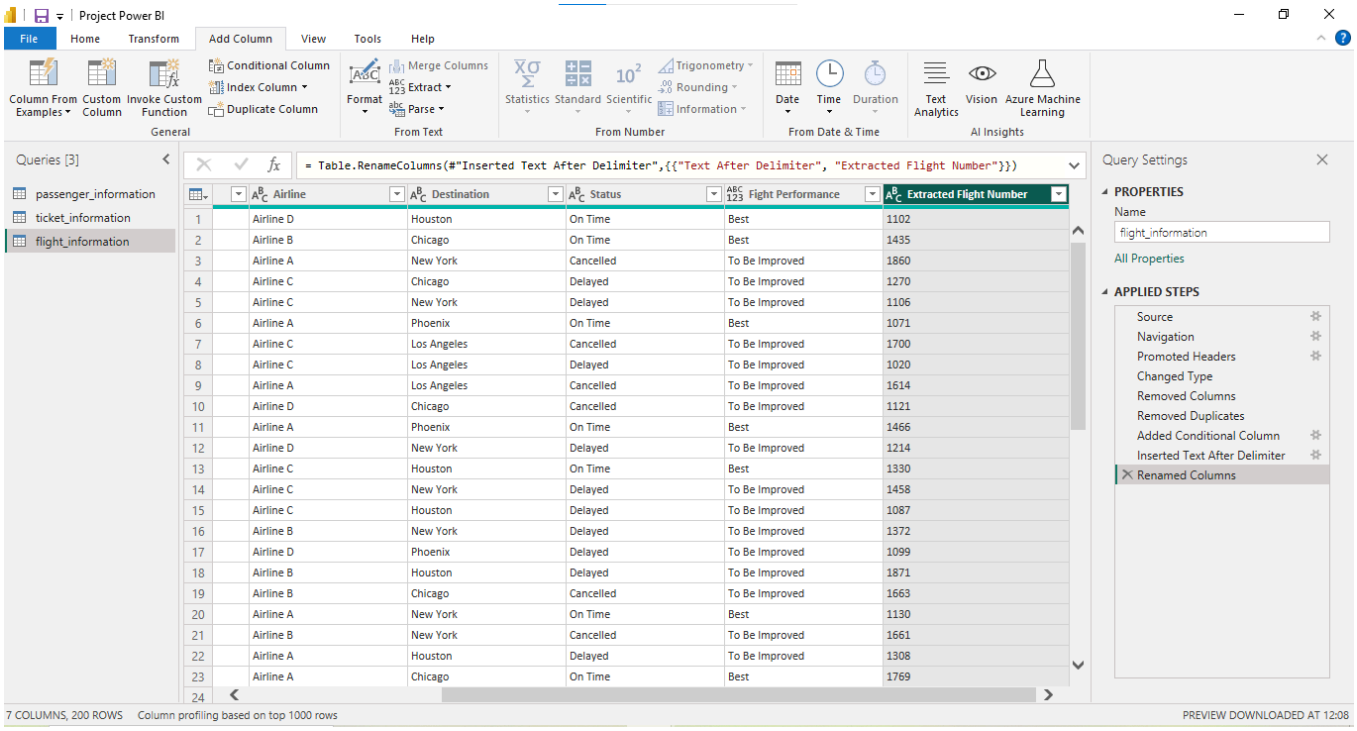
Step 1: Add a Conditional Column to Classify Flights

1. **Open Power Query Editor**
    a. Click **"Transform Data"** to access Power Query Editor.
2. **Select the Flight_Information Table**
    a. Choose the **Flight_Information** dataset where the **Status** column is present.
3. **Add a Conditional Column**
    a. Go to **Add Column → Conditional Column**.
    b. Configure the logic:
        i. **Column Name:** `Flight_Category`
        ii. **Condition:**
            1. If **Status** = "On Time" → **Best**
            2. If **Status** = "Delayed" or "Cancelled" → **To Be Improved**
    c. Click **OK** to apply changes.



Step 2: Extract Flight Number Using “Column from Examples”

1. **Select Flight_Information Table**
    a. Choose the **Flight_Information** dataset.
    b. Select the **FlightNumber** column.
2. **Add Column from Examples**
    a. Go to **Add Column > Column from Examples > From Selection**.
    b. Type examples of the desired output:
        i. For **FL1102**, enter **1102**.
        ii. For **FL1435**, enter **1435**.
    c. Power BI will detect the pattern and generate the new column.
3. **Rename Column**
    a. Rename the new column to **Flight_Number_Extracted**.



	Airline	Destination	Status	Fight Performance	Extracted Flight Number
1	Airline D	Houston	On Time	Best	1102
2	Airline B	Chicago	On Time	Best	1435
3	Airline A	New York	Cancelled	To Be Improved	1860
4	Airline C	Chicago	Delayed	To Be Improved	1270
5	Airline C	New York	Delayed	To Be Improved	1106
6	Airline A	Phoenix	On Time	Best	1071
7	Airline C	Los Angeles	Cancelled	To Be Improved	1700
8	Airline C	Los Angeles	Delayed	To Be Improved	1020
9	Airline A	Los Angeles	Cancelled	To Be Improved	1614
10	Airline D	Chicago	Cancelled	To Be Improved	1121
11	Airline A	Phoenix	On Time	Best	1466
12	Airline D	New York	Delayed	To Be Improved	1214
13	Airline C	Houston	On Time	Best	1330
14	Airline C	New York	Delayed	To Be Improved	1458
15	Airline C	Houston	Delayed	To Be Improved	1087
16	Airline B	New York	Delayed	To Be Improved	1372
17	Airline D	Phoenix	Delayed	To Be Improved	1099
18	Airline B	Houston	Delayed	To Be Improved	1871
19	Airline B	Chicago	Cancelled	To Be Improved	1663
20	Airline A	New York	On Time	Best	1130
21	Airline B	New York	Cancelled	To Be Improved	1661
22	Airline A	Houston	Delayed	To Be Improved	1308
23	Airline A	Chicago	On Time	Best	1769
24					

Task 4: Calculations Using DAX

Perform key calculations using **DAX (Data Analysis Expressions)** to extract insights.

1. Total Passengers for a Specific Flight

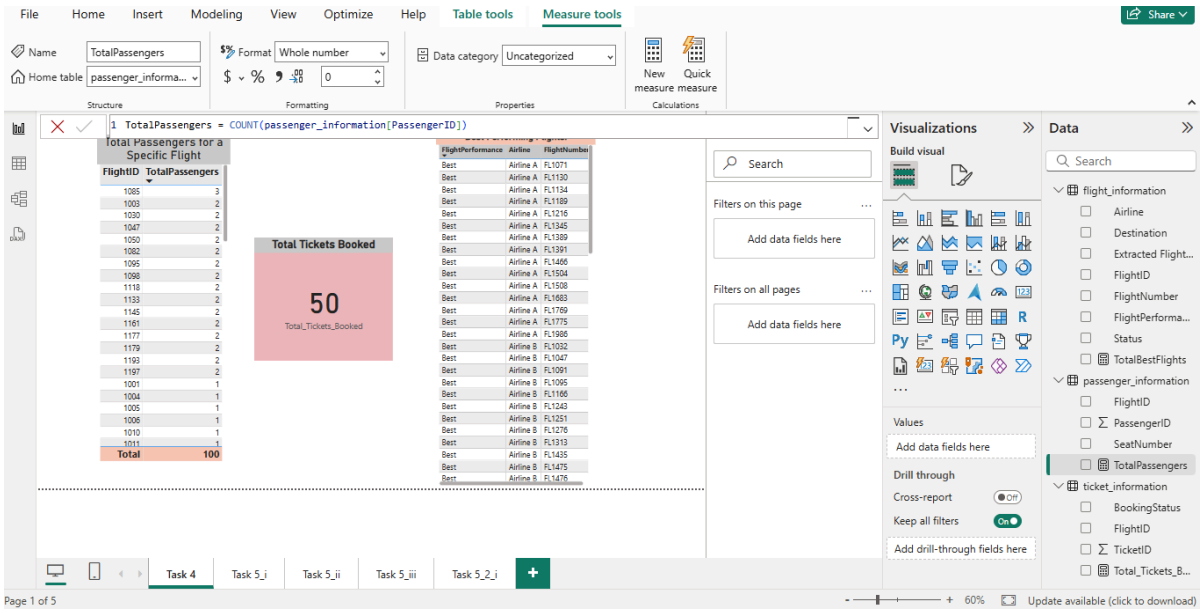
Goal:

Count the number of passengers associated with a specific **FlightID**.

DAX Formula

```
TotalPassengers = COUNT(passenger_information[PassengerID])
```

This measure calculates the total number of passengers by counting unique **PassengerID** values.



2. Total Tickets Booked

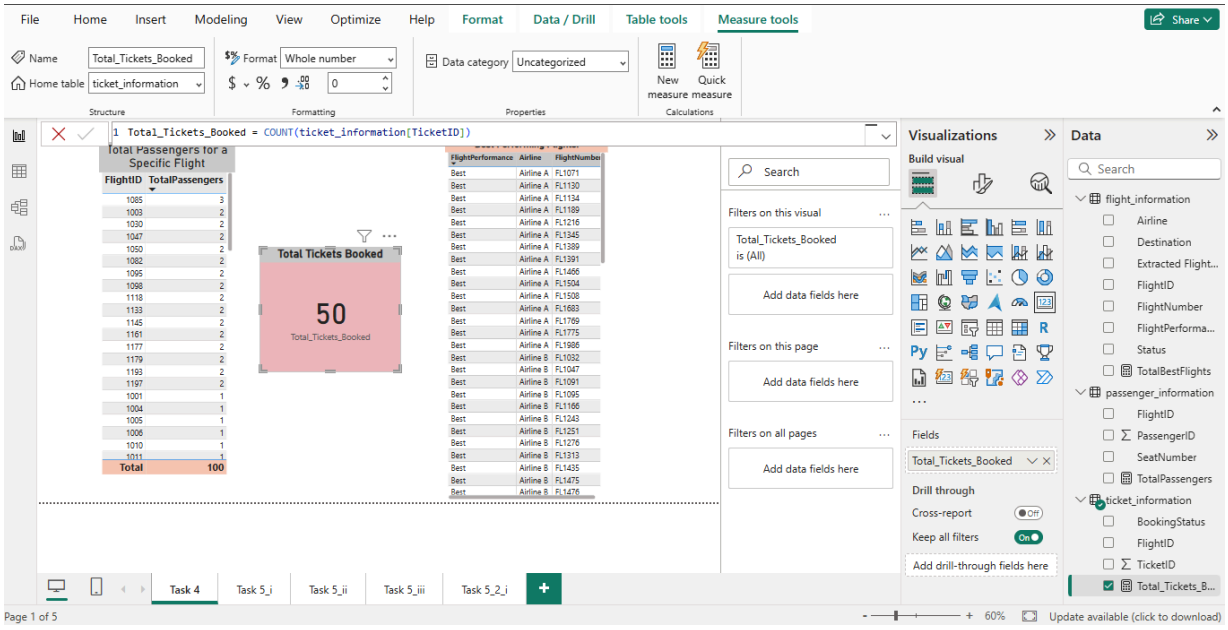
Goal:

Count the total number of tickets booked across all flights.

DAX Formula

```
Total_Tickets_Booked = COUNT(ticket_information[TicketID])
```

This measure calculates the total number of tickets by counting unique **TicketID** values.



3. Filtered Table Showing “Best” Flights Only

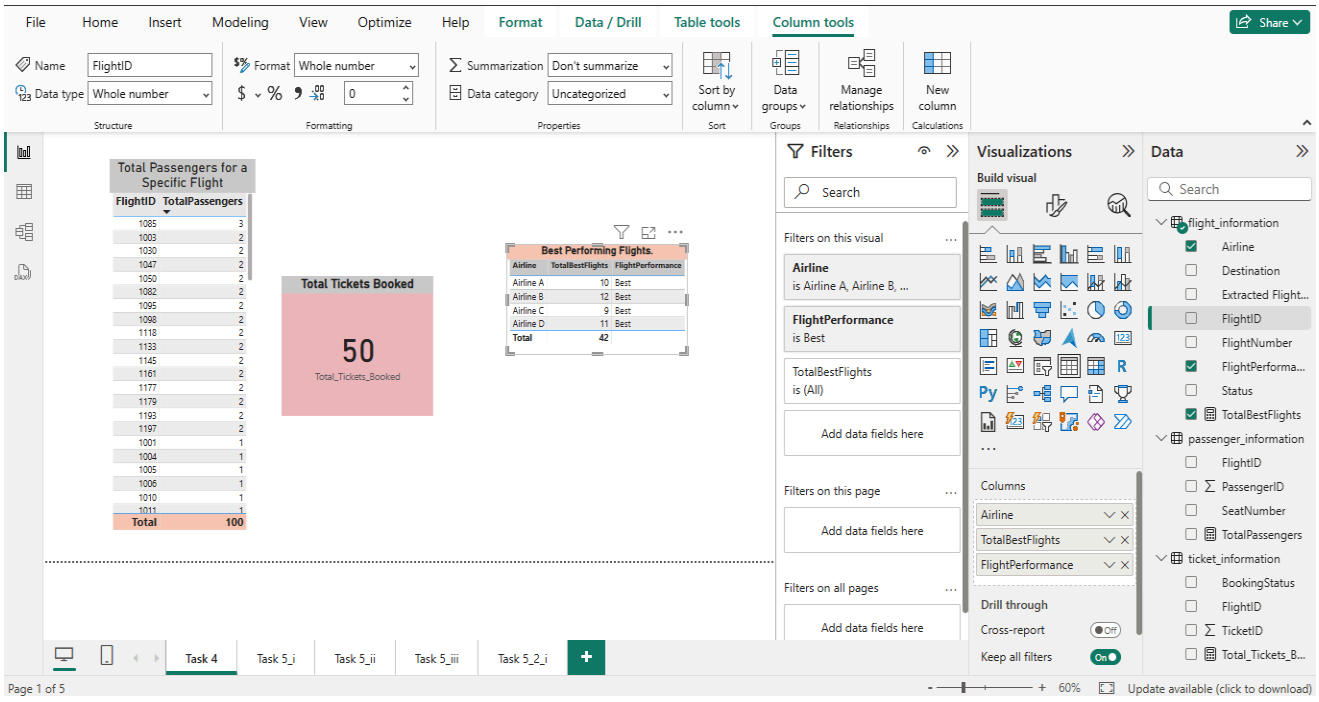
Goal

Filter the **Flight_Information** table to show only flights classified as **“Best”**.

DAX Formula

```
TotalBestFlights =
CALCULATE( COUNT(passenger_information[FlightID]), FILTER(Flight_Information,
flight_information[FlightPerformance] = "Best") )
```

This measure counts the number of passengers for flights categorized as **“Best”** in the **Flight_Information** table.



Task 5: Visualization and Interactive Features

Enhance the Power BI report with visualizations and interactive elements for better insights.

Step 1: Create Required Visuals

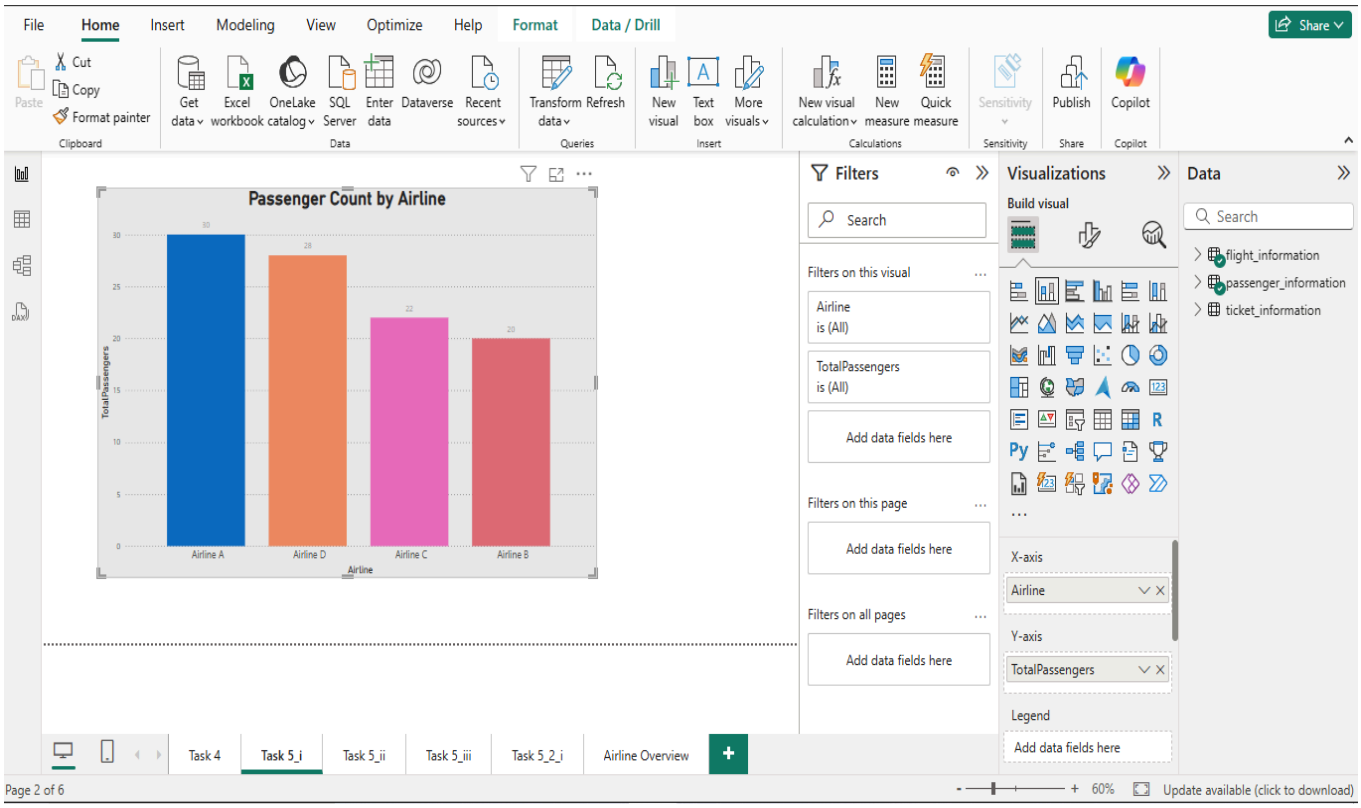
1. Passenger Count by Airline

- **Visual Type: Clustered Column Chart** or **Pie Chart**
- **Steps:**
    - Select **"Clustered Column Chart"** or **"Pie Chart"** from the **Visualizations** pane.
    - Drag **Airline** from **Flight_Information** to **Axis/Legend**.
    - Drag **TotalPassenger** from **Passenger_Information** to **Values**.
    - Change aggregation to **Count**.

- **Customization:**

✅ **Title:** "Passenger Count by Airline"

✅ Use **distinct colors** for better visibility



Step 2: Create Additional Required Visuals

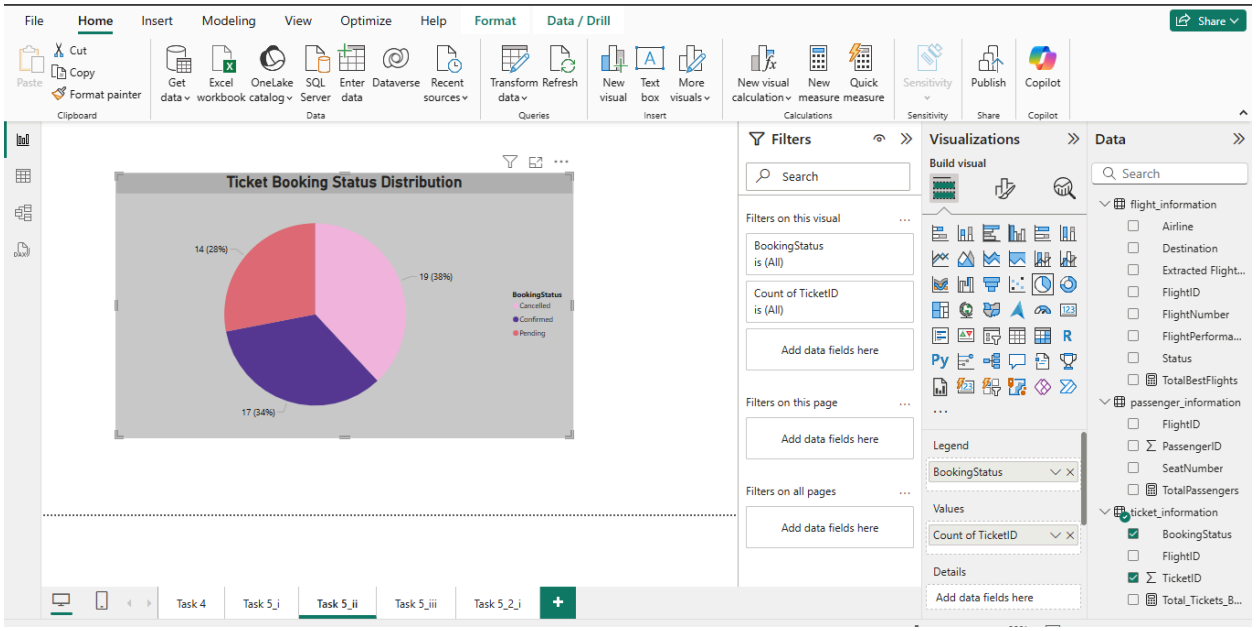
2. Ticket Booking Statuses

- **Visual Type: Pie Chart**
- **Steps:**
  - Select **"Pie Chart"** from the **Visualizations** pane.
  - Drag **BookingStatus** from **Ticket_Information** to **Legend/Axis**.
  - Drag **TicketID** from **Ticket_Information** to **Values** and set aggregation to **Count**.
- **Customization:**

✅ **Title:** "Ticket Booking Status Distribution"

✅ Apply **contrasting colors** for different statuses

✅ Enable **data labels** for quick insights



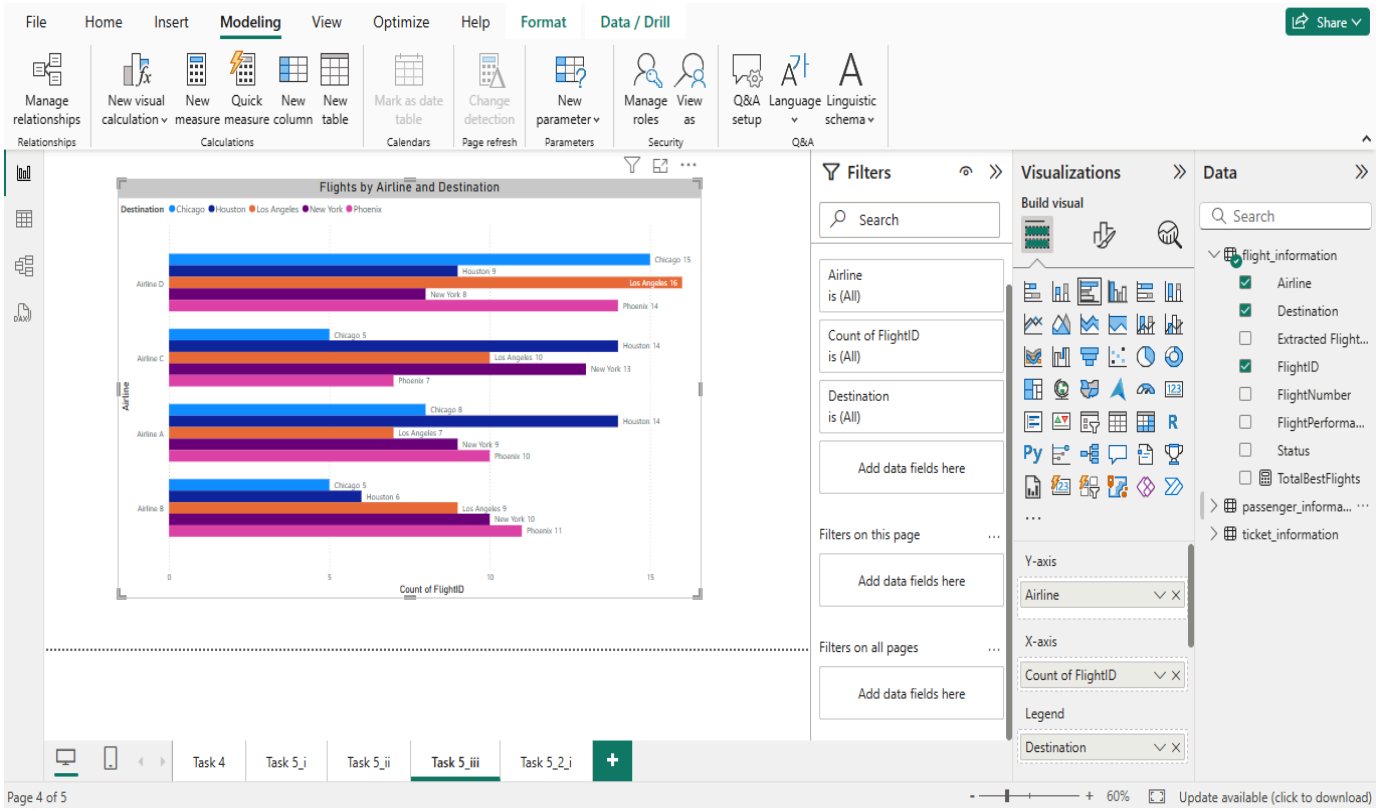
3. Flights by Airline and Destination

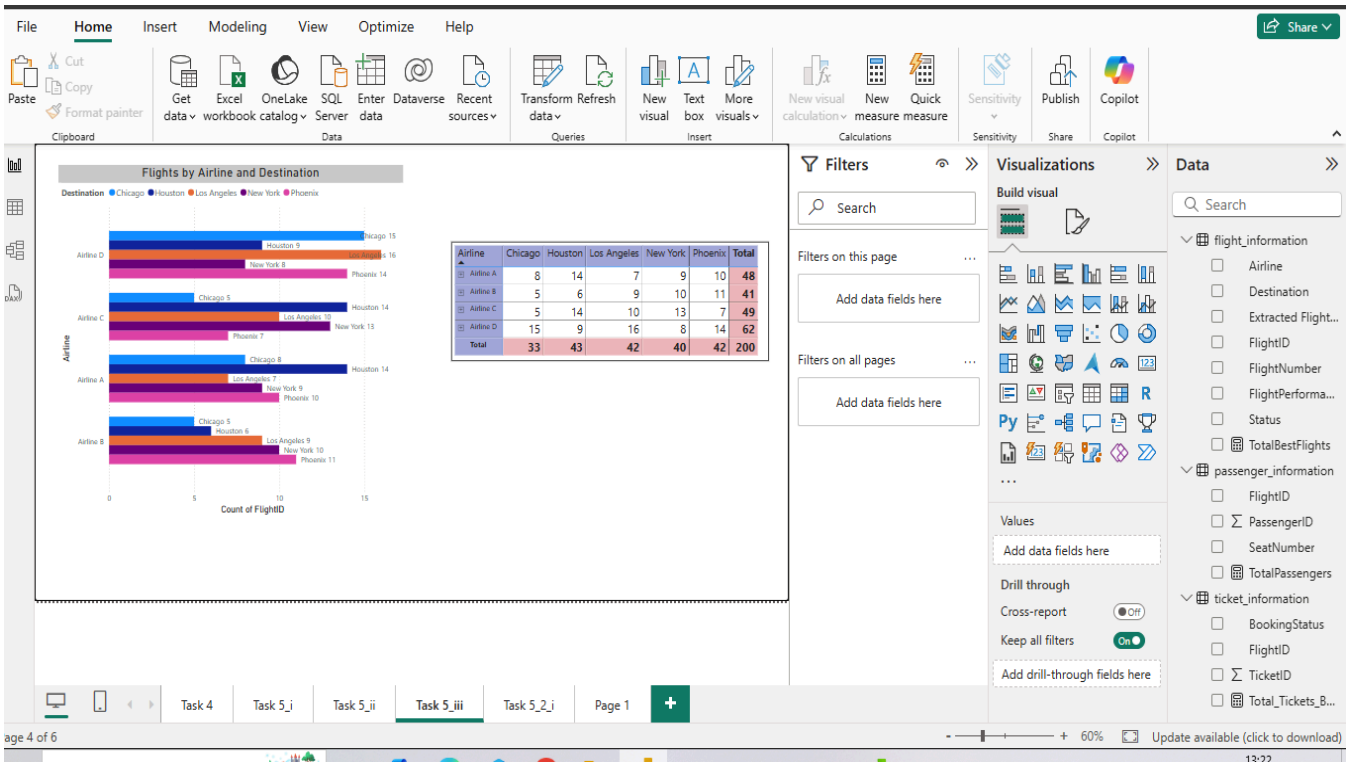
- **Visual Type: Stacked Column Chart**
- **Steps:**
  - Select **"Stacked Column Chart"** from the **Visualizations** pane.
  - Drag **Airline** from **Flight_Information** to **Axis**.
  - Drag **Destination** from **Flight_Information** to **Legend**.
  - Drag **FlightID** from **Flight_Information** to **Values** and set aggregation to **Count**.
- **Customization:**

✅ **Title:** "Flights by Airline and Destination"

✅ Use **stacked bars** for easy comparison

✅ Enable **filters** for interactive analysis

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Flights by Airline and Destination
Destination Chicago Houston Los Angeles New York Phoenix
Airline
Count of FlightID
Airline | Chicago | Houston | Los Angeles | New York | Phoenix | Total
Airline A | 8 | 14 | 7 | 9 | 10 | 48
Airline B | 5 | 6 | 9 | 10 | 11 | 41
Airline C | 5 | 14 | 10 | 13 | 7 | 49
Airline D | 15 | 9 | 16 | 8 | 14 | 62
Total | 33 | 43 | 42 | 40 | 42 | 200
Filters
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FlightPerforma...
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Task 5_ii
Task 5_iii
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Page 1
age 4 of 6
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Step 3: Add Interactive Features

✅ Destination and Airline Filters:

- **Visual Type: Slicer**

Steps:

- **Select "Slicer"** from the **Visualizations** pane.
- **Drag `Destination`** from **Flight_Information** to the slicer.
- **Add another slicer** and **drag `Airline`** into it.
- **Enable Multi-Select** to allow selecting multiple destinations or airlines.

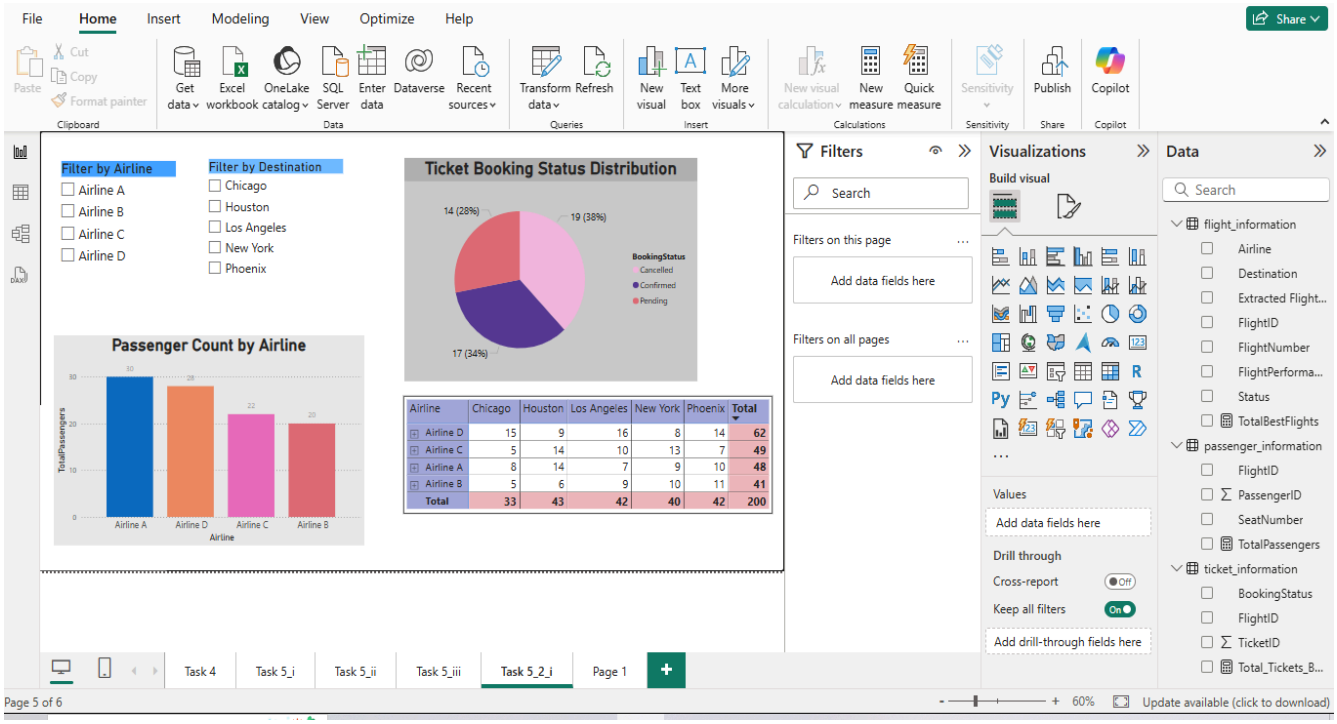
Customization:

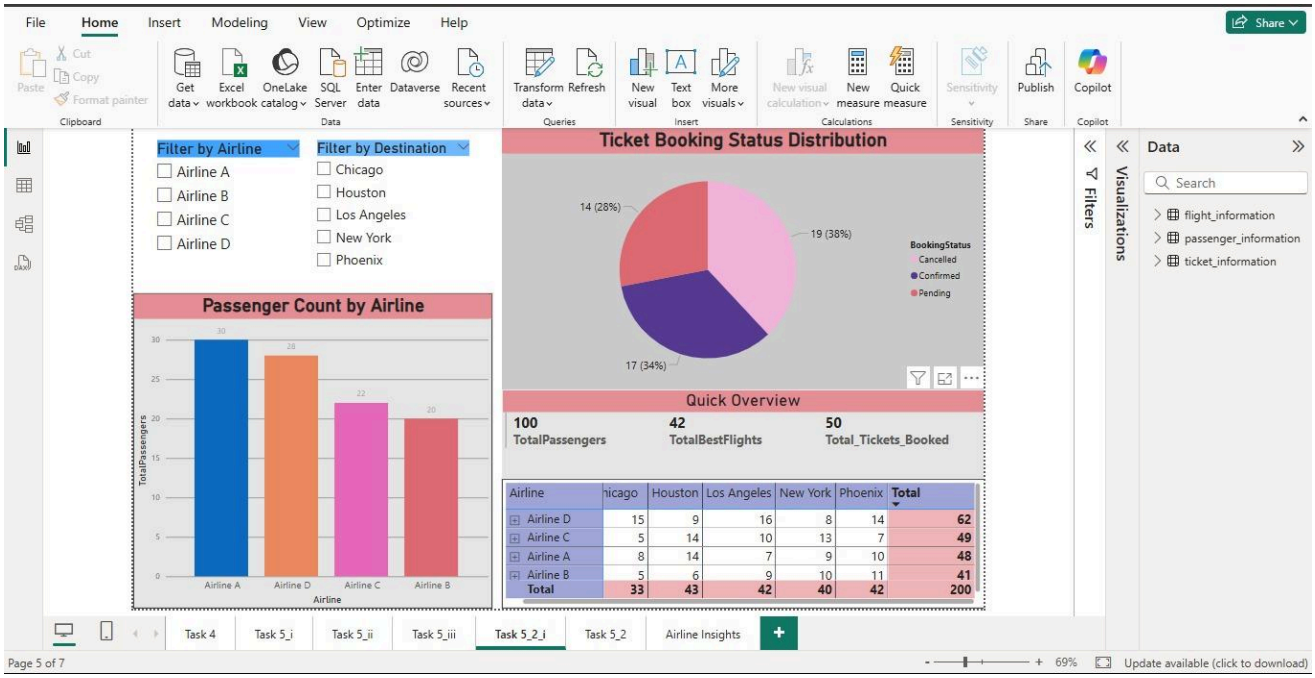
✅ Add title: “Filter by Destination” and “Filter by Airline”.

✅ Enable **multi-selection** for better user control

✅ Apply **dropdown or list format** for better readability

✅ These filters will allow users to **dynamically explore data** based on their selected destinations and airlines.

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Filter by Airline
Airline A
Airline B
Airline C
Airline D
Filter by Destination
Chicago
Houston
Los Angeles
New York
Phoenix
Ticket Booking Status Distribution
14 (28%)
19 (38%)
17 (34%)
BookingStatus
Cancelled
Confirmed
Pending
Passenger Count by Airline
TotalPassengers
Airline
Quick Overview
100
TotalPassengers
42
TotalBestFlights
50
Total_Tickets_Booked
Airline | Houston | Los Angeles | New York | Phoenix | Total
Airline D | 9 | 16 | 8 | 14 | 62
Airline C | 14 | 10 | 13 | 7 | 49
Airline A | 14 | 7 | 9 | 10 | 48
Airline B | 6 | 9 | 10 | 11 | 41
Total | 43 | 42 | 40 | 42 | 200
Data
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Task 4
Task 5_i
Task 5_ii
Task 5_iii
Task 5_2_i
Task 5_2
Airline Insights
Page 5 of 7
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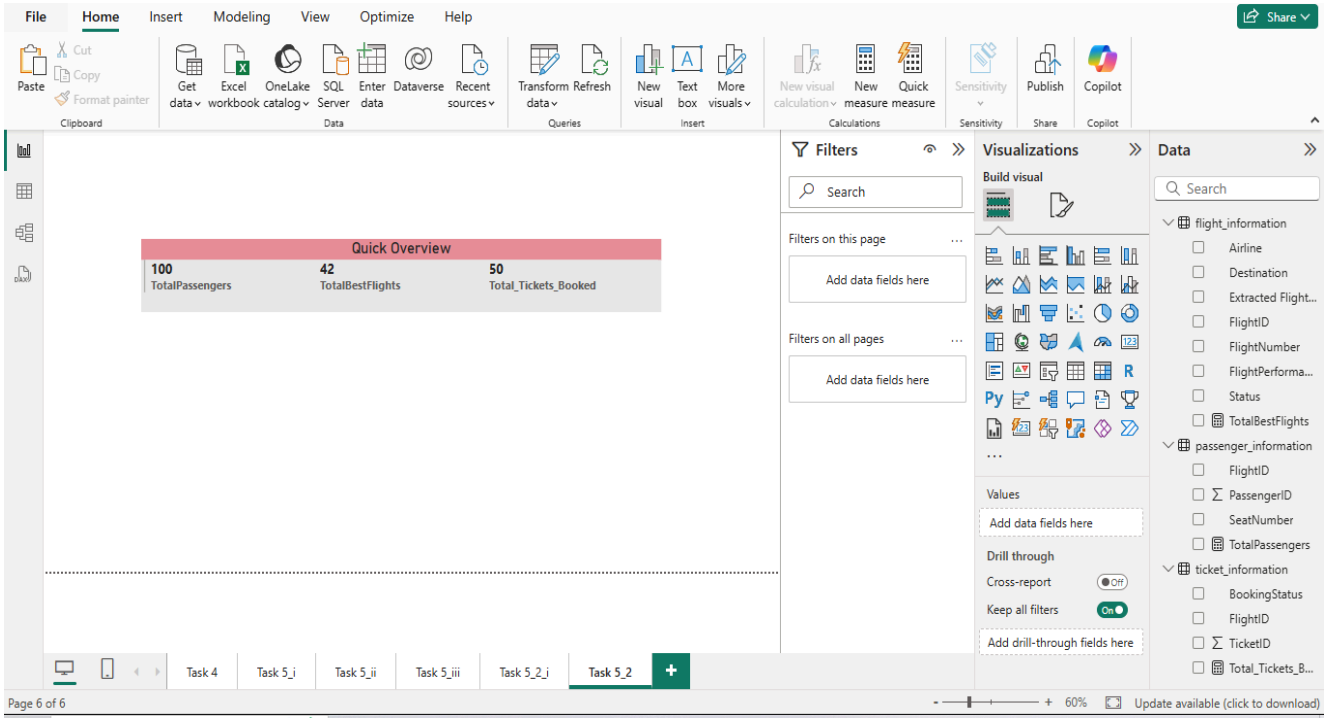
✅ Quick Views:

- **Select Visualization**
  - Choose **"Card"** from the Visualizations pane.
- **Add Key Metrics**
  - Include **Total Passengers, Best Flights, and Total Tickets**.
- **Format Data**
  - Display **numerical values & percentages** clearly.
- **Customize for Clarity**
  - Title: **“Quick Overview”**
  - Use **colors & icons** for better presentation.



Step 4: Create Airline-Specific Pages with Interactive Features

Goal:

✅ Create an **"Airline Insights"** page for flight details.

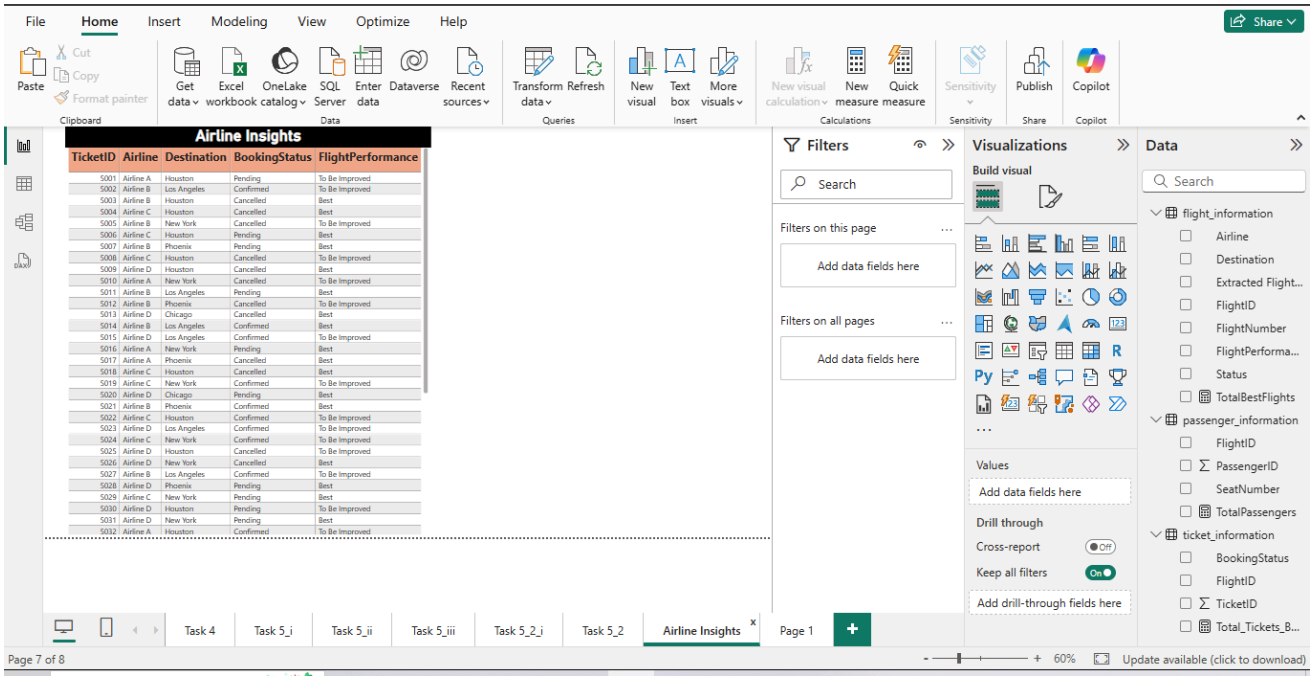
✅ Add a **back button** for easy navigation.

✅ Use **bookmarks & interactive buttons** for airline-specific views.

Step 4.1: Create Airline Insights Page

1. **Add a New Page:**
    a. Click **"+"** to create a new page.
    b. Rename it to **"Airline Insights"**.
2. **Add a Table for Flight Details:**
    a. Select **"Table"** from the Visualizations pane.
    b. Drag these fields into the table:
        i. **TicketID** (from Ticket_Information)
        ii. **Airline** (from Flight_Information)
        iii. **Destination** (from Flight_Information)
        iv. **BookingStatus** (from Ticket_Information)
        v. **Status** (from Flight_Information)
        vi. **Flight_Category** (from Flight_Information)

3. **Customize the Table:**
    a. Enable **sorting** for columns.
    b. Apply **conditional formatting** for key details.
    c. Add a **title: "Airline Insights"**.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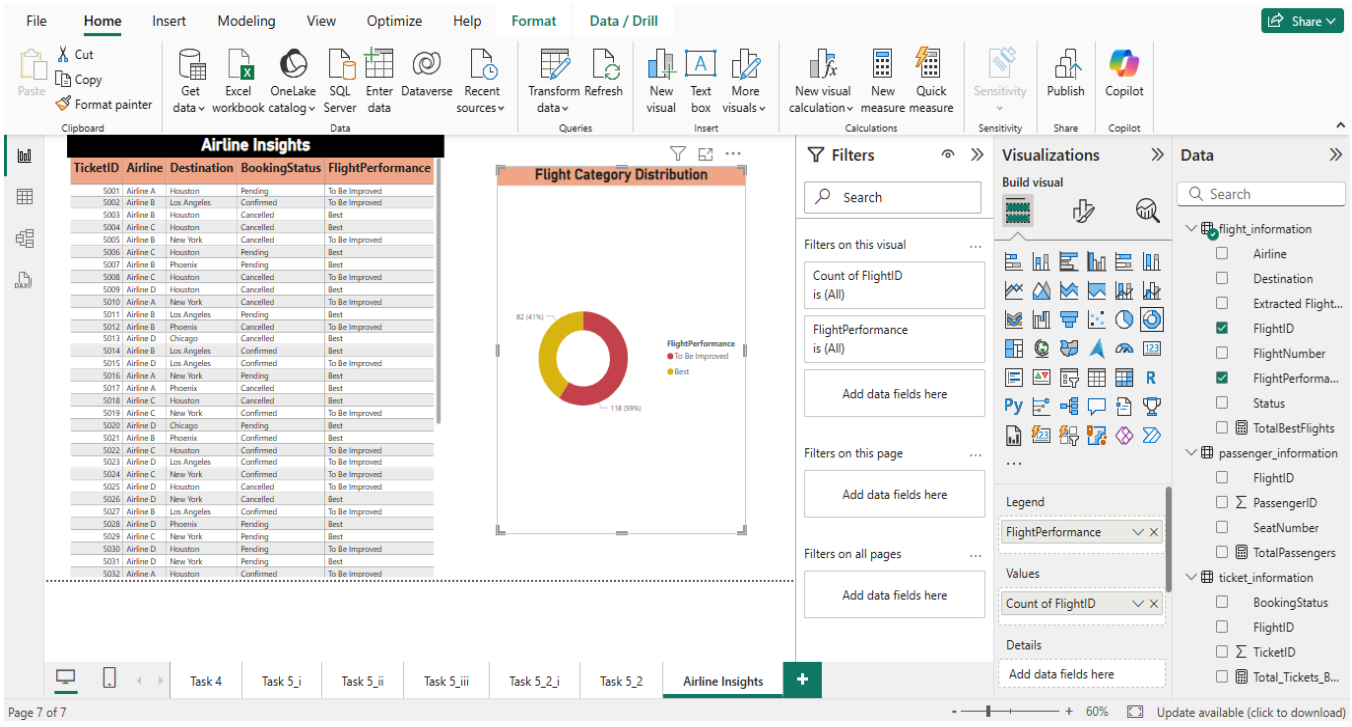
Step 4.2: Add a Pie Chart for Flight Category Distribution

1. **Insert a Donut Chart:**
    a. Select **"Donut Chart"** from the Visualizations pane.
    b. Drag **Flight_Category** to the **Legend**.
    c. Drag **TicketID** to **Values** and set aggregation to **Count**.

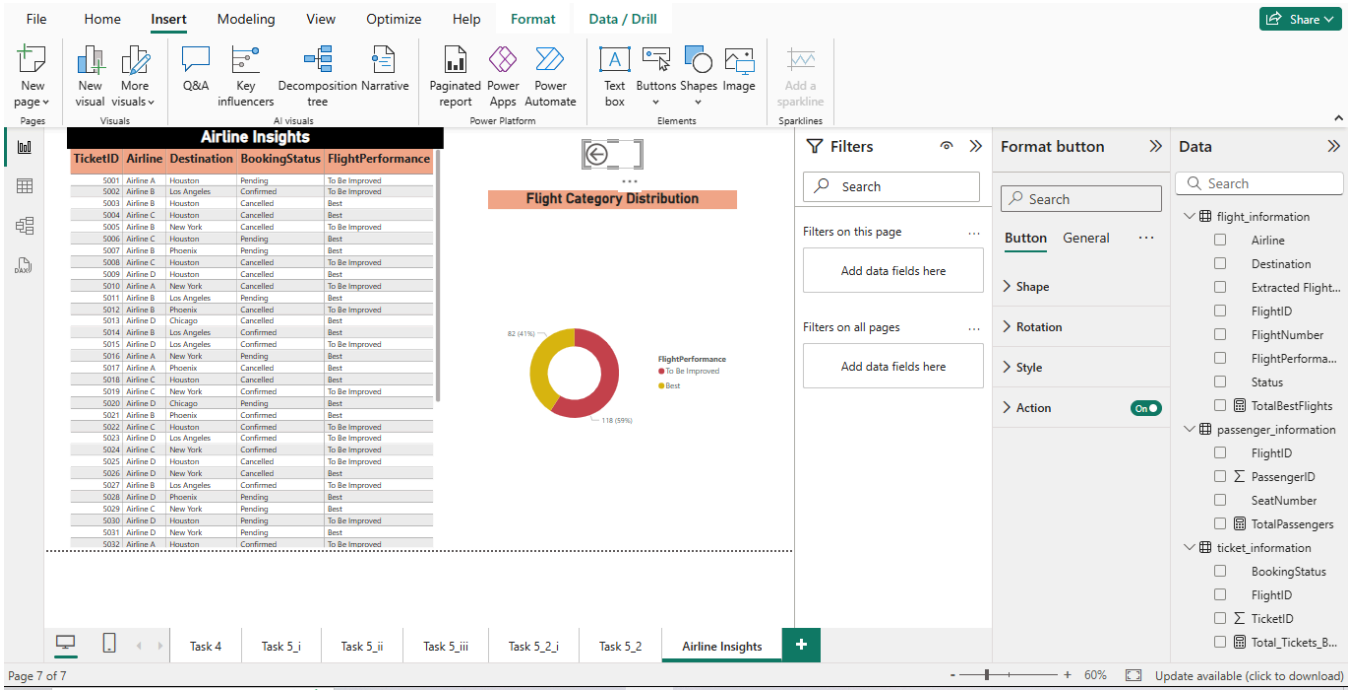
2. **Customize the Pie Chart:**
    a. Add **title: "Flight Category Distribution"**.
    b. Enable **data labels** for clarity.
    c. Use **distinct colors** for better visualization.



Step 4.3: Add a Back Button for Navigation

1. **Insert Back Button:**
    a. Go to **“Insert” → “Buttons” → Select “Back”**.
    b. Position it at the **top or bottom** of the page.

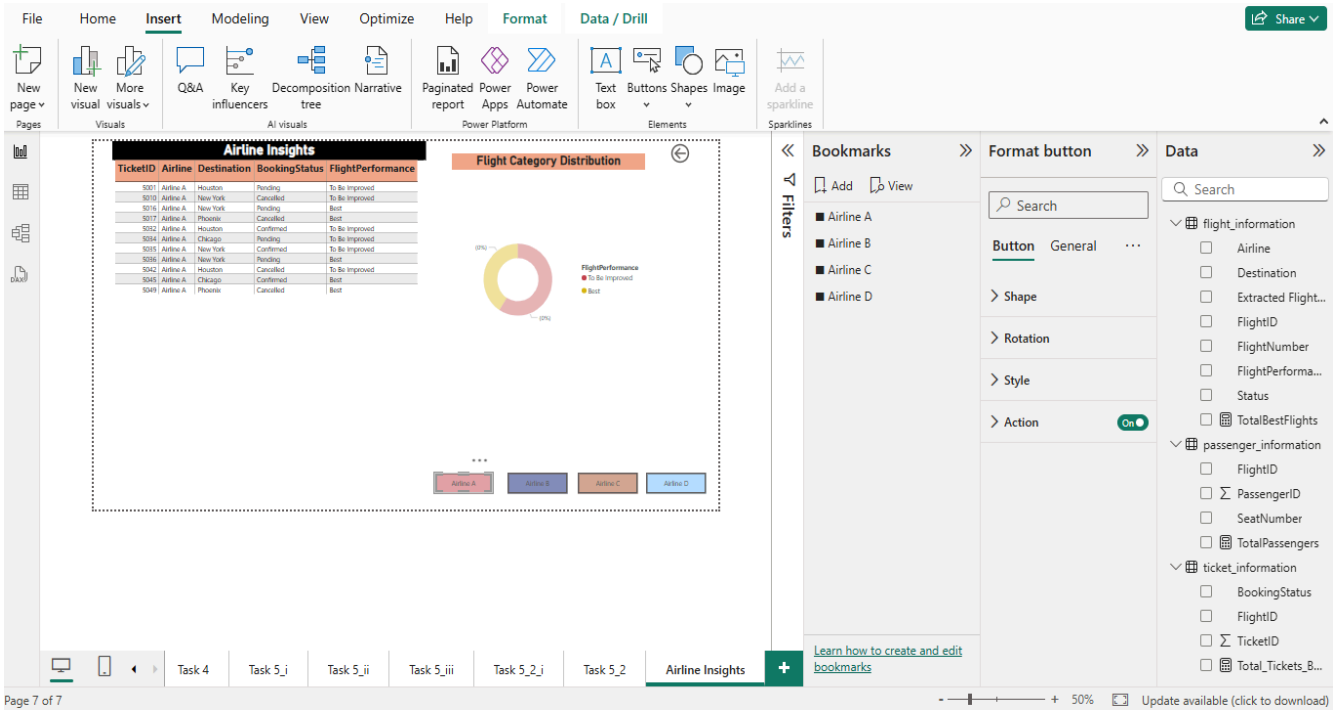
2. **Set Button Action:**
    a. Click the button and open the **“Format”** pane.
    b. Under **“Action”**, set it to **“Back”**.
    c. This allows users to return to the **main page** easily.



Step 4.4: Add Filters and Create Bookmarks for Airlines

1. **Add a Filter for Airline:**
    a. Drag **Airline** to the **Filters Pane**.
    b. Set the filter to **"All"** by default.

2. **Create Airline-Specific Bookmarks:**
    a. Filter the page for a specific airline.
    b. Create a Bookmark:
        i. Go to **"View" → Open "Bookmarks Pane"**.
        ii. Click **"Add"**, then rename it (e.g., **Airline A, Airline B, Airline C, Airline D**).
    c. **Repeat** the process for each airline.

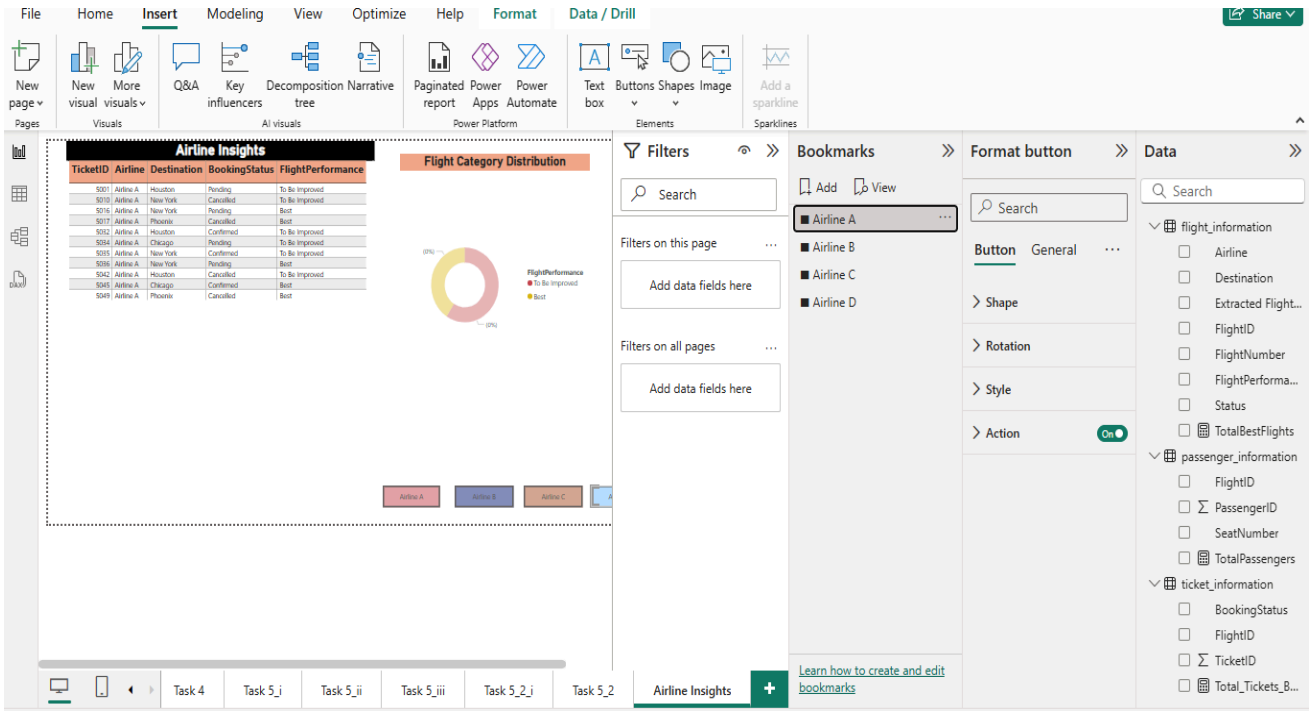


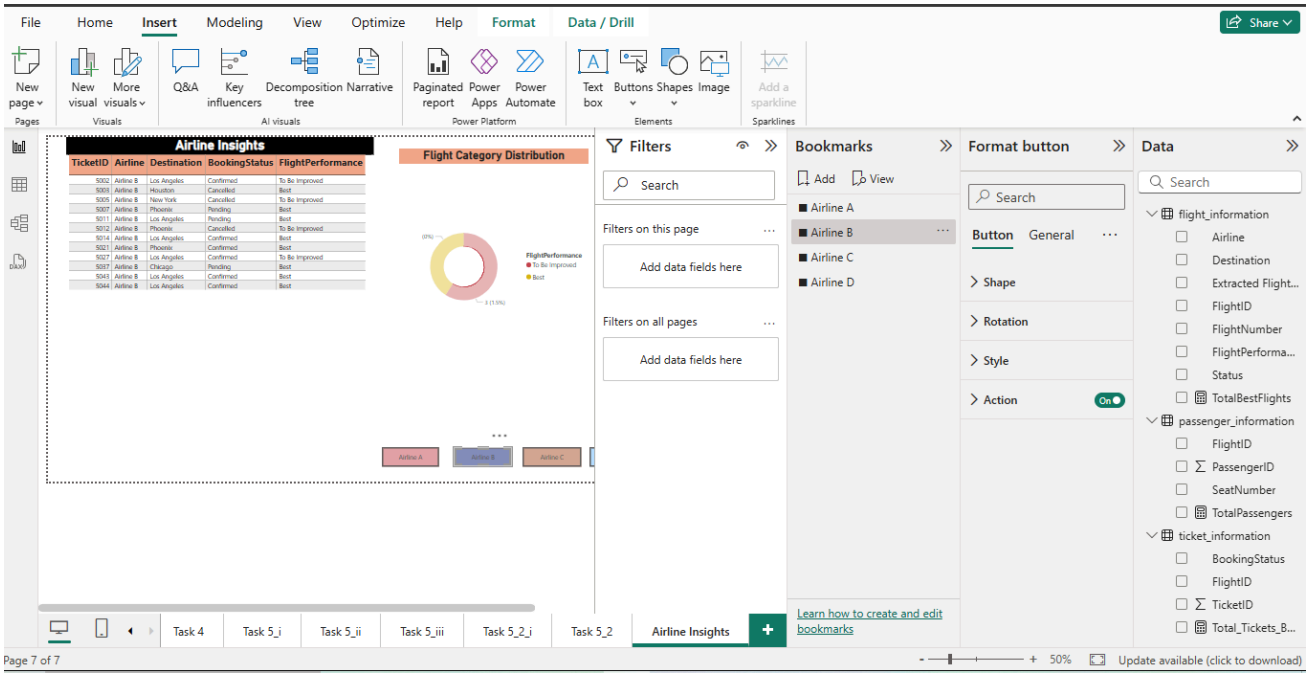
Step 4.5: Add Bookmark Buttons for Navigation

1. **Go to Main Page:**
    a. Switch to the **Main Page** where you want to add airline-specific buttons.

2. **Insert Buttons for Each Bookmark:**
    a. Go to **"Insert" → "Buttons" → Select "Blank"**.
    b. Create **four buttons** labeled:
        i. **Airline A**
        ii. **Airline B**
        iii. **Airline C**
        iv. **Airline D**

3. **Set Button Actions:**
    a. Select each button and open the **"Format"** pane.
    b. Enable **"Action"** and set the action type to **"Bookmark"**.
    c. Link each button to its **corresponding bookmark**.

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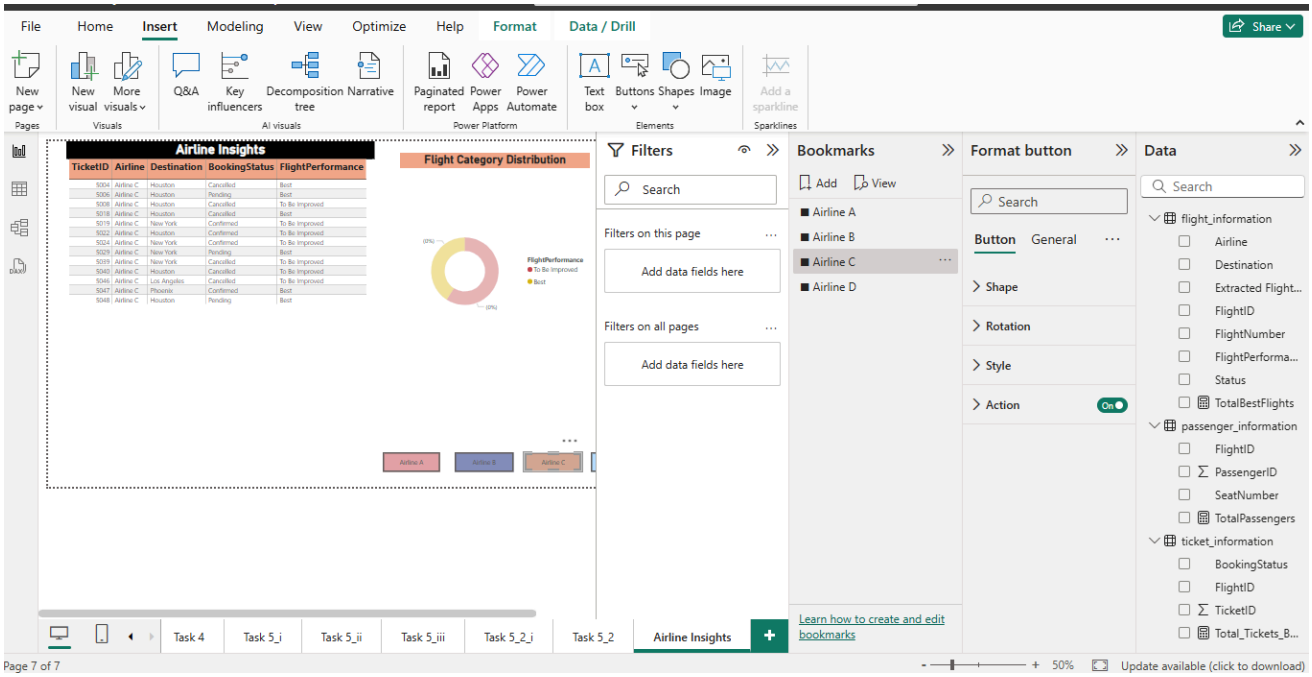
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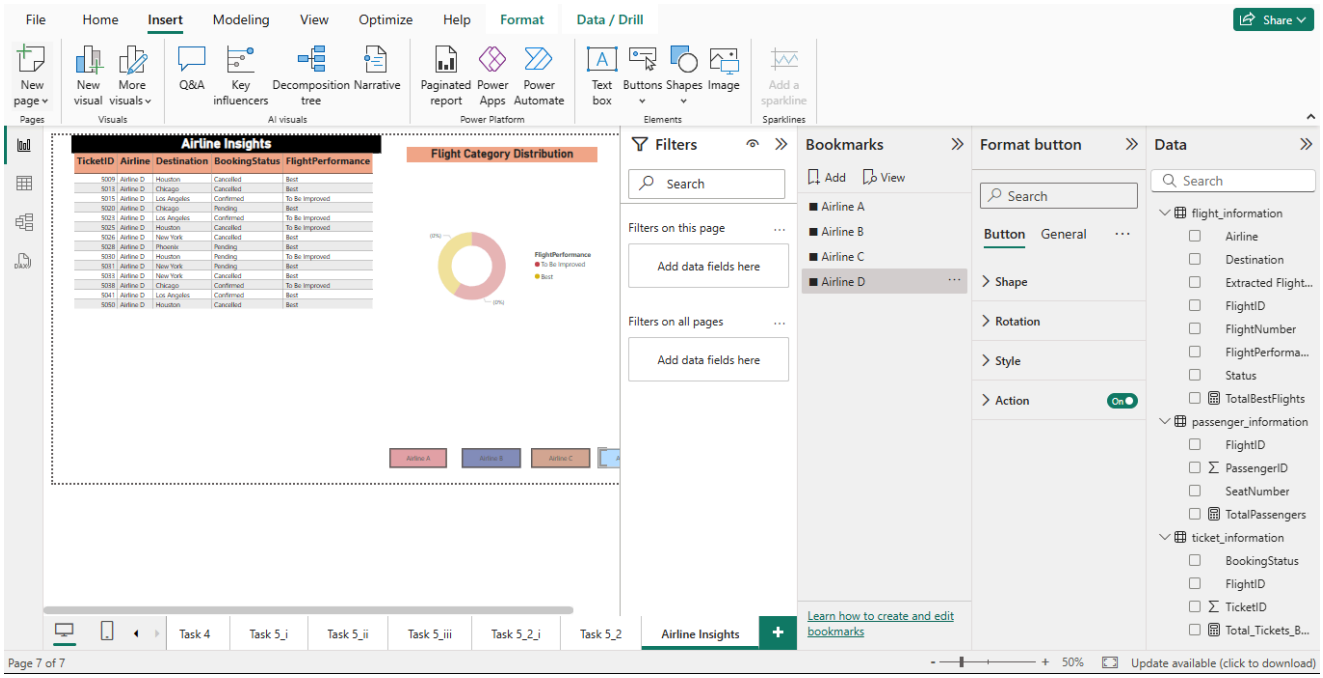
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Task 6: Final Dashboard and Power BI Service Configuration

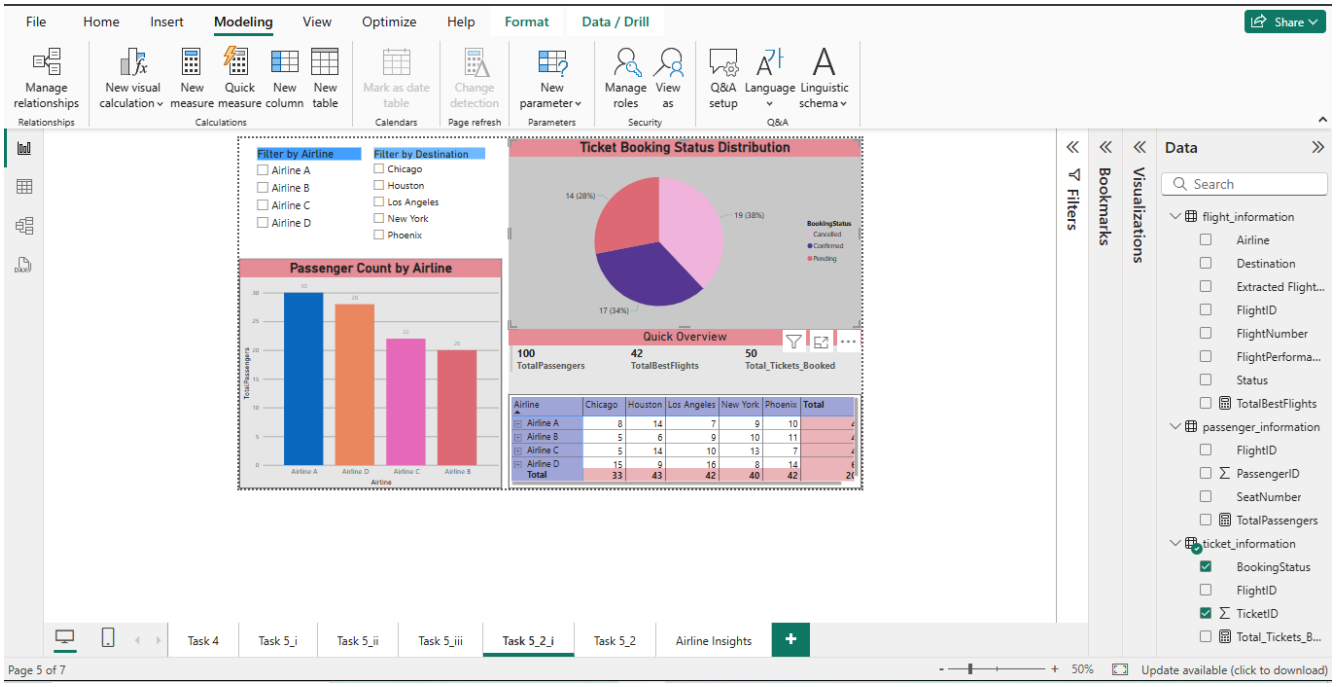
Part 1: Design a Comprehensive Dashboard

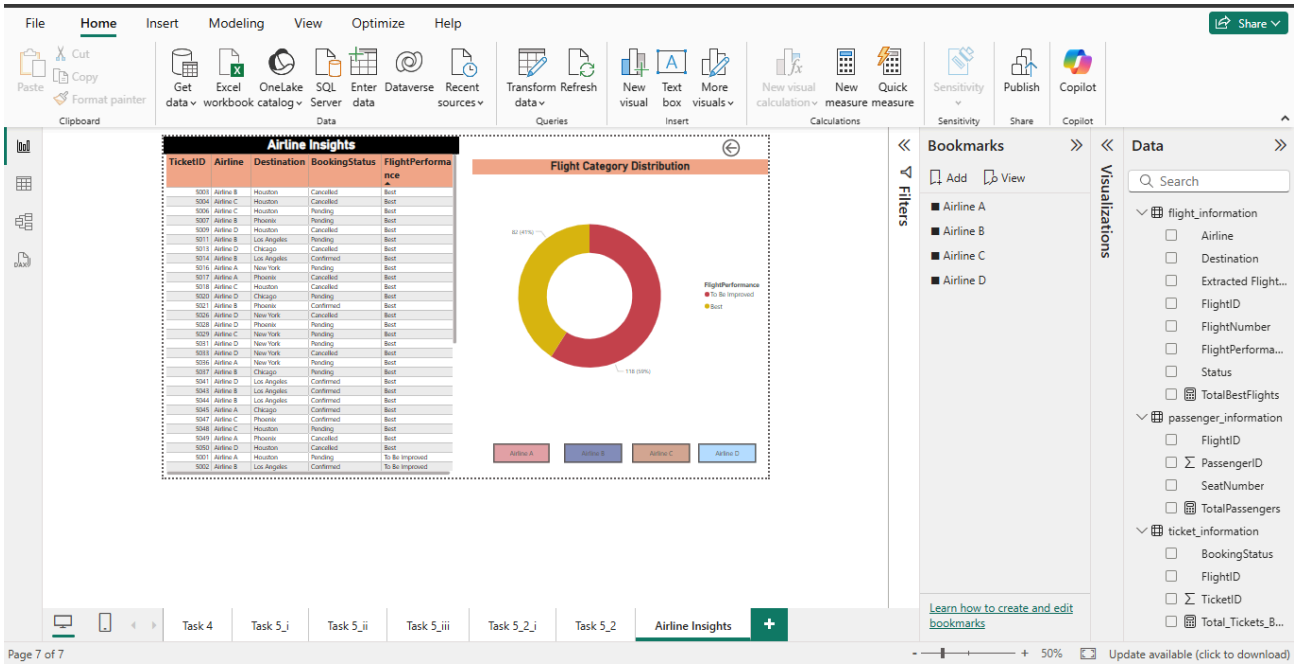
Step 1: Create a Final Dashboard

1. **Open Power BI Desktop:**
    a. Launch **Power BI** and ensure all required visuals are added.
2. **Add Key Visuals:**
    a. **Passenger Count by Airline:**
        i. **Chart Type:** Bar/Column Chart
        ii. **X-axis:** Airline
        iii. **Y-axis:** Count of PassengerID
    b. **Ticket Booking Statuses:**
        i. **Chart Type:** Pie/Donut Chart
        ii. **Legend:** BookingStatus
        iii. **Values:** Count of TicketID
    c. **Flights by Airline and Destination:**
        i. **Chart Type:** Matrix/Table
        ii. **Rows:** Airline
        iii. **Columns:** Destination
        iv. **Values:** Count of FlightID
    d. **Flight Category Count:**
        i. **Chart Type:** Pie Chart
        ii. **Legend:** FlightPerformance
        iii. **Values:** Count of TicketID
    e. **Flight Insights Table:**
        i. **Chart Type:** Table
        ii. **Columns:** TicketID, Airline, Destination, BookingStatus, Status, Flight_Category

Step 2: Customize Dashboard Layout

1. **Set Page Size:**
    a. Go to **Format Pane → Canvas Settings**.
    b. Choose **16:9** for a **standard layout**.
2. **Add Titles & Tooltips:**
    a. Assign **clear titles** to each visual.
    b. Enable **tooltips** for additional insights.
3. **Apply Consistent Theme:**
    a. Use a **uniform color scheme** that aligns with the airline's branding.

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Part 2: Configure Row-Level Security (RLS) for Airline

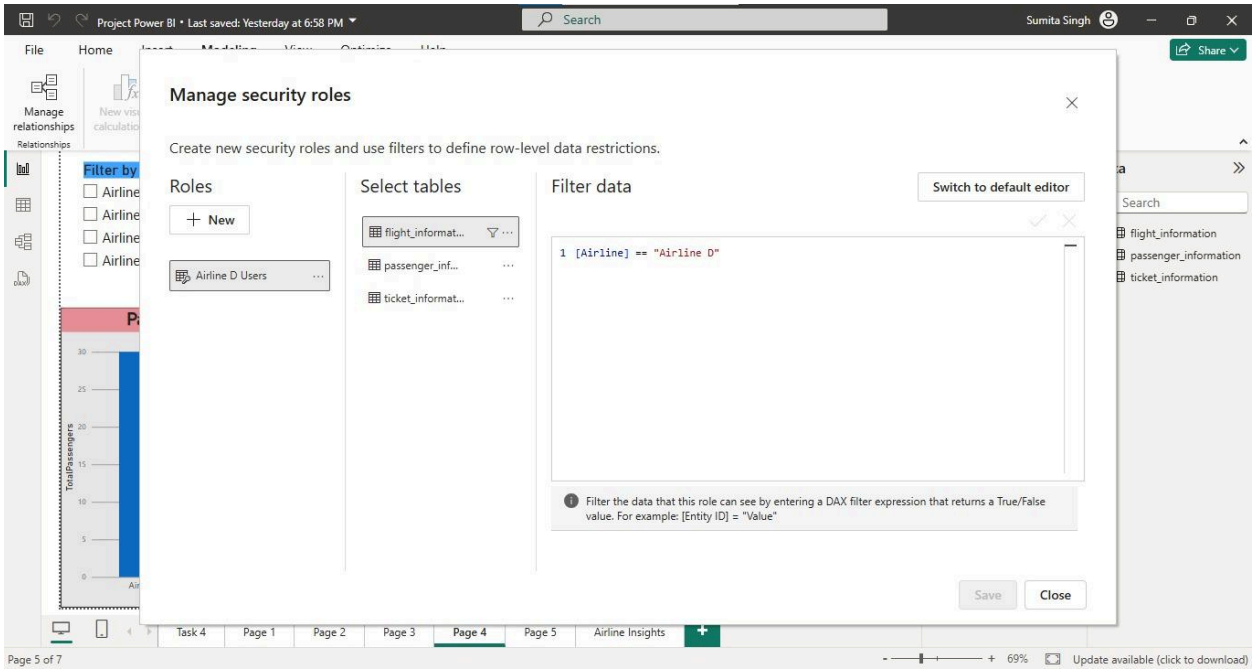
Step 1: Create Role for Airline D

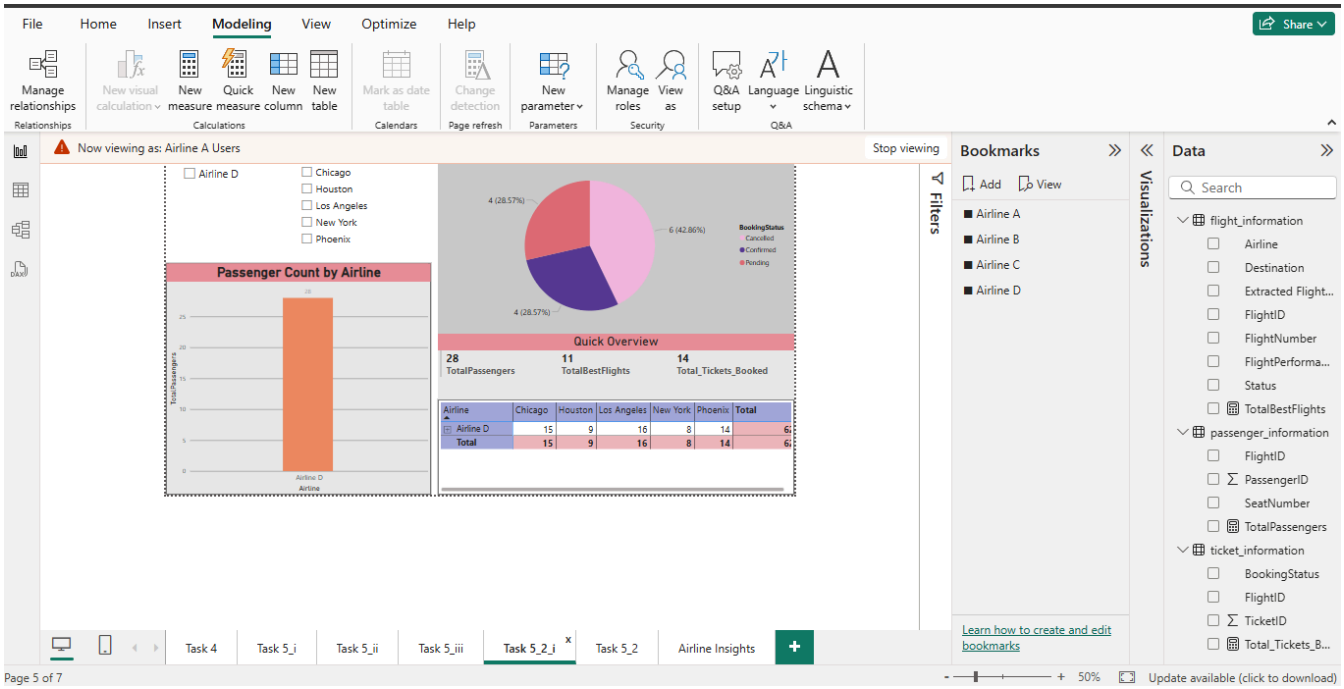
1. **Open Power BI Desktop:**
    a. Go to **Model View** (third icon on the left).

2. **Define Role:**
    a. Click **Manage Roles** from the ribbon.
    b. Click **Create** and name the role as **Airline_D_Role**.
3. **Set Filter Condition:**
    a. Select the **Flight_Information** table.
    b. Apply this **DAX expression**:

```
[Airline] = "Airline D"
```

4. **Save and Validate:**
    a. Click **Save** after applying the condition.
    b. Click on **View As Role** to test and ensure only **Airline D** data is visible.

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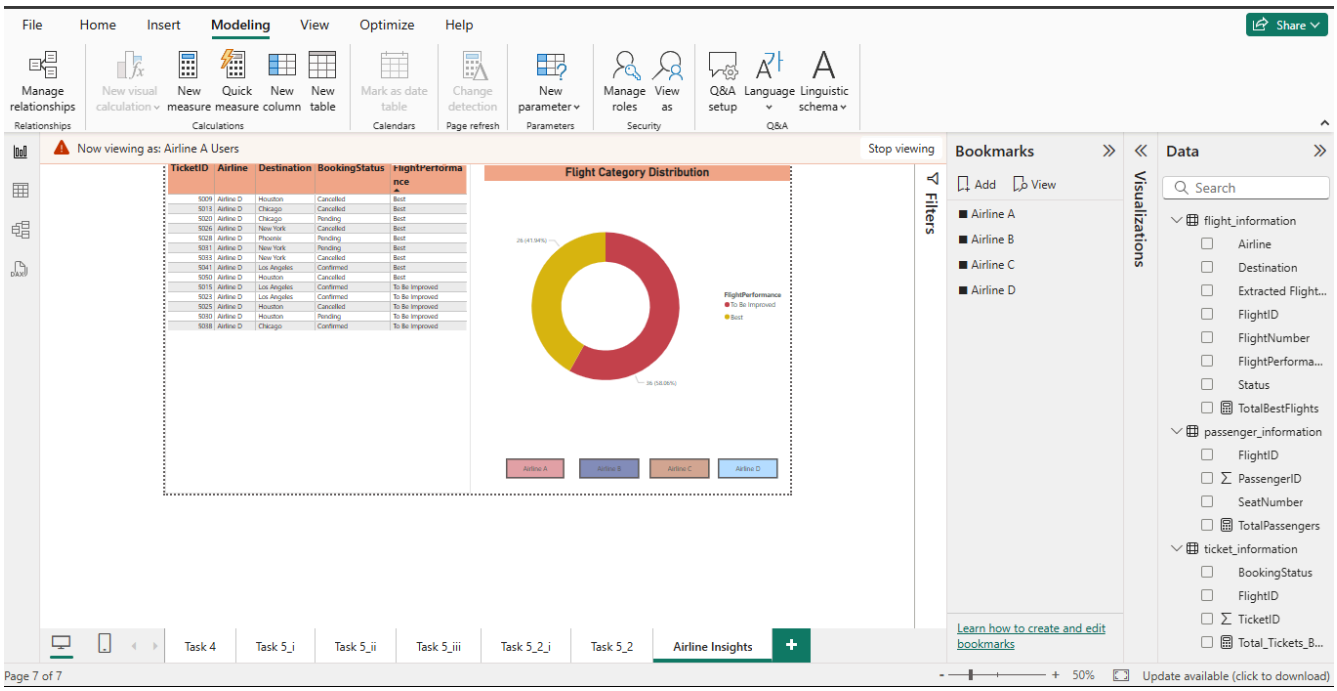
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Step 2: Assign User to Role in Power BI Service

1. Publish the Report:

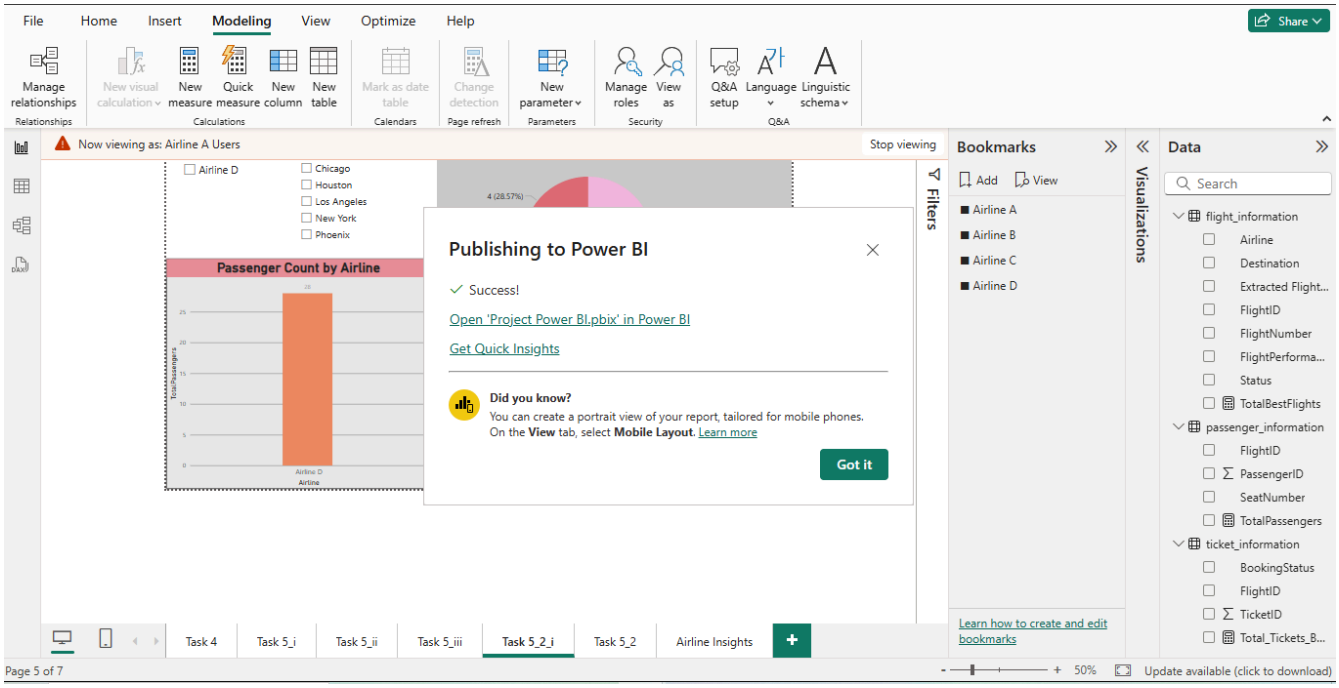
- Click **Publish** from the **Home** tab.
- Select the desired **workspace** in **Power BI Service**.

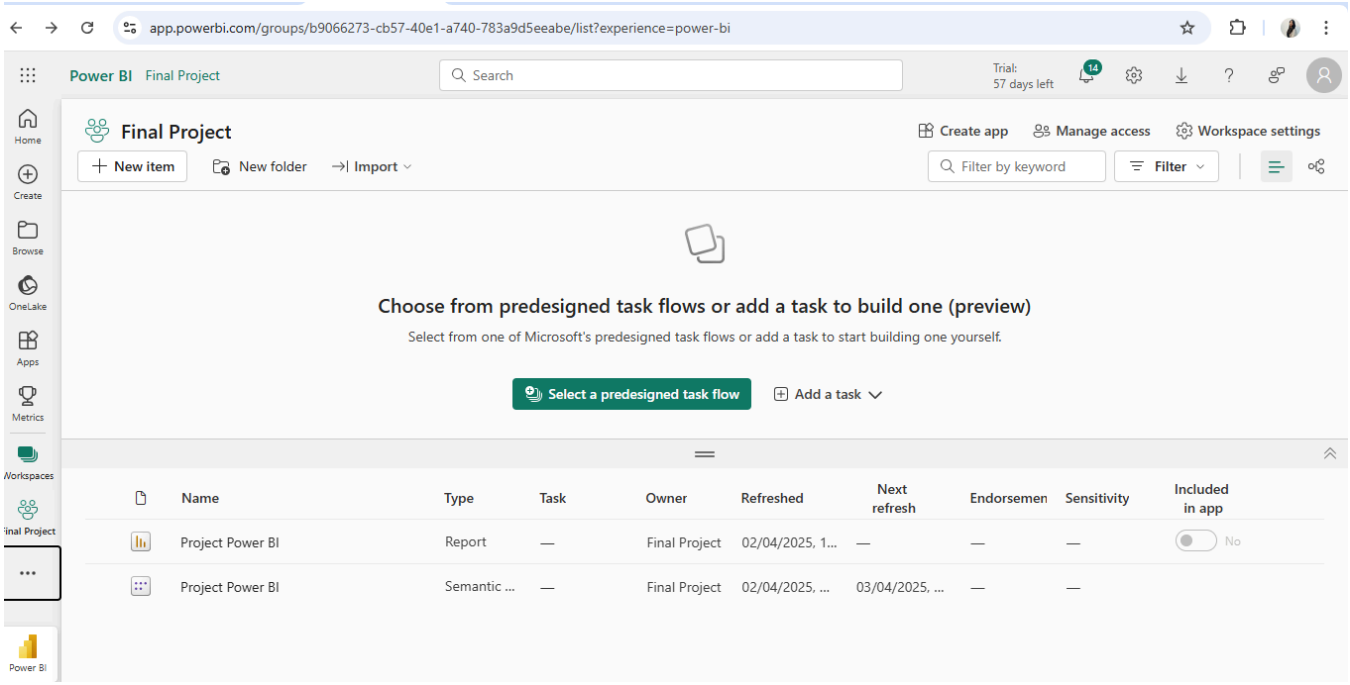
2. Open Report in Power BI Service:

- Go to **Power BI Service**.
- Open the **published dataset**.

3. Configure Security:

- Click on the **More Options (⋯)** beside the dataset.
- Select **Security**.
- Assign the role **Airline_A_Role** to the intended user(s).
- Add their **email IDs** and click **OK**.

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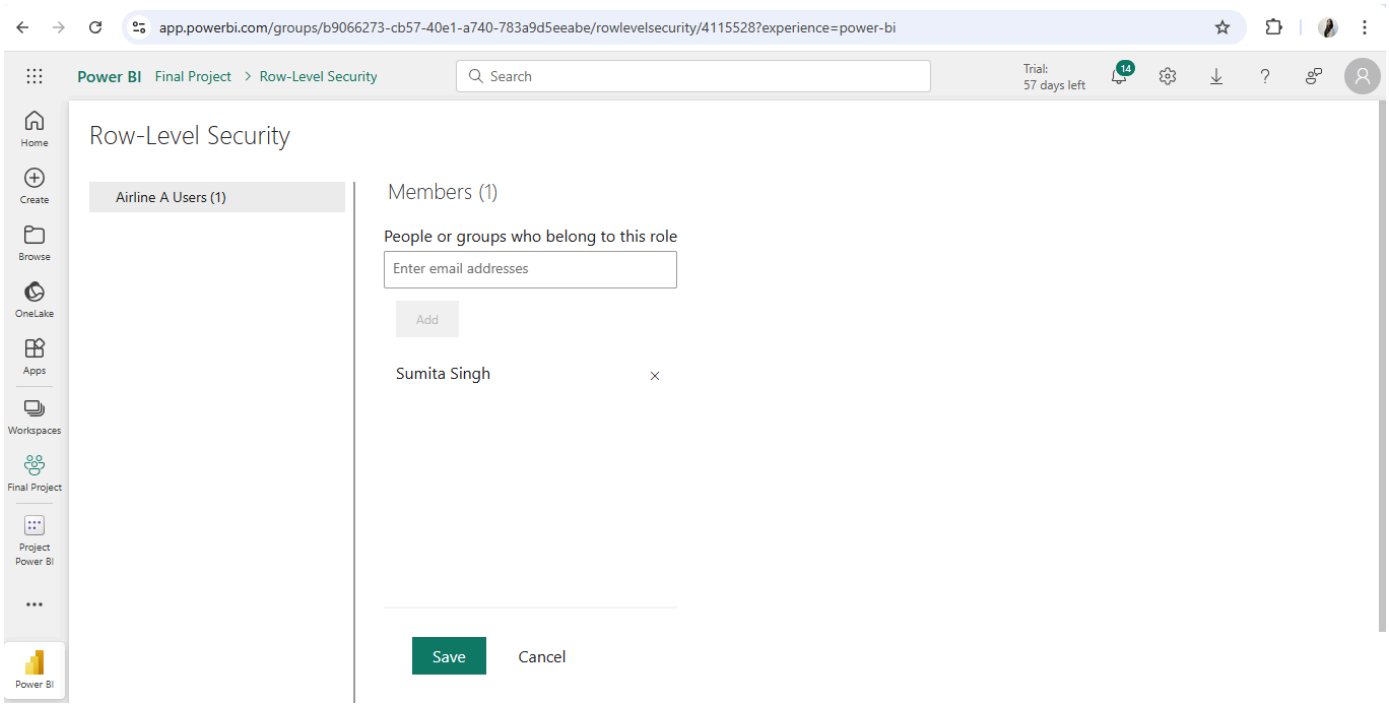
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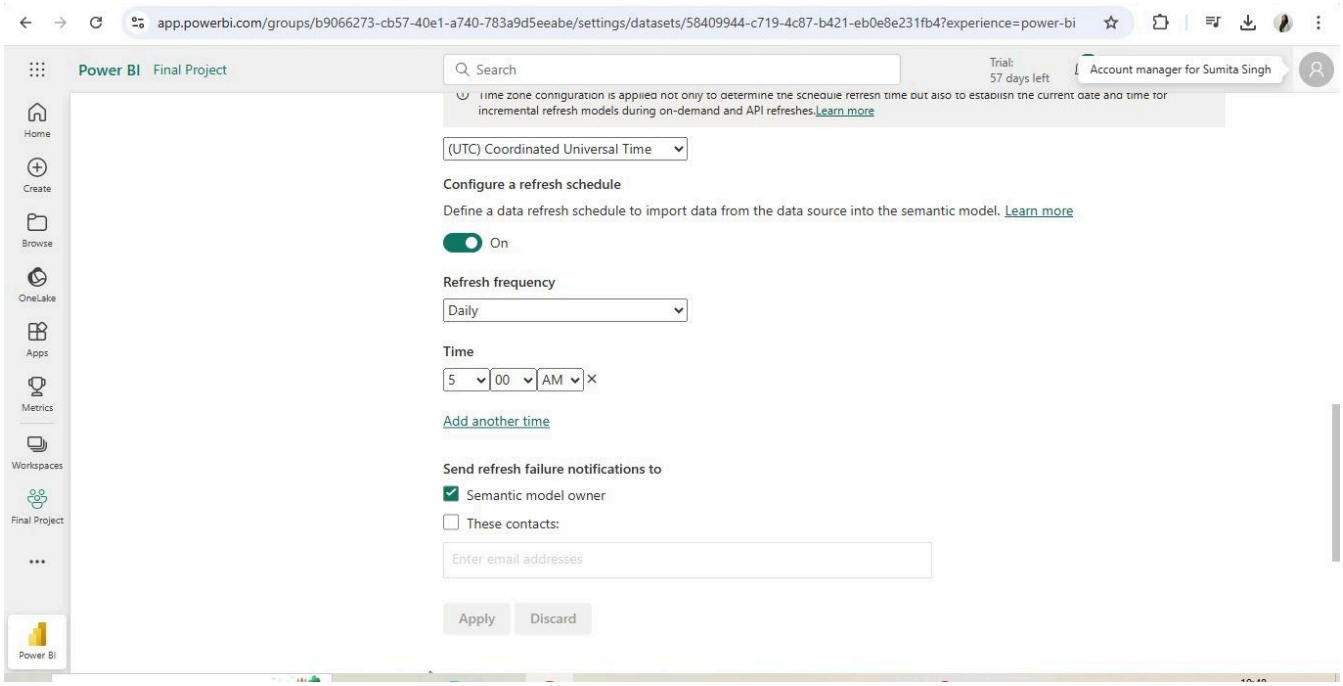
Part 3: Schedule Data Refresh at 5 PM Daily

Step 1: Configure Scheduled Refresh

1. **Go to Dataset Settings:**
    a. Open **Power BI Service**.
    b. Click on **More Options (⋯)** next to the dataset.
    c. Select **Settings**.

2. **Set Data Source Credentials:**
    a. Expand **Data Source Credentials**.
    b. Set up the necessary **authentication** for the data connection.

3. **Schedule Refresh:**
    a. Expand **Scheduled Refresh**.
    b. Enable **"Keep data updated"**.
    c. Set the refresh time to **5:00 PM**.
    d. Select the **desired time zone**.
    e. Click **Apply**.



Project Explanation Video:
https://drive.google.com/file/d/1otE_gMSgITOdELs5GNagZ-egEEaLGOKt/view?usp=sharing