Video Explanation:
https://drive.google.com/file/d/11tWZY6boDBRhS4xppbiHDYy_mVc2_hZm/view?usp=sharing

DS PGC COURSE 3 PROJECT

Airline Performance Analysis Using Power BI

Abstract

The project will utilize various Power BI features to transform, model, and visualize data, ultimately creating a comprehensive dashboard for decision-making.

Amit Hiremath- DS PGC – 1st July

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Project Title:

Airline Performance Analysis using Power BI

Problem Statement:

The airline industry is highly dynamic, with numerous daily operations, including flight scheduling, passenger management, and ticket booking. Analyzing and managing this data effectively is crucial for operational efficiency, customer satisfaction, and strategic decision-making. This project aims to streamline and analyze airline operations using Power BI to uncover insights and improve management processes.

Datasets Used:

1. Flight Information: Fight_Information
Contains details about flights, including FlightID, FlightNumber, Airline, Destination, and Status.

2. Passenger Information: Passenger_Information
Contains details about passengers, including PassengerID, FlightID, and SeatNumber.

3. Ticket Information: Ticket_Information
Contains details about ticket bookings, including TicketID, FlightID, and BookingStatus.

Objective:
The primary objective of this project is to analyze and visualize the airline data to gain insights into flight operations, passenger management, and ticketing. The project will utilize various Power BI features to transform, model, and visualize data, ultimately creating a comprehensive dashboard for decision-making.

Tasks:

1. Data Extraction and Transformation in Power Query:

- Extract data from the provided CSV files and load them into Power BI.

- Extracted the data to load into power query.

- Perform data cleaning activities such as removing duplicates, handling missing values, and formatting columns appropriately.

- Cleaned the data. Removed duplicates, blanks and errors. Formatted the columns appropriately.

2. Conditional and Custom Columns:

- Create a conditional column to classify flights as “best” and “to be improved” based on the status column of the flight information dataset(best for on time and to be improved for the rest).

- Created a Conditional Column “FlightClass” for “Best” & “To be improved” classes of flights.

3. Column from Examples and Replace Values:

- Use the "Column from Examples" feature to extract a substring from the FlightNumber column that represents the flight number.

- Created the column “SubstringFlightNumber” from “FlightNumber” column using “Column from Examples”.

- Replace values in the Status column to standardize them (e.g., "On Time" to "On- Time").

- Replaced the “On Time” by “On -Time” for standardizing the column.

4. Merge Queries and Merge Columns:

- Merge the Flight Information and Passenger Information datasets based on FlightID to create a unified dataset for analysis.

- Merged the Flight_information and Passenger_Information Queries based on FlightID. The resultant query contained “Null” for “PassengerID” column and “SeatNumber” column. Replaced the “Null" values with 0 in “PassengerID” column and “na” in “SeatNumber” Column.
- “flight_Information” table renamed as “flight_passenger_information”.

- Merge the SeatNumber and PassengerID columns to create a unique identifier for each passenger.

- Created a new column “UniquePassenger” to merge “SeatNumber” and “PassengerID” columns.

5. Create Relationships:

- Establish relationships between the datasets (e.g., FlightID as a key between Flight Information and Ticket Information) and understand cardinality.

- As the “flight_information” and “passenger_information” have been merged, the cardinality between “flight_passenger_information” and “Ticket_information” is Many-to-Many & cross filter direction in “Both”.

6. DAX:

-Find the total number of passengers who booked a ticket on a specific flight FL5011

- There is no Flight “FL5011”. Hence the number of tickets booked on the flight are “Null” or “Blank” or “0”.
- Checked on another flight “FL1771” the number of tickets booked are 2.

-Total number of tickets booked.

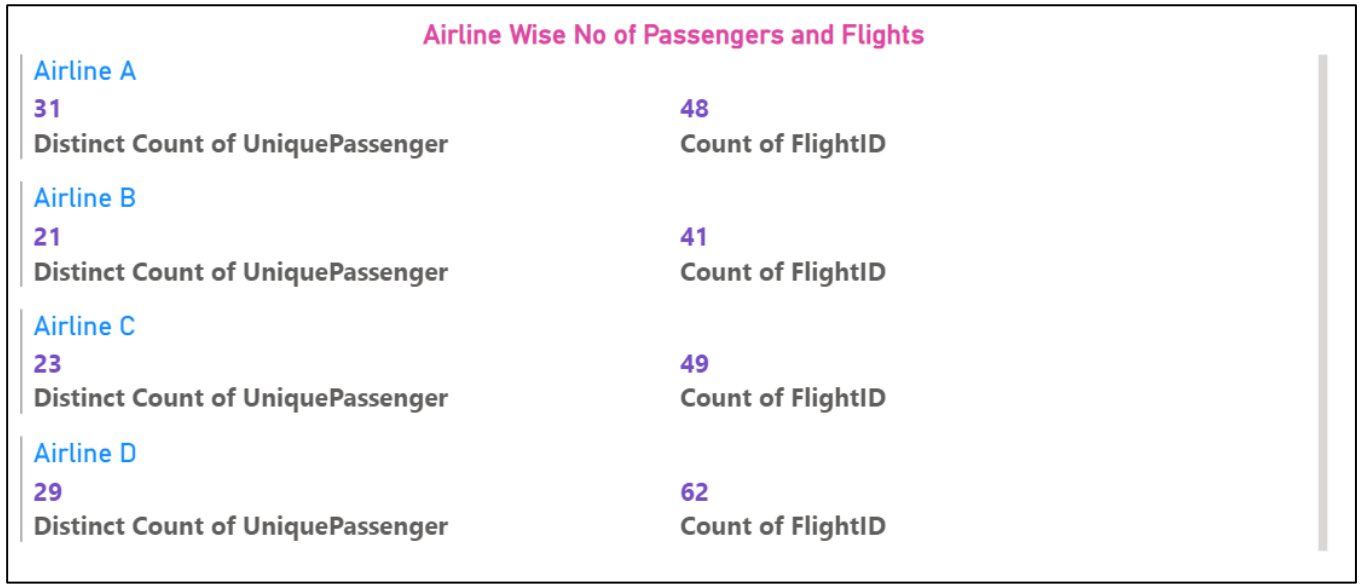
- Total Tickets are 50. Confirmed are 17. Pending are 14. Cancelled are 19.

-Create filtered table using DAX to show only best flights information.

- Created a filtered “Best Flights” Table After filtering “FlightClass” column by “Best” flights.

7. Visualization:

- Create a multi card chart to visualize the number of passengers, flights for each airline.



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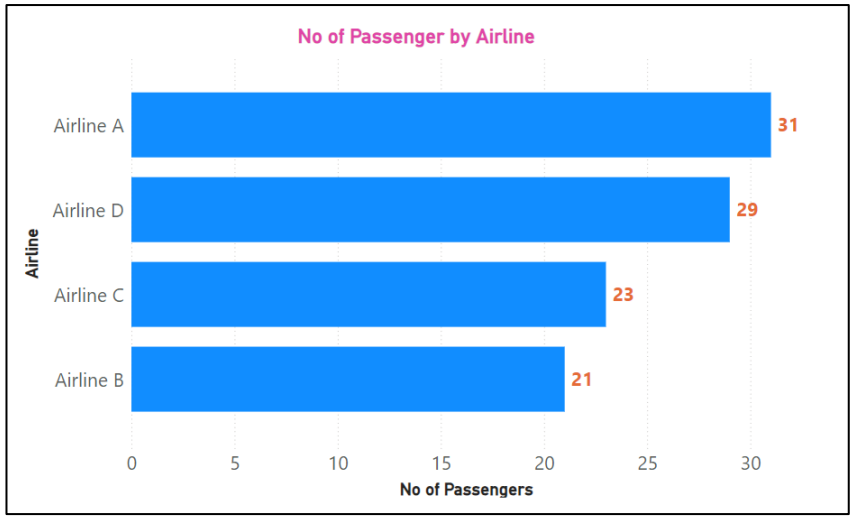
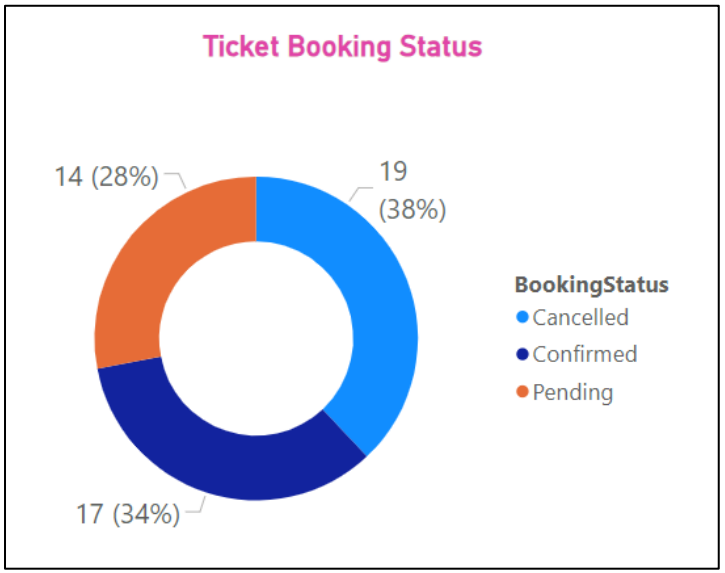
- Develop a bar chart to compare the number of passengers per airline.

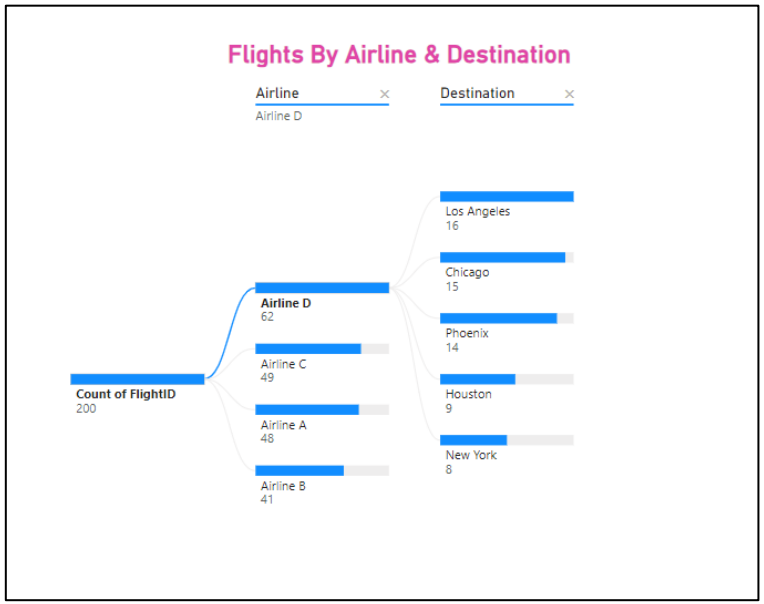


- Use a donut chart to represent thedistribution of ticket booking statuses.

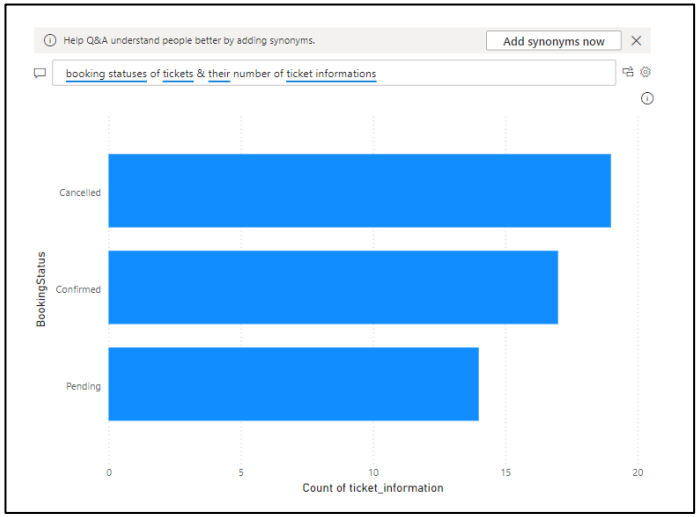


8. Advanced Visualizations: Decomposition Tree and Key Influencer:

- Use a decomposition tree to break down the number of flights based on airlines and destination.



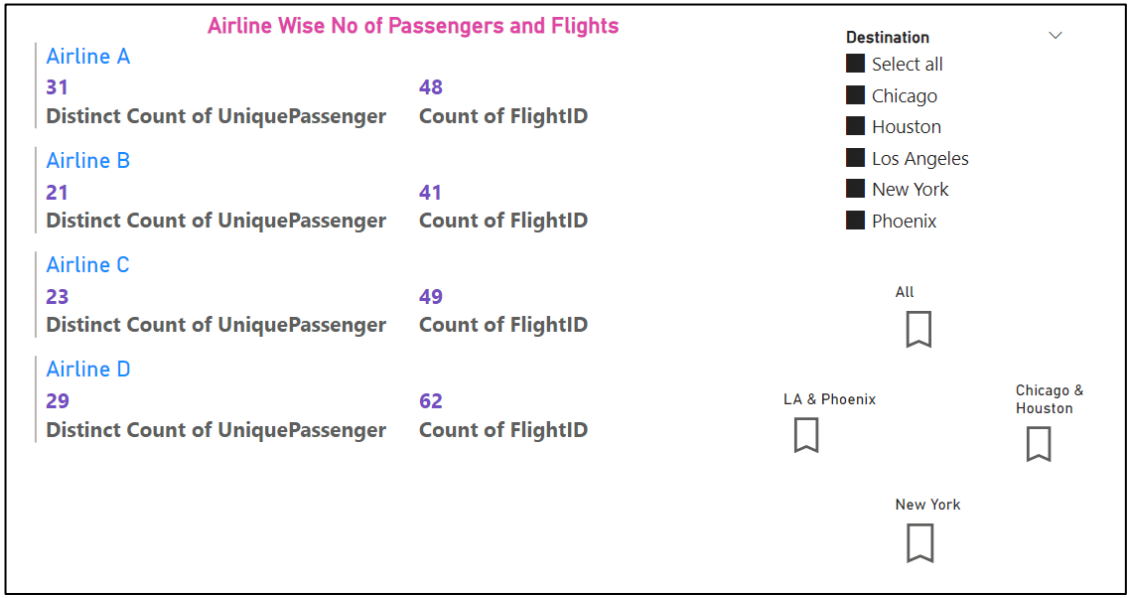
- Implement the Q&A to visualize booking statuses by total tickets.



9. Interactive Features: Slicers, Bookmarks, and Drill Through:

- Add Destination slicer to filter data by Airline, total passengers and total flights.

-Status. - Create bookmarks to save different views of the report for quick access.

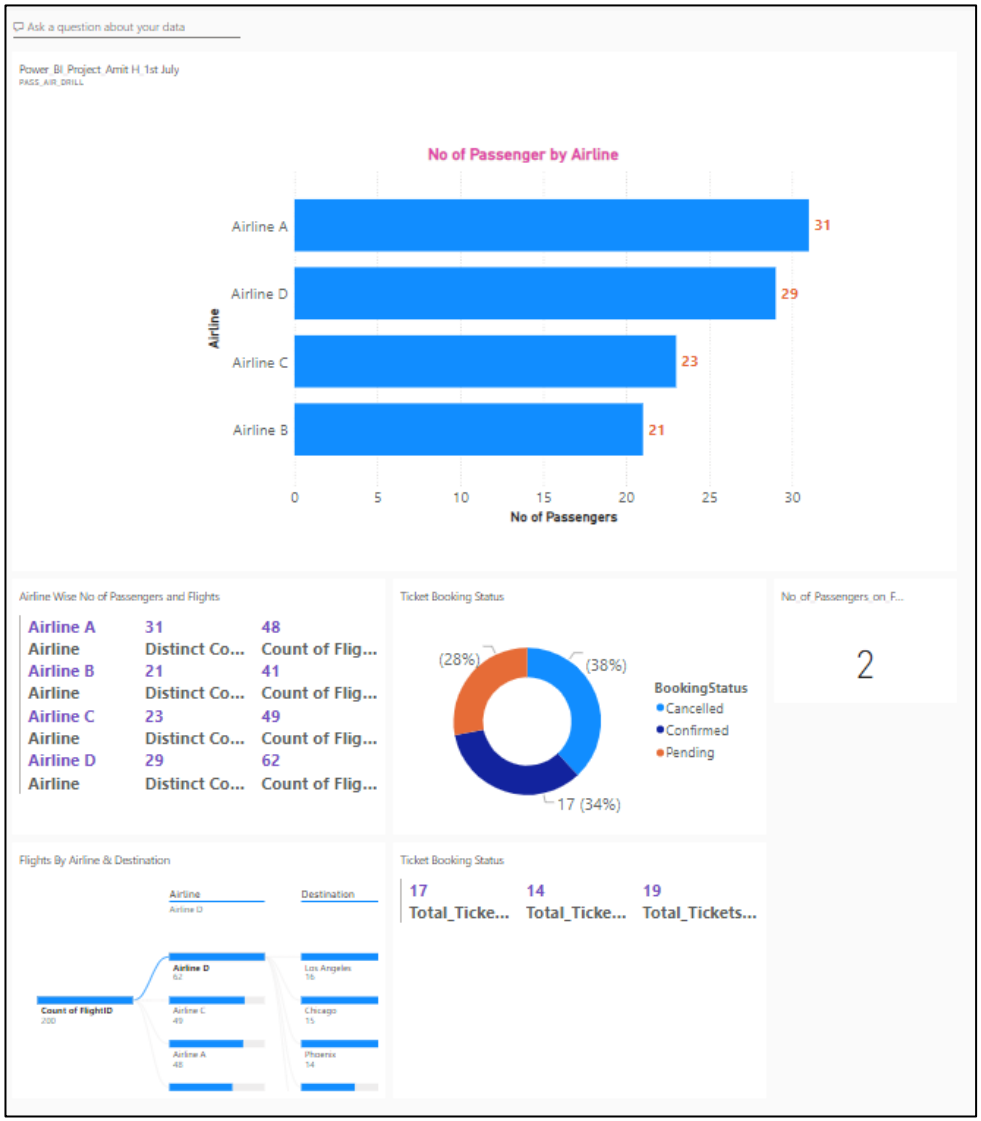


- Implement a drill-through feature to navigate from a page having all airline names to a page that will drill to that specific airline and its destinations and number of flights.

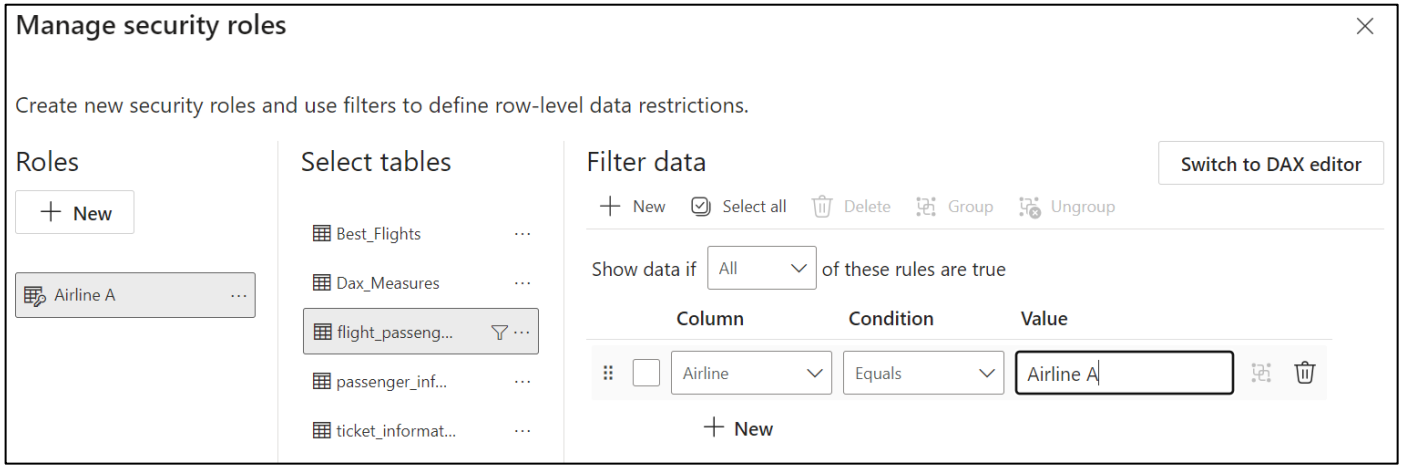
10. Final Report and Dashboard:

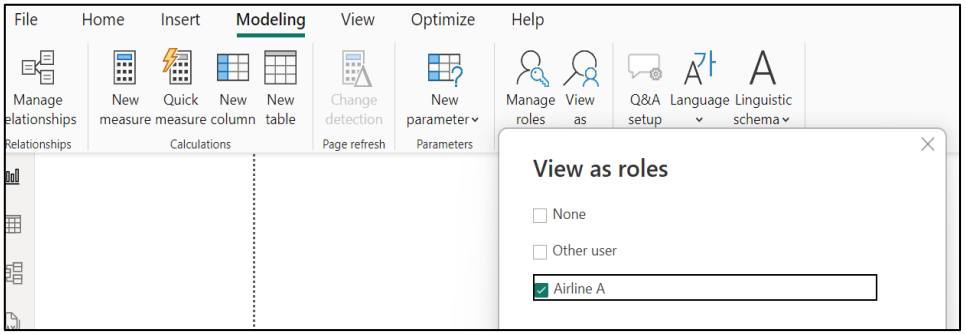
- Create a workspace “Airline” and design a comprehensive dashboard that includes the created visuals, a Q&A section, and a summary of key insights.

➢ Created workspace “Airline” & Dashboard as well. PFB.



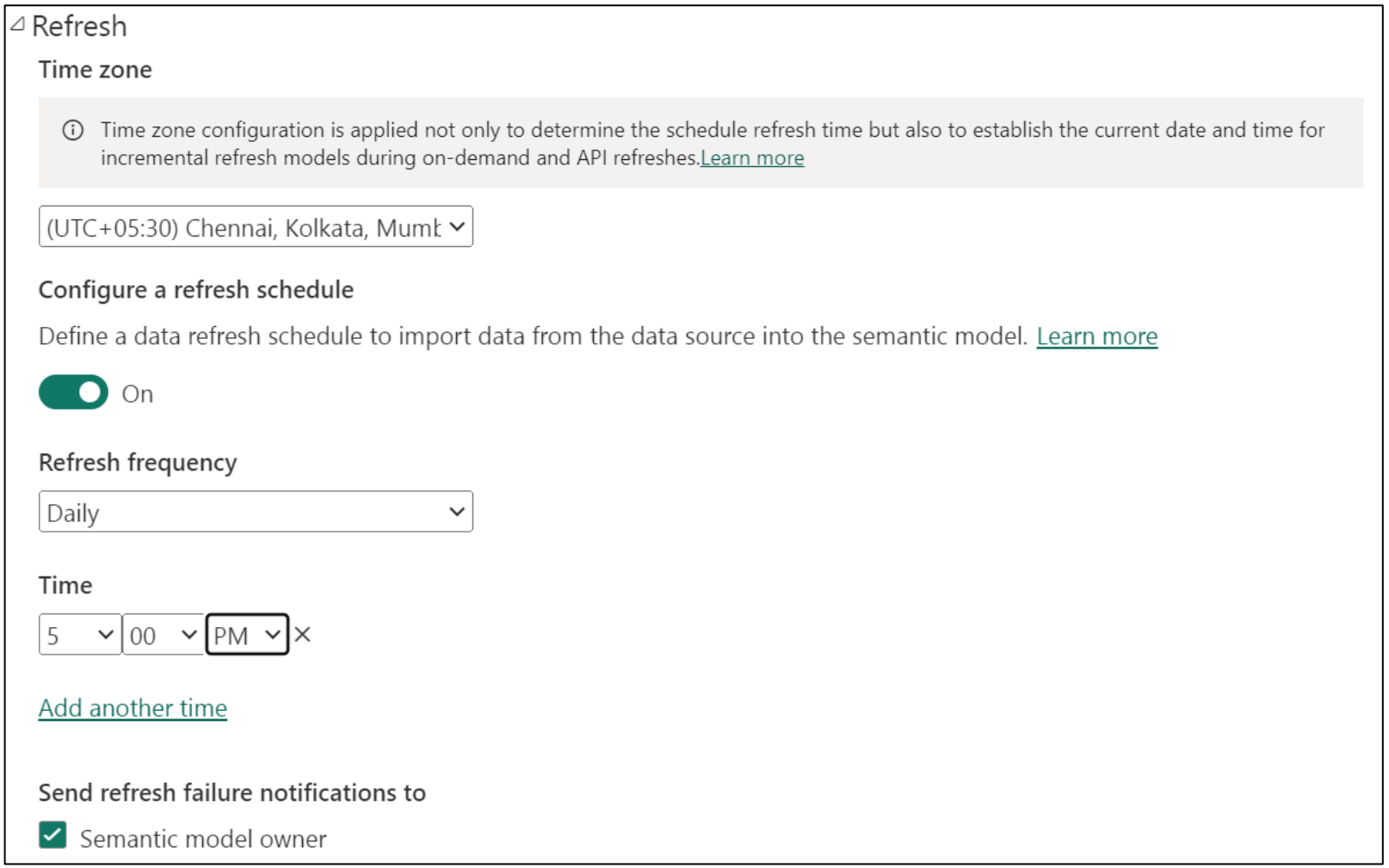
- Create a RLS to view only Airline A data across all the sheets of the report and assign it to a colleague on power bi service.



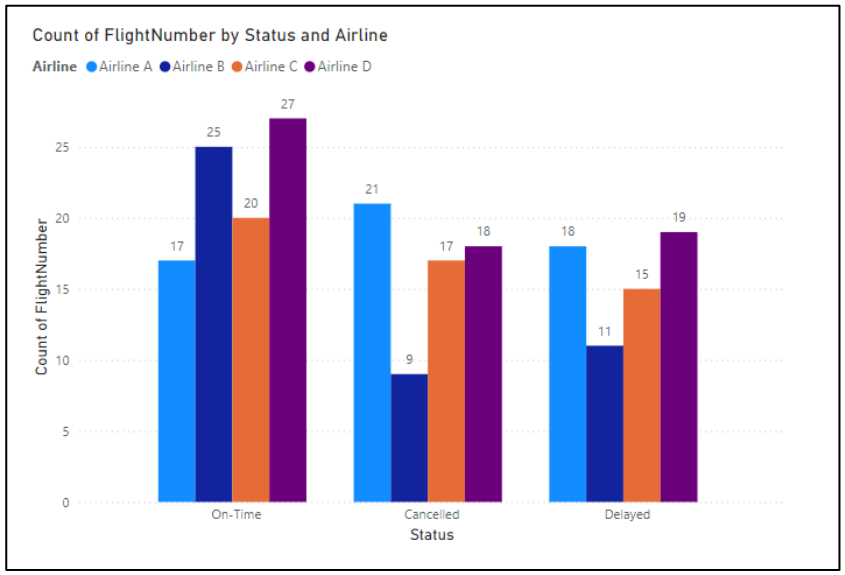


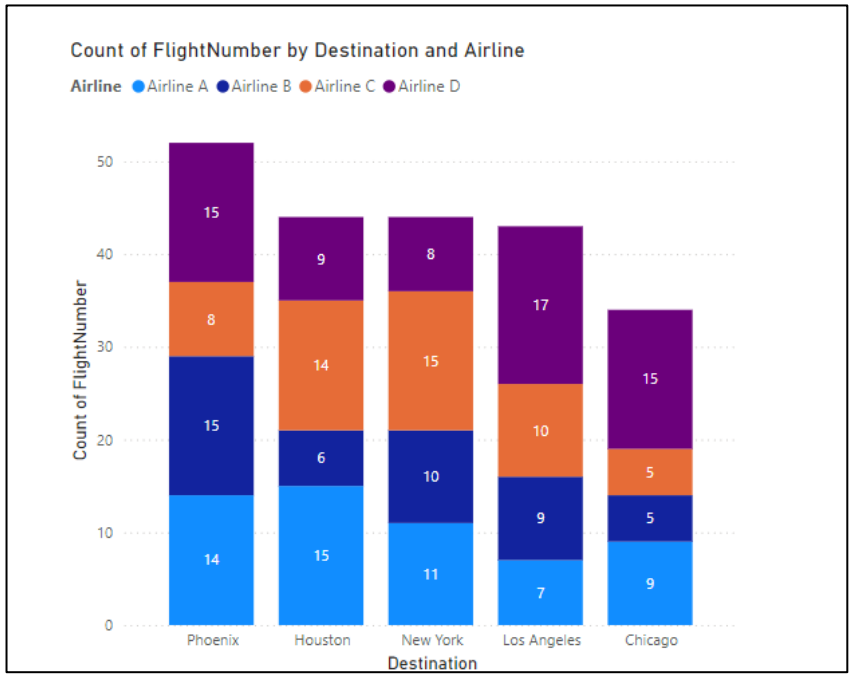
INTERNSHALA TRAININGS

- Configure the report in the Workspace and set up a schedule refresh to keep the data up to date at 5 pm everyday.



Insights from the “Airline” Datasets





Airlines and Destinations

- Number of Airlines are 4. Namely A,B,C,D.
- Destinations are 5. Namely Chicago, Houston, Los Angles, New York, Phoenix.

Flights

- Total Flights – 200. 60 Cancelled. 58 Delayed. 82 On time.
- Airline A – 48 flights. 18 Cancelled. 15 Delayed. 15 On time.
- Airline B – 41 flights. 9 Cancelled. 10 Delayed. 22 On time.
- Airline C – 49 flights. 15 Cancelled. 15 Delayed. 19 On time.
- Airline D – 62 flights. 18 Cancelled. 18 Delayed. 26 On time.

Destination Details

- Airline A – Chicago - 8 flights, Houston - 14 flights, Los Angles - 7 flights, New York - 9 flights, Phoenix - 10 flights
- Airline B – Chicago – 5 flights, Houston – 6 flights, Los Angles – 9 flights, New York – 10 flights, Phoenix – 11 flights

- Airline C – Chicago – 5 flights, Houston – 14 flights, Los Angles – 10 flights, New York – 13 flights, Phoenix – 7 flights
- Airline D – Chicago – 15 flights, Houston – 9 flights, Los Angles – 16 flights, New York – 8 flights, Phoenix – 14 flights.

Total flights by Destination

- Chicago – 33 flights. Cancelled - 13 , Delayed - 7, On Time - 13.
- Houston – 43 flights. Cancelled - 8 , Delayed - 21 , On Time - 14.
- Los Angles – 42 flights. Cancelled - 17, Delayed - 11 , On Time - 14.
- New York – 40 flights. Cancelled -13 , Delayed - 8, On Time - 19.
- Phoenix – 42 flights. Cancelled - 9, Delayed -11 , On Time - 22.

Passenger Info

- Number of Passengers = 100. Airline A – 30, Airline B – 20, Airline C – 22, Airline D – 28.
- Ticket info = 50. Cancelled - 19 , Confirmed - 17 , Pending - 14.

Recommendations:

Recommendations to enhance Airline's operational efficiency, improve customer satisfaction, and optimize their overall performance, leading to increased profitability and a stronger market position:

1. To Improve On-Time Performance

- Focus on reducing delays, especially for Airlines A, C, and D, which have higher delay rates. Implement more efficient scheduling, optimize crew rotations, and invest in technology to predict and mitigate potential delays (e.g., weather disruptions, maintenance).

Impact: Improved on-time performance will enhance customer satisfaction and reduce the likelihood of cancellations or missed connections.

2. To Optimize Route and Flight Allocation

- Analyze the demand and profitability of routes to adjust the allocation of flights. For example, Airline D has the highest number of flights, but also a significant number of cancellations and delays. Assess whether

reducing flights on underperforming routes or reallocating resources to more reliable routes (e.g., New York, Phoenix) would improve overall performance.

Impact: Better flight allocation can improve profitability and reduce operational costs while maintaining or increasing customer satisfaction.

3. To Reduce Cancellations

- With 60 out of 200 flights canceled (30%), it's essential to identify the root causes of these cancellations. Consider strategies such as improving aircraft maintenance, increasing spare parts availability, and enhancing communication between operations and flight crews to reduce this number.

Impact: Lower cancellations improve customer trust and reduce compensation costs associated with cancellations.

4. Focus on Key Destinations

- Focus improvement efforts on Houston and Los Angeles, which have high delays and cancellations. Consider expanding resources in these hubs, such as additional ground crew, better maintenance facilities, or improved scheduling practices.

Impact: Enhanced reliability in high-volume or problematic destinations can significantly boost overall performance metrics.

5.To Enhance Customer Experience and Communication

- Improve communication with passengers regarding flight status, especially for those on flights with frequent delays or cancellations. Implement better notification systems, provide compensation or vouchers proactively, and enhance the overall customer support experience.

Impact: This will build customer loyalty and potentially turn negative experiences into positive ones, mitigating the impact of disruptions.

6. Analyze Passenger Distribution and Flight Demand

- Re-evaluate the distribution of passengers across airlines, especially since Airline A has the highest number of passengers but also the highest number of cancellations. Consider whether pricing strategies, loyalty programs, or flight frequencies should be adjusted to better match demand and improve passenger load factors.

Impact: Optimizing passenger distribution and matching flight capacities with demand will improve profitability and operational efficiency.

7. Increase Sales and Marketing Efforts for Confirmations

- With 50 ticket info entries showing 19 cancellations, focus marketing efforts on converting "Pending" ticket statuses to "Confirmed." Utilize targeted promotions, improved booking experiences, and incentives for early booking.

Impact: Increasing the confirmation rate will improve the airline's revenue stability and reduce the uncertainty of passenger loads.

8. Strategic Focus on Top-Performing Destinations

- Phoenix and New York have better on-time performance rates compared to other destinations. Focus marketing and operational strategies to further capitalize on these strengths, such as promoting these routes more aggressively or expanding capacity.

Impact: Leveraging high-performing destinations can maximize revenue and enhance brand reputation for reliability.

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