Data and Artificial Intelligence
Cyber Shujaa Program

Week 4 Assignment
Business Intelligence Analysis for Hotel Management Using Power BI

Student Name: John Brown Ouma

Student ID: CS-DA01-25030.

Introduction

This Report documents hands-on experience in Business intelligence (BI) using Power BI for hotel Management. The objective was to analyze hotel booking data to derive actionable insights that could aid in decision making. The tasks included loading and transforming datasets, building a data model using a star Schema, creating Data Analysis Expressions (DAX) measures, and designing an interactive dashboard.

The Key objectives of the project were:

- **Understand the Hotel Business and client needs:** Analyze datasets to identify trends and metrics relevant to hotel management.
- **Load and Transform Data:** Import and clean datasets such as dim_date, dim_rooms, and dim_hotels.
- **Build the Data Model:** Use a star a schema to establish relationships between tables.
- **Create DAX measures:** Develop calculated columns and measure to support analysis.
- **Visualize Insights:** Design an interactive dashboard to present key metrics.

Tasks Completed

1. Data Loading and Transformation

The following datasets were loaded into Power BI:

- **dim_date.csv**: Contains date related information, including week numbers and day types.
- **dim_hotels.csv**: Includes property details such as name, category, and city.
- **dim_rooms.csv**: Lists room classes (standard, Elite, Premium, Presidential).
- **fact_bookings.csv**: Contain booking details like revenue, status, and ratings.

Transformations Applied:

- Ensured consistent formatting for date.
- Validated categorical values (e.g., room classes, hotel categories)
- Handled Missing values or duplicate data where necessary.

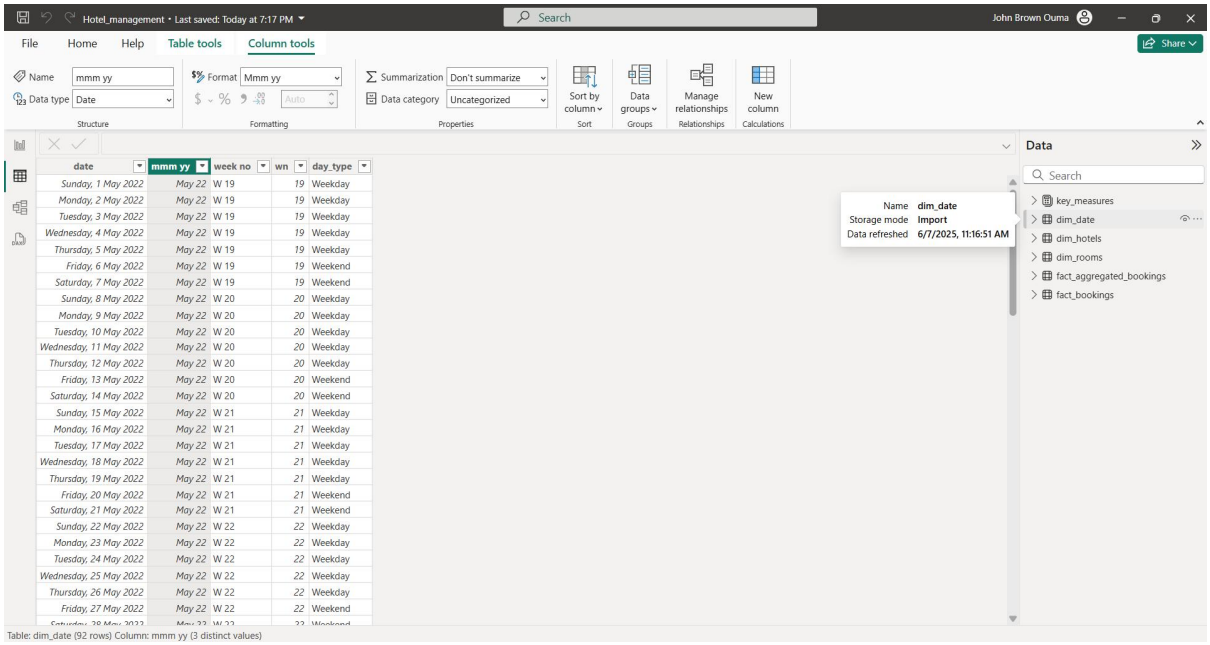

Figure 1:Data transformation steps applied in Power Query Editor.

2. Building the Data Model

A star schema was implemented to organize the data model, with fact_bookings and fact_aggregated_bookings as the central fact tables linked to dimension table (dim_date, dim_hotels, dim_rooms)

Relationships Established:

dim_date[date] -> fact_bookings[date]

dim_date[date] -> fact_aggregated_bookings[date]

dim_hotels[property_id] -> fact_bookings[property_id]

dim_hotels[property_id] -> fact_aggregated_bookings[property_id]

dim_rooms[room_category] ->fact_bookings[room_category]

dim_rooms[room_category] ->fact_aggregated_bookings[room_category]

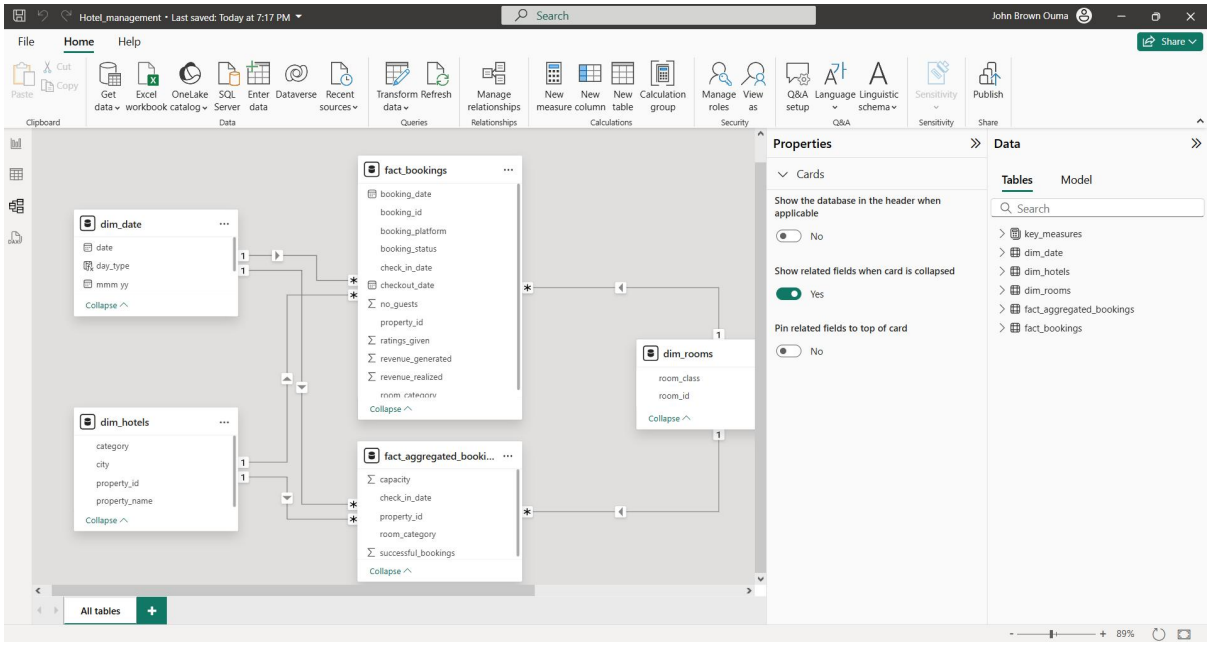

Figure 2: Star schema model with relationships between fact and dimension tables.

3. Creating DAX Measures

Key Data Analysis Expression (DAX) measures were taken to analyze hotel performance. Examples include:

i. Calculated Columns:

Sno	Calculated Column Name	Description/Purpose	DAX formula	Table
1	wn	To get the week number from the corresponding date.	wn = WEEKNUM(dim_date[date])	dim_date
2	day type	Based on the feedback from stakeholder, we considered Friday and Saturday as weekend and weekdays from Sunday to Thurdsay. In PowerBI, Sunday weekday number is 1, Monday is 2 and so on. So, if weekday number is greater than 5, then weekend	day type = Var wkd = WEEKDAY(dim_date[date],1) return IF(wkd>5,"Weekend","Weekday")	dim_date

		or else weekday.		

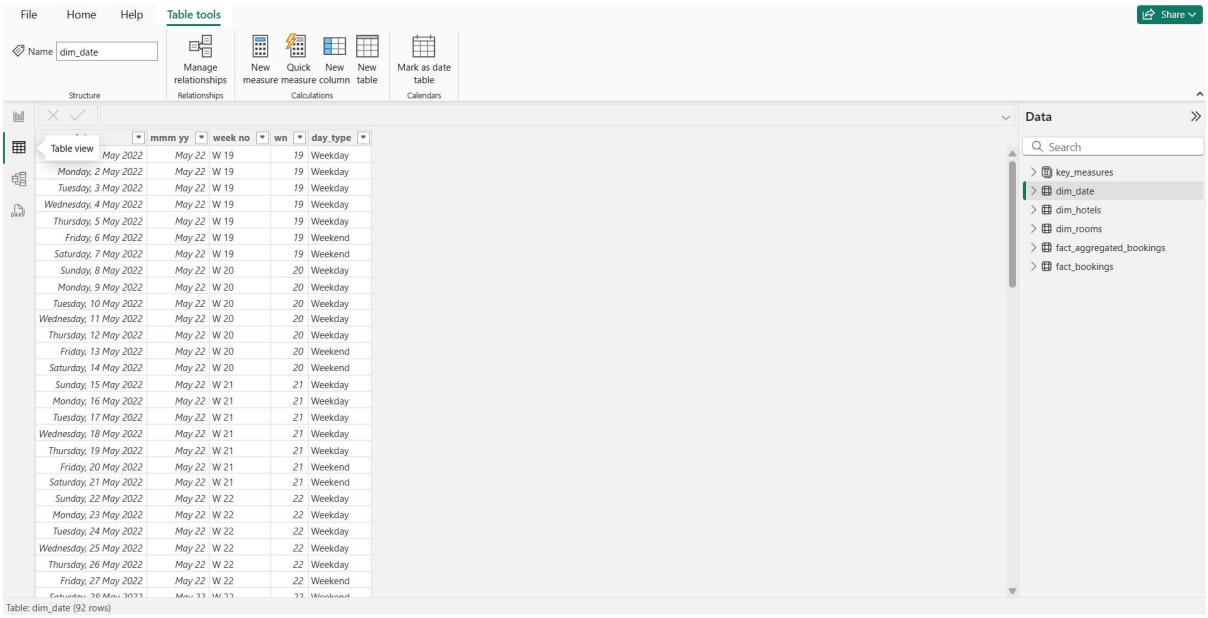

Figure 3: Showing Calculated columns for key data analysis expression

ii. Measures:

Sno	Measures	Description/Purpose	DAX FORMULA	TABLE
1	Revenue	To get the total revenue_realized	Revenue = SUM(fact_bookings[revenue_realized])	fact_bookings
2	Total bookings	To get the total number of bookings happened	Total Bookings = COUNT(fact_bookings[booking_id])	fact_bookings
3	Total Capacity	To get the total capacity of rooms present in hotels	Total Capacity = SUM(fact_aggregated_bookings[capacity])	fact_aggregated_bookings
4	Total successful Bookings	To get the total succesful bookings happened for all	Total Succesful Bookings = SUM(fact_aggregated_bookings[successful_bookings])	fact_aggregated_bookings

		hotels		
5	Occupancy %	Occupancy means total successful bookings happened to the total rooms available(capacity)	Occupancy % = DIVIDE([Total Succesful Bookings],[Total Capacity],0)	fact_aggregated_bookings
6	Average Rating	Get the average ratings given by the customers	Average Rating = AVERAGE(fact_bookings[ratings_given])	fact_bookings
7	No of days	To get the total number of days present in the data. In our case, we have data from May to July. So 92 days.	No of days = DATEDIFF(MIN(dim_date[date]),MAX(dim_date[date]),DAY) +1	dim_date
8	Total Cancelled bookings	To get the"Cancelled" bookings out of all Total bookings happened	Total cancelled bookings = CALCULATE([Total Bookings],fact_bookings[booking_status]="Cancelled")	fact_bookings
9	Cancellation %	calculating the cancellaton percentage.	Cancellation % = DIVIDE([Total cancelled bookings],[Total Bookings])	fact_bookings
10	Total Checkout	To get the successful 'Checked out' bookings	Total Checked Out = CALCULATE([Total Bookings],fact_bookings[booking_status]="Checked Out")	fact_bookings

		out of all Total bookings happened		
11	Total no show booking	To get the"No Show" bookings out of all Total bookings happened ("No show" means those customers who neither cancelled nor attend to their booked rooms)	Total no show bookings = CALCULATE([Total Bookings],fact_bookings[booking_status]="No Show")	fact_bookings
12	No show rate %	calculating the no show percentage.	No Show rate % = DIVIDE([Total no show bookings],[Total Bookings])	fact_bookings
13	Booking % by Platform	To show the percentage contribution of each booking platform for bookings in hotels. We have booking platforms like makeyourtrip, logtrip, tripster etc)	Booking % by Platform = DIVIDE([Total Bookings], CALCULATE([Total Bookings], ALL(fact_bookings[booking_platform])))*100	fact_bookings
14	Booking % by	To show the	Booking % by Room class = DIVIDE([Total	fact_bookings, dim_rooms

	Room Class	percentage contribution of each booking platform for booking in hotels. We have room classes like Standard, Elite, Premium	Bookings], CALCULATE([Total Bookings], ALL(dim_rooms[room_class])))*100	
15	ADR	Calculate the ADR(Average Daily rate) It is the ratio of revenue to the total rooms booked/sold. It is the measure of the average paid for rooms sold in a given time period	ADR = DIVIDE([Revenue], [Total Bookings],0)	fact_bookings
16	Realisation %	calculate the realisation percentage. It is nothing but the succesful "checked out" percentage over all bookings	Realisation % = 1- ([Cancellation %]+[No Show rate %])	fact_bookings

		happened.		
17	Revpar	Calculate the RevPAR(Revenue Per Available Room) RevPAR represents the revenue generated per available room, whether or not they are occupied. RevPAR helps hotels measure their revenue generating performance to accurately price rooms. RevPAR can help hotels measure themselves against other properties or brands.	RevPAR = DIVIDE([Revenue],[Total Capacity])	fact_bookings, fact_agg_bookings
18	DBRN	calculate DBRN(Daily Booked Room Nights) This metrics	DBRN = DIVIDE([Total Bookings], [No of days])	fact_bookings, dim_date

		tells on average how many rooms are booked for a day considering a time period		
19	DSRN	calculate DSRN(Daily Sellable Room Nights) This metrics tells on average how many rooms are ready to sell for a day considering a time period	DSRN = DIVIDE([Total Capacity], [No of days])	fact_agg_bookings,dim_date
20	DURN	calculate DURN(Daily Utilized Room Nights) This metric tells on average how many rooms are succesfully utilized by customers for a day considering a time period	DURN = DIVIDE([Total Checked Out],[No of days])	fact_bookings, dim_date

21	Revenue WoW change %	To get the revenue change percentage week over week. Here, revcw for current week revpw for previous week	Revenue WoW change % = Var selv = IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([Revenue],dim_date[wn]= selv) var revpw = CALCULATE([Revenue],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	dim_date
22	Occupancy WoW change %	To get the occupancy change percentage week over week. Here, revcw for current week revpw for previous week	Occupancy WoW change % = Var selv = IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([Occupancy %],dim_date[wn]= selv) var revpw = CALCULATE([Occupancy %],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	dim_date
23	ADR WoW change %	To get the ADR(Average Daily rate) change percentage week over week. Here, revcw for current week revpw for previous week	ADR WoW change % = Var selv = IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([ADR],dim_date[wn]= selv) var revpw = CALCULATE([ADR],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	dim_date
24	RevPar Wow	To get the RevPar(Re	Revpar WoW change % = Var selv =	dim_date

	Change %	venue Per Available Room) change percentage week over week. Here, revcw for current week revpw for previous week	IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([RevPAR],dim_date[wn]= selv) var revpw = CALCULATE([RevPAR],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	
25	Realisation WoW change %	To get the Realisation change percentage week over week. Here, revcw for current week revpw for previous week	Realisation WoW change % = Var selv = IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([Realisation %],dim_date[wn]= selv) var revpw = CALCULATE([Realisation %],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	dim_date
26	DSRN WoW change %	To get the DSRN(Daily Sellable Room Nights) change percentage week over week. Here, revcw for current week revpw for previous week	DSRN WoW change % = Var selv = IF(HASONEFILTER(dim_date[wn]),SELECTEDVALUE(dim_date[wn]),MAX(dim_date[wn])) var revcw = CALCULATE([DSRN],dim_date[wn]= selv) var revpw = CALCULATE([DSRN],FILTER(ALL(dim_date),dim_date[wn]= selv-1)) return DIVIDE(revcw,revpw,0)-1	dim_date

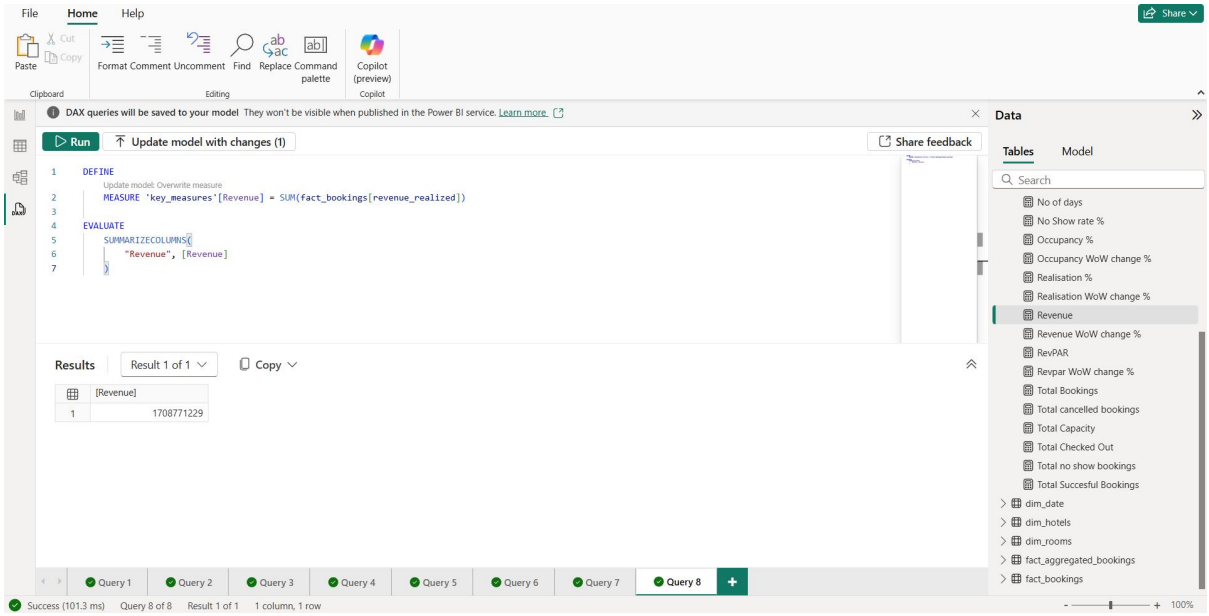

Figure 3.1: DAX measures created for revenue

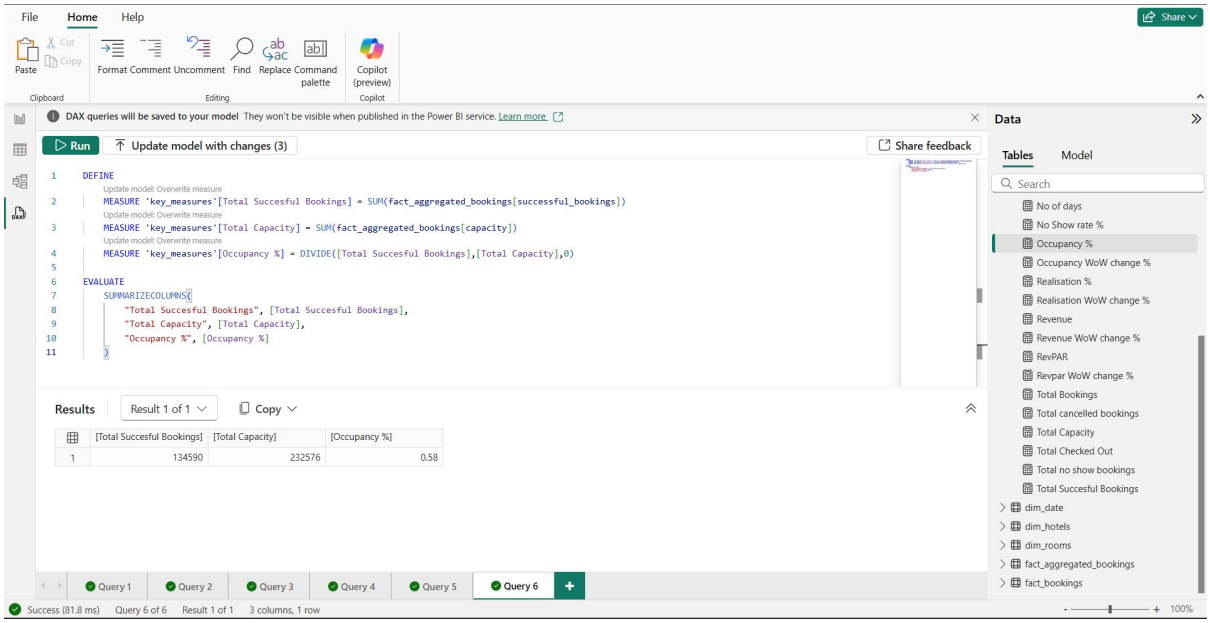

Figure 3.2: DAX measures created for occupancy

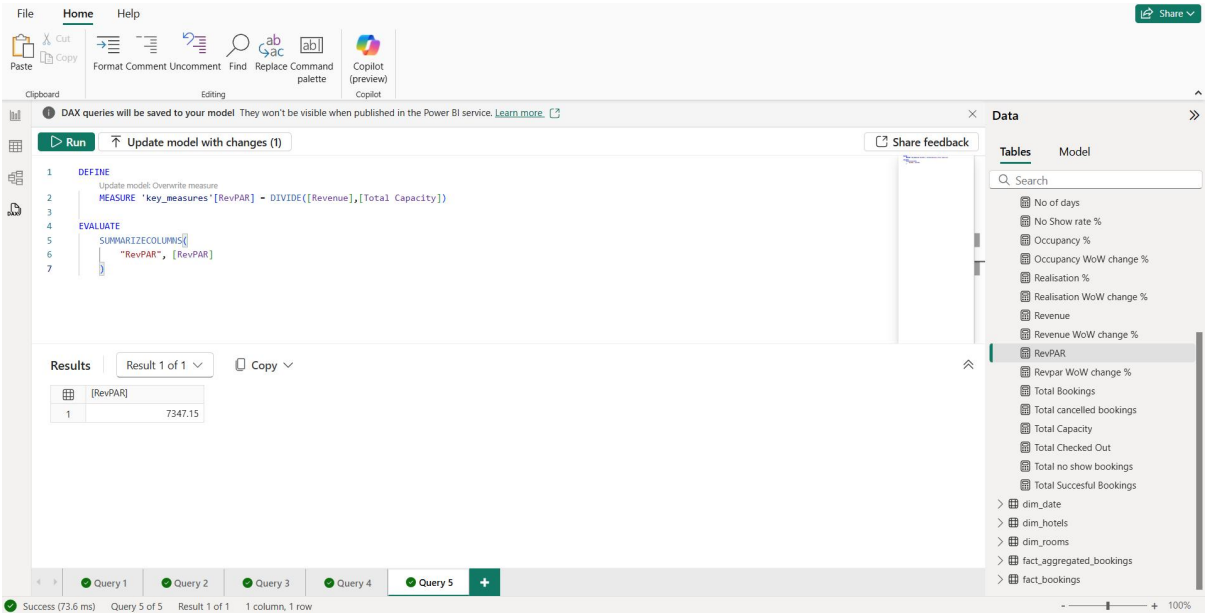

Figure 3.3: DAX measures created for RevPAR

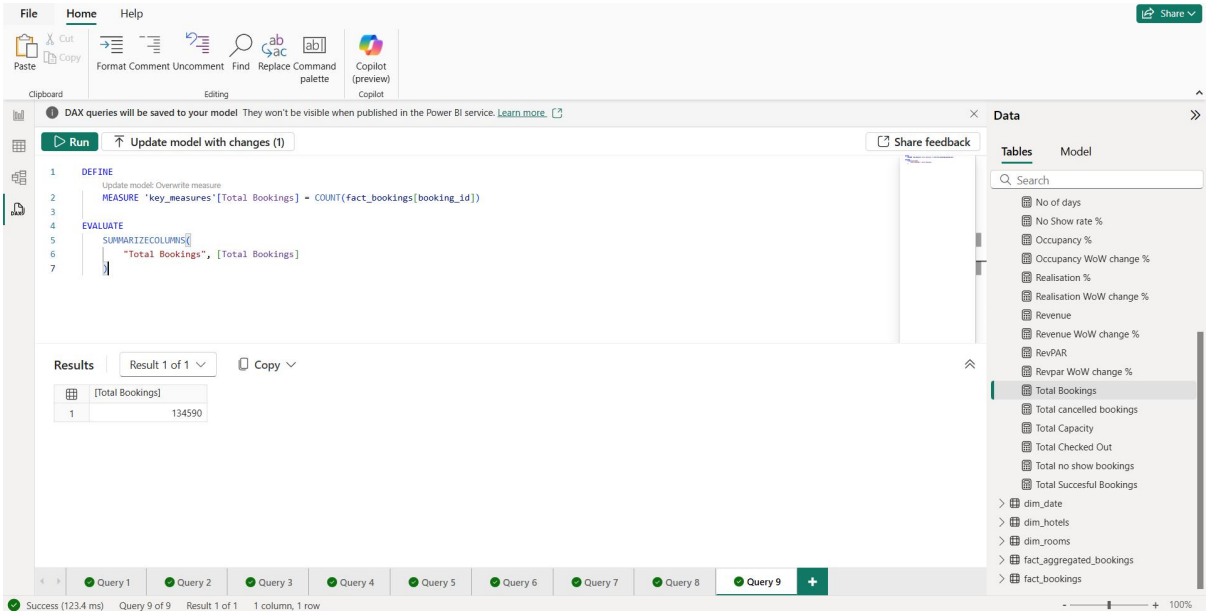

Figure 3.4: DAX measures created for Total bookings

4. Dashboard Visualization

An interactive dashboard was designed to highlight key metrics

- **Revenue Trends:** Line chart showing revenue by week.
- **Occupancy Heatmap:** Matrix visual displaying occupancy by city and room class.
- **Cancellation Analysis:** Pie chart comparing cancellation rates.
- **Top Performers:** Bar chart ranking hotels by revenue.

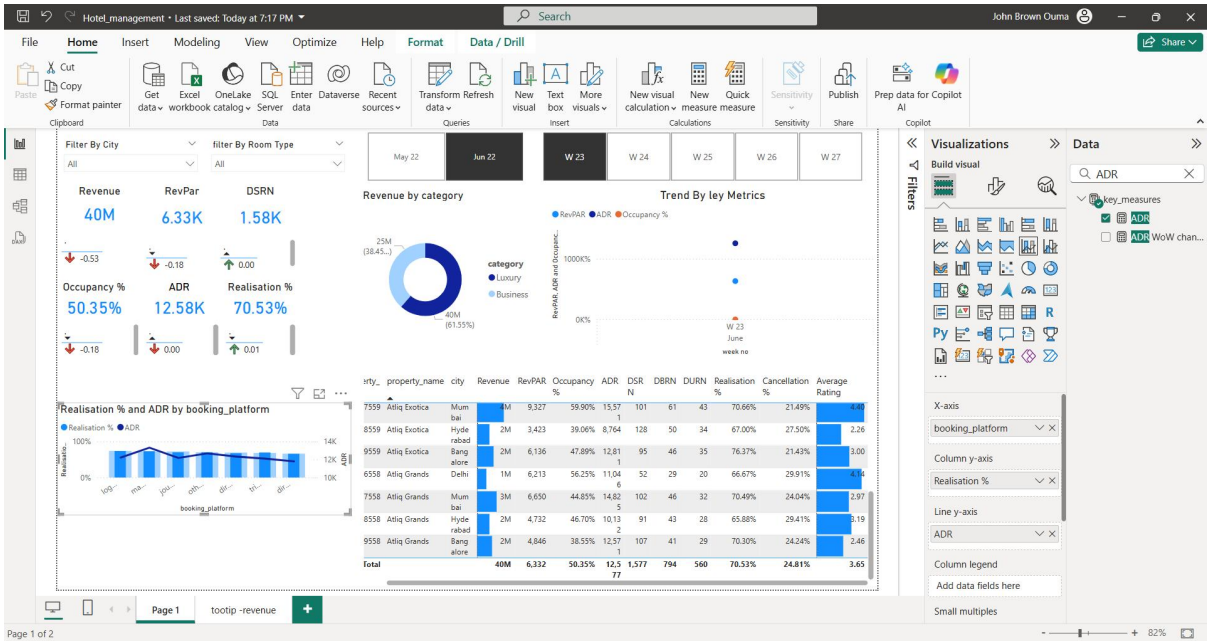

Figure 4: Interactive dashboard with filters for city, room class, and date range.

5. Publishing and Sharing

The final dashboard was published to Power BI Service and shared with public access.

Link to Dashboard: Power BI Hotel Management Dashboard.pbix

Conclusion

This Project Provided a comprehensive introduction to Business Intelligence using Power BI. By analyzing hotel booking data, I gained practical experience in data modelling, DAX, and visualization. The insights derived-such as revenue trends, occupancy rates, and cancellation patterns-can help hotel managers optimize operations and improve customer satisfaction.

Moving forward, I plan to expand this project by incorporating real-time data and advanced predictive analytics. This assignments has strengthened my BI skills and added a valuable project to my portfolio.

DASHBOARD LINK: Power BI Hotel Management Dashboard.pbix