

SRI LANKA INSTITUTE OF INFORMATION TECHNOLOGY

Data Warehousing and Business Intelligence

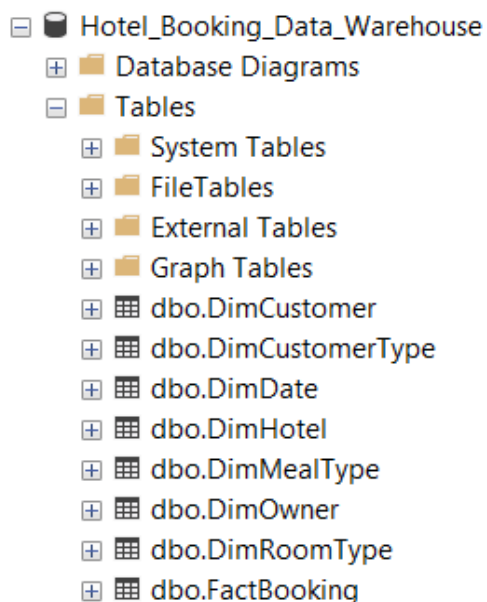
Assignment 2



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Batch: DS weekend

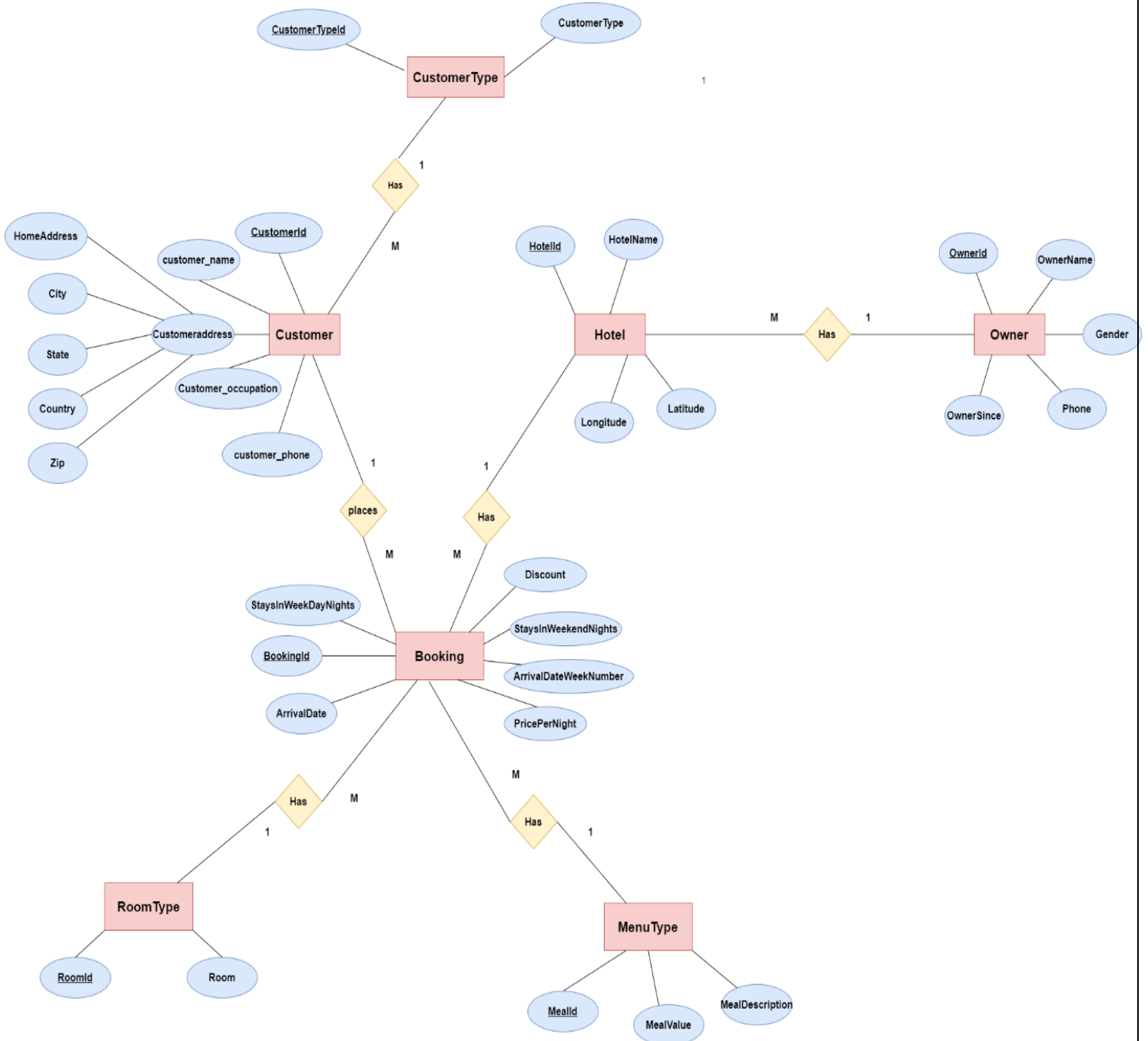
Step 1: Data source

Data warehouse designed at the Assignment 1 is used as the data source for this assignment. Data warehouse consists of 7 dimension tables and one fact tables to represent Hotel Booking data altogether.

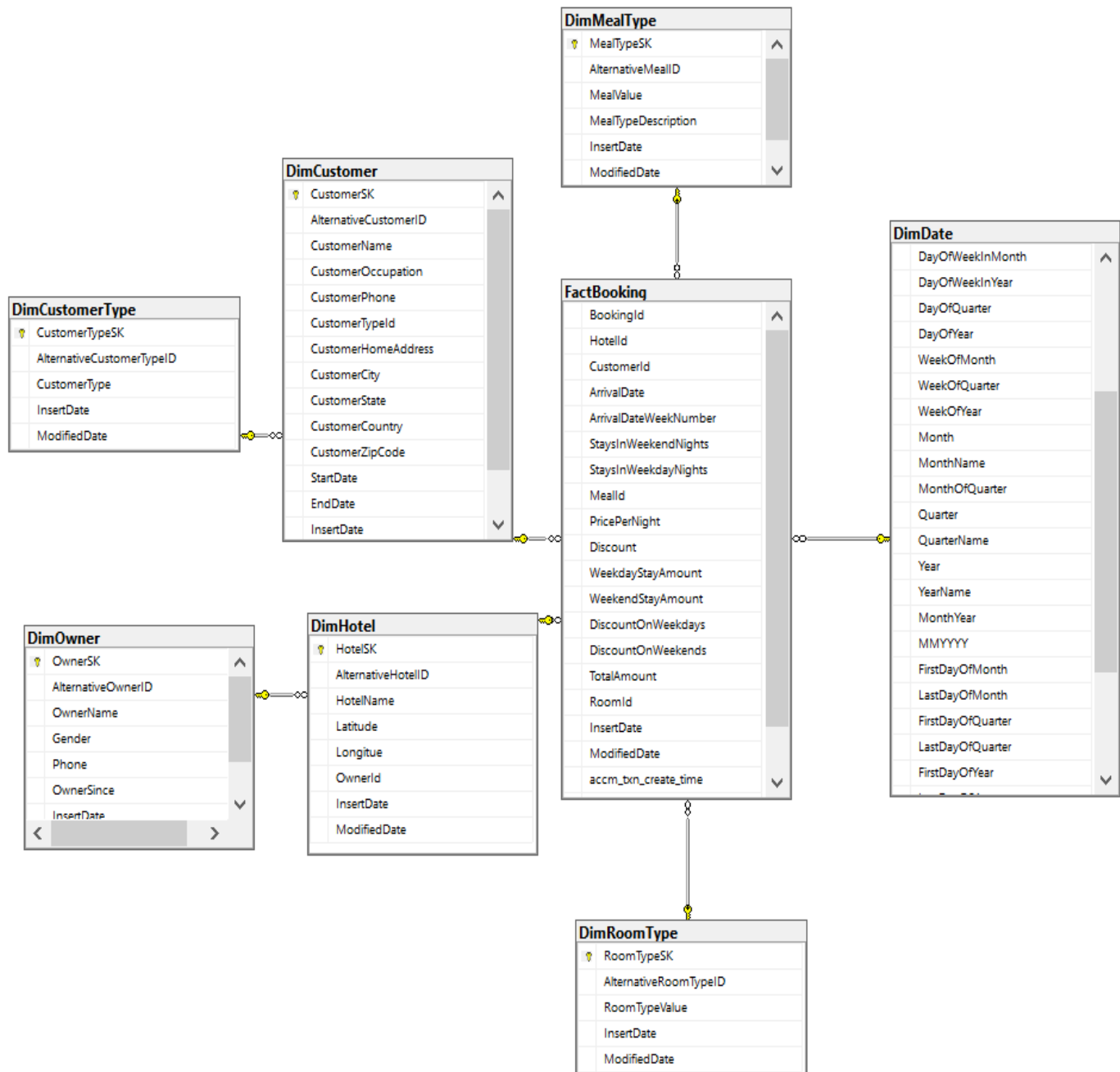


I used these data to create OLAP cubes and to generate OLAP operations in Excel and prepare reports in Report Builder.

ER Diagram



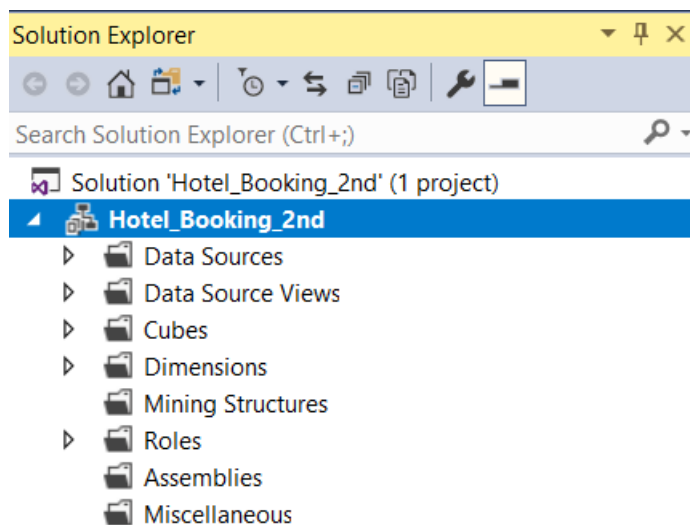
Data Warehouse Design Diagram



Step 2: SSAS Cube implementation

- Used Tools :- SSAS
SQL Server Management Studio SSDT

When creating the OLAP cubes first I created Analysis Services Multidimensional and Data Mining Project on SSDT. Then I renamed it as “Hotel_Booking_2nd”. Then we can see folder structure as below.



SSAS cube implementation is consist with the following steps.

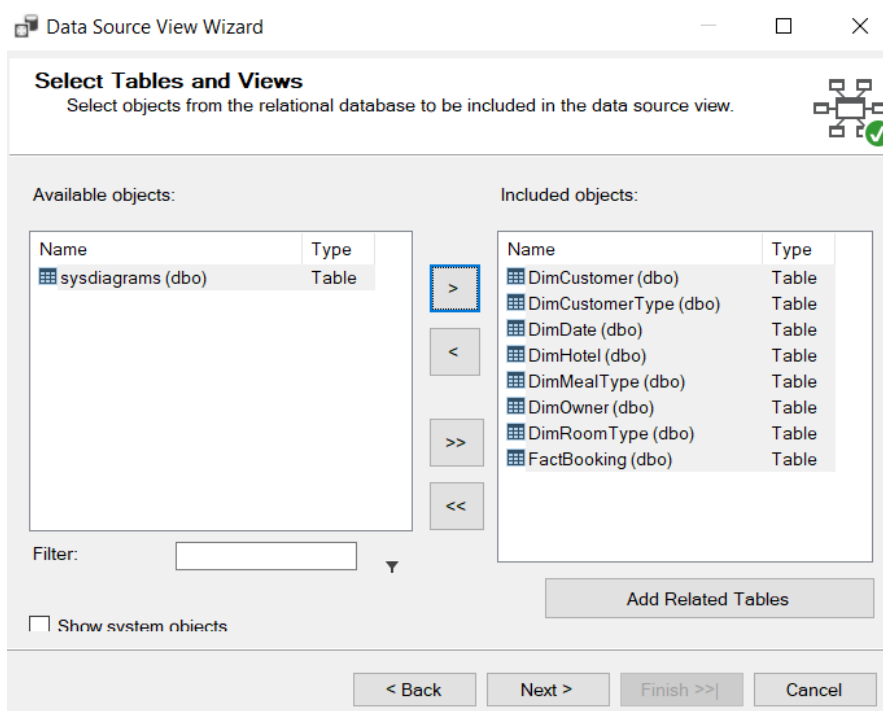
I. Project Creation

Project creation SSAS project is created in Visual studio for the hotel Booking data in data warehouse. The project is renamed to SSAS_Hotel_Booking_Assignment2.

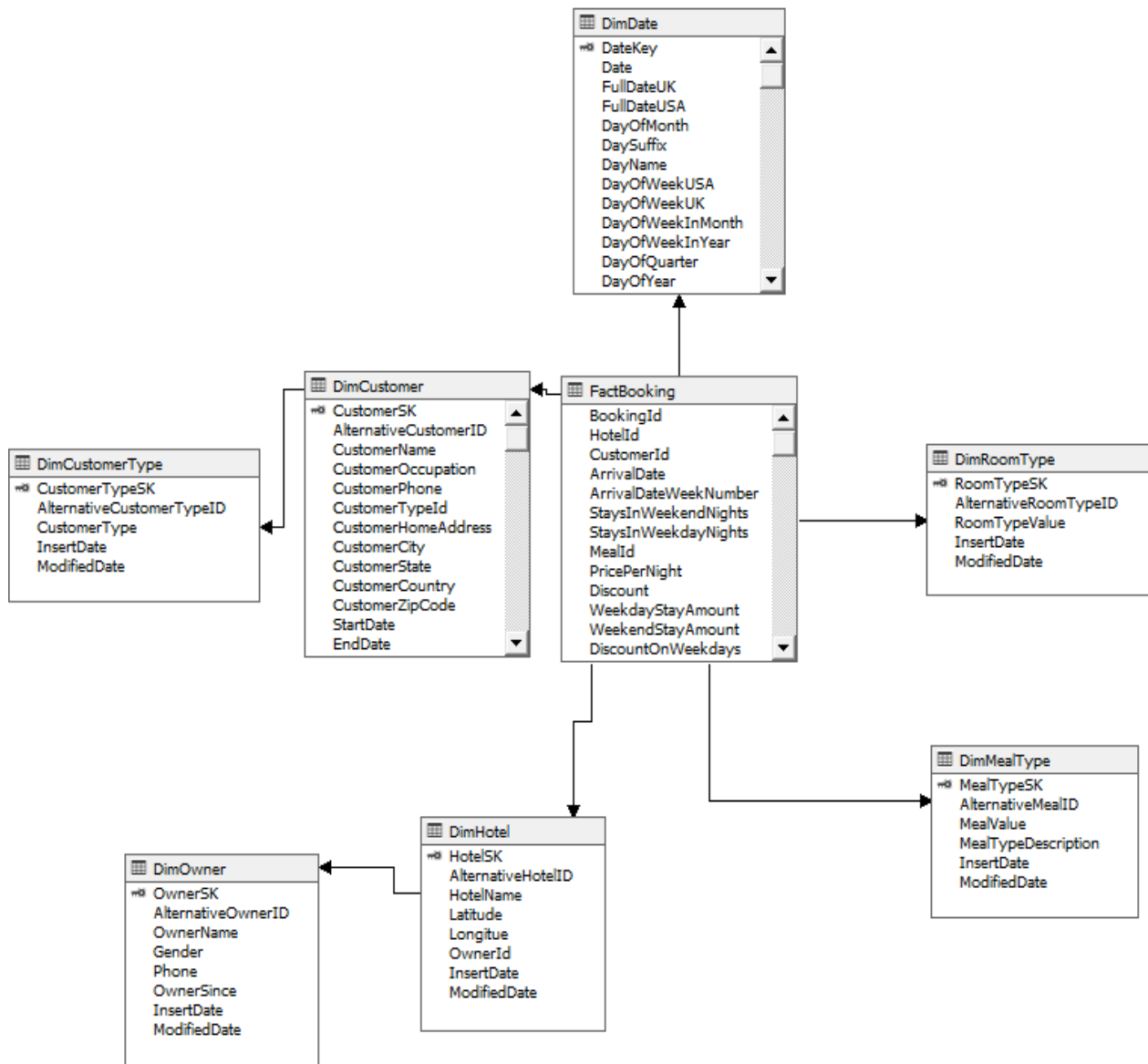
II. Data Sources Configuration

Data Sources Configuration In the created project, data source folder is selected under the DS_Hotel Booking Data Warehouse package. After creating a connection to the MS SQL server, 'Hotel_Booking_Data_Warehouse' database in sql server has been selected as the data source.

III. Data Source View Configuration



Data Source View



IV. Cube Design

In the Cube wizard FactBooking has been selected as the Measure table and DimHotel, DimDate, DimCustomer, DimRoomType and DimealType as dimension tables for the cube.

The image shows two screenshots of the 'Cube Wizard' application window. The top screenshot is the 'Select Measures' step, where 'Fact Booking' is selected as the measure. The bottom screenshot is the 'Select New Dimensions' step, where several dimension tables are selected.

Top Screenshot: Select Measures

Measure

- ☒ Fact Booking
 - ☒ Booking Id
 - ☒ Arrival Date Week Number
 - ☒ Stays In Weekend Nights
 - ☒ Stays In Weekday Nights
 - ☒ Price Per Night
 - ☒ Discount
 - ☒ Weekday Stay Amount
 - ☒ Weekend Stay Amount
 - ☒ Discount On Weekdays
 - ☒ Discount On Weekends
 - ☒ Total Amount
 - ☒ Txn Process Time Hours
 - ☒ Fact Booking Count

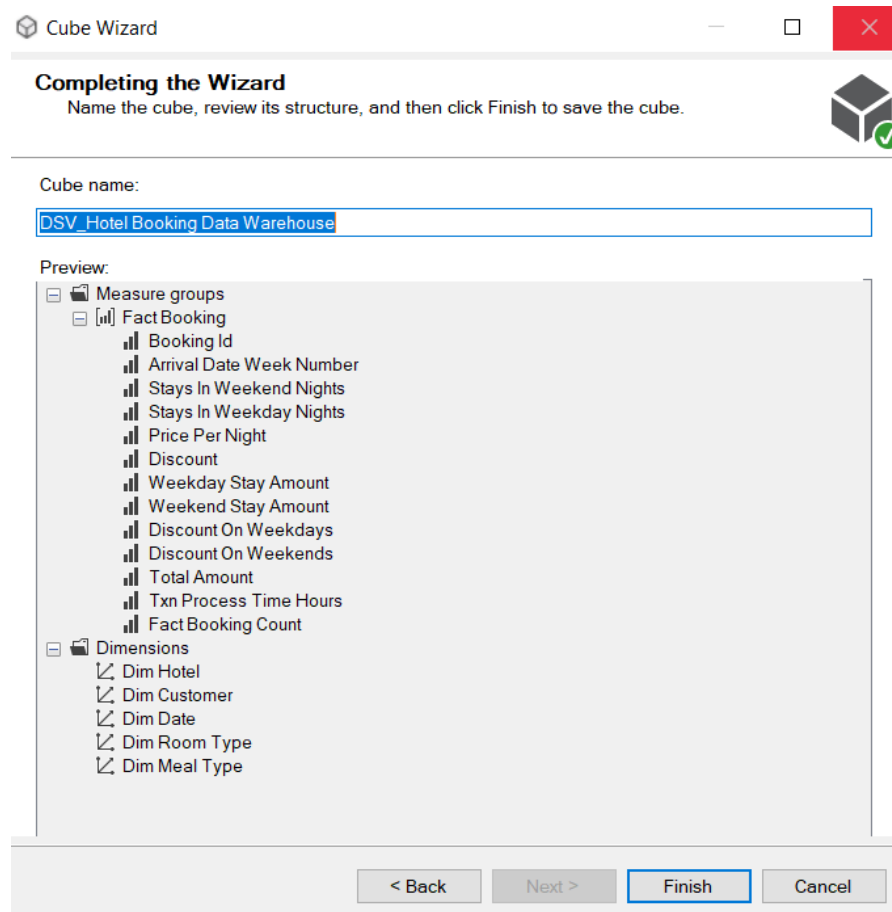
Bottom Screenshot: Select New Dimensions

Dimension

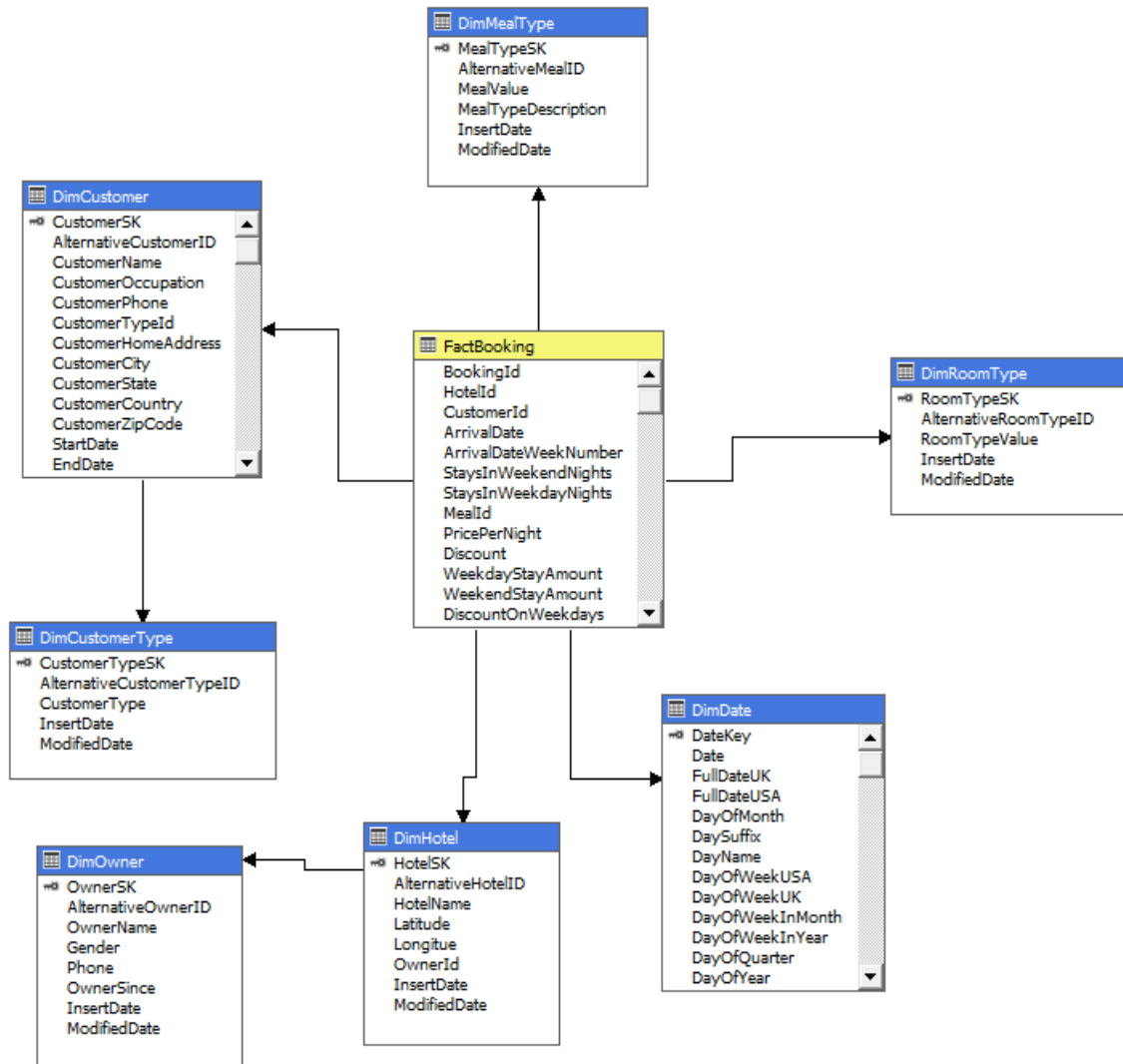
- ☒ Dim Hotel
 - ☒ DimHotel
 - ☒ DimOwner
- ☒ Dim Customer
 - ☒ DimCustomer
 - ☒ DimCustomerType
- ☒ Dim Date
 - ☒ DimDate
- ☒ Dim Room Type
 - ☒ DimRoomType
- ☒ Dim Meal Type
 - ☒ DimMealType

< Back Next > Finish >> Cancel

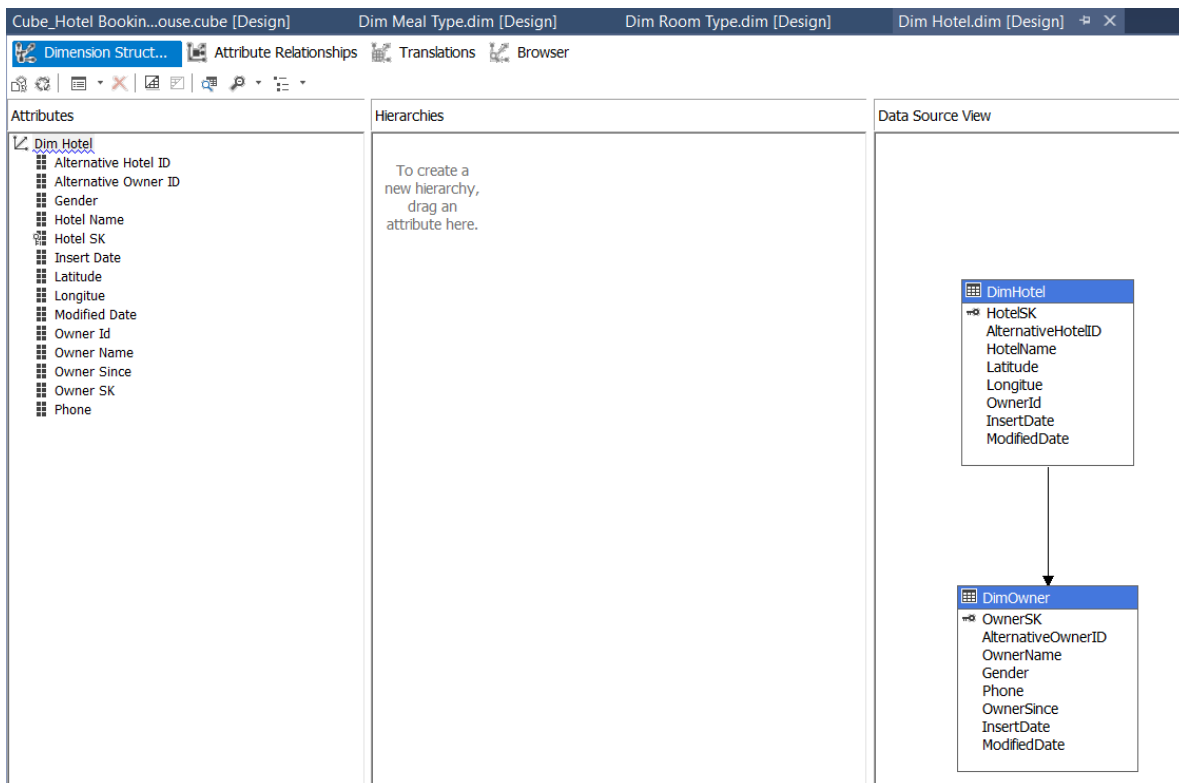
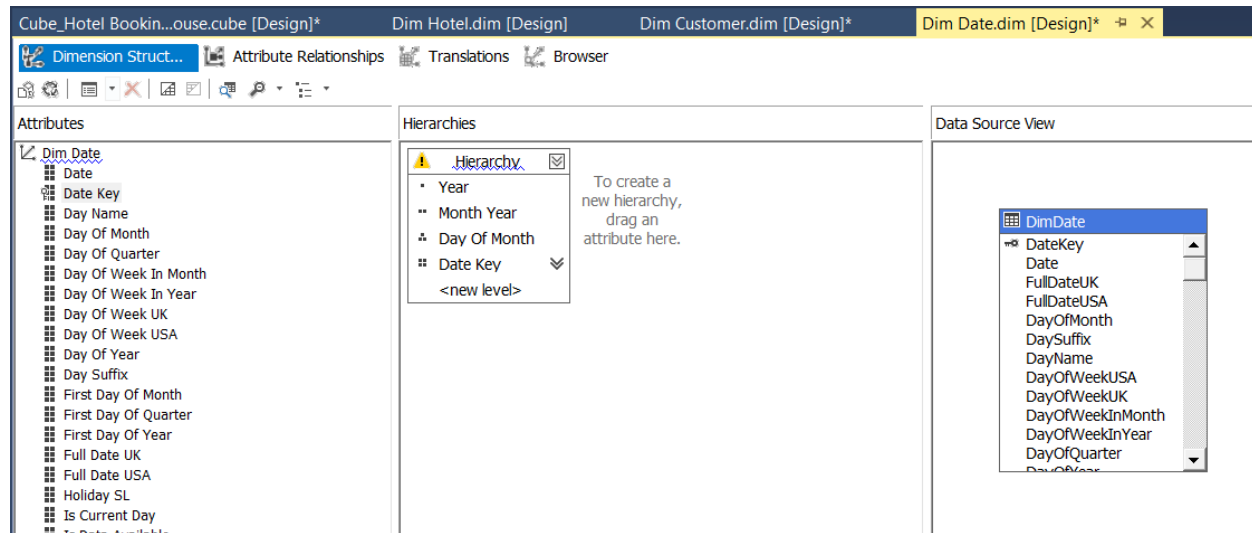
Using measure and dimension cube is designed as below.

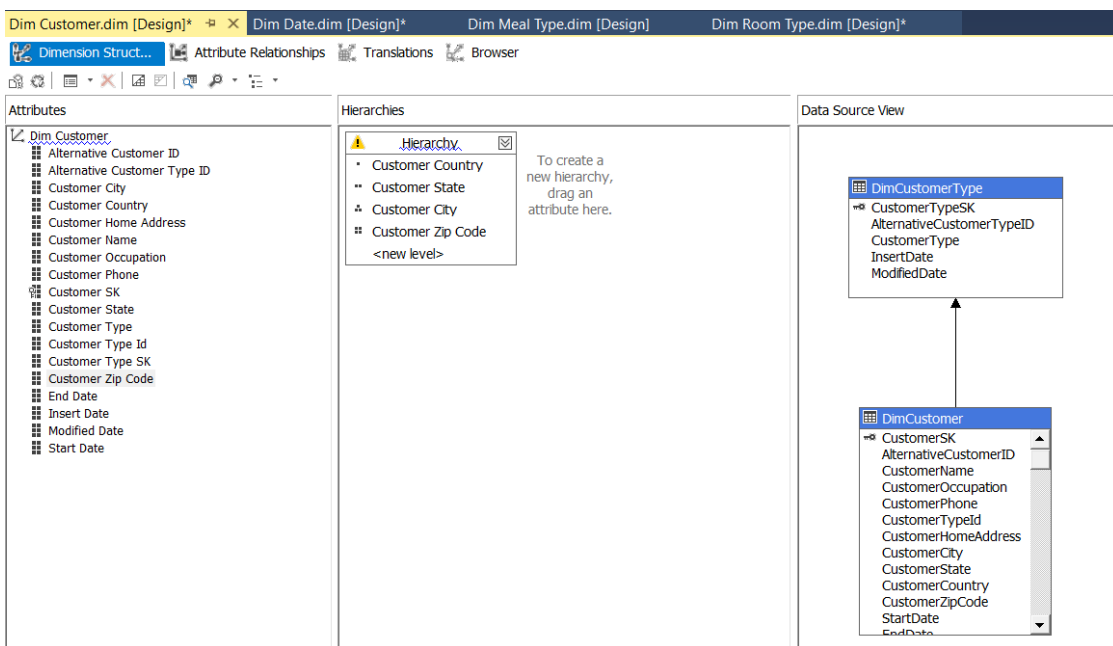
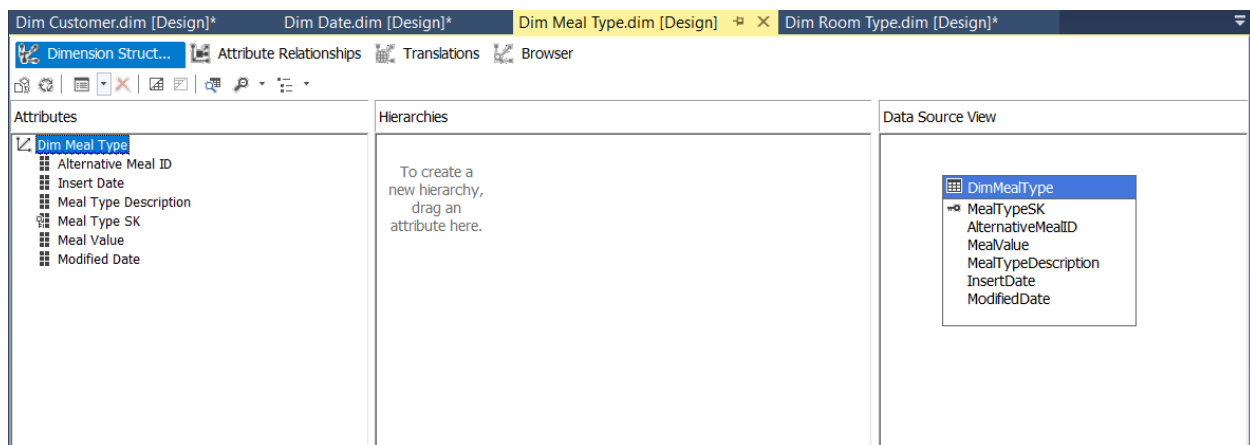
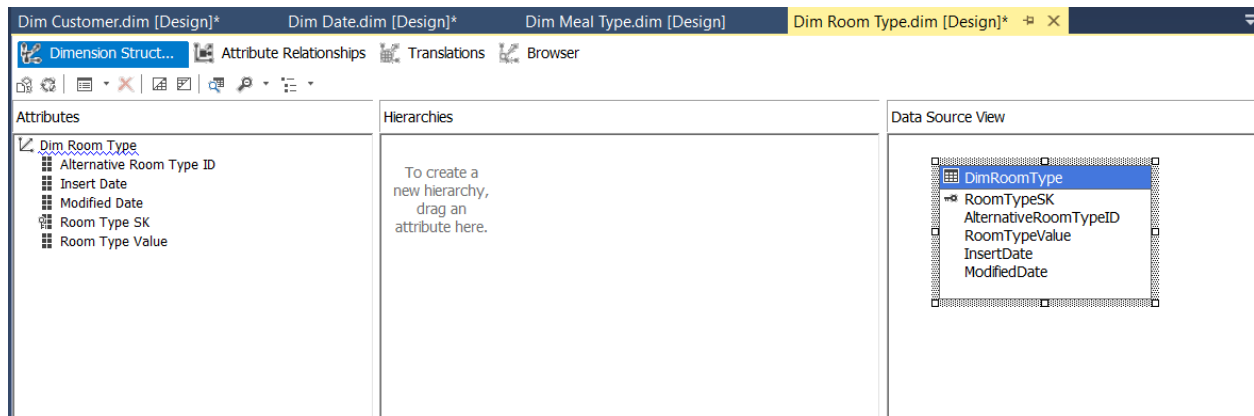


Cube Design

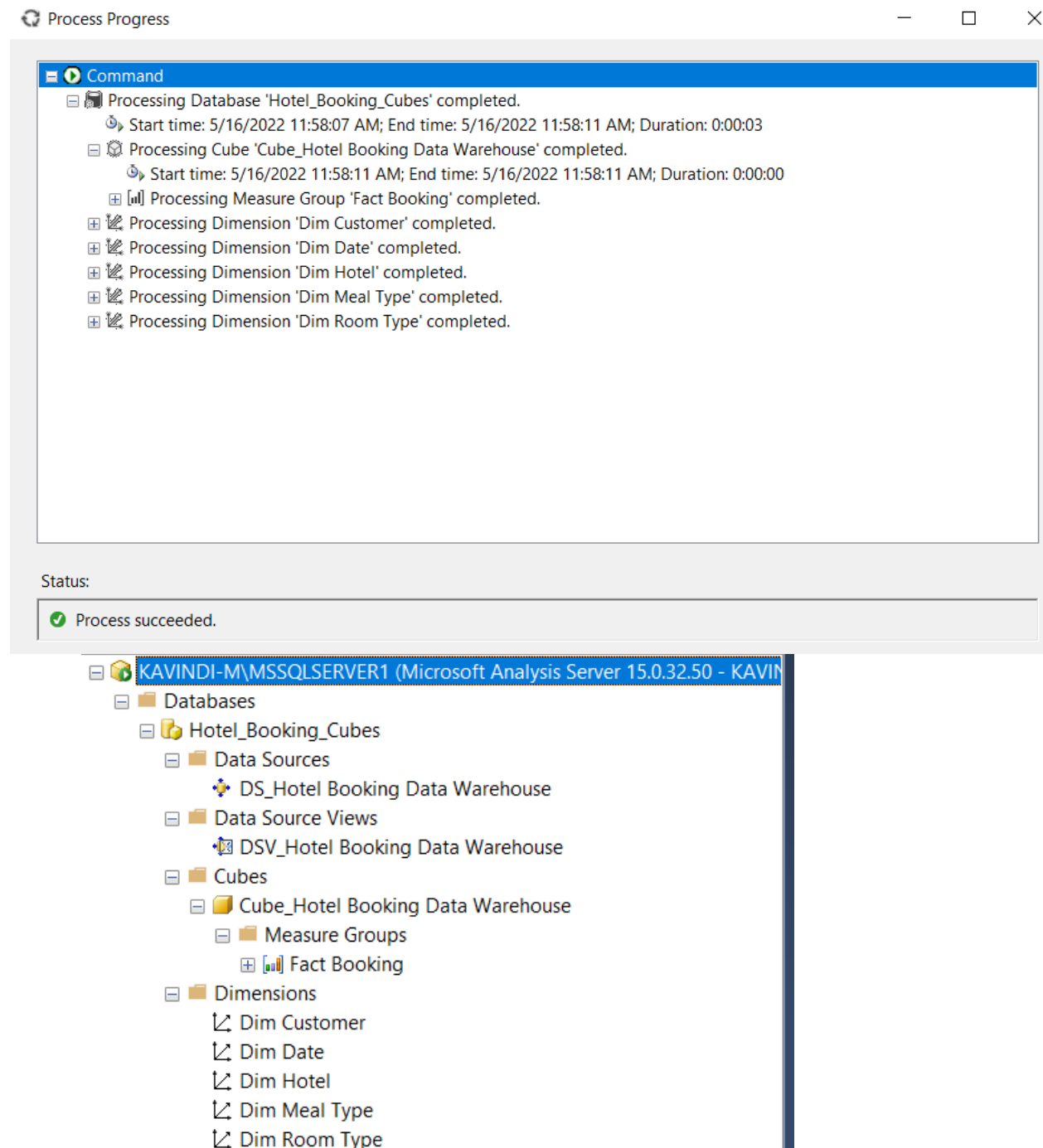


Then I added attributes to all dimensions and created hierarchy to relevant dimensions.





Then the SSAS was deployed in sql server management studio. The deployed data cube contains the fact booking measure table with DimRoomType, Dim Customer,DimDate,Dim MenuType,DimHotel tables dimension tables.



KPI Creation

KPI is designed on TotalAmount attribute of Measures. It checks if the TotalAmount more than \$1400.If so value is set to success(True) else set to fail(False).

⌵ KPI

Name:

Associated measure group:

⌵ Value Expression

⌵ Goal Expression

⌵ Status

Status indicator:

Status expression:

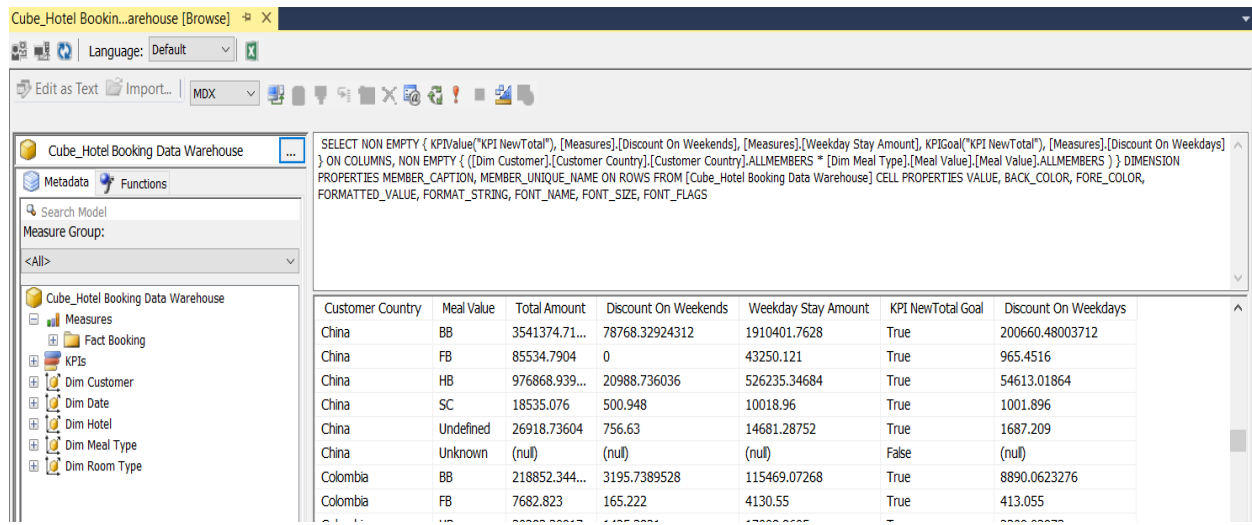
⌵ Trend

Trend indicator:

Date Key	KPI TotalAmount Value	KPI TotalAmount Goal
20170317	23375.7618	True
20170318	98811.450872	True
20170319	13787.82528	True
20170320	1276.8	False
20170321	(null)	False
20170322	8403.864	True
20170323	13086.4848	True
20170324	33271.2668	True
20170325	19601.88878	True
20170326	14637.9864	True
20170327	33435.1883	True
20170328	49006.6026	True
20170329	20266.68481	True

Browse Cube Data

Browsing data is done via using SSMS. By connecting SSAS to SSMS using instance and MDX queries can generated by selecting the relevant fields from the dimensions. When browsing cube data, a KPI value or measurement value is compulsory .Otherwise it will not be executed. Below figure shows how to browse data in SSMS.



The screenshot displays the 'Cube_Hotel Booking Data Warehouse' in SQL Server Enterprise Manager. The left pane shows the cube's structure, including Measures, Fact Booking, KPIs, and Dimensions. The right pane shows the MDX query and the resulting data table.

MDX Query:

```
SELECT NON EMPTY ( KPIValue("KPI NewTotal"), [Measures].[Discount On Weekends], [Measures].[Weekday Stay Amount], KPIGoal("KPI NewTotal"), [Measures].[Discount On Weekdays] ) ON COLUMNS, NON EMPTY ( ([Dim Customer].[Customer Country].[Customer Country].ALLMEMBERS * [Dim Meal Type].[Meal Value].[Meal Value].ALLMEMBERS ) ) DIMENSION PROPERTIES MEMBER_CAPTION, MEMBER_UNIQUE_NAME ON ROWS FROM [Cube_Hotel Booking Data Warehouse] CELL PROPERTIES VALUE, BACK_COLOR, FORE_COLOR, FORMATTED_VALUE, FORMAT_STRING, FONT_NAME, FONT_SIZE, FONT_FLAGS
```

Resulting Data Table:

Customer Country	Meal Value	Total Amount	Discount On Weekends	Weekday Stay Amount	KPI NewTotal Goal	Discount On Weekdays
China	BB	3541374.71...	78768.32924312	1910401.7628	True	200660.48003712
China	FB	85534.7904	0	43250.121	True	965.4516
China	HB	976868.939...	20988.736036	526235.34684	True	54613.01864
China	SC	18535.076	500.948	10018.96	True	1001.896
China	Undefined	26918.73604	756.63	14681.28752	True	1687.209
China	Unknown	(null)	(null)	(null)	False	(null)
Colombia	BB	218852.344...	3195.7389528	115469.07268	True	8890.0623276
Colombia	FB	7682.823	165.222	4130.55	True	413.055

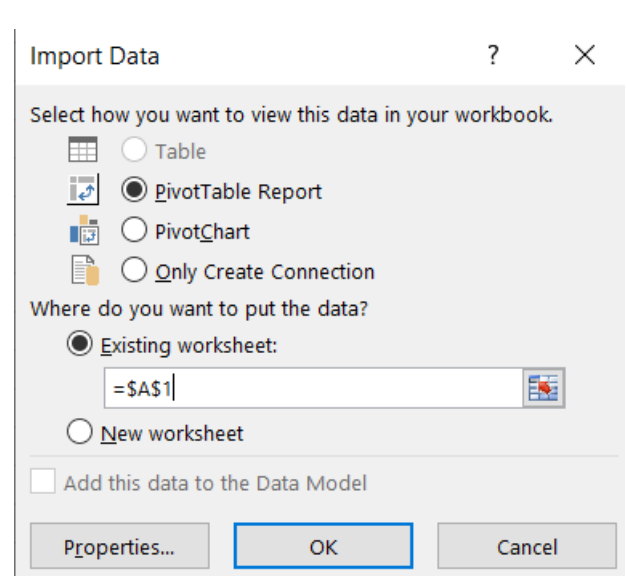
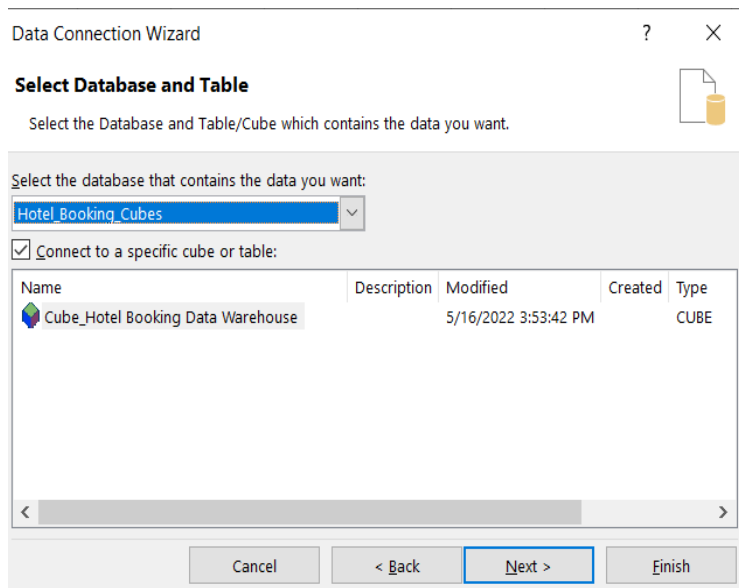
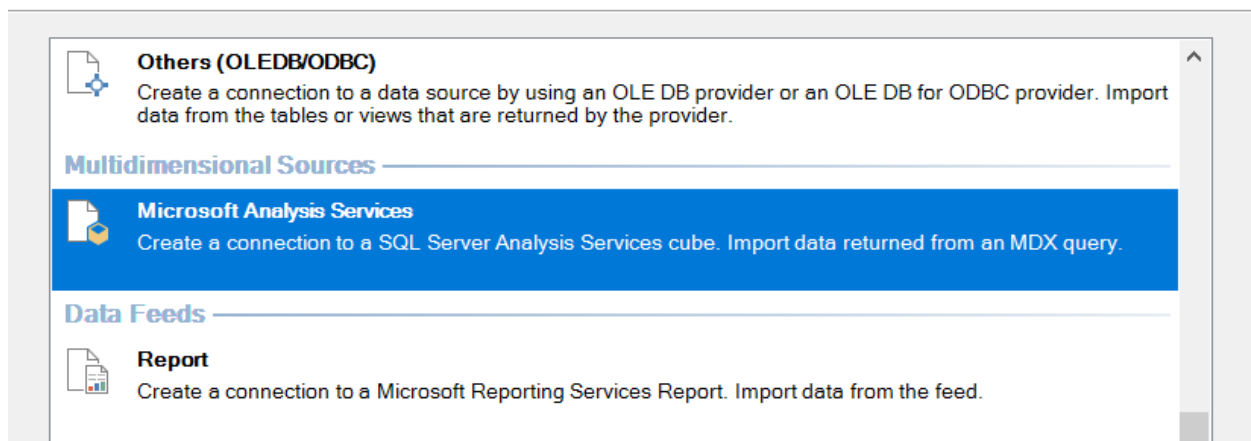
Step 3: Demonstration of OLAP Operations

In the data tab of excel Microsoft analysis services are selected from other sources. There the relevant database to create the pivot table “Hotel_Booking_Cubess” database is selected. Then the data there gets imported as a pivot table report.

Table Import Wizard

Connect to a Data Source

You can either create a connection to a data source, or you can use one that already exists.



To display the OLAP operation first , the Excel is connected to SSAS cube using MDX query. MDX query is created using above process . And below picture show how to connect the Excel to SSAS Cube successfully.

Table Import Wizard

Connect to Microsoft SQL Server Analysis Services.
Enter the information required to connect to a Microsoft SQL Server Analysis Services database.

Friendly connection name: AnalysisServices KAVINDI-MMSSQLSERVER1 Hotel_Booking_CubesS

Server or File Name: KAVINDI-MMSSQLSERVER1

Log on to the server

☒ Use Windows Authentication

☐ Use SQL Server Authentication

User name:

Password:

☐ Save my password

Database name: Hotel_Booking_CubesS


Advanced Test Connection

< Back Next > Finish Cancel


Then, this shows how to successfully insert MDX query for generating data to create OLAP operations.

Table Import Wizard

Importing
The import operation might take several minutes to complete. To stop the import operation, click the Stop Import button.

 **Success** Total: 1 Cancelled: 0
Success: 1 Error: 0

Details:

Work Item	Status	Message
 Query	Success. 300 rows transferred.	

(1)Roll up

It can be seen weekday stay amount, discount amount on weekends and the total amount, discount on weekdays is displayed countries for each meal type. High level understanding can be obtained.

Hotel_Booking_IT20024918.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Power Pivot Team Analyze Design Tell me what you want to do... Sign in Share

SECURITY WARNING External Data Connections have been disabled Enable Content

E25

Row Labels	Sum of MeasuresDiscount On Weekdays	Sum of MeasuresTotal Amount	Sum of MeasuresWeekday Stay Amount	Sum of MeasuresDiscount On Weekends
BB	917602.7378	16200759.41	8727988.664	337615.1824
Brazil	61604.21709	1200843.671	643636.076	24824.26401
Cuba	14417.52409	389657.9422	204875.9109	5676.355591
France	215453.6954	3883148.337	2086808.979	75015.92596
India	133859.6109	2123588.732	1153356.531	49264.71943
Indonesia	79921.70138	1743198.471	925320.4276	27520.68299
Japan	47475.87377	527144.7683	296644.5086	18668.3751
Mexico	139926.5246	2328064.023	1261970.182	55949.81664
Morocco	30766.41387	438784.742	240697.649	11844.14204
New Zealand	51014.23743	756513.8973	415104.2943	22680.45381
Spain	37331.38006	1004598.988	525615.141	9299.913518
United Kingdom	105831.5593	1805215.836	973958.9645	36870.53328
FB	12269.48689	190839.1169	103675.2708	4241.937848
HB	257606.2409	4521912.637	2441903.602	104288.3258
SC	632.064	11988.42	6319.74	18.996
Undefined	12823.6932	174108.2946	95026.77	3121.5522
Brazil	1511.712	12450.384	6998.04	33.984
France	1504.902	38437.0748	20162.644	383.3112
India	1335.4608	69787.7342	35736.094	348.993
Indonesia	137.5704	14622.5736	7380.072	0
Japan	67.836	1288.884	678.36	0
Mexico	0	6430.8	3215.4	0
Morocco	0	2097.92	1048.96	0
New Zealand	0	1136.64	568.32	0
Spain	7065.792	21353.712	15387.384	2355.264

PivotTable Fields

ACTIVE ALL

Choose fields to add to report:

Search

☒ Dim Meal TypeMeal ValueMeal Value

☒ MeasuresTotal Amount

☒ MeasuresDiscount On Weekends

☒ MeasuresWeekday Stay Amount

☒ MeasuresKPI NewTotal Goal

☒ MeasuresDiscount On Weekdays

Drag fields between areas below:

FILTERS

MeasuresKPI NewTot...

COLUMNS

Σ Values

ROWS

Dim Meal TypeMeal ...

Dim CustomerCusto...

VALUES

Σ Values

Sum of MeasuresD...

Sum of MeasuresT...

Sum of Measures...

Activate Windows

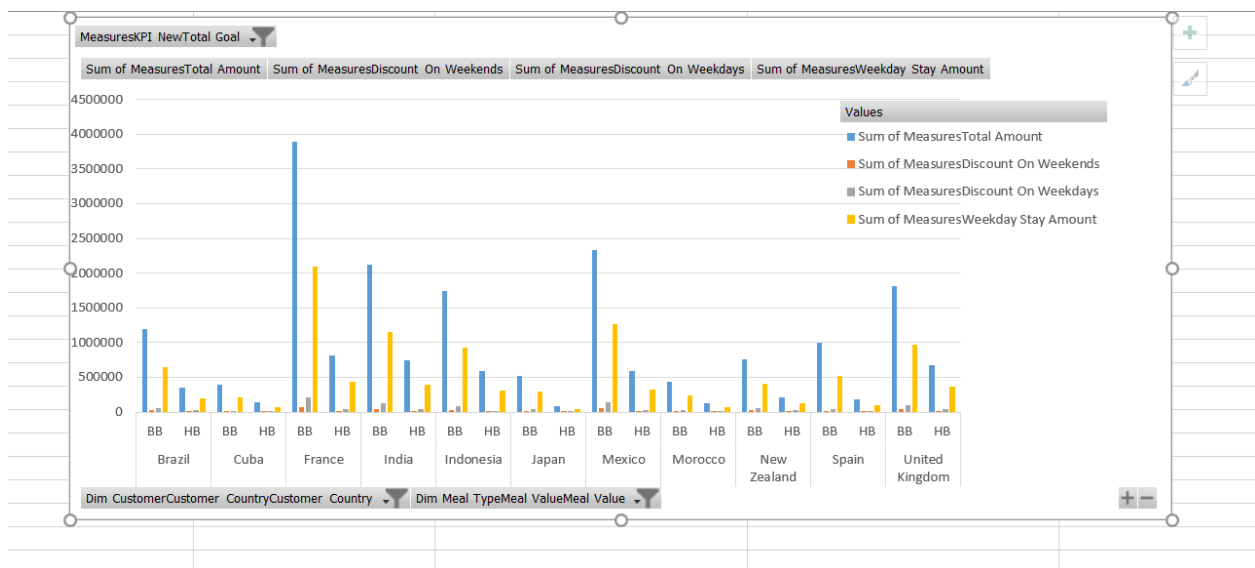
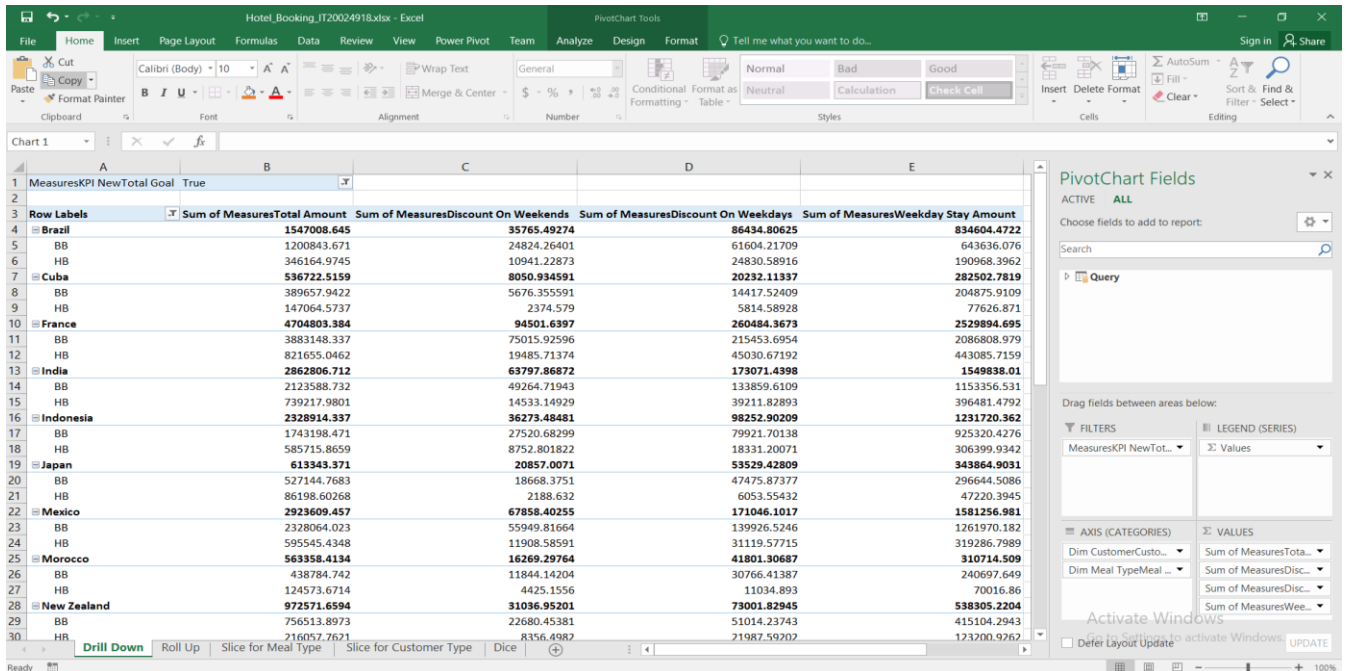
Go to Settings to activate Windows. UPDATE

Drill Down Roll Up Slice for Meal Type Slice for Customer Type Dice



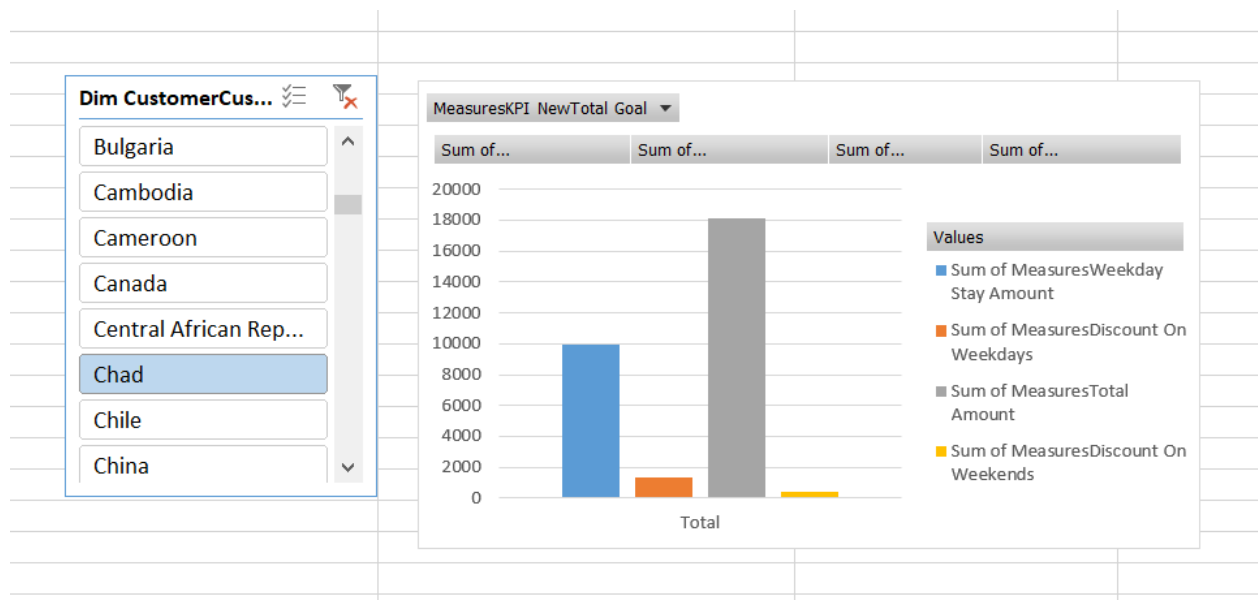
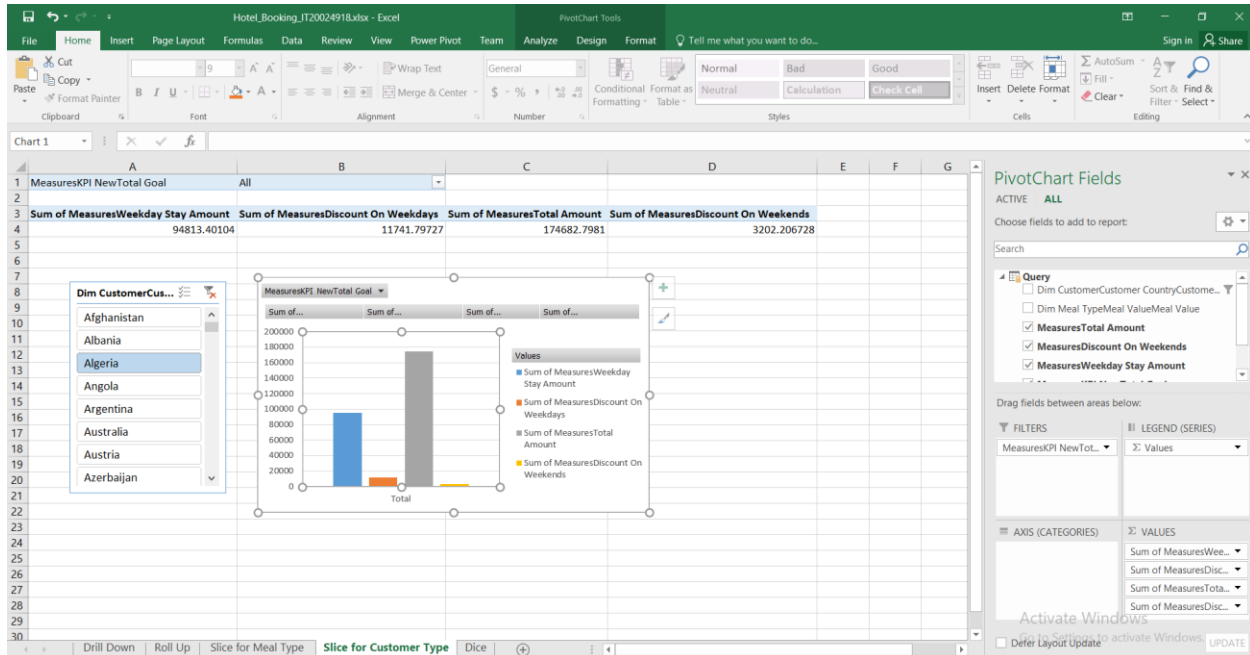
(2) Drill Down

By using the countries and meals here I have done the drill down.

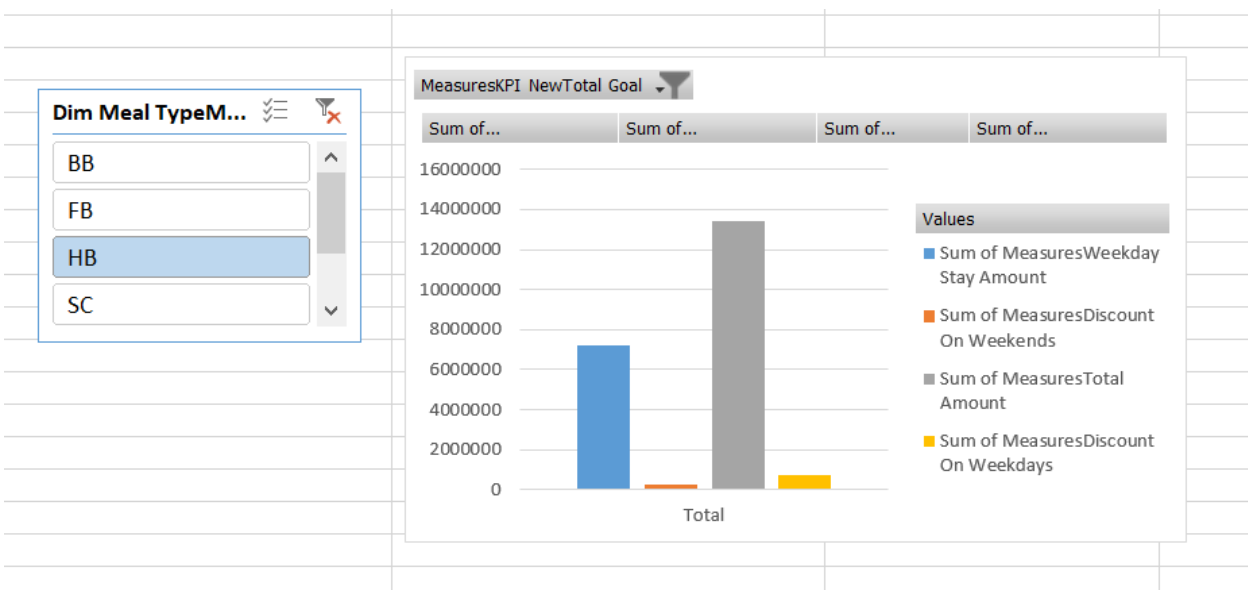
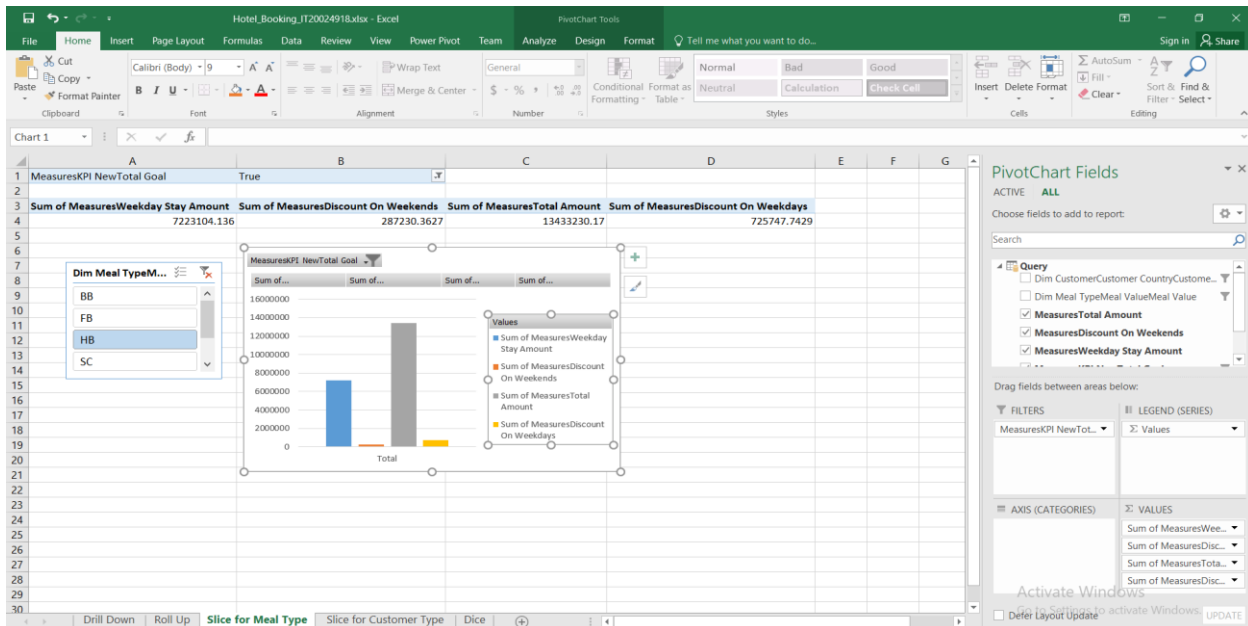


(3)Slice

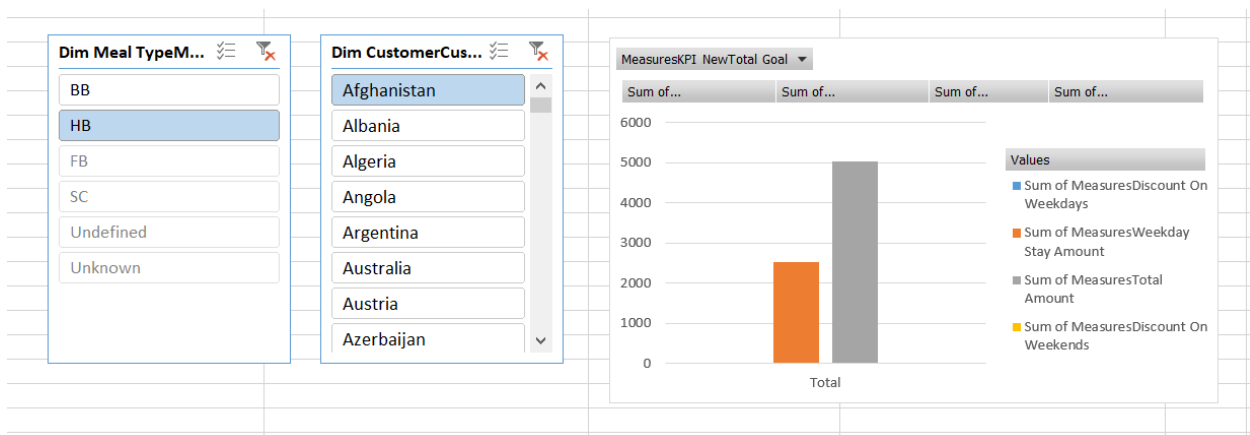
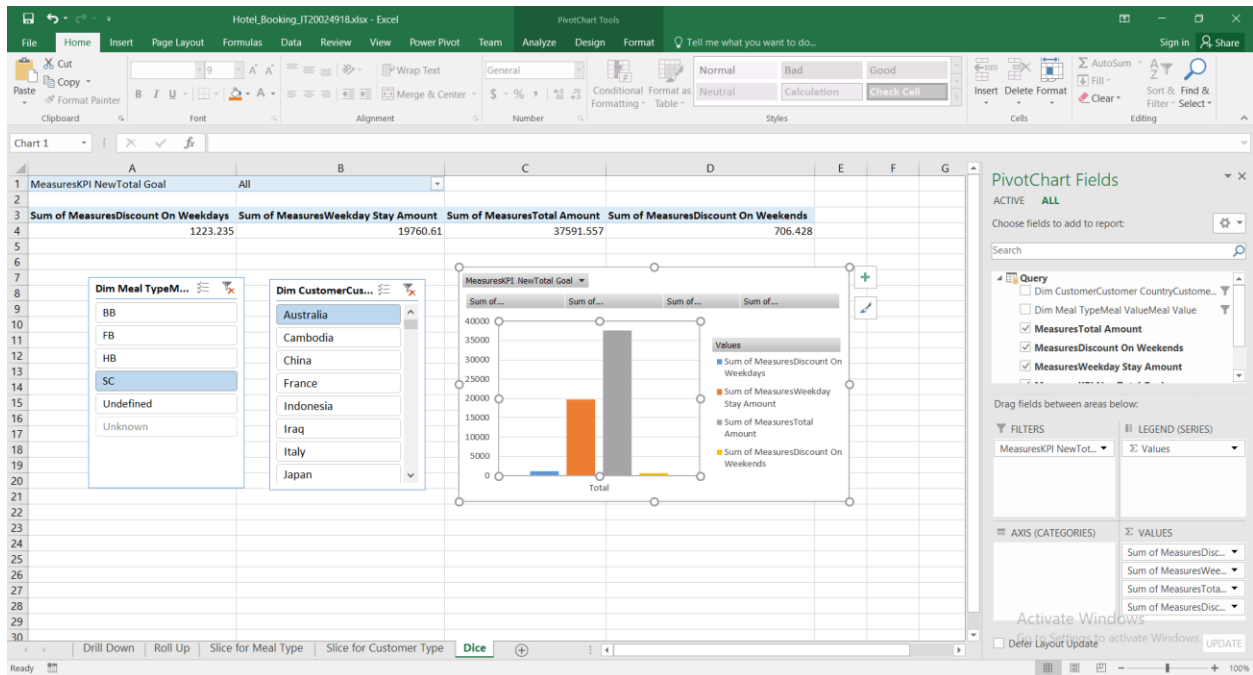
Slice for Customer



Slice for MealType



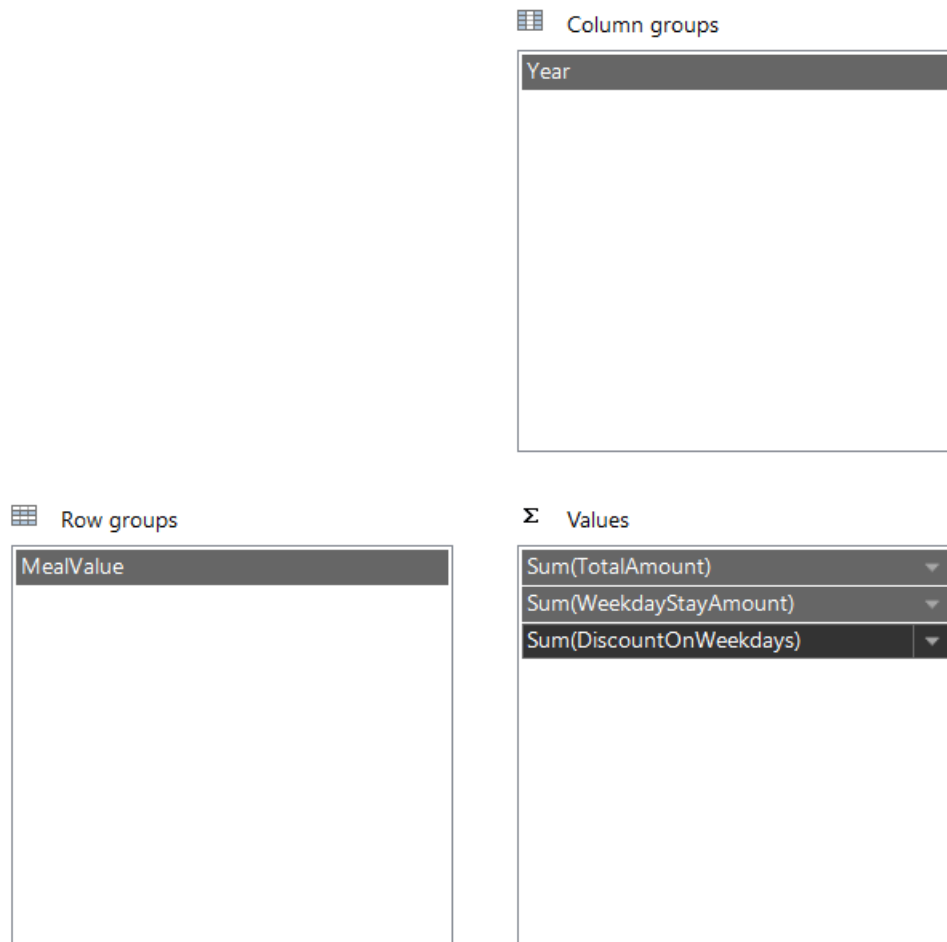
(4) Dice



Step 4 – SSRS Reports

Report 1 : Report with a matrix

Below figure shows how to add columns according to the report ,



I have used meal types to get this report.

Bookings with Meal Type Distribution

	[Year]			Total		
Meal Value	Total Amoun	Weekday Sta	Discount On	Total Amoun	Weekday Sta	Discount On
[MealValue]	[Sum(TotalAm	[Sum(Weekday	[Sum(Discount	[Sum(TotalAr	[Sum(Weekda	[Sum(Discoun
Total	[Sum(TotalAr	[Sum(Weekda	[Sum(Discount	[Sum(TotalAr	[Sum(Weekda	[Sum(Discoun
[&ExecutionTime]						

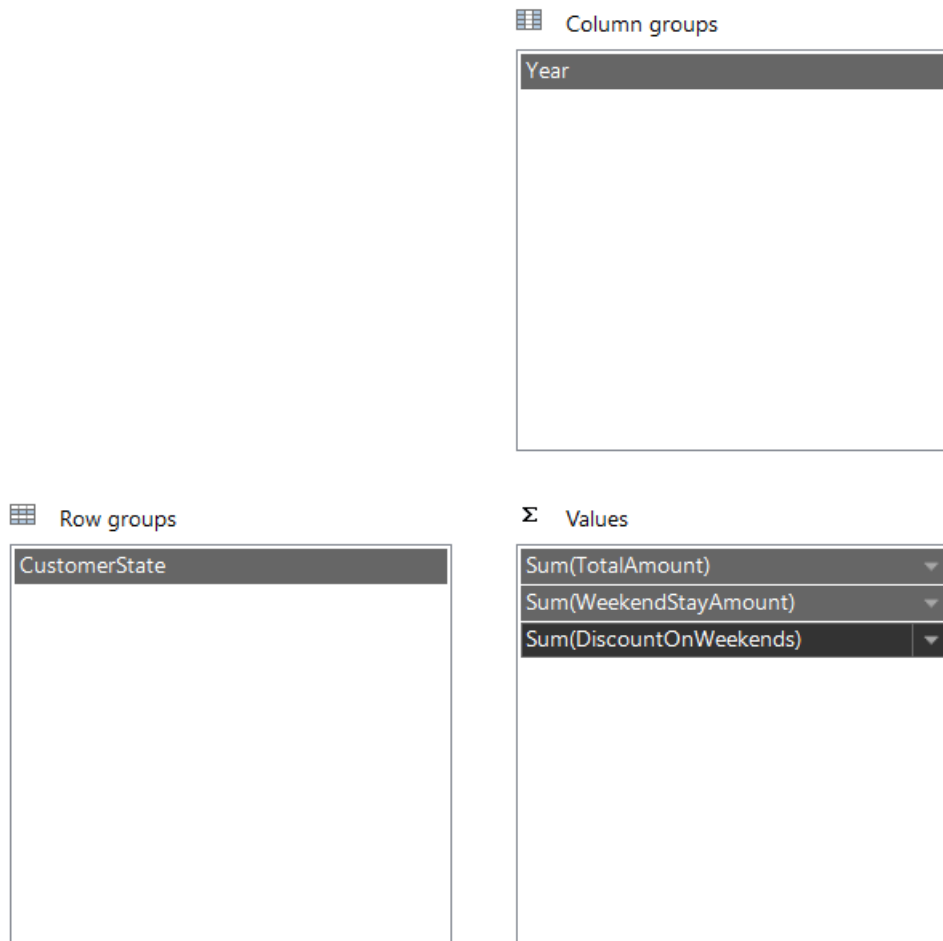
Bookings with Meal Type Distribution

	2015			2016			2017			Total		
Meal Value	Total Amount	Weekday Stay Amount	Discount On Weekdays	Total Amount	Weekday Stay Amount	Discount On Weekdays	Total Amount	Weekday Stay Amount	Discount On Weekdays	Total Amount	Weekday Stay Amount	Discount On Weekdays
BB	9008522.28206	4880701.12462	550194.475437	27914863.1791	15029880.1794	1562167.37876	8363924.52296	4536237.69386	509134.653932	45287309.98	24446818.99	2621496.508
	602		08	22		132	462		2	41526	788	1306
FB	262119.085342	138202.2497	10873.50515	369969.210857	194616.35962	14122.1044544	64524.12	34410.9916	3400.344	696612.4161	367229.6009	28395.95360
				6						996		
HB	2714820.43681	1470260.96558	164884.672304	7451575.44982	3991803.14728	379219.278301	3266737.40664	1761040.0231	181643.792327	13433133.29	7223104.135	725747.7429
	3			42			12		2	32784	96001	322
SC	36930.6406	19758.3558	1975.353	96516.0386	50616.919	3302.7208	-349.004592	0	0	133097.6746	70375.2748	5278.0738
Undefined	69347.927368	36163.99472	2382.516072	329124.66325	177920.72152	19841.05103	156303.116464	84044.5482	8854.281872	554775.7070	298129.2644	31077.84897
Total	12091740.37	6545086.690	730310.5219	36162048.54	19444837.32	1978652.533	11851140.16	6415733.256	703033.0721	60104929.07	32405657.27	3411996.127
	2189		6308	16538	682	34672	14778	75999	314	53205		44119

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Report 2 : Report with more than one parameter

Below figure shows how to add columns according to the report ,



Customer state and country has used to do this report.

Country Wise Booking Analysis			
	[Year]		
Customer State	Total Amount	Weekend Stay Amount	Discount On Weekends
[CustomerState]	[Sum(TotalAmount)]	[Sum(WeekendStayAmount)]	[Sum(DiscountOnWeekends)]
[&ExecutionTime]			

State

Country

Country Wise Booking Analysis

<input type="text" value=""/>	2015			2016			2017				
Customer State	Total Amount	Weekend Stay Amount	Discount On Weekends	Total Amount	Weekend Stay Amount	Discount On Weekends	Total Amount	Weekend Stay Amount	Discount On Weekends		
Anhui	72983.1776	41545.8112	2890.2144	228599.24198	119396.405	1886.36988	55962.13886	30459.338	1530.34444		

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Report 3 : Drill Down

We have used state and city to do the drill down.

Drill Down Analysis

State	City	Total Price	Discount Value
[State]	[City]	[TotalPrice]	[DiscountValue]

State	City	Total Price	Discount Value
☐ Ad Dawhah	Doha	3145.68	534.7656
	Doha	455.04	45.504
	Doha	1788.588	361.294776
	Doha	839.8	1.6796
	Doha	170.88	0
	Doha	15120	1512
☒ Basque Country		33718.68	15847.7796
		23643.468	2364.3468
		664.35	0
☒ Beirut		4370.94	743.0598
		541.188	0
☒ Galicia		12192.6	1219.26

Report 4: SSRS drill-through report

Used CustomerCountry and CustomerState to do the drill through. When you click on the country you will be able to display the relevant state.

Drill through level 1 :

New Table or Matrix



Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functions such as Sum, Avg, and Count on the fields in the Values box.

Available fields

AlternativeCustomerID
CustomerName
CustomerCity
CustomerState
CustomerCountry
CustomerType
Month
MonthName
Year
HotelName
MealValue
OwnerName
RoomTypeValue
TotalAmount
WeekdayStayAmount
WeekendStayAmount
DiscountOnWeekdays
DiscountOnWeekends
Discount
PricePerNight

Column groups

Year

Row groups

CustomerCountry

Σ Values

Sum(TotalAmount)

Sum(WeekdayStayAmount)

Following data are used to get the graph.

New Chart

×

Arrange chart fields

Add data fields to the chart. For most chart types, a field in the Categories list is displayed on the x-axis. A field in the Values list shows aggregated data on the y-axis. A field in the Series list creates a new series in the chart.

Available fields

AlternativeCustomerID
CustomerName
CustomerCity
CustomerState
CustomerCountry
CustomerType
Month
MonthName
Year
HotelName
MealValue
OwnerName
RoomTypeValue
TotalAmount
WeekdayStayAmount
WeekendStayAmount
DiscountOnWeekdays
DiscountOnWeekends
Discount
PricePerNight

Series

Year

Categories

CustomerCountry

Values

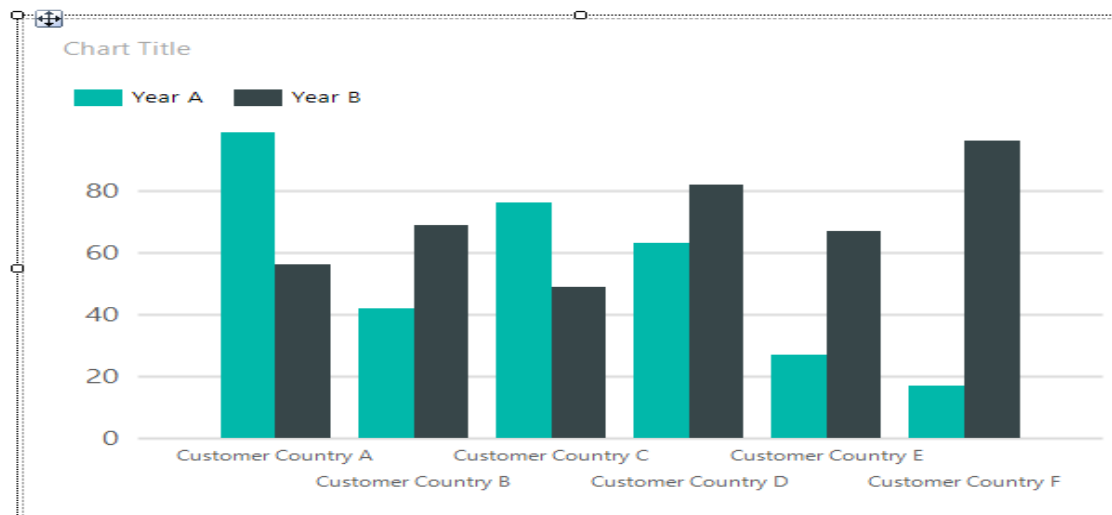
Sum(PricePerNight)

Help

< Back

Next >

Cancel



Drill through Level 2 : Used state

New Table or Matrix



Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functions such as Sum, Avg, and Count on the fields in the Values box.

Available fields

- AlternativeCustomerID
- CustomerName
- CustomerCity
- CustomerState
- CustomerCountry
- CustomerType
- Month
- MonthName
- Year
- HotelName
- MealValue
- OwnerName
- RoomTypeValue
- TotalAmount
- WeekdayStayAmount**
- WeekendStayAmount
- DiscountOnWeekdays
- DiscountOnWeekends
- Discount
- PricePerNight

Column groups

Year

Row groups

CustomerCountry

Values

Sum(TotalAmount)

Sum(WeekdayStayAmount)

Drill Through Level 2

	[Year]	
Customer State	Total Amount	Weekday Stay Amount
[CustomerState]	[Sum(TotalAmount)]	[Sum(WeekdayStayAmount)]

Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functions such as Sum, Avg, and Count on the fields in the Values box.

Available fields

- AlternativeCustomerID
- CustomerName
- CustomerCity
- CustomerState
- CustomerCountry
- CustomerType
- Month
- MonthName
- Year
- HotelName
- MealValue
- OwnerName
- RoomTypeValue
- TotalAmount
- WeekdayStayAmount
- WeekendStayAmount
- DiscountOnWeekdays
- DiscountOnWeekends
- Discount
- PricePerNight
- CustomerSK

Column groups

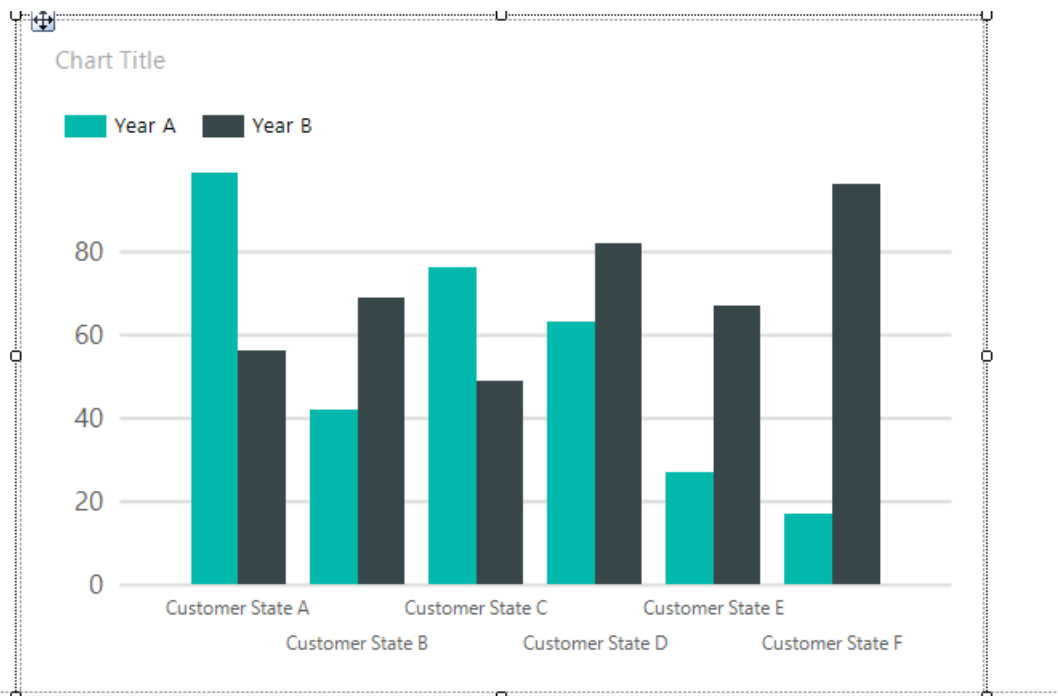
Year

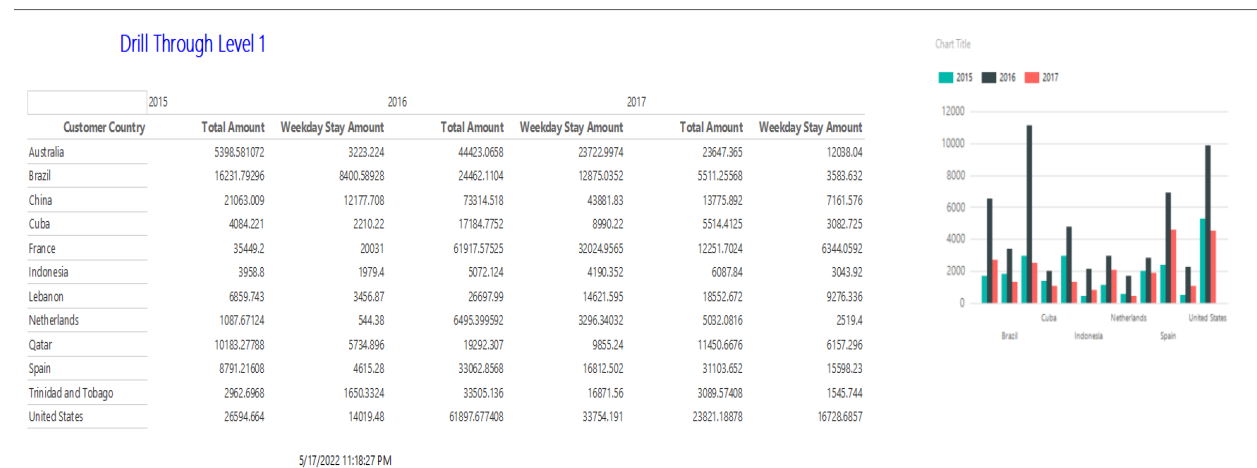
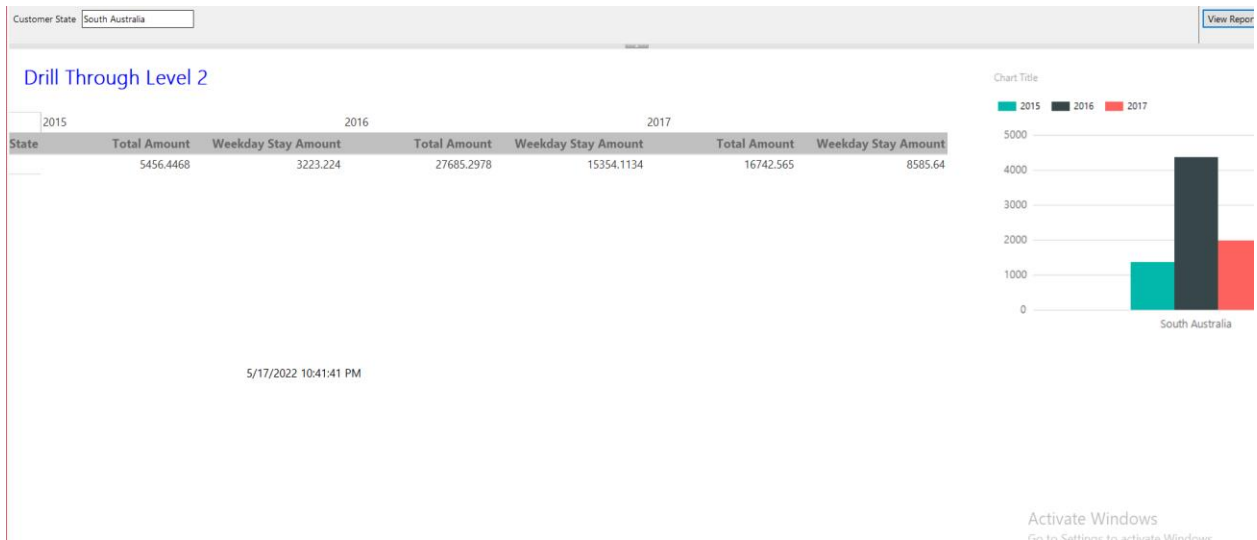
Row groups

CustomerState

Values

- Sum(TotalAmount)
- Sum(WeekdayStayAmount)






Final reports

 SQL Server Reporting Services

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 BookingWithMealType ...

 Country Wise booking analysis report ...

 drill down ...

 drill through level 1 ...

 drill through level 2 ...

Thank you!