Sri Lanka Institute of Information Technology

Data warehousing and Business Intelligence

Assignment 2

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Step 1 – Data Source for the Assignment

I used data warehouse database (GlobalSuperStore_DW) as the data source which I created in Assignment 1.In there , the fact table and the dimensions as follows,

FactOrder

DimDate

DimCustomer

DimShipmentDetails

DimOrderPriorityDetails

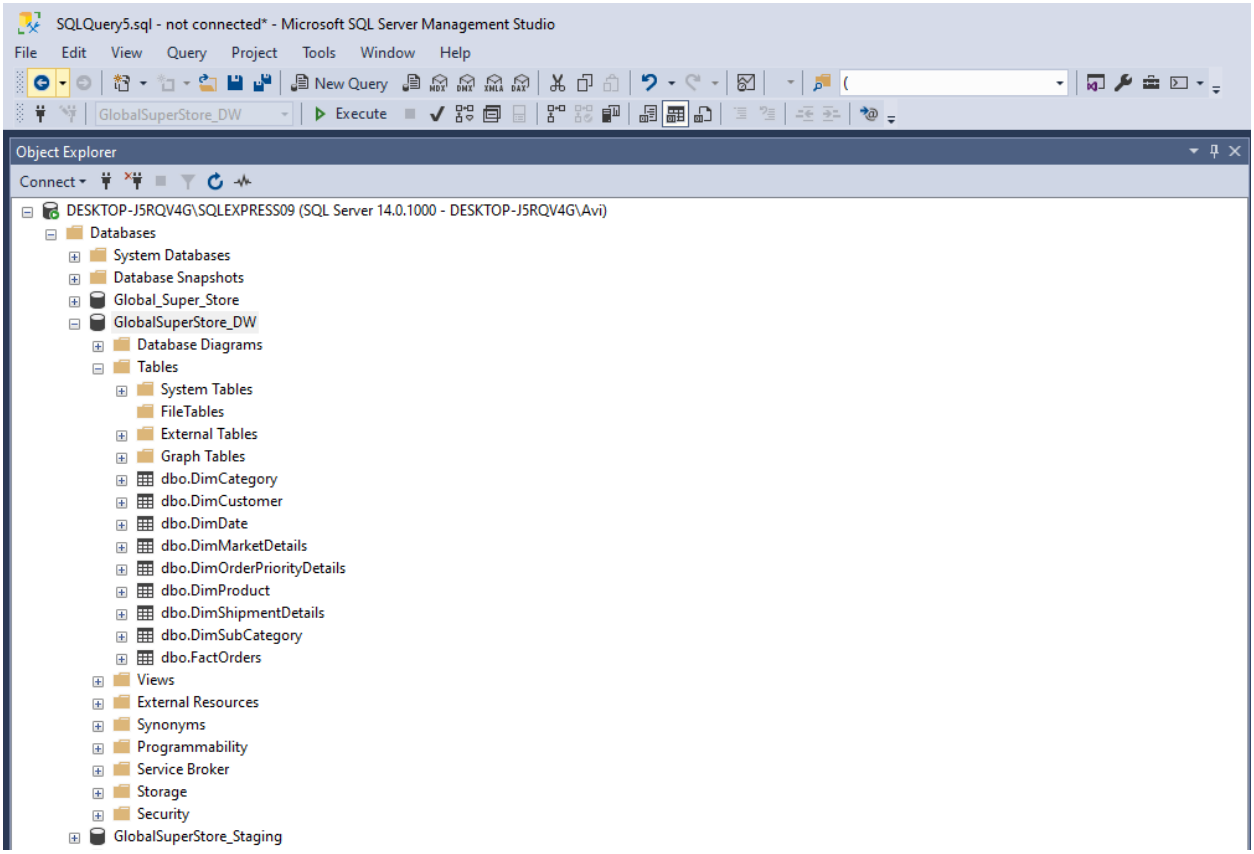
DimMarketDetails

DimSubCategory

DimCategory

DimProduct

Also, I used snowflake schema to integrate them. I used these data to create OLAP cubes and to generate OLAP operations in Excel and to prepare reports in Report Builder.



Step 2 – SSAS Cube Implementation

Used Tools:-

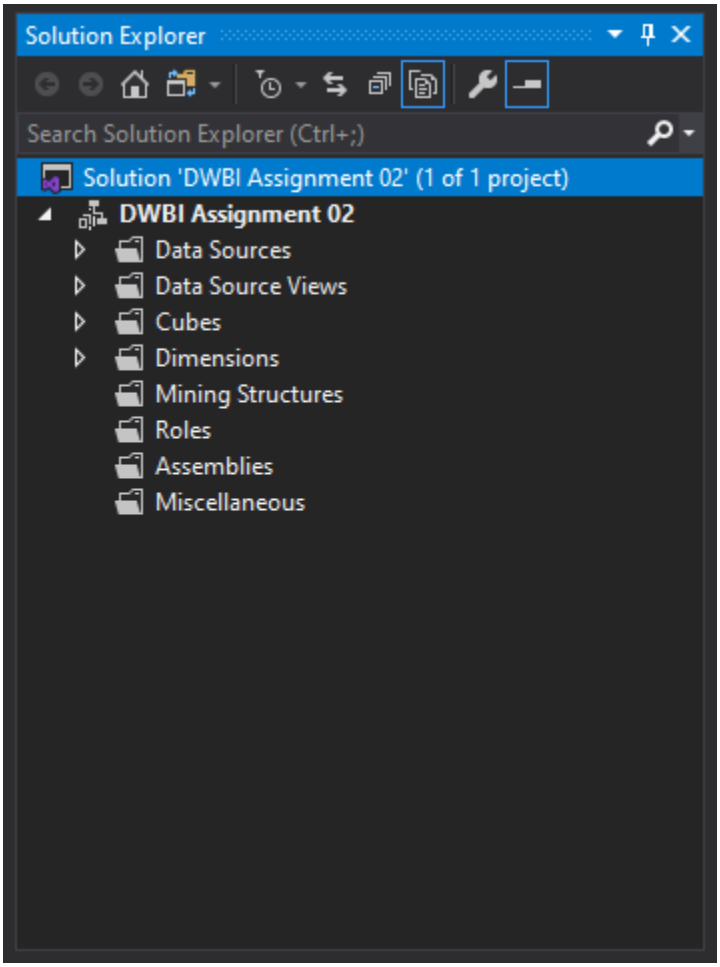
SQL Server Analysis Services

SQL Server Management Studio

SQL Server Data Tools

When creating the OLAP cubes first I created Analysis Services Multidimensional and Data Mining Project on SSDT.

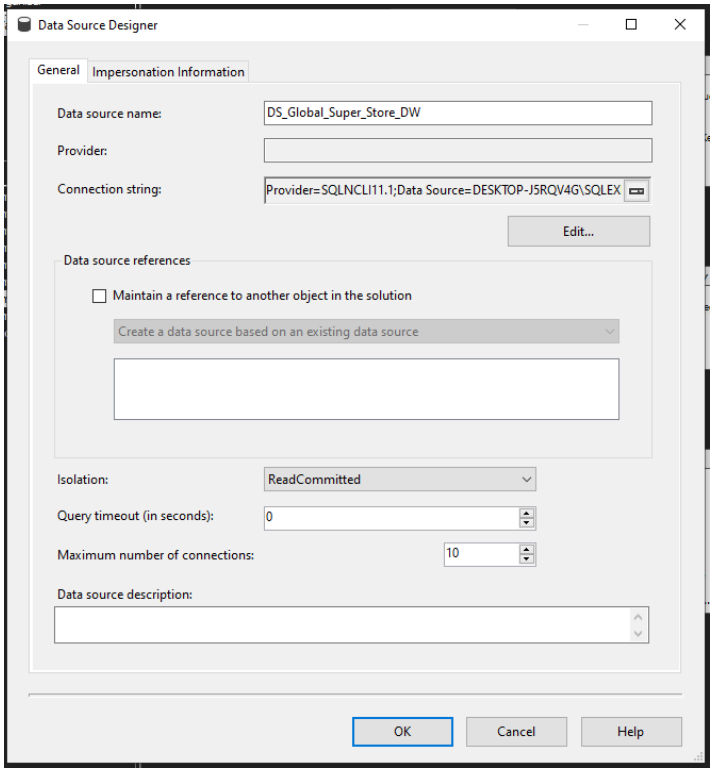
Then I renamed it as “DWBI Assignment 02”.Then the folder structure is as follow.

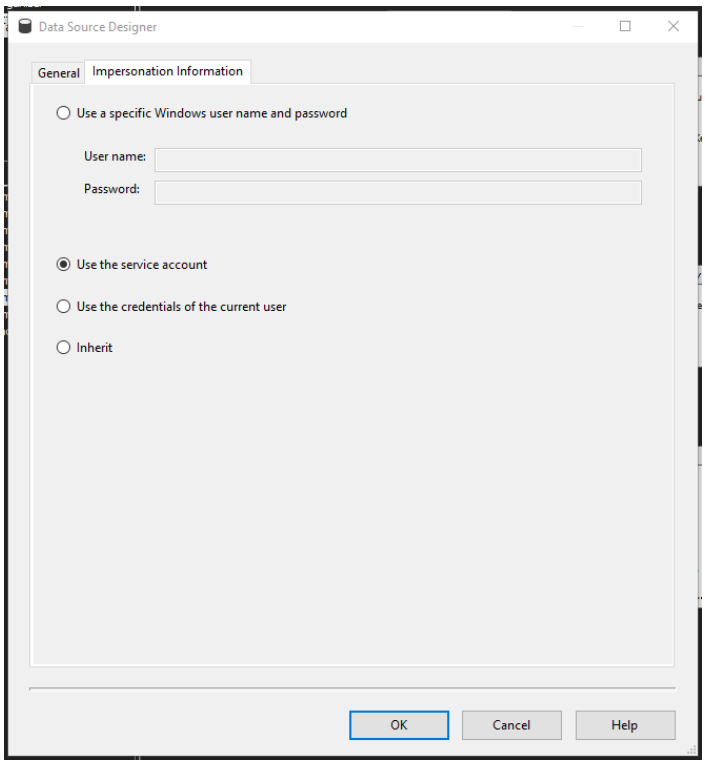


Then the following steps are done ,

1. **Create a Data source**

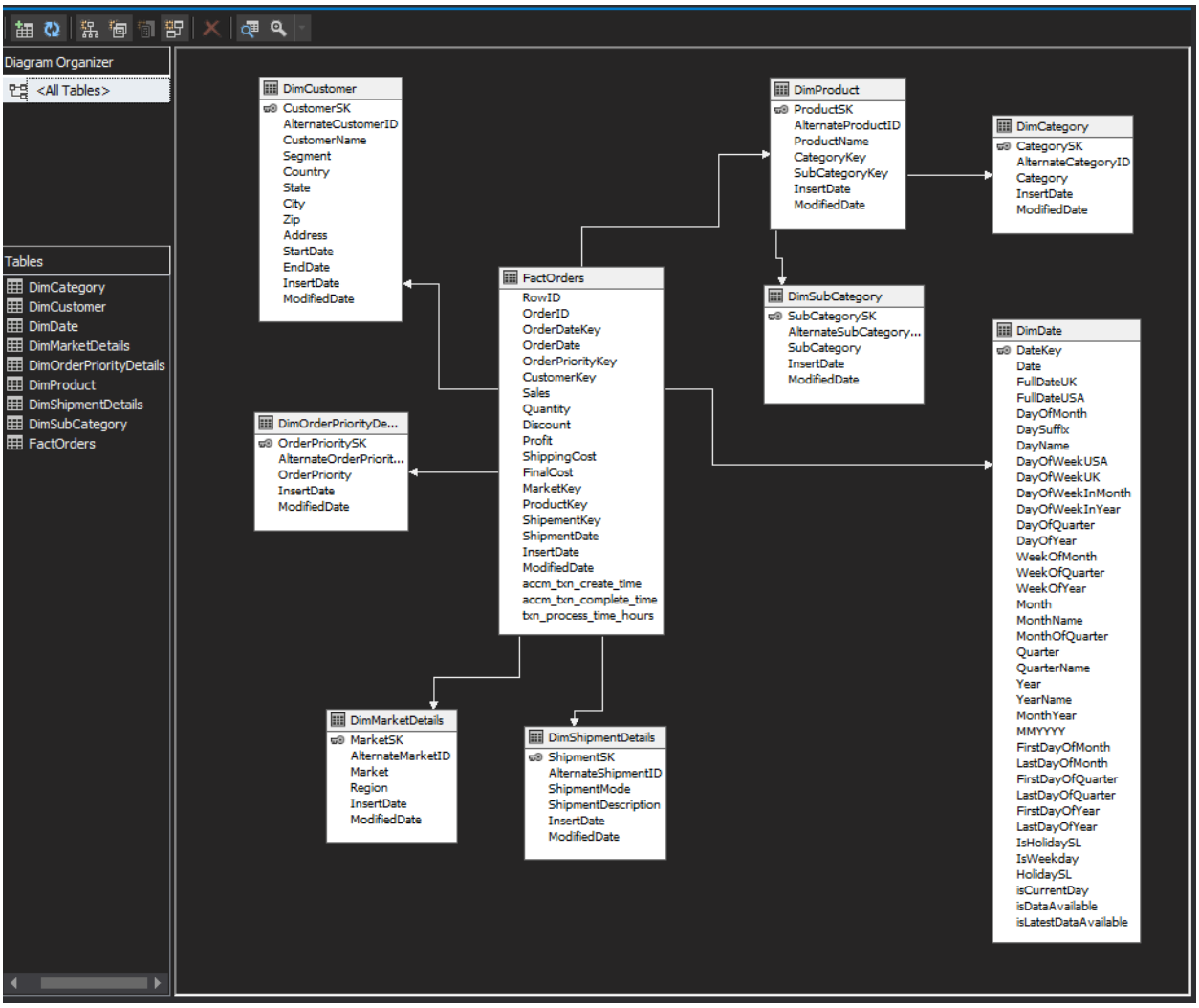
Under the Data Sources folder in above folder structure, and a new Data Source to create connection with my GlobalSuperStore_DW is added and renamed as DS_Global_Super_Store_DW. I used the service account option to connect it.





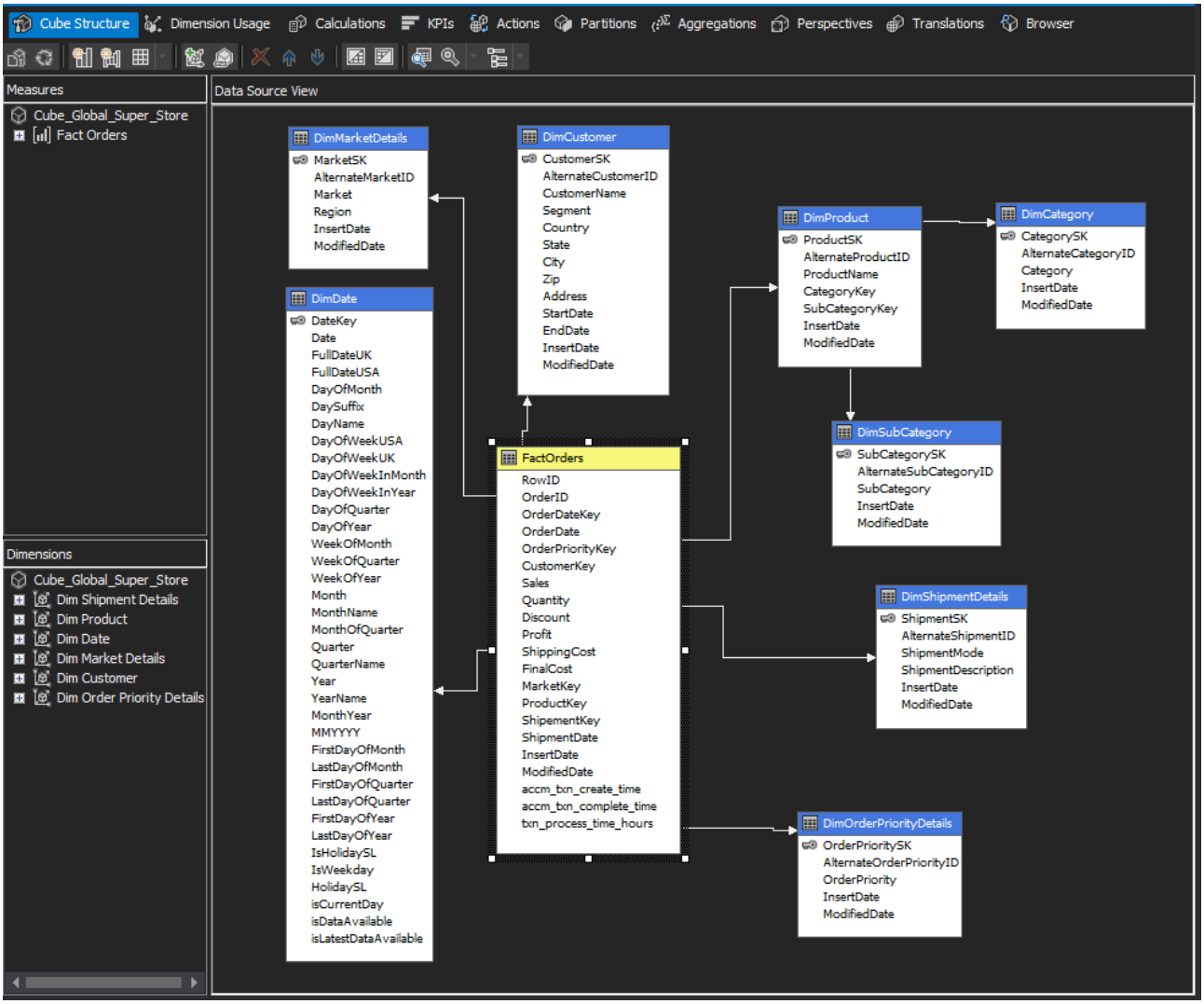
2. Create a Data Source View

Under the Data Source Views folder, I added new data source view called DSV_Global_Super_Store_DW.

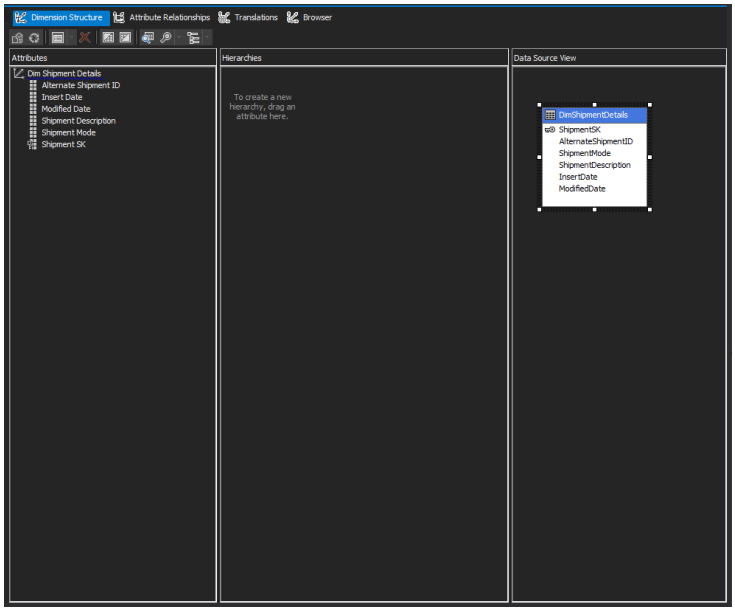


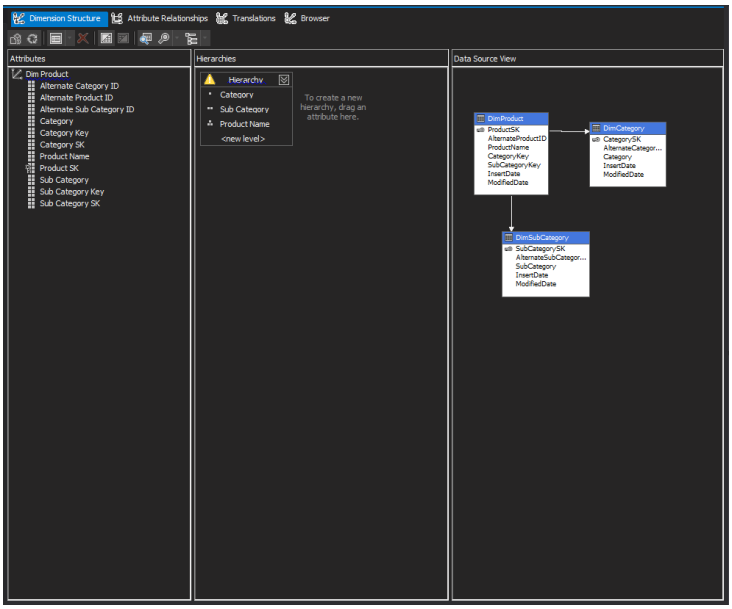
3. Create a Cube

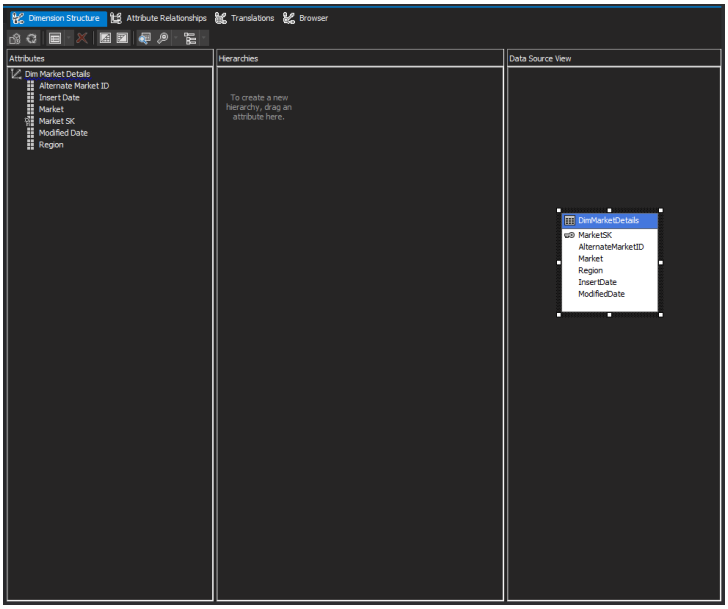
Under the Cubes folder I created new cube using above data source view called Cube_Global_Super_Store _DW.

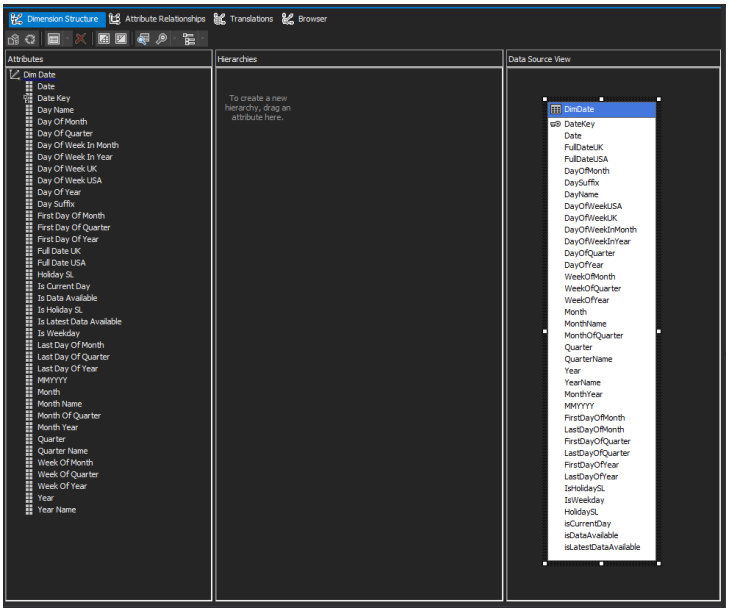


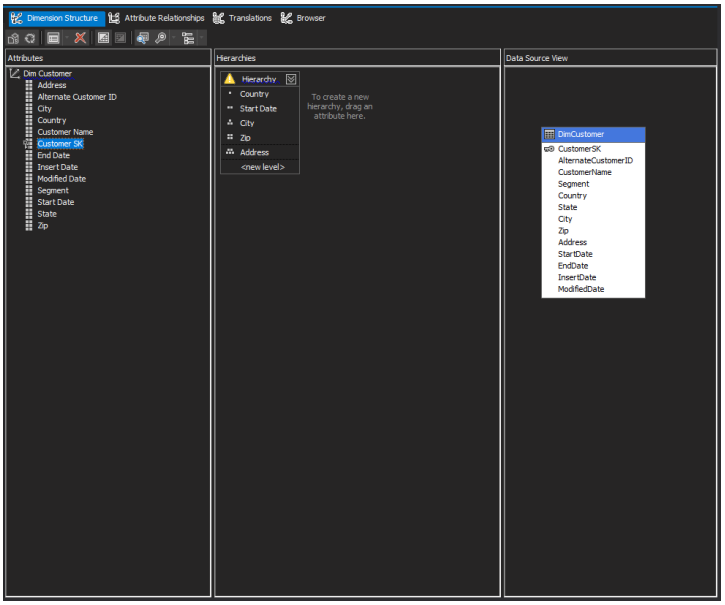
Then, I added attributes to all dimensions and created hierarchy to relevant dimensions.



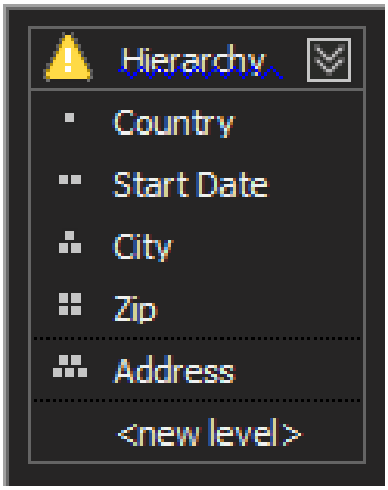




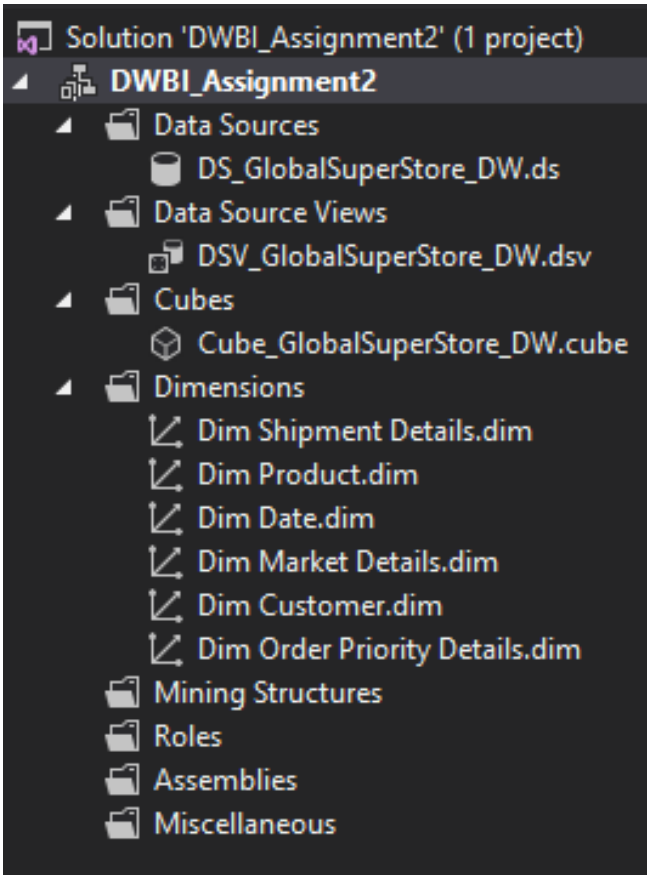




These are the 2 hierarchies that was created,

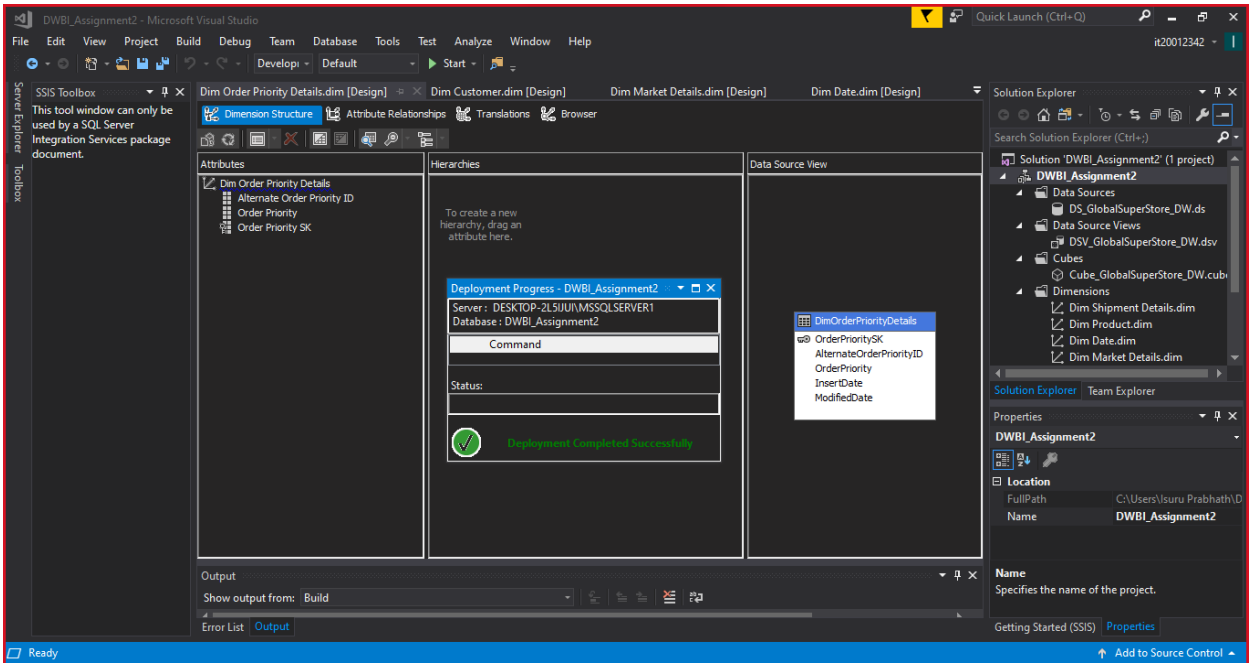


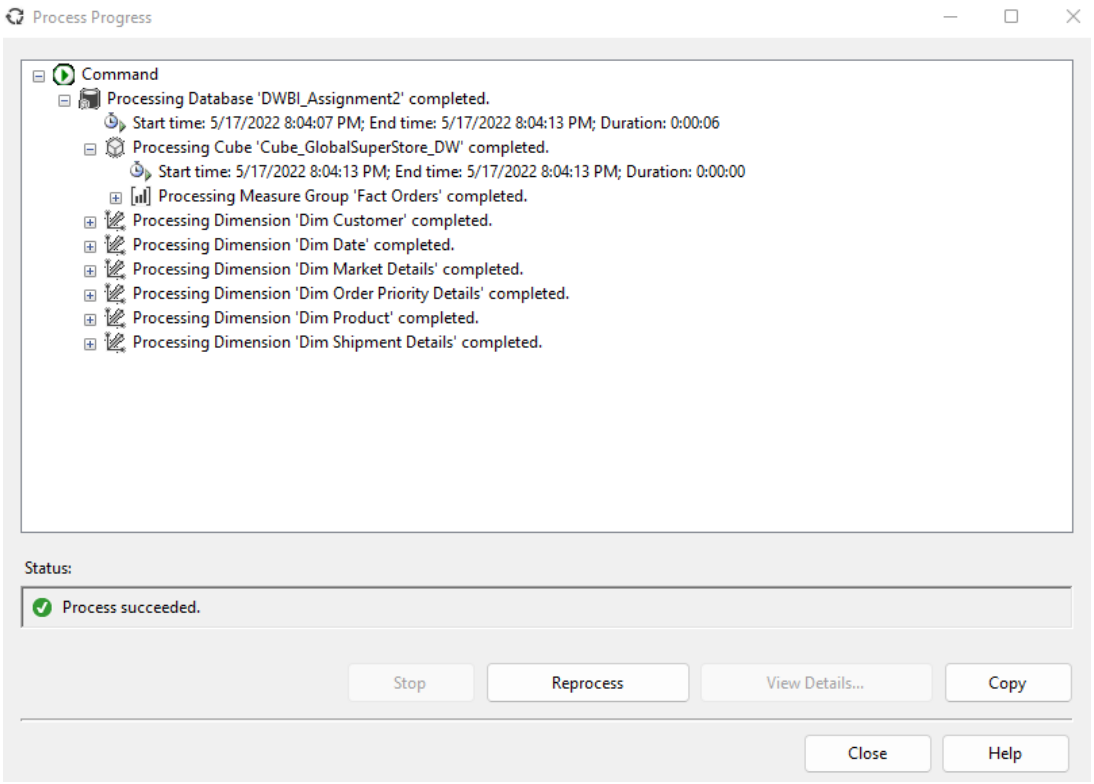
After been deployed folder structure is shown as below,



4. Deploy the Cube

After finishing all the above steps, the cube is deployed. If it is successfully deployed a message is displayed signifying deployment's success as shown below.

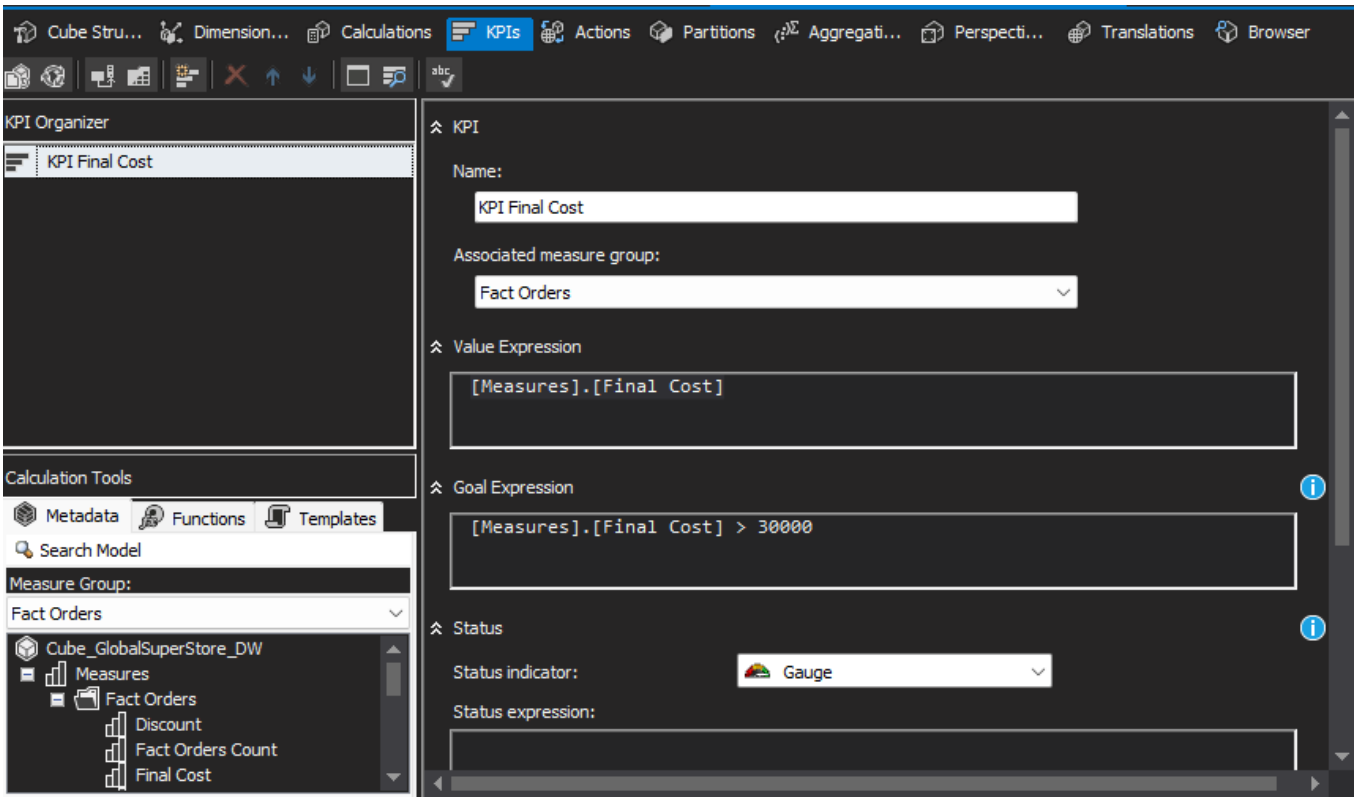




5. Create KPI

KPIs are developed based on the needs of the SuperStore. KPIs are used by businesses to assess their progress toward achieving their objectives.

Following Figure shows the KPI which I created after the deploying cube. These are the KPI values which created for GlobalSuperStore. It can be used for determining how much of customers have paid final cost per order more than $30000.

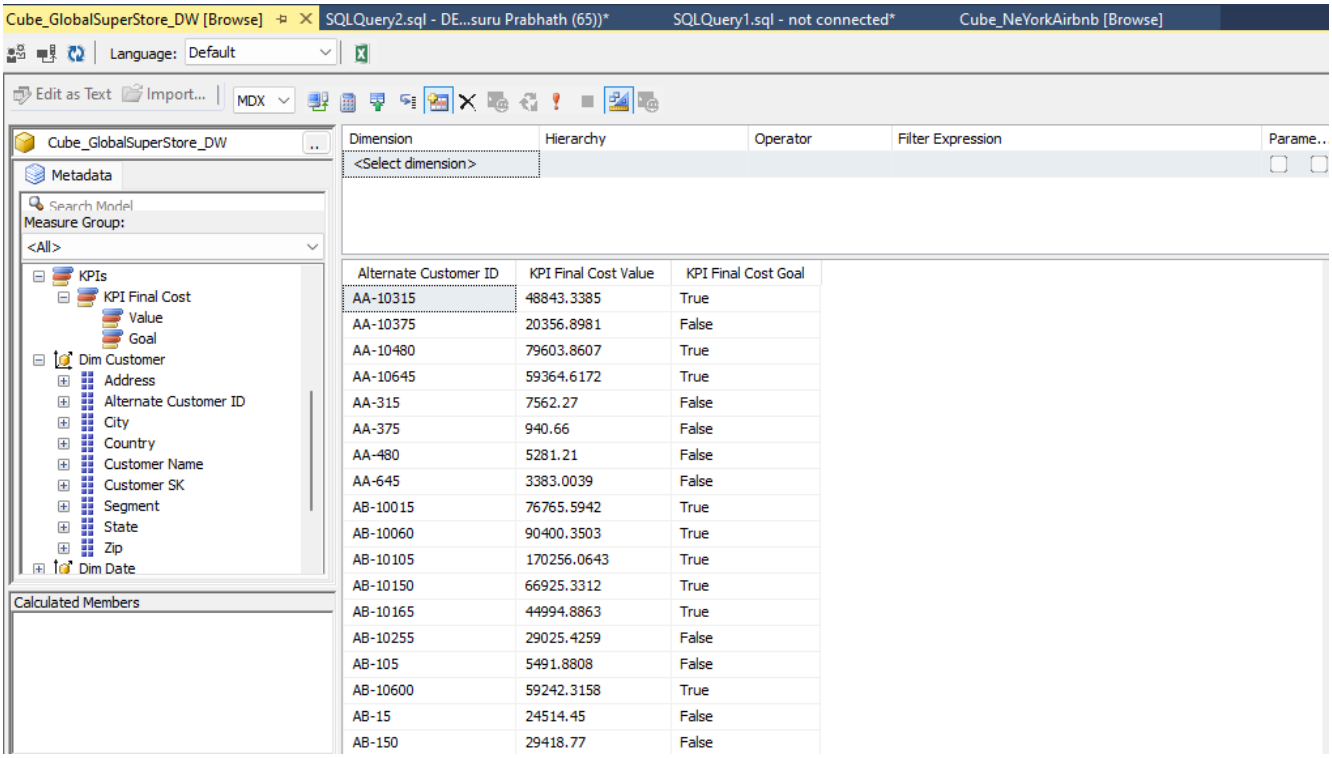


6. Browse Cube Data

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,



Alternate Customer ID	KPI Final Cost Value	KPI Final Cost Goal
AA-10315	48843.3385	True
AA-10375	20356.8981	False
AA-10480	79603.8607	True
AA-10645	59364.6172	True
AA-315	7562.27	False
AA-375	940.66	False
AA-480	5281.21	False
AA-645	3383.0039	False
AB-10015	76765.5942	True
AB-10060	90400.3503	True
AB-10105	170256.0643	True
AB-10150	66925.3312	True
AB-10165	44994.8863	True
AB-10255	29025.4259	False
AB-105	5491.8808	False
AB-10600	59242.3158	True
AB-15	24514.45	False
AB-150	29418.77	False

Step 3 – Demonstration of OLAP Operations

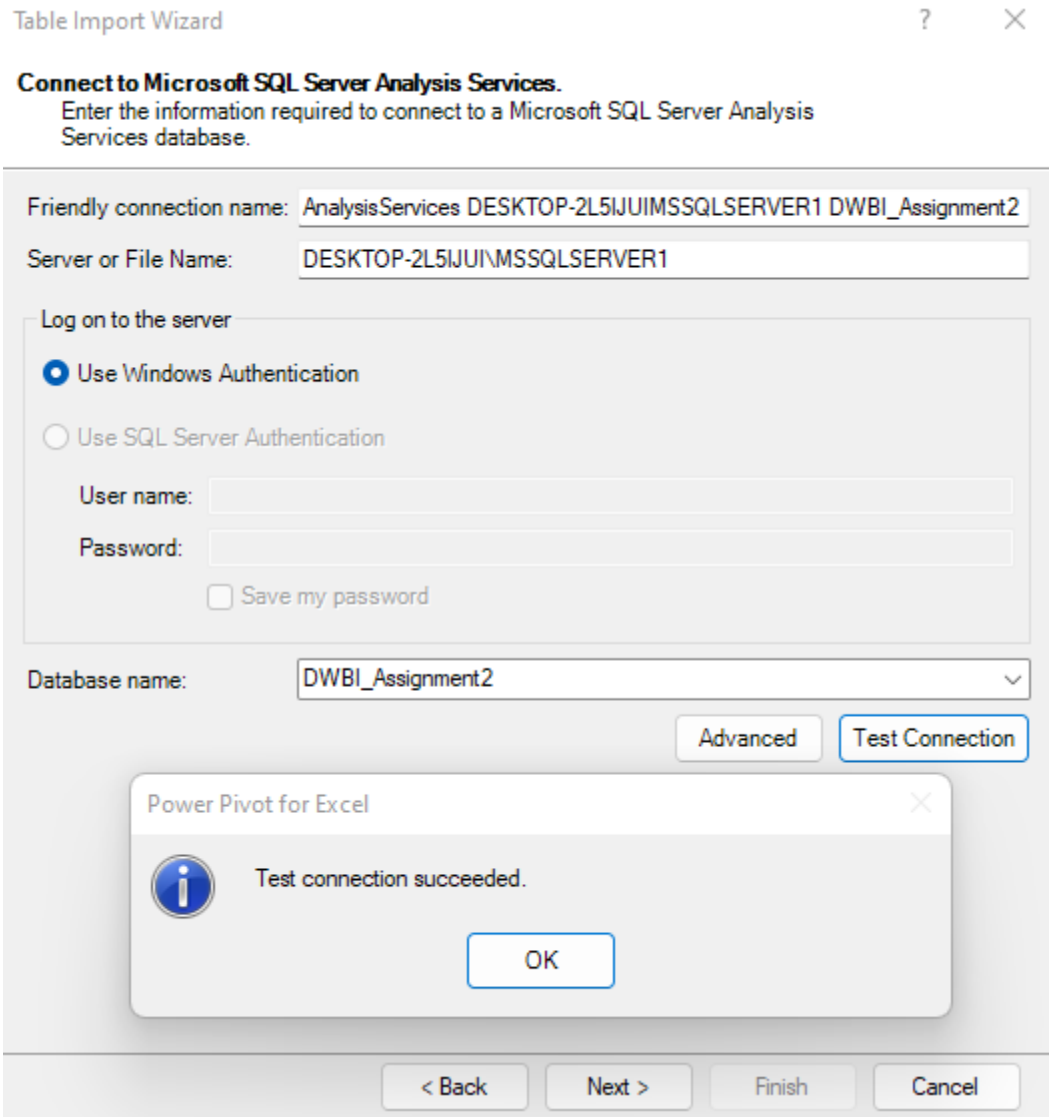
Used Tools :-

Excel

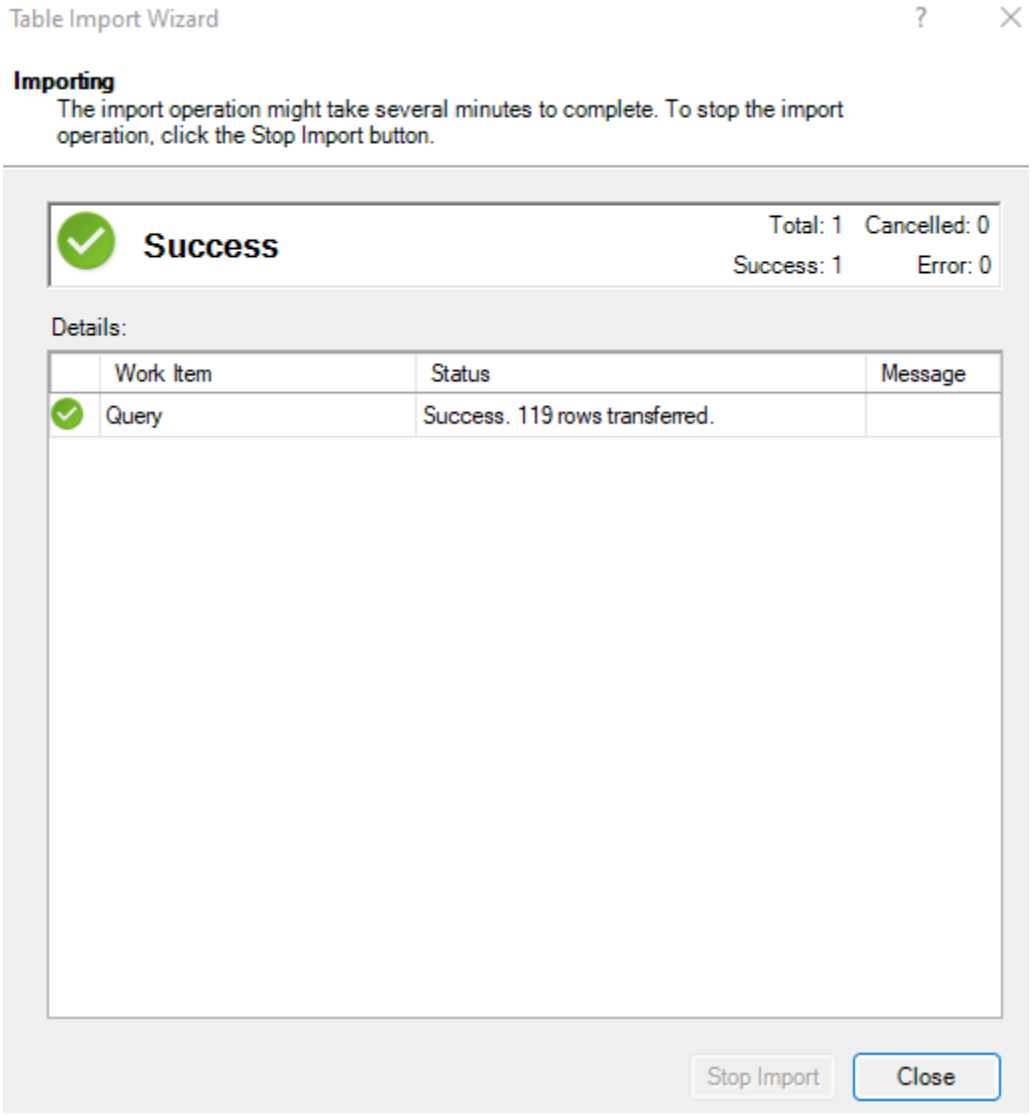
SQL Server Management Studio

SQL Server Analysis Service

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.



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



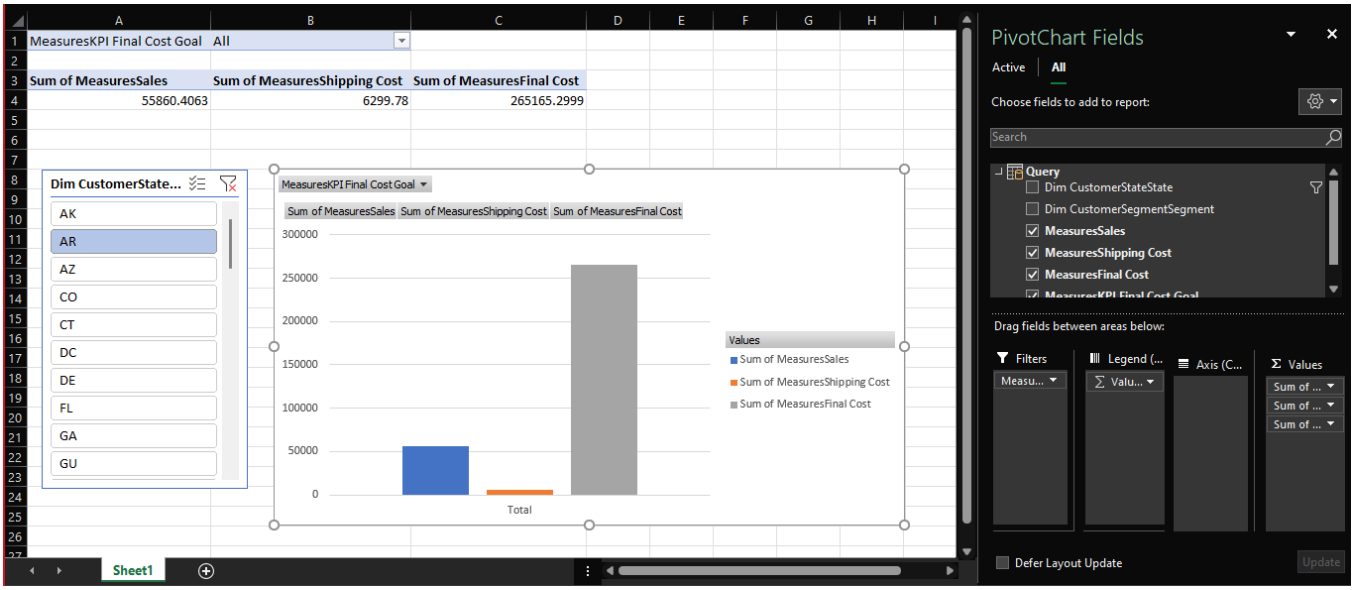
1. Slice

Slices are visual filters that can be used to filter data in a pivot table or chart.

The slices I used to filter my pivot table and pivot chart are shown in the diagram below.

In this excel sheet I added the slicers on Customer State, when I clicked the State, I can get the Sum of Final Costs, Sum of Shipping Costs and sum of sale amount of orders according to the selected state of customer.

And the chart showed state-wise Sum of Final Costs, Sum of Shipping Costs and sum of sale amount of orders

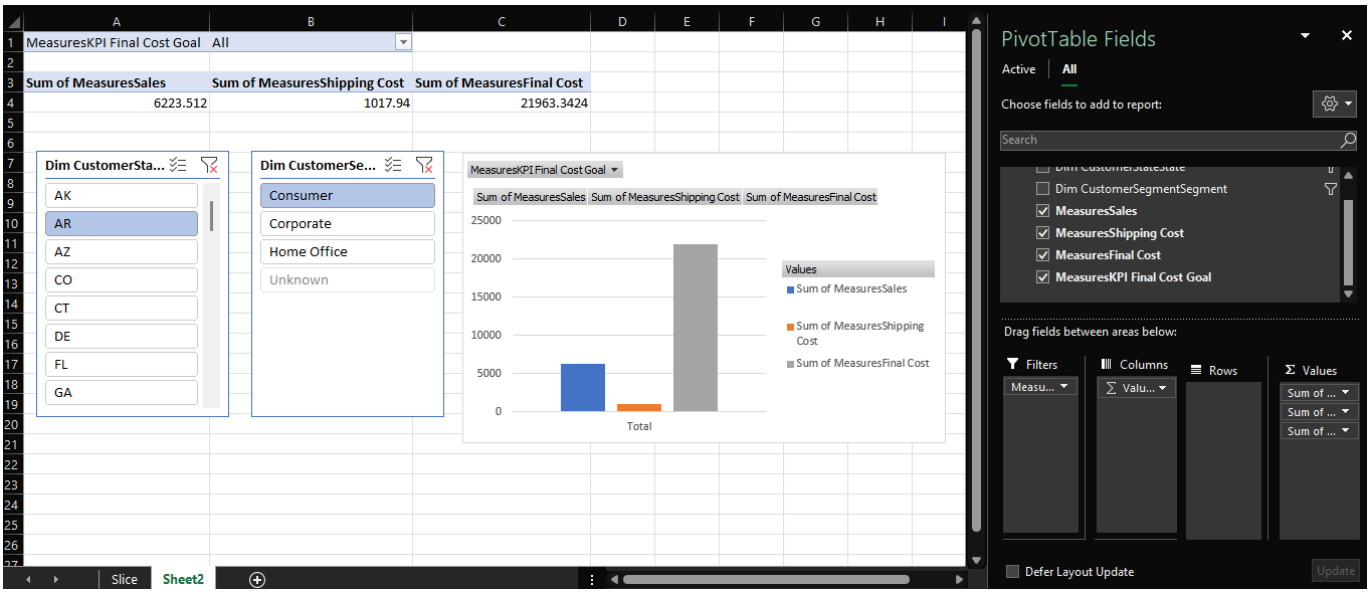


2. Dice

Selecting appropriate qualities to group the data by is referred to as dicing the data.

To analyze the data in the pivot table and pivot chart, I utilized two slicers. Those are CustomerState slicer and CustomerSegment slicer.Then I grouped data according to State of customers and types of customers

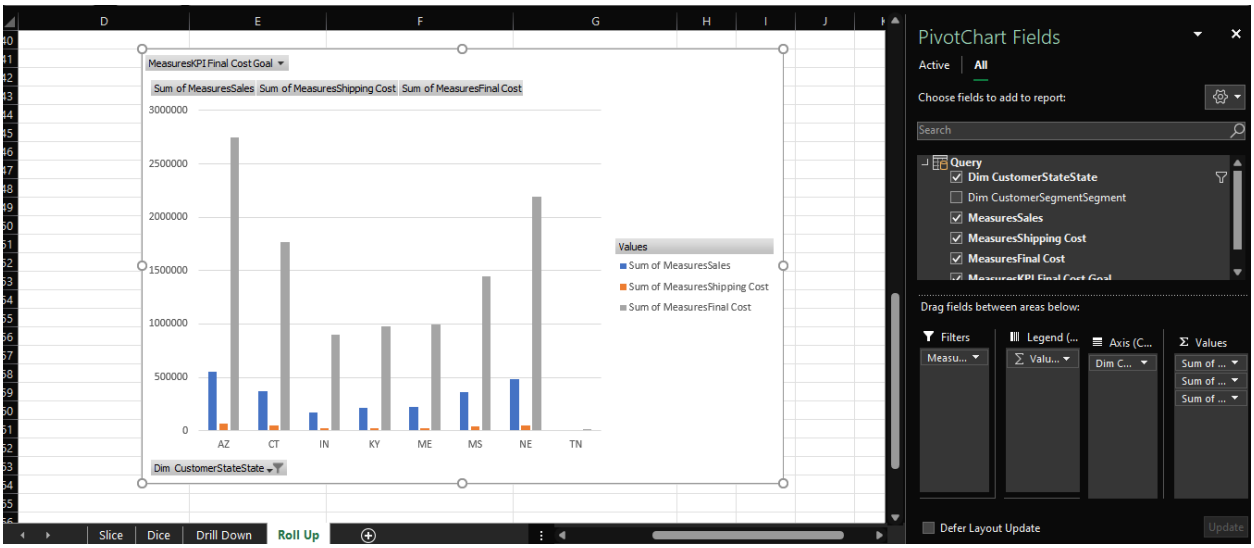
After that, I can get state-wise result sum of sales according to state.



3. Roll-up

Climbing up a hierarchy of a dimension to aggregate data is what the Roll up OLAP function in cubes signifies.

In this following excel sheet shows State and Sales amounts



MeasuresKPI Final Cost Goal	All		
Row Labels	**Sum of MeasuresSales**	**Sum of MeasuresShipping Cost**	**Sum of MeasuresFinal Cost**
AZ	549173.9632	67482.84	2747080.163
CT	372438.2949	46545.04	1764767.304
IN	173666.9266	20485.45	895959.5711
KY	215019.8286	21903.99	979449.9675
ME	225371.1487	23666.11	994934.2277
MS	361632.6335	36687.65	1449374.445
NE	480508.2201	52507.61	2189679.019
TN	3282.096	330.63	12887.97
Grand Total	**2381093.112**	**269609.32**	**11034132.67**

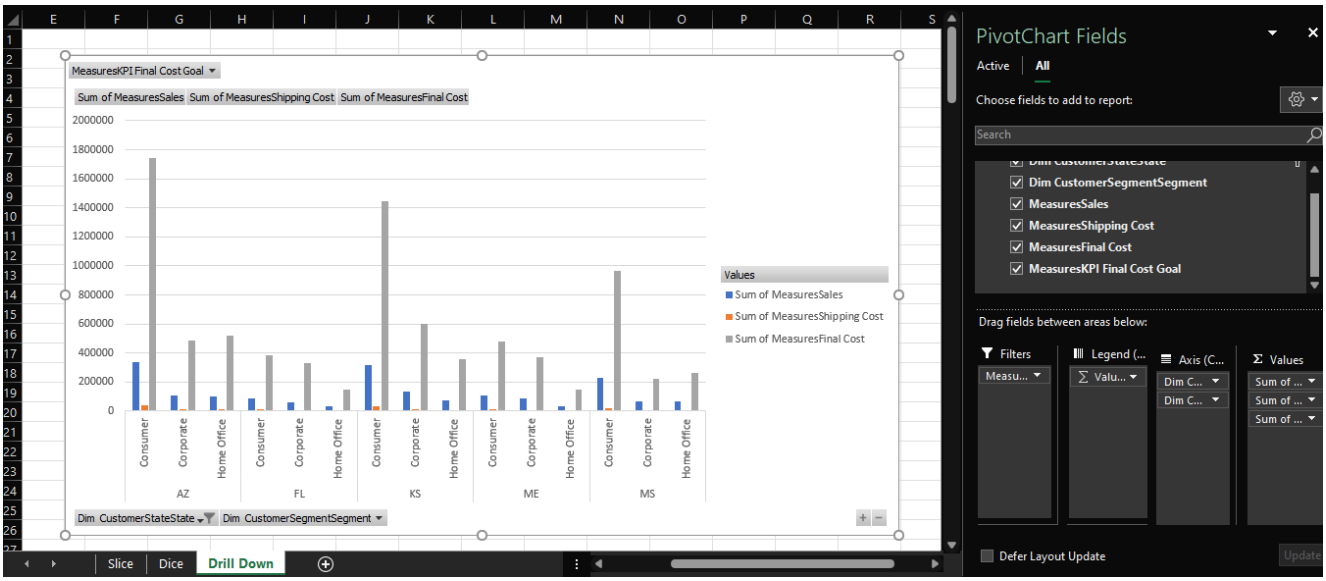
4. Drill-down

In cubes, the drill down OLAP function entails navigating through details by moving down a hierarchy of a dimension.

Following Figure shows state can be drilled down to the customer segement

So, we can view the sales amounts state wise. This process is the opposite of the roll up operation.

And the graph shows state wise sum of final costs and the sum of sales.



MeasuresKPI Final Cost Goal	All		
Row Labels	**Sum of MeasuresSales**	**Sum of MeasuresShipping Cost**	**Sum of MeasuresFinal Cost**
AZ			
Consumer	338877.5189	42555.69	1741213.11
Corporate	106879.1891	13578.31	486124.2119
Home Office	103417.2552	11348.84	519742.8409
FL			
Consumer	84509.5452	9899.49	384364.5869
Corporate	60340.5608	7289.01	328168.5539
Home Office	33567.7982	4122.92	148774.356
KS			
Consumer	315034.9341	34974.07	1444112.141
Corporate	133193.2599	15268.6	602961.0296
Home Office	77271.0119	7820.28	357962.632
ME			
Consumer	106173.0418	11006.28	477007.5104
Corporate	87377.2052	9711.83	369908.7504
Home Office	31820.9017	2948	148017.9669
MS			
Consumer	232153.731	23194.07	963291.5991
Corporate	64817.8465	6489.92	225737.4231
Home Office	64661.056	7003.66	260345.4224
Grand Total	**1840094.856**	**207210.97**	**8457732.135**

Step 4 – SSRS Reports

Used Tools:-

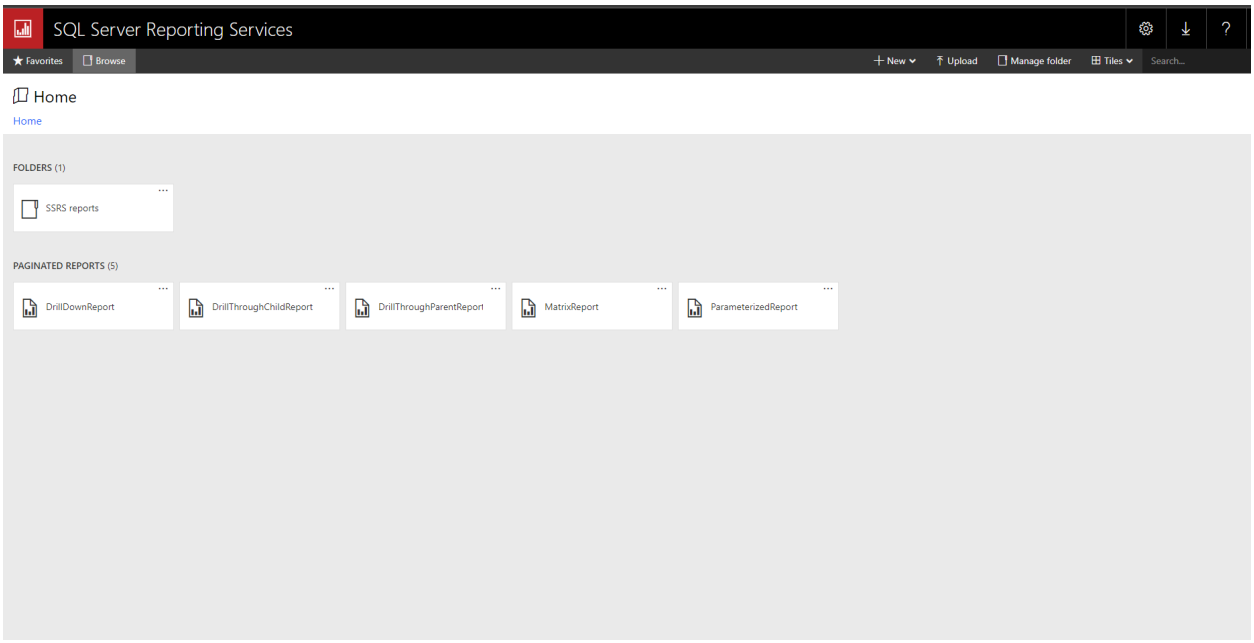
Report server

SSRS web portal

Report Server Configuration Manager

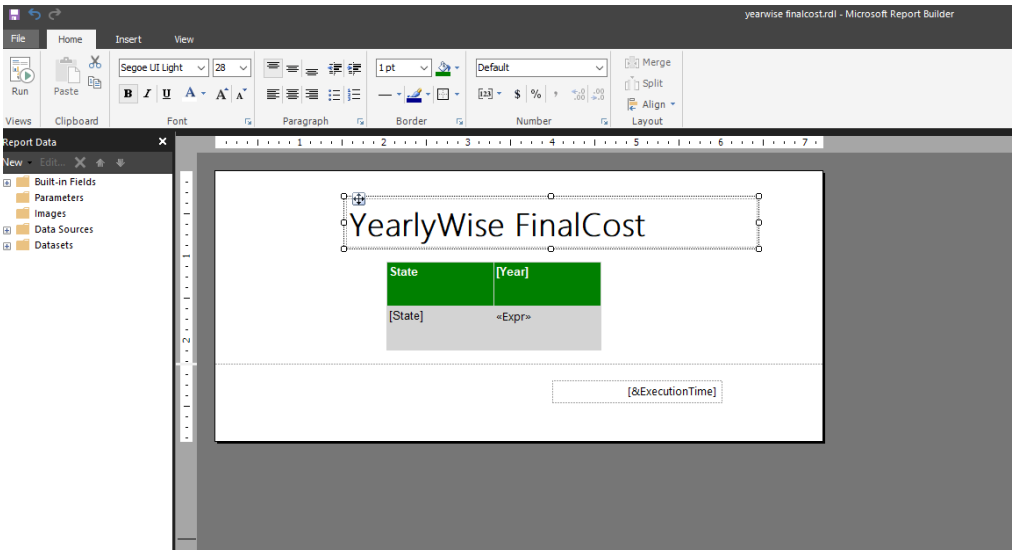
Report Server database

Below figure show the web portal view . In there, the created paginated reports and SSRS folder is displayed.



1. Report 1: Report with a matrix

Below figure shows how to add rows, columns and data according to the report,



Below report shows year wise total final costs for each sales according to the states of customers .

YearlyWise FinalCost

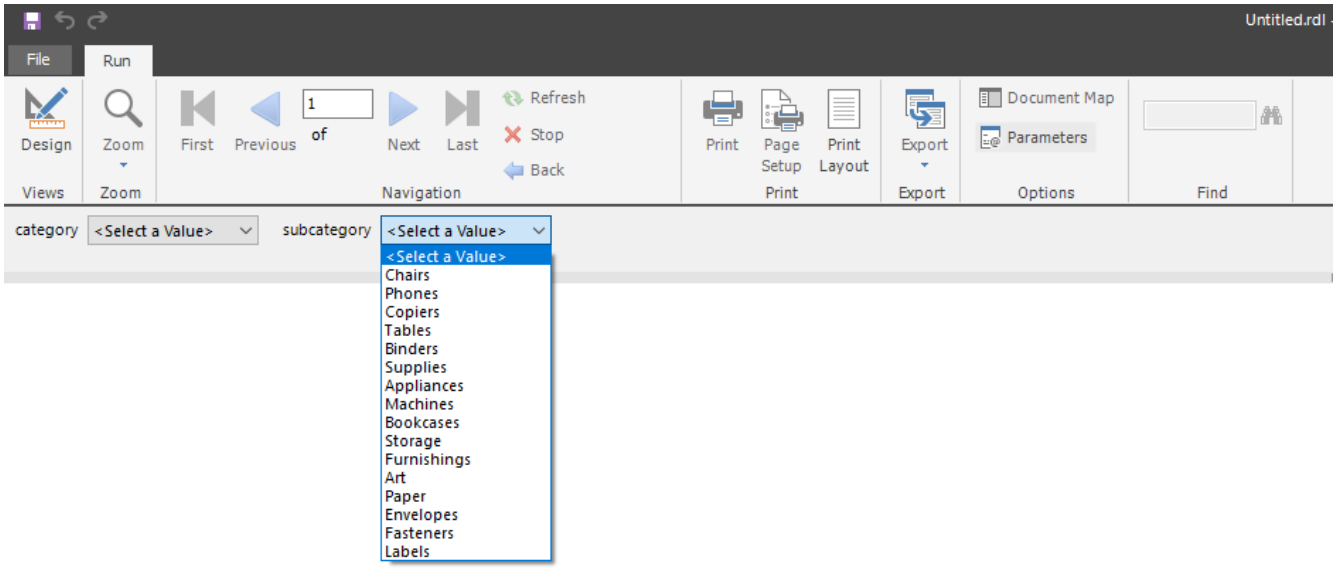
State	2011	2012	2013	2014
AK	84076.8629	60161.7065	80053.6067	125983.7341
AR	44639.9951	64794.0229	90861.2095	64870.0724
AZ	541613.8202	667966.4912	597242.4942	940257.3572
CO	53617.2821	116122.7725	152385.1766	115669.9805
CT	367288.0304	353416.0928	428077.4144	615985.7668
DC	37784.2338	25165.7633	32226.4284	61907.9137
DE	8764.0912	4014.2464	7016.9456	27054.4574
FL	110974.0002	157838.3553	217564.6511	374930.4902
GA	4172.7608	0	998.9300	0
GU	1416.7564	8652.1232	387.9996	4453.4292
HI	8379.0839	13962.5100	6767.0226	10825.2911
IA	272160.9287	302575.5167	384730.3589	521410.9071
IL	6533.8739	15199.2114	7360.1952	5256.6098
IN	240277.7728	127082.8007	257723.2752	270875.7224
KS	403904.3431	533618.7161	591336.3222	876176.4112
KY	146089.3152	183422.0488	302588.2233	347350.3802
LA	3023.7900	14017.0416	23963.1768	9204.9576
MA	164398.8059	90127.2102	100820.8274	211032.5070
MD	204432.8527	112392.7155	159778.4759	249318.7429
ME	126605.1233	228029.9580	283032.8488	357266.2976
MI	742580.2669	1063219.0441	1052076.3822	1359899.8930
MN	182665.6640	220833.1131	333218.9062	446500.1595
MO	13804.0576	47959.1888	20836.5902	50955.4468
MP	41117.3700	4656.5100	613.4200	0
MS	216466.8816	265862.7874	449687.3413	517357.4343
MT	34645.9423	37340.3868	131036.7883	106914.5315
NC	50476.9361	73304.2465	116768.8344	166172.7588
ND	0	0	171.1400	228.0672
NE	437512.5225	336280.2793	651026.2210	764859.9958
NH	65.2968	1056.0200	2902.9500	13318.6500
NM	381976.0338	358644.8580	491687.2999	554992.9503

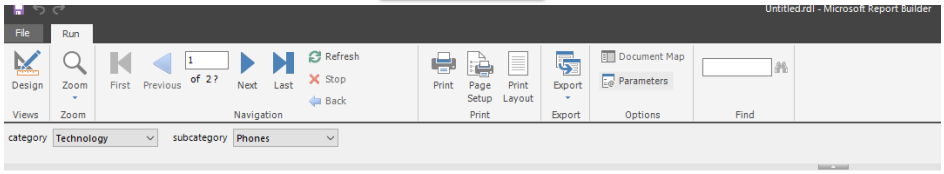
2. Report 2: Report with more than one parameter

In this report I used two parameters of Category and SubCategory. There is a dropdown to select the options.

Then, it can select values from category drop down and subcategory drop down and then relevant details related to parameter values is displayed.

Below figures shows two parameters and the result reports of them.

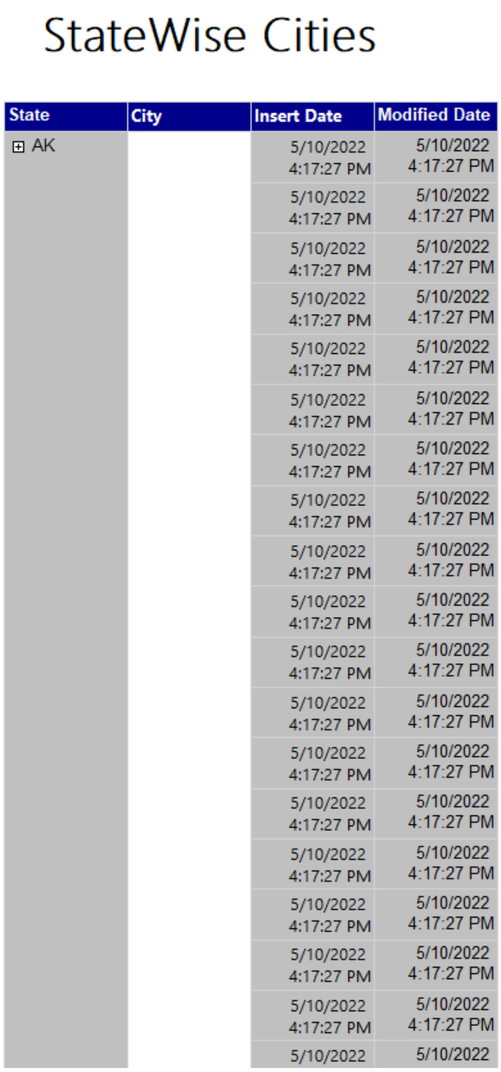




Products According to Category and SubCategory

Category	Sub Category	Product Name	Insert Date	Modified Date
Technology	Phones	Cisco Speaker Phone, VoIP	5/10/2022	5/10/2022
Technology	Phones	Blue Parrot B250XT Professional Grade Wireless Blu	5/10/2022	5/10/2022
Technology	Phones	Apple Audio Dock, VoIP	5/10/2022	5/10/2022
Technology	Phones	Cisco Smart Phone, Full Size	5/10/2022	5/10/2022
Technology	Phones	Apple Office Telephone, Full Size	5/10/2022	5/10/2022
Technology	Phones	Apple Audio Dock, Cordless	5/10/2022	5/10/2022
Technology	Phones	Samsung Speaker Phone, Full Size	5/10/2022	5/10/2022
Technology	Phones	Motorola Office Telephone, with Caller ID	5/10/2022	5/10/2022
Technology	Phones	Nokia Signal Booster, Full Size	5/10/2022	5/10/2022
Technology	Phones	Motorola Office Telephone, with Caller ID	5/10/2022	5/10/2022
Technology	Phones	Ooma Telo VoIP Home	5/10/2022	5/10/2022

3. **Report 3 : Create an SSRS drill-down report.**



StateWise Cities

State	City	Insert Date	Modified Date
⊞ AK		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
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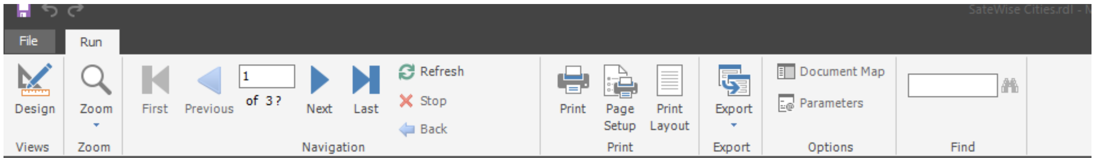
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
		5/10/2022	5/10/2022

Drill Down Reports allow users to Show or Hide Column Data by using plus and minus symbols.

In here we can view customer's cities are hidden by providing a plus sign. It can be expanded by clicking plus sign to see other hidden fields.



StateWise Cities

State	City	Insert Date	Modified Date
⊟ AK	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Cordova	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Bethel	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Cordova	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022 4:17:27 PM	5/10/2022 4:17:27 PM
	Anchorage	5/10/2022	5/10/2022

4. Report 4 : Create an SSRS drill-through report

A drill-through report is one that a user accesses by following a link from another report. Drilling down through a report opens a new window with an entirely different visualization or report.

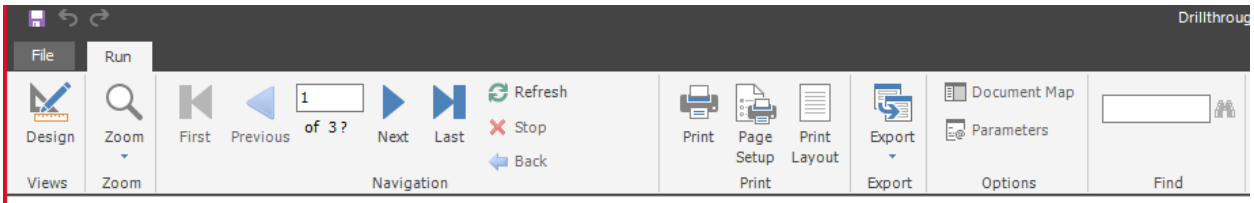
In this report is visualized orders according to markets. In parent drill through report there are markets. By clicking a relevant market, it would navigate to a separate report which contains all orders happened in that market

Below figures shows that detailed reports of market and orders.

Markets

Market SK	Market	Region
1	US	East
2	APAC	Oceania
3	EU	Central
4	Africa	Africa
5	US	West
6	US	South
7	APAC	Central Asia
8	EMEA	EMEA
9	LATAM	South
10	APAC	North Asia
11	EU	South
12	US	Central
13	EU	North
14	LATAM	North
15	LATAM	Central
16	LATAM	Caribbean
17	APAC	Southeast Asia
18	Canada	Canada
19	US	North

5/18/2022 3:53:30 AM



Orders relavant to EMEA

EMEA market orders						
Order ID	**Sales**	**Quantity**	**Discount**	**Profit**	**Shipping Cost**	**Final Cost**
ID-2012-28402	4626.1500	5	0.000	647.5500	835.5700	23966.3200
US-2011-128776	1696.6400	5	0.200	-148.4600	704.0600	7490.6200
MX-2014-126984	3473.1400	11	0.000	868.1200	634.5300	38839.0700
IN-2014-66615	5049.0000	11	0.000	656.3700	595.5000	56134.5000
CA-2014-118892	4416.1740	9	0.300	-630.8820	566.6500	28388.5462
ID-2013-25742	2465.8200	7	0.250	197.1900	546.4900	13492.0450
IN-2013-15368	1601.6400	5	0.100	587.1900	511.4700	7718.8500
IN-2014-39077	3278.5848	8	0.070	140.8248	492.2800	24884.9509
CA-2012-114069	1931.0400	9	0.100	321.8400	477.1500	16118.5740
ID-2014-10076	2910.0816	8	0.070	125.1216	456.3200	22107.3271
ID-2013-29564	1637.0100	5	0.100	-36.3900	452.2800	7818.8250
ES-2011-1712442	4453.0500	7	0.000	1424.8500	433.4100	31604.7600
US-2011-158554	2044.8000	6	0.200	-332.2800	417.9900	10233.0300
IN-2013-13891	5211.1200	8	0.000	833.7600	404.9700	42093.9300
IN-2011-67651	2539.8765	7	0.070	709.9365	393.5800	16928.1760
IN-2011-86278	3694.6800	4	0.000	886.6800	382.7700	15161.4900
ES-2013-3042991	2698.6500	9	0.000	890.4600	369.9800	24657.8300
SG-2014-9460	3908.8800	6	0.000	1563.4800	363.1600	23816.4400
IN-2013-81112	1512.0000	6	0.000	498.9600	356.8400	9428.8400
HU-2014-7310	1269.9000	6	0.000	558.7200	352.5200	7971.9200
CA-2013-118689	17499.9500	5	0.000	8399.9760	349.0700	87848.8200
ES-2014-4856325	1189.2420	9	0.100	250.9920	334.2300	9967.0902
ES-2014-4622860	935.1720	4	0.100	114.2520	327.1100	3693.7292
US-2014-	2509.3600	7	0.000	426.5800	320.9600	17886.4800