Sri Lanka Institute of Information Technology

Data Warehousing and Business Intelligence IT3021

B.Sc. (Hons) in Information Technology
DATA SCIENCE

Contents

Declaration

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Acknowledgement

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A special gratitude goes to Mr.Sheron Dinushka for guiding me with industrial best practices and knowledge while completing this assignment.

Finally, a special thanks to Sri Lanka Institute of Information Technology for taking measures to provide continuous support in carrying out this specialization amidst this pandemic situation too.

1.0 Data Source for Assignment 2

The Data Warehouse created for Assignment 1 is the main data source used to carry out the necessary steps of the task. SQL Server Management Studio 2016 and SQL Server Data tools 2015 (Visual Studio) are the major tools used in Source data set compilation and ETL orchestration in order to create the Data Warehouse.

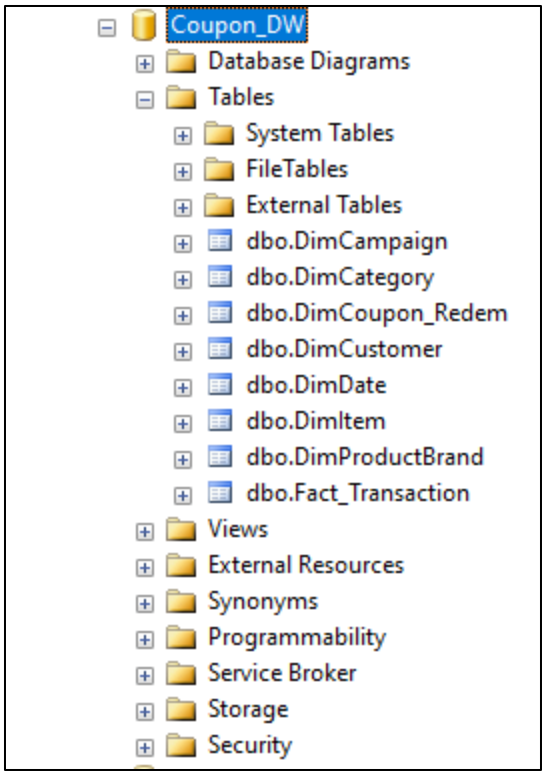


Figure 1 Data Source table structure

The Data Warehouse represents the data of a Brick-and-Mortar Retail shop that uses discount marketing as their major strategy in carrying out successful business operations. By analyzing the business entities, a snowflake schema was designed in order to carry out efficient Data Warehousing and Business Intelligence principles in the business process.

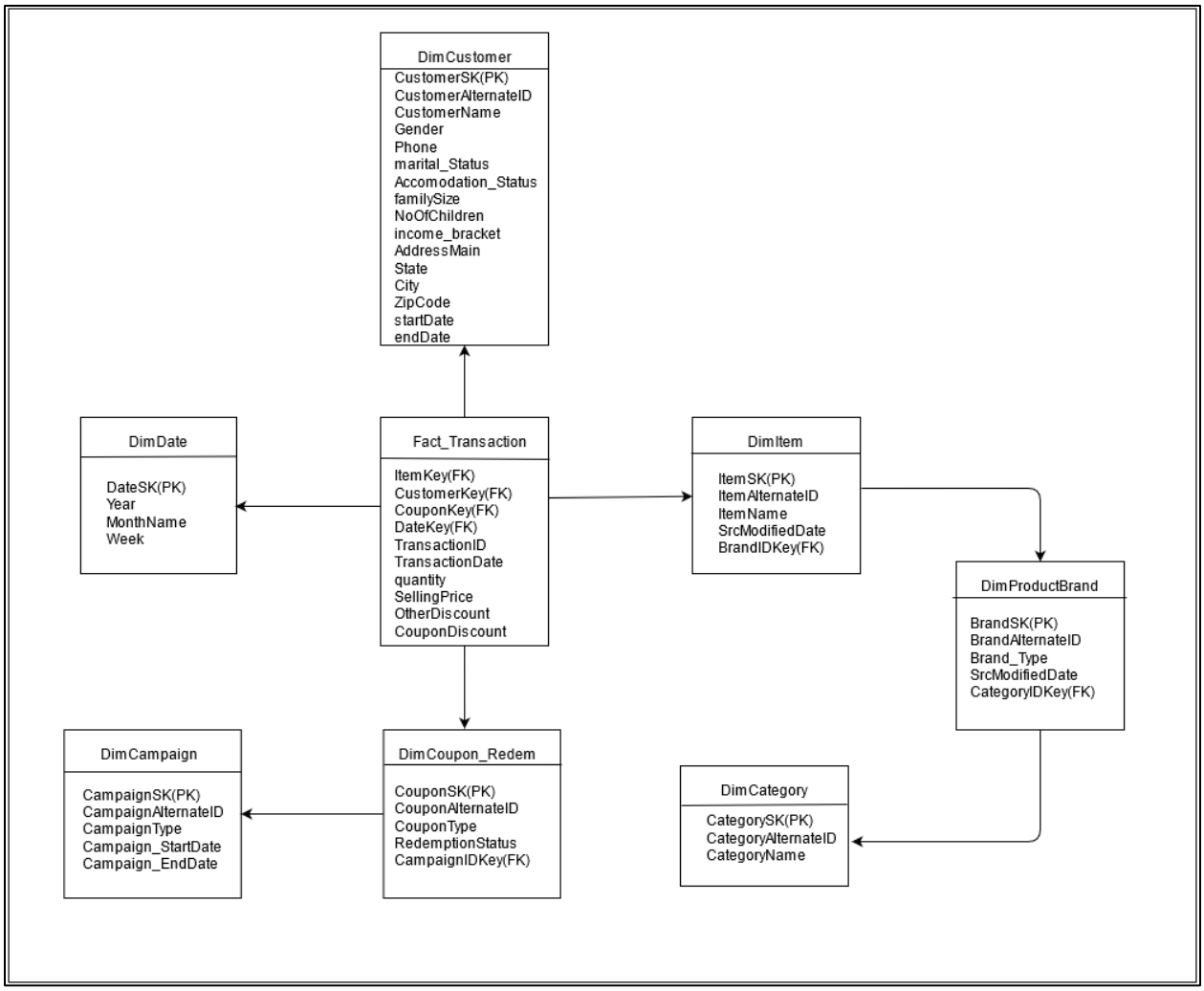


Figure 2 Datawarehouse SNOWFLAKE schema

The schema consists of one fact table and seven-dimension table including date dimension. It is observed that the entities are in a normalized form because of the snowflake design.

Hierarchical implementations are found in this schema
1. DimProductBrand and DimCategory are hierarchical dimensions of DimItem
2. DimCustomer has a customer location wise hierarchy.
3. DimDate has a date wise hierarchy.

DimCustomer dimension is **a slowly changing dimension** with historical attributes and changing attributes where Type 2 and Type 1 implementations are being enforced, respectively. Transaction of a customer for a particular date is considered as the **grain** of the Fact_Transaction fact table.

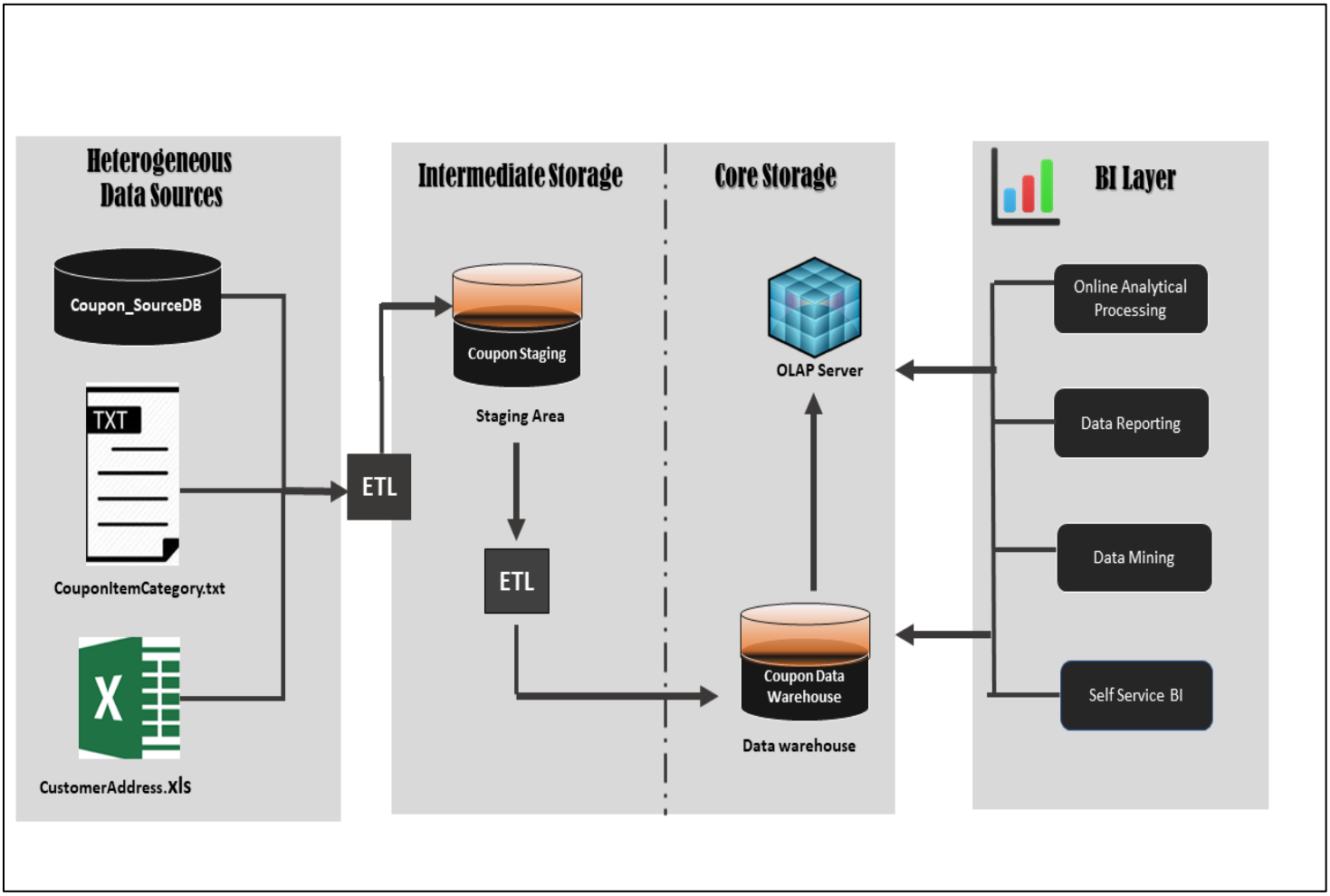


Figure 3 Solution Architecture

The Data warehouse created is used as a source to create an OLAP Cube which helps to carry out efficient business intelligence principles improving the performance of business.

2.0 SSAS Cube Implementation

SQL server data tools 2015 was used to create an ***Analysis Services Multidimensional and Data Mining Project*** in order to create the Cube Structure with the Source data.(Datawarehouse)

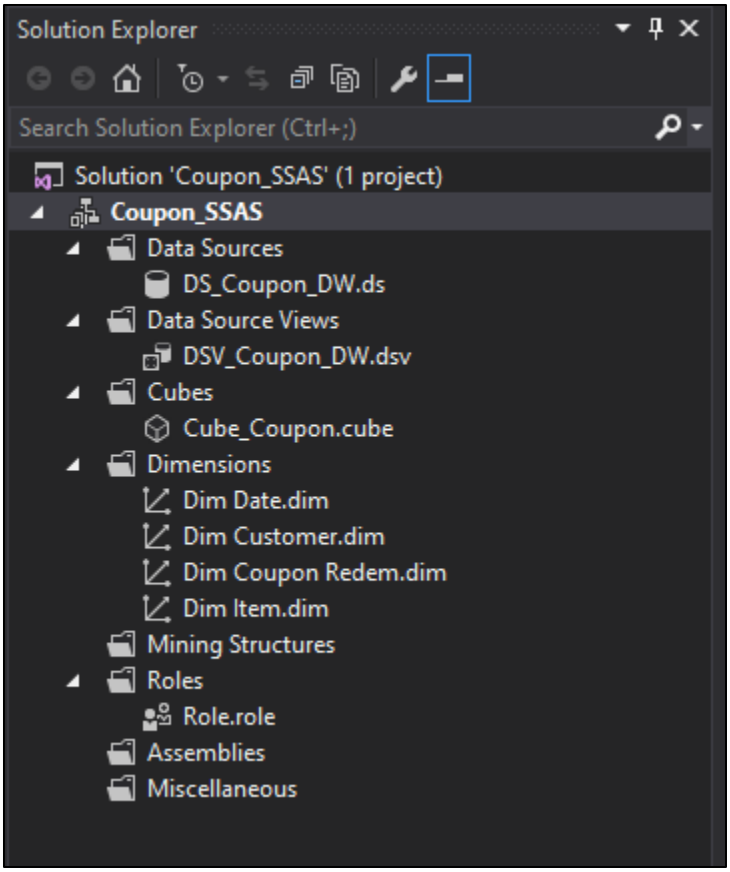


Figure 4 Cube structure Solution explorer

In order to create a working SSAS cube as shown above , sequence of tasks were carried out such as

1. Data source Creation**. (DS_Coupon_DW)**
2. Data Source View Creation**.(DSV_Coupon_DW)**
3. Cube creation**.(Cube_Coupon)**

2.1 Data Source View

Once the data source was created a data source view was created by making use of the Source data warehouse Coupon_DW.

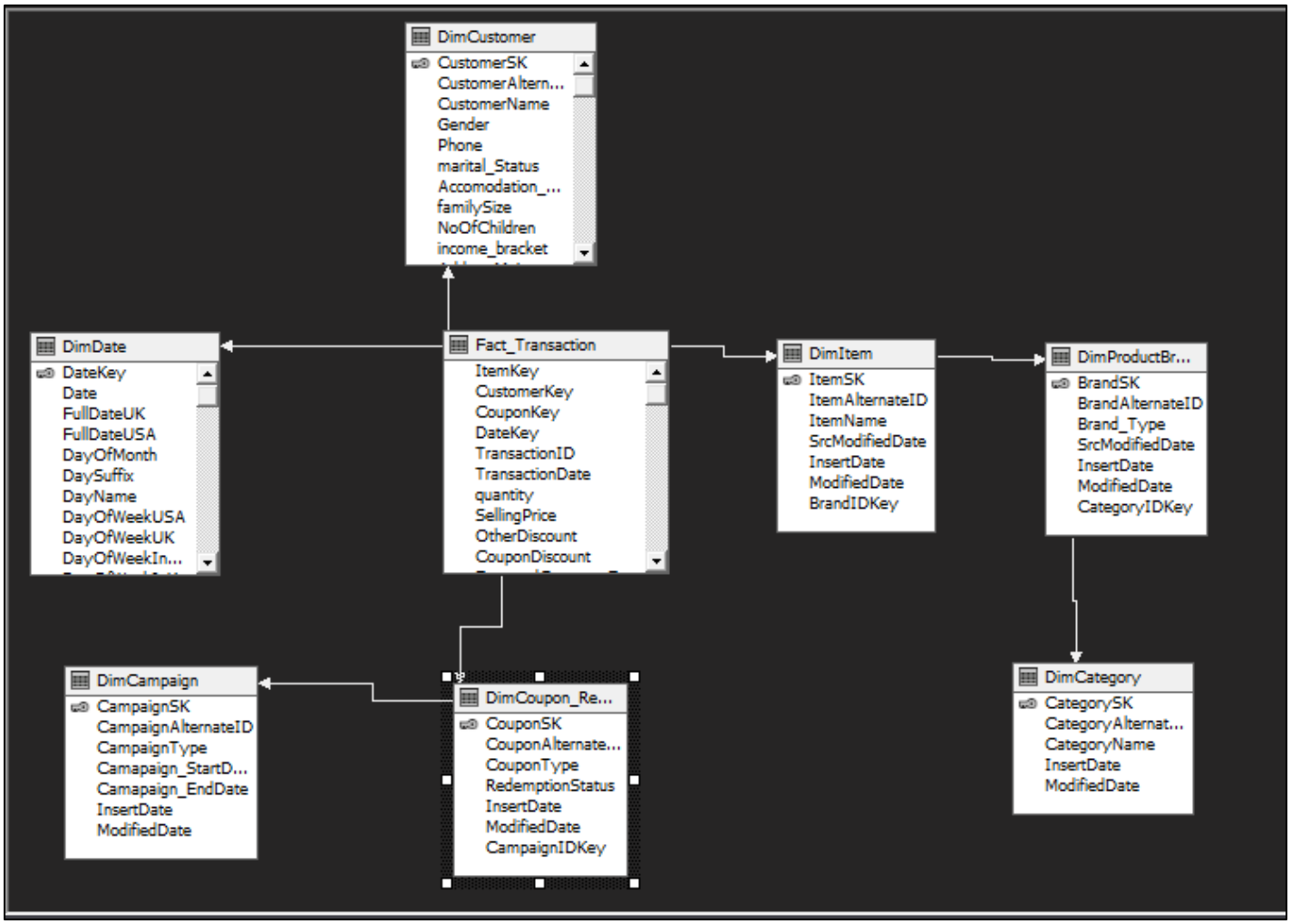


Figure 5 Data Source view (DSV_Coupon_DW)

Relationships among the facts and dimensions were manually created with the use of Surrogate keys of dimensions and foreign keys in the fact table.

2.2 Cube Structure

As the final step the cube structure **(Cube_Coupon)** is designed by using the data source view created in the previous step.

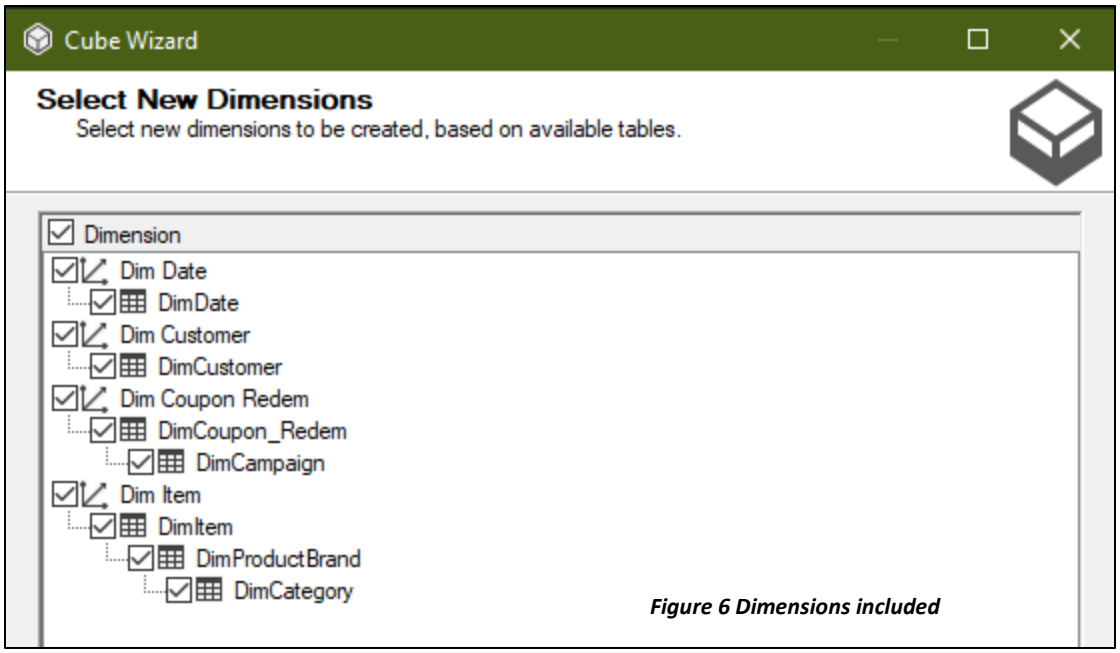


Figure 6 Dimensions included

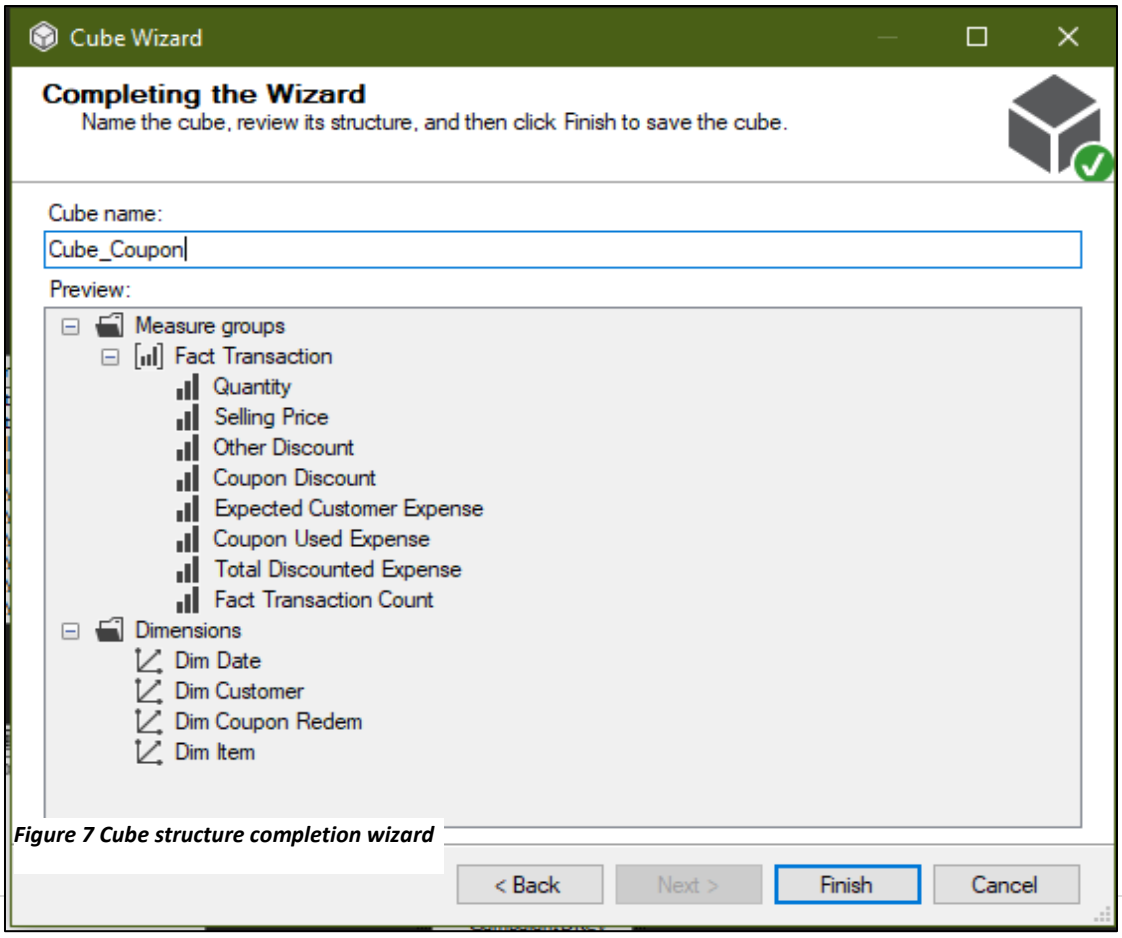


Figure 7 Cube structure completion wizard

The final cube structure created is as shown below. 7 main dimensions and a fact table are used in creating this cube structure

Dimensions and Fact tables used – DimCustomer , DimDate , DimCampaign , DimCoupon_Redemption , DimCategory , DimProductBrand , DimItem and Fact_Transaction.

The 4 dimensions DimCustomer , DimDate , DimCoupon_Redemption ,and DimItem are directly connected with the fact table whereas DimCategory , DimProductBrand and DimCampaign are hierarchical implementations.

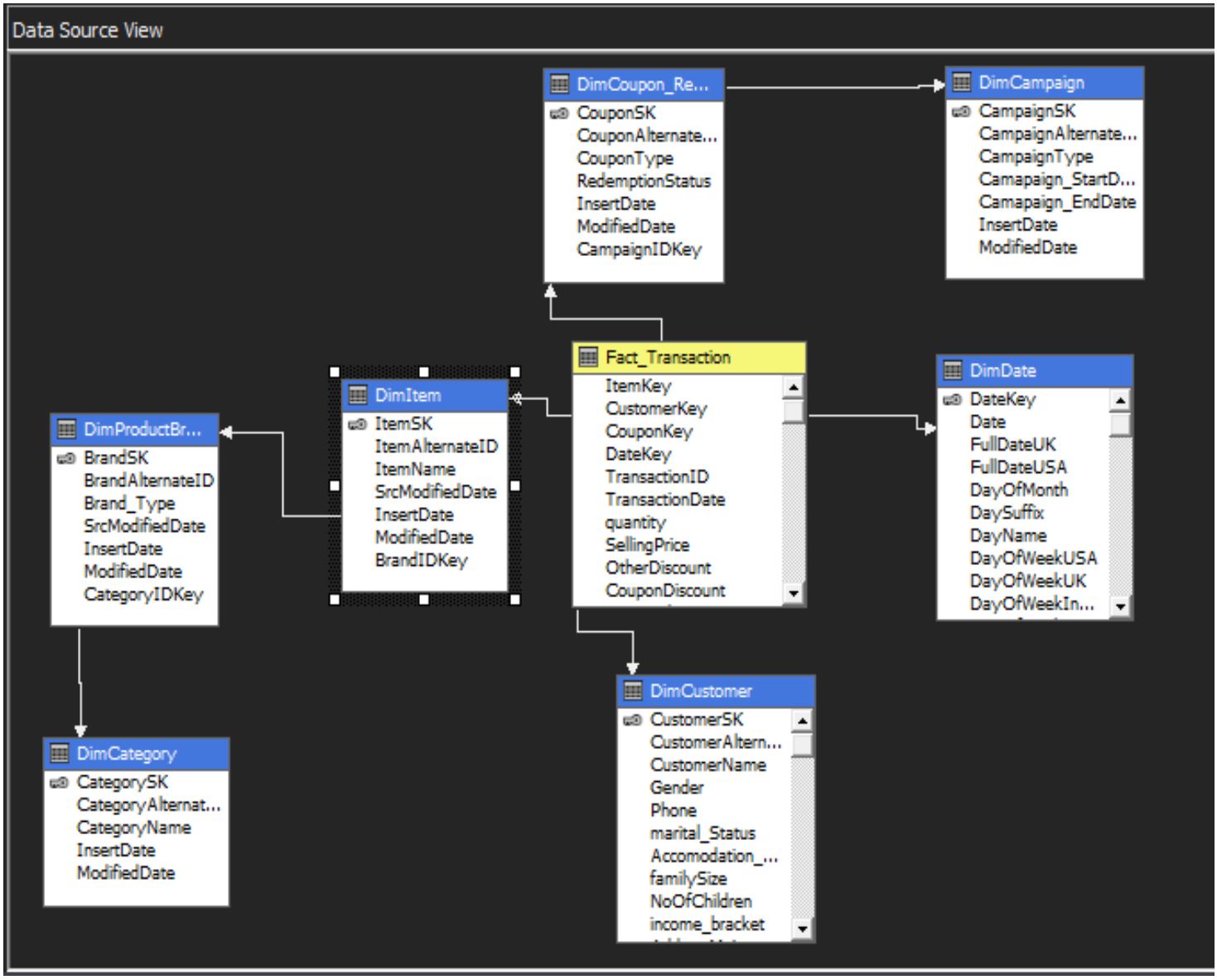


Figure 8 Cube (Snowflake Structure)

2.3 Hierarchies.

According to the data loaded in data warehouse, the built snowflake schema reflects many hierarchical relationships between data in data warehouse. Hierarchies are created for DimCustomer , DimItem and DimDate dimensions, respectively. The hierarchies created are mainly based on location of the Customers , Category details of Items sold in the retail shop and Date of business processes. In addition, hierarchical relationships between two dimensions DimCampaign and DimCouponRedem also exists. The main purpose of hierarchy creation is to provide the ability to drill down to detailed level data and to roll up to create aggregated data thus making business analysis purposes efficient.

Hierarchies are built in the **Dimension Structure** of the dimensions.

a. Date hierarchy.

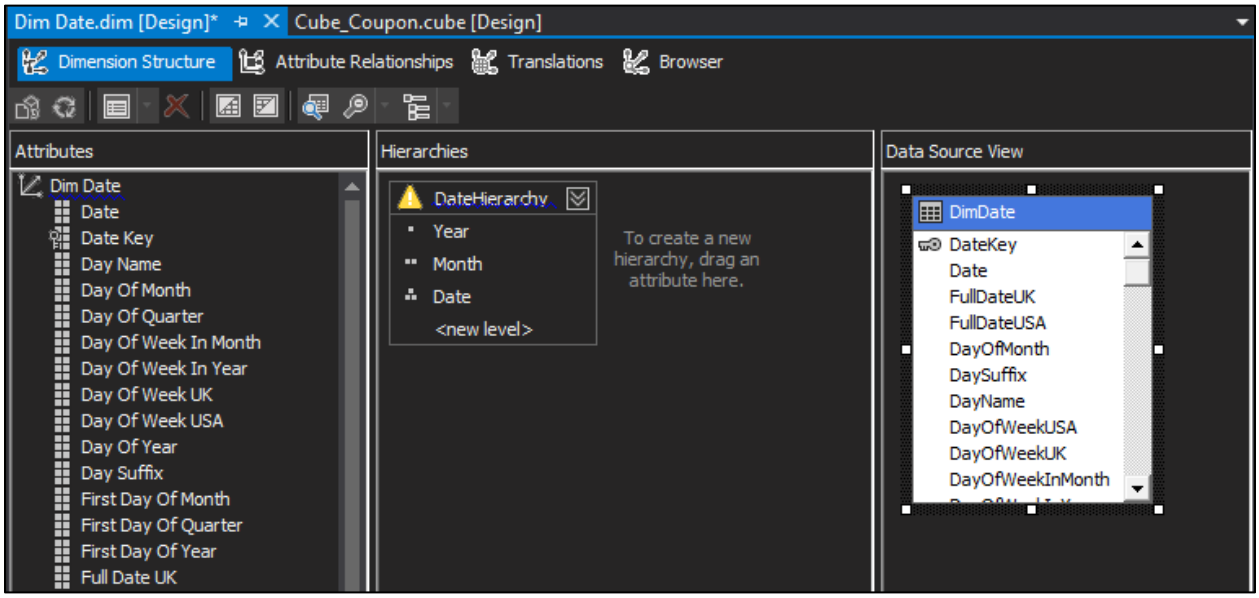
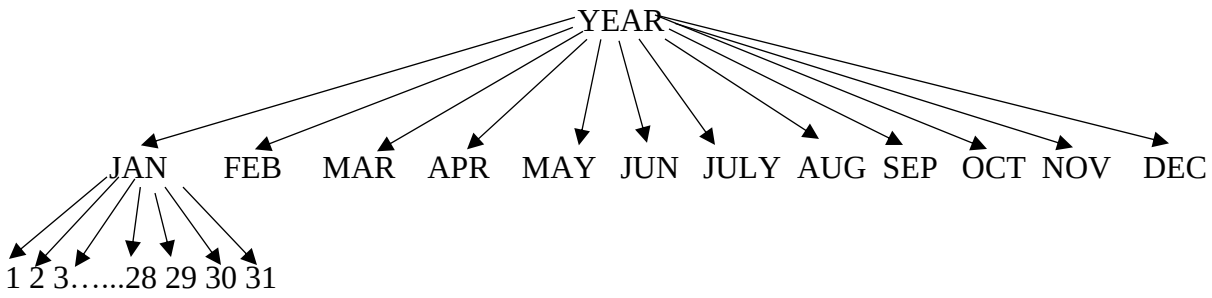


Figure 9 Date hierarchy

As per requirement Year , Month , Date wise hierarchy is created to analyze data in a more detailed manner with respect to date.



b. Location hierarchy.

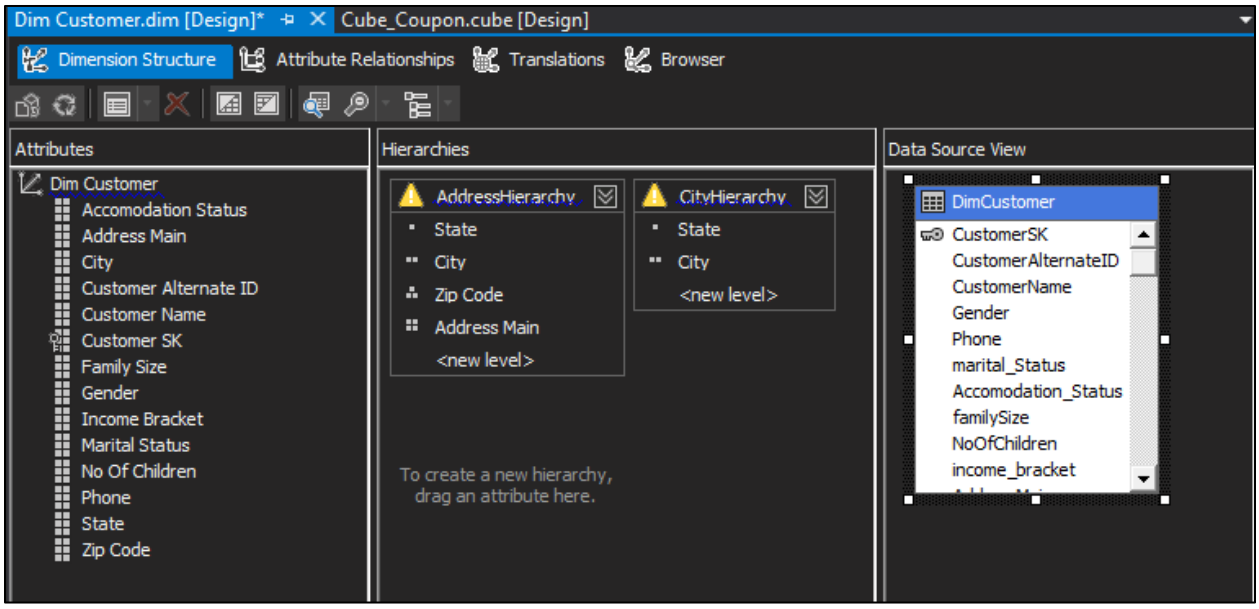
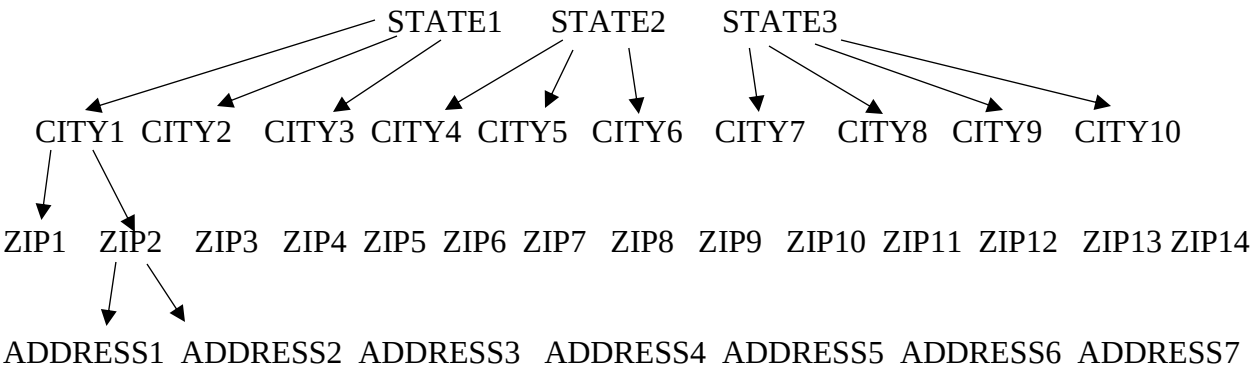


Figure 10 Location hierarchy

Customer location is analyzed in many aspects as per business requirements. Therefore 2 location hierarchies are created in the same dimension providing two different levels of detail.



c. Product hierarchy.

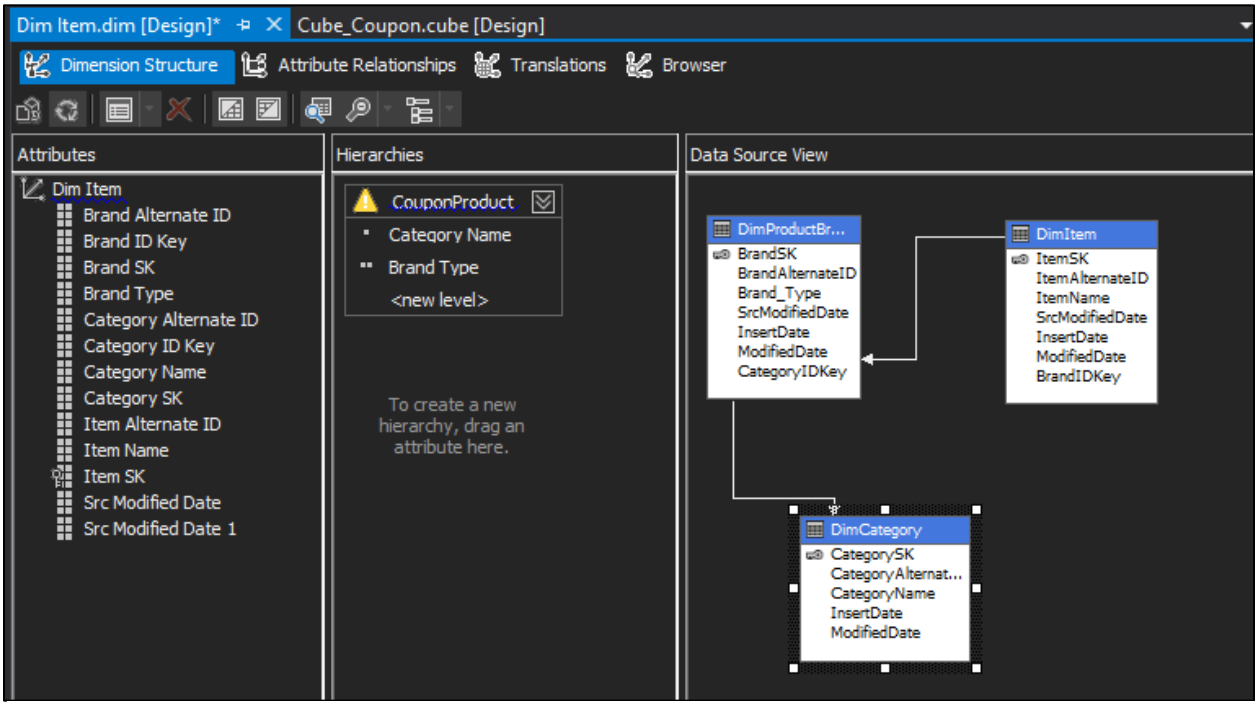
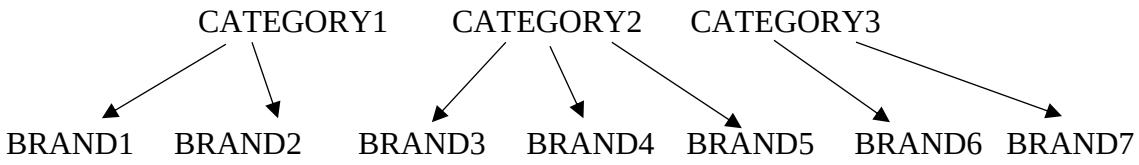


Figure 11 Product Hierarchy

Products in retail shop are analyzed in terms of category and brands where each item belongs to.



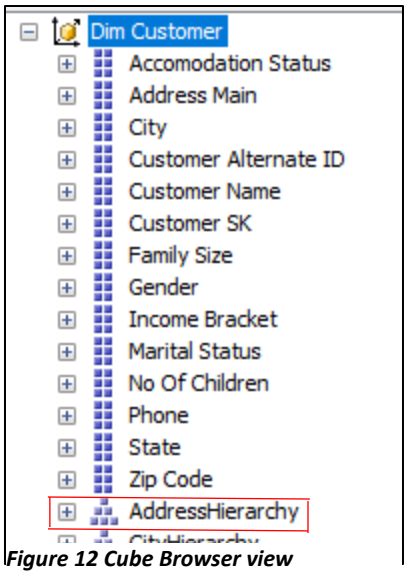


Figure 12 Cube Browser view

Once the hierarchies are created, they can be viewed in the cube browser as shown here.

2.4 KPI Creation.

KPI (Key Performance Indicator) shows the amount of progress that is done to achieve a business goal. The fact table Fact_Transaction is mainly used to create the KPIs here.

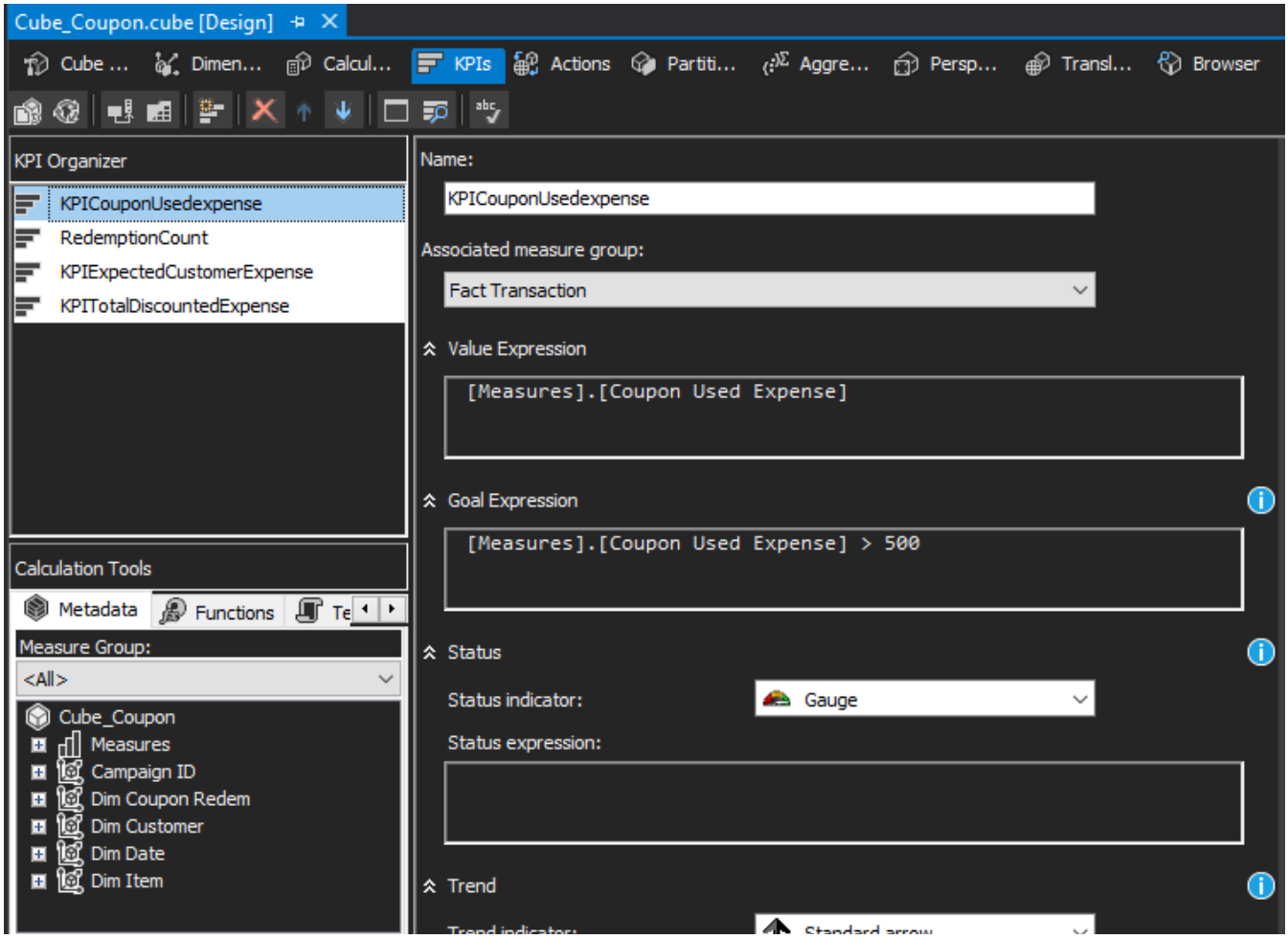


Figure 13 KPI creation wizard

KPI	GOAL	Description
KPICouponUsedExpense	`[Measures].[Coupon Used Expense] > 500`	If goal is false, then there is no expected coupon usage.
RedemptionCount	`[Dim Coupon Redem].[Redemption Status] > 200`	If goal is true, then the coupon marketing target successful.
KPITotalDiscountedExpense	`[Measures].[Total Discounted Expense] > 5000`	If goal is true business discount transactions successful,

2.5 Role.

Roles are created to provide control access to users in order to ensure who can do what. Role has a set of customized control access options to permit or deny permissions to objects within a particular database or cube. In this step Full control (Administrator) permission is provided to the role.

Figure 14 User role

2.6 Cube deployment.

Once the sub tasks are over finally cube is deployed in order to carry out the analysis purpose.

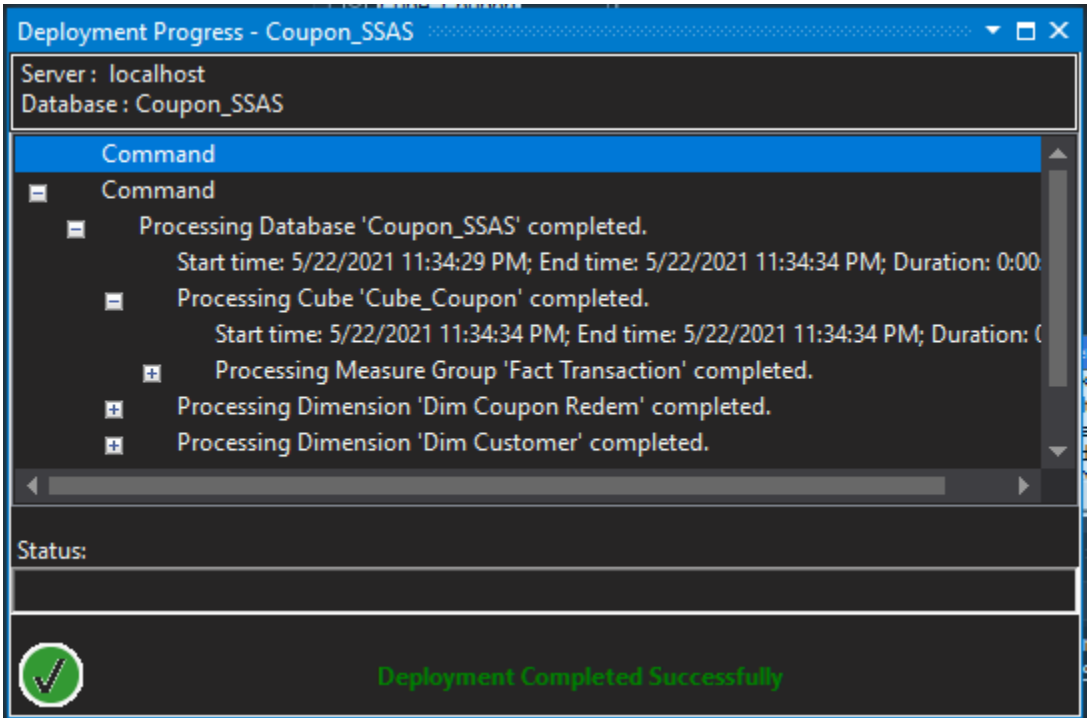


Figure 15 Cube deployment

At the end of completion of cube structure, Cube_Coupon is created successfully under the provided valid impersonation information credentials.

3.0 OLAP Operation Demonstration.

Once the cube is deployed successfully, deployed cube can be viewed in SQL Server Analysis service of SQL Server Management Studio.

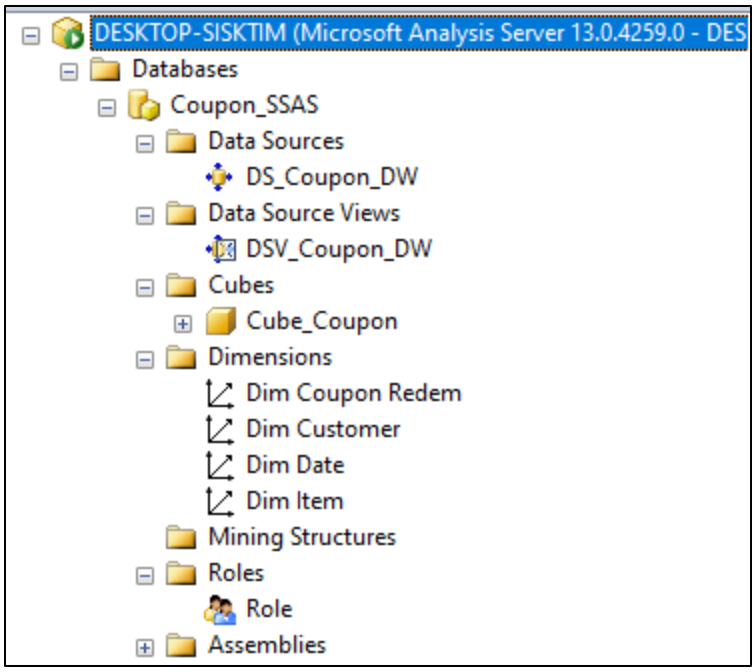


Figure 16 SSAS Cube Structure

This Cube Structure can be used to browse data in SQL Server Analysis Service where queries can be passed as MDX query for visualization processes.

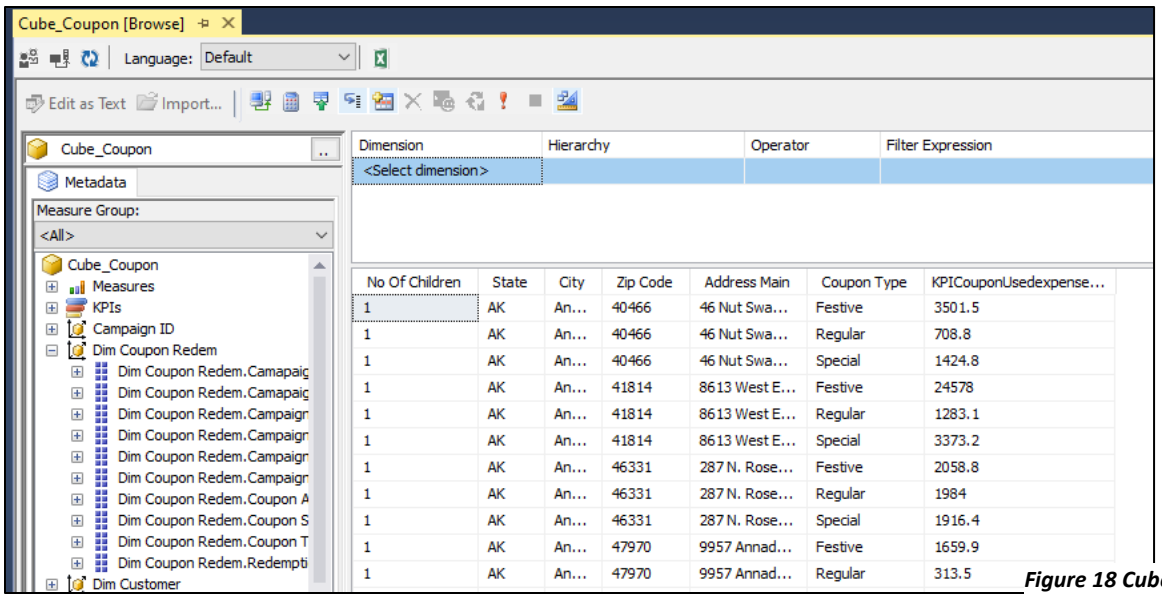


Figure 18 Cube Browsing

There are some main OLAP Operations demonstrated through Excel visualizations

- Slice Operations
- Dice Operations
- Pivot Operations
- Drill-Down Operations
- Roll-Up Operations

To demonstrate all of these operations , Excel workbook was connected to the cube via Data tab. Data from Cube is considered as the data source and is obtained via Analysis services.

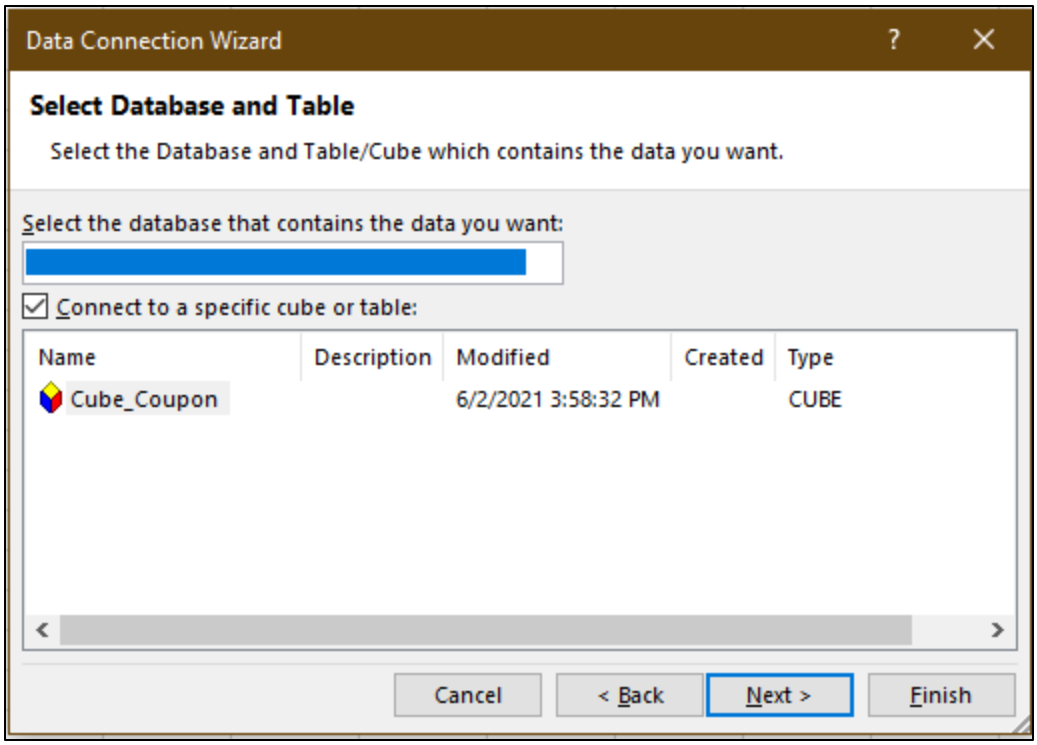


Figure 19 Cube Connection wizard in Excel

Pivot Table, Pivot charts and Power View Dashboards are used to demonstrate the above mentioned OLAP operations.

NOTE – All operations are demonstrated in separate excel sheets of the Excel Workbook RetailStoreReports.xlsx.

For all the operations Pivot charts and tables can be generated using Pivot Chart fields which was obtained from the Cube accessed via Analysis Service of Data tab.

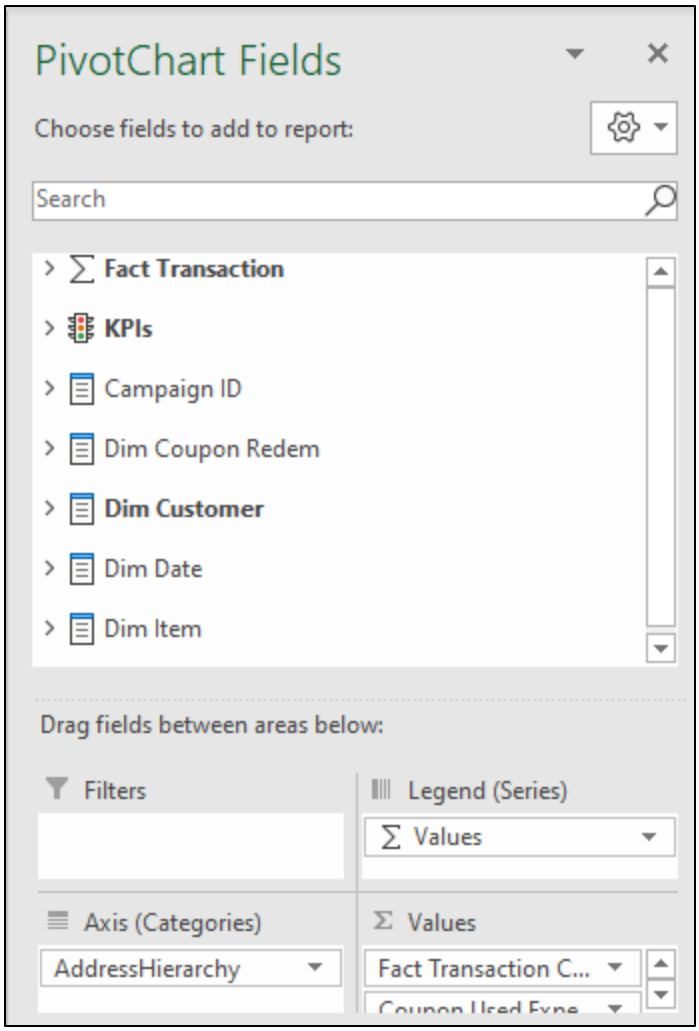


Figure 20 Pivot Chart Fields

3.1 SLICE - OLAP Operation.

In Slice a single dimension is selected from OLAP cube which represents a Sub cube creation. Slice operation changes the overview section in accordance with the passed dimension. In simple terms the original view is sliced to get another different view.
In order to demonstrate the SLICE operation Pivot Chart and Pivot Table was used along with a Slicer.

Campaign ID.Campaign Y

OLAP OPERATION - SLICE

Row Labels	Expected Customer Expense	Other Discount	Coupon Used Expense	Total Discounted Expense
Albuquerque	101146.3	-15209.8	99872.1	67881.9
Anchorage	118880.8	-12819.5	113948.3	82257.3
Atlanta	141183	-20535.1	134251.6	101659

City
Albuquerque
Anchorage
Atlanta
Baltimore

Figure 21 Pivot Table - Slice Operation

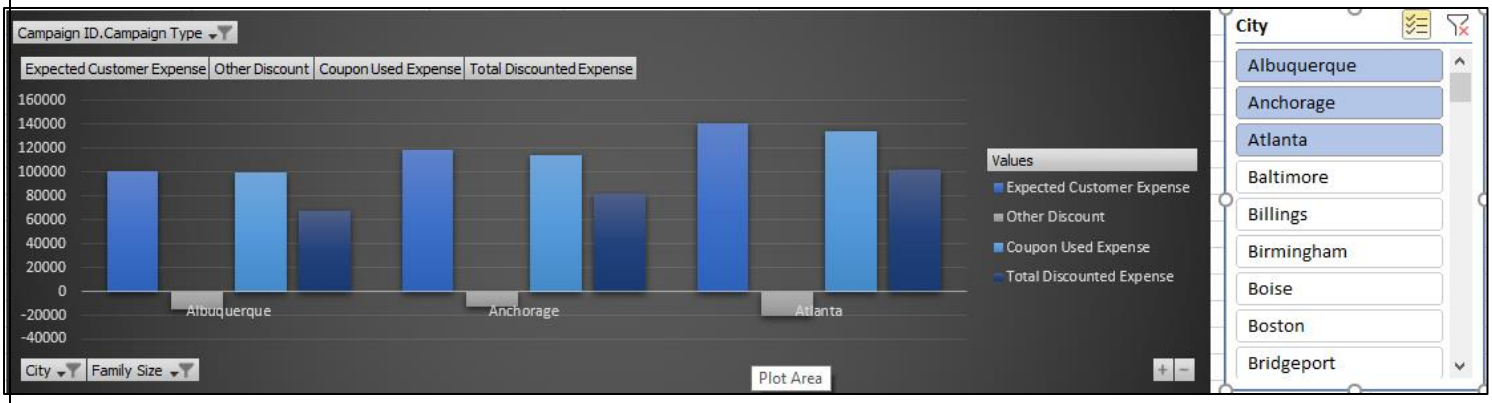


Figure 22 Pivot Chart - Slice Operation

The above Slice Operation Demonstrates the visualization that results by Slicing Cube using Customer City. Expected Customer expense, Other Discount , Coupon Used Expense and Total Discounted Expense filtered by the Type of Campaign is Visualized here by Slicing , we can analyze the city wise statistics.

A	B	C	D	E
Campaign ID.Campaign Type	Y		OLAP OPERATION - SLICE	
Row Labels	Expected Customer Expense	Other Discount	Coupon Used Expense	Total Discounted Expense
Albuquerque	101146.3	-15209.8	99872.1	67881.9

City
Albuquerque
Anchorage
Atlanta

Figure 24 Slice By Single City Pivot table

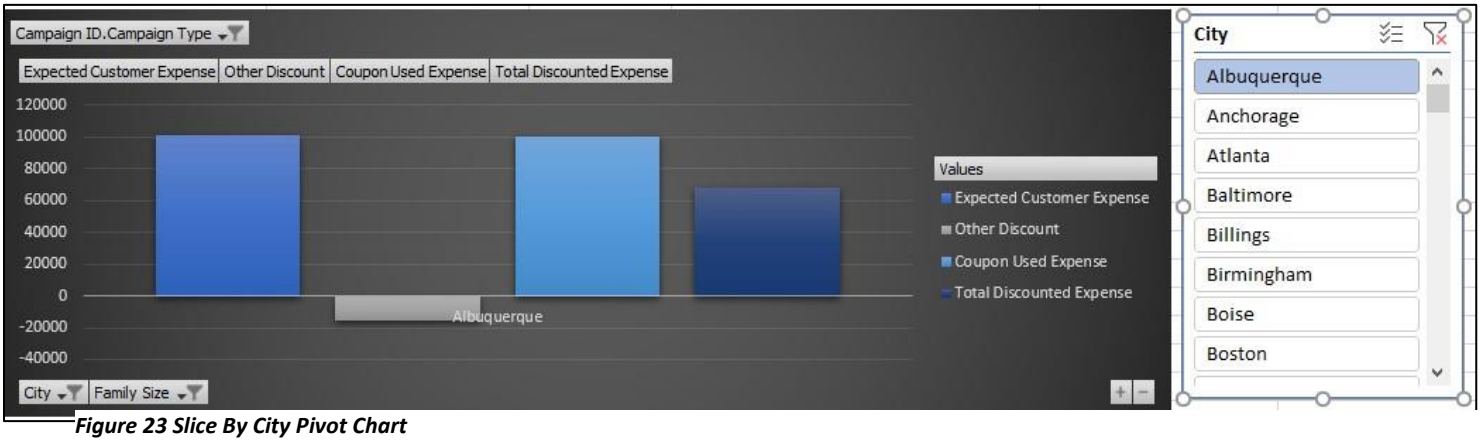
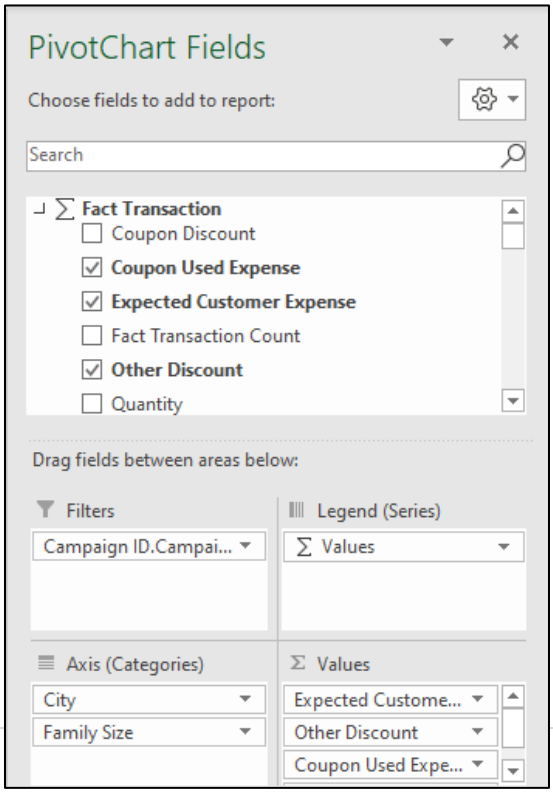


Figure 23 Slice By City Pivot Chart

Figure 25 Pivot Chart fields for Slicing



3.2 DICE – OLAP OPERATION

In Dice two or more dimensions are selected from OLAP cube which represents a Sub cube creation. Dice operation changes the overview section in accordance with the passed dimensions. In simple terms the original view is diced to get another different view.
In order to demonstrate the DICE operation Pivot Chart and Pivot Table was used along with more than 1 Slicer. Here Cube is divided based on many dimensions , by selecting specific values on those dimensions.

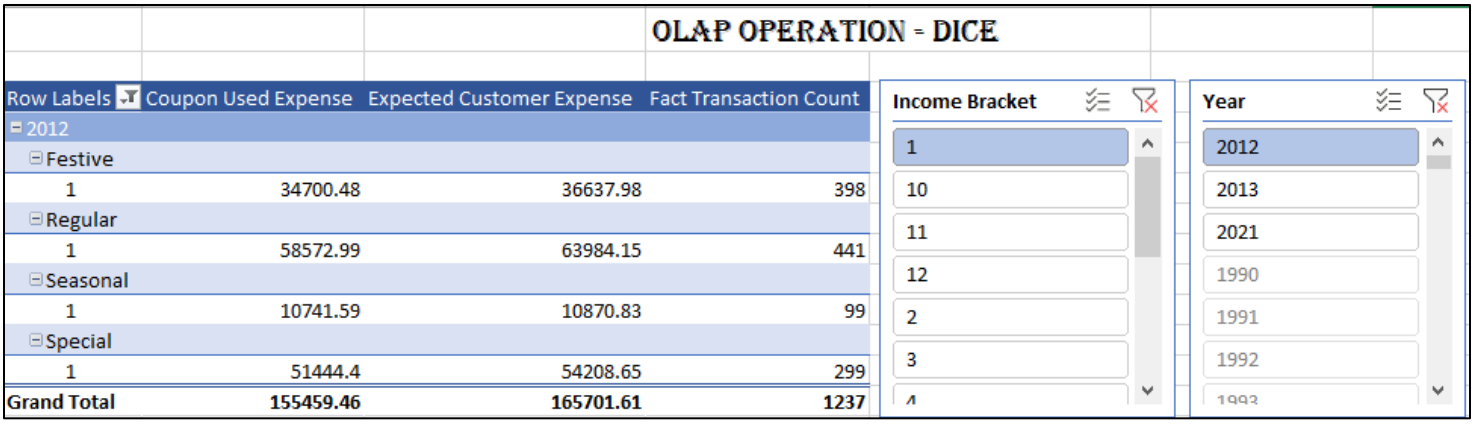


Figure 26 Pivot Table - Dice Operation

Figure 27 Pivot Chart - Dice Operation

The above Dice Operation Demonstrates the visualization that results by Dicing Cube using Customer income bracket and Year. Expected Customer expense, Coupon Used Expense and Number of Transactions in that Year with regard to customer's income bracket is visualized here. By dicing, this statistics in the point of view of various dimensions can be created.

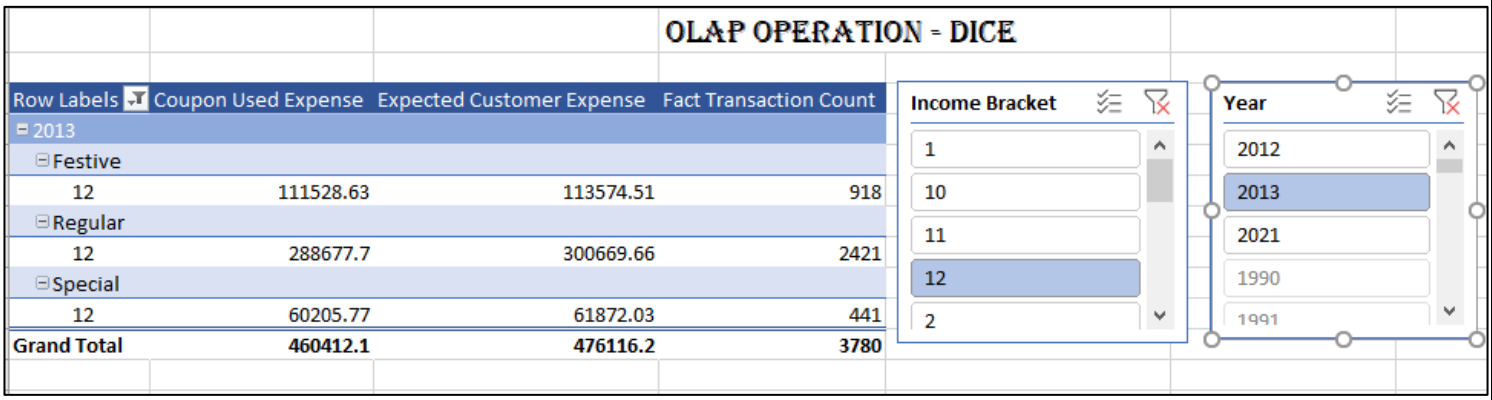


Figure 28 Pivot table - Dice By Different Values

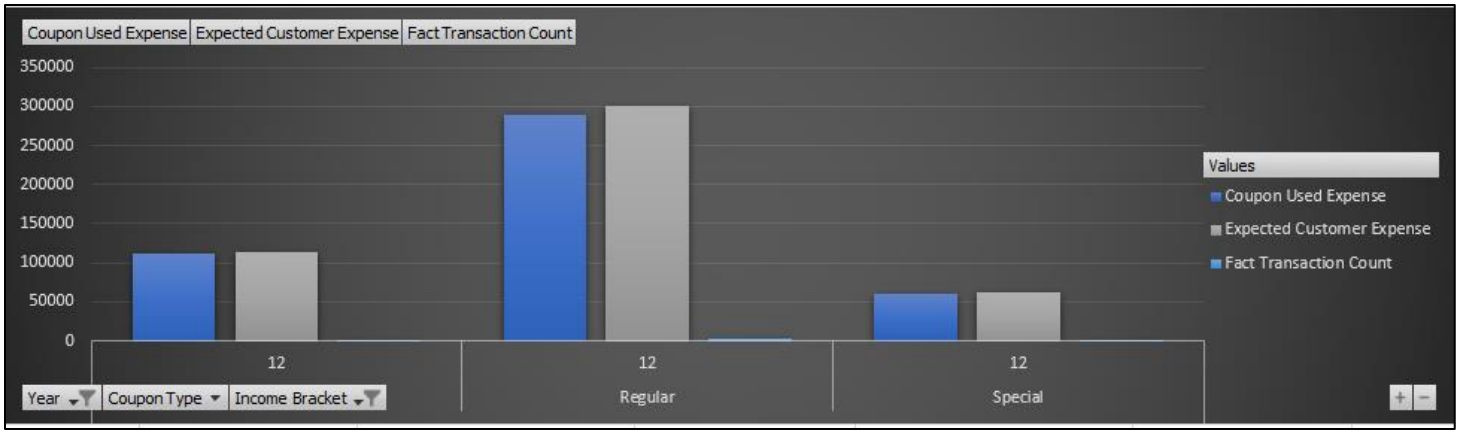


Figure 29 Pivot chart -Dice by different values

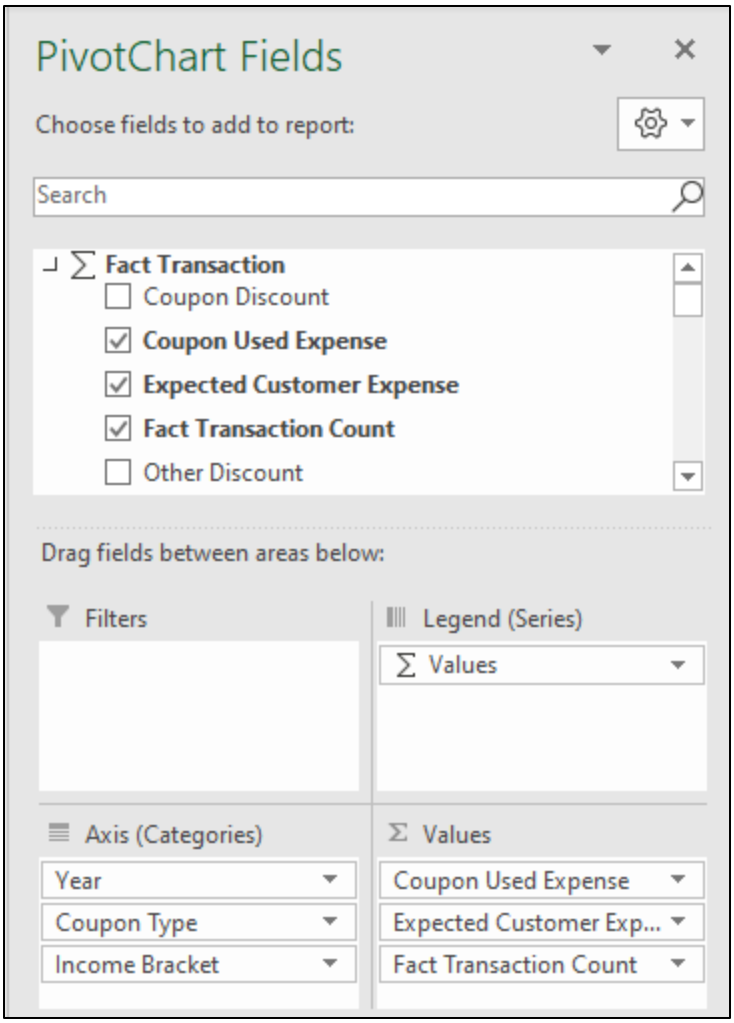


Figure 30 Pivot chart Filed - Dicer

3.3 PIVOT – OLAP OPERATION

Pivot is a visualization operation which rotates the data axes to provide an alternative presentation of the data. Simply said it's a summary table , where a single column can represent all the data by particular rows to the column value.

Row Labels	KPICouponUsedexpense	KPICouponUsedexpense Goal
⊟ Bakery		
Local	2,863,526.00	TRUE
Beverage	0.00	FALSE
⊞ Dairy juices & Snacks	175,852.80	TRUE
⊞ Grocery	7,972,642.30	TRUE
⊞ Meat	5,182.60	TRUE
⊞ Miscellaneous	0.00	FALSE
⊞ Natural Products	1,068,977.70	TRUE
⊞ Packaged Meat	806,784.00	TRUE
⊞ Pharmaceutical	3,268,128.20	TRUE
⊞ Prepared Food	2,874.50	TRUE
⊞ Seafood	151,856.20	TRUE
⊞ Skin & Hair Care	0.00	FALSE
⊞ Unknown	0.00	FALSE
Grand Total	**16,315,824.30**	**TRUE**

Figure 31 Pivot table Initial View

	Column Labels				
	⊟ Bakery	⊞ Beverage	⊟ Dairy juices & Snacks	⊟ Grocery	
Values	Local		Established	Established	Local
KPICouponUsedexpense	2,863,526.00	0.00	175,852.80	6,167,949.60	1,804,692.70
KPICouponUsedexpense Goal	TRUE	FALSE	TRUE	TRUE	TRUE

Figure 32 Rotated view of Pivot table

The above illustration shows how a pivot table is rotating its axis. After rotation, all summary values of a particular category and brand is obtained column wise.

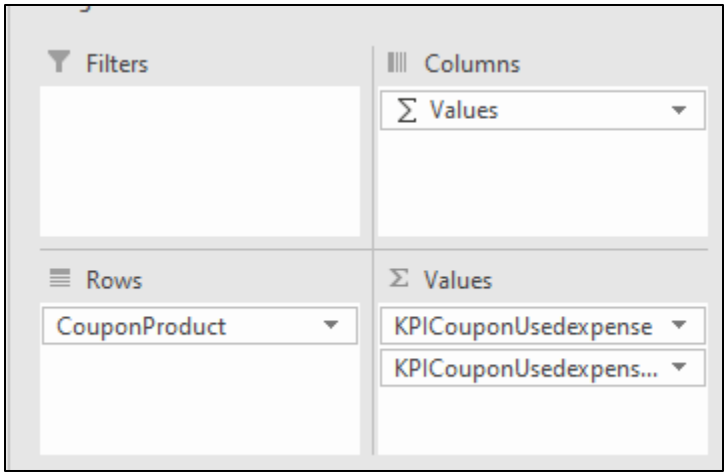


Figure 34 Pivot table fields of Initial View

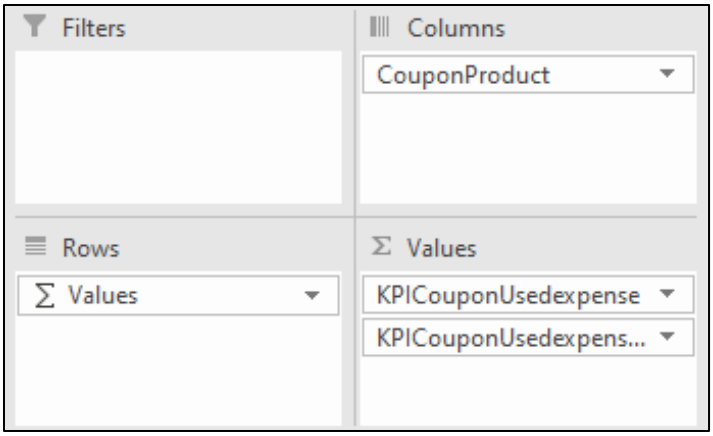


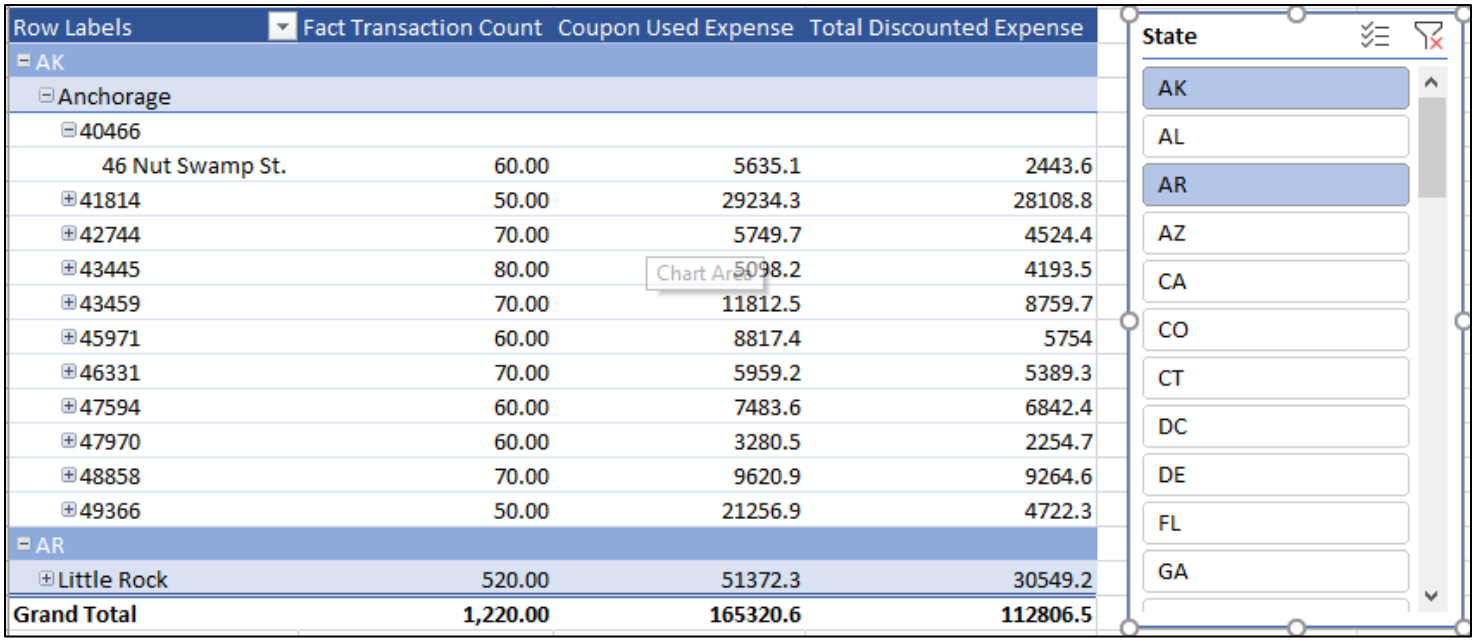
Figure 33 Pivot table fields of Rotated View

The above image shows how pivoting is done to rotate axis by shifting Columns and Rows of Cube.

3.4 DRILL-DOWN AND ROLL UP – OLAP OPERATION

The drill down operation is the opposite of roll-up operation. Drill down operation is used to navigate from less detailed data to more detailed data. That is from the Top-level hierarchy to lower most level hierarchy.
It can be visualized by stepping down through small fragments of 1 dimension or introducing additional dimensions. On contrary to drill down roll up climbs up a hierarchy of a dimension to aggregate data.

The below image shows how **Customer Location wise data** is analyzed. Cube is also sliced to visualize the cube based on specific states too. As defined in the hierarchy while designing the cube , this visualization helps to drill down along Customer State , City , Zip Code and Main Address and analyze the number of transactions done , Coupon Used Expense and Total Discounted Expense of Customer with the retail shop.



Row Labels	Fact Transaction Count	Coupon Used Expense	Total Discounted Expense
⊟AK			
⊟Anchorage			
⊟40466			
46 Nut Swamp St.	60.00	5635.1	2443.6
⊞41814	50.00	29234.3	28108.8
⊞42744	70.00	5749.7	4524.4
⊞43445	80.00	5098.2	4193.5
⊞43459	70.00	11812.5	8759.7
⊞45971	60.00	8817.4	5754
⊞46331	70.00	5959.2	5389.3
⊞47594	60.00	7483.6	6842.4
⊞47970	60.00	3280.5	2254.7
⊞48858	70.00	9620.9	9264.6
⊞49366	50.00	21256.9	4722.3
⊟AR			
⊞Little Rock	520.00	51372.3	30549.2
Grand Total	**1,220.00**	**165320.6**	**112806.5**

Figure 35 Location Hierarchy Drill Down Pivot table

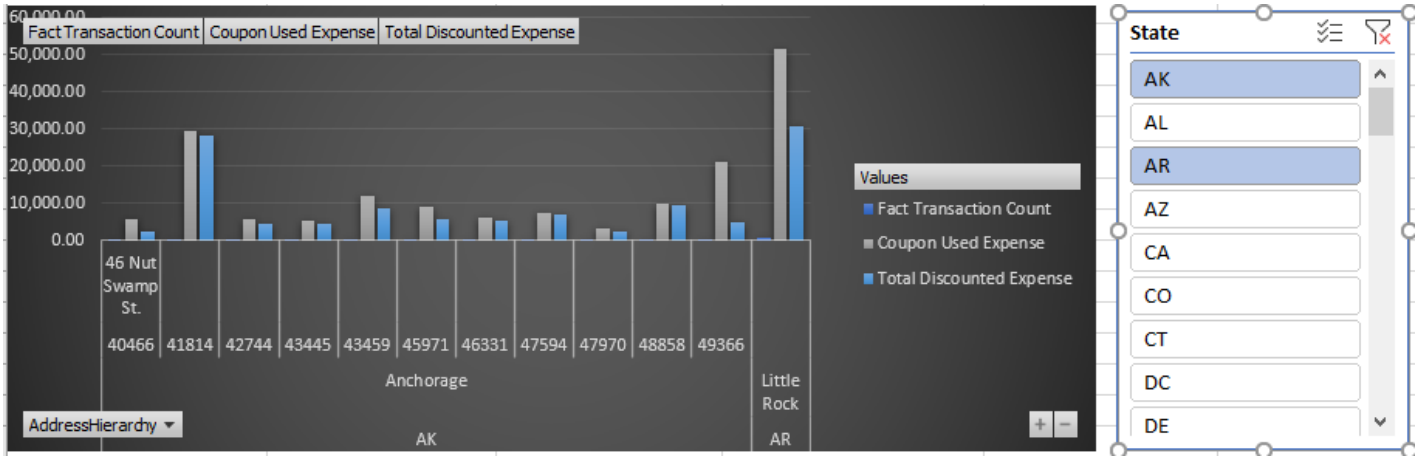


Figure 36 Location hierarchy Drill-down Pivot Chart

On the other hand, the Location Hierarchy can be rolled up to analyze aggregated data. That is the number of transactions done , Coupon used expense and total Discounted expense can be analyzed at an aggregated higher level for City wise or State wise.

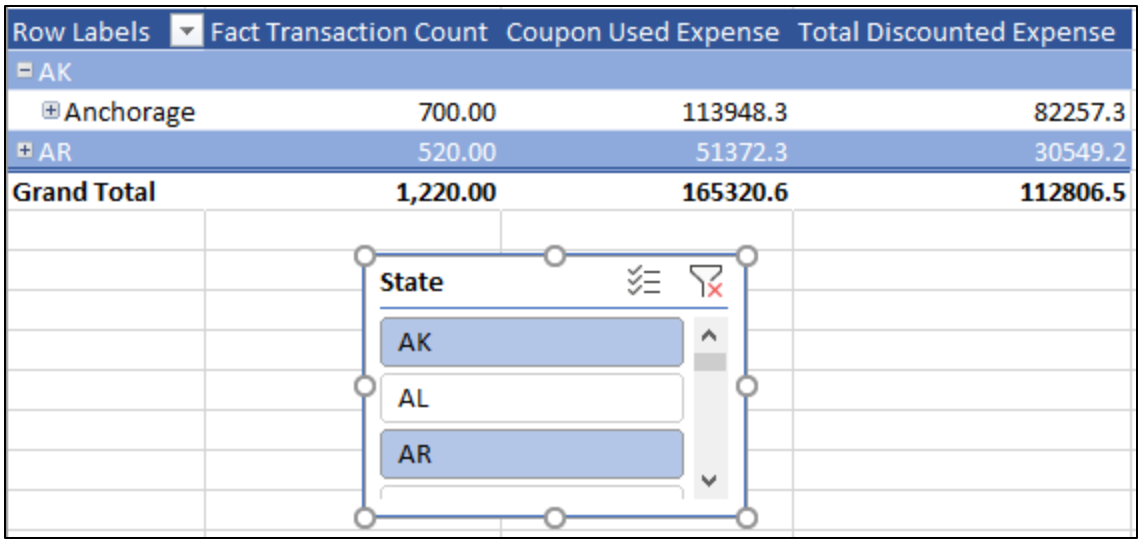


Figure 37 Location hierarchy Roll-up Pivot Table

In the above visualization , we can observe that the detailed data is rolled up and aggregated.

Data are visualized for the City Anchorage of State AK by aggregating data of all zip codes and their respective Main addresses. On the other hand , the aggregated statistics of State AR is rolled up and visualized in the above figure.

Figure 39 Location Hierarchy Roll-up Pivot Chart

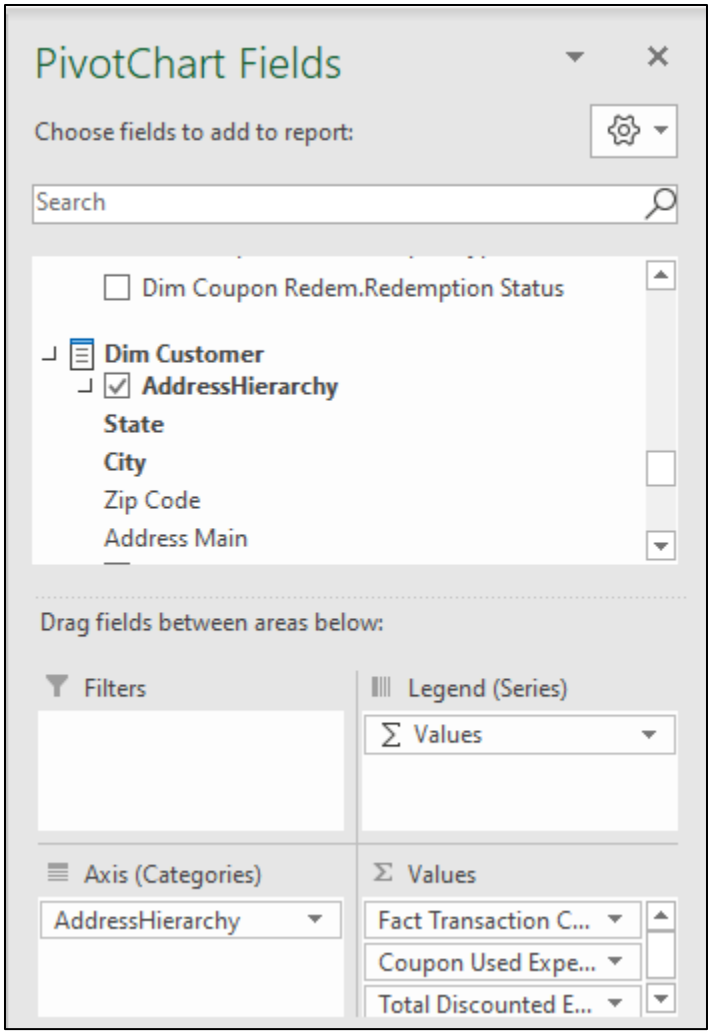
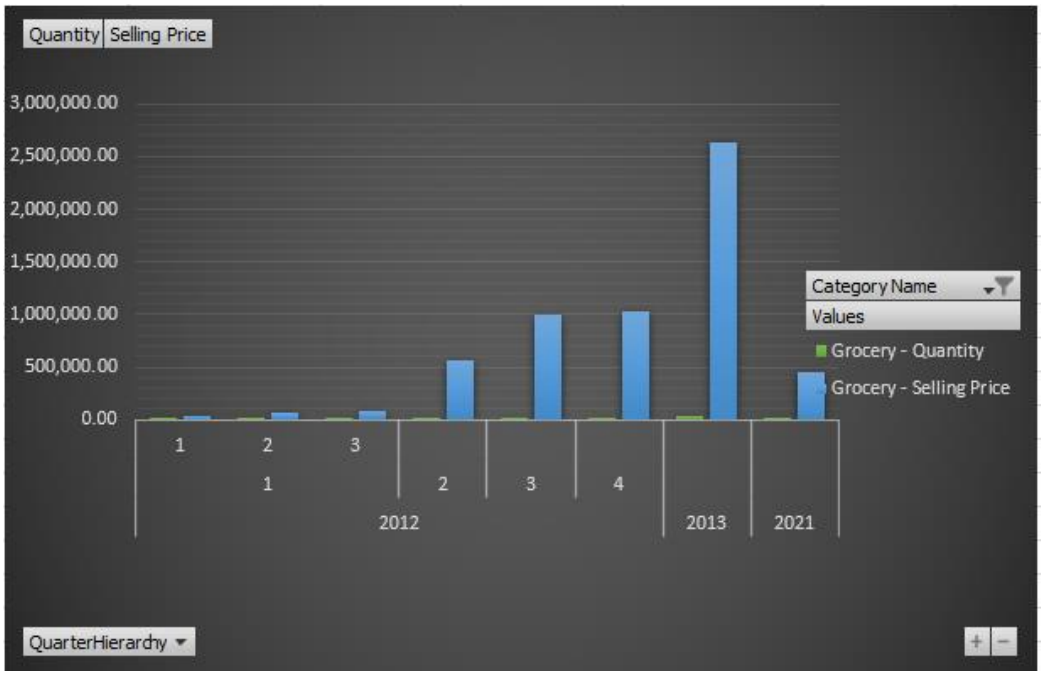


Figure 38 Location Hierarchy Pivot chart fields for Drill down & Roll up

The below image shows how **Date wise** data analysis is done. The Cube is also sliced to visualize the cube based on specific Product Category too. As defined in the hierarchy while designing the cube , this visualization helps to drill down along Year , quarter, and Month to analyze the quantity and selling price of products under each category in the retail shop.

	Column Labels	
	Grocery	
Row Labels	Quantity	Selling Price
2012		
1		
1	750.00	30177.2
2	560.00	67713.5
3	1,190.00	82257.2
2	7,250.00	571419.4
3	12,173.00	1000218.81
4	12,303.00	1024625.07
2013	32,454.00	2641782.51
2021	5,640.00	459712.91
Grand Total	**72,320.00**	**5877906.6**

Figure 40 Date hierarchy Drill-down pivot table



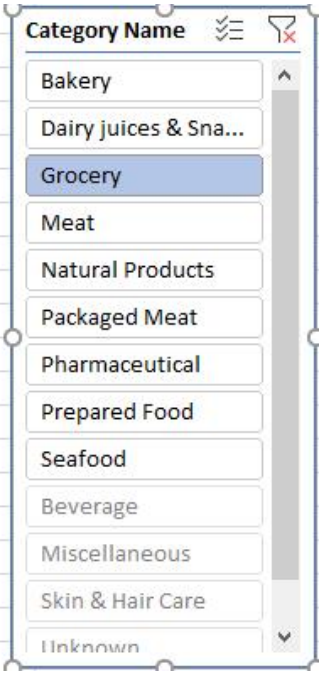
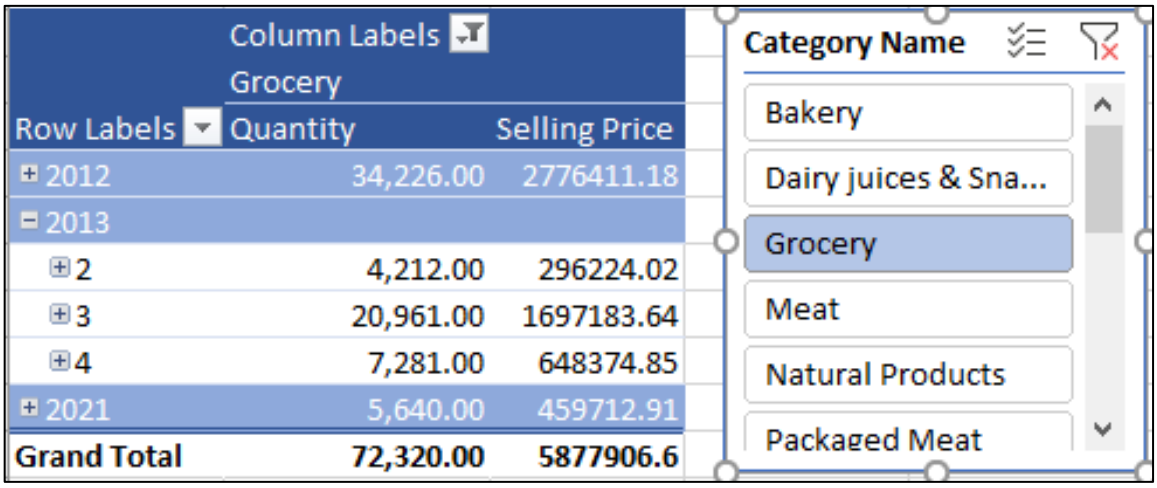


Figure 41Date hierarchy Drill-down pivot chart

On the other hand, the Date Hierarchy can be rolled up to analyze aggregated data. That is the quantity and selling price of products for a particular category can be analyzed at an aggregated higher level for Year wise or Quarter wise



Row Labels	Column Labels: Grocery – Quantity	Grocery – Selling Price
2012	34,226.00	2776411.18
2013		
2	4,212.00	296224.02
3	20,961.00	1697183.64
4	7,281.00	648374.85
2021	5,640.00	459712.91
Grand Total	**72,320.00**	**5877906.6**

Figure 42 Date Hierarchy Roll-up Pivot table

In the above visualization , we can observe that the detailed data is rolled up and aggregated.

Data are visualized for the Year 2013 quarter wise by aggregating data monthly . On the other hand , the aggregated statistics of Year 2012 is rolled up and visualized in the above figure.

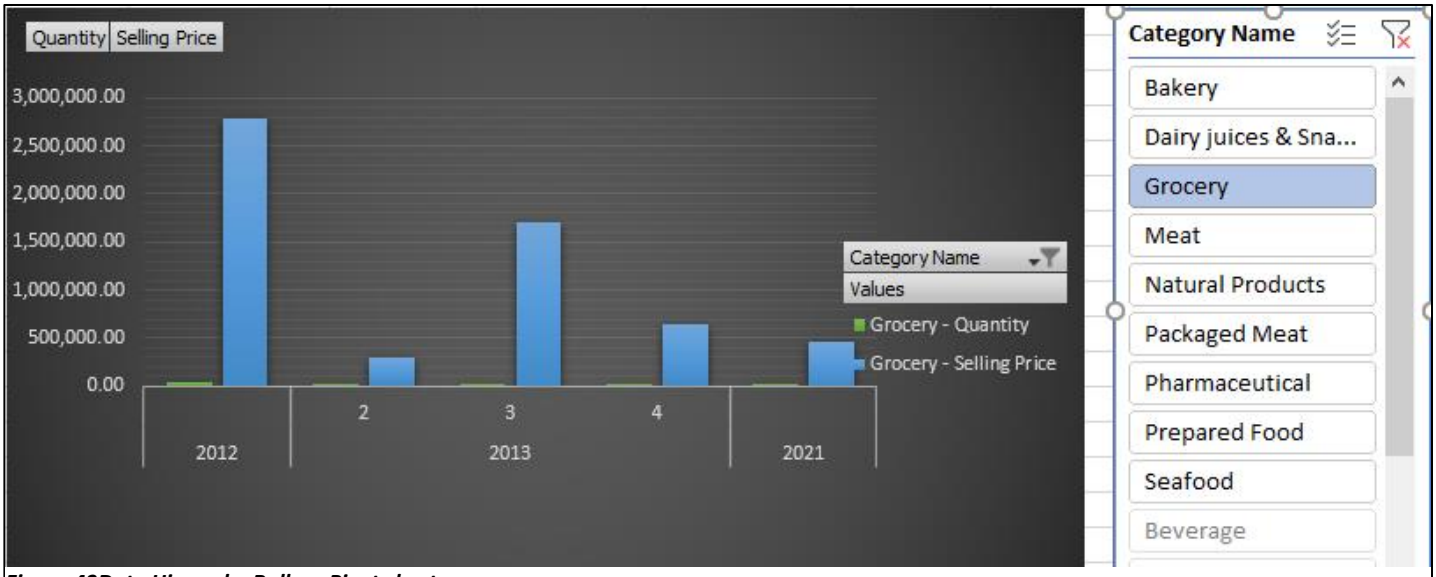


Figure 43Date Hierarchy Roll-up Pivot chart

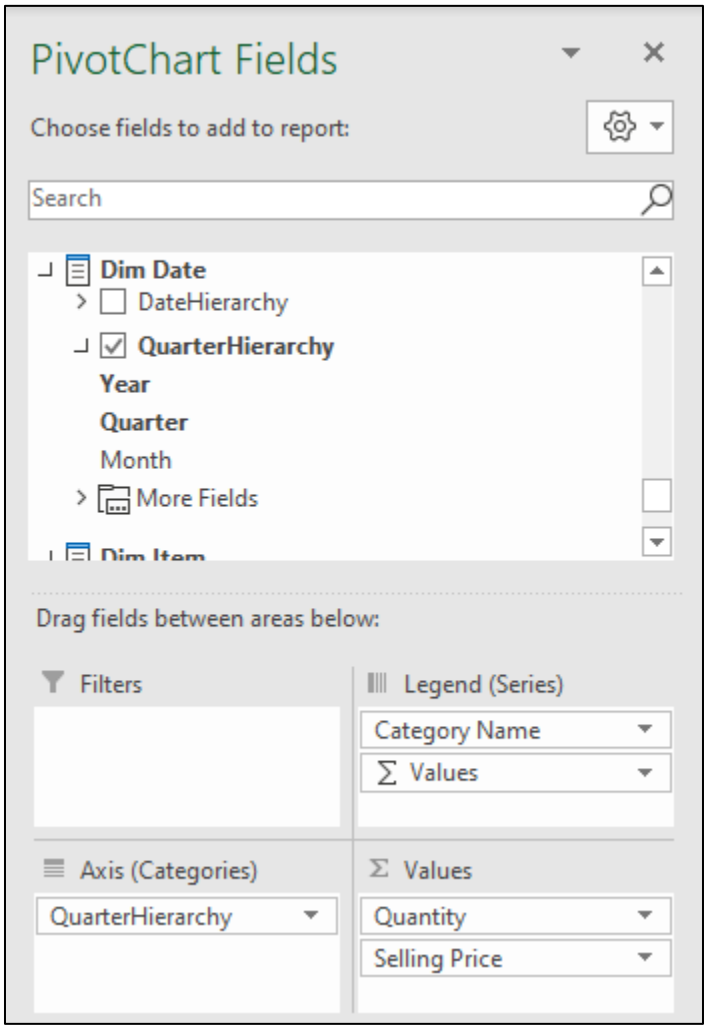


Figure 44Date Hierarchy Pivot Chart fields for DRill-down and Roll-up

3.5 POWER VIEW DEMONSTRATION

In order to visualize the key factors of the Business a Power View Dashboard was created using Excel Power View Option. In order to enable it Microsoft Silver light was installed. **Power View** is a data visualization technology that lets us create interactive charts, graphs, maps, and other visuals that bring our data to life. It has closer interactiveness to Power BI.

Figure 45 Power View Dashboard

When a particular subject area is clicked user can view all visualizations in terms of that subject area through a power view dashboard.

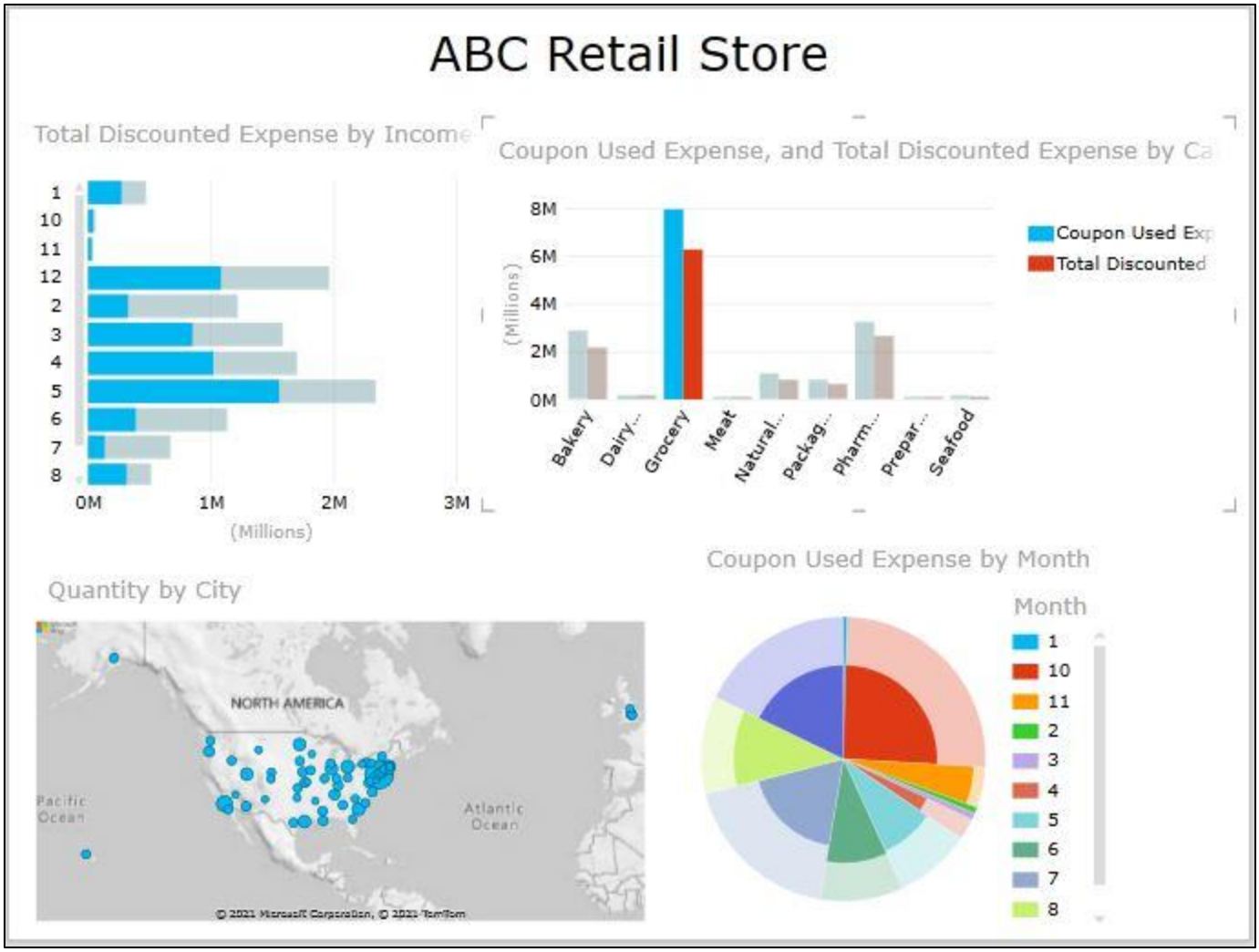


Figure 46 Power view Interactivity

Bar charts are used to compare categories where length of the bars are proportional to the value implied.

Maps are used to compare the number of goods bought in total location wise.

The monthly coupon used proportion is represented as a part whole composition by pie chart.

4.0 SSRS Reports

SQL Server Reporting Service and Report Builder are the main tools for SSRS reporting. Other than that there are few components in SSRS platform which supports SSRS reporting such as

- Report Server
- SSRS Web Portal
- Report Server Configuration Manager
- Report Server Database

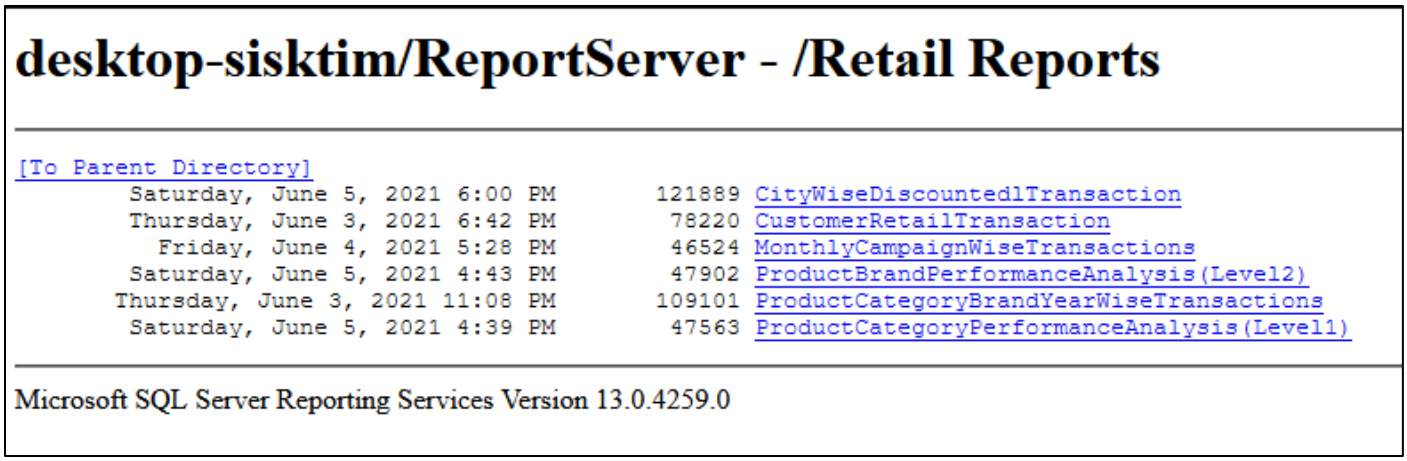


Figure 48 SSRS Report Server

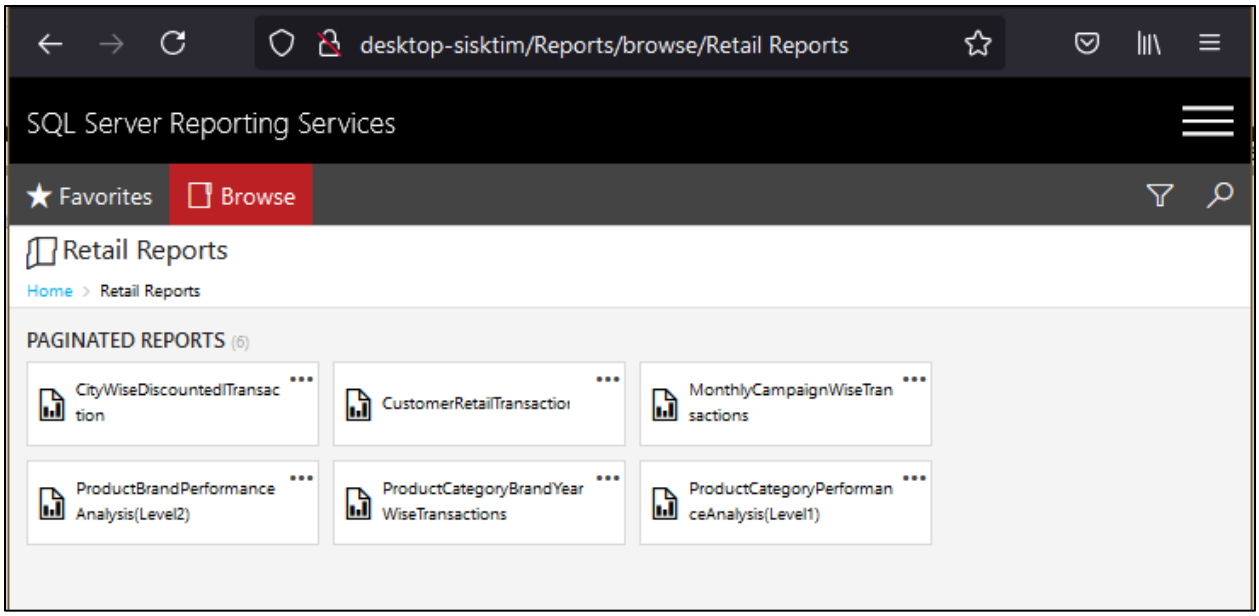


Figure 47 SSRS Web Portal

Initially before creating the SSRS report from the Report Builder , a few steps should be followed.

1. Create a Data Source

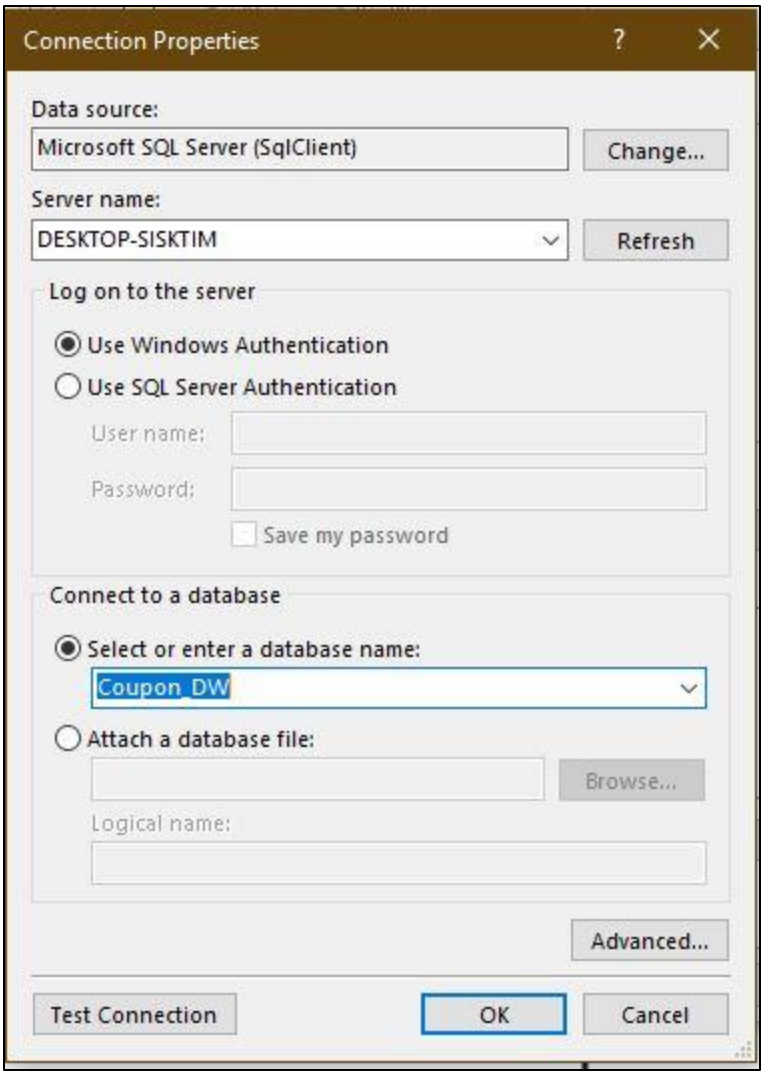


Figure 49 Data Source Creation

2. Create a Data Set

Data set to be used for reporting is created by building queries to extract data from the cube. It is designed using the Query designer of Report Builder.

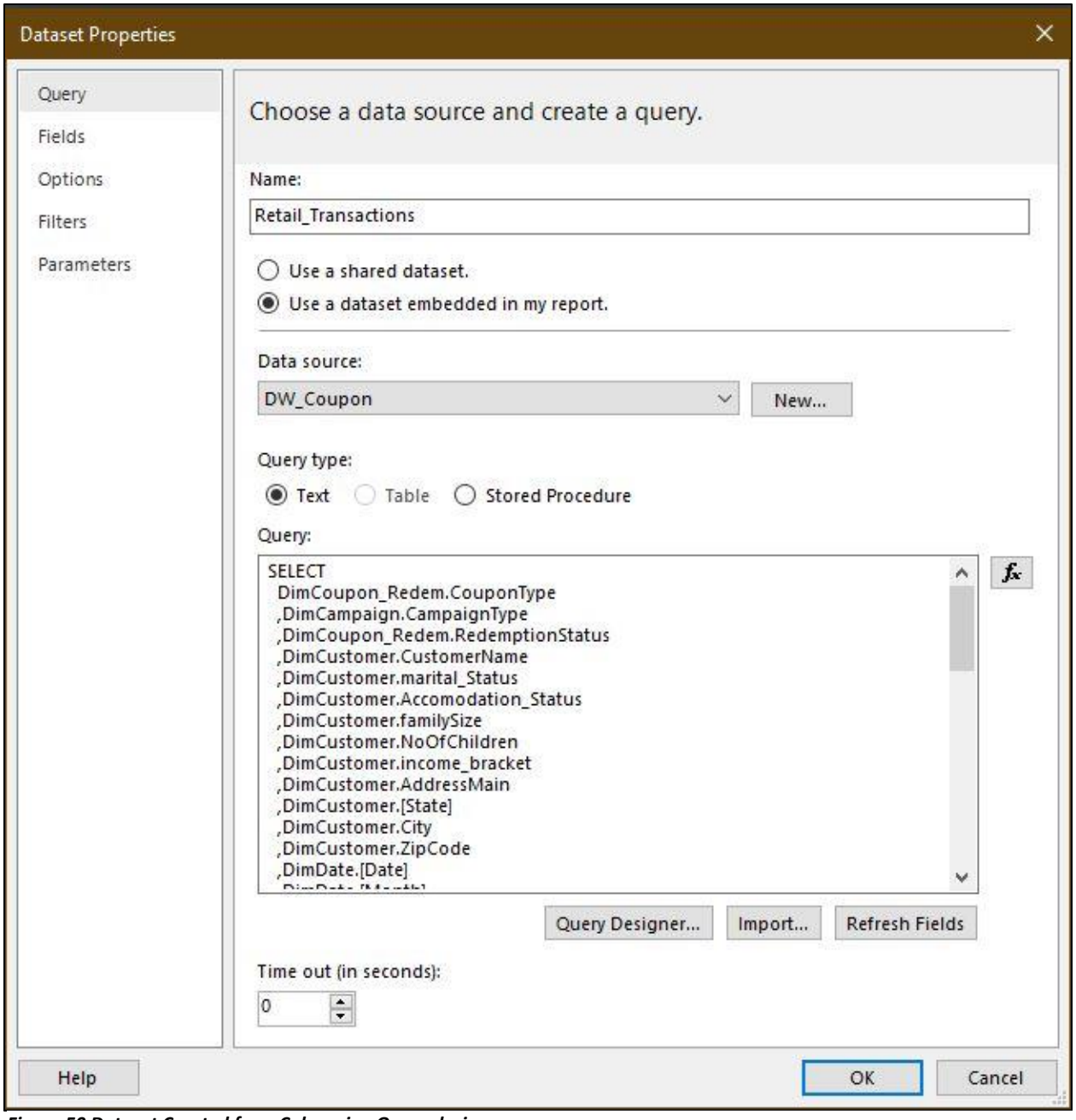


Figure 50 Dataset Created from Cube using Query designer

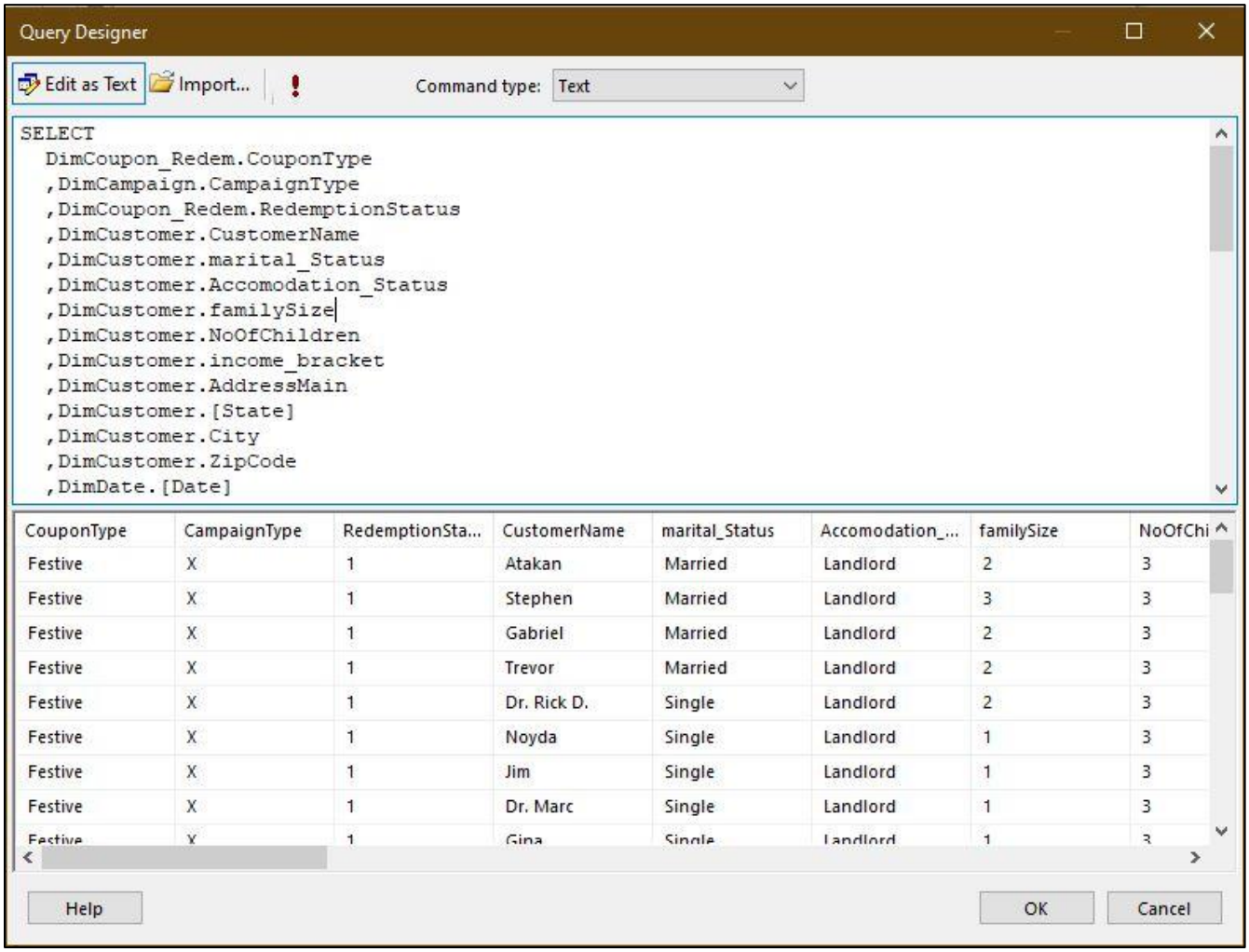


Figure 51 Query Designer Window

3. Design data using the Design View in Report Builder

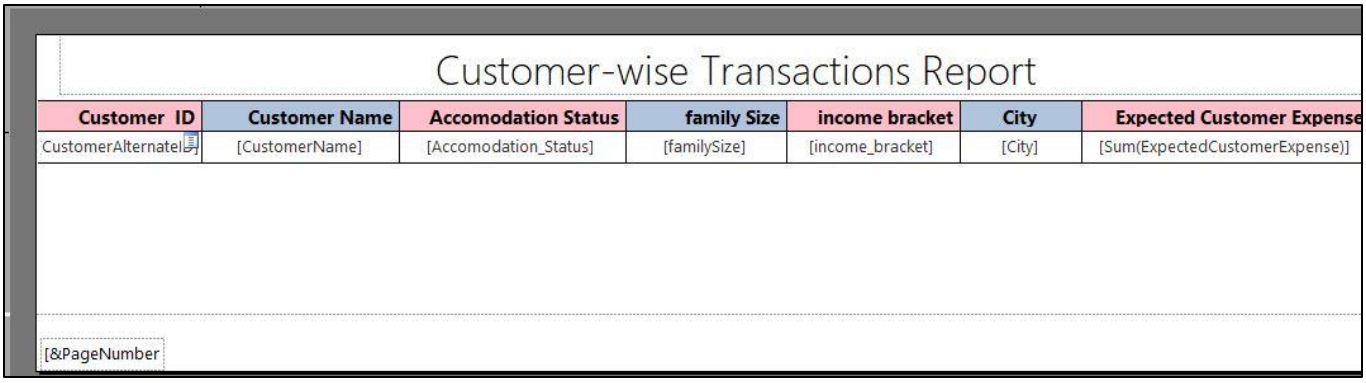
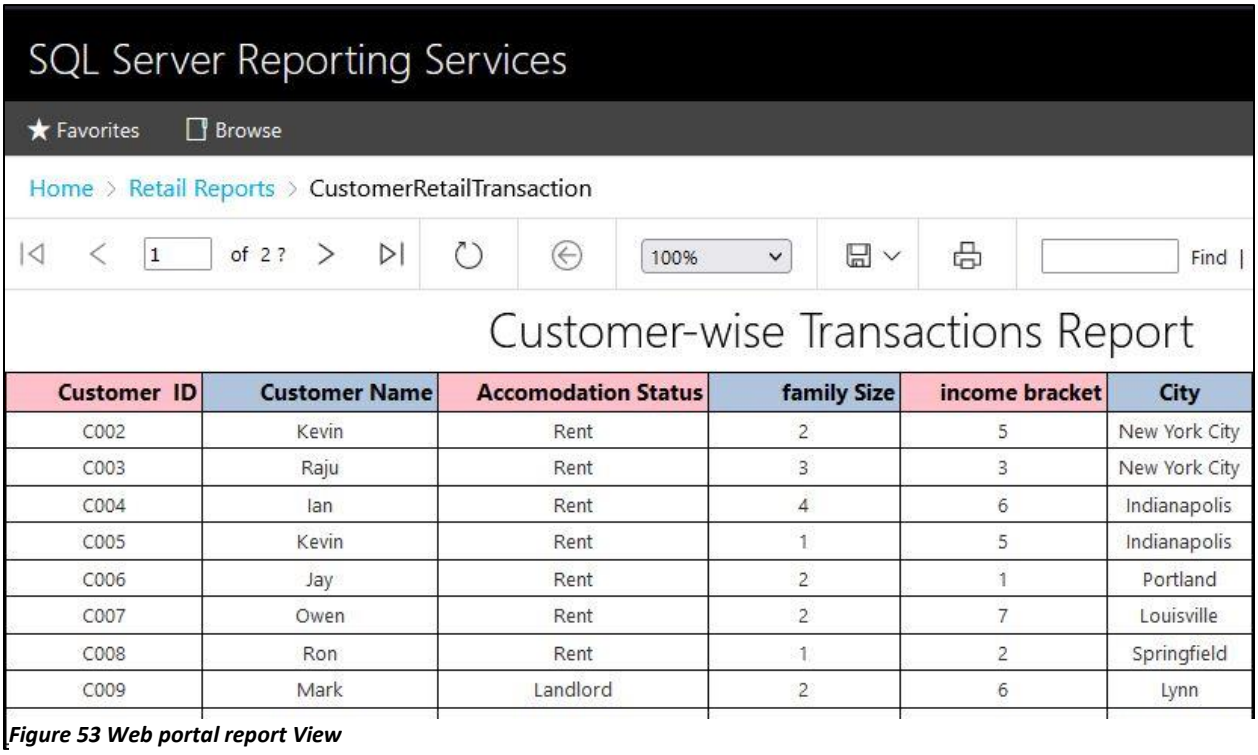


Figure 52 Design view Of Report

Once the above-mentioned Steps are completed SSRS reports can be published and viewed in the SSRS Web Portal.



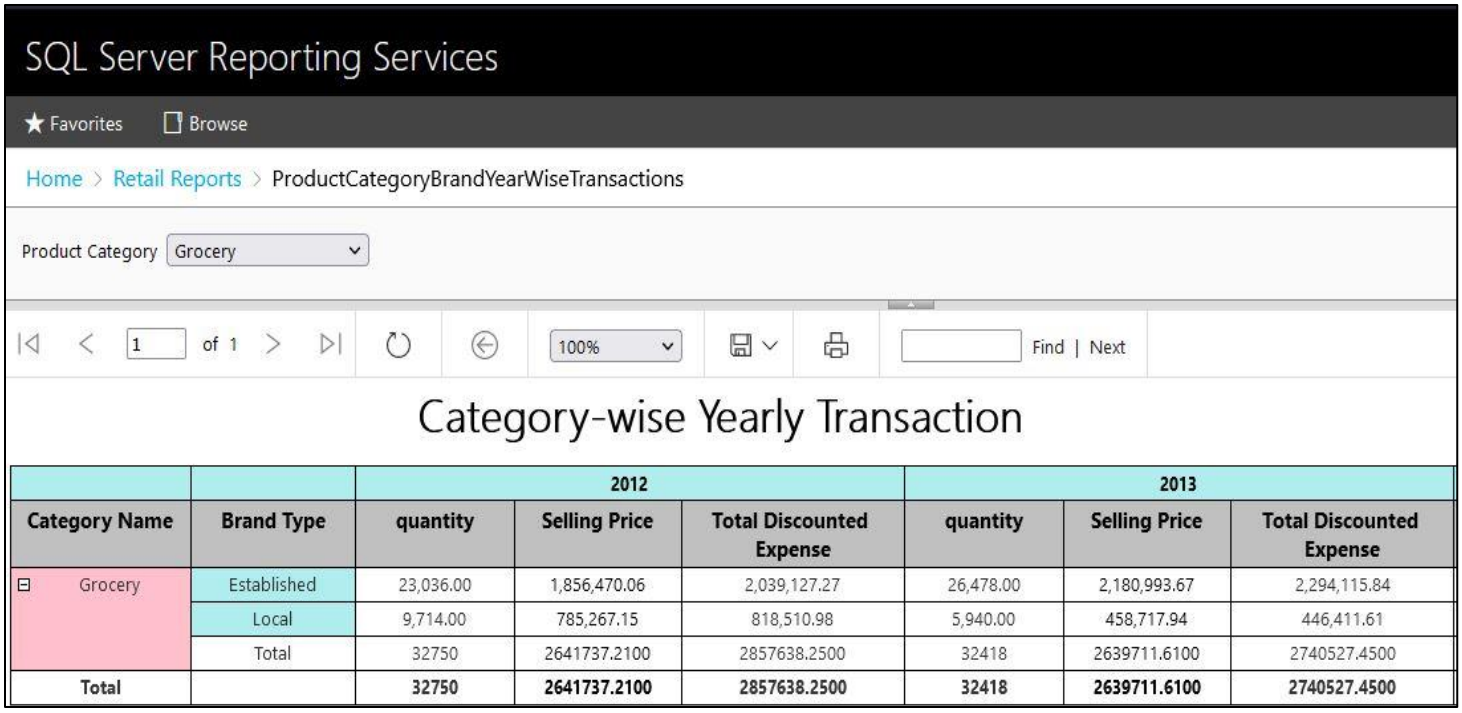
Customer-wise Transactions Report

Customer ID	Customer Name	Accomodation Status	family Size	income bracket	City
C002	Kevin	Rent	2	5	New York City
C003	Raju	Rent	3	3	New York City
C004	Ian	Rent	4	6	Indianapolis
C005	Kevin	Rent	1	5	Indianapolis
C006	Jay	Rent	2	1	Portland
C007	Owen	Rent	2	7	Louisville
C008	Ron	Rent	1	2	Springfield
C009	Mark	Landlord	2	6	Lynn

Figure 53 Web portal report View

Reports can be created mainly as a Table view or a Matrix View. The figure shown above is a Table report published in SSRS web portal. It shows the Details of a Customer along with the Transactions done with the Retail Shop.

4.1 Report With Matrix.



		2012			2013		
Category Name	**Brand Type**	**quantity**	**Selling Price**	**Total Discounted Expense**	**quantity**	**Selling Price**	**Total Discounted Expense**
⊟ Grocery	Established	23,036.00	1,856,470.06	2,039,127.27	26,478.00	2,180,993.67	2,294,115.84
	Local	9,714.00	785,267.15	818,510.98	5,940.00	458,717.94	446,411.61
	Total	32750	2641737.2100	2857638.2500	32418	2639711.6100	2740527.4500
Total		**32750**	**2641737.2100**	**2857638.2500**	**32418**	**2639711.6100**	**2740527.4500**

Figure 54 Report With Matrix

Matrix is visualized such that data are grouped by columns and rows with aggregate data at the intersection. The above report gives the quantity, Selling Price ,Total Discounted Expense of Particular Category and their Brands for respective Years 2012, 2013 and 2021.

In addition to the matrix created , a parameter is added to facilitate for the user to choose a specific category of product to be visualized where the product category can be drilled down to view brand details as well.

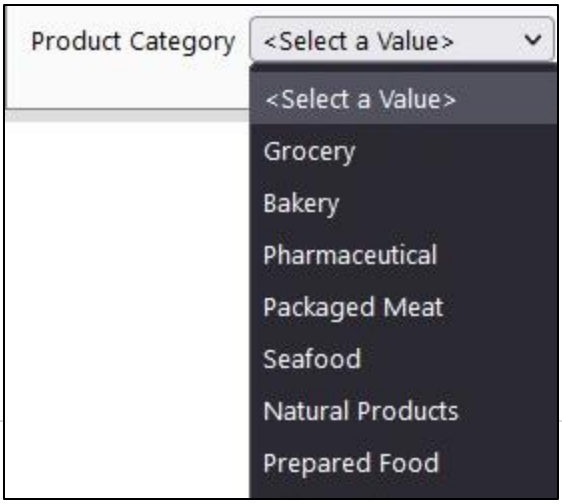


Figure 55 Single parameter dropdown

4.2 Report With Multiple Parameter

To create a report with multiple parameters the initial data set query was modified by adding a where clause. Month and campaign type wise coupon discounts were needed to be presented. Hence 2 parameters to select ; month and campaign type were created, respectively.

Month is a multivalued parameter where user can select many months to be viewed and campaign type is a single valued parameter where user can select any one campaign type such as X or Y.

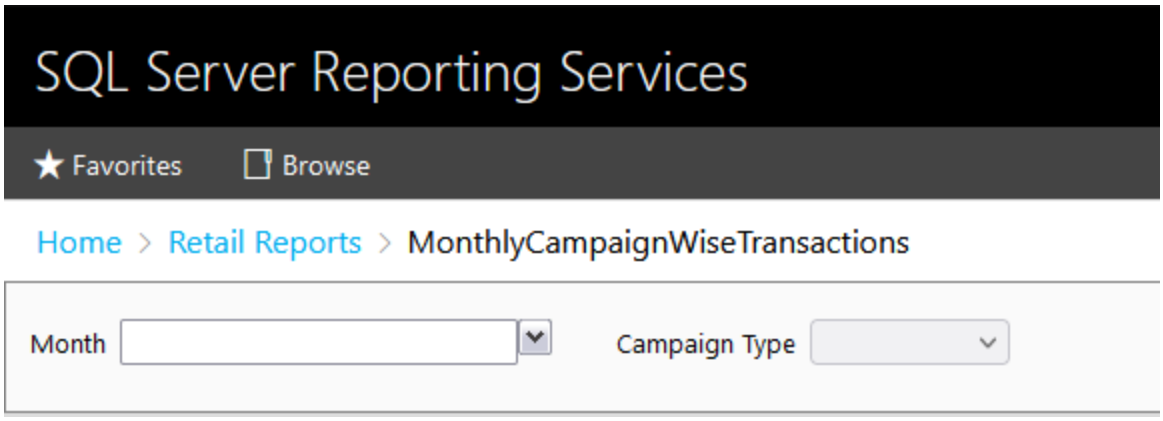


Figure 56 Multiple Parameter dropdown

Initially data is filtered by the months entered by user and then shows the campaign types that could be selected for those months, respectively. Then data is filtered by selected campaign type to produce the final report.

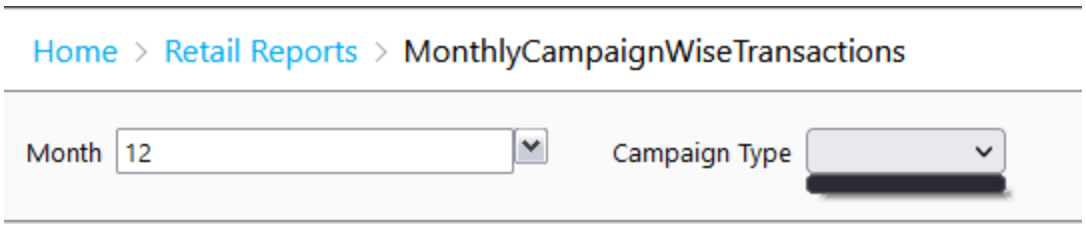
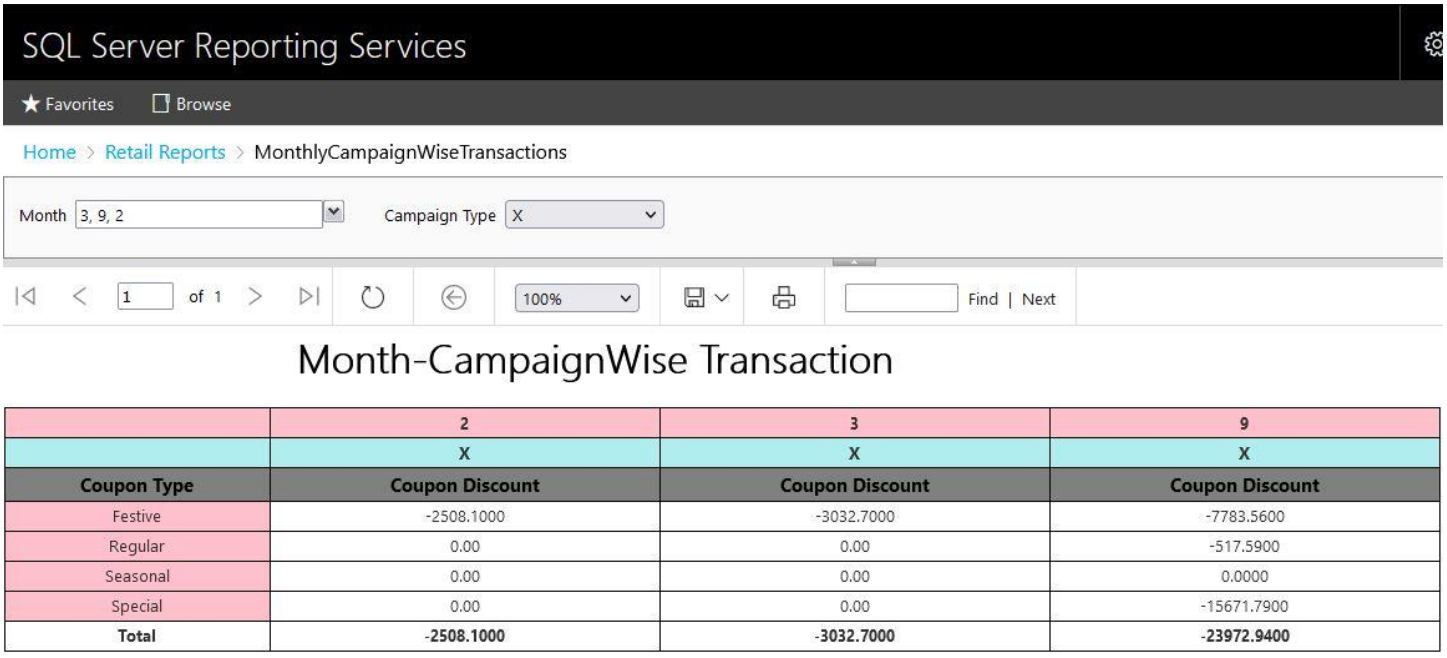


Figure 57 No campaigns for month 12



	2	3	9
	X	X	X
Coupon Type	**Coupon Discount**	**Coupon Discount**	**Coupon Discount**
Festive	-2508.1000	-3032.7000	-7783.5600
Regular	0.00	0.00	-517.5900
Seasonal	0.00	0.00	0.0000
Special	0.00	0.00	-15671.7900
Total	**-2508.1000**	**-3032.7000**	**-23972.9400**

Figure 58 Multiple parameter report

The above report shows the total coupon discounts gained for items in different coupon types based on the selected month numeric and the campaign type. The report displays the report for the 2nd , 3rd, and 9th month with campaign type X coupon data.

In addition to this the Coupon discount text box contains functions expressions that validates the field. If the field does not contain a value, '0.00' is assigned for it to provide more clarity to the report.

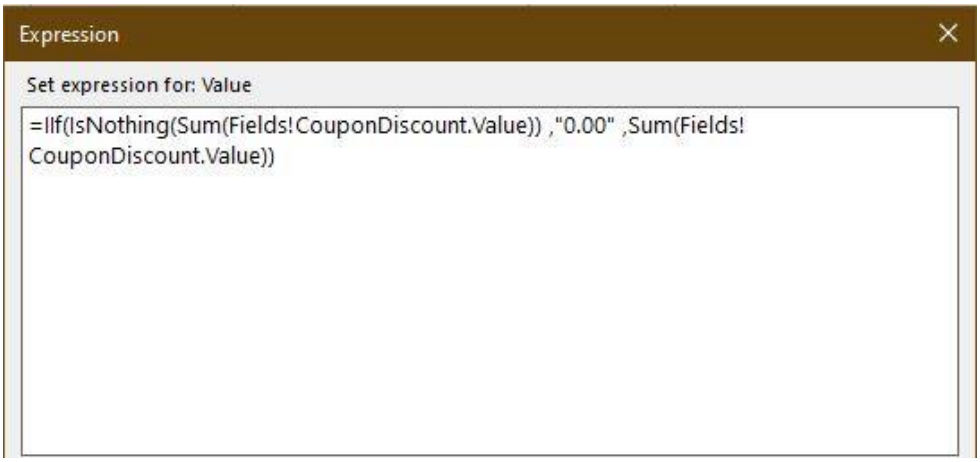


Figure 59 Function Validation

4.3 SSRS drill down Report

A SSRS drill down report facilitates to step down the hierarchy to analyze detailed data. The report is divided into subparts by doing so. In order to demonstrate the drill down operation location wise hierarchy is used.

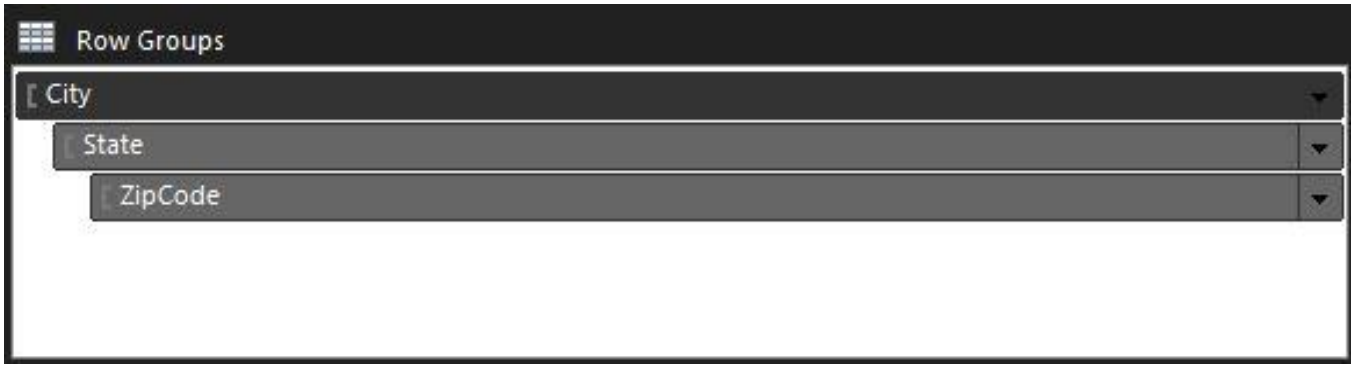
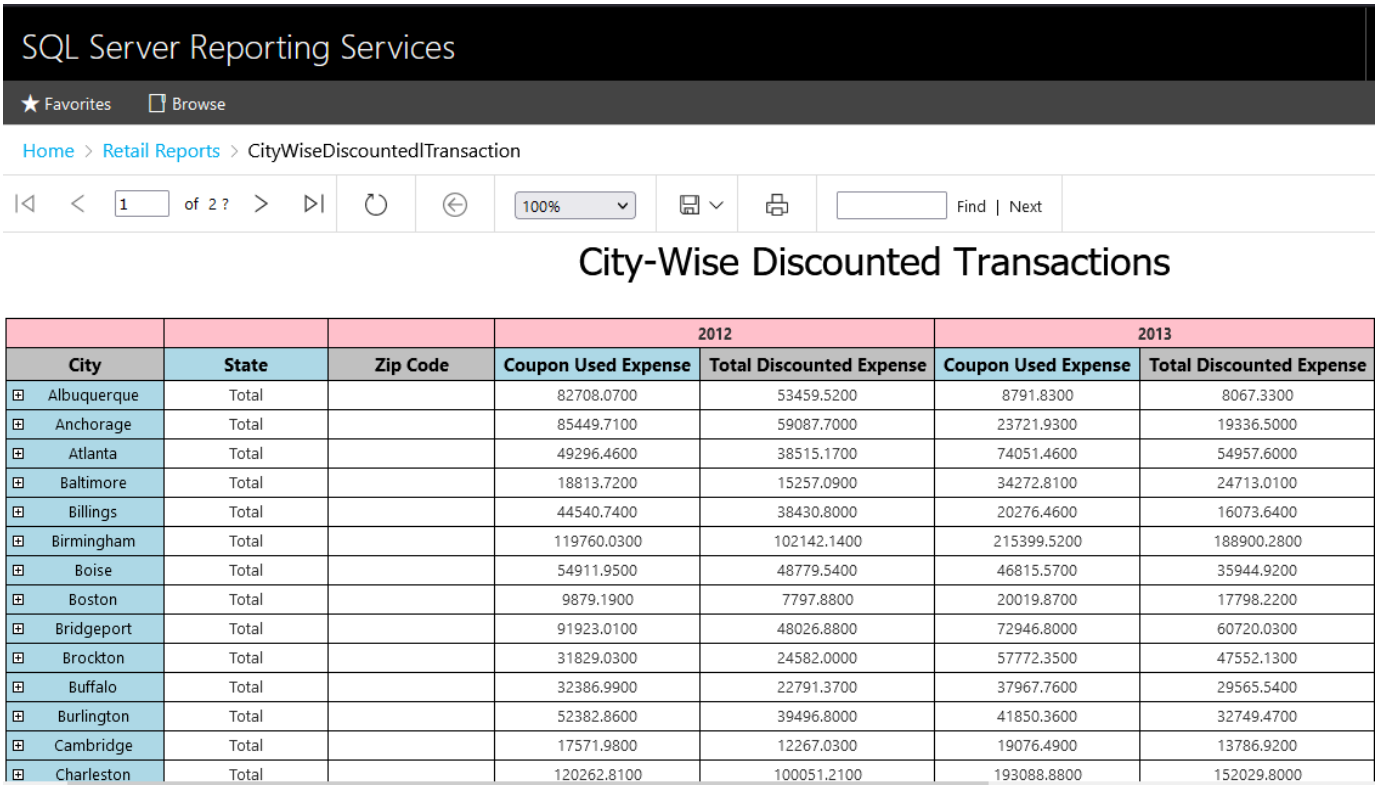


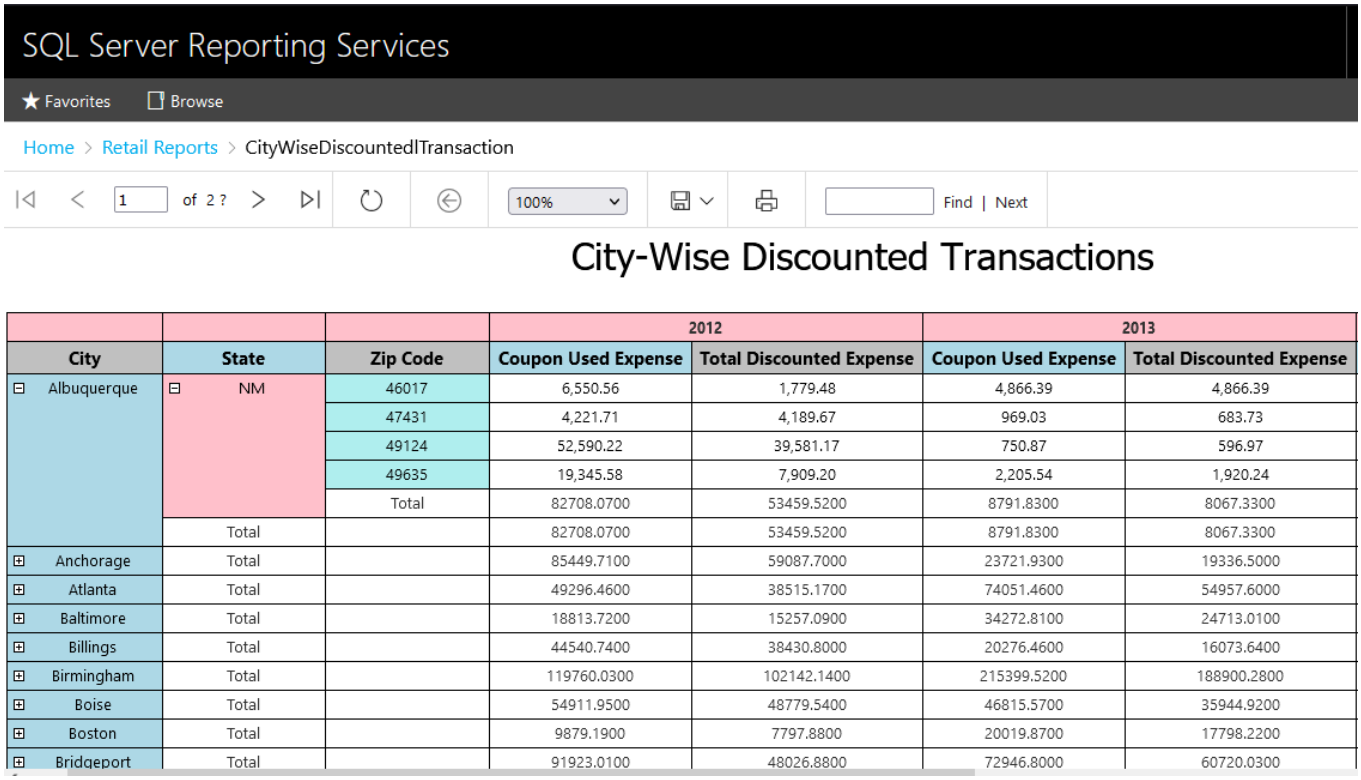
Figure 60 Location hierarchy in Report builder



			2012		2013	
City	State	Zip Code	Coupon Used Expense	Total Discounted Expense	Coupon Used Expense	Total Discounted Expense
Albuquerque	Total		82708.0700	53459.5200	8791.8300	8067.3300
Anchorage	Total		85449.7100	59087.7000	23721.9300	19336.5000
Atlanta	Total		49296.4600	38515.1700	74051.4600	54957.6000
Baltimore	Total		18813.7200	15257.0900	34272.8100	24713.0100
Billings	Total		44540.7400	38430.8000	20276.4600	16073.6400
Birmingham	Total		119760.0300	102142.1400	215399.5200	188900.2800
Boise	Total		54911.9500	48779.5400	46815.5700	35944.9200
Boston	Total		9879.1900	7797.8800	20019.8700	17798.2200
Bridgeport	Total		91923.0100	48026.8800	72946.8000	60720.0300
Brockton	Total		31829.0300	24582.0000	57772.3500	47552.1300
Buffalo	Total		32386.9900	22791.3700	37967.7600	29565.5400
Burlington	Total		52382.8600	39496.8000	41850.3600	32749.4700
Cambridge	Total		17571.9800	12267.0300	19076.4900	13786.9200
Charleston	Total		120262.8100	100051.2100	193088.8800	152029.8000

Figure 61 Initial View

The above report shows the details of Coupon Used expense and Total Discounted expense of customers in various city for the year 2012 , 2013.



			2012		2013	
City	State	Zip Code	Coupon Used Expense	Total Discounted Expense	Coupon Used Expense	Total Discounted Expense
⊟ Albuquerque	⊟ NM	46017	6,550.56	1,779.48	4,866.39	4,866.39
		47431	4,221.71	4,189.67	969.03	683.73
		49124	52,590.22	39,581.17	750.87	596.97
		49635	19,345.58	7,909.20	2,205.54	1,920.24
		Total	82708.0700	53459.5200	8791.8300	8067.3300
	Total		82708.0700	53459.5200	8791.8300	8067.3300
⊞ Anchorage	Total		85449.7100	59087.7000	23721.9300	19336.5000
⊞ Atlanta	Total		49296.4600	38515.1700	74051.4600	54957.6000
⊞ Baltimore	Total		18813.7200	15257.0900	34272.8100	24713.0100
⊞ Billings	Total		44540.7400	38430.8000	20276.4600	16073.6400
⊞ Birmingham	Total		119760.0300	102142.1400	215399.5200	188900.2800
⊞ Boise	Total		54911.9500	48779.5400	46815.5700	35944.9200
⊞ Boston	Total		9879.1900	7797.8800	20019.8700	17798.2200
⊞ Bridgeport	Total		91923.0100	48026.8800	72946.8000	60720.0300

Figure 62 Drill down report

The above figure shows how drill down operation works. Using the location hierarchy, it is able to step down to analyze the detail level data of Coupon Used Expense and Total Discounted Expense of customers for the year 2012 and 2013 in a state wise basis and further according to zip code too.

In addition, field validations are done to the report as shown below.

Figure 63 Field Validation

4.4 SSRS drill through Report

Drill through reports provide more efficient analysis by directing the user to another report when the user needs to know more details on the data of the current report. Instead of taking the user to a more granular level of the data , drill through takes him to a report that is relevant to the data being analyzed by just at a mouse click.

Charts were created to do a product drill through analysis. Initially the first level chart shows a product category wise visualization. Quantity and coupon discount for Year 2012 and 2013 in a Product category wise basis is analyzed at the first level.

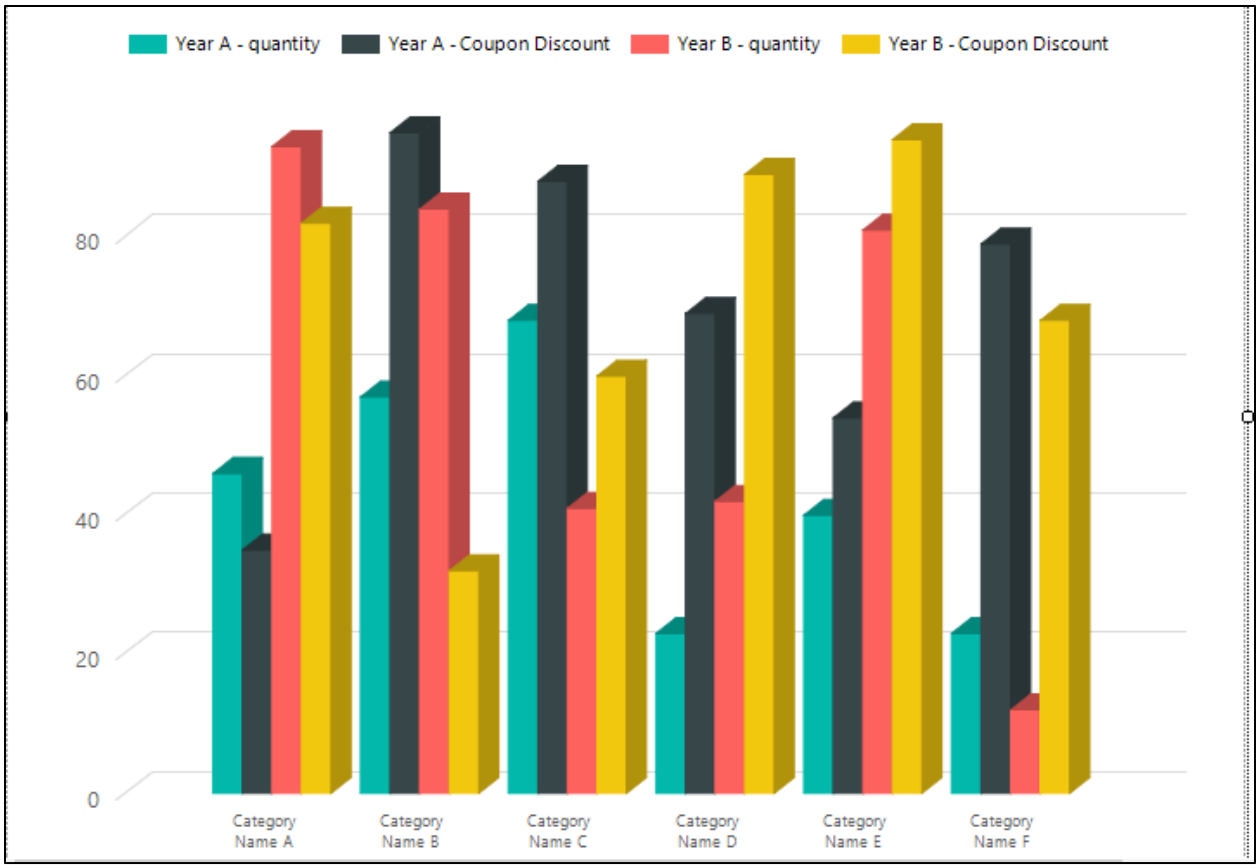


Figure 64 Level 1 Category analysis Design

Once the user needs to analyze this visualization further , user can click on a category to drill through to analyze Brands of that particular category at the second level.

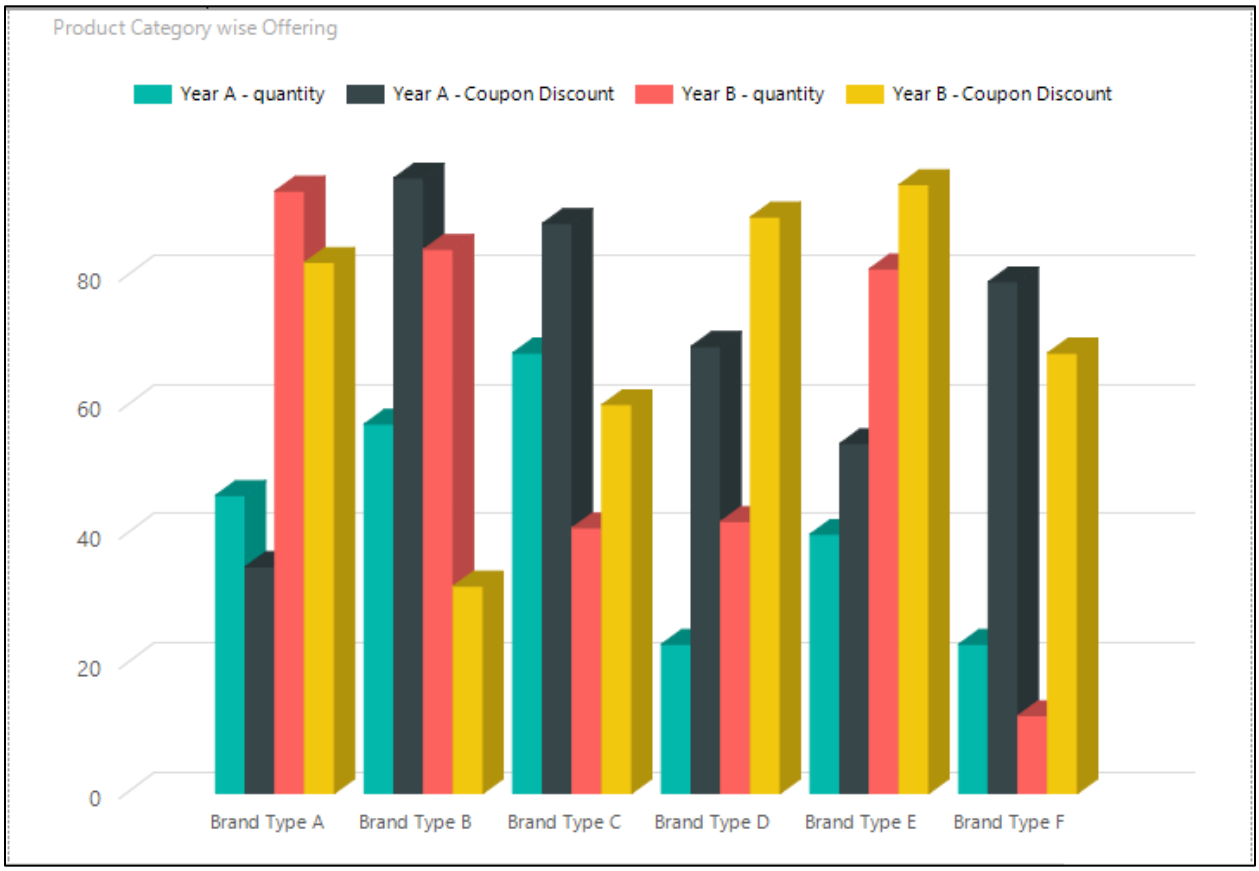


Figure 65 Brand Analysis of selected category Design

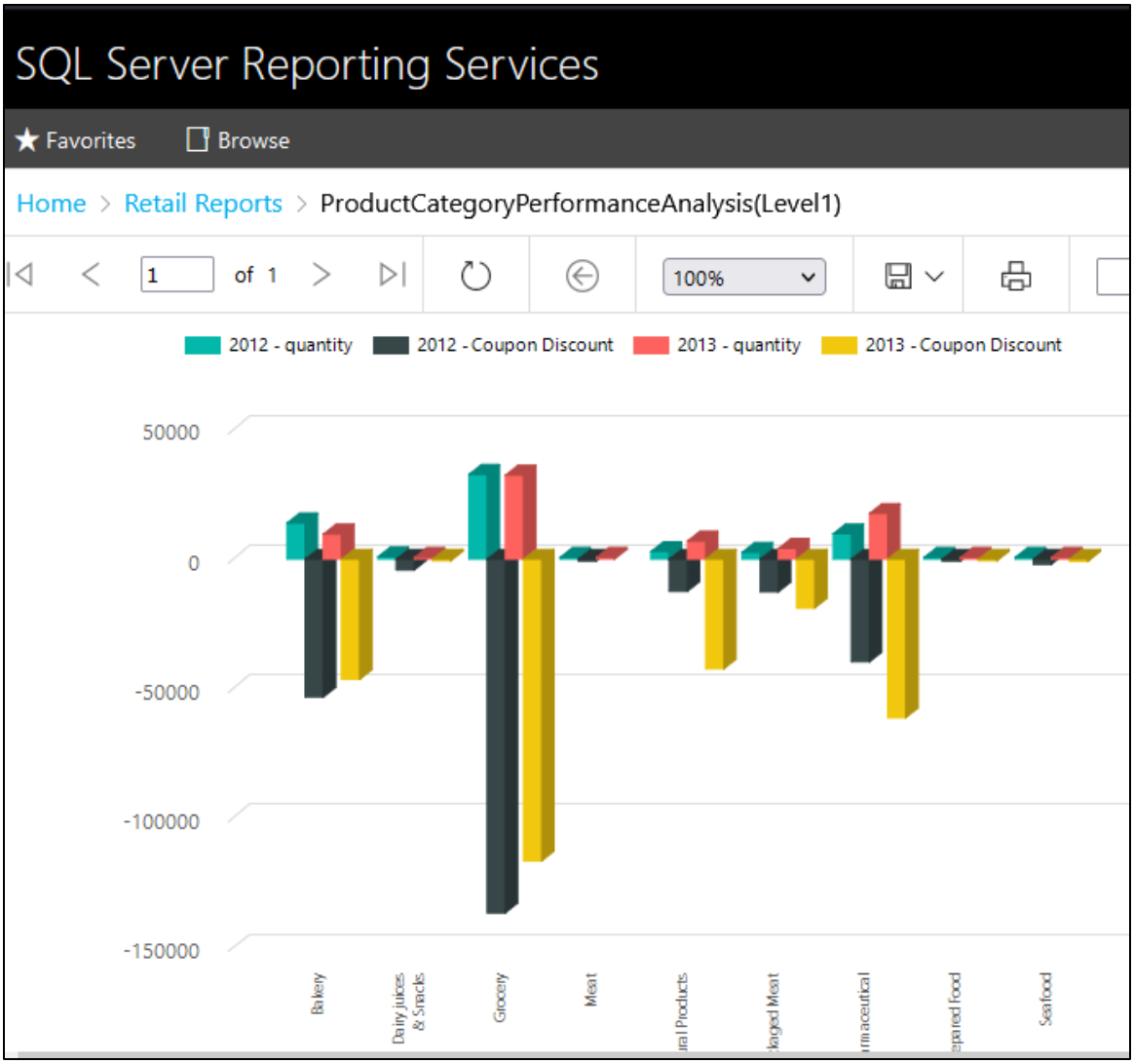


Figure 66 SSRS Category Analysis report

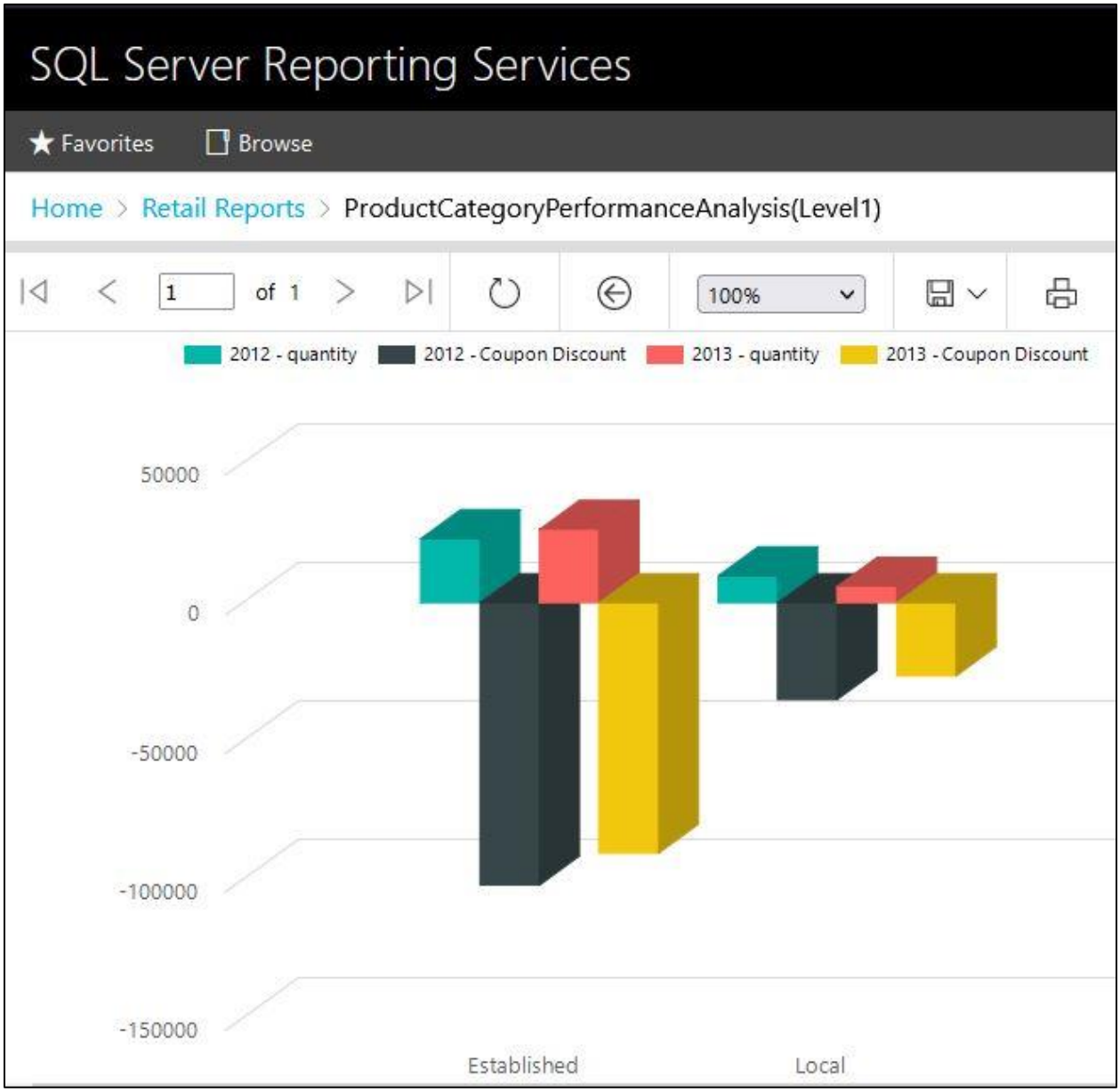


Figure 67 SSRS Brand Analysis for selected Category

As shown above when a particular category is clicked , brand wise analysis of that category can be done by a drill through operation.

Another drill through visualization was created to do another product wise visualization.

Initially the first level chart shows a product category wise visualization. Coupon Used Expense and Total Discounted expense for Year 2012 and 2013 in a Product category wise basis is analyzed at the first level.

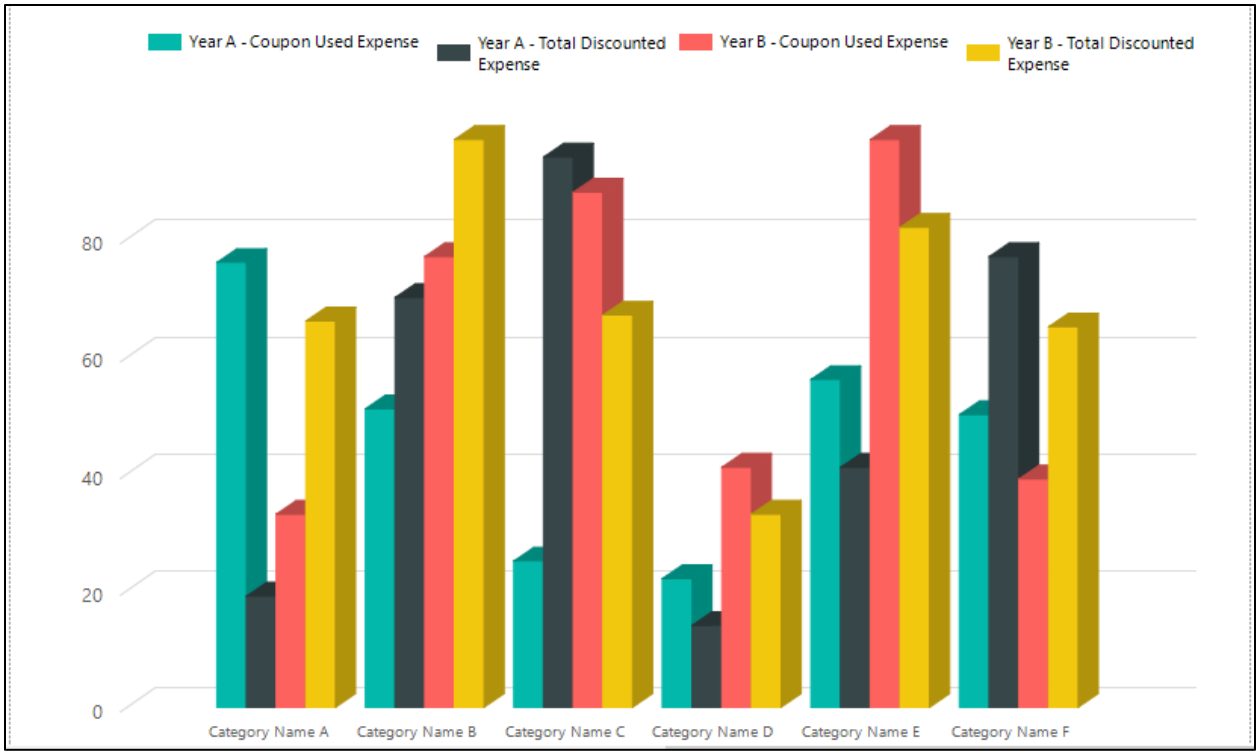


Figure 68 Level 1 Category Analysis design

Once the user needs to analyze this visualization further , user can click on a category to drill through to analyze brands of that particular category at the second level.

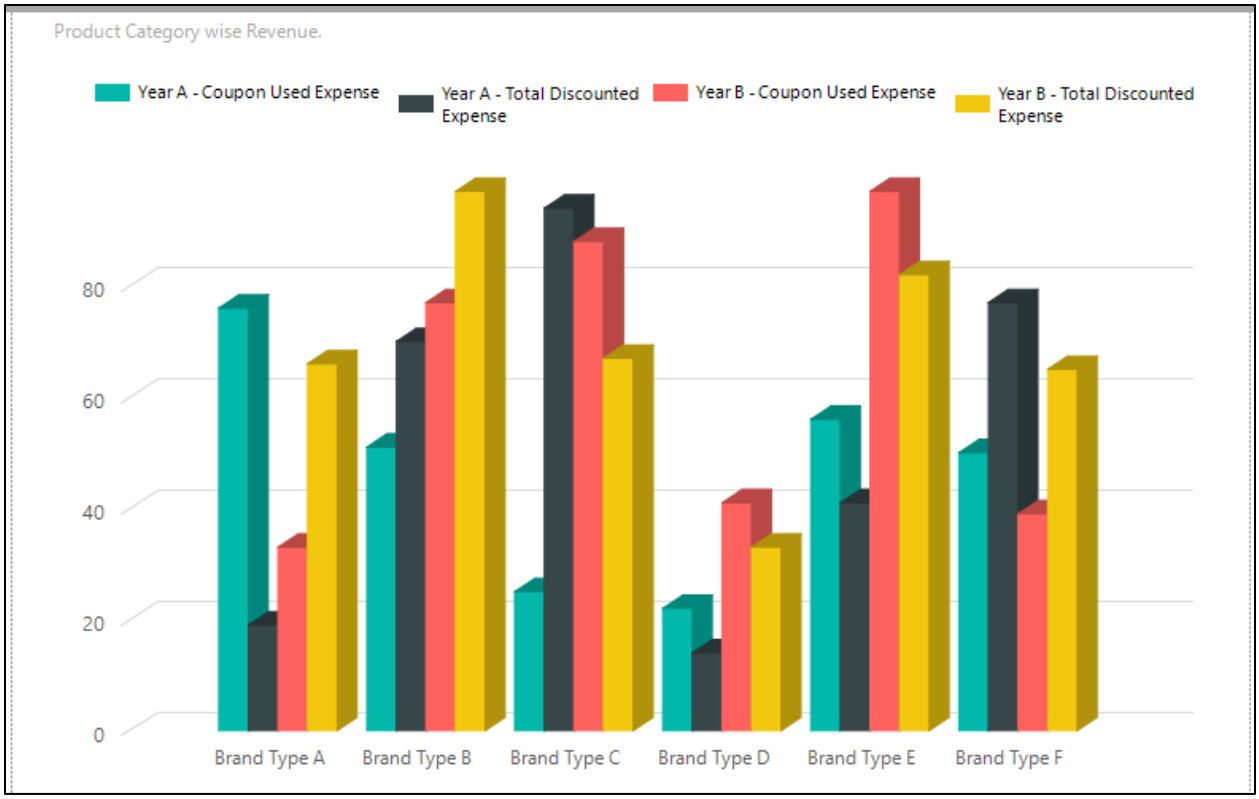


Figure 69 Brand analysis of Category Design

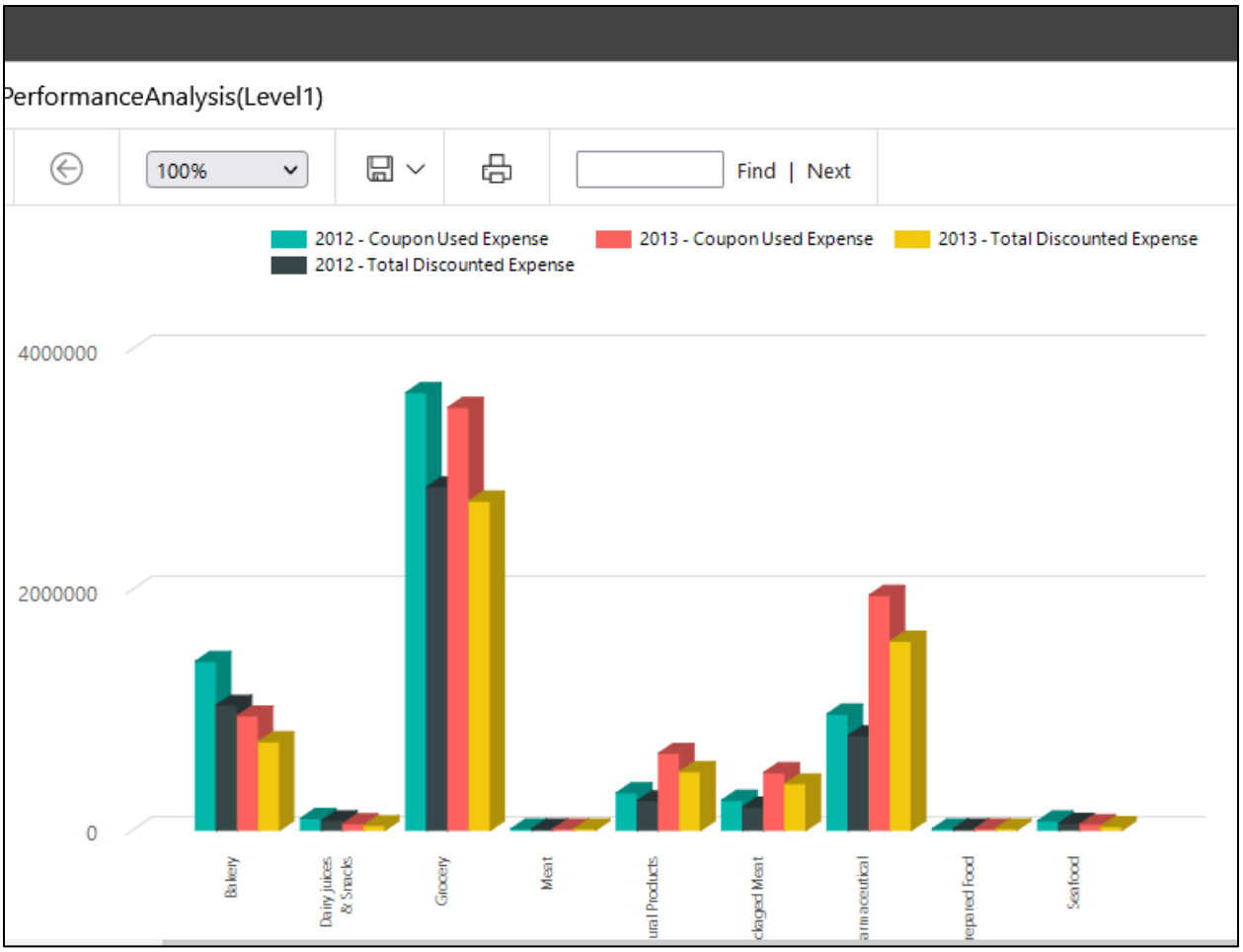


Figure 70 SSRS Category Analysis

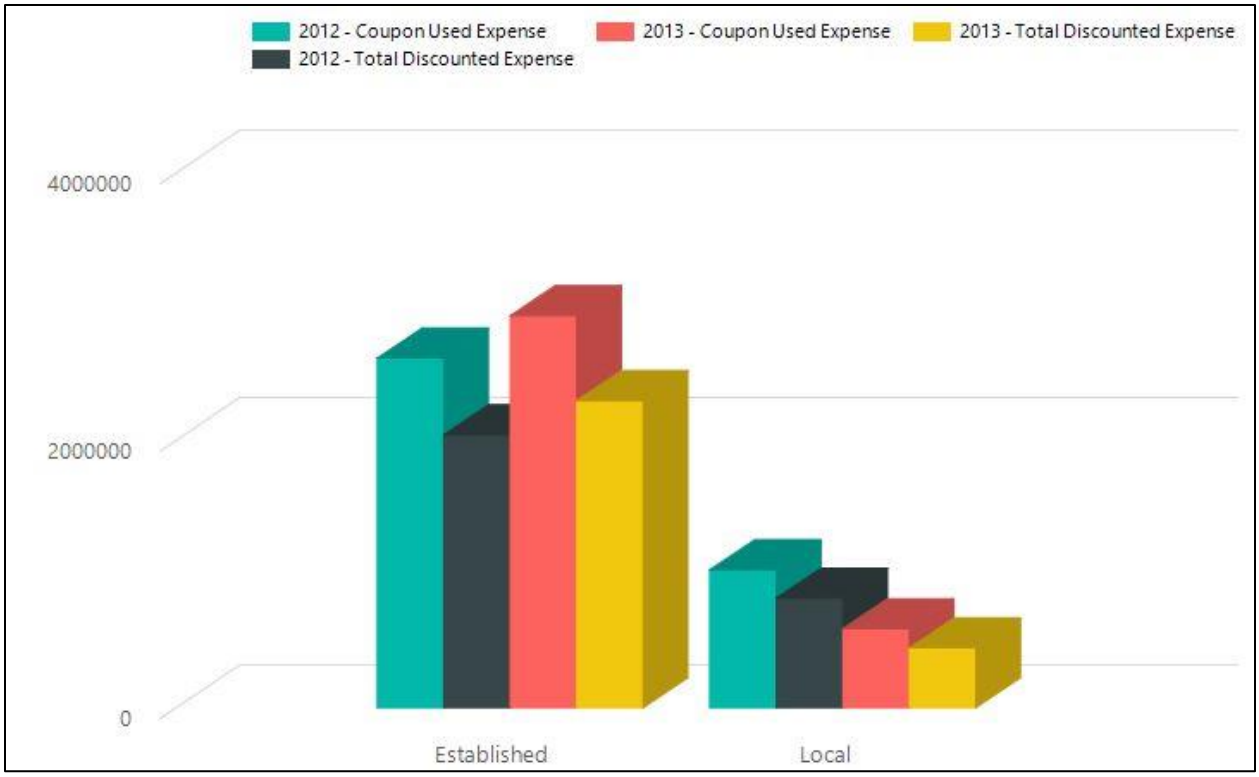


Figure 71 SSRS Brand Analysis for selected Category

As shown above when a particular category is clicked , brand wise analysis of that category can be done by a drill through operation

5.0 References

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