Data Warehousing & Business Intelligent
3rd Year, 1st Semester

Assignment 2

Submitted to

Sri Lanka Institute of Information Technology

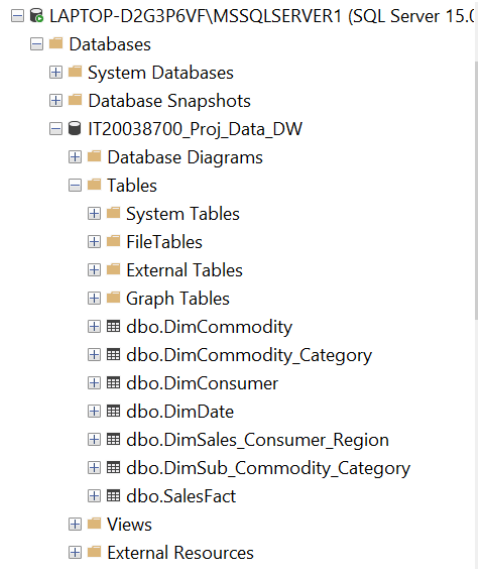Bachelor of Science Special Honors Degree
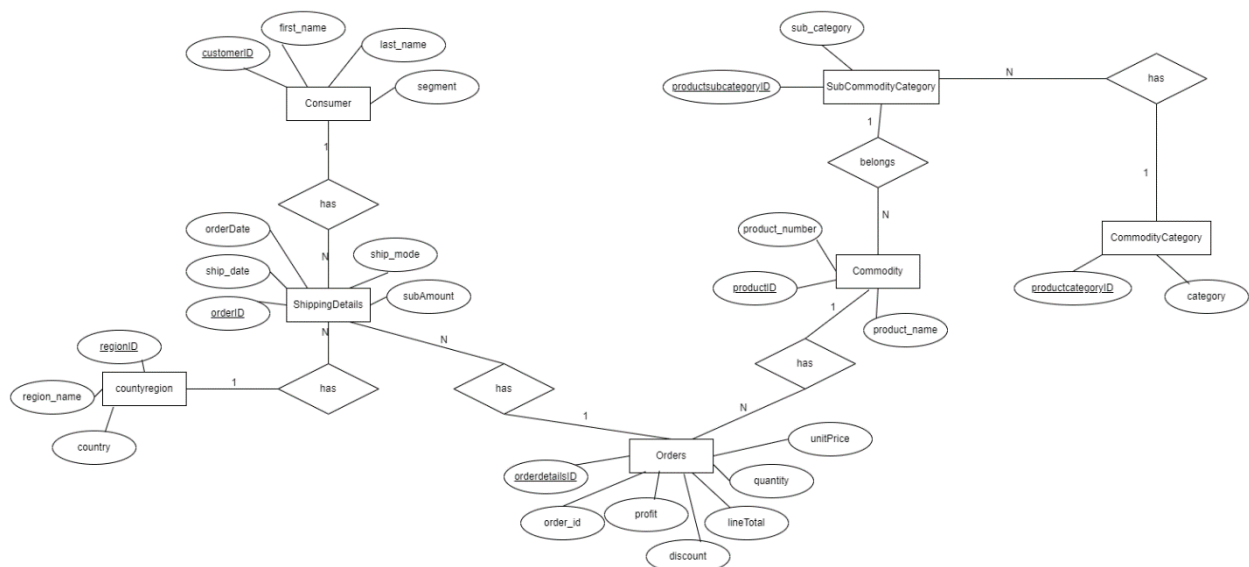in Data Science

IT20038700

S.A.C.H.Senadeera

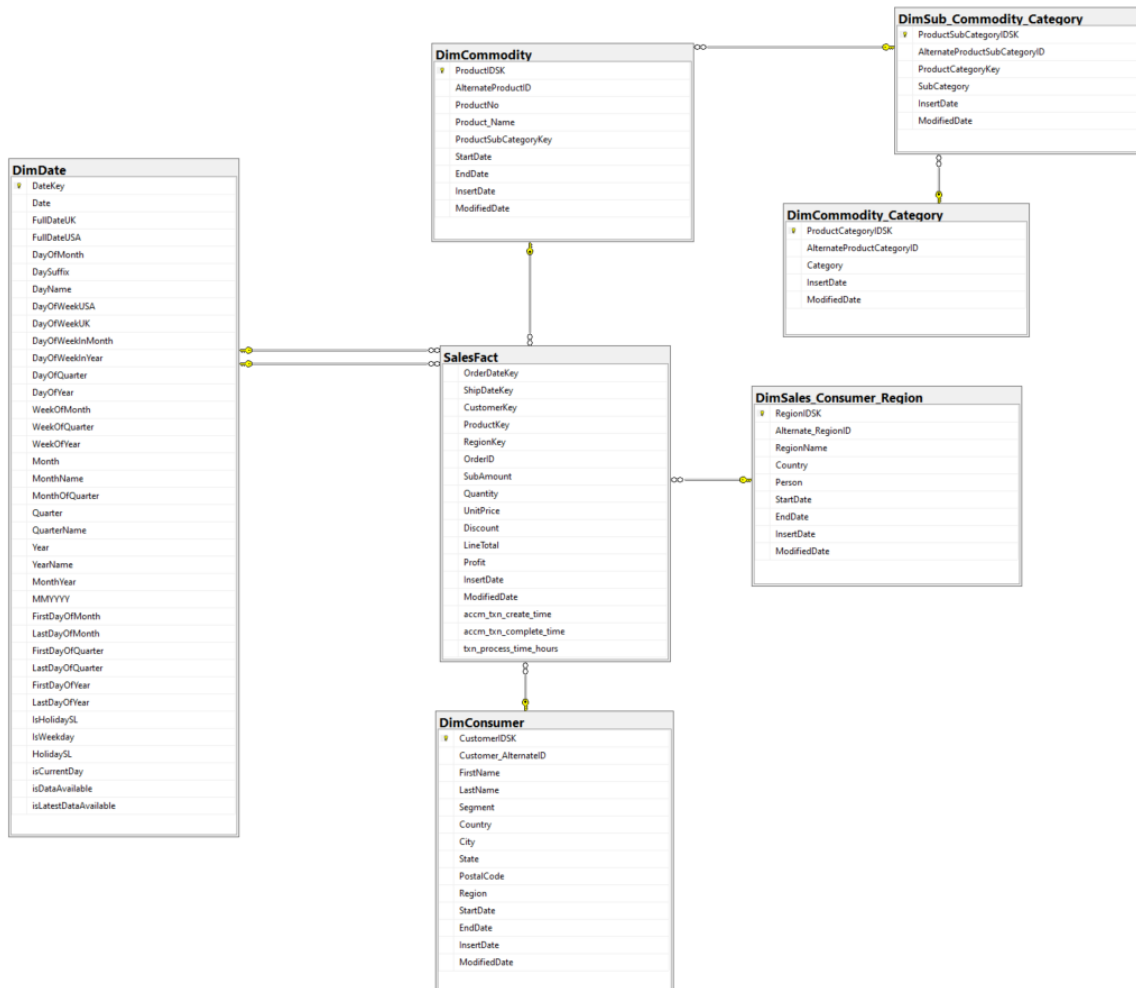Weekend Batch

Step 1: Data source

Data Warehouse design at the **Assignment 1** is used as the data source for this Assignment. Data Warehouse consists of 6-dimension tables and one fact table(SalesFact) to represent Superstore data altogether.

ER Diagram for Source System

Data Warehouse Diagram

Step 2: SSAS Cube Implementation

SSAS cube implementation is followed with several steps.

I. Project Creation

SSAS project is created in Visual studio for the Superstore data in data warehouse. The project is renamed to **IT20038700_Proj_Assignment1.**

II. Data Source Configuration

In the created project, data source folder is selected under the **IT20038700_Proj_Assignment1** package. After creating a connection to the MS SQL server, 'the **IT20038700_Proj_DATA DW**'
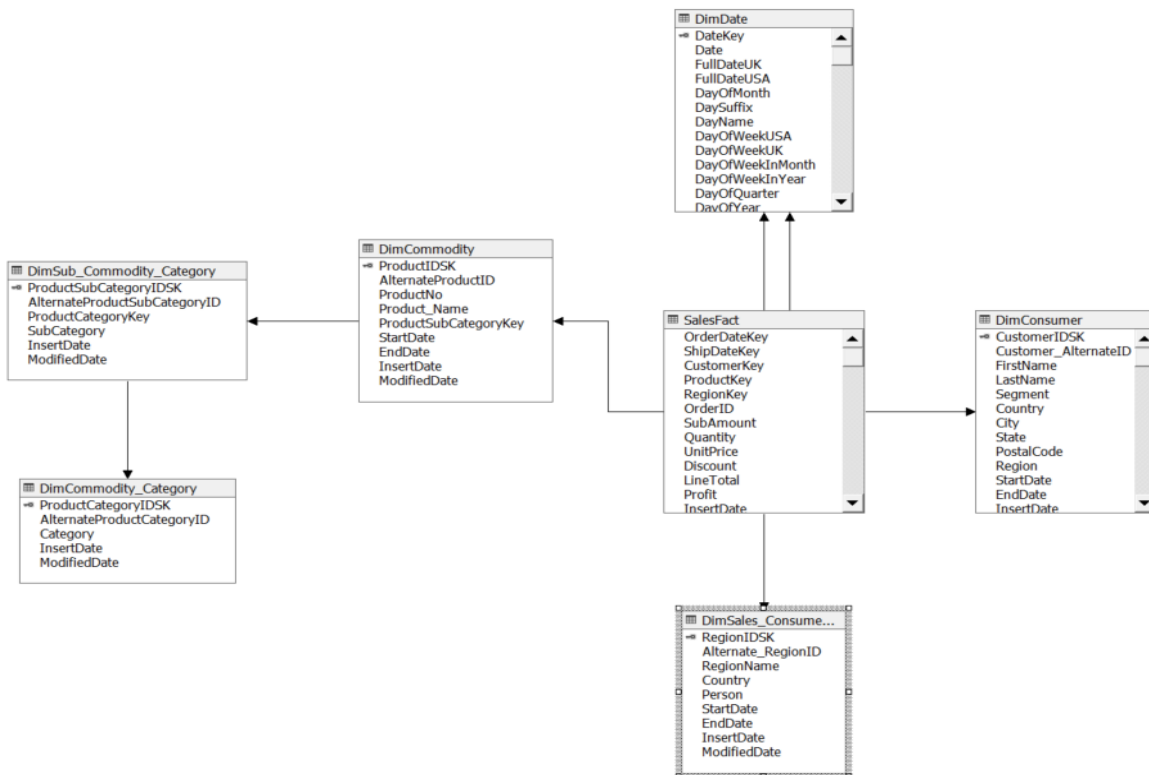
database in SQL server has been selected as the data source.

III.   Data Source View Configuration

In the Data Source View Wizard, configured data source has been selected. Then the necessary tables and views required for cube design has been selected as shown below.
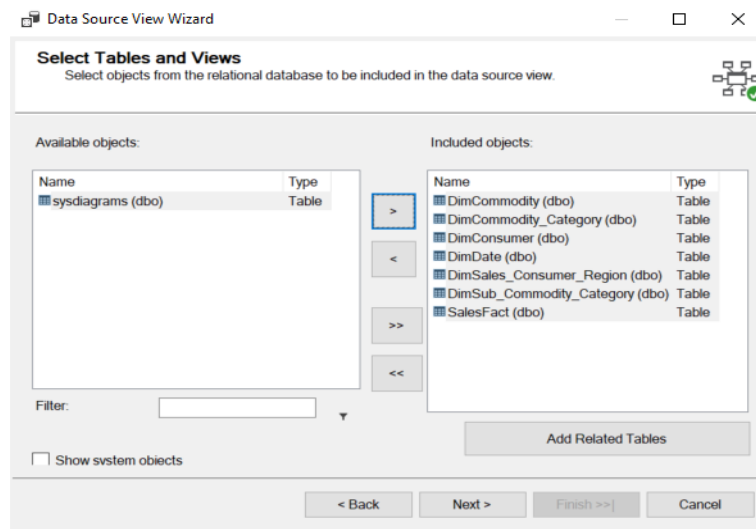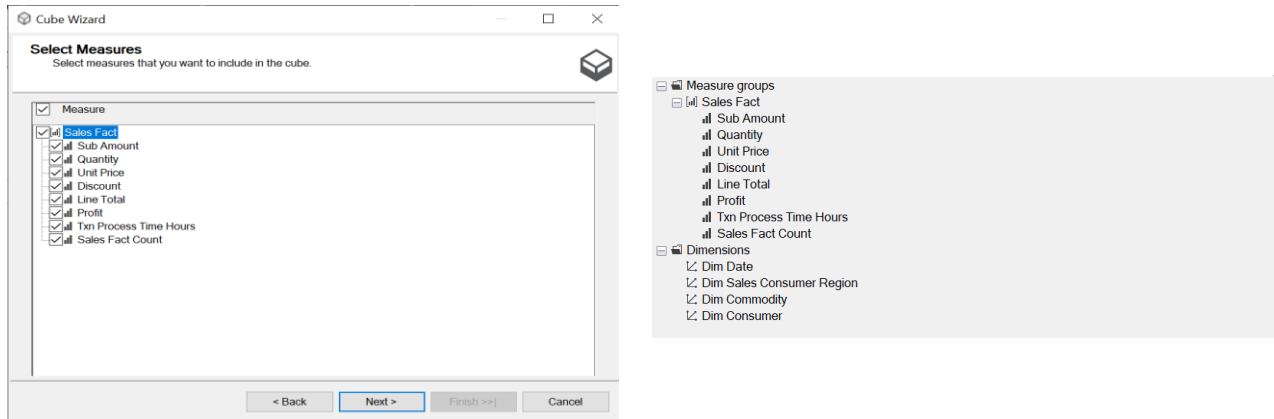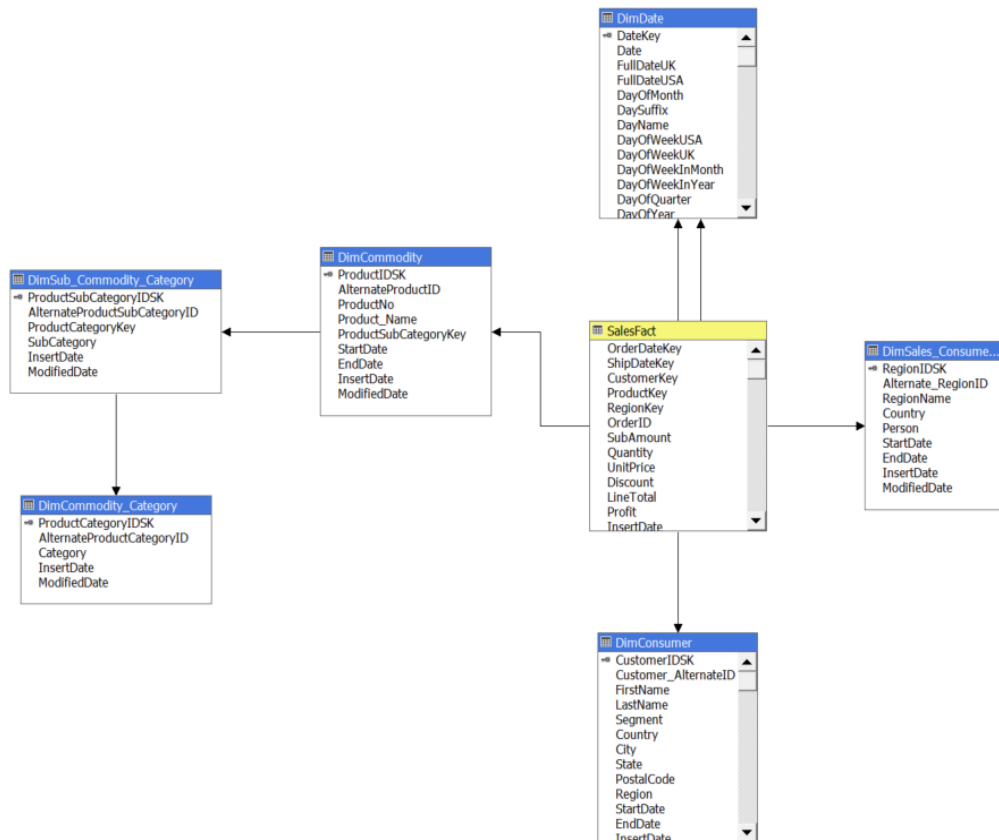

Data Source View

IV. Cube Design

In the Cube wizard SalesFact has been selected as the Measure table and DimCommodity, DimCommodity_Category, DimSub_Commodity_Category, DimDate, DimConsumer and DimSales_Consumer as dimension tables for the cube.

Cube Design

V.   Cube Implementation

Implementing Hierarchies

- Hierarchies on DimDate

- Hierarchies on DimConsumer

Then the SSAS was deployed in SQL server management studio. The deployed data cube contains the SalesFact measure table with DimCommodity, DimConsumer, Dim Date, Dim Sales Consumer Region dimension tables.
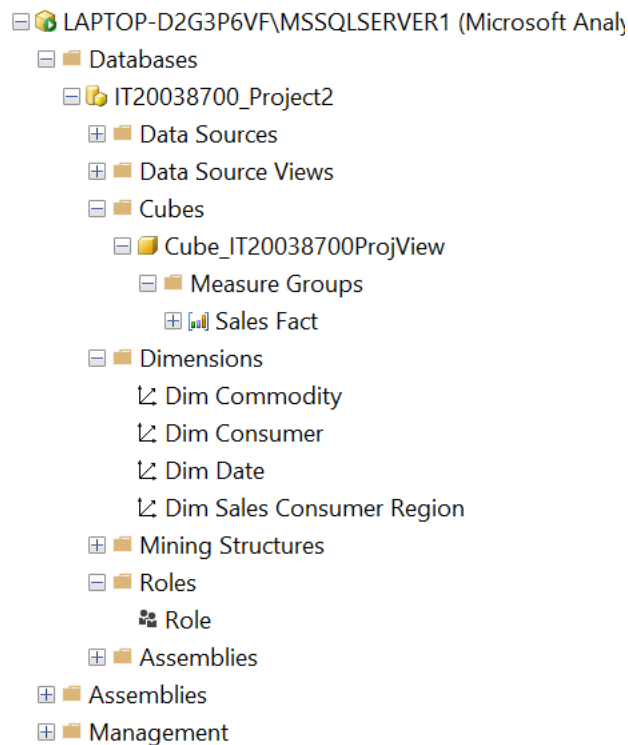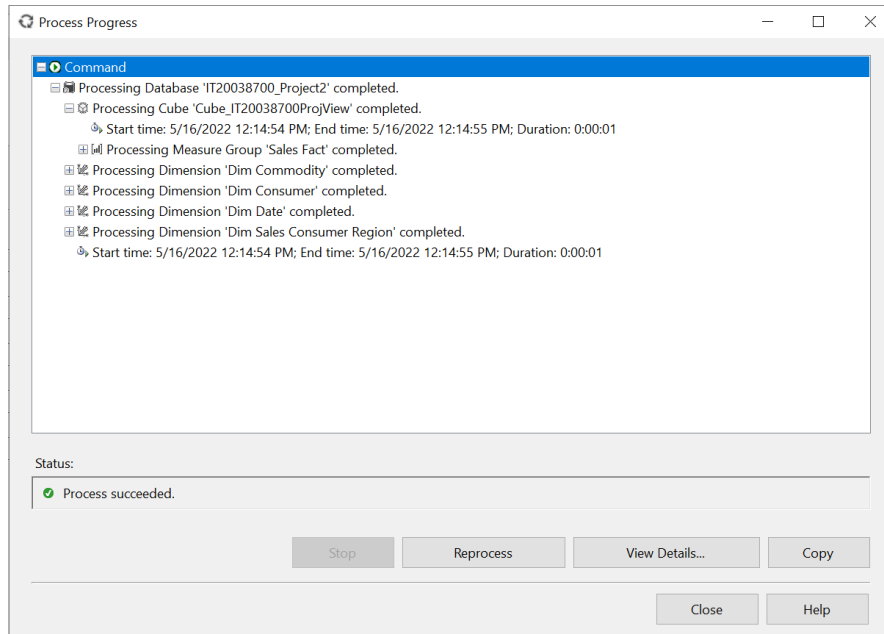
KPI Creation

KPI is designed on SubAmount attribute of Measures. It checks if the SubAmount is more than $50. If so value is set to success(True) else set to fail(False).

Date Key	KPI Sub Amount Value	KPI Sub Amount Goal
20140113	574.217987239361	True
20140114	61.4599990844727	True
20140115	149.949998855591	True
20140116	17.887999355793	False
20140117	(null)	False
20140118	64.6639984101057	True
20140119	31.6399996876717	False
20140120	106.403999149799	True
20140121	25.0480010956526	False
20140122	(null)	False
20140123	46.0199990272522	False
20140124	(null)	False
20140125	(null)	False
20140126	23.0999999046326	False
20140127	36.439998626709	False
20140128	3.72799997031689	False
20140129	(null)	False
20140130	10.5600004196167	False

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 i.e. Cube_IT20038700ProjView database is selected. Then the data there gets imported as a pivot table report.
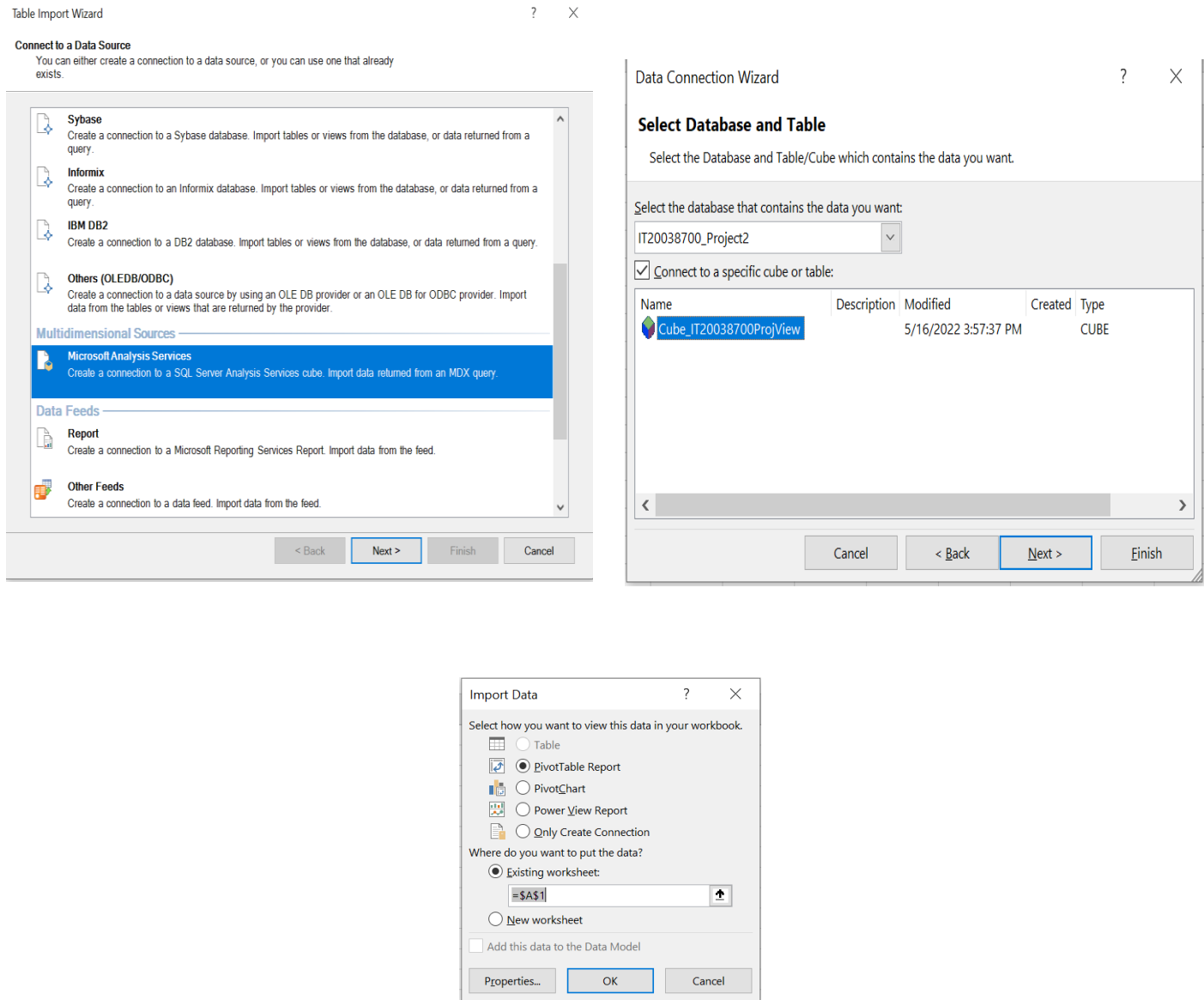
i. Roll-Up

It can be seen Product Discount, Line Total, Unit Price and the Sub Amount is displayed for each Sub Category type. High level understanding can be obtained.

MeasuresKPI SubAmount Goal	True			
Row Labels	Sum of MeasuresDiscount	Sum of MeasuresLine Total	Sum of MeasuresUnit Price	Sum of MeasuresSub Amount
Accessories	22.60000034	45623.53197	12860.68604	45600.93206
Appliances	36.10000054	24611.47801	7128.06497	24575.37784
Art	40.4000006	13075.17	3597.484005	13034.77002
Binders	386.2	64087.04768	18331.70086	63700.84745
Bookcases	12.37000014	26898.28408	8339.59779	26885.91407
Chairs	33.50000084	96973.28109	25179.93209	96939.78138
Copiers	3.000000045	33639.51532	10559.84995	33636.51584
Envelopes	11.40000017	6971.129969	2187.553977	6959.729912
Furnishings	70.20000221	33247.72196	9148.741996	33177.52195
Labels	15.60000023	4512.391978	1337.932	4496.792001
Machines	7.70000001	28435.12082	8293.817003	28427.42105
Paper	58.40000087	31529.24397	9583.40795	31470.84384
Phones	48.80000073	82214.77785	24467.72406	82165.97828
Storage	24.80000037	62580.4721	17823.41209	62555.67235
Supplies	7.800000116	7229.377955	2706.909985	7221.57795
Tables	30.50000045	65057.88839	17992.17698	65027.38846
Grand Total	**809.3700077**	**626686.4331**	**179538.9917**	**625877.0644**
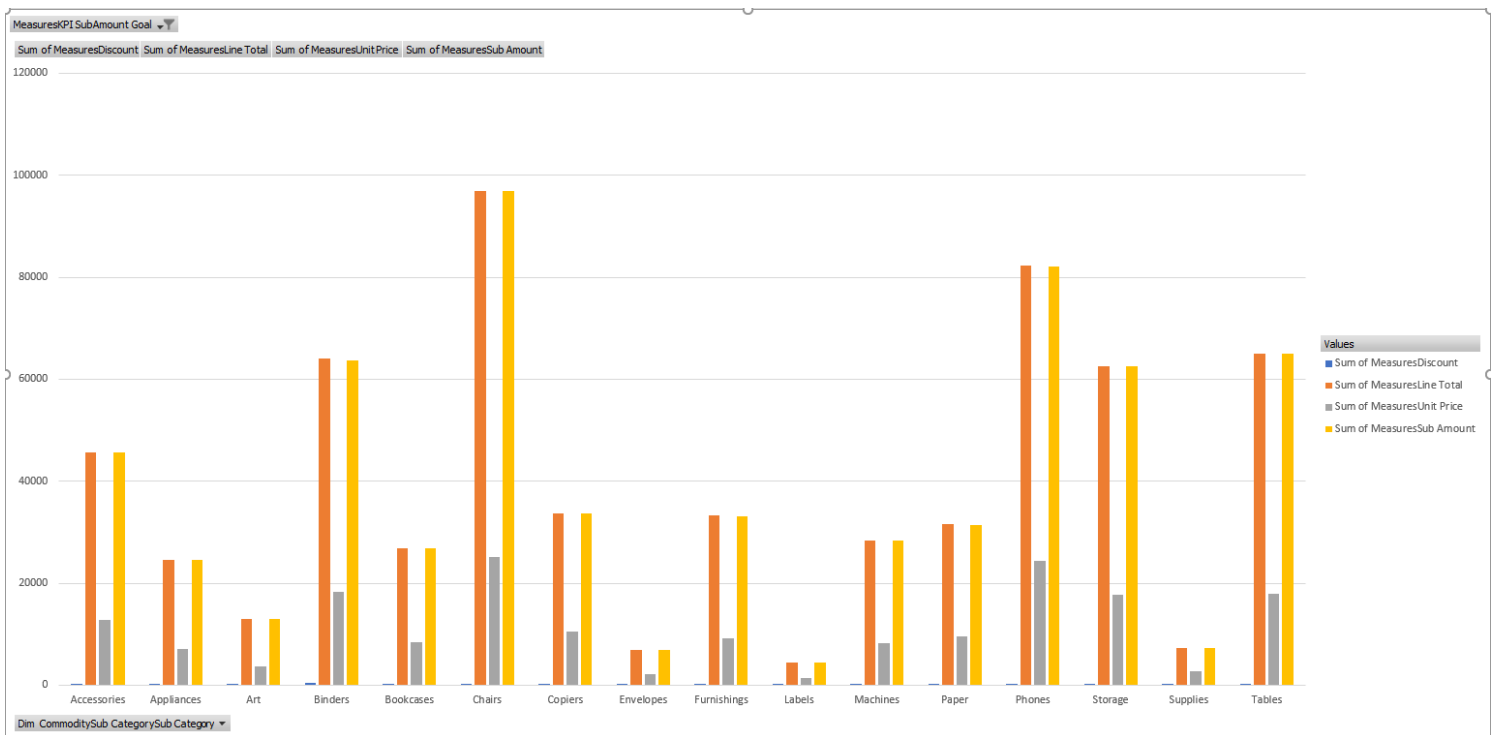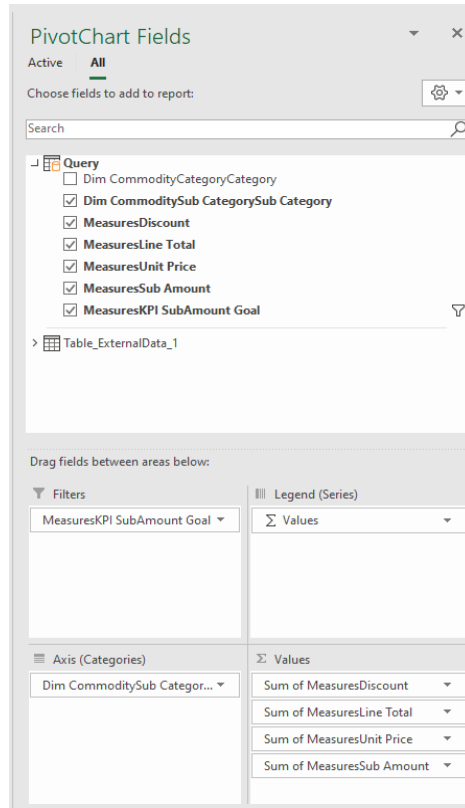
ii. Drill-Down

In depth understanding of Superstore details for each Sub Category type on each Category can be obtained through the completely drilled down pivot table.

MeasuresKPI SubAmount Goal	True			
Row Labels	Sum of MeasuresDiscount	Sum of MeasuresLine Total	Sum of MeasuresUnit Price	Sum of MeasuresSub Amount
⊟Furniture				
Bookcases	12.37000014	26898.28408	8339.59779	26885.91407
Chairs	33.50000084	96973.28109	25179.93209	96939.78138
Furnishings	70.20000221	33247.72196	9148.741996	33177.52195
Tables	30.50000045	65057.88839	17992.17698	65027.38846
⊟Office Supplies				
Appliances	36.10000054	24611.47801	7128.06497	24575.37784
Art	40.4000006	13075.17	3597.484005	13034.77002
Binders	386.2	64087.04768	18331.70086	63700.84745
Envelopes	11.40000017	6971.129969	2187.553977	6959.729912
Labels	15.60000023	4512.391978	1337.932	4496.792001
Paper	58.40000087	31529.24397	9583.40795	31470.84384
Storage	24.80000037	62580.4721	17823.41209	62555.67235
Supplies	7.800000116	7229.377955	2706.909985	7221.57795
⊟Technology				
Accessories	22.60000034	45623.53197	12860.68604	45600.93206
Copiers	3.000000045	33639.51532	10559.84995	33636.51584
Machines	7.70000001	28435.12082	8293.817003	28427.42105
Phones	48.80000073	82214.77785	24467.72406	82165.97828
Grand Total	**809.3700077**	**626686.4331**	**179538.9917**	**625877.0644**

iii.   Slice

MeasuresKPI SubAmount Goal	All		
Sum of MeasuresDiscount	**Sum of MeasuresLine Total**	**Sum of MeasuresUnit Price**	**Sum of MeasuresSub Amount**
386.2	64087.04768	18331.70086	63700.84745

Dim CommodityS...

- Accessories
- Appliances
- Art
- Binders
- Bookcases
- Chairs
- Copiers
- Envelopes

MeasuresKPI SubAmount Goal

Sum of MeasuresDiscount   Sum of MeasuresLine Total   Sum of MeasuresUnit Price   Sum of MeasuresSub Amount

Values
- Sum of MeasuresDiscount
- Sum of MeasuresLine Total
- Sum of MeasuresUnit Price
- Sum of MeasuresSub Amount
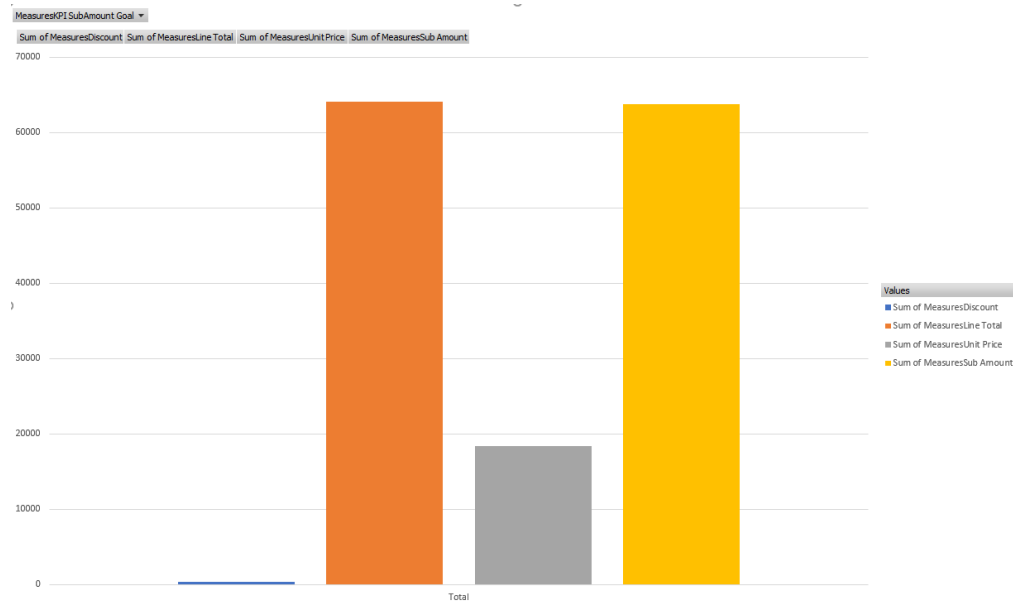
MeasuresKPI SubAmount Goal	All		
Sum of MeasuresDiscount	**Sum of MeasuresLine Total**	**Sum of MeasuresUnit Price**	**Sum of MeasuresSub Amount**
820.9700079	628493.5671	180012.6997	627672.5984
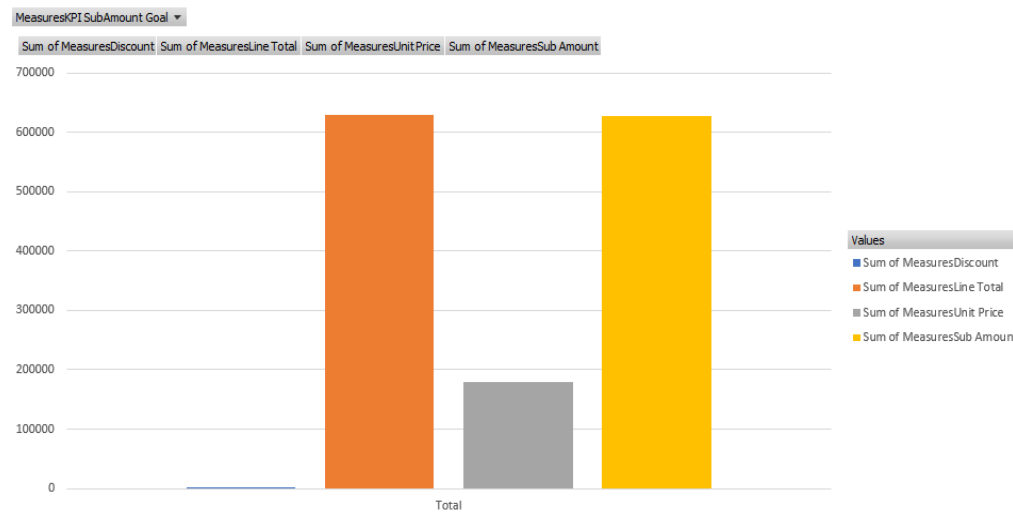
Dim CommodityC...

- Furniture
- Office Supplies
- Technology

MeasuresKPI SubAmount Goal

Sum of MeasuresDiscount   Sum of MeasuresLine Total   Sum of MeasuresUnit Price   Sum of MeasuresSub Amount

Values
- Sum of MeasuresDiscount
- Sum of MeasuresLine Total
- Sum of MeasuresUnit Price
- Sum of MeasuresSub Amount

iv. Dice

A new column-wise categorization is introduced so that values can be filtered in two dimensions.

MeasuresKPI SubAmount Goal	All			
Sum of MeasuresDiscount	**Sum of MeasuresLine Total**	**Sum of MeasuresUnit Price**	**Sum of MeasuresSub Amount**	
386.2	64087.04768	18331.70086	63700.84745	

Dim CommodityC... — Office Supplies, Furniture, Technology

Dim CommodityS... — Accessories, Appliances, Art, Binders, Bookcases, Chairs, Copiers, Envelopes

MeasuresKPI SubAmount Goal ▾

Sum of MeasuresDiscount   Sum of MeasuresLine Total   Sum of MeasuresUnit Price   Sum of MeasuresSub Amount

Values
- Sum of MeasuresDiscount
- Sum of MeasuresLine Total
- Sum of MeasuresUnit Price
- Sum of MeasuresSub Amount

Total

Step 3: SSRS Reports

> **Used Tools :-**
> Report server
> SSRS web portal
> Report Server Configuration Manager
> Report Server database

Preparation

Connection has been set to the data warehouse in report builder

1. ## Report 1: Report with a matrix

Report with row of labels and column of labels is created. Commodity Quantity, Line Total and Sub Amount received by each **Year** can be observed through this report.

Column groups

Year

Row groups

Category
SubCategory

Σ Values

Sum(Quantity)
Sum(LineTotal)
Sum(SubAmount)

Commodity_Category-wise YOY Sales Report

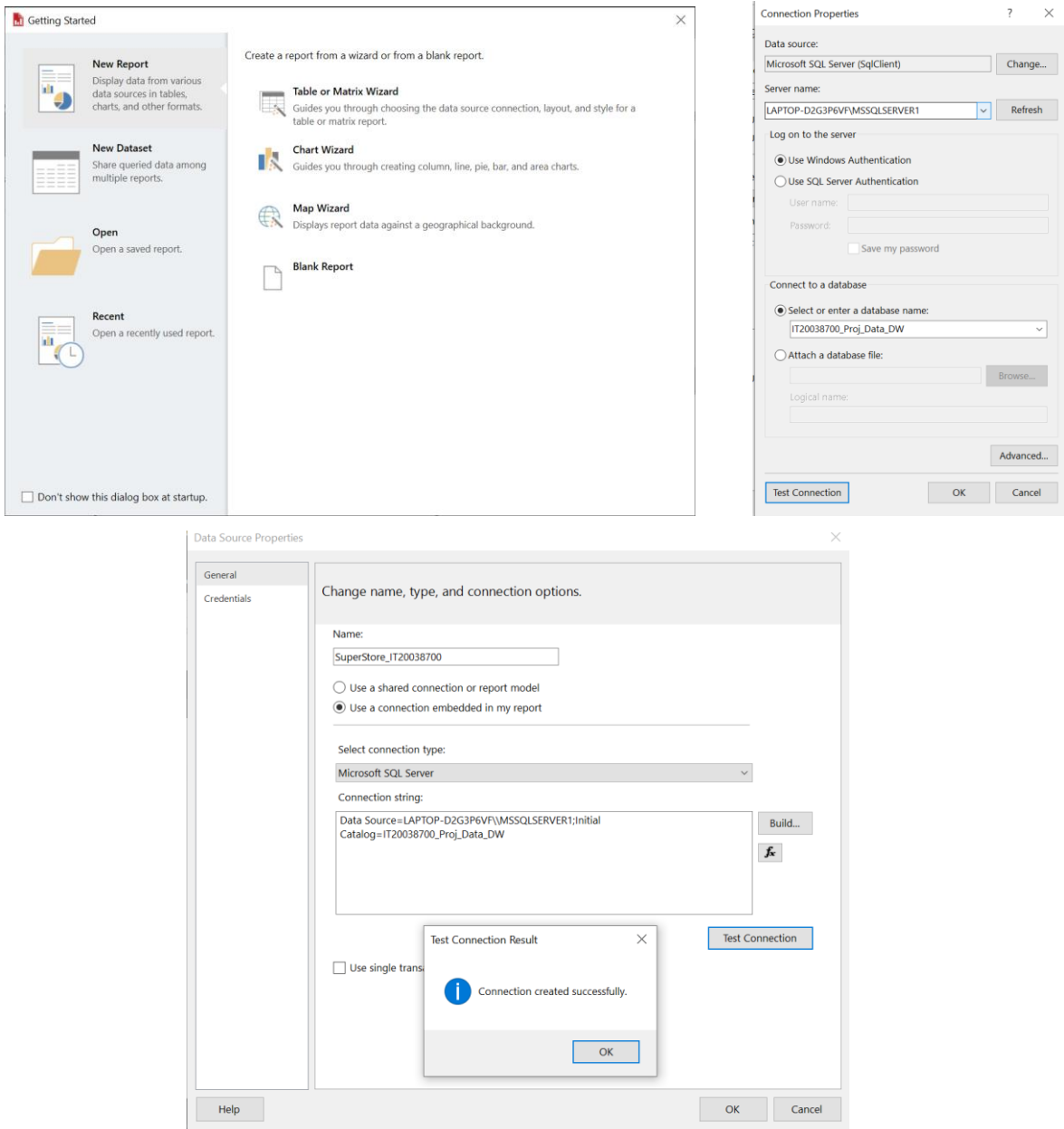|		[Year]			Total		
Category	Sub Category	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount
[Category]	[SubCategory]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]
	Total	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]
Total		**[Sum(Quantity)]**	**[Sum(LineTotal)]**	**[Sum(SubAmount)]**	**[Sum(Quantity)]**	**[Sum(LineTotal)]**	**[Sum(SubAmount)]**

[&ExecutionTime]

Commodity_Category-wise YOY Sales Report

		2014			2015			2016			2017			Total		
Category	Sub Category	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount
Furniture	Total	26	1959.81698989868	1958.6169712618	32	1650.40398406982	1649.40401670337	57	5550.62800979614	5548.37801261246	64	4051.27199411392	4049.07194446027	179	13212.1209778786	13205.4709450379
Office Supplies	Total	127	3052.7340105176	3045.93397533894	114	1059.64200496674	1051.24199835211	147	1574.36999130249	1567.77000249922	161	3435.20598053932	3426.90596061945	549	9121.95198732615	9091.85193680972
Technology	Total	21	2179.19997596741	2178.6000174433	21	2169.81805419922	2169.41805800796	33	4308.03889465332	4306.53889274597	34	5480.25193548203	5478.45204894245	109	14137.308860302	14133.0090171397
Total		174	7191.75097638369	7183.15096404403	167	4879.86404323578	4870.06407306343	237	11433.036895752	11422.6869078577	259	12966.7299101353	12954.4299540222	837	36471.3818255067	36430.3318989873

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2. Report 2: Report with more than one parameter

Data in a given commodity Category in a given Sub Category can be observed though this report.

Commodity_SubCategory-wise YOY Sales Report

	[Year]			
Sub Category	Quantity	Line Total	Discount	Sub Amount
[SubCategory]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(Discount)]	[Sum(SubAmount)]

[&UserID]   [&ExecutionTime]

Commodity_Category Furniture   Sub_Category Bookcases

Commodity_SubCategory-wise YOY Sales Report

	2016			
Sub Category	Quantity	Line Total	Discount	Sub Amount
Bookcases	7	712.732978820801	0.350000008940697	712.383001700044

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3. Report 3: SSRS Drill Down Report

Drill Down Analysis

Category	Sub Category	[Year]			Total		
		Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount
[Category]	[SubCategory]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]
	Total	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]
Total		[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]	[Sum(Quantity)]	[Sum(LineTotal)]	[Sum(SubAmount)]

Drill Down Analysis

Category	Sub Category	2014			2015			2016			2017			Total		
		Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount	Quantity	Line Total	Sub Amount
⊟ Furniture	Bookcases							7	712.732978820801	712.383001700044				7	712.732978820801	712.383001700044
	Chairs	19	1907.1969909668	1906.59697187692	11	1282.48797607422	1282.08800658584	12	1592.78802490234	1592.5880496949	18	1142.02801513672	1141.32800367475	60	5924.50100708008	5922.6010318324
	Furnishings	7	52.6199989318848	52.0199993848801	21	367.916007995605	367.316010117531	25	993.757991790771	993.158007994294	29	325.532003879547	324.931996226311	82	1739.82600259781	1737.42601372302
	Tables							13	2251.34901428223	2250.24895322323	17	2583.71197509766	2582.81194455922	30	4835.06098937988	4833.06089778244
	Total	26	1959.81698989868	1958.6169712618	32	1650.40398406982	1649.40401670337	57	5550.62800979614	5548.37801261246	64	4051.27199411392	4049.07194446027	179	13212.1209778786	13205.4709450379
⊟ Office Supplies	Appliances	11	928.504018783569	928.103057742453	8	162.410002231598	160.710002206266	4	63.2999992370605	63.2999992370605	6	831.3759765625	830.97597655654	29	1985.58999681473	1983.08993574232
	Art	17	287.330006599426	286.929995149874	18	100.159999847412	99.3599994778633	16	245.450000762939	245.450003623962	24	178.667997360229	178.0679987818	75	811.608004570007	809.807997033
	Binders	18	257.98599845171	253.385998591781	26	163.173997402191	159.074001222849	39	229.754000663757	225.354001998901	55	350.900000810623	345.399997144938	138	1001.81399732828	983.213998958468
	Envelopes	7	29.7599992752075	29.5599992722273	3	29.3400001525879	29.3399991989136	15	282.571992874146	282.371999070048	7	53.539999961853	53.539999961853	32	395.211992263794	394.811997503042
	Fasteners	16	37.539999961853	37.34000043571	2	5.84000015258789	5.84000015258789	9	21.9999995231628	21.9999996423721	3	11.1900000572205	11.1900000572205	30	76.5699996948242	76.3700002878904
	Labels	12	35.3699998855591	35.3700013160706	5	20.5939998626709	20.3939998596907	11	72.7600002288818	72.5599997490644	7	49.6099987030029	49.6099987030029	35	178.333998680115	177.933996427829
	Paper	27	458.27198600769	457.871990770102	26	136.912002563477	135.711999207735	26	314.763996124268	313.564000159502	45	943.482008457184	941.681994602084	124	1853.42999315262	1848.82998473942
	Storage	17	1010.61200141907	1010.0120319277	26	441.212002754211	440.811997026205	10	173.139999389648	172.740003198385	14	1016.43999862671	1016.43999481201	67	2641.40400218964	2640.00402696431
	Supplies	2	7.3600001335144	7.3600001335144				17	170.630002498627	170.429995819926				19	177.990002632141	177.789995953441
	Total	127	3052.7340105176	3045.93397533894	114	1059.64200496674	1051.24199835211	147	1574.36999130249	1567.77000249922	161	3435.20598053932	3426.90596061945	549	9121.95198732615	9091.85193680972
⊟ Technology	Total	21	2179.19997596741	2178.6000174433	21	2169.81805419922	2169.41805800796	33	4308.03889465332	4306.53889274597	34	5480.25193548203	5478.45204894245	109	14137.308860302	14133.0090171397
Total		174	7191.75097638369	7183.15096404403	167	4879.86404323578	4870.06407306343	237	11433.036895752	11422.6869078577	259	12966.7299101353	12954.4299540222	837	36471.3818255067	36430.3318989873

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4. Report 3: SSRS Drill Through Report

Report to represent Sub Amount and Line Total for a given year has been created. Further For each Category it can be checked whether the amount is gained through Which Sub Category by clicking on columns of the column chart. Then it will be directed to another report with chart.
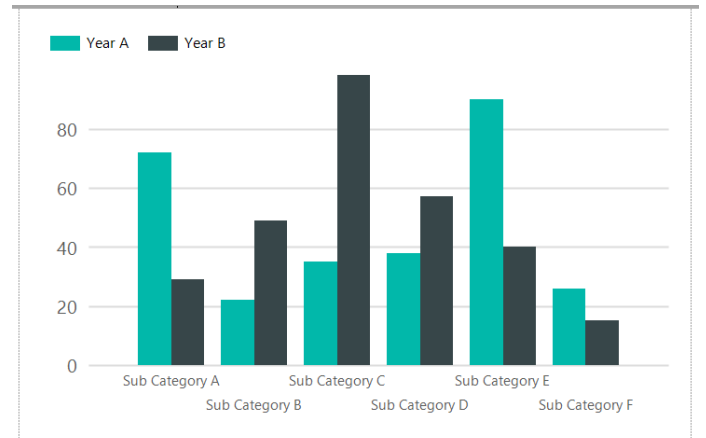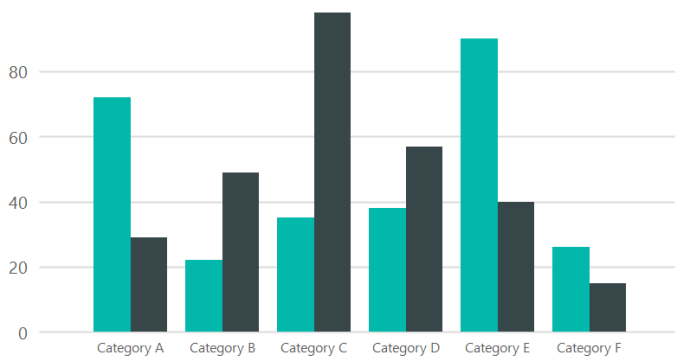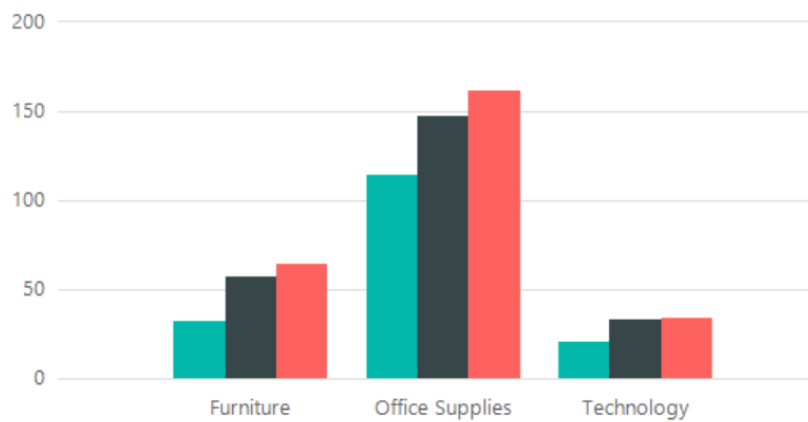

In order to perform the drill through necessary parameters should be set on the first report as shown below.

Text Box Properties

Change action options.

Enable as an action:

- ○ None
- ● Go to report
- ○ Go to bookmark
- ○ Go to URL

Specify a report:

/Commodity_Details-level 2 Sales Report

Use these parameters to run the report:

Add   Delete

Name	Value		Omit
SubCategory	[SubCategory]		

Help   OK   Cancel

Commodity_Details-level 1 Sales Report

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On click of the Category of the above report user gets directed to the below Another chart.

Commodity_Details-level 2 Sales Report

Sub Category	2015				2016				2017			
	Sub Amount	Unit Price	Discount	Line Total	Sub Amount	Unit Price	Discount	Line Total	Sub Amount	Unit Price	Discount	Line Total
Chairs	1282.08800658584	306.176002502441	0.400000005960464	1282.48797607422	1592.5880496949	308.964010238647	0.200000002980232	1592.78802490234	1141.32800367475	409.348003387451	0.700000017881393	1142.02801513672

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Final set of reports: