



Sri Lanka Institute of Information Technology

Data Warehousing & Business Intelligence

Assignment 02

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Y3S1 – 04 (DS – WEEKEND)

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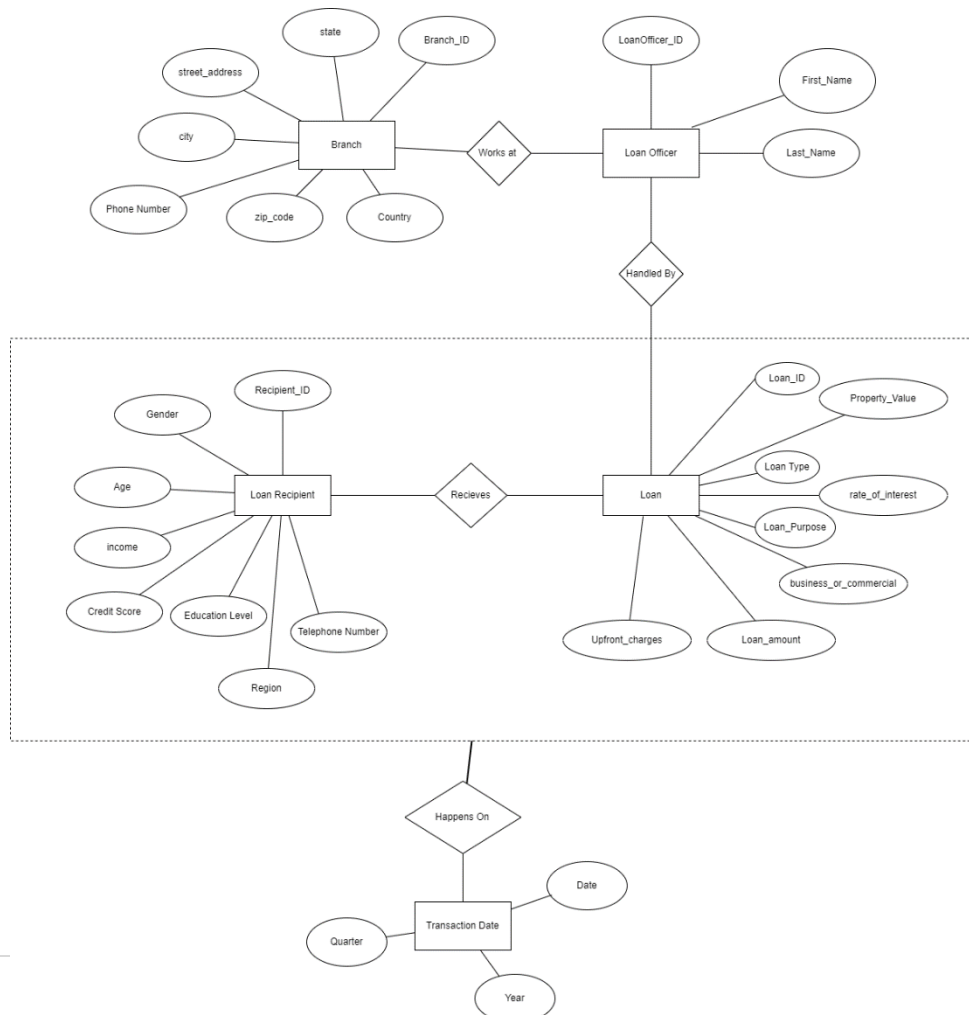
1. Data Source For the Assignment 02

Data Source – LoanDB_DW

LoanDB_DW has the following tables:

- **DimDate** – 10099 Rows
- **DimBranch** – 51 Rows
- **DimLoanOfficer** – 900 Rows
- **DimLoanType** – 10099 Rows
- **DimRecipient** – 10099 Rows
- **FactLoan** – 10099 Rows

ER Diagram

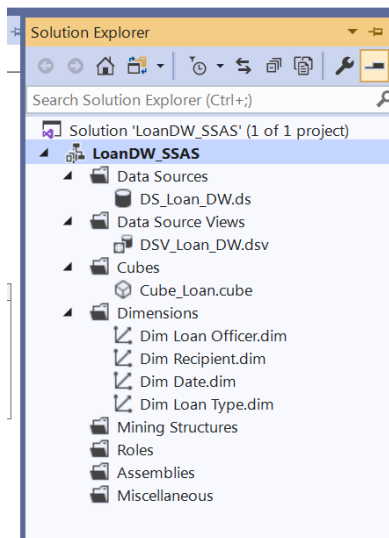


2. SSAS Cube Implementation

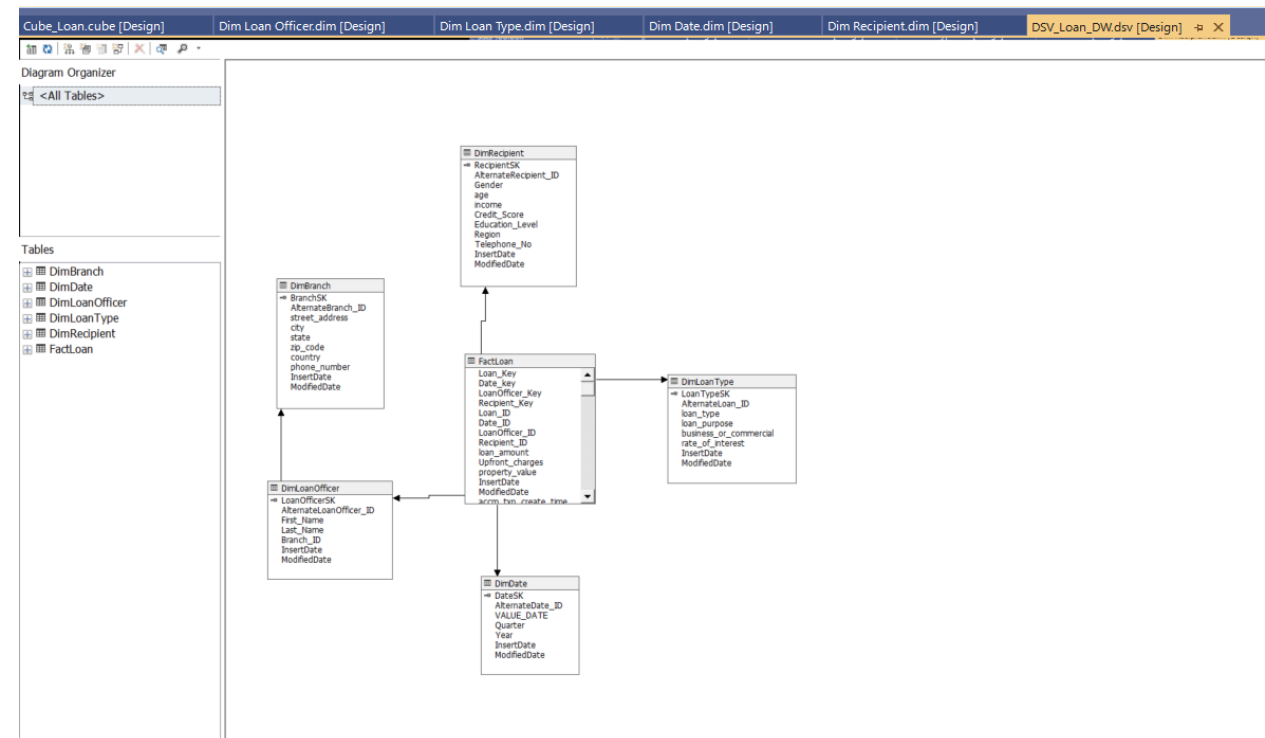
- A cube is a multi-dimensional data source which have dimensions and facts as its basic constituents.
 - From a relational perspective, dimensions can be thought of as master tables and facts can be thought of as measurable details.
-
- Dimensions
 - DimBranch
 - DimLoanOfficer
 - DimLoanType
 - DimDate
 - DimRecipient
 - Fact
 - FactLoan

Implementaton Procedure

1. The cube – Cube_Loan was implemented using the data warehouse



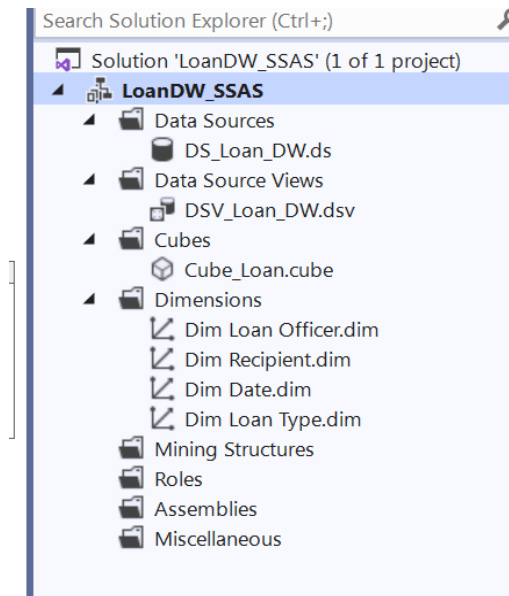
2. Creation of the data source – DS_Loan_DW and configuration of the snowflake schema



3. Creating dimensions, measures, and cubes from this schema

- Choose the fact table for the cube as the Measure Group Table
- Then Selected the measures from the Fact Table.
- Selected the dimensions Respectively

Final Cube Structure is as follows:



4. Fine tuning the cube as per the requirements

- As default only the primary key column is added to the dimensions at the creation of the cube.
- Fine tuning the cube includes adding all the columns for all the dimensions and defining any possible hierarchies.

DimRecipient

The screenshot displays the SQL Server Enterprise Developer interface with the 'Dimension Structure' tab selected. The 'Dim Recipient.dim [Design]' window is active, showing a list of attributes in the 'Attributes' pane on the left. The 'Hierarchies' pane in the center contains a placeholder text: 'To create a new hierarchy, drag an attribute here.' The 'Data Source View' pane on the right shows a preview of the dimension structure, listing the attributes: RecipientSK, AlternateRecipient_ID, Gender, age, Income, Credit_Score, Education_Level, Region, Telephone_No, InsertDate, and ModifiedDate.

Attributes	Hierarchies	Data Source View
<ul style="list-style-type: none">Dim Recipient<ul style="list-style-type: none">AgeAlternate Recipient IDCredit ScoreEducation LevelGenderIncomeInsert DateModified DateRecipient SKRegionTelephone No	<p>To create a new hierarchy, drag an attribute here.</p>	<ul style="list-style-type: none">DimRecipient<ul style="list-style-type: none">RecipientSKAlternateRecipient_IDGenderageIncomeCredit_ScoreEducation_LevelRegionTelephone_NoInsertDateModifiedDate

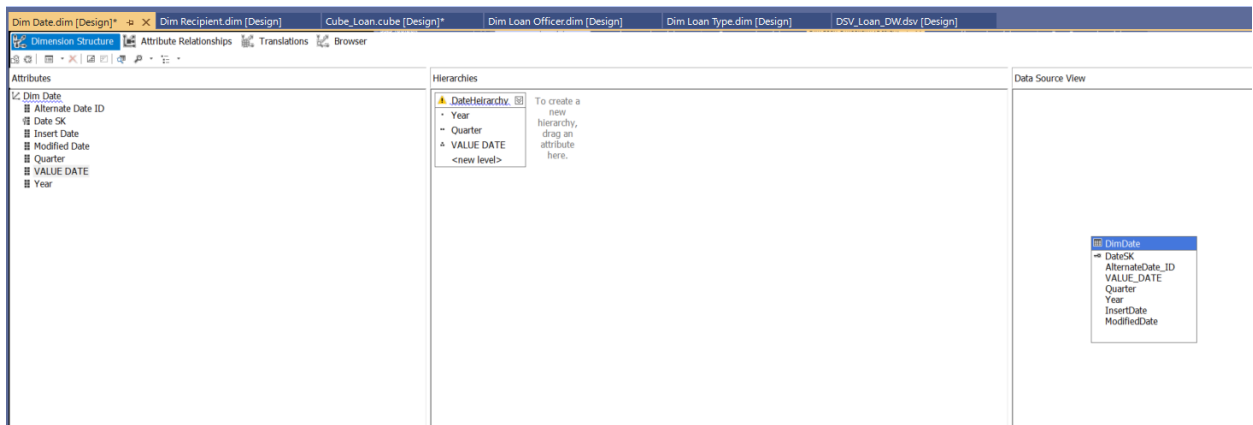
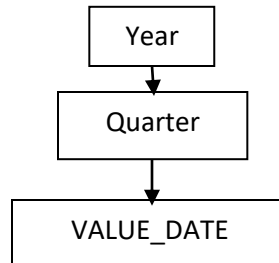
DimLoanType

The screenshot displays the SQL Server Enterprise Developer interface with the 'Dimension Structure' tab selected. The 'Dim Date.dim [Design]' window is active, showing a list of attributes in the 'Attributes' pane on the left. The 'Hierarchies' pane in the center contains a placeholder text: 'To create a new hierarchy, drag an attribute here.' The 'Data Source View' pane on the right shows a preview of the dimension structure, listing the attributes: DateSK, AlternateDate_ID, VALUE_DATE, Quarter, Year, InsertDate, and ModifiedDate.

Attributes	Hierarchies	Data Source View
<ul style="list-style-type: none">Dim Date<ul style="list-style-type: none">Alternate Date IDDate SKInsert DateModified DateQuarterVALUE DATEYear	<p>To create a new hierarchy, drag an attribute here.</p>	<ul style="list-style-type: none">DimDate<ul style="list-style-type: none">DateSKAlternateDate_IDVALUE_DATEQuarterYearInsertDateModifiedDate

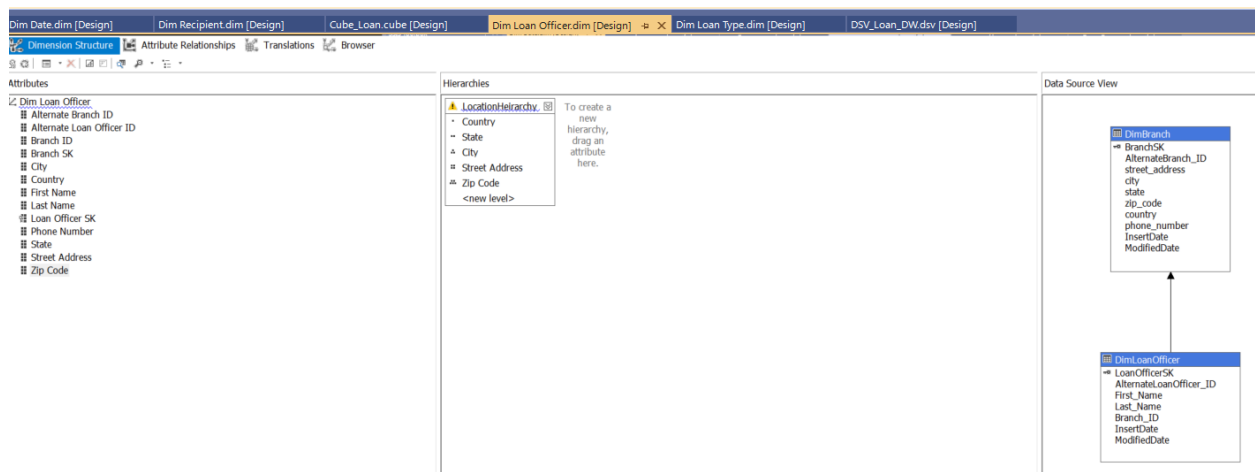
DimDate

- Date Heirarchy is as follows



DimBranch

- Branch Heirarchy is as follows



5. Deploying the cube

Creating KPIs

- A Key Performance Indicator is the measurable value that uses to measure the effectiveness sing Business Inteligence
- A KPI called 'KPI Loan Amount' was created with the following expression

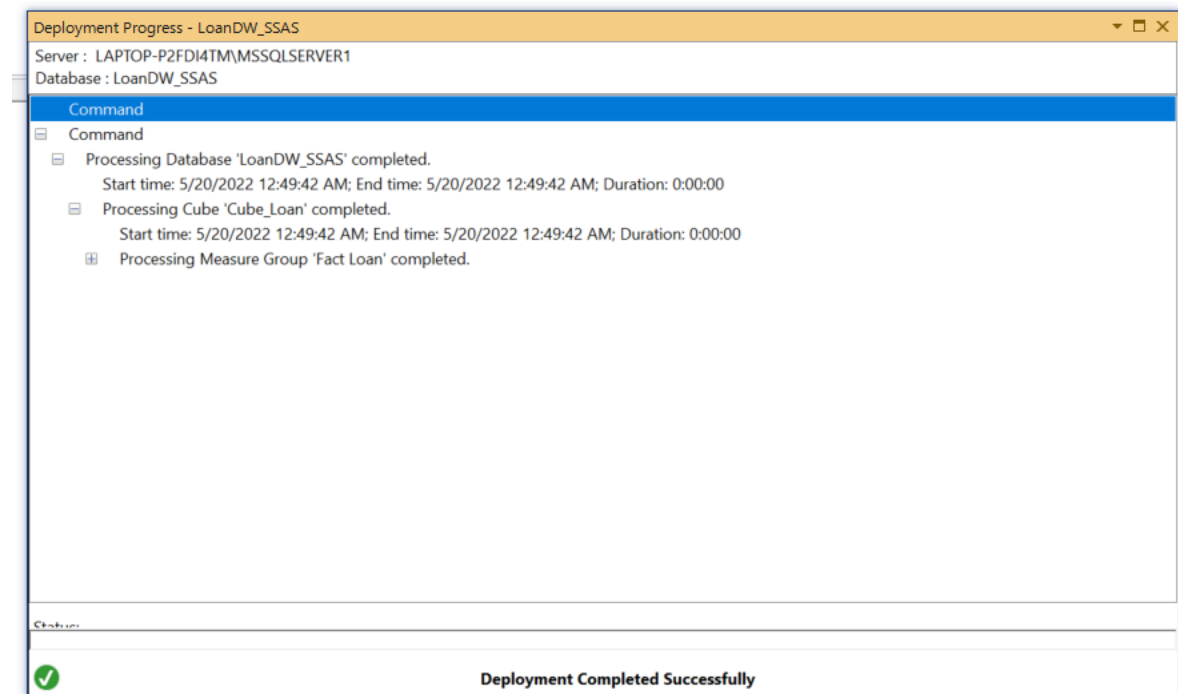
The screenshot displays the 'KPI property value' window in SSDT. On the left, the 'Calculation Tools' pane shows the 'Measures' folder expanded, with 'KPI loan amount' selected. The main area is divided into several sections:

- Goal Expression:** Contains the expression `[Measures].[Loan Amount]` with a status of 'No issues found'.
- Status:** The 'Status indicator' is set to 'Gauge'. The 'Status expression' is also `[Measures].[Loan Amount]` with a status of 'No issues found'.
- Trend:** The 'Trend indicator' is set to 'Standard arrow'. The 'Trend expression' is also `[Measures].[Loan Amount]` with a status of 'No issues found'.
- Additional Properties:** This section is currently collapsed.

The changes were saved. After processing the cube we can see like this in the SSMS

The screenshot shows the 'Cube_Loan' cube in the 'Metadata' pane of the SQL Server Enterprise Manager. The 'Measures' folder is expanded, showing the 'KPIs' folder. Inside 'KPIs', the 'KPI property value' and 'KPI loan amount' are listed. The 'Dimension' pane on the right shows the 'Select dimension' button. The 'Calculated Members' pane at the bottom is empty.

Then the cube is deployed and the success message was shown.



3. Demonstration of OLAP operations

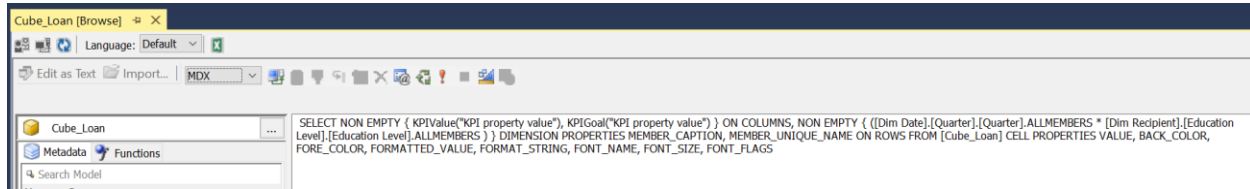
- OLAP operations can be demonstrated using Microsoft Excel.
- Multi-dimensional expression (MDX) is the query language used to query the cube.
- Here this demonstration process follows two steps

1. **Develop calculated measures and named sets using MDX** Connect to SQL Server Analysis Service, then execute the MDX query using cube's browser.

The screenshot displays the Microsoft Excel OLAP client interface for the 'Cube_Loan' cube. The left-hand pane shows the metadata tree with 'Education Level' selected under the 'Dim Recipient' dimension. The central pane displays a table of data with columns: Quarter, Education Level, KPI property value Value, and KPI property value Goal. The right-hand pane shows the dimension and hierarchy configuration for 'Dim Loan Officer'.

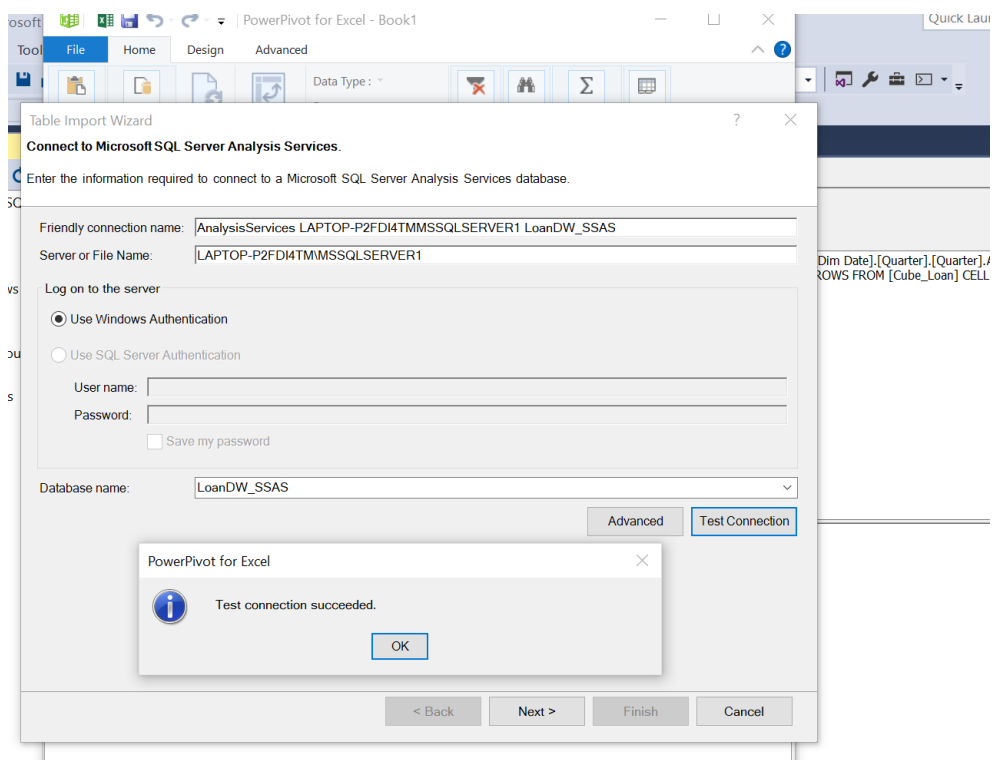
Quarter	Education Level	KPI property value Value	KPI property value Goal
1	1	261840000	True
1	2	300244000	True
1	3	256328000	True
1	Unknown	(null)	False
2	1	289002000	True
2	2	313544000	True
2	3	314822000	True
2	Unknown	(null)	False
3	1	551522000	True
3	2	552764000	True
3	3	598056234	True
3	Unknown	(null)	False
4	1	336546000	True
4	2	375152000	True
4	3	366656000	True
4	Unknown	(null)	False
Unkno...	1	(null)	False
Unkno...	2	(null)	False

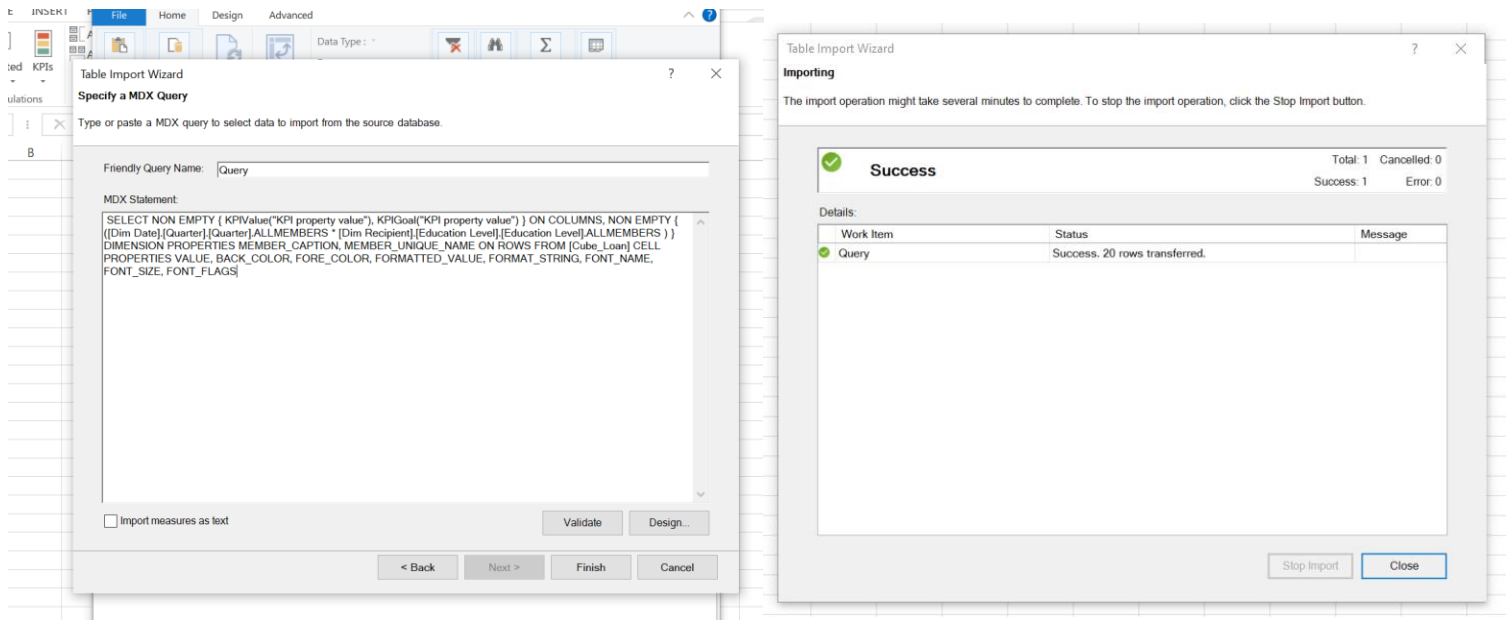
2. Acquire the MDX query in the design view



3. Browse the cube data using Excel as the client tool

- Selecting Power Tool in Microsoft Excel
- Then Selecting “Database from Analysis Service or PowerPivot”
- Then a Table Import Wizard is opened and had to fill out Server Name and Database Name
- Finally Had to paste the MDX Query made in the Previous step using SSMS.
- After Clicking Finish the Query is Executed





The initial view of the powerpivot table is as follows:

Dim Loan OfficerStreet AddressStreet Address	Dim Loan OfficerCityCity	Dim Loan OfficerStateState	Dim DateQuarterQuarter	Dim DateYearYear	MeasuresLoan Amount	MeasuresLoan Amount
#NAME?	Topeka	KS	1	2016		False
#NAME?	Topeka	KS	Unknown	Unknown		False
1035 Beesons Field Drive	Kernersville	NC	Unknown	Unknown		False
1041 Edgefield Rd	North Augusta	SC	Unknown	Unknown		False
10840 Martin Luther King Jr Boulevard	El Paso	TX	Unknown	Unknown		False
1101 W Highway 32	Salem	MO	Unknown	Unknown		False
1155 Hwy 65 North	Conway	AR	1	2016		False
1155 Hwy 65 North	Conway	AR	Unknown	Unknown		False
1201 N Service Rd E	Ruston	LA	1	2016		False
1201 N Service Rd E	Ruston	LA	Unknown	Unknown		False
1211 Highway 367 N	Newport	AR	Unknown	Unknown		False
1303 S Main St	Sikeston	MO	1	2016		False
1303 S Main St	Sikeston	MO	Unknown	Unknown		False
1310 Preacher Roe Blvd	West Plains	MO	1	2016		False
1310 Preacher Roe Blvd	West Plains	MO	Unknown	Unknown		False
1500 S Lynn Riggs Blvd	Claremore	OK	Unknown	Unknown		False
161 N Walmart Dr	Harrison	AR	2	2016		False
161 N Walmart Dr	Harrison	AR	Unknown	Unknown		False
1623 N Highway 367 N	Harrison	AR	1	2016		False

Slice

- A new sub cube is created using one dimension.
- Here the dimension LoanOfficer is sliced using the KPI Loan Officer State

E15	:	X	✓	fx	
	A	B	C	D	
1					
2					
3	Row Labels	Sum of Measures	Loan Amount		
4	2016		76161000		
5	1		2098500		
6	2		5867500		
7	3		23816000		
8	4		44379000		
9	2017		152683500		
10	1		24810000		
11	2		40499000		
12	3		43289000		
13	4		44085500		
14	2018		390293500		
15	1		48741000		
16	2		91524000		
17	3		174080500		
18	4		75948000		
19	2019		54464500		
20	1		54464500		
21	Grand Total		673602500		
22					

Dim Loan OfficerStateS...

AR

CA

FL

GA

KS

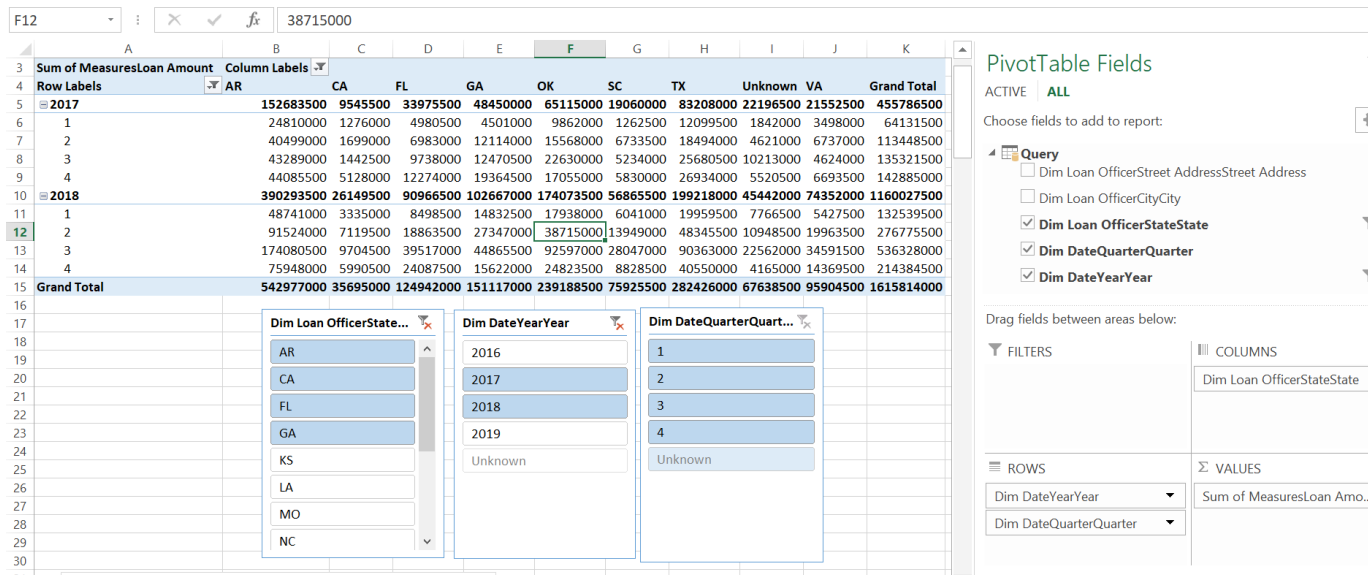
LA

MO

NC

Dice

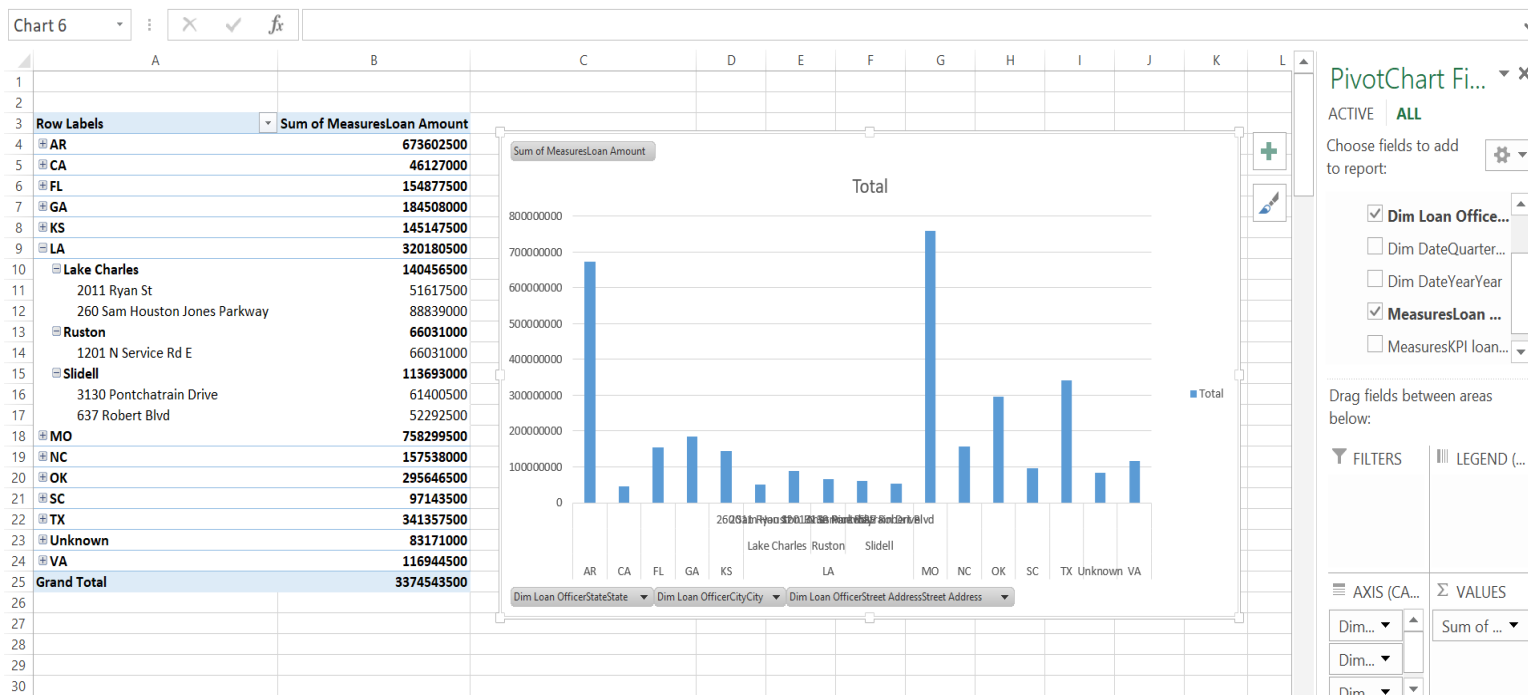
- Similar to Slice
- But here two or more dimensions are resulted in the creation of a sub cube.



Drill Down

In drill down data is fragmented into smaller parts.

- It can be done via moving down the concept hierarchy increasing the dimension.
- Here data hierarchy of DimBranch is drilled down.



Roll up

- Roll up is known as “consolidation” or “aggregation”.
- Here roll up operation is performed climbing up the date concept hierarchy of DimDate.

Row Labels	Sum of MeasuresLoan Amount
2016	358212500
1	14755500
2	31466000
3	109998000
4	201993000
2017	759642500
1	103371500
2	186845500
3	234997500
4	234428000
2018	1978835000
1	224660000
2	456698000
3	936466000
4	361011000
2019	277853500
1	277853500
Grand Total	3374543500

Pivot

- Pivot is a visualization operation which rotates the data axes in view to provide an alternative presentation of the data.
- Here it represents the Sum of Loan Amounts for Borrowers Based on the city from which they obtained the loan.

B5

✕

✓

fx

46853000

	A	B	C	D	E	F	G	H	I
1									
2									
3	Row Labels	Sum of MeasuresLoan Amount							
4	Branson	56856000							
5	Carthage	46853000							
6	Claremore	59594500							
7	Clinton	38276000							
8	Commerce	73419000							
9	Concord	37545000							
10	Conway	35336000							
11	Dexter	64557000							
12	El Paso	132153000							
13	Harrison	52680000							
14	Jacksonville	75813500							
15	Kernersville	55028000							
16	King	64965000							
17	Lake Charles	140456500							
18	Leavenworth	55978000							
19	Lebanon	47186500							
20	Mcallen	67334500							
21	Mexico	105700000							
22	Miami	40506500							
23	Morrilton	75333000							
24	Mountain Home	72954000							
25	Neosho	53460500							
26	New Caney	83567000							
27	Newport	57140000							
28	Norfolk	69448500							
29	North Augusta	97143500							

Dim DateYearYear

2016

2017

2018

2019

Unknown

Dim DateQuarterQuart...

1

2

3

4

Unknown

PivotTable Fields

ACTIVE ALL

Choose fields to add to report:

☒ MeasuresLoan Amount

☐ MeasuresKPI loan amount Goal

☒ Query 1

☐ MeasuresProperty Value
 ☐ MeasuresUpfront Charges

Drag fields between areas below:

FILTERS

COLUMNS

ROWS

VALUES

Dim Loan OfficerCityCity

Sum of MeasuresLoan Amo...

☐ Defer Layout Update

UPDATE

Sheet1

READY

87%

4. SSRS Reports

- Report builder was used to create the reports
- First step is creating the data source. The previous data source used – “DS_LoanDB_DW” was added
- Next the data set was created.
- The below query was used to create the dataset

```
SQLQuery1.sql - L...2FDI4TM\ASUS (55))* X
select dlt.loan_type, dlt.loan_purpose, dlt.rate_of_interest,
dr.AlternateRecipient_ID, dr.Gender, dr.Credit_Score, dr.Telephone_No,
db.city, db.state, dd.Quarter,
dd.Year, dl.first_name, fl.loan_amount, fl.Upfront_charges, fl.property_value
from FactLoan fl
inner join DimLoanType dlt on fl.Loan_Key = dlt.LoanTypeSK
inner join DimRecipient dr
on fl.Recipient_Key = dr.RecipientSK
inner join DimLoanOfficer dl
on fl.LoanOfficer_Key = dl.LoanOfficerSK
inner join DimBranch db
on dl.Branch_ID = db.BranchSK
inner join DimDate dd
on fl.Date_key = dd.DateSK
```

Report 1 – Report with a Matrix

SQL Server Reporting Services

Home > loan type wise YOY report

loan type wise YOY report

		2016		2017		2018		2019		Total	
loan type	loan purpose	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges
type1	Total	284220500	2160196.02	578322500	4558800.67	1532363000	11688405.86	215764500	1484638.9	2610670500	19892041.45
type2	Total	32414000	204696.51	88839500	465323.24	210064000	1067170.99	32130500	113441.75	363448000	1850632.49
type3	Total	35571000	174693.02	70284000	494996.83	190966000	1070232	20433000	122733.43	317254000	1862655.28
Total		352205500	2539585.55	737446000	5519120.74	1933393000	13825808.850001	268328000	1720814.08	3291372500	23605329.219999

Report 2 – Multi Parameterized Report

Here the table is filtered on the loan type and the loan purpose parameters.

SQL Server Reporting Services

Home > multi parameterized report final

loan type: type3 loan purpose: p1

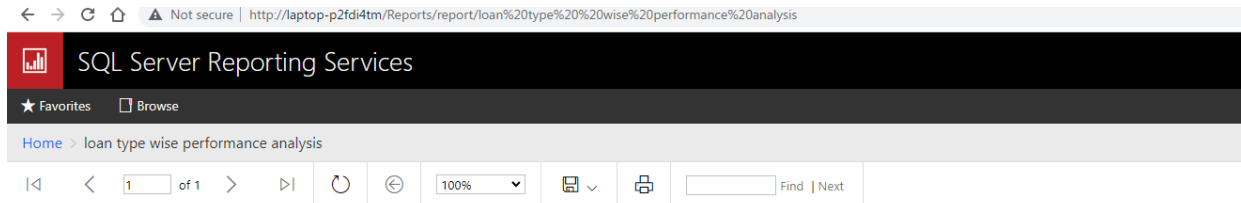
View Report

		2016		2017		2018		2019	
loan type	loan purpose	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges
type1	p1	68466000	351078.05	140625500	989430.97	360429500	2088272.64	57838500	250662.95
type2	p1	8654000	52286.17	25521500	138102.19	62698500	376887.2	8595000	26799.81
type3	p1	3615000	14725.91	12550000	80368.88	30984000	149001.1	4588000	6931.18

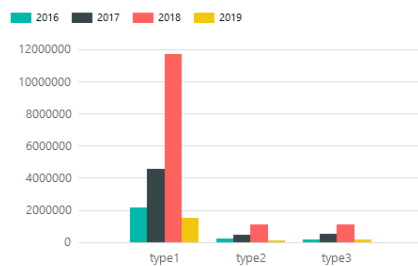
5/21/2022 12:09:14 PM

Report 3 – Drill Through Report

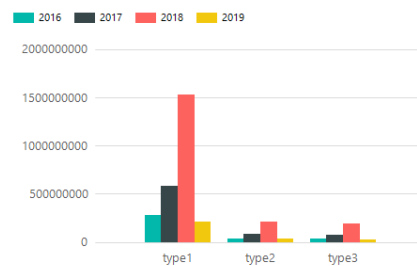
Here the loan type parameter is drilled through to find the loan purpose wise Loan amounts and upfront charges. When a column of the loan type wise charts is clicked, it automatically navigates to loan_purpose wise charts.



Loan type wise Loan amounts



Loan Type wise upfront charges



5/21/2022 2:00:18 PM

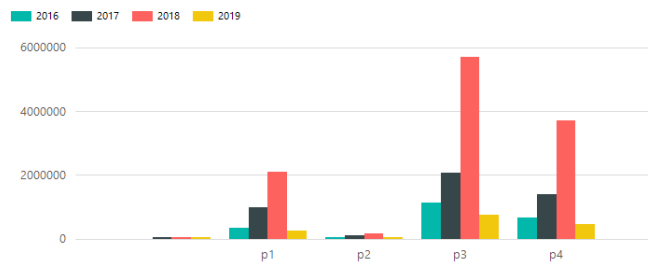


When a chart column is clicked

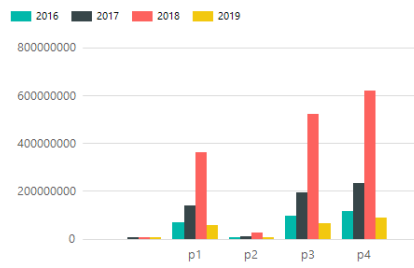


Navigation bar with icons for back, forward, search, and other document controls. It includes a search box with the text "Find | Next" and a "100%" zoom level indicator.

Loan Purpose wise Loan amounts



Loan Purpose wise upfront charges



5/21/2022 2:03:51 PM

Report 4 – Drill Down Report

Here the data is drilled down the location hierarchy.

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

loan_type
loan_purpose
rate_of_interest
AlternateRecipient_ID
Gender
Credit_Score
Telephone_No
street_address
city
state
Quarter
Year
first_name
loan_amount
Upfront_charges
property_value

Column groups

Year

Row groups

state
city
street_address

Values

Sum(loan_amount)
Sum(Upfront_charges)

Help

< Back

Next >

Cancel



SQL Server Reporting Services

★ Favorites □ Browse

Home > location wise drill down

1 of 1 100% Find | Next

Locaton Wise Loan Details Report

state	city	street address	2016		2017		2018		2019	
			loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges	loan amount	Upfront charges
AR			76161000	465937.58	152683500	1122563.72	390293500	2975830.49	54464500	340243.88
CA			3501500	30390.41	9545500	79997.32	26149500	203240.12	6930500	27678.48
FL	Pensacola	9301 Pine Forest Road	6947000	56690.55	11467000	77442.46	32739000	233998.7	6390500	26140.07
	Tampa		8548500	65789.34	22508500	226350.47	58227500	338148.53	8049500	61089.27
GA			17865000	141501.31	48450000	324266.85	102667000	792255.6	15526000	103773
KS	Leavenworth		4127500	30857.82	13386500	89008.08	34313000	258006.44	4151000	31609.46
	Topeka		10431500	75103.21	16609000	101408.49	55046000	361878.96	7083000	46976.99
LA			25076000	170075.86	72374500	445038.62	198146500	1415185.31	24583500	170154.97
MO			87546000	669549.35	165120500	1326854.36	442897000	3063811.72	62736000	423783.91
NC			16502000	117877.73	36365500	205126.25	88405000	707420.06	16265500	77768.79
OK			35626000	276236.02	65115000	519620.72	174073500	1291057.8	20832000	174954.51
SC			12035000	59510.18	19060000	169645.89	56865500	395986.91	9183000	41601.04
TX			36031000	277294.31	83208000	700808.78	199218000	1321176.17	22900500	145211.4
VA			11807500	102771.88	21552500	130988.73	74352000	467812.04	9232500	49828.31

