



# **Sri Lanka Institute of Information Technology**

## **Data Warehousing and Business Intelligence IT3021**

### **- Assignment 2 - 2022**

#### **Assignment 2 Report**

Student Name – Jayasooriya C. A

IT Number – IT20250942

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# 1 Data source for the assignment 2

## 1.1 Data Source Introduction

The data warehouse, which was created and loaded using the transformed, staged data in the assignment has been used as the data source for this project (DS\_Insurance\_Claims\_Fraud\_DW).

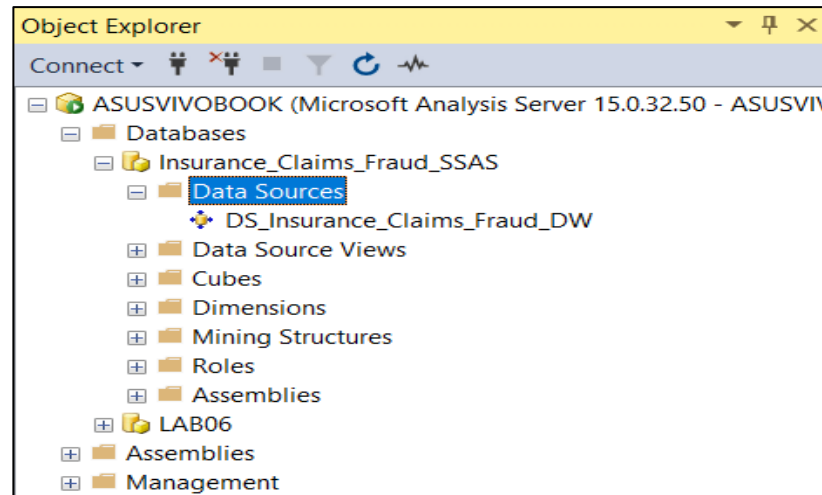


Figure 1: Data Source

The data warehouse was created using the Insurance Claims Fraud dataset which contains a one-year worth data, from 2020/06/01 till 2021/06/30 about insurance claims frauds.

**Snowflake** schema was used, and the data warehouse contains five dimensional tables and a fact table.

- Dimensions –
  1. DimPolicyClaim – The policy claim dimension table contains the policy claim details. PolicyClaimsSK is the surrogate key.
  2. DimCustomer – The customer dimension contains insurance policy holder / customer details. CustomerSK is the surrogate key.
  3. DimAgent – Contains details of insurance agents who manages the customer insurances. AgentSK is the surrogate key.
  4. DimVendor – Contains insurance provider details. VendorSK is the surrogate key.
  5. DimDate – This is a common dimension. DateKey is the surrogate key. An SQL script was used to generate the date dimension.
- Fact table –
  1. FactInsurance – Contains all the transactional data. References dimension tables via foreign keys.

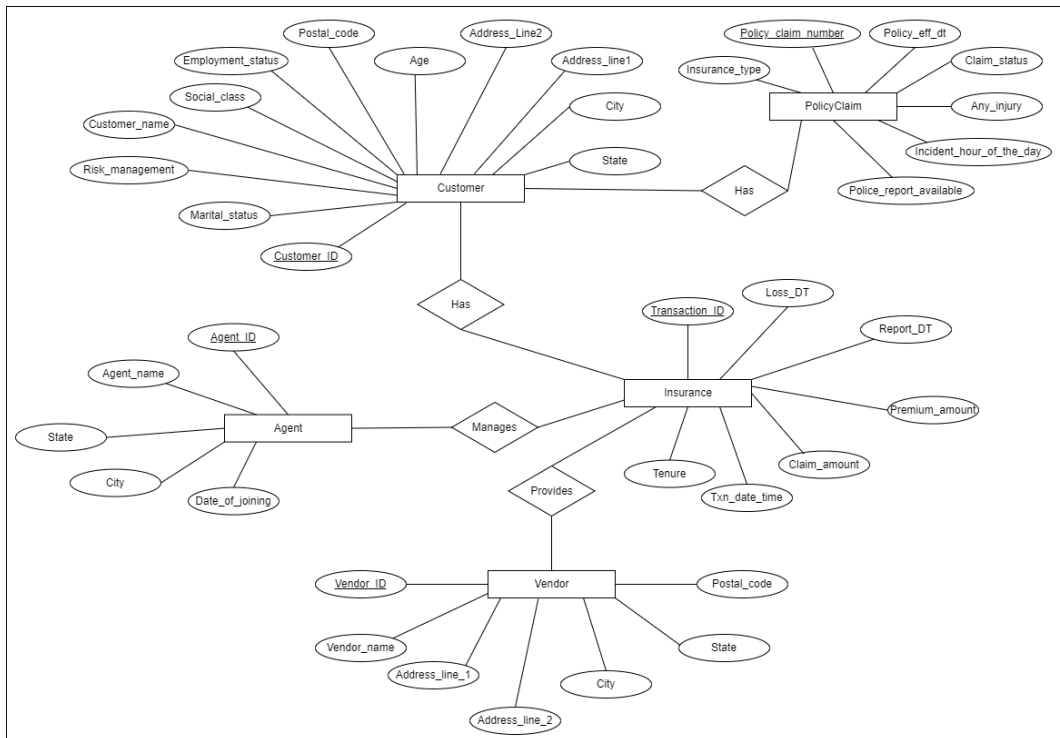


Figure 2: Data Warehouse ER

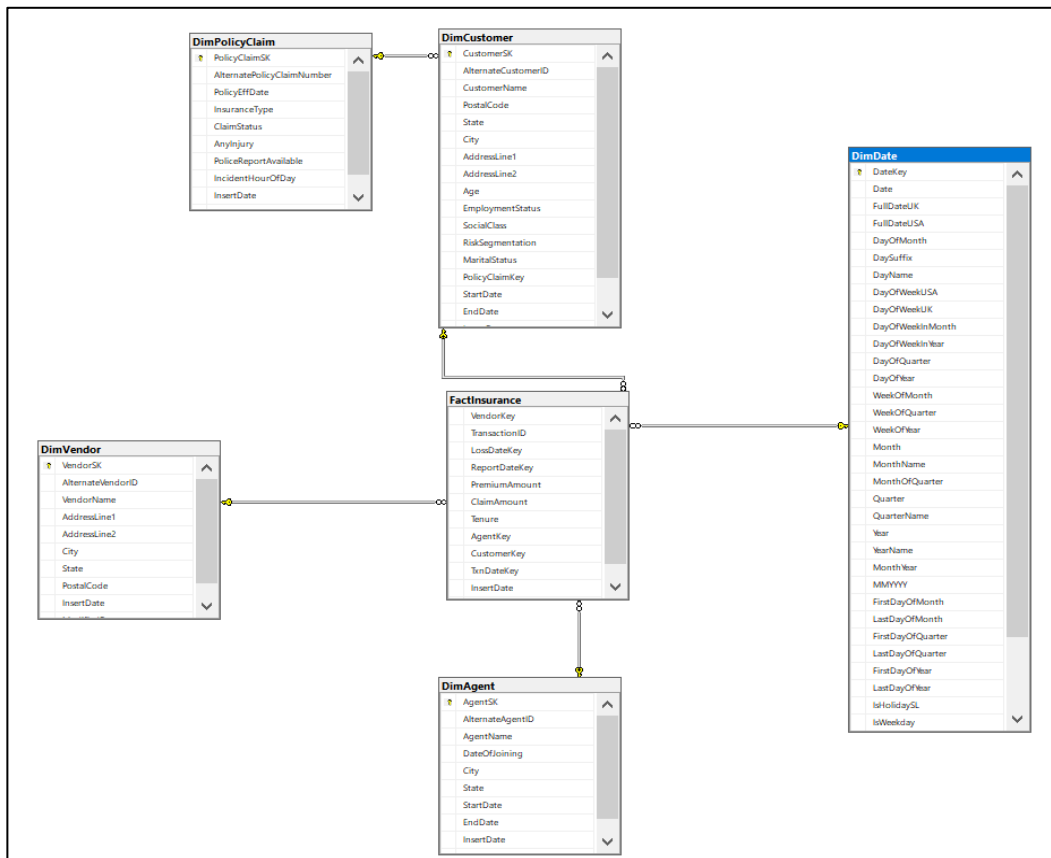


Figure 3: Implemented DW

## 2 SSAS Cube implementation

A data structure called an OLAP cube, also known as a hypercube or multidimensional cube, allows OLAP databases to do near-instantaneous data analysis.

The most significant parts of a cube are its dimensions and measurements.

- Dimensions – These are the dimensions that come from the data source.
- Measure group – This has a similar concept to the fact table of the data warehouse. Here all the measures of the OLAP cube are present.

For the creation of the new project SQL Server Data Tools was used as below:

- Analysis Services -> Multidimensional -> Analysis Services Multidimensional and Data Mining Project

### 2.1 Cube Implementation

#### 2.1.1 Creating the Data Source

A data warehouse has been chosen as the data source by connecting the data warehouse, DS\_Insurance\_Claims\_Fraud\_DW through the SQL Server Management Studio. The service account mode was used in connecting to the SSMS.

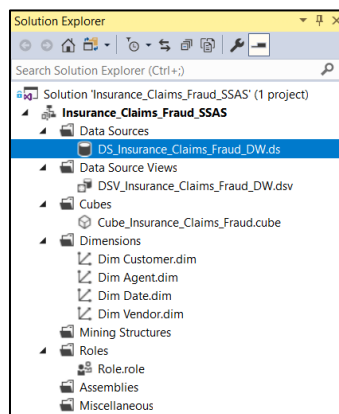


Figure 4: DS in SSDT Solution Explorer

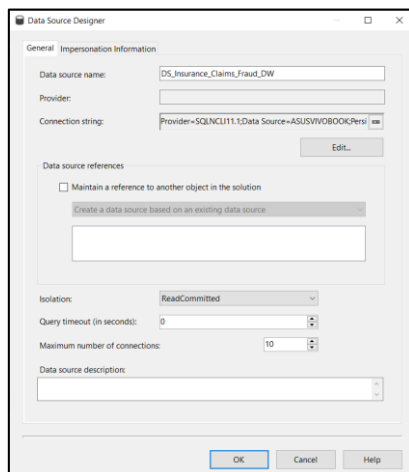


Figure 6: Data Source, General

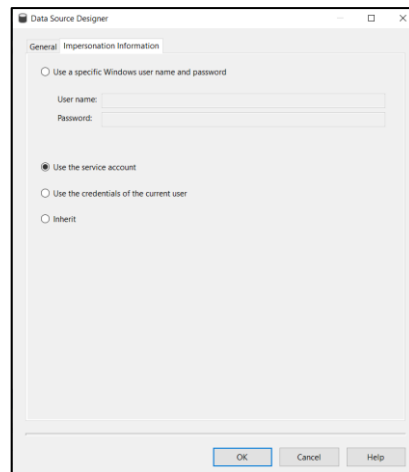


Figure 5: Data Source, Impersonation Information

## 2.1.2 Creating the Data Source View

The analysis service can access only the data tables that are present in the data source view. Hence, we create the data source view using the data source that was created above.

Using the data source view the created data source was selected, then the utilizing relations are selected, and the data source view is created by giving a proper name.

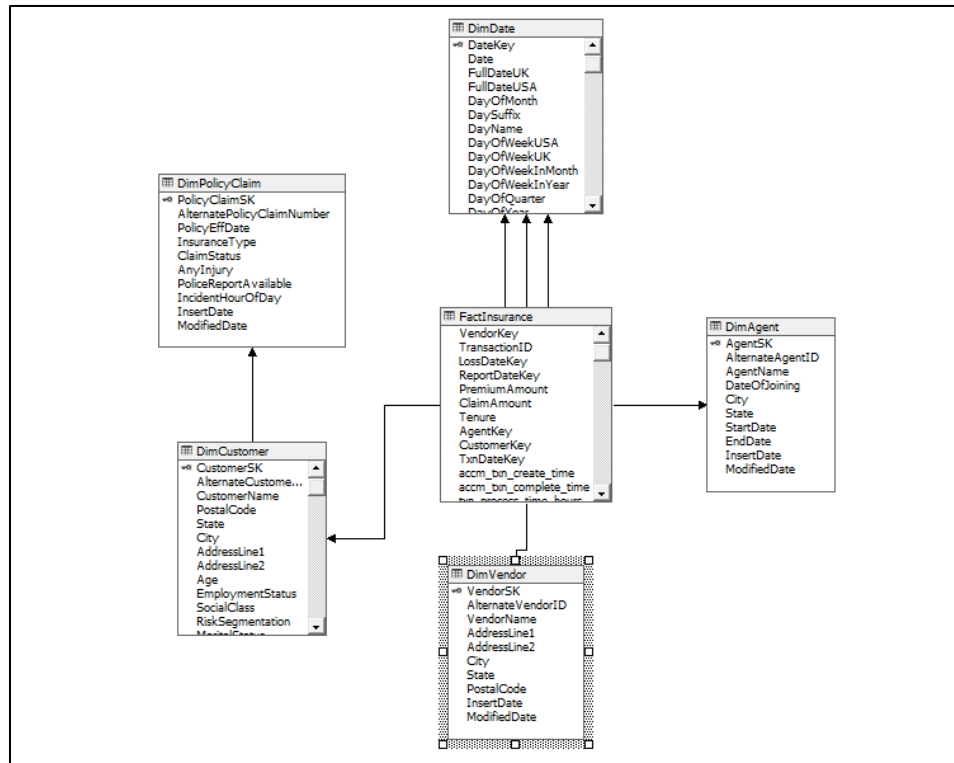


Figure 8: Data Source View

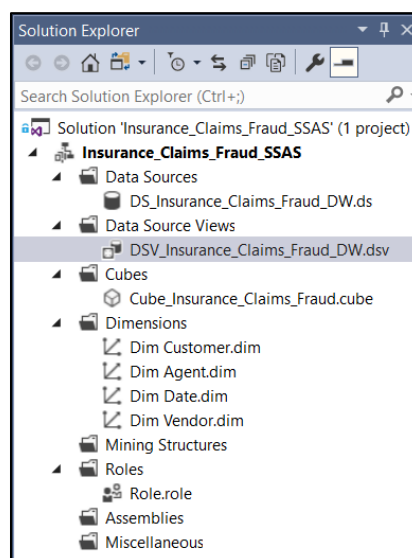


Figure 7: DSV in SSDT Solution Explorer

### 2.1.3 Creating the Cube

Using the created data source view in the above step, the cube has been created. In the Cube Wizard the created data source view was selected. Then the Fact table was selected as the measures group table. Then the measures used are selected and finally the available dimensions are selected, and the cube is given a proper name.

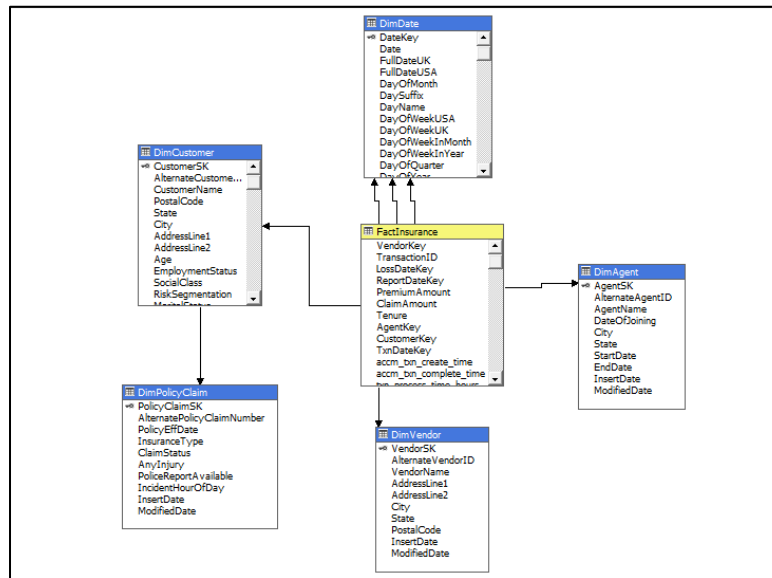


Figure 9: Implemented Cube

### 2.1.4 Creating Hierarchies and Dimension Structures

After the cube has been created, the dimensions will be present in the dimension's directory of the solution explorer.

Then the attributes of the dimensions must be selected by dragging and dropping them into the attributes column from the Data Source View column.

Similarly, the hierarchies can be setup by dragging and dropping the hierarchy attributes from the attributes column into the hierarchy column in the same window.

This process is repeated for all the dimensions.

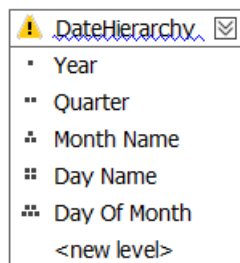


Figure 13: Date Hierarchy

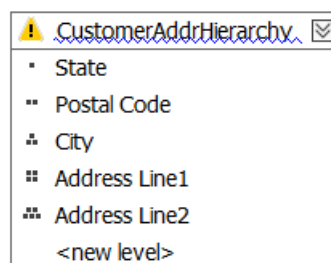


Figure 12: Customer Hierarchy

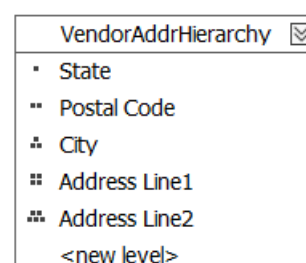


Figure 11: Vendor Hierarchy

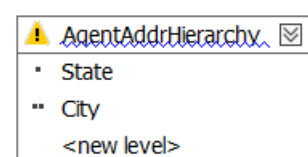


Figure 10: Agent Hierarchy

## 2.1.5 Creating KPIs

KPIs or Key Performance Indicators, are a quantitative assessment of performance for a specific objective. KPIs provide teams with objectives to aspire towards, milestones to measure progress, and insights to help everyone in the organization make better decisions [1].

In this scenario KPIs have been created for Claimed Amount, Tenure, attribute and Claimed Loss.

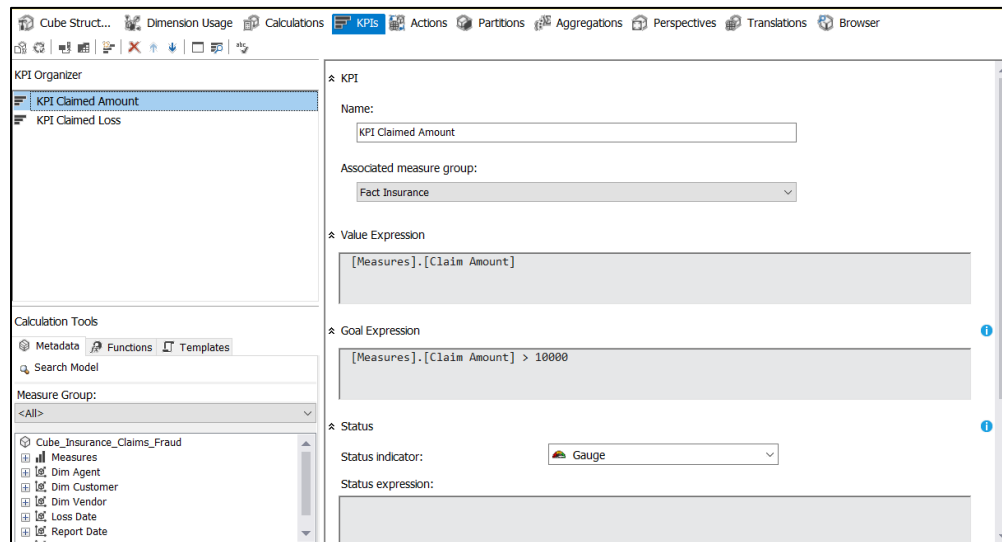


Figure 14: KPI Claimed Amount

## 2.1.6 Deploying the Cube

Finally, after all the above was done, the finalized cube was deployed.

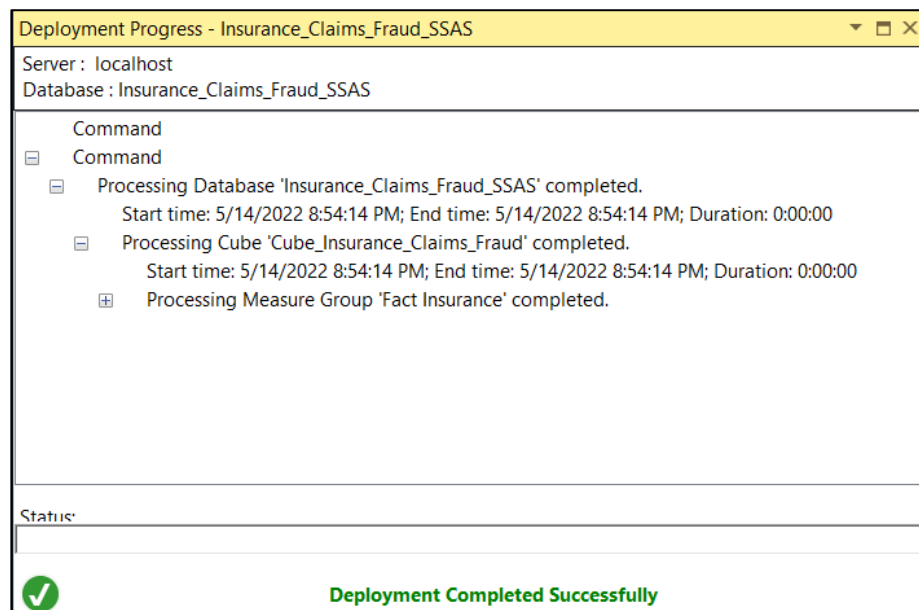


Figure 15: Cube Deploying



### 3 Demonstration of OLAP Operations

OLAP stands for Online Analytical Processing. This enables easy understanding of data and easy handling of data in making important business decisions. OLAP is an integral part of business intelligence (BI) where it helps greatly in trend analysis and other data analysis functions from various perspectives [1].

There are 5 main OLAP operations:

1. Drill Down – Drilling down converts less detailed information into more detailed information. It's possible to accomplish so by working your way down the concept hierarchy.
2. Roll Up – This is the opposite of drilling down. This performs aggregations on the data cube. This can be performed by climbing up the concept hierarchy.
3. Slice – It takes a single dimension from the OLAP cube and turns it into a new sub-cube.
4. Dice – Here a sub cube is selected from the OLAP cube by selecting two or more dimensions [1].
5. Pivot – This acts as a rotation operation, where the current view is rotated to get a new view.

#### 3.1 Connecting to the SSAS Cube

To apply the OLAP operations we must connect an Excel workbook to the data in the cube, MDX queries can be used for this process. MDX queries can be generated accordingly by browsing the cube.

In this instance MDX queries have not been used, instead the DATA tab feature of excel was used.

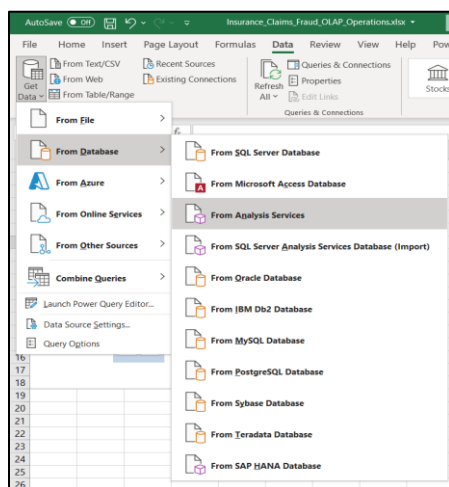


Figure 18: Connecting to SSAS Cube, 1

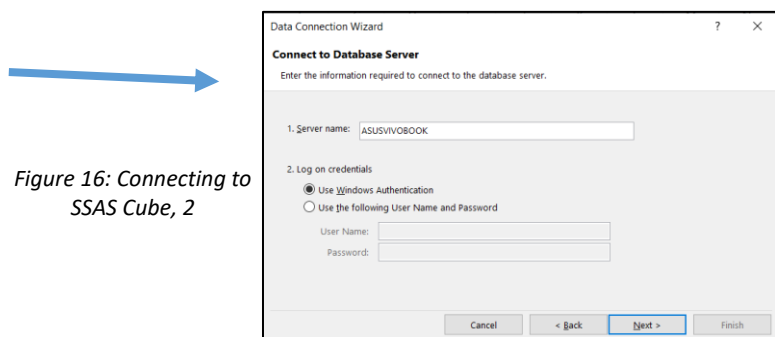


Figure 16: Connecting to SSAS Cube, 2

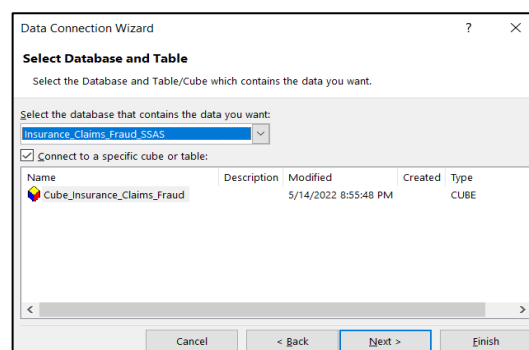


Figure 17: Connecting to SSAS Cube, 3



### 3.2.2 Drill Down

Here the drill down has been done for the measures according to Vendor and Year.

When drilling down according to the vendor, which working state, which postal code in that state, which city in that postal code, which branch in that city, which agent in that branch, which customer of that agent can be found for analysis. Same process can be done down the date hierarchy.

1					
2	Insurance Fraud Transactions				
3	Row Labels	Premium Amount	Claim Amount	No. of Policies	
4	Adams, Mcneil and Gray	986.55	285800	13	
5	Adams-Johnson	1054.9	395700	14	
6	Alvarado, Garcia and Thomas	2077.1	380900	23	
7	Andersen, Davis and Washington	1013.89	263100	17	
8	Anderson Inc				
9	AL	1526.96	304500	19	
10	CO				
11	81435				
12	Telluride				
13	35 Pilot Knob Lane				
14	AGENT00037				
15	Richard Eggleston	71.97	65000	1	
16	AGENT00058	124.82	9000	1	
17	AGENT00087	79.9	47000	1	
18	AGENT00129	137.55	20000	1	
19	AGENT00149	97.38	26000	1	
20	AGENT00176	82.5	20000	1	
21	AGENT00178	51.12	1000	1	
22	AGENT00282	75.79	2000	1	
23	AGENT00498	10.53	300	1	
24	AGENT00560	164.76	20000	1	
25	AGENT00642	95.22	11000	1	
26	AGENT00676	59.24	3000	1	
27	AGENT00709	127.47	7000	1	
28	AGENT00957	84.64	26000	1	
29	AGENT01007	92.62	27000	1	
30	AGENT01189	79.6	38000	1	
31	Anderson, Johnson and Kaiser	1030.64	225500	14	
32	Anderson-Wilson	1610.23	464800	19	
33	Armstrong-Ramirez	1409.75	327200	16	
34	Armstrong-Summers	1368.94	189600	15	
35	Avila-Baker	1934.52	455200	20	

Figure 21: Drill down according to Vendor

1			Insurance Fraud Transactions																							
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Figure 22: Drilling down according to Date Hierarchy

### 3.2.3 Slice

Here two slicing have been done in two ways to obtain the premium amount, claim amount and no of policies data. First the Vendor dimension have been sliced to give out the measures data for a specific vendor. Secondly the Date dimension have been sliced to obtain the measure mentioned for the year 2021 for each vendor.

Insurance Fraud Transactions									
Column Labels			2020			2021			
Row Labels	Premium Amount	Claim Amount	No. of Policies	Premium Amount	Claim Amount	No. of Policies	Total Premium Amount	Total Claim Amount	Total No. of Policies
Johnson LLC	893.59	143100	10	875.70	256000	9	1,769.29	399100	19
Grand Total	893.59	143100	10	875.70	256000	9	1,769.29	399100	19

Figure 24: Slice done for the Vendor dimension

Insurance Fraud Transactions									
Column Labels			2021			Total Premium Amount	Total Claim Amount	Total No. of Policies	
Row Labels	Premium Amount	Claim Amount	No. of Policies	Premium Amount	Claim Amount	No. of Policies			
Adams, Mcneil and Gray	642.15	160,600.00	7	642.15	160,600.00	7			
Adams-Johnson	601.44	121,000.00	8	601.44	121,000.00	8			
Alvarado, Garcia and Thomas	1040.69	239,600.00	11	1040.69	239,600.00	11			
Andersen, Davis and Washington	742.78	130,100.00	8	742.78	130,100.00	8			
Anderson Inc	834.26	184,000.00	11	834.26	184,000.00	11			
Anderson, Johnson and Kaiser	602.88	166,400.00	8	602.88	166,400.00	8			
Anderson-Wilson	548.69	88,700.00	7	548.69	88,700.00	7			
Armstrong-Ramirez	611.76	235,200.00	9	611.76	235,200.00	9			
Armstrong-Summers	613.69	90,100.00	7	613.69	90,100.00	7			
Avila-Baker	708.61	279,200.00	8	708.61	279,200.00	8			
Ayala PLC	953.81	164,000.00	9	953.81	164,000.00	9			
Baker and Sons	369.15	30,700.00	5	369.15	30,700.00	5			
Baker Ltd	641.96	181,000.00	7	641.96	181,000.00	7			
Baker, Tucker and Anderson	808.24	201,100.00	10	808.24	201,100.00	10			
Barnes PLC	700.46	71,900.00	9	700.46	71,900.00	9			
Barnes, Mills and Hill	488.11	148,800.00	7	488.11	148,800.00	7			
Barnes-Fox	514.91	133,000.00	6	514.91	133,000.00	6			
Barrett and Sons	1068.87	182,000.00	9	1068.87	182,000.00	9			
Bartlett-Winters	480.8	72,500.00	6	480.8	72,500.00	6			
Bass, Garcia and Garcia	1125.29	409,000.00	11	1125.29	409,000.00	11			
Bell PLC	954.17	207,600.00	10	954.17	207,600.00	10			
Bell, Hernandez and Reynolds	392.96	51,000.00	3	392.96	51,000.00	3			
Beltran Ltd	697.39	149,500.00	7	697.39	149,500.00	7			
Benson-Hayes	264.79	14,000.00	3	264.79	14,000.00	3			
Best PLC	414.99	62,600.00	5	414.99	62,600.00	5			
Black-Fuentes	385.28	71,000.00	3	385.28	71,000.00	3			
Blackwell-Foster	856.37	236,000.00	7	856.37	236,000.00	7			
Blake, Jackson and Scott	590.49	89,000.00	5	590.49	89,000.00	5			
Boyd-Fleming	929.22	217,000.00	9	929.22	217,000.00	9			
Bradley Ltd	632.05	156,000.00	7	632.05	156,000.00	7			
Bridges and Sons	626.5	67,100.00	6	626.5	67,100.00	6			
Brooks-Bowen	417.18	54,000.00	3	417.18	54,000.00	3			
Brooks-Henry	736.56	212,400.00	10	736.56	212,400.00	10			
Brown Group	1519.25	314,200.00	14	1519.25	314,200.00	14			
Brown Inc	757.2	153,600.00	8	757.2	153,600.00	8			
Brown Ltd	482.41	51,700.00	8	482.41	51,700.00	8			

Figure 23: Slice done for the Date dimension

### 3.2.4 Dice

Here dicing is done to get a sub-cube which can be used to visualize the measures according to the selected vendors and a particular year. Another dicing was done to get the sub cube which represents the data according to the vendor's name, insurance type and the year.

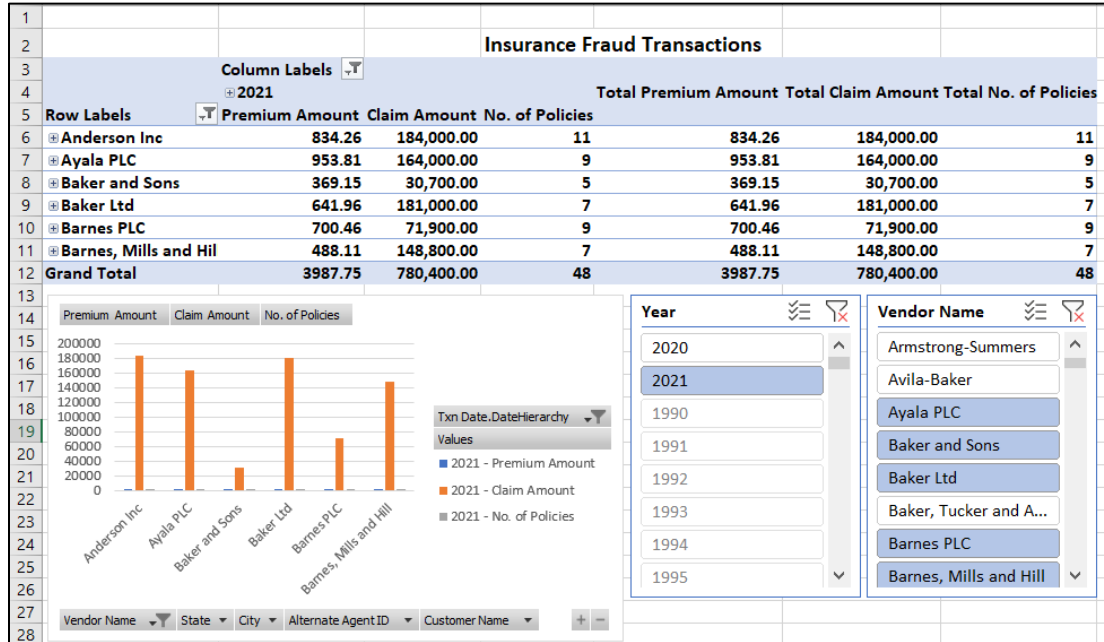


Figure 26: Dicing according to Vendor and Year

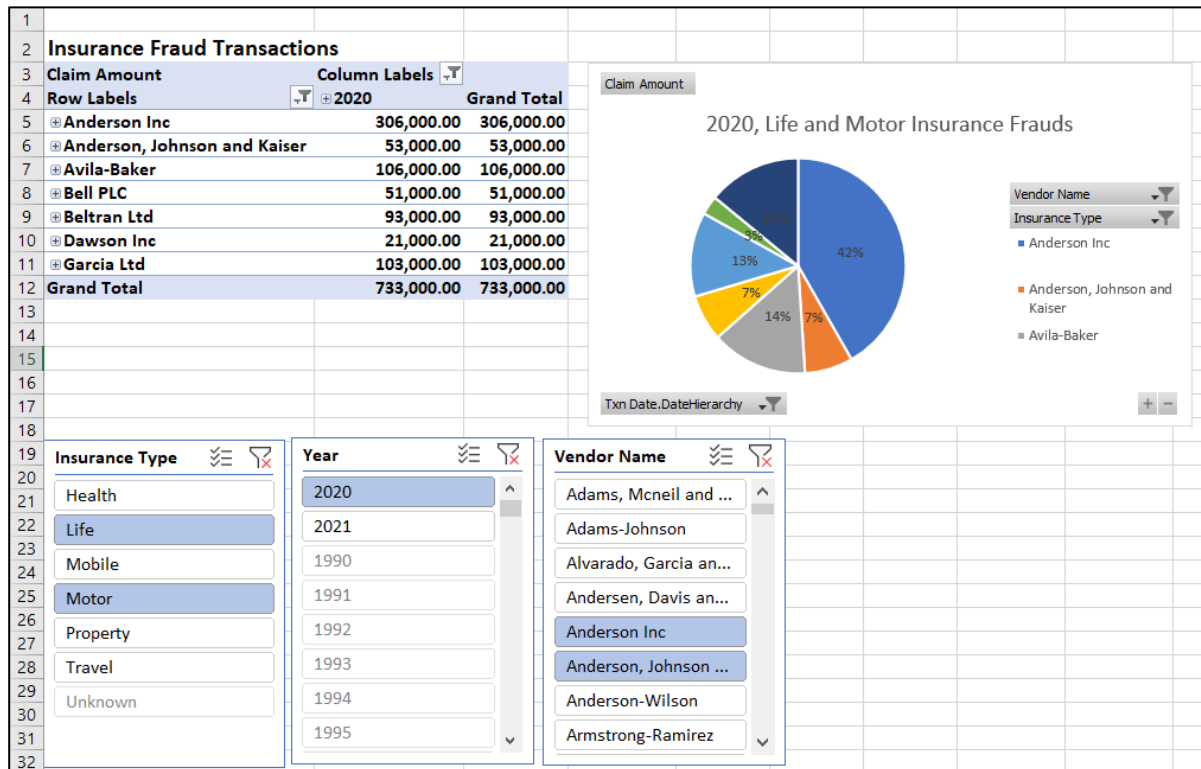


Figure 25: Dicing According to Insurance type, Year and Vendor

### 3.2.5 Pivot

Here the sub-cube has been pivoted among the year, insurance type and state dimensional axis accordingly to get a newer views of the claimed amount measure from various perspectives [1]. First the claimed amount is viewed according to Year and State, then according to State and Insurance Type, and finally according to the Year and Insurance Type

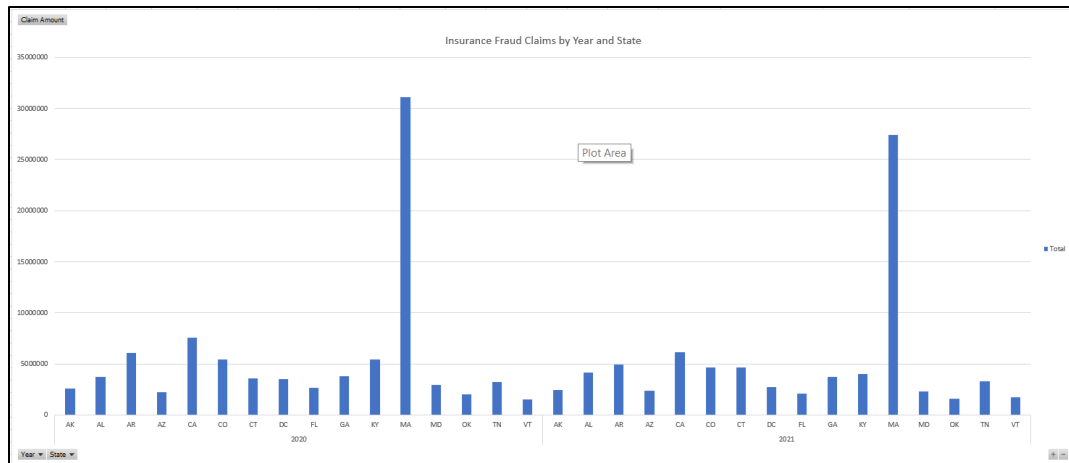


Figure 27: Pivot to view according to Year, State

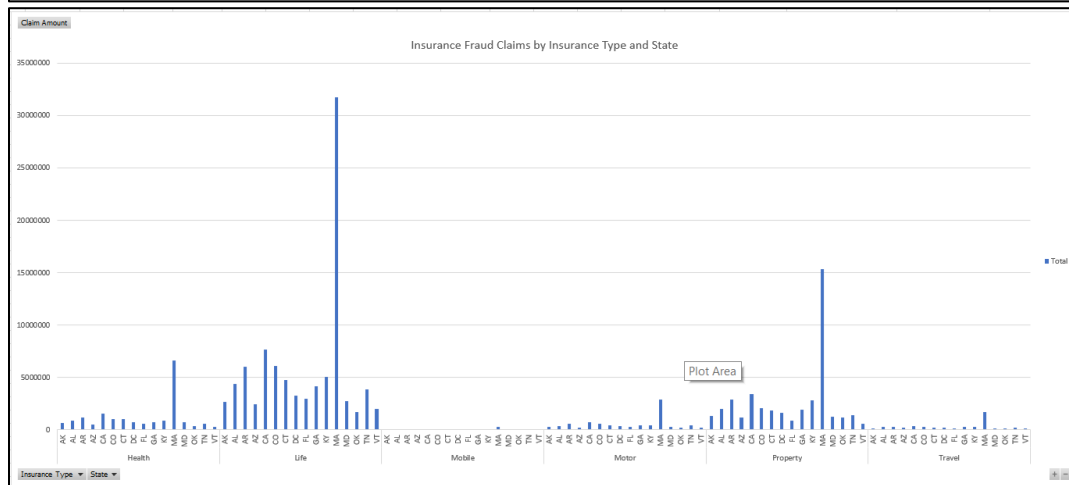


Figure 28: Pivot to view according to Insurance Type, State

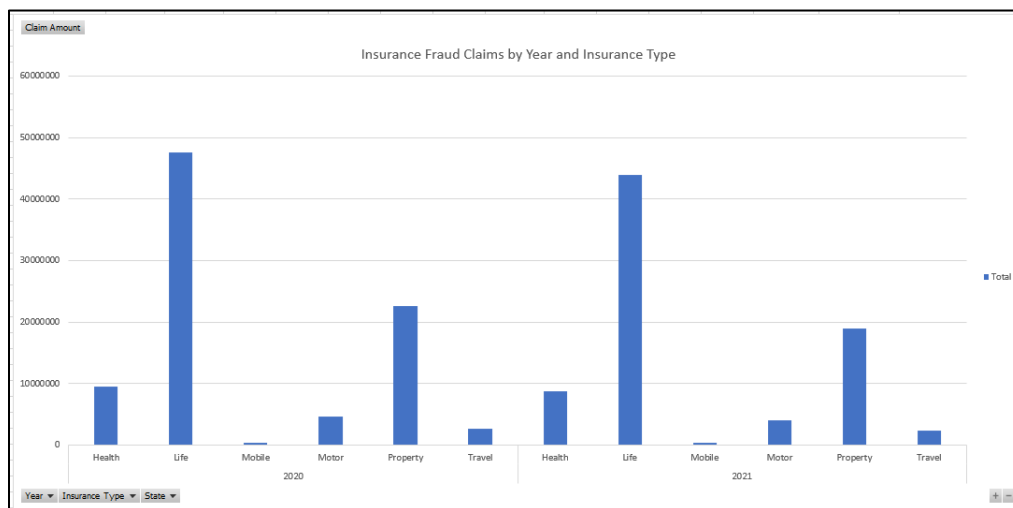


Figure 29: Pivot to view according to Year, Insurance Type

## 4 SQL Server Reporting Service (SSRS) Reports

SQL Server Reporting Services (SSRS) is a reporting tool that allows you to generate structured reports with tables, graphs, images, and charts. These reports are kept on a server and may be accessed at any time using user-defined criteria. The Microsoft SQL Server Services package includes it [1].

The web portal of a Reporting Services report server is a web-based experience. The portal allows you to move between the components of your report server instance and see reports, mobile reports, and KPIs. A single report server instance can also be managed via the web interface.

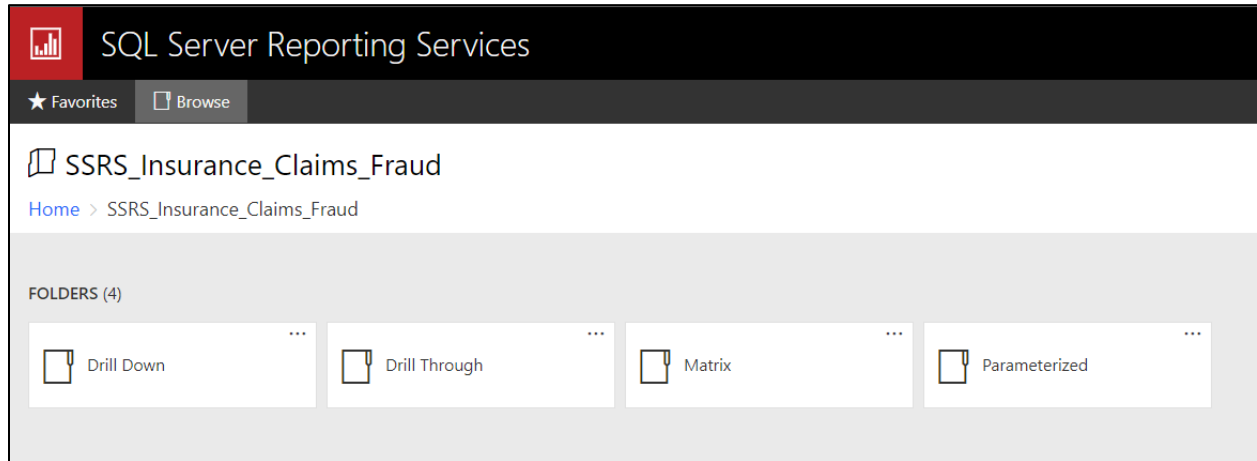


Figure 30: SSRS Web portal

### 4.1 Building the Reports

Report Builder is a self-contained program that you or an administrator installs on your computer. It may be downloaded through the Microsoft Download Center, a SQL Server 2016 Reporting Services report server, or a SharePoint site with Reporting Services integration [1].

Initially before creating the report in report builder, the data source and the data set must be created. Then the tables, matrices and charts can be created accordingly.

When creating the data source, the data warehouse is selected by making a connection with the SQL server. Then the data source created gets a proper name and is added as the data source.

In the creation of the data set, the previously used data source is selected and the necessary data fields from the table are taken via a query or using the GUI to select the needed fields. In this scenario a proper query is written to extract the necessary fields out of the source.

Finally, using the created dataset, tables, matrices or charts and graphs can be created by using the necessary wizards.

## 4.1.1 Creating the Data Source

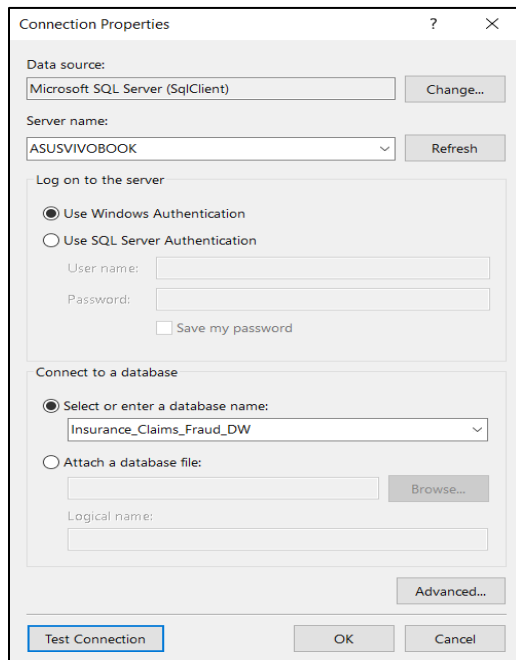


Figure 32: Setting up the connection

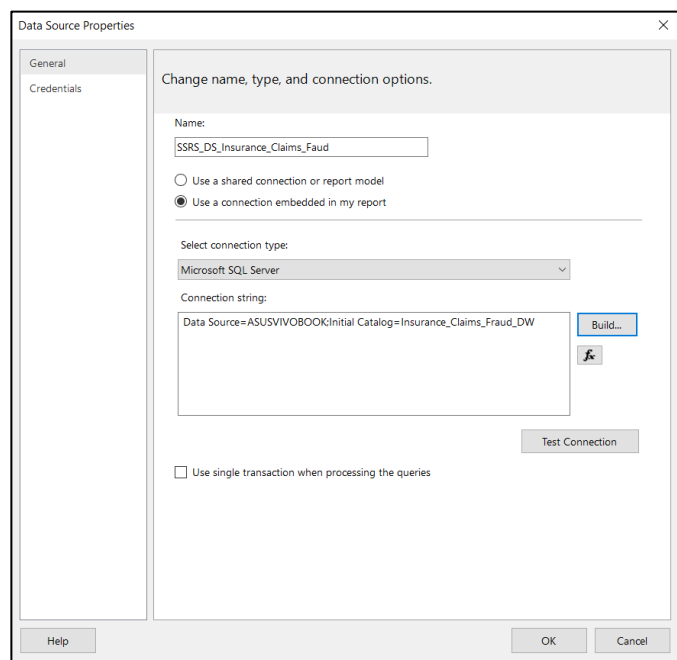


Figure 31: Creating the data source

## 4.1.2 Creating the Data Set

In this scenario a query is written to get the necessary fields out of the source and into the data set.

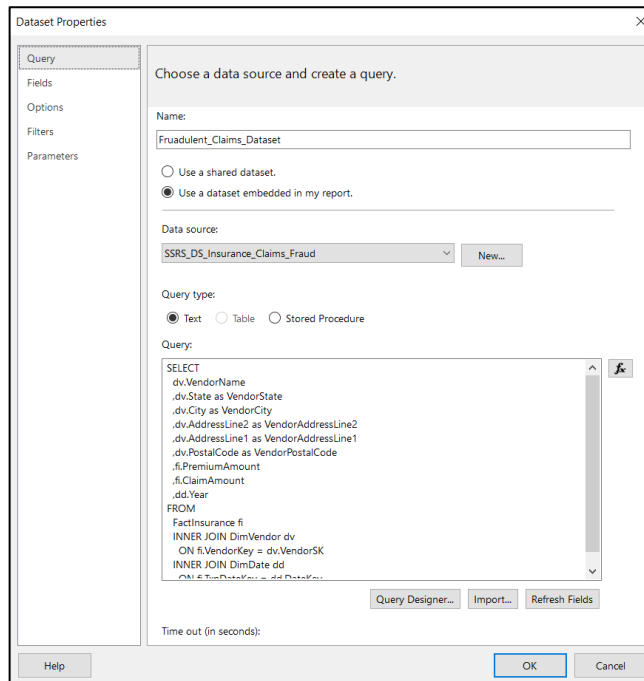


Figure 33: Creating the data set



### 4.1.3 Creating Tables Matrices and Charts

A wizard like the following is present for the creation of tables, matrices, and charts in the report builder.

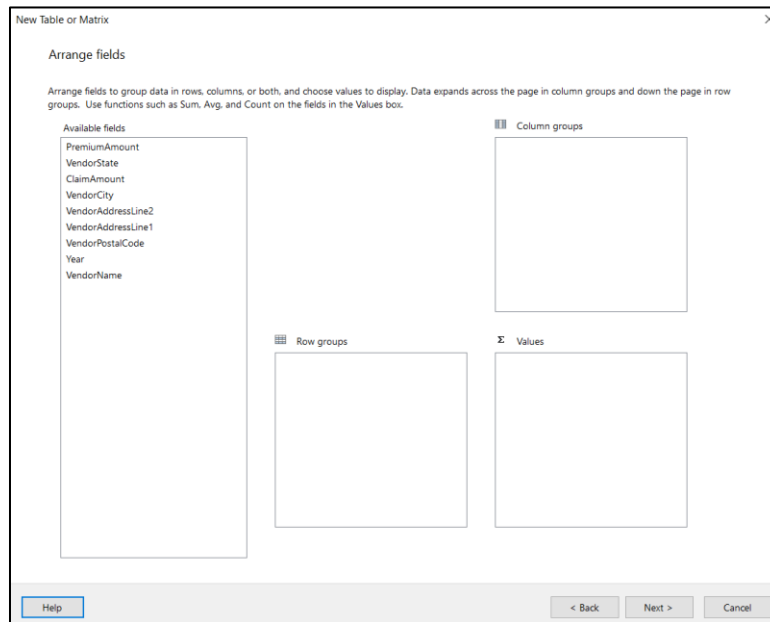


Figure 34: Table create wizard

## 4.2 Report Demonstrations

The following reports have been created and deployed to the SSRS web portal,

- [Report 1: Report with a matrix.](#)
- [Report 2: Report with more than one parameter.](#)
- [Report 3: SSRS drill-down report.](#)
- [Report 4: SSRS drill-through report.](#)
- [Extra Report: Report with one parameter.](#)

(CTRL + Click on the above bookmarks to move to the necessary report)

## 4.2.1 Report 1: Report with a matrix.

A matrix is like a table, except it is set up to display data in columns and rows, with aggregate data at the intersections [1].

```
SELECT
  dv.VendorName
, dv.State as VendorState
, dv.City as VendorCity
, dv.AddressLine2 as VendorAddressLine2
, dv.AddressLine1 as VendorAddressLine1
, dv.PostalCode as VendorPostalCode
, fi.PremiumAmount
, dd.Year
FROM
  FactInsurance fi
  INNER JOIN DimVendor dv
    ON fi.VendorKey = dv.VendorSK
  INNER JOIN DimDate dd
    ON fi.TxnDateKey = dd.DateKey
```

Figure 36: Matrix build query

Vendor and Year-wise Insurance transactions.rdl - Microsoft Report Builder

Report Data

- Built-in Fields
- Parameters
- Images
- Data Sources
- SSRS\_DS\_Insurance\_Claims\_Fra
- Datasets
- Fraudulent\_Claims\_Dataset

YOY - Vendor Insurance Transactions

	[Year]		Total	
Vendor Name	Claims Recieved	Premium Amount Earned	Total Claims Recieved	Total Premium Amount Earned
[VendorName]	[Sum(ClaimAmount)]	[Sum(PremiumAmount)]	[Sum(ClaimAmount)]	[Sum(PremiumAmount)]
Total	[Sum(ClaimAmount)]	[Sum(PremiumAmount)]	[Sum(ClaimAmount)]	[Sum(PremiumAmount)]

[&ExecutionTime]

Figure 35: Matrix build

YOY - Vendor Insurance Transactions

	2020		2021		Total	
Vendor Name	Claims Recieved	Premium Amount Earned	Claims Recieved	Premium Amount Earned	Total Claims Recieved	Total Premium Amount Earned
Adams, Mcneil and Gray	125,200.00	344.40	160,600.00	642.15	285,800.00	986.55
Adams-Johnson	274,700.00	453.46	121,000.00	601.44	395,700.00	1,054.90
Alvarado, Garcia and Thomas	141,300.00	1,036.41	239,600.00	1,040.69	380,900.00	2,077.10
Andersen, Davis and Washington	133,000.00	271.11	130,100.00	742.78	263,100.00	1,013.89
Anderson Inc	442,800.00	2,127.81	184,000.00	834.26	626,800.00	2,962.07
Anderson, Johnson and Kaiser	59,100.00	427.76	166,400.00	602.88	225,500.00	1,030.64
Anderson-Wilson	376,100.00	1,061.54	88,700.00	548.69	464,800.00	1,610.23
Armstrong-Ramirez	92,000.00	797.99	235,200.00	611.76	327,200.00	1,409.75
Armstrong-Summers	99,500.00	755.25	90,100.00	613.69	189,600.00	1,368.94
Avila-Baker	176,000.00	1,225.91	279,200.00	708.61	455,200.00	1,934.52
Ayala PLC	107,000.00	375.13	164,000.00	953.81	271,000.00	1,328.94

Figure 37: Matrix

## 4.2.2 Report with more than one parameter.

Multiple parameters in SSRS enable users to dynamically filter SSRS reports using multiple parameter values. Here selection of multiple values per parameter has also been enabled [1].

2 Parameters and 3 datasets have been used.

- Fruadulent\_claims\_dataset – Contains the data fields needed for the report build.
- PolicyTypesList – Contains the policy types to be used in the first parameter dropdown.
- CustomerNameList – Contains customer names filtered by policy types for parameter two.

```
SELECT
dc.CustomerName
,dc.AlternateCustomerID
,pc.AlternatePolicyClaimNumber
,pc.InsuranceType
,fi.PremiumAmount
,fi.ClaimAmount
,fi.Tenure
,dd.[Year]
,dd.Quarter
,dd.MonthName
,da.AlternateAgentID
,da.AgentName
,dc.AddressLine1
,dc.City
,dv.VendorName
FROM
DimCustomer dc
INNER JOIN DimPolicyClaim pc
ON dc.PolicyClaimKey = pc.PolicyClaimSK
INNER JOIN FactInsurance fi
ON dc.CustomerSK = fi.CustomerKey
INNER JOIN DimAgent da
ON fi.AgentKey = da.AgentSK
INNER JOIN DimVendor dv
ON fi.VendorKey = dv.VendorSK
INNER JOIN DimDate dd
ON fi.TxnDateKey = dd.DateKey
where dc.AlternateCustomerID in (@Customer_Name)
```

Figure 39: Multi-parameter data set query

```
select distinct InsuranceType
from DimPolicyClaim
```

Figure 40: PolicyTypeList query

```
SELECT
pc.InsuranceType, dc.CustomerName, dc.AlternateCustomerID
FROM
DimCustomer dc
INNER JOIN DimPolicyClaim pc
ON dc.PolicyClaimKey = pc.PolicyClaimSK
INNER JOIN FactInsurance fi
ON dc.CustomerSK = fi.CustomerKey
INNER JOIN DimAgent da
ON fi.AgentKey = da.AgentSK
INNER JOIN DimDate dd
ON fi.TxnDateKey = dd.DateKey
where pc.InsuranceType in (@Insurance_Type)
order by dc.CustomerName
```

Figure 38: Customer name list query

The screenshot shows the Microsoft Report Builder interface for a report titled "Insurance Fraud Transactions by Policy Types and Customer". The report is displayed in a preview window, showing a table with the following columns: Insurance, Customer, Customer ID, Policy Claim, Insurance, Handled, City, Customer, Premium Am, Tenure, and Claim Amou. The table is filtered by parameters: InsuranceType, CustomerName, and Year. The report is built using three datasets: SSRS\_DS\_Insurance\_Claims\_Fra, Fruadulent\_Claims\_Dataset, and PolicyTypeList. The report is titled "Insurance Fraud Transactions by Policy Types and Customer" and includes a footer with the execution time.

Figure 43: Selecting values for parameter 1

Figure 42: Selecting values for parameter 2

Insurance Type	Customer Name	Customer ID	Policy Claim Number	Insurance Vendor	Handled Agent ID	City	Customer Address	2020			2021		
								Premium Amount Paid	Tenure	Claim Amount Requested	Premium Amount Paid	Tenure	Claim Amount Requested
Life	Aaron Hearnen	A00002039	PLC00008406	Miller, Perez and Cannon	AGENT00921	Montgomery	2133 Boulter Street	71.37	16.00	64,000.00	0.00	0.00	0.00
	Alexander Dinkens	A00009895	PLC00007222	Luna, Meyer and Lopez	AGENT00022	Arvada	5581 Nolan Street	94.52	113.00	37,000.00	0.00	0.00	0.00
	Alicia Helm	A00006957	PLC00001895	Miller, Perez and Cannon	AGENT00741	Hanford	2064 West Columbia Way	91.09	11.00	87,000.00	0.00	0.00	0.00
	Aurelio Wohlert	A00004429	PLC00002858	Mcclure Ltd	AGENT01011	Louisville	1903 Bashford Manor Lane	0.00	0.00	0.00	81.23	97.00	27,000.00
	Barbar Waggoner	A00003045	PLC00008785	Miller, Perez and Cannon	AGENT01082	Fresno	5396 North Reese Avenue	0.00	0.00	0.00	86.12	79.00	10,000.00
	Barbara Baron	A00007072	PLC00003464	Miller, Perez and Cannon	AGENT00899	Anchorage	12800 Saunders Road	70.33	32.00	83,000.00	0.00	0.00	0.00
Motor	Aaron Mcgrath	A00004002	PLC00009915	French and Sons	AGENT00065	Marshfield	150 Meadowview Street	0.00	0.00	0.00	93.17	7.00	9,000.00
	Alesia Radcliffe	A00007971	PLC00000980	Miller, Perez and Cannon	AGENT00245	Nashville	3701 Lake Towne Drive	0.00	0.00	0.00	119.06	93.00	10,000.00
	Augusta Sartoris	A00003716	PLC00000124	Miller, Perez and Cannon	AGENT00236	Glendale	6451 West Bell Road	0.00	0.00	0.00	120.33	49.00	3,000.00

Figure 44: Multi-parameter report build

Figure 41: Multi Parameter report build

In the report builder, the following expression has been added to the cells where measures are displayed, and null values are expected to occur. This replaces the null value with 0.

=IIf(IsNothing(Sum(Fields!<<field name>>.Value)), 0, Sum(Fields!<<field name>>.Value))

### 4.2.3 Report 3: SSRS drill-down report.

By adding plus and minus icons on a text field in a paginated report, you may allow users to conceal and expose items interactively. This is referred to as a drilldown action. In a table or matrix, you may show or hide static rows and columns, as well as group-related rows and columns [1].

```
SELECT
    dc.AlternateCustomerID
    ,dc.CustomerName
    ,dc.[State]
    ,dc.City
    ,dc.AddressLine1
    ,dc.AddressLine2
    ,dd.[Year]
    ,dd.[Month]
    ,dd.Quarter
    ,fi.Tenure
    ,fi.ClaimAmount
    ,fi.PremiumAmount
FROM
    FactInsurance fi
    INNER JOIN DimCustomer dc
        ON fi.CustomerKey = dc.CustomerSK
    INNER JOIN DimDate dd
        ON fi.TxnDateKey = dd.DateKey
```

Figure 45: Drill down report's dataset query

Overall Customer Insurance Fraud Transactions

State	City	Address	Customer	Premiums Pa	Claims Recie	Tenure	Total Premi	Total Claims	Full Tenure
[State]	Total			«Expr»	«Expr»	«Expr»	niumAmount]]	ClaimAmount]]	[Sum(Tenure)]
	[City]	Total		«Expr»	«Expr»	«Expr»	niumAmount]]	ClaimAmount]]	[Sum(Tenure)]
		[AddressLine1]	Total	«Expr»	«Expr»	«Expr»	niumAmount]]	ClaimAmount]]	[Sum(Tenure)]
			[CustomerName]	«Expr»	«Expr»	«Expr»	niumAmount]]	ClaimAmount]]	[Sum(Tenure)]
Total				niumAmount]]	ClaimAmount]]	[Sum(Tenure)]	niumAmount]]	ClaimAmount]]	[Sum(Tenure)]

Row Groups: State, City, AddressLine1, CustomerName

Column Groups: Year

Figure 46: Drill down report build

Overall Customer Insurance Fraud Transactions												
State	City	Address	Customer Name	2020			2021			Total		
				Premiums Paid	Claims Recieved	Tenure	Premiums Paid	Claims Recieved	Tenure	Total Premiums Paid	Total Claims Recieved	Full Tenure
AK	Total			24,375.72	4,590,800.00	17,486.00	22,189.13	3,932,600.00	15,714.00	46,564.85	8,523,400.00	33,200.00
AL	Total			27,513.26	4,951,100.00	18,785.00	28,206.24	5,469,600.00	19,633.00	55,719.50	10,420,700.00	38,418.00
AR	Total			31,601.01	6,206,000.00	22,521.00	25,581.15	5,450,800.00	19,108.00	57,182.16	11,656,800.00	41,629.00
AZ	Total			28,647.88	5,401,100.00	20,415.00	25,302.31	4,638,300.00	16,293.00	53,950.19	10,039,400.00	36,708.00
CA	Total			48,888.06	10,040,800.00	35,311.00	41,598.17	8,034,800.00	29,455.00	90,486.23	18,075,600.00	64,766.00
CO	Total			30,503.32	5,773,000.00	22,370.00	29,717.85	4,809,500.00	19,518.00	60,221.17	10,582,500.00	41,888.00
CT	Total			29,443.10	5,203,400.00	18,857.00	21,963.76	3,754,500.00	16,464.00	51,406.86	8,957,900.00	35,321.00
DC	Total			28,503.10	5,312,300.00	20,972.00	23,696.96	4,057,200.00	15,860.00	52,200.06	9,369,500.00	36,832.00
FL	Total			30,946.86	5,457,900.00	21,800.00	28,109.07	5,044,100.00	19,915.00	59,055.93	10,502,000.00	41,715.00
GA	Total			31,339.69	5,868,000.00	22,849.00	25,114.33	5,423,600.00	17,100.00	56,454.02	11,291,600.00	39,949.00
KY	Total			28,055.85	4,593,400.00	19,476.00	24,070.26	4,458,000.00	17,181.00	52,126.11	9,051,400.00	36,657.00
MA	Total			25,350.10	4,583,300.00	18,381.00	22,620.79	4,347,300.00	15,744.00	47,970.89	8,930,400.00	34,125.00
MD	Total			24,016.91	4,036,600.00	17,820.00	24,685.95	4,947,900.00	18,261.00	48,702.86	8,984,500.00	36,081.00
OK	Total			22,824.60	4,505,000.00	17,013.00	21,939.63	4,435,400.00	16,472.00	44,764.23	8,940,400.00	33,485.00
TN	Total			32,405.22	5,909,700.00	23,710.00	23,645.72	4,811,100.00	17,485.00	56,050.94	10,720,800.00	41,195.00
VT	Total			27,093.30	5,030,500.00	20,030.00	25,136.65	4,560,900.00	17,499.00	52,229.95	9,591,400.00	37,529.00
Total				471,507.98	87,462,700.00	337,796.00	413,577.97	78,175,600.00	291,702.00	885,085.95	165,638,300.00	629,498.00

Figure 47: Before drilling-down

Overall Customer Insurance Fraud Transactions												
State	City	Address	Customer Name	2020			2021			Total		
				Premiums Paid	Claims Recieved	Tenure	Premiums Paid	Claims Recieved	Tenure	Total Premiums Paid	Total Claims Recieved	Full Tenure
AK	Total			24,375.72	4,590,800.00	17,486.00	22,189.13	3,932,600.00	15,714.00	46,564.85	8,523,400.00	33,200.00
	Anchorage	Total		23,685.01	4,538,200.00	17,084.00	21,687.71	3,843,100.00	15,331.00	45,372.72	8,381,300.00	32,415.00
	Homer	Total		114.67	16,000.00	52.00	81.28	4,000.00	84.00	195.95	20,000.00	136.00
	Kenai	Total		443.06	24,000.00	135.00	140.58	26,500.00	110.00	583.64	50,500.00	245.00
	36528 Short Circle	Total		443.06	24,000.00	135.00	11.91	500.00	78.00	454.97	24,500.00	213.00
	51185 Helmsman Street	Total		0.00	0.00	0.00	128.67	26,000.00	32.00	128.67	26,000.00	32.00
	51185 Helmsman Street	Kristen Collins		0.00	0.00	0.00	128.67	26,000.00	32.00	128.67	26,000.00	32.00
AK	Soldotna	Total		132.98	12,600.00	215.00	279.56	59,000.00	189.00	412.54	71,600.00	404.00
	Total			27,513.26	4,951,100.00	18,785.00	28,206.24	5,469,600.00	19,633.00	55,719.50	10,420,700.00	38,418.00
AR	Total			31,601.01	6,206,000.00	22,521.00	25,581.15	5,450,800.00	19,108.00	57,182.16	11,656,800.00	41,629.00
AZ	Total			28,647.88	5,401,100.00	20,415.00	25,302.31	4,638,300.00	16,293.00	53,950.19	10,039,400.00	36,708.00
CA	Total			48,888.06	10,040,800.00	35,311.00	41,598.17	8,034,800.00	29,455.00	90,486.23	18,075,600.00	64,766.00
CO	Total			30,503.32	5,773,000.00	22,370.00	29,717.85	4,809,500.00	19,518.00	60,221.17	10,582,500.00	41,888.00
CT	Total			29,443.10	5,203,400.00	18,857.00	21,963.76	3,754,500.00	16,464.00	51,406.86	8,957,900.00	35,321.00
DC	Total			28,503.10	5,312,300.00	20,972.00	23,696.96	4,057,200.00	15,860.00	52,200.06	9,369,500.00	36,832.00
FL	Total			30,946.86	5,457,900.00	21,800.00	28,109.07	5,044,100.00	19,915.00	59,055.93	10,502,000.00	41,715.00
GA	Total			31,339.69	5,868,000.00	22,849.00	25,114.33	5,423,600.00	17,100.00	56,454.02	11,291,600.00	39,949.00
KY	Total			28,055.85	4,593,400.00	19,476.00	24,070.26	4,458,000.00	17,181.00	52,126.11	9,051,400.00	36,657.00

Figure 48: After drilling-down, expansion occurs when the plus sign is clicked

## 4.2.4 Report 4: SSRS drill-through report.

A Drill-through report is one that a user may get by clicking a link in another report. Drill-through reports provide more information on an item included in the initial summary report [1].

- The first report contains a column graph that summarize policy-types details related to the given measures.
- When the consumer presses a policy-type, a link to the risk segmentations of that type is executed and a column graph that summarize risk segmentations are shown.
- When the consumer selects a risk segment, a tabular report of all the customer details of that risk segment will be shown.

```
SELECT
dc.CustomerName
,dc.AlternateCustomerID
,pc.AlternatePolicyClaimNumber
,pc.InsuranceType
,fi.PremiumAmount
,fi.ClaimAmount
,fi.Tenure
,dd.[Year]
,dd.Quarter
,dd.MonthName
,da.AlternateAgentID
,da.AgentName
,dc.AddressLine1
,dc.City
,dv.VendorName
FROM
DimCustomer dc
INNER JOIN DimPolicyClaim pc
ON dc.PolicyClaimKey = pc.PolicyClaimSK
INNER JOIN FactInsurance fi
ON dc.CustomerSK = fi.CustomerKey
INNER JOIN DimAgent da
ON fi.AgentKey = da.AgentSK
INNER JOIN DimVendor dv
ON fi.VendorKey = dv.VendorSK
INNER JOIN DimDate dd
ON fi.TxnDateKey = dd.DateKey
```

Figure 50: Drill through first level dataset query

Name	Value	Omit
Insurance_Type	[InsuranceType]	

Figure 51: Setting the action to link level 2

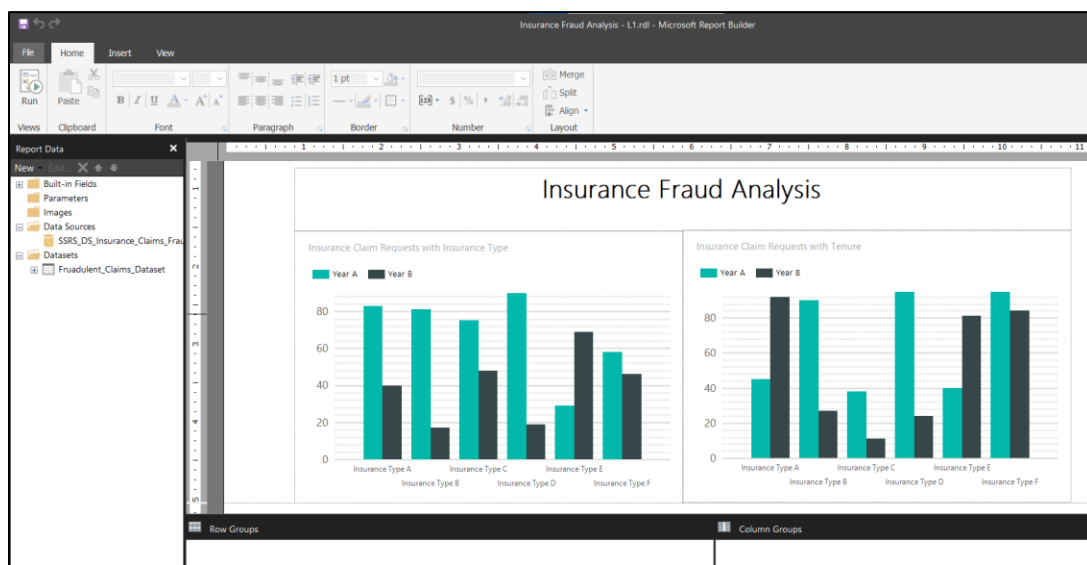


Figure 49: Drill through first level report build

A parameter (@Insurance\_Type) has been setup in the level 2 report to get the value passed from the level 1 report and filter the fields according to that value.

```
SELECT
dc.CustomerName
,dc.AlternateCustomerID
,pc.AlternatePolicyClaimNumber
,pc.InsuranceType
,fi.PremiumAmount
,fi.ClaimAmount
,fi.Tenure
,dd.[Year]
,dd.Quarter
,dd.MonthName
,da.AlternateAgentID
,da.AgentName
,dc.AddressLine1
,dc.City
,dv.VendorName
,dc.RiskSegmentation
FROM
DimCustomer dc
INNER JOIN DimPolicyClaim pc
ON dc.PolicyClaimKey = pc.PolicyClaimSK
INNER JOIN FactInsurance fi
ON dc.CustomerSK = fi.CustomerKey
INNER JOIN DimAgent da
ON fi.AgentKey = da.AgentSK
INNER JOIN DimVendor dv
ON fi.VendorKey = dv.VendorSK
INNER JOIN DimDate dd
ON fi.TxnDateKey = dd.DateKey
where pc.InsuranceType = @Insurance_Type
```

Figure 54: Drill through second level dataset query

Name	Value	Omit
Risk_Segmentation	[RiskSegmentation]	<input type="checkbox"/>
Insurance_Type	[InsuranceType]	<input type="checkbox"/>

Figure 53: Setting the action to link level 3

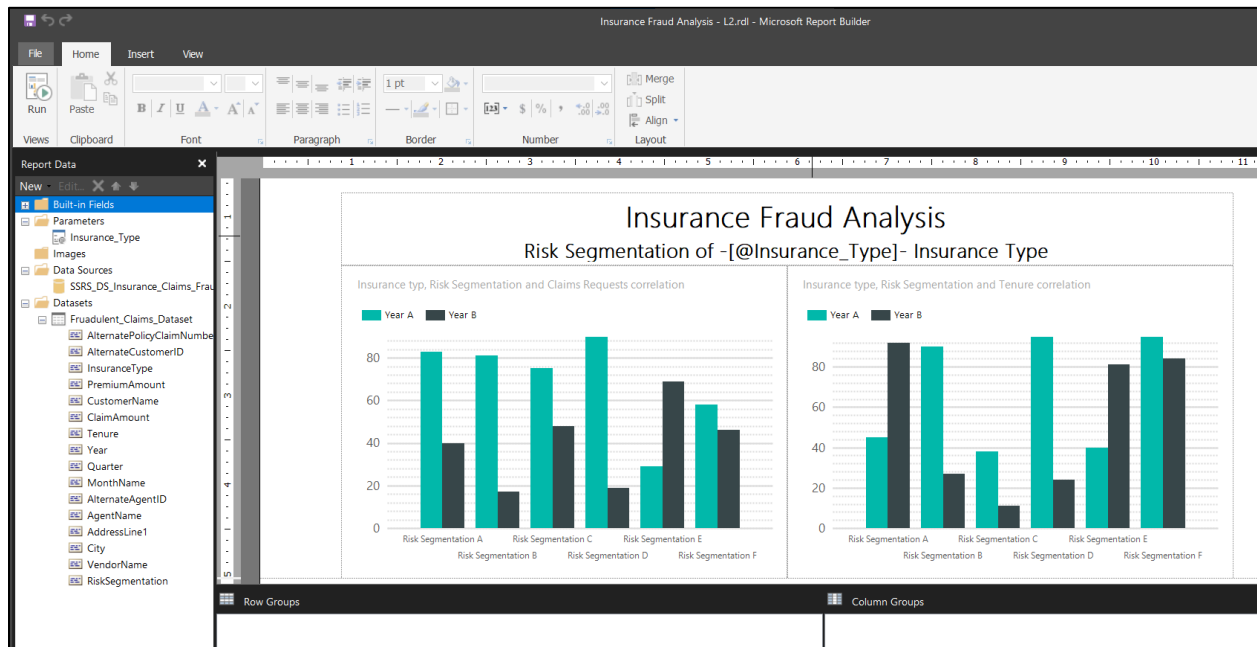


Figure 52: Drill through second level report build



2 parameter (@Insurance\_Type) has been setup in the level 2 report to get the value passed from the level 1 report and filter the fields according to that value.

```
SELECT
    dc.CustomerName
    ,dc.AlternateCustomerID
    ,pc.AlternatePolicyClaimNumber
    ,pc.InsuranceType
    ,dc.RiskSegmentation
    ,fi.PremiumAmount
    ,fi.ClaimAmount
    ,fi.Tenure
    ,dd.[Year]
    ,dd.Quarter
    ,dd.MonthName
    ,da.AlternateAgentID
    ,da.AgentName
    ,dc.AddressLine1
    ,dc.City
    ,dv.VendorName
FROM
    DimCustomer dc
    INNER JOIN DimPolicyClaim pc
        ON dc.PolicyClaimKey = pc.PolicyClaimSK
    INNER JOIN FactInsurance fi
        ON dc.CustomerSK = fi.CustomerKey
    INNER JOIN DimAgent da
        ON fi.AgentKey = da.AgentSK
    INNER JOIN DimVendor dv
        ON fi.VendorKey = dv.VendorSK
    INNER JOIN DimDate dd
        ON fi.TxnDateKey = dd.DateKey
where pc.InsuranceType = @Insurance_Type and dc.RiskSegmentation=@Risk_Segmentation
```

Figure 55:Drill through last level dataset query

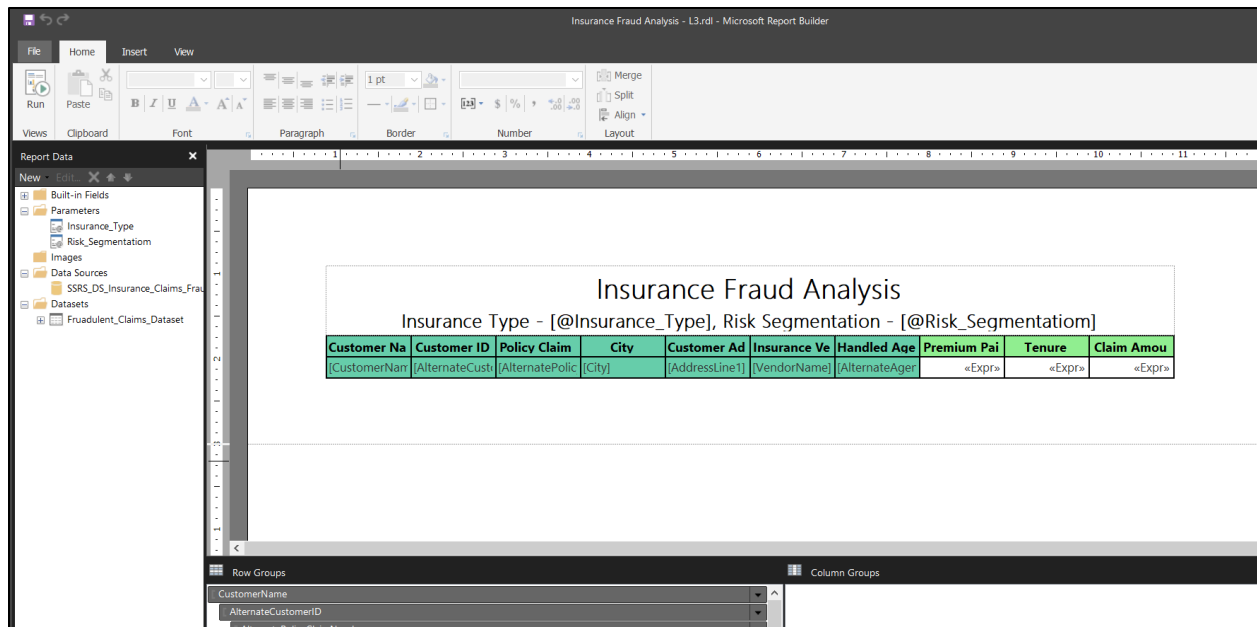


Figure 56: Drill through last level report build

#### 4.2.4.1 Drill - through flow

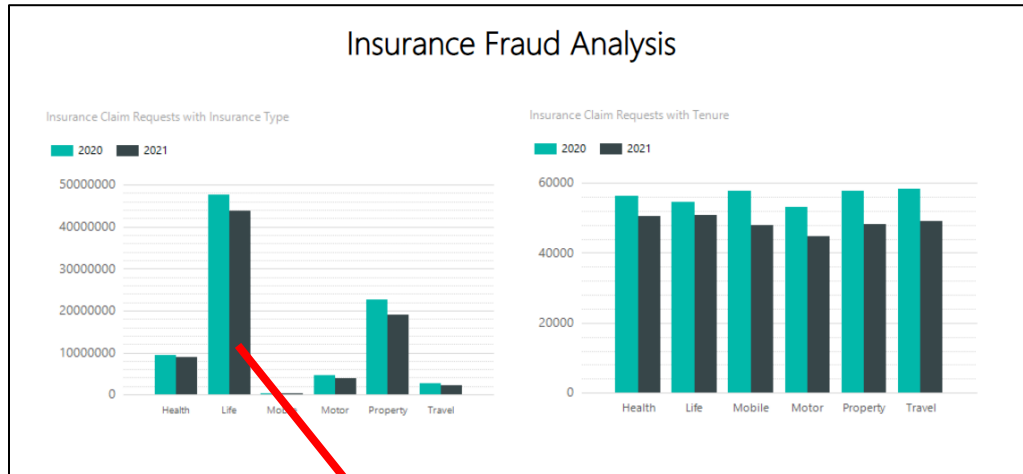
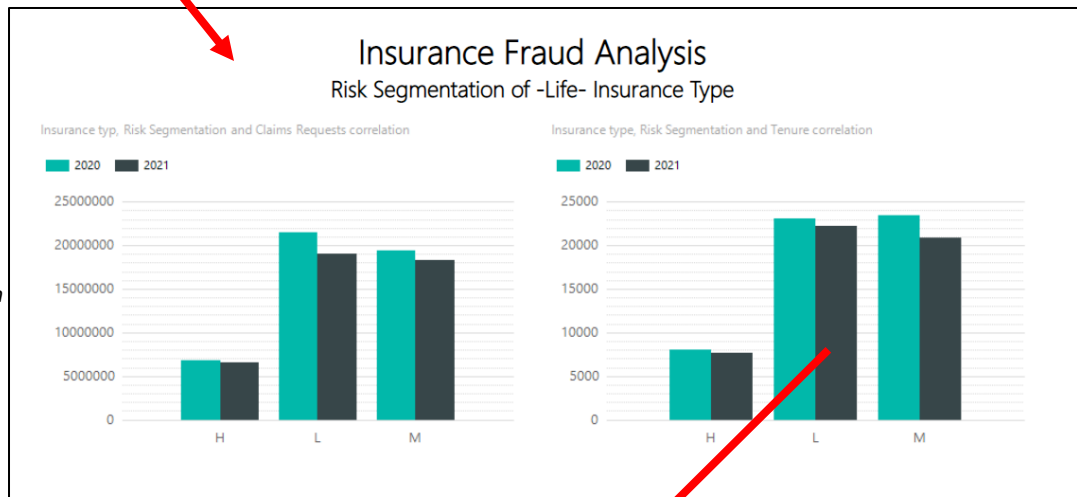


Figure 58: Drill Through L1 report

Figure 59: Drill Through L2 report



**Insurance Fraud Analysis**  
Insurance Type - Life, Risk Segmentation - M

Customer Name	Customer ID	Policy Claim Number	City	Customer Address	Insurance Vendor	Handled Agent ID	Premium Paid	Tenure	Claim Amount Requested
Aaron Hearnen	A00002039	PLC00008406	Montgomery	2133 Boulter Street	Miller, Perez and Cannon	AGENT00921	71.37	16.00	64,000.00
Adela Downin	A00003879	PLC00006178	Washington	2507 R Street Southeast	Hunter PLC	AGENT00807	67.43	105.00	74,000.00
Alana Anderson	A00009226	PLC00007317	Louisville	10406 Sunlight Lane	Castillo-Gates	AGENT00241	70.89	111.00	67,000.00
Albert Andrews	A00003611	PLC00000093	Oakhurst	45430 Lauri Lane	Anderson-Wilson	AGENT00248	71.49	47.00	28,000.00
Alberta Powell	A00008635	PLC00000868	Louisville	15510 Champion Lakes Place	Hurley PLC	AGENT00036	89.01	65.00	63,000.00
Alberto Jeffery	A00008338	PLC00001331	Savannah	713 East 32nd Street	Johnson, Cook and Harrington	AGENT00461	65.14	95.00	60,000.00
Alejandro Williams	A00003280	PLC00004735	Montgomery	2572 Drake Street	Cherry LLC	AGENT00184	51.94	27.00	30,000.00
Alex Jeffrey	A00008703	PLC00006169	Fayetteville	17 West 26th Circle	Stewart Ltd	AGENT00321	85.20	35.00	15,000.00
Alexander Dinkens	A00009895	PLC00007222	Arvada	5581 Nolan Street	Luna, Meyer and Lopez	AGENT00022	94.52	113.00	37,000.00

Figure 57: Drill Through L3 report

#### 4.2.5 Extra Report: Report with one parameter.

A single parameter has been setup to take the needed insurance type (@Insurance\_Type). This parameter can receive multiple values.

A second dataset is used to provide the needed insurance types for the parameter's drop down.

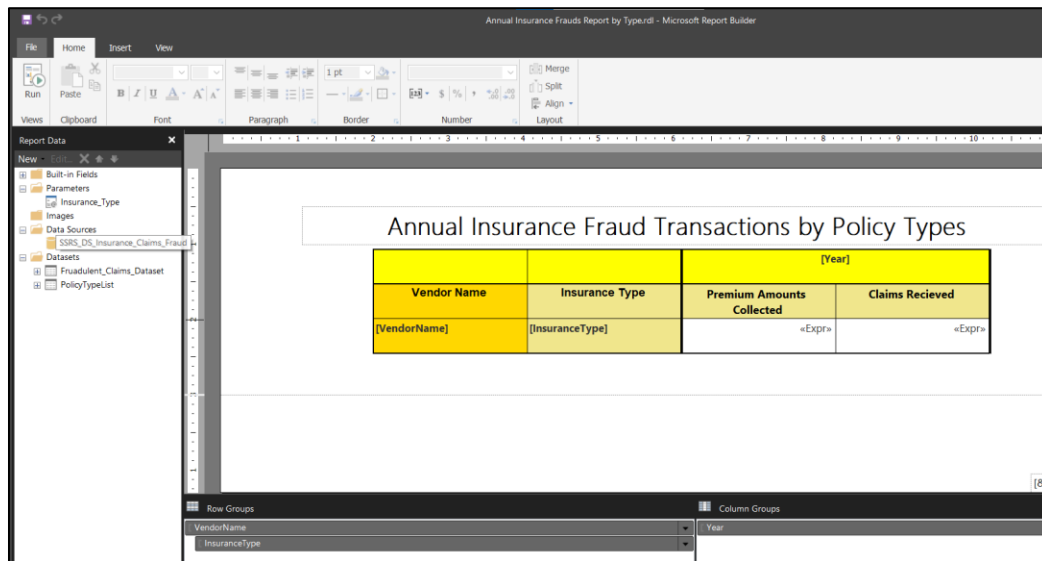


Figure 60: Single parameter report build

Annual Insurance Fraud Transactions by Policy Types					
Vendor Name	Insurance Type	2020		2021	
		Premium Amounts Collected	Claims Recieved	Premium Amounts Collected	Claims Recieved
Adams, Mcneil and Gray	Health	0.00	0.00	129.65	14,000.00
	Motor	0.00	0.00	294.50	25,000.00
Adams-Johnson	Health	0.00	0.00	190.34	1,000.00
	Motor	0.00	0.00	95.22	5,000.00
Alvarado, Garcia and Thomas	Health	447.73	36,000.00	296.78	34,000.00
	Motor	187.94	14,000.00	210.09	9,000.00
Andersen, Davis and Washington	Health	0.00	0.00	241.35	32,000.00
Anderson Inc	Health	607.48	61,000.00	124.82	9,000.00

Figure 61: Single parameter report

## 5 Insurance Claims Dashboard

A Business Intelligence dashboard is a visual representation of data. It is a visual presentation on a single computer screen that includes two or more graphs or charts. All levels of management utilize dashboards to acquire a clear view of many parts of the business in a single, succinct manner.

A business dashboard is an easy and aesthetically pleasant approach to consume data that provides at-a-glance insights based on key performance indicators (KPIs).

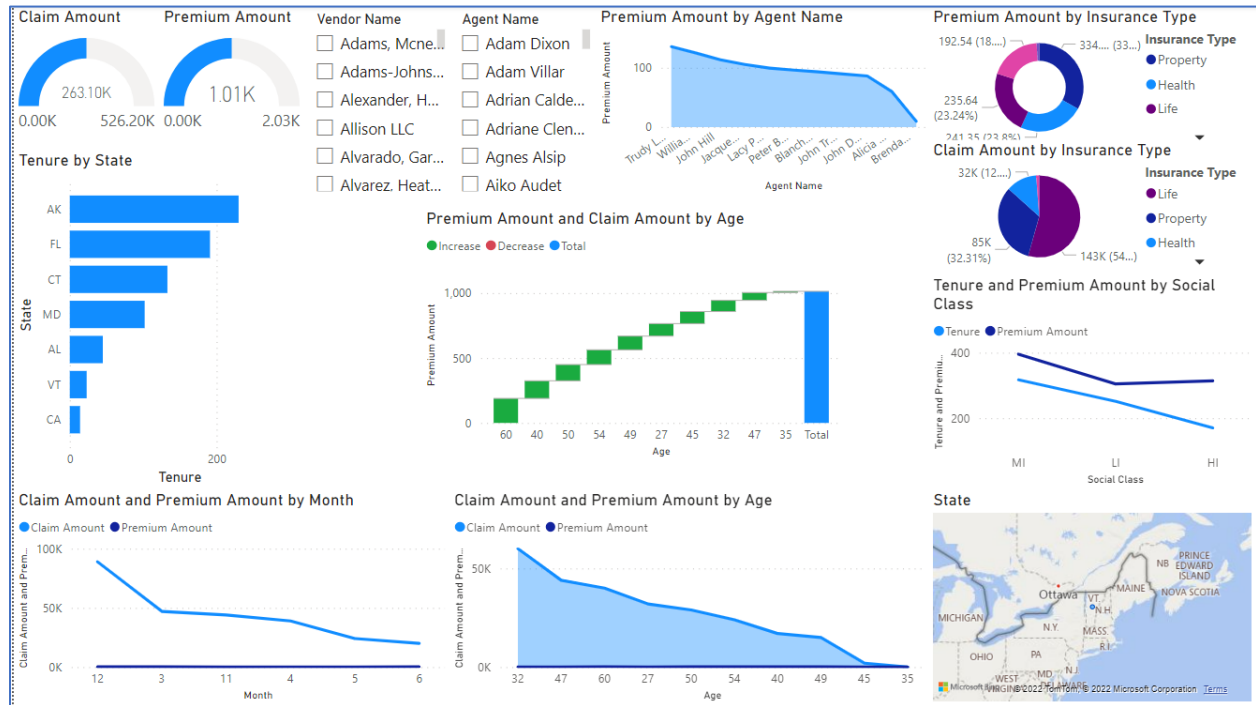


Figure 62: Dashboard

## 6 References

- [1] "qlik," [Online]. Available: <https://www.qlik.com/us/kpi>.
- [2] "geeksforgeeks," [Online]. Available: <https://www.geeksforgeeks.org/olap-operations-in-dbms/>.
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