

Assignment – 3

Title - Create cube based on ROLAP, MOLAP and HOLAP model.

Problem Statement –

Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.

Objective -

To learn how to create the cube with Dimension and fact tables.

Outcome -

Student will be able to create the cube with Dimension and fact tables.

Theory -

Cube:

When data is grouped or combined in multidimensional matrices called Data Cubes. The data cube method has a few alternative names or a few variants, such as "Multidimensional databases," "materialized views," and "OLAP (On-Line Analytical Processing)." Data cube method is an interesting technique with many applications. Data cubes could be sparse in many cases because not every cell in each dimension may have corresponding data in the database. Dimensions are a fact that defines a data cube. Facts are generally quantities, which are used for analyzing the relationship between dimensions.

OLAP:

OLAP stands for On-Line Analytical Processing. OLAP is a classification of software technology which authorizes analysts, managers, and executives to gain insight into information through fast, consistent, interactive access in a wide variety of possible views of data that has been transformed from raw information to reflect the real dimensionality of the enterprise as understood by the clients.

OLAP implement the multidimensional analysis of business information and support the capability for complex estimations, trend analysis, and sophisticated data modeling.

Types of OLAP -

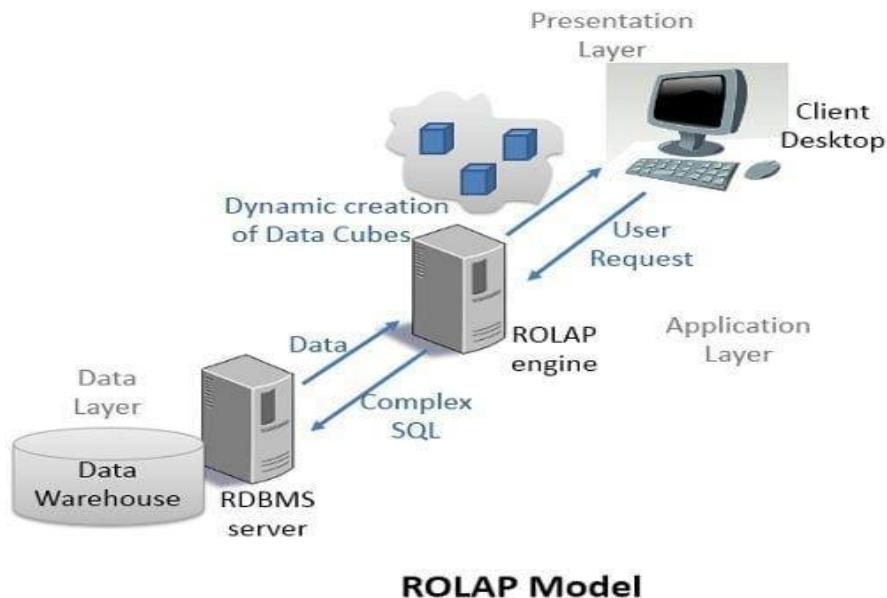
1. ROLAP:

ROLAP is an abbreviation for Relational Online Analytical Processing. In this type of analytical processing, data storage is done in a relational database. In this database, the arrangement of data is made in rows and columns. Data is presented to end-users in a multi-dimensional form.

There are three main components in a ROLAP model:

- Database server: This exists in the data layer. This consists of data that is loaded into the ROLAP server.

- ROLAP server: This consists of the ROLAP engine that exists in the application layer.
- Front-end tool: This is the client desktop that exists in the presentation layer.

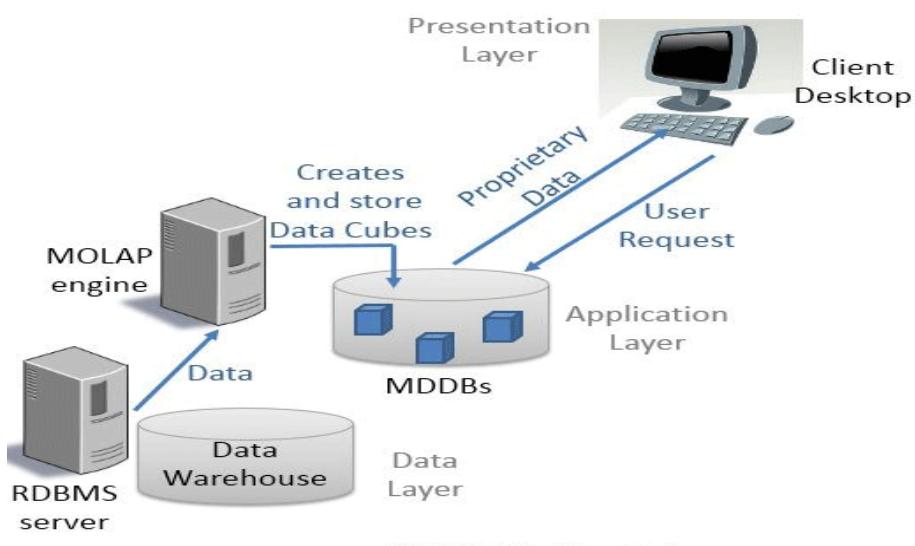


2. MOLAP:

MOLAP is an abbreviation for Multi-dimensional Online Analytical Processing. In this type of analytical processing, multi-dimensional databases (MDDBs) are used to store data. This data is later used for analysis. MOLAP consists of data that is pre-computed and fabricated. The data cubes from MDDBs carry data that has already been calculated. This increases the speed of querying data.

The architecture of MOLAP consists of three main components:

- Database server: This exists in the data layer.

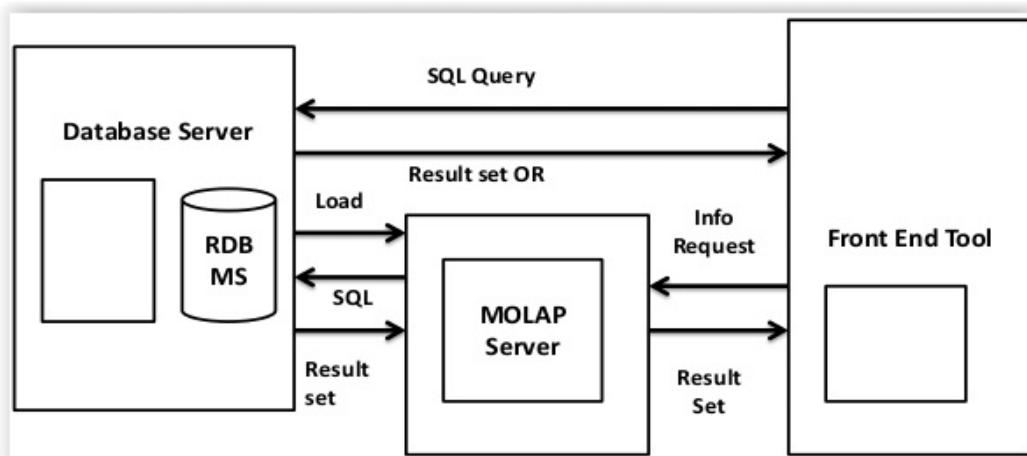


- MOLAP server: This consists of the MOLAP engine in the application layer.
- Front-end tool: This is usually the client desktop in the presentation layer.

3. HOLAP:

This is an abbreviation for Hybrid Online Analytical Processing. This type of analytical processing solves the limitations of MOLAP and ROLAP and combines their attributes. Data in the database is divided into two parts: specialized storage and relational storage. Integrating these two aspects addresses issues relating to performance and scalability. HOLAP stores huge volumes of data in a relational database and keeps aggregations in a MOLAP server.

The HOLAP model consists of a server that can support ROLAP and MOLAP. It consists of a complex architecture that requires frequent maintenance. Queries made in the HOLAP model involve the multi-dimensional database and the relational database. The front-user tool presents data from the database management system (directly) or through the intermediate MOLAP.



Step to perform the ROLAP, MOLAP and HOLAP Model

1) Create the Data warehouse in SQL Server.

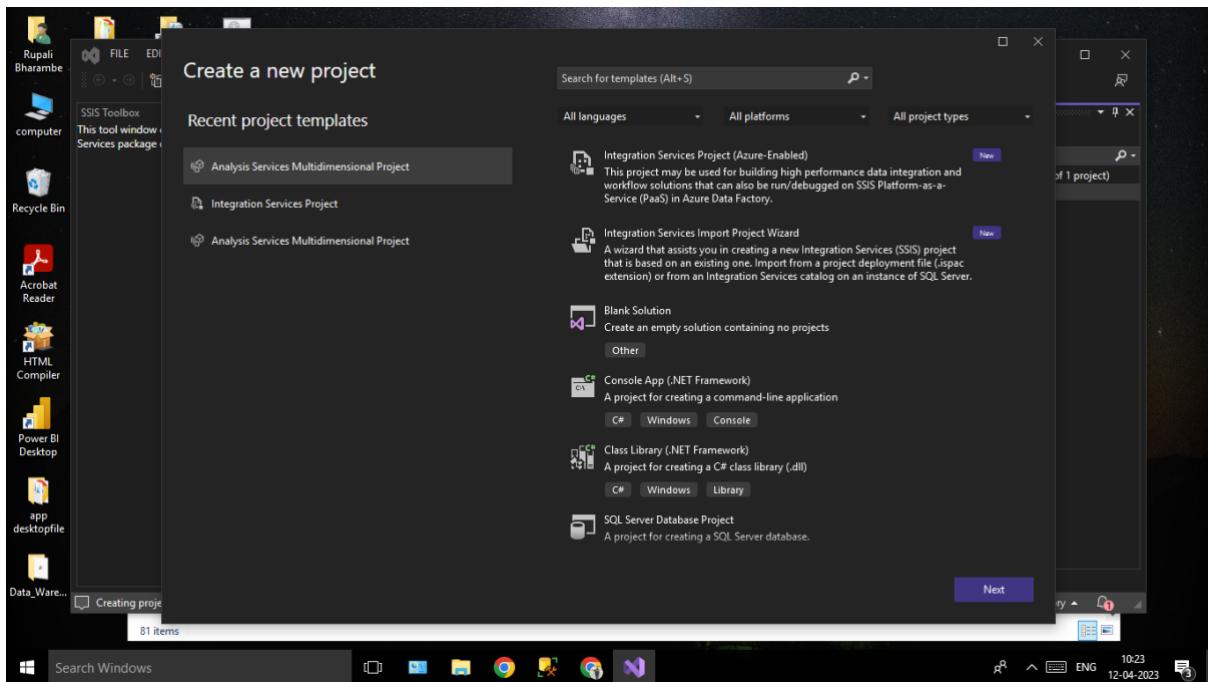
The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, a database named 'Sales DW' is selected under 'DESKTOP-J9EONOA\SQLEXPRESS (SQL Server)'. In the center pane, a query window titled 'Data WareHouse SQLScript.sql - DESKTOP-J9EONOA\SQLEXPRESS.Sales_DW (Rupali (52))' contains the following T-SQL script:

```
GO
Create database Sales_DW
Go
Use Sales_DW
Go
Create table DimCustomer
(
    CustomerID int primary key identity,
    CustomerAltID varchar(10) not null,
    CustomerName varchar(50),
    Gender varchar(20)
)
Go
Insert into DimCustomer(CustomerAltID,CustomerName,Gender)values
('INT-001','Henry Ford','M'),
('INT-002','Bill Gates','M'),
('INT-003','Muskan Shaikh','F'),
('INT-004','Richard Thriburn','M'),
('INT-005','Emma Wattson','F');
```

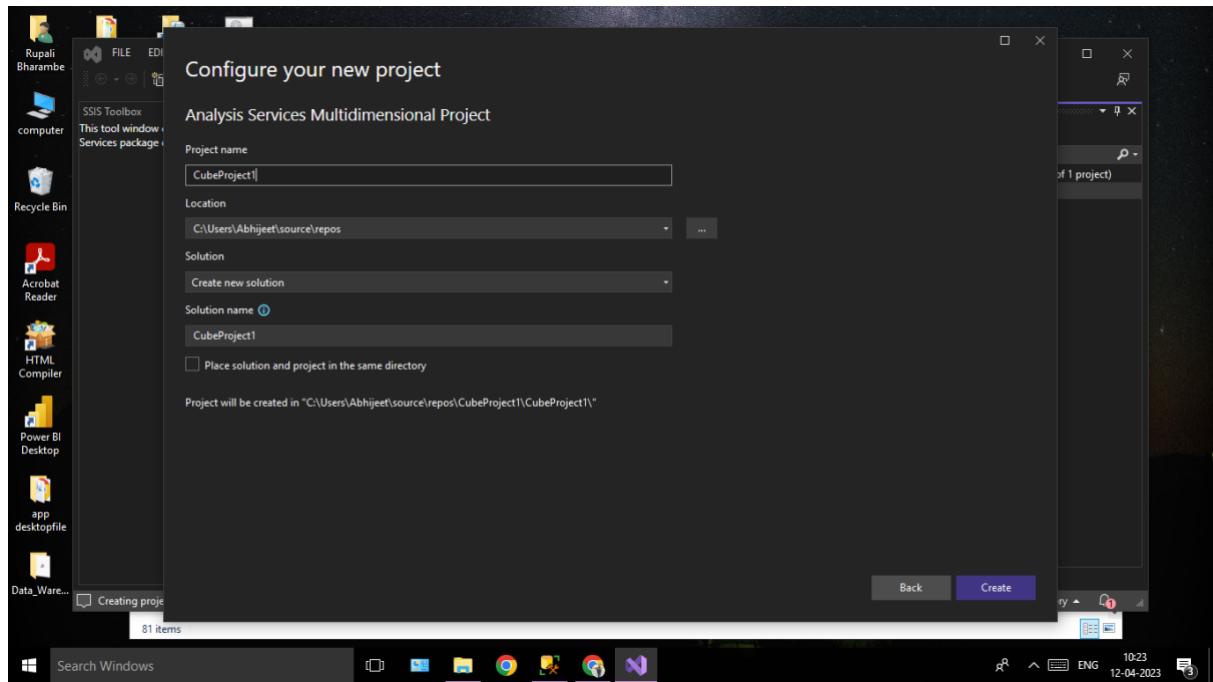
Below the script, a results grid displays 730 rows of data from the 'DimCustomer' table. The columns include DateKey, Date, FullDateUK, FullDateUSA, DayOfMonth, DaySuffix, DayName, DayOfWeekUSA, DayOfWeekUK, DayOfWeekInMonth, DayOfWeekInYear, and DayOfQuarter. The data shows various dates from January 1, 2013, to January 8, 2013, with corresponding days of the week and years.

At the bottom of the screen, the taskbar shows the date as 12-04-2023 and the time as 10:06.

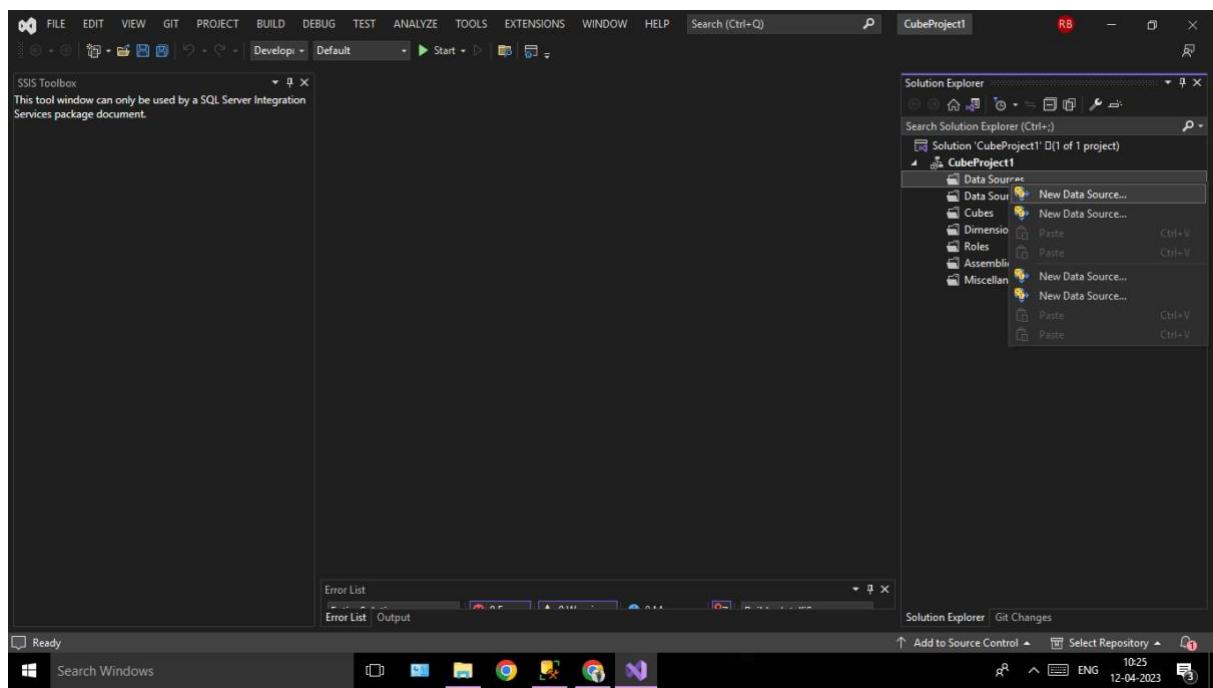
2) Create the project in Visual Studio



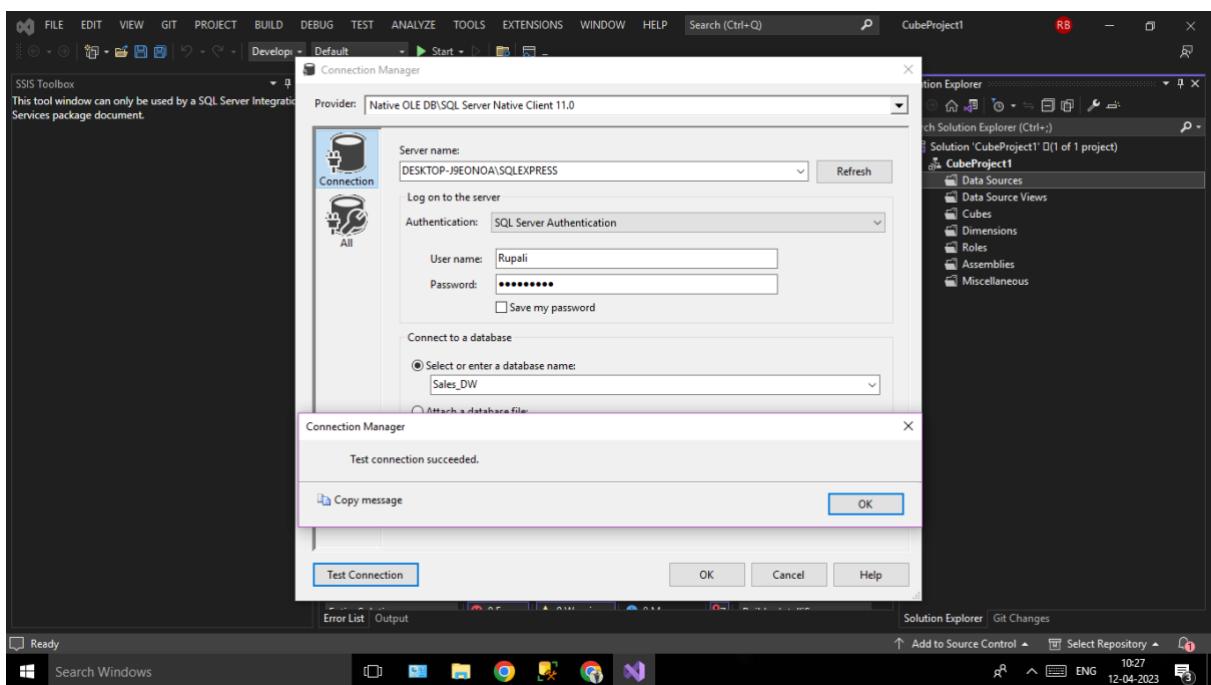
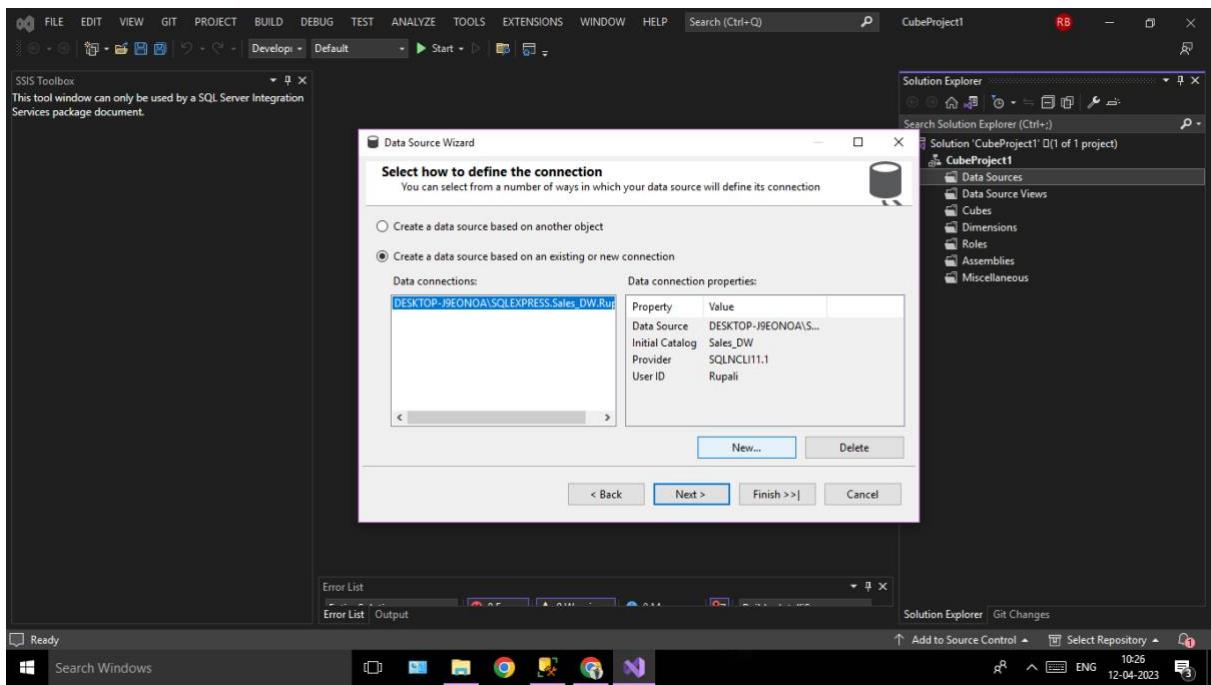
3) Configure the Project

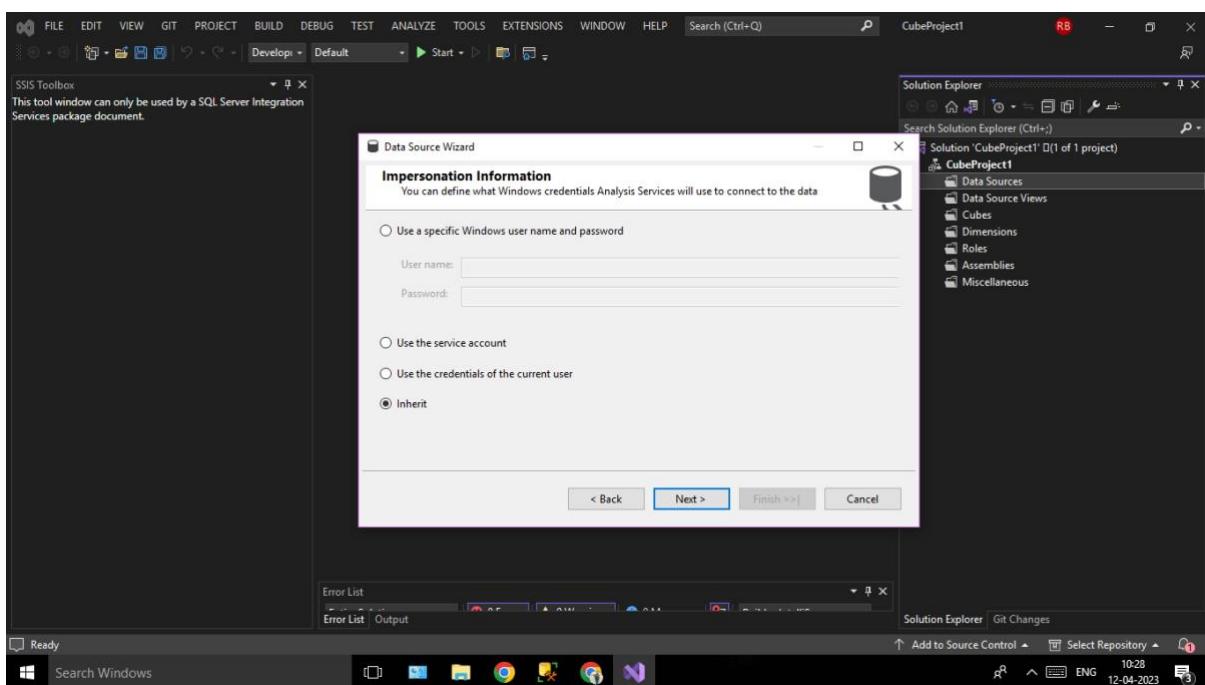
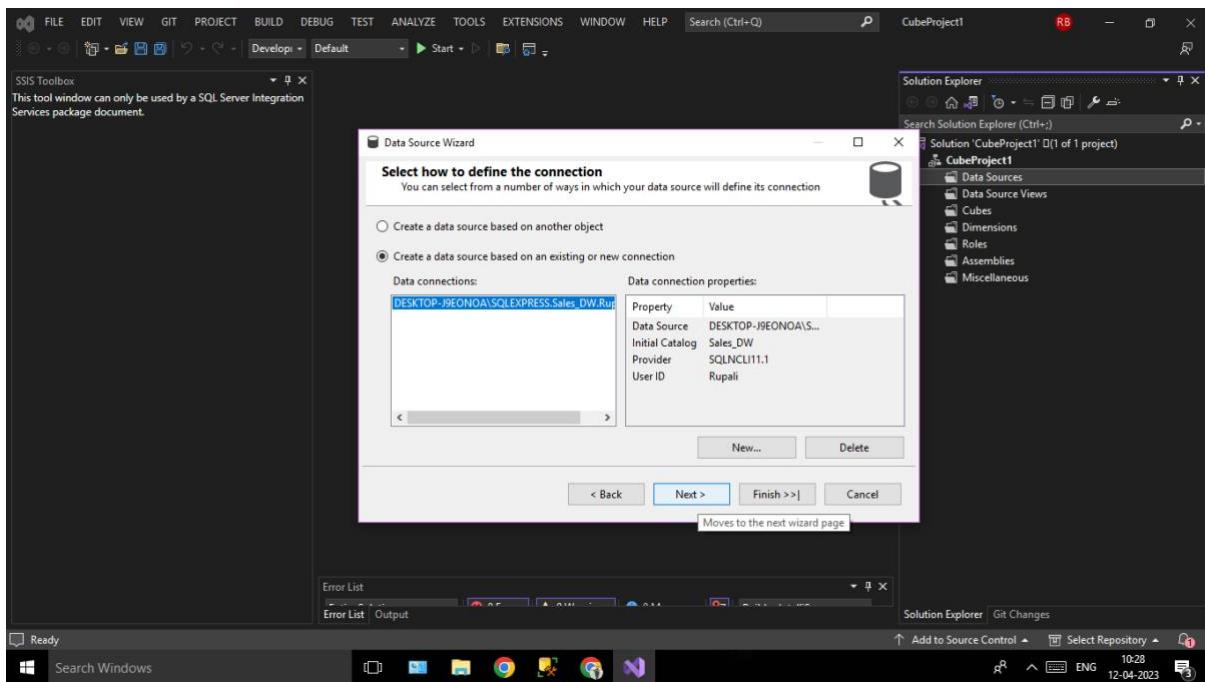


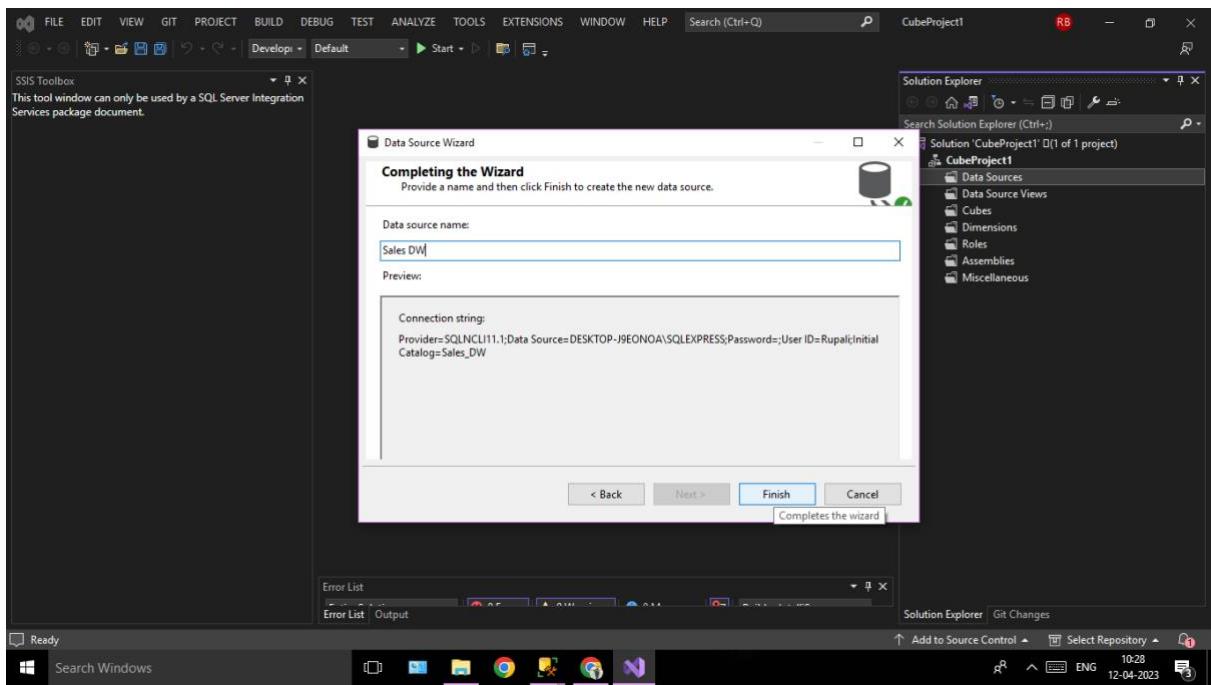
4) Create the New Data Source



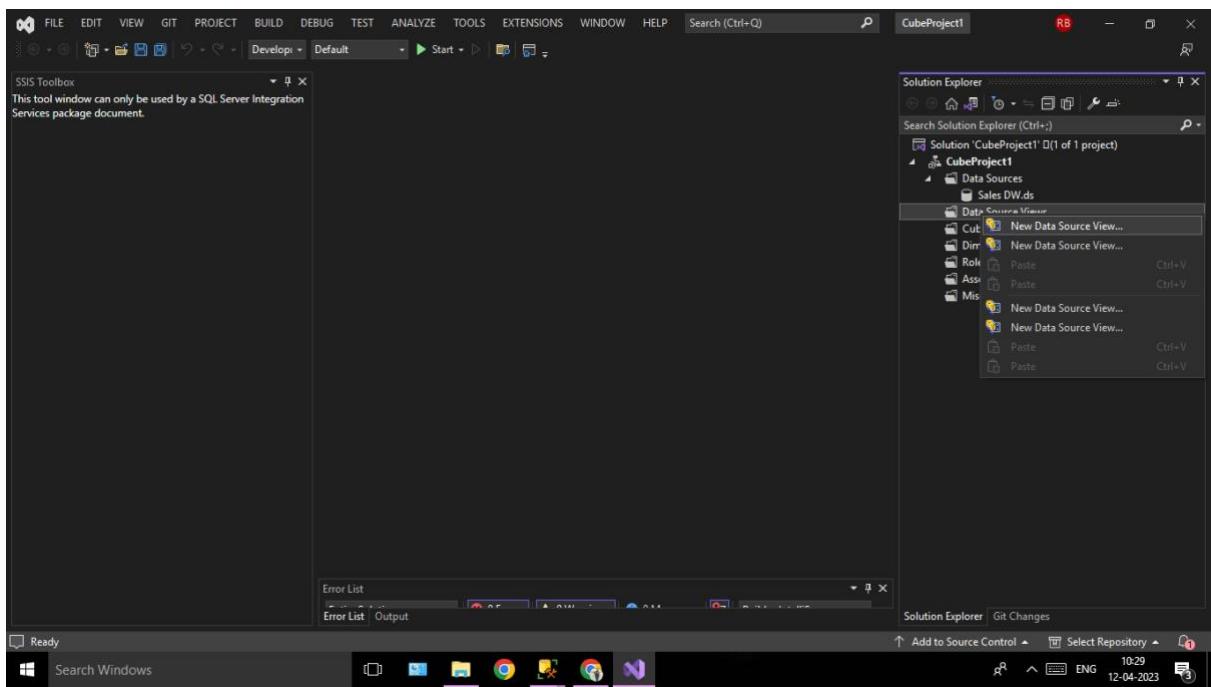
5) Create the connection between data source

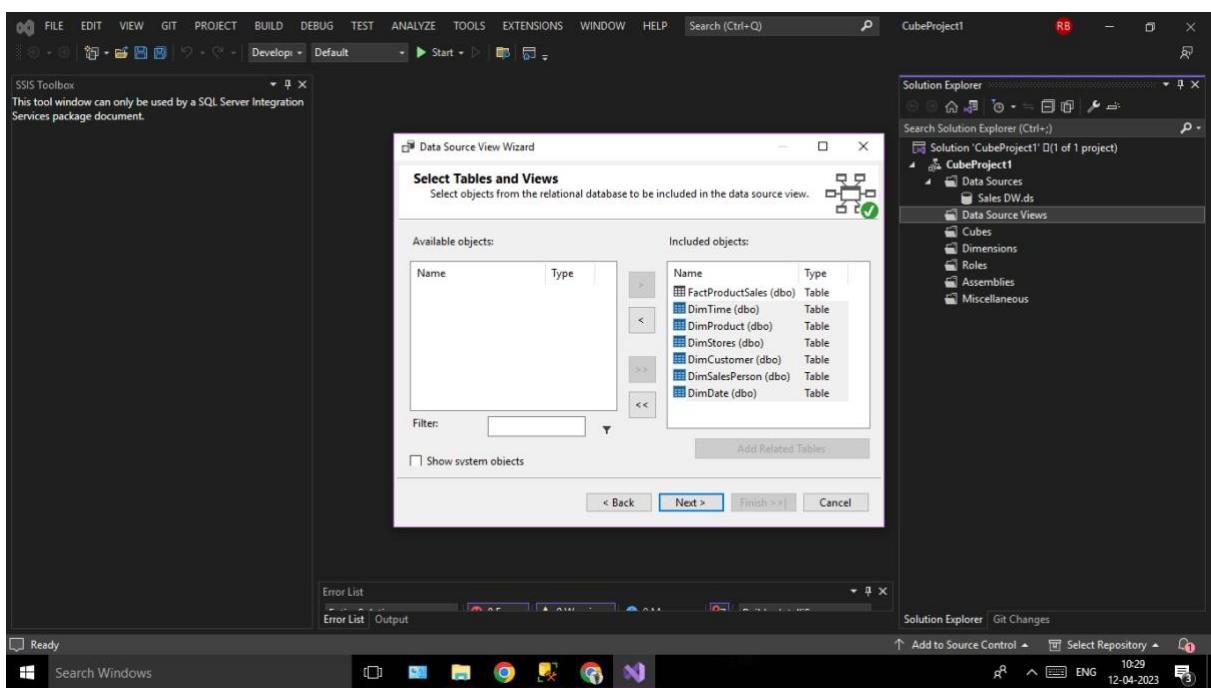
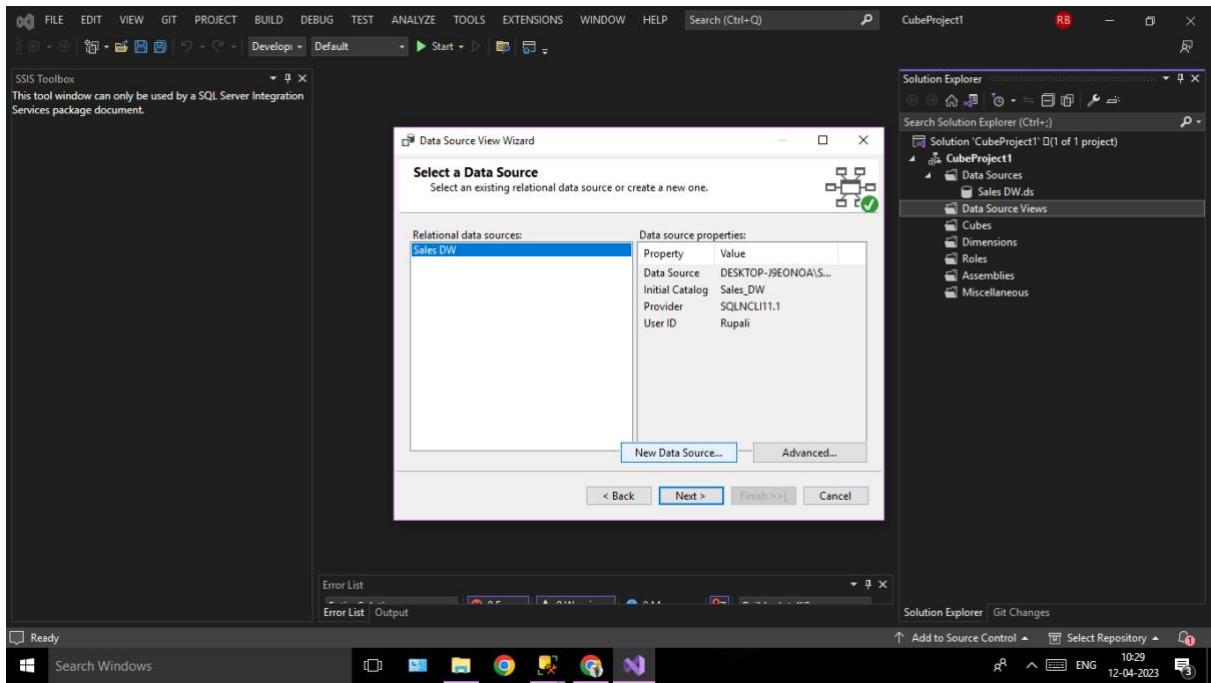


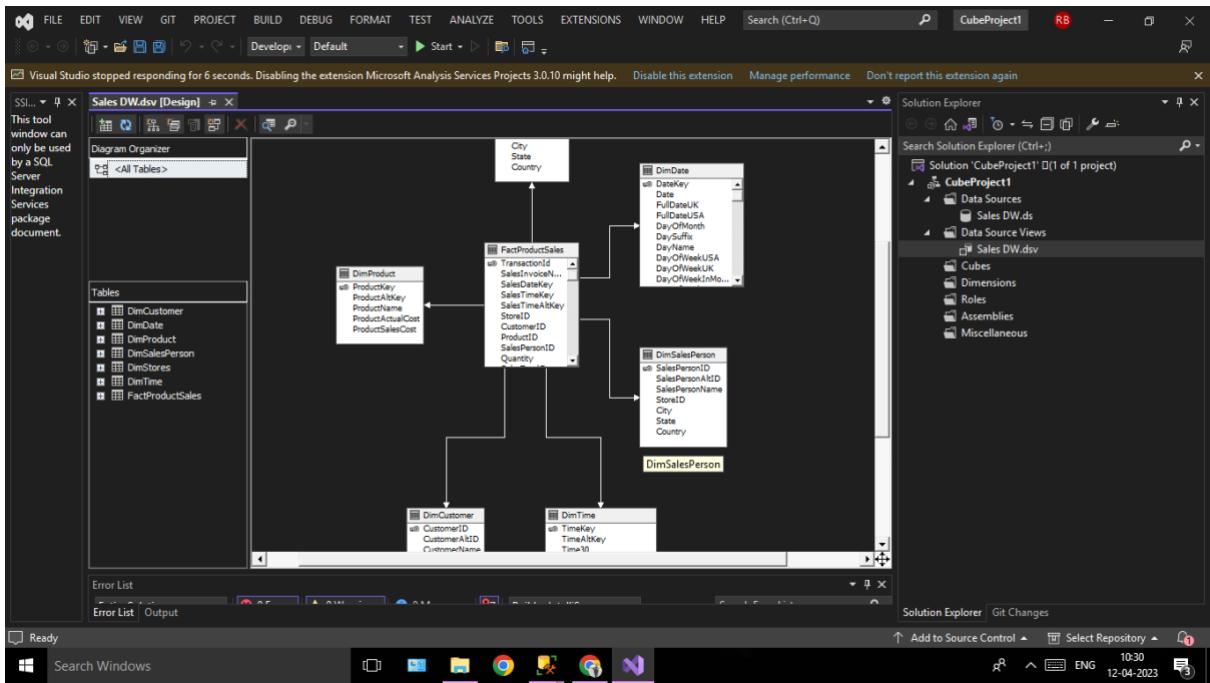




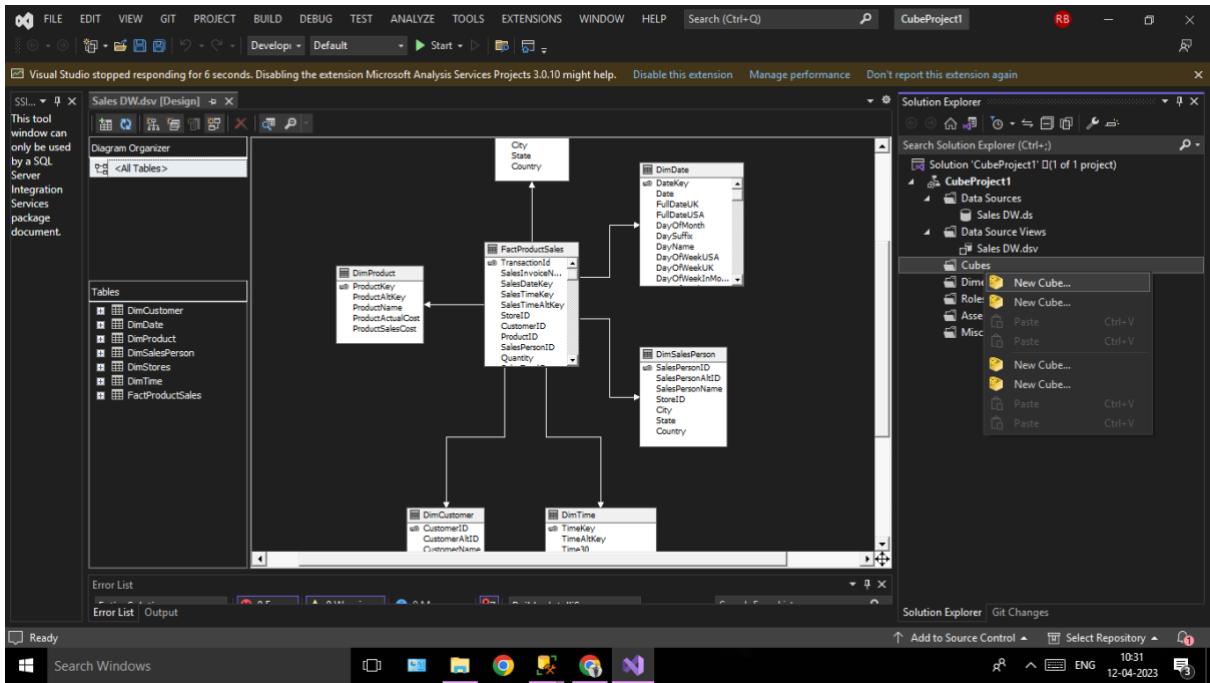
6) Create the Data source and view using the following step.

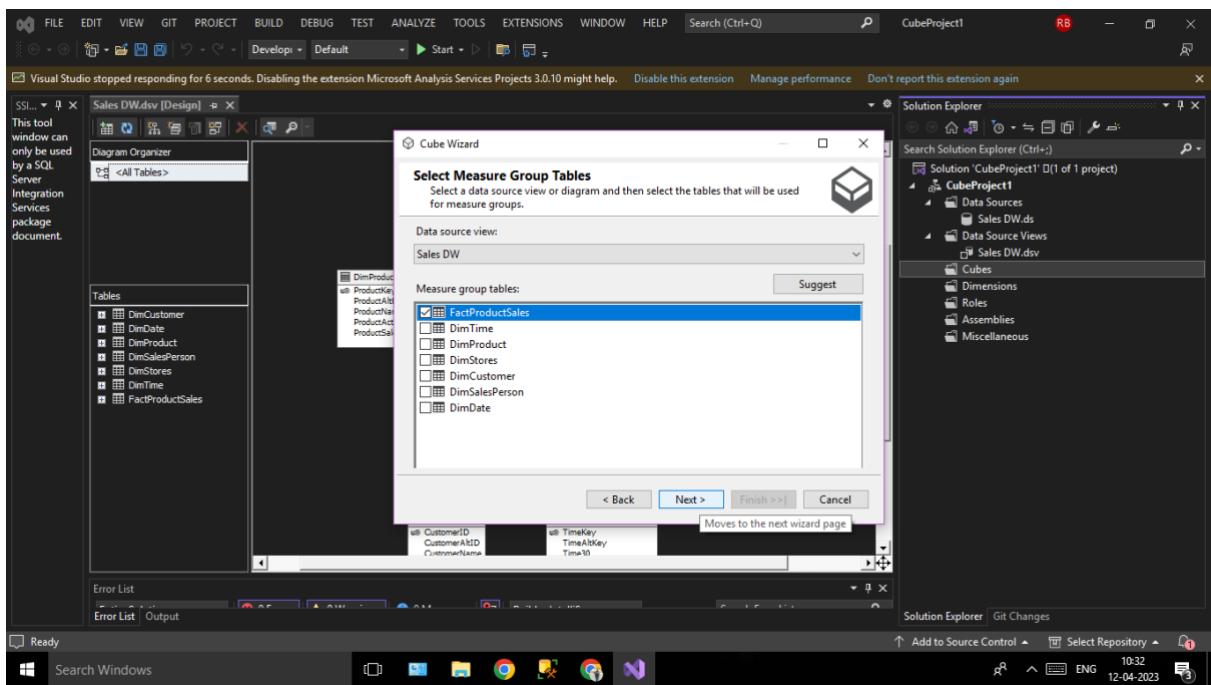
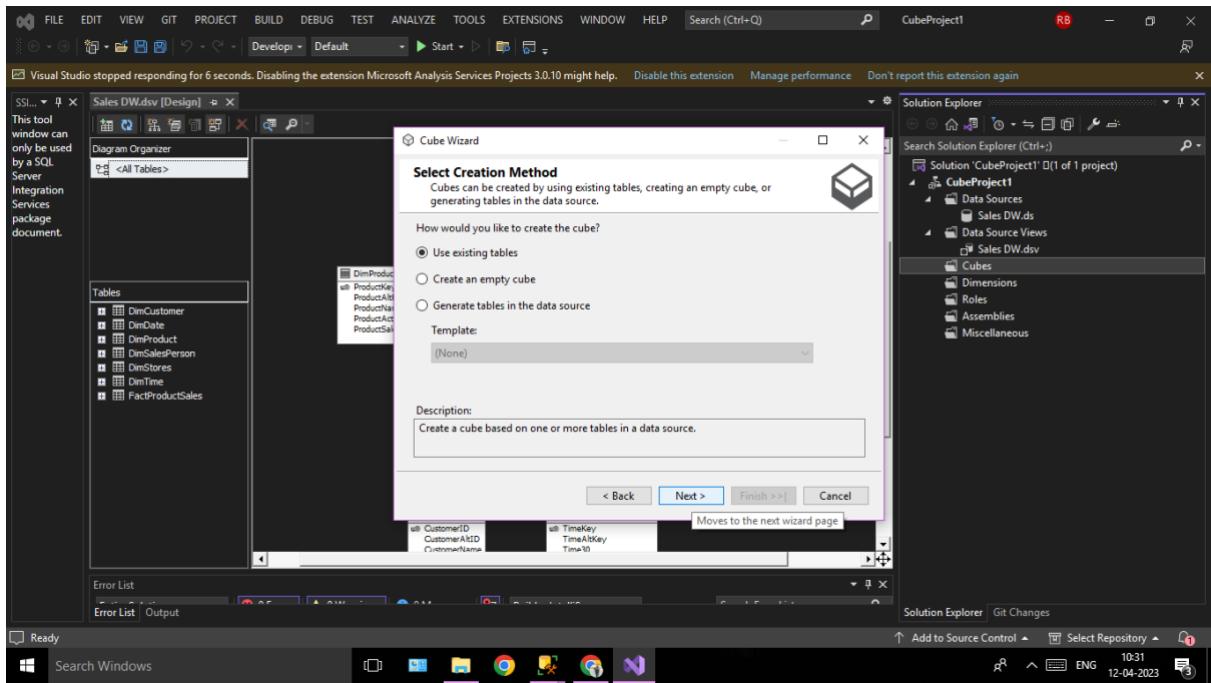


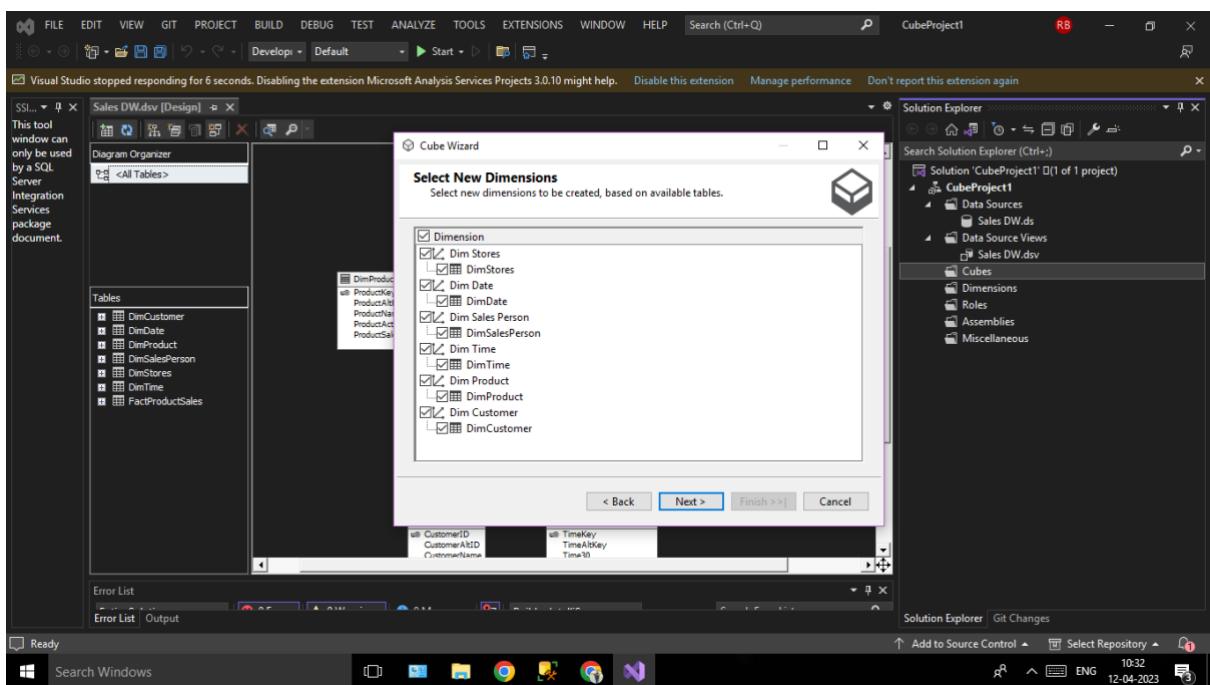
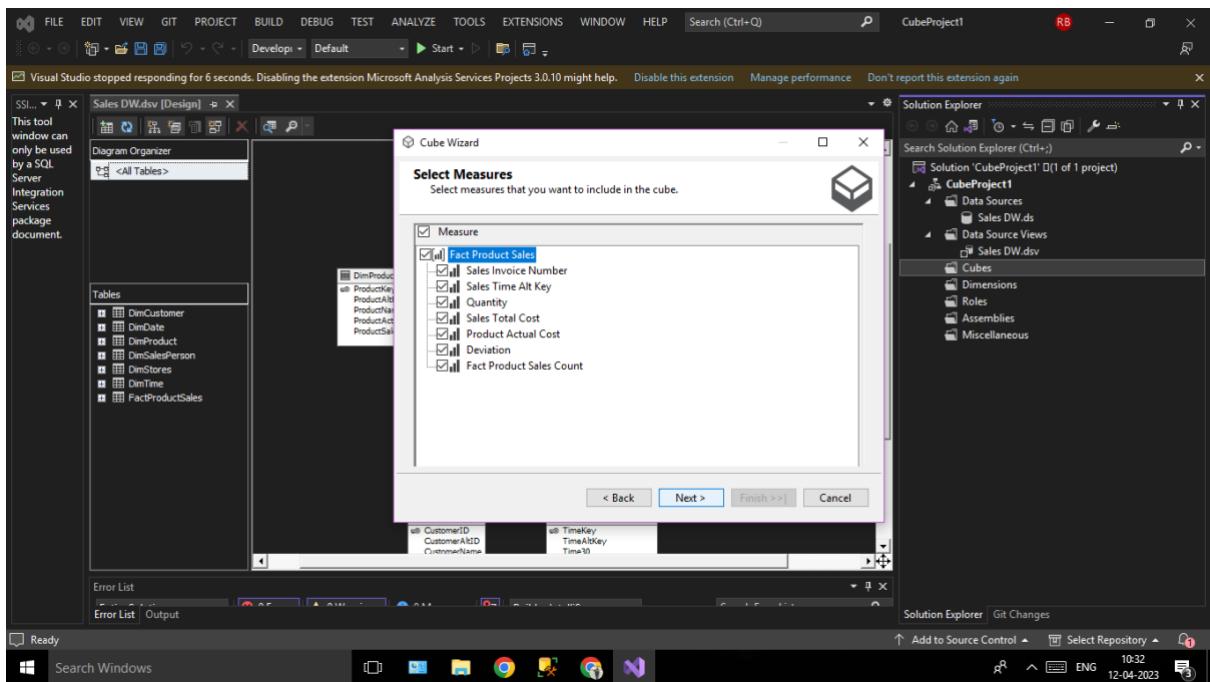


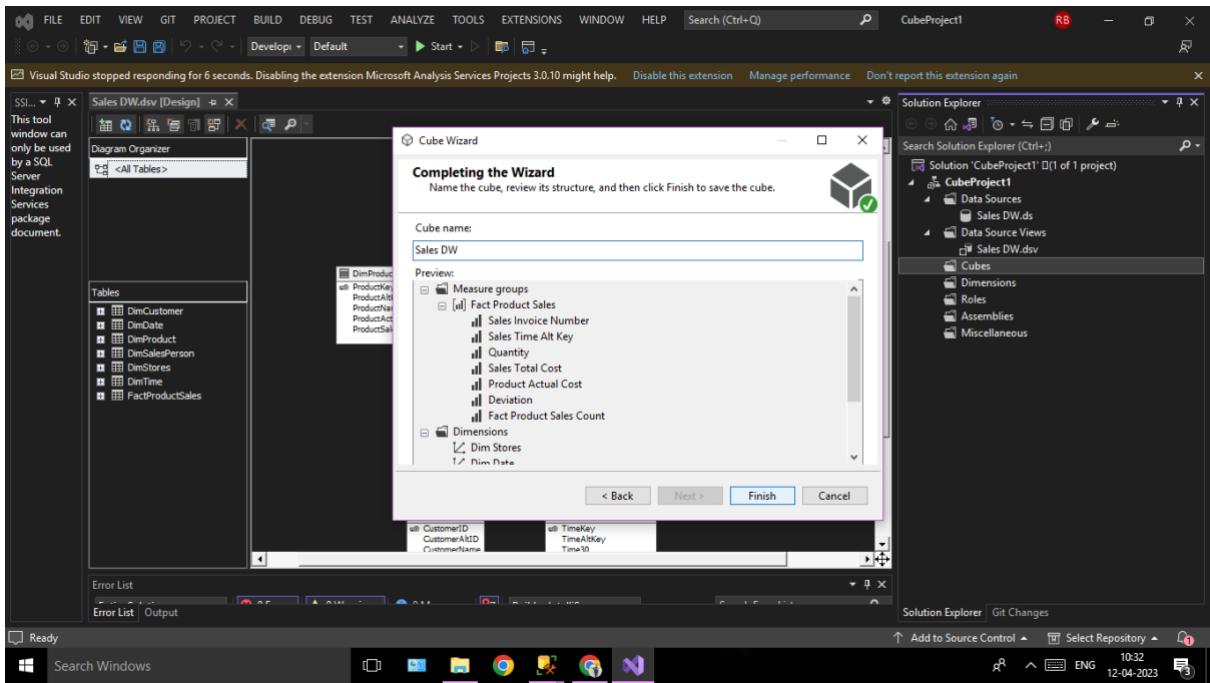


7) Create the Cube using following step.

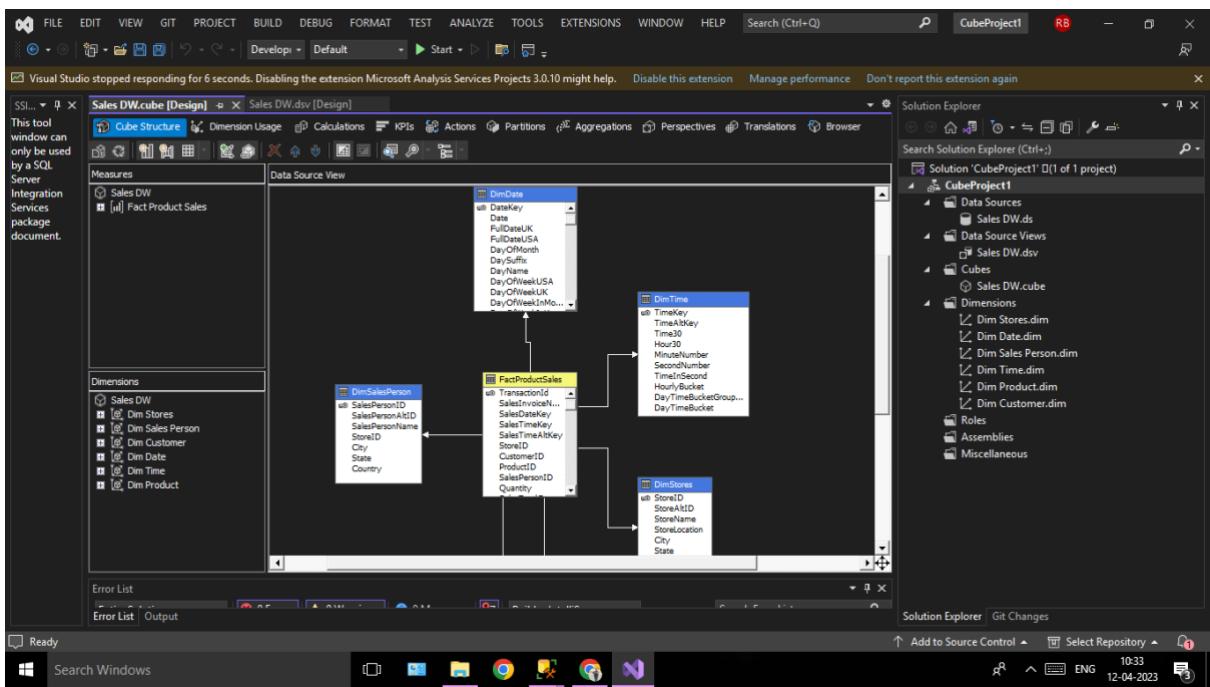




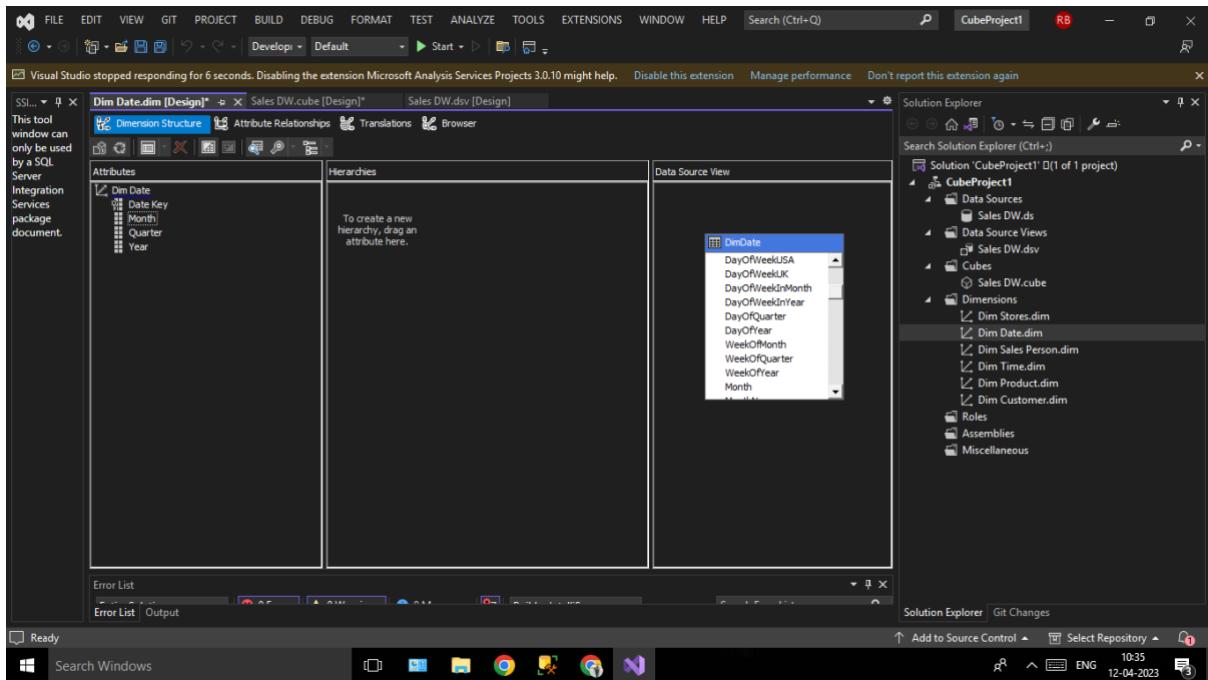




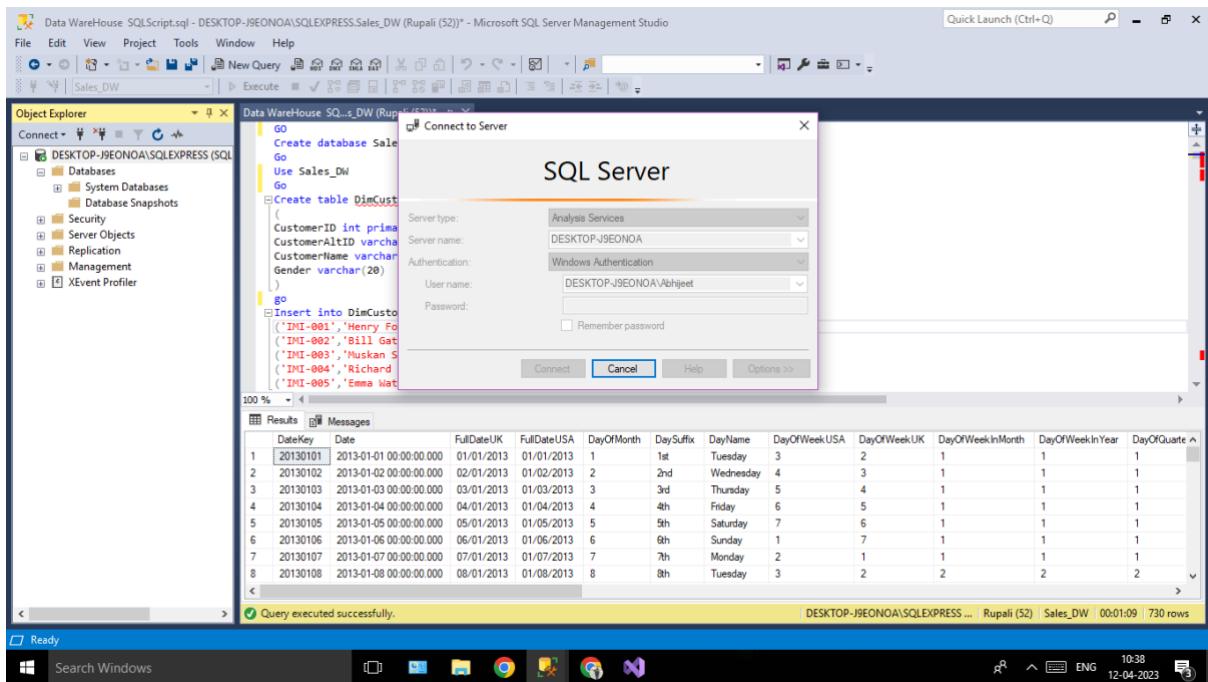
8) Analyze the Cube.



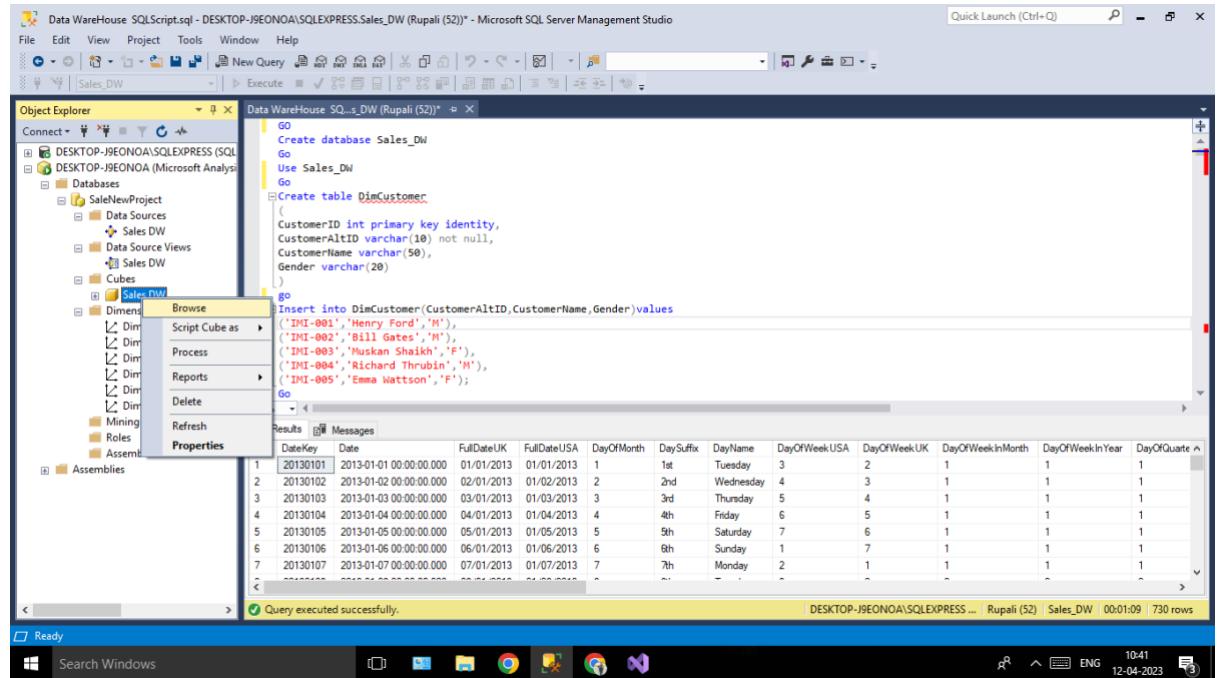
9) Create the dimension structure and hierarchy.



10) Open the SQL server



11) Connect the server and analyze the data.



The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, under the SalesDW database, a context menu is open over the DimCustomer table. The 'Browse' option is selected. The Results pane displays the results of an executed query:

```

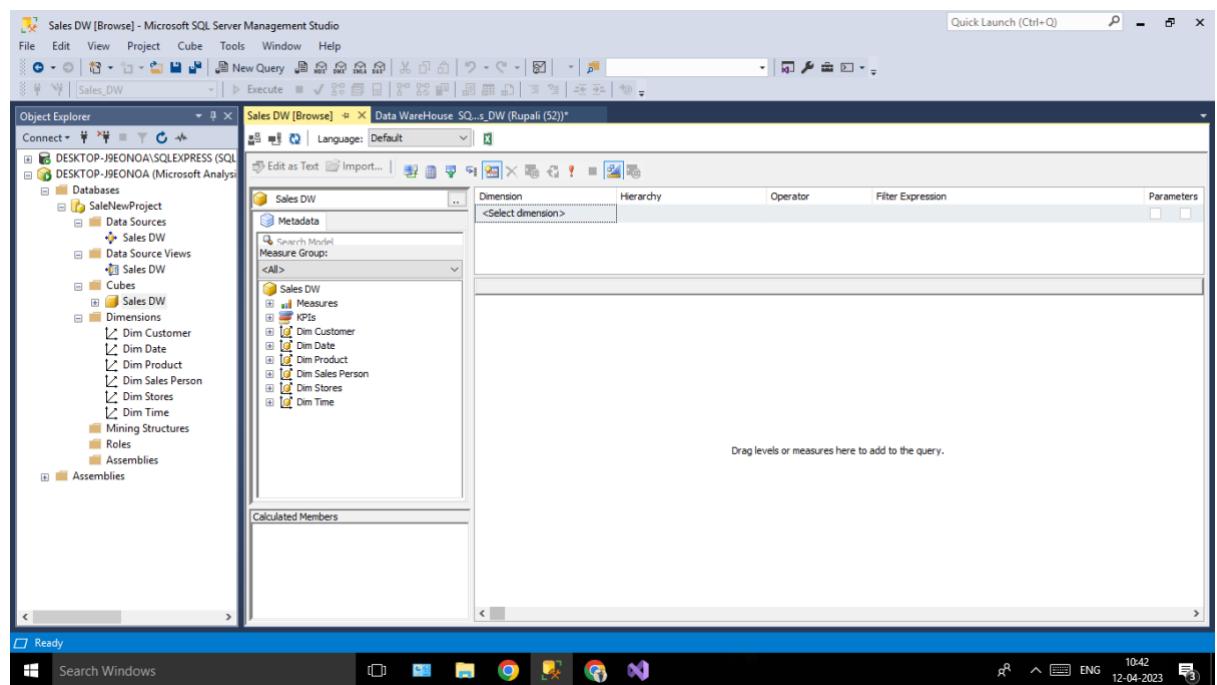
GO
Create database Sales_DW
Go
Use Sales_DW
Go
Create table DimCustomer
(
    CustomerID int primary key identity,
    CustomerAltID varchar(10) not null,
    CustomerName varchar(50),
    Gender varchar(20)
)
Go
Insert into DimCustomer(CustomerAltID,CustomerName,Gender)values
('INT-001','Henry Ford','M'),
('INT-002','Bill Gates','M'),
('INT-003','Muskan Shaikh','F'),
('INT-004','Richard Thriburn','M'),
('INT-005','Emma Wattson','F');
Go

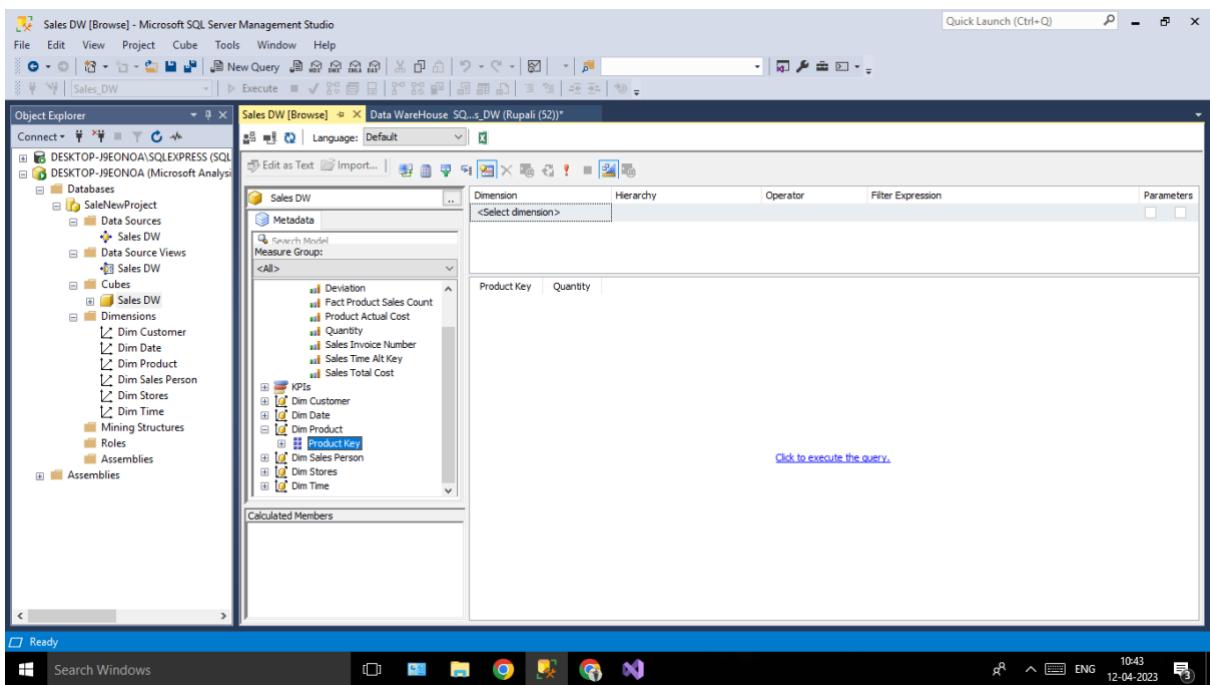
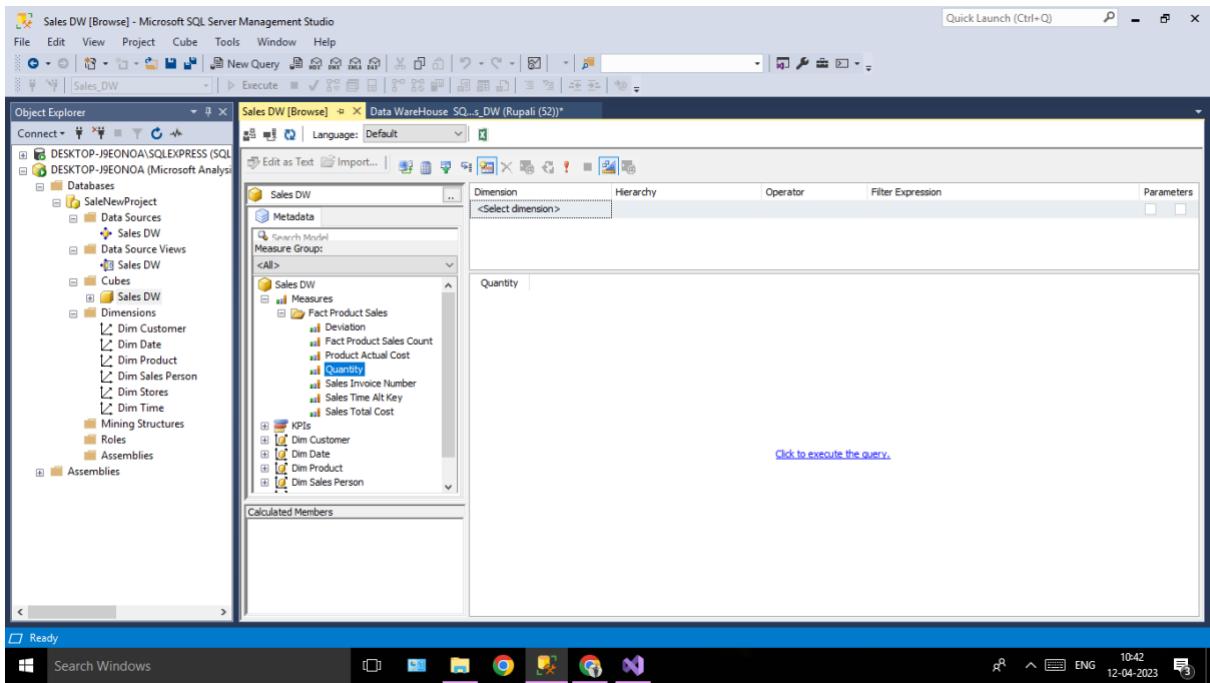
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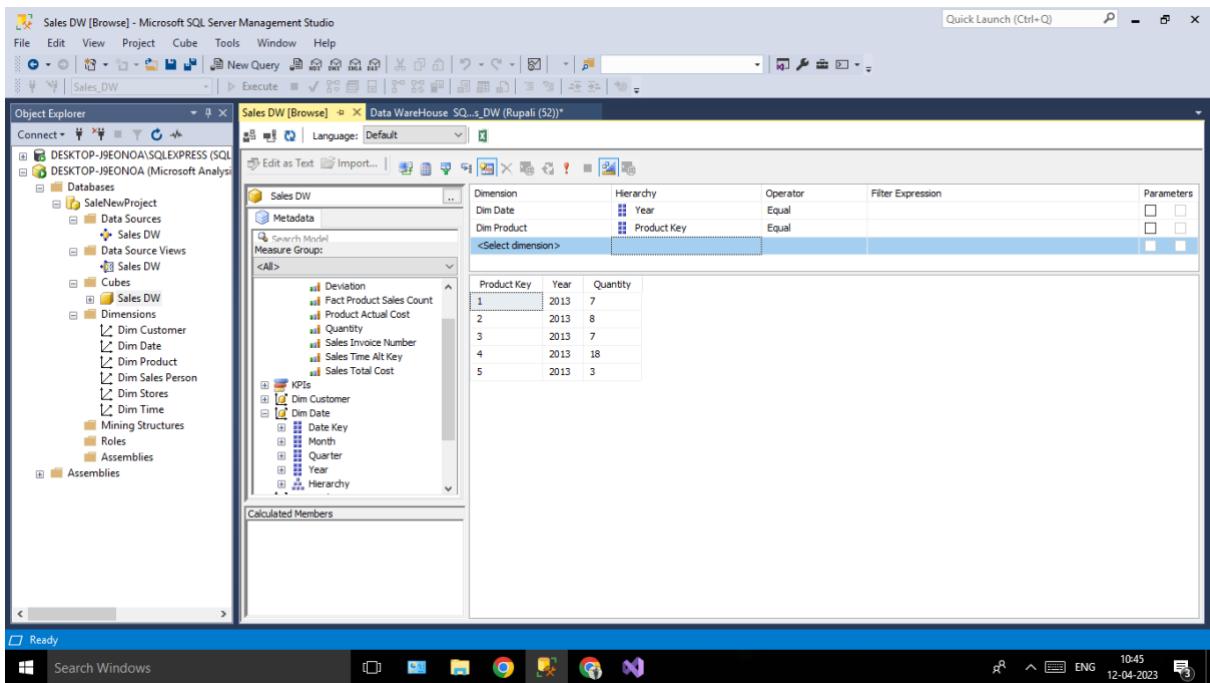
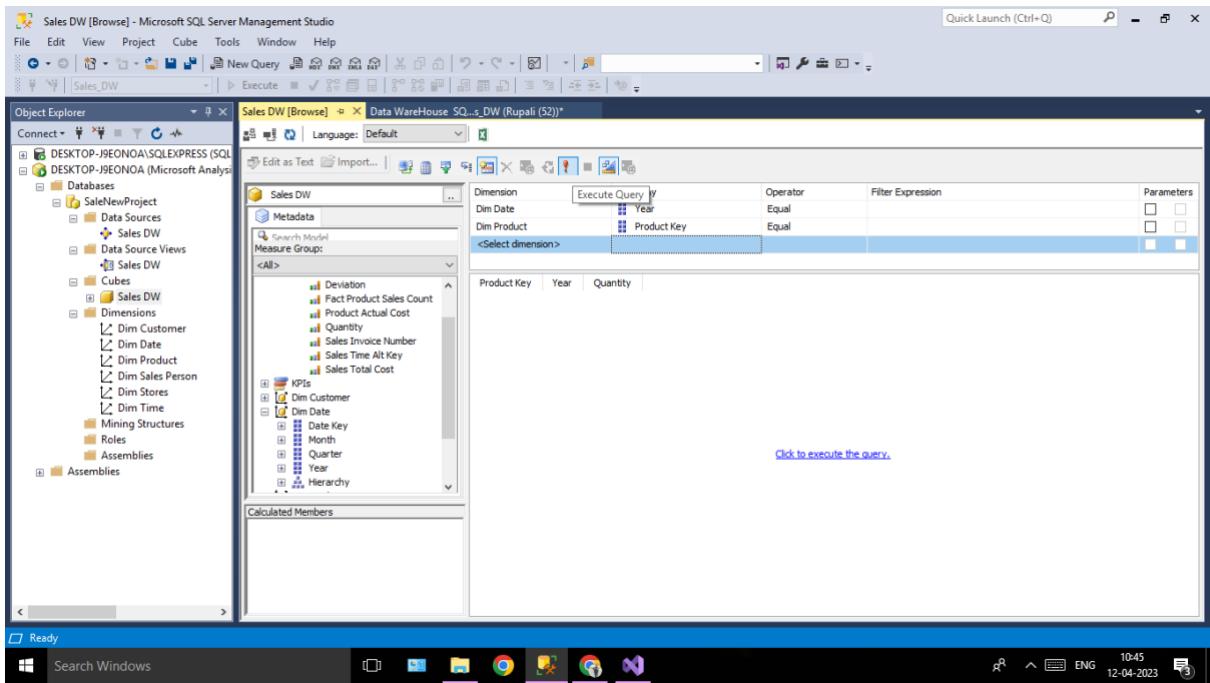
The Results pane also shows a table with 730 rows of data:

DateKey	Date	FullDateUK	FullDateUSA	DayOfMonth	DaySuffix	DayName	DayOfWeekUSA	DayOfWeekUK	DayOfWeekInMonth	DayOfWeekInYear	DayOfQuarter
1	2013-01-01	01/01/2013	01/01/2013	1	1st	Tuesday	3	2	1	1	1
2	2013-01-02	02/01/2013	02/01/2013	2	2nd	Wednesday	4	3	1	1	1
3	2013-01-03	03/01/2013	03/01/2013	3	3rd	Thursday	5	4	1	1	1
4	2013-01-04	04/01/2013	04/01/2013	4	4th	Friday	6	5	1	1	1
5	2013-01-05	05/01/2013	05/01/2013	5	5th	Saturday	7	6	1	1	1
6	2013-01-06	06/01/2013	06/01/2013	6	6th	Sunday	1	7	1	1	1
7	2013-01-07	07/01/2013	07/01/2013	7	7th	Monday	2	1	1	1	1

At the bottom of the Results pane, it says "Query executed successfully."







Conclusion:

Hence, Student will be able to create cube with Dimensions and Fact tables based on ROLAP, MOLAP and HOLAP model.