Instructor Notes:

Capgemini

SQL Server Analysis Services

Lesson 04 Using MDX Queries

Instructor Notes:

Lesson Objectives

After completing this module you will be able to know:
- What is MDX Query?
- MDX Query Terms:
    - Member
    - Tuple
    - Set
- MDX Query Examples
- Defining Calculated Members in SSAS Cube
- Defining KPI in SSAS Cube

Instructor Notes:

MDX Query

Multidimensional Expressions (MDX) is the query language that we can use to retrieve multidimensional data in Microsoft Analysis Services.

MDX utilizes expressions composed of identifiers, values, statements, functions, and operators that Analysis Services can evaluate

MDX is superficially similar in many ways to the SQL syntax that is typically used with relational databases. However, MDX is not an extension of the SQL language and is different from SQL in many ways. In order to create MDX expressions used to design or secure cubes, or to create MDX queries to return and format multidimensional data, you need to understand basic concepts in MDX and dimensional modeling, MDX syntax elements, MDX operators, MDX statements.

Instructor Notes:

MDX Query Related Terms

Member:-

- A member is a value stored in a dimension.
- For example, [time].[January 8th, 2009] could be a member in a time dimension.
- Product dimension can contain members
  [product].[Toyota].[camry].[2003],
  [product].[Nissan].[maxima].[2004],
  [product].[Ford].[mustang].[2005].
- Note that each member and dimension name is enclosed in square brackets. MDX requires square brackets if a member contains a space or is a number.

Instructor Notes:

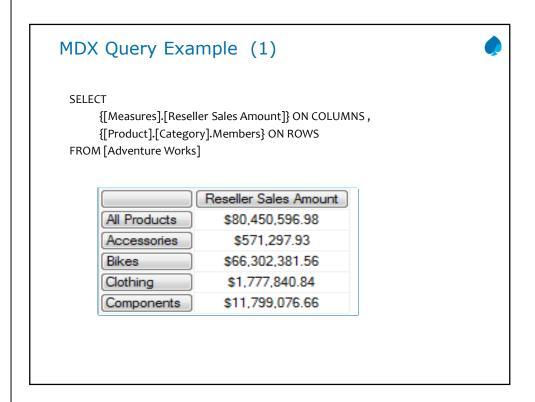## MDX Query Related Terms

Tuple:-

- A tuple is a combination of members from one or multiple dimensions;
- A tuple can only contain ONE member from each dimension. A tuple that refers to multiple dimensions could be ([product].[Cadillac], [time].[January 8th, 2009]).
- If you attempt to reference more than one member from each dimension the tuple will become invalid

Instructor Notes:

MDX Query Related Terms

Set:-

- A set is a collection of zero, or more tuples that have the same dimensionality. All tuples enclosed in a set must reference the same dimensions in the same order.
- For example ([product].[Cadillac], [time].[January]) cannot be combined with ([time].[February], [product].[Ford]) because they specify dimensions in reverse order.
- However, {([product].[Cadillac], [time].[January]), ([product].[Audi], [time].[December])} is a valid set.

Instructor Notes:

MDX Query Example (1)

```
SELECT
      {[Measures].[Reseller Sales Amount]} ON COLUMNS ,
      {[Product].[Category].Members} ON ROWS
FROM [Adventure Works]
```

	Reseller Sales Amount
All Products	$80,450,596.98
Accessories	$571,297.93
Bikes	$66,302,381.56
Clothing	$1,777,840.84
Components	$11,799,076.66

MDX Query Showing Total Reseller Sales for every Product Category

Instructor Notes:

MDX Query Example (2)

```
SELECT
            { [Measures].[Reseller Sales Amount] } ON COLUMNS ,
            {       [Product].[Category].[Accessories],
                 [Product].[Category].[Bikes],
          [Product].[Category].[Clothing],
          [Product].[Category].[Components]
        }     ON ROWS
FROM    [Adventure Works]
```

MDX Query Showing Total Reseller Sales for specific Product Categories

Instructor Notes:

MDX Query Example (2)

	Reseller Sales Amount
Accessories	$571,297.93
Bikes	$66,302,381.56
Clothing	$1,777,840.84
Components	$11,799,076.66

Instructor Notes:

MDX Query Example (3)

```
SELECT      {
                    [Measures].[Reseller Sales Amount],
                    [Measures].[Reseller Freight Cost]
            } ON COLUMNS ,
            {
                    [Product].[Category].[Accessories],
                    [Product].[Category].[Bikes],
                    [Product].[Category].[Clothing],
                    [Product].[Category].[Components]
            } ON ROWS
FROM        [Adventure Works]
```

MDX Query Showing Total Reseller Sales as well as Reseller Freight Cost for specific Product Categories

Instructor Notes:

MDX Query Example (4)

```
SELECT {
            [Date].[Fiscal Year].[FY 2002],
            [Date].[Fiscal Year].[FY 2003]
        } ON COLUMNS ,
        {
            [Product].[Category].[Accessories],
            [Product].[Category].[Bikes]
        } ON ROWS
FROM    [Adventure Works]
```

--	FY 2002	FY 2003
Accessories	$36,814.85	$124,433.35
Bikes	$15,018,534.07	$22,417,419.69

MDX Query Showing Total Reseller Sales for specific Product Categories for Financial Years 2002 and 2003

Instructor Notes:

MDX Query Example (5)

```
SELECT
          {          [Date].[Fiscal Year].[FY 2002],
                     [Date].[Fiscal Year].[FY 2003]
          } ON COLUMNS ,
          { [Product].[Category].[Accessories],
                     [Product].[Category].[Bikes]
          } ON ROWS
FROM [Adventure Works]
WHERE  ([Measures].[Reseller Freight Cost],
                          [Geography].[Country].[United States])
```

	FY 2002	FY 2003
Accessories	$698.17	$2,002.55
Bikes	$305,240.32	$393,466.15

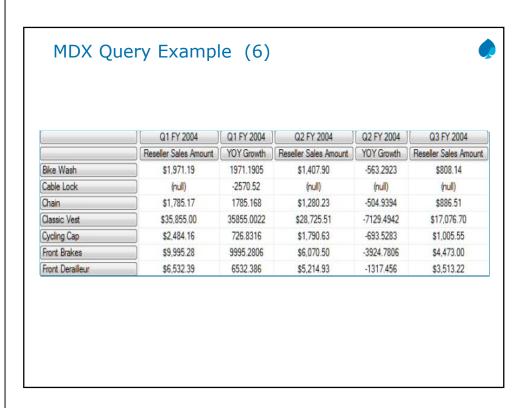MDX Query Showing Total Reseller Freight Cost for specific Product Categories for Financial Years 2002 and 2003 in United States.

Instructor Notes:

MDX Query Example (6)

```
WITH
        MEMBER [Measures].[YOY Growth]  AS
        (
                [Date].[Fiscal Quarter].CurrentMember,
                [Measures].[Reseller Sales Amount]
        )  -
        (
                [Date].[Fiscal Quarter].PrevMember,
                [Measures].[Re     seller Sales Amount]
        )
```

Example shows use of Calculated Member.
The Calculated Member shows the difference between Reseller Sales done in a
current Time Period and Reseller Sales in immediate previous Time period

Instructor Notes:

MDX Query Example (6)

```
SELECT
    NONEMPTY(
                            [Date].[Fiscal Quarter].Children *
                            {  [Measures].[Reseller Sales Amount],
                                [Measures].[YOY Growth]  }
                ) ON COLUMNS ,
    NONEMPTY(
                            [Product].[Model Name].Children
                ) ON ROWS
FROM [Adventure Works]

WHERE ([Geography].[Country].[United States])
```

In this example it shows details of Reseller Sales happened in Quarters of current Fiscal Year and Last Fiscal Year and the sales difference

Instructor Notes:

MDX Query Example (6)

	Q1 FY 2004	Q1 FY 2004	Q2 FY 2004	Q2 FY 2004	Q3 FY 2004
	Reseller Sales Amount	YOY Growth	Reseller Sales Amount	YOY Growth	Reseller Sales Amount
Bike Wash	$1,971.19	1971.1905	$1,407.90	-563.2923	$808.14
Cable Lock	(null)	-2570.52	(null)	(null)	(null)
Chain	$1,785.17	1785.168	$1,280.23	-504.9394	$886.51
Classic Vest	$35,855.00	35855.0022	$28,725.51	-7129.4942	$17,076.70
Cycling Cap	$2,484.16	726.8316	$1,790.63	-693.5283	$1,005.55
Front Brakes	$9,995.28	9995.2806	$6,070.50	-3924.7806	$4,473.00
Front Derailleur	$6,532.39	6532.386	$5,214.93	-1317.456	$3,513.22

The Example (6) Output:

Instructor Notes:

MDX Query Example (7)

```
WITH MEMBER [Measures].[Avg Sales] AS
AVG (
        {
          [Product].[Product Categories].CurrentMember.Children
        },
        [Measures].[Reseller Sales Amount]
     )
```

Calculation Member which calculates the Avarage Reseller Sales among
Subcategories of Current Category

Instructor Notes:

MDX Query Example (7)

```
SELECT
        NONEMPTY  (       [Date].[Fiscal Quarter].Children *
                          {
                                  [Measures].[Reseller Sales Amount],
                                  [Measures].[Avg Sales]
                          }) ON COLUMNS ,
        NONEMPTY (   [Product].[Product Categories].Children   )
                                                        ON ROWS
FROM     [Adventure Works]
WHERE    ( [Geography].[Country].[United States]  )
```

Instructor Notes:

MDX Query Example (7)

	Q1 FY 2002	Q1 FY 2002	Q2 FY 2002	Q2 FY 2002
	Reseller Sales Amount	Avg Sales	Reseller Sales Amount	Avg Sales
Accessories	$6,479.87	$6,479.87	$8,607.94	$8,607.94
Bikes	$2,346,155.56	$1,173,077.78	$3,678,471.79	$1,839,235.89
Clothing	$12,034.33	$4,011.44	$14,428.68	$4,809.56
Components	$190,981.36	$95,490.68	$294,916.32	$147,458.16

Instructor Notes:

Calculated Members in Cube

By just applying aggregate functions on numeric columns of fact tables we cannot create all the measures that would be required for Reporting

So we create one or more calculated members in a SSAS Cube, by manipulating or operating on existing measures.

Calculated Member is created using MDX Script.

But BIDS gives us a GUI way of creating Calculated Member.

Calculations enable you to define calculated members, named sets, and execute other script commands to extend the capabilities of an Analysis Services cube. When you define a new calculation in Cube Designer, the calculation is added to the **Script Organizer** pane of the **Calculations** tab of Cube Designer, and the fields for the particular calculation type are displayed in a calculations form in the **Calculation Expressions** pane. Calculations are executed in the order in which they are listed in the **Script Organizer** pane. You can reorder the calculations by right-clicking on a particular calculation and then selecting **Move Up** or **Move Down,** or by clicking a particular calculation and then using the **Move Up** or **Move Down** icons on the toolbar of the **Calculations** tab.

On the **Calculations** tab, you can add new calculations and view or edit existing calculations in the following views in the **Calculation Expressions** pane:

Form view. This view shows the expressions and properties for a single command in a graphical format. When you edit an MDX script, an expression box fills the Form view.

Script view. This view displays all calculation scripts in a code editor, which lets you easily change the calculation scripts. When the **Calculation Expressions** pane is in Script view, the **Script Organizer** is hidden. The Script view provides color coding, parenthesis matching, auto-complete, and MDX code regions. You can expand or collapse the MDX code regions to make editing easier.

Instructor Notes:

Defining KPI

KPI stands for Key Performance Indicators

These are used in analytical reports to show a quick status of how each division of your business is performing

For example, if you feel that $100 million in sales means good performance you could show a smiling face or a green light for divisions that have achieved this level of sales; on the other hand you could show a frown or red light for divisions that have not performed so well

Alternatively you could show a thermometer that shows the level of sales for each division

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To define key performance indicators (KPIs), you first define a KPI name and the measure group to which the KPI is associated. A KPI can be associated with all measure groups or with a single measure group. You then define the following elements of the KPI:

The value expression

Value expression is a physical measure such as Sales, a calculated measure such as Profit, or a calculation that is defined within the KPI by using a Multidimensional Expressions (MDX) expression.

The goal expression

A goal expression is a value, or an MDX expression that resolves to a value, that defines the target for the measure that the value expression defines. For example, a goal expression could be the amount by which the business managers of a company want to increase sales or profit.

The status expression

A status expression is an MDX expression that Analysis Services uses to evaluate the current status of the value expression compared to the goal expression. A goal expression is a normalized value in the range of -1 to +1, where -1 is very bad, and +1 is very good. The status expression displays a graphic to help you easily determine the status of the value expression compared to the goal expression.

The trend expression

A trend expression is an MDX expression that Analysis Services uses to evaluate the current trend of the value expression compared to the goal expression. The trend expression helps the business user to quickly determine whether the value expression is becoming better or worse relative to the goal expression. You can associate one of several graphics with the trend expression to help business users be able to quickly understand the trend.

Explain the lesson
coverage

Summary

In this lesson, you learnt:
- What is MDX Query?
- MDX Query Terms:
  - Member
  - Tuple
  - Set
- MDX Query Examples
- Defining Calculated Members in SSAS Cube
- Defining   KPI in SSAS Cube

Summary

Instructor Notes:

Ques tion	Answer
1	Tuple
2	True
3	True

Review Question

Question 1: A _____- is a combination of members from one or multiple dimensions;

Question 2: A tuple can only contain ONE member from each dimension
- True
- False

Question 3: A set is a collection of zero, or more tuples that have the different dimensionality
- True
- False