KPI definitions

KPI definitions amend Bus Transport Organization's Multidimensional Project's Cube definition (see KPIs tab).

1. *The monthly increase by at least 0,5% in average satisfaction levels of the 'travelled' routes compared to previous month.*

Name:

Satisfaction Level

Value expression:

[Measures].[Average satisfaction level]

Goal Expression:

```
( KPIValue( "Satisfaction Level" ), ParallelPeriod ( [DATE].[TRAVEL DATE HIERARCHY].[Month], 1,
[DATE].[TRAVEL DATE HIERARCHY].CurrentMember ) ) * 1.005
```

Status expression:

```
IIf ( KPIValue( "Satisfaction Level" ) > KPIGoal(" Satisfaction Level "), 1, -1)
```

Trend expression:

```
IIf ( KPIValue( "Satisfaction Level" ) > ( KPIValue( "Satisfaction Level" ), ParallelPeriod
(      [DATE].[TRAVEL DATE HIERARCHY].[Month], 1,
[DATE].[TRAVEL DATE HIERARCHY].CurrentMember ) ), 1, -1)
```

2. *The average bus occupancy at the end of 2021-year will be not less than 15% of total bus capacity.*

Name:

Bus occupancy

Value expression:

[Measures].[Tickets Validated]/[Measures].[BUS TRAVEL Count]

Goal Expression:

(0.15*([Measures].[Bus Total Capacity]/[Measures].[BUS TRAVEL Count]))

Status expression:

```
IIf(KPIValue("Bus Occupancy") >= KPIGoal("Bus Occupancy"),1, -1)
```

Trend expression:

```
IIf ( KPIValue( "Bus Occupancy" ) > ( KPIValue( "Bus Occupancy" ), ParallelPeriod
( [DATE].[TRAVEL DATE HIERARCHY].[Year], 1, [DATE].[TRAVEL DATE
HIERARCHY].CurrentMember ) ), 1, -1)
```

Analytical problems queries

MDX queries can be executed using Microsoft SQL Server Management Studio tool by connecting to Analytical Server with Bus Transport Organization Data Warehouse deployed and creating a new MDX query.

Analytical problem: Why are there such differences in the number of passengers?

MDX expressions for Bus Transport Organization

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1. Compare the average number of passengers on weekdays and weekends in current and previous month.

Measure: Average number of passengers

```
WITH MEMBER [Prev month Avg number of passenger] AS '(PARALLELPERIOD([DATE].[TRAVEL DATE HIERARCHY].[Month], 1, [DATE].[TRAVEL DATE HIERARCHY].CurrentMember), [Measures].[Average number of passengers])'

SELECT CrossJoin([DATE].[TRAVEL DATE HIERARCHY].[Year].[2021].[January], [DATE].[Type Of Day].Members) ON ROWS,

{[Measures].[Average number of passengers],  [Prev month Avg number of passenger]} ON COLUMNS

FROM [Bus Travel DW];
```

2. On which days are buses most crowded: weekdays, weekends or holidays?

Measure: Bus Occupancy Percentage

```
WITH MEMBER [Measures].[Working Days Crowdedness] AS

   ([Measures].[Bus Occupancy Percentage],

    [Date].[TRAVEL TYPE OF DAY HIERARCHY].[Type Of Day].[working day])

MEMBER [Measures].[Weekend Crowdedness] AS

   ([Measures].[Bus Occupancy Percentage],

    [Date].[TRAVEL TYPE OF DAY HIERARCHY].[Type Of Day].[weekend])

MEMBER [Measures].[Vacation Crowdedness] AS

   ([Measures].[Bus Occupancy Percentage],

    [Date].[TRAVEL TYPE OF DAY HIERARCHY].[Type Of Day].[vacation])

SELECT

{    [Measures].[Working Days Crowdedness],

 [Measures].[Weekend Crowdedness],

 [Measures].[Vacation Crowdedness]

} ON COLUMNS

FROM  [Bus Travel DW]
```

```
WHERE
{    [DATE].[YEAR].[2020]}
```

3. Identify routes with at least 10% increase in average passenger count from the current month to the previous month.

Measures: Average number of passengers

```
WITH MEMBER [Measures].[Passengers diff] AS
    '([DATE].[Month].CurrentMember,[Measures].[Average number of passengers]) -
  ([DATE].[Month].PrevMember,[Measures].[Average number of passengers])'
SELECT
 {[Measures].[Average number of passengers], [Measures].[Passengers diff]} ON COLUMNS,
 FILTER(
   [Route].[Route Number].Members,
   (([Measures].[Average number of passengers] - [Measures].[Passengers diff]) /
[Measures].[Passengers diff]) >= 0.1
 ) ON ROWS
FROM [Bus Travel DW]
WHERE
 [DATE].[Month].&[September]
```

4. Identify routes with the lowest bus occupancy (<15% of total bus capacity).

Measure: Bus Occupancy Percentage

```
SELECT
 {[Measures].[Bus Occupancy Percentage]} ON COLUMNS,
 {[Route].[Route Number].MEMBERS} ON ROWS
FROM [Bus Travel DW]
WHERE
 [Junk].[Occupation Category].&[very low]
```

5. Compare the number of travelled routes from different bus offices in the current month to those in the previous month.

Measure: Bus Travel Count

```
WITH MEMBER [Prev month number of travelled routes] AS '(PARALLELPERIOD([DATE].[TRAVEL DATE HIERARCHY].[Month], 1, [DATE].[TRAVEL DATE HIERARCHY].CurrentMember), [Measures].[BUS TRAVEL Count])'

SELECT CrossJoin([DATE].[TRAVEL DATE HIERARCHY].[Year].[2021].[July], [Route].[Route Number].Members, [BUS OFFICE].[Bus Office Name].Members) ON ROWS,

{[Measures].[BUS TRAVEL Count],  [Prev month number of travelled routes]} ON COLUMNS

FROM [Bus Travel DW];
```

6. From which region did the bus office operate the most bus travel?

Measure: Bus Travel Count

```
SELECT

 TOPCOUNT(

  FILTER(

   [BUS OFFICE].[Region].Members,

   NOT ([BUS OFFICE].[Region].CurrentMember IS [BUS OFFICE].[Region].[All])), 1, [Measures].[BUS TRAVEL Count]) ON ROWS,

 {[Measures].[BUS TRAVEL Count]} ON COLUMNS

FROM [Bus Travel DW];
```

7. Compare the average number of passengers depending on the type of bus in current and previous month.

Measure: Average number of passengers

```
WITH MEMBER [Prev month avg number of passenger depending on type of bus] AS '(PARALLELPERIOD([DATE].[TRAVEL DATE HIERARCHY].[Month], 1, [DATE].[TRAVEL DATE HIERARCHY].CurrentMember), [Measures].[Average number of passengers])'
```

```
SELECT CrossJoin([DATE].[TRAVEL DATE HIERARCHY].[Year].[2021].[March], [BUS].[Type Of Bus].Members) ON ROWS,

{[Measures].[Average number of passengers],  [Prev month avg number of passenger depending on type of bus]} ON COLUMNS

FROM [Bus Travel DW];
```

Analytical problem: Why was there an increase and decrease in satisfaction in the surveys?

1. Compare the average satisfaction level for all routes in the current month to those in the previous month.

Measure: Average satisfaction level

```
WITH MEMBER [Prev month Avg Satisfaction] AS '(PARALLELPERIOD([DATE].[TRAVEL DATE HIERARCHY].[Month], 1, [DATE].[TRAVEL DATE HIERARCHY].CurrentMember), [Measures].[Average satisfaction level])'

SELECT CrossJoin([DATE].[TRAVEL DATE HIERARCHY].[Year].[2020].[May], [Route].[Route Number].Members) ON ROWS,

{[Measures].[Average satisfaction level],  [Prev month Avg Satisfaction]} ON COLUMNS

FROM [Bus Travel DW];
```

2. Whether passenger satisfaction level decreases when buses exceed a certain occupancy threshold? (<30%, 30-75%, >75%)

Measure: Average satisfaction level

```
SELECT ([Junk].[Occupation Category].Members) ON ROWS,

([Measures].[Average satisfaction level]) ON COLUMNS

FROM [Bus Travel DW];
```

3. Do certain routes are associated with more frequent passenger feedback?

Measure: Satisfaction Surveys Number

```
SELECT (ORDER(TOPCOUNT([Route].[Route Number].Members, 10, [Measures].[Satisfaction Surveys Number]),

[Measures].[Satisfaction Surveys Number], DESC)) ON ROWS,
```

([Measures].[Satisfaction Surveys Number]) ON COLUMNS

FROM [Bus Travel DW]

4. Are passengers more likely to complete surveys when travelling on a bus with a feedback monitor installed?

Measure: Satisfaction Surveys Number

WITH MEMBER [BUS].[Feedback Monitor].[With/Without FeedbackMonitor DIFF] AS '[BUS].[Feedback Monitor].[yes] - [BUS].[Feedback Monitor].[no]'

SELECT ([DATE].[TRAVEL DATE HIERARCHY].[Year].Members, [Measures].[Satisfaction Surveys Number]) ON ROWS,

{[BUS].[Feedback Monitor].[yes], [BUS].[Feedback Monitor].[no], [BUS].[Feedback Monitor].[With/Without FeedbackMonitor DIFF]} ON COLUMNS

FROM [Bus Travel DW]

5. Which route has the lowest and highest average satisfaction level in the survey?

Measure: Average satisfaction level

WITH MEMBER [Measures].[Lowest Average Satisfaction Level] AS MIN([Route].[Route Number].Members, [Measures].[Average satisfaction level])

MEMBER [Measures].[Highest Average Satisfaction Level] AS MAX([Route].[Route Number].Members [Measures].[Average satisfaction level])

SELECT {[Measures].[Average satisfaction level], [Measures].[Lowest Average Satisfaction Level] [Measures].[Highest Average Satisfaction Level]} ON COLUMNS,

{[DATE].[TRAVEL DATE HIERARCHY].[Year].Members} ON ROWS

FROM [Bus Travel DW]

6. Do additional amenities such as air conditioning or wheelchair access affect satisfaction levels?

Measure: Average satisfaction level

WITH MEMBER [BUS].[Additional Equipment].[Additional Equipment DIFF] AS ' [BUS].[Additional Equipment].[yes] - [BUS].[Additional Equipment].[no]'

```
SELECT ([DATE].[TRAVEL DATE HIERARCHY].[Year].Members, [Measures].[Average satisfaction level]) ON
ROWS,

{[BUS].[Additional Equipment].[yes], [BUS].[Additional Equipment].[no], [BUS].[Additional
Equipment].[Additional Equipment DIFF]} ON COLUMNS

FROM [Bus Travel DW]
```

7. Are old buses (Production Year < 2010) receiving lower ratings?

Measure: Average satisfaction level

```
SELECT {[Measures].[Average satisfaction level]} ON COLUMNS,

(CrossJoin([BUS].[Age Category].Members, [DATE].[TRAVEL DATE HIERARCHY].[Year].Members)) ON
ROWS

FROM [Bus Travel DW]
```