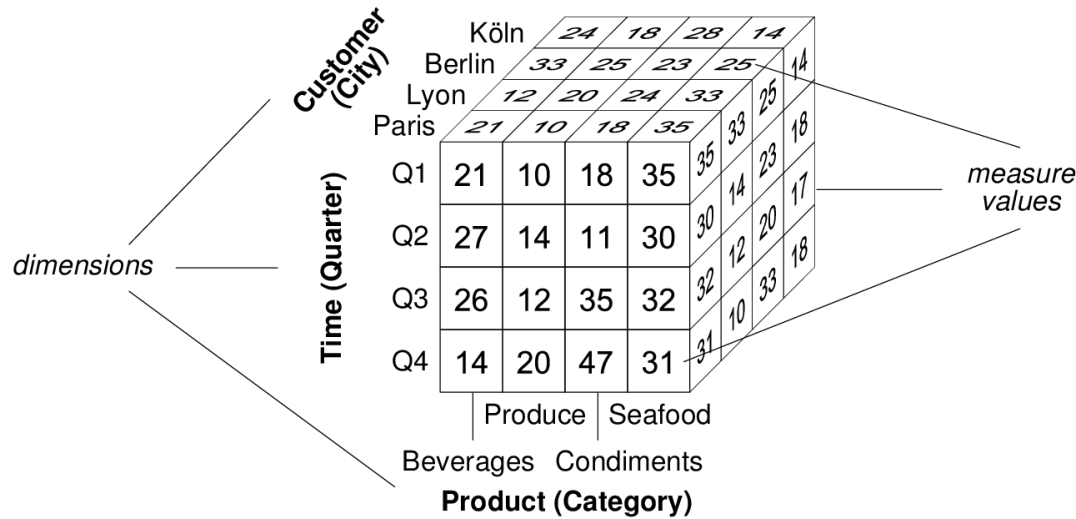


Data Analysis and Integration

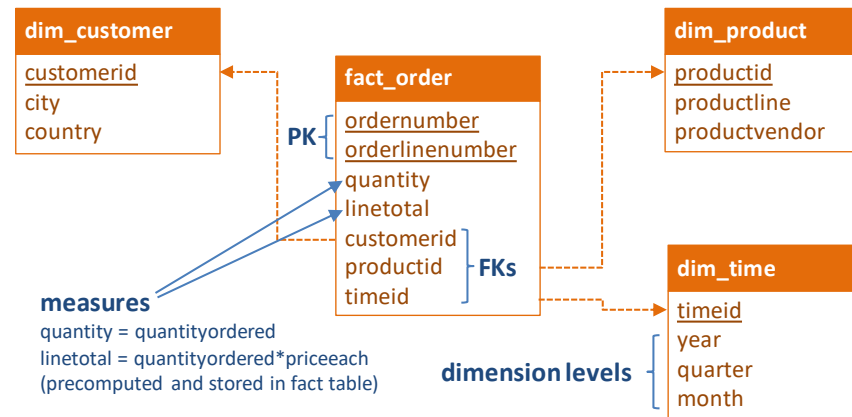
Defining the OLAP cube

Introduction

OLAP cube
OLAP server
MDX queries



DW tables
database system
SQL queries



OLAP cube
definition
(XML)

OLAP server

- What is an OLAP server?
 - serves data as a cube
 - data may or may not come from a star schema
 - allows a client to run queries over the data cube
 - we will talk about MDX in the next lectures
 - knows how to perform OLAP operations
 - drill-down, roll-up, slice, dice, pivot, etc.
 - automatically calculates and aggregates measures
 - according to the requested dimension levels
 - with a certain aggregation operation (sum, count, average, etc.)

OLAP server

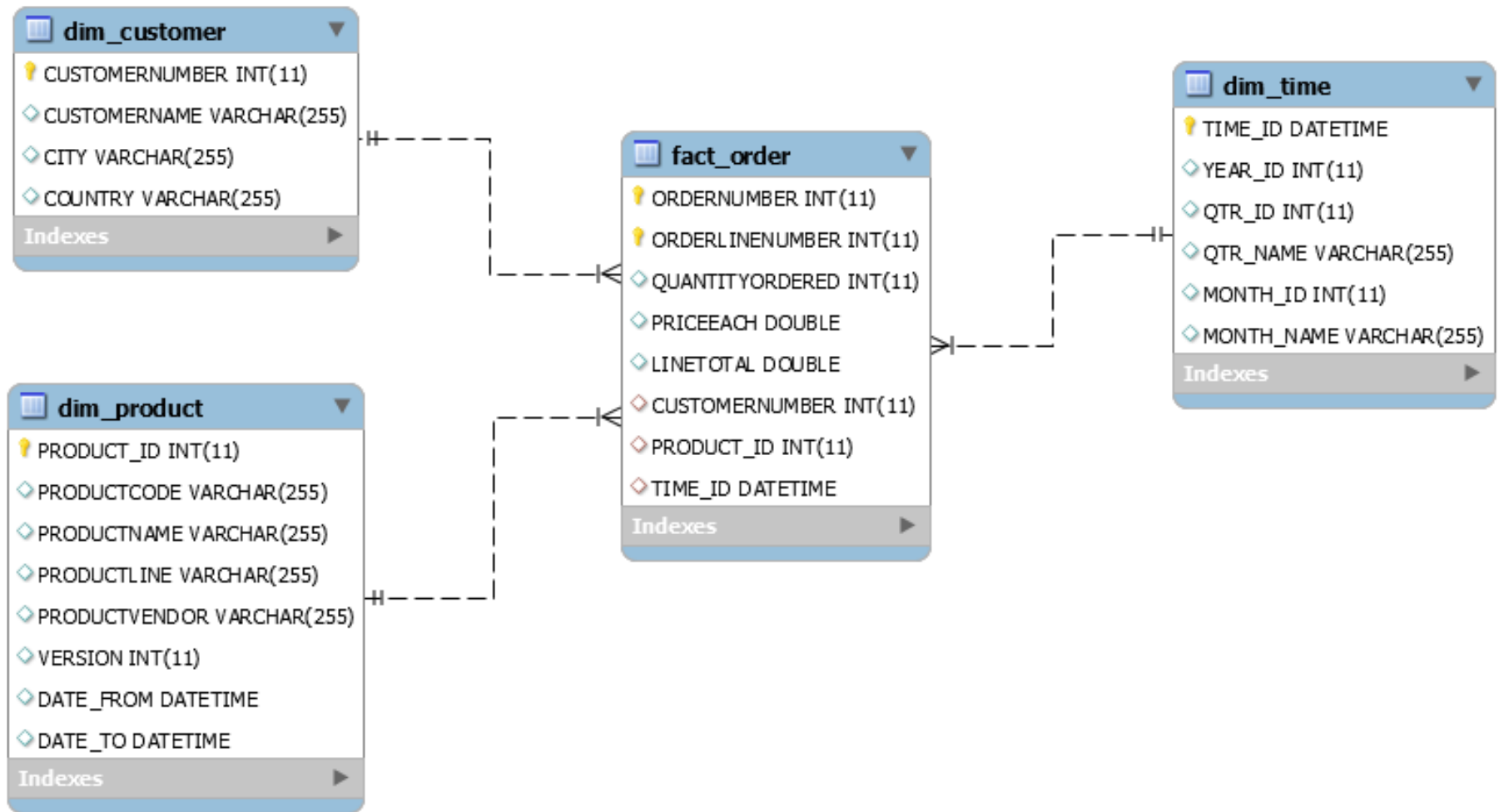
- An OLAP server needs a cube definition
 - where is the fact table?
 - where are the dimensions?
 - where are the hierarchies for each dimension?
 - where are the levels for each hierarchy?
 - where are the tables where those levels can be found?
 - is it a regular dimension or a time dimension?
 - where are the measures?
 - which columns should be aggregated?
 - which aggregation operations should be used?

OLAP server

- Such cube definition is usually provided in an XML file

```
<Schema ...>
  <Cube ...>
    <Table ... />
    <Dimension ...>
      <Hierarchy ...>
        <Table ... />
        <Level ... />
      </Hierarchy>
    </Dimension>
    <Measure ... />
  </Cube>
</Schema>
```

Data warehouse



OLAP cube

- Defining the cube and its fact table

```
<Schema name="steelwheels_dw">  
  <Cube name="Orders" ...>  
    <Table name="fact_order">  
      </Table>  
    ...  
  </Cube>  
</Schema>
```

OLAP cube

- Defining the customer dimension and its hierarchy

```
<Dimension name="Customer"
    foreignKey="CUSTOMERNUMBER"
    type="StandardDimension">
    <Hierarchy name="Customer Hierarchy"
        primaryKey="CUSTOMERNUMBER"
        allMemberName="All Customers">
        <Table name="dim_customer">
        </Table>
        ...
    </Hierarchy>
</Dimension>
```


OLAP cube

- Defining the levels of the customer hierarchy

```
<Level name="Country" column="COUNTRY"  
      type="String" levelType="Regular">  
</Level>
```

```
<Level name="City" column="CITY"  
      type="String" levelType="Regular">  
</Level>
```

```
<Level name="Customer Name" column="CUSTOMERNAME"  
      type="String" levelType="Regular">  
</Level>
```

OLAP cube

- Defining the product dimension and its hierarchy

```
<Dimension name="Product"
    foreignKey="PRODUCT_ID"
    type="StandardDimension">
    <Hierarchy name="Product Hierarchy"
        primaryKey="PRODUCT_ID"
        allMemberName="All Products">
        <Table name="dim_product">
        </Table>
        ...
    </Hierarchy>
</Dimension>
```

OLAP cube

- Defining the levels of the product hierarchy

```
<Level name="Product Line" column="PRODUCTLINE"  
      type="String" levelType="Regular">  
</Level>
```

```
<Level name="Product Vendor" column="PRODUCTVENDOR"  
      type="String" levelType="Regular">  
</Level>
```

```
<Level name="Product Name" column="PRODUCTNAME"  
      type="String" levelType="Regular">  
</Level>
```

OLAP cube

- Defining the time dimension and its hierarchy

```
<Dimension name="Time"
    foreignKey="TIME_ID"
    type="TimeDimension">
    <Hierarchy name="Time Hierarchy"
        primaryKey="TIME_ID"
        allMemberName="All Years">
        <Table name="dim_time">
        </Table>
        ...
    </Hierarchy>
</Dimension>
```

OLAP cube

- Defining the levels of the time hierarchy

```
<Level name="Year" column="YEAR_ID"  
      type="Integer" levelType="TimeYears">  
</Level>
```

```
<Level name="Quarter" column="QTR_NAME"  
      ordinalColumn="QTR_ID"  
      type="String" levelType="TimeQuarters">  
</Level>
```

```
<Level name="Month" column="MONTH_NAME"  
      ordinalColumn="MONTH_ID"  
      type="String" levelType="TimeMonths">  
</Level>
```

OLAP cube

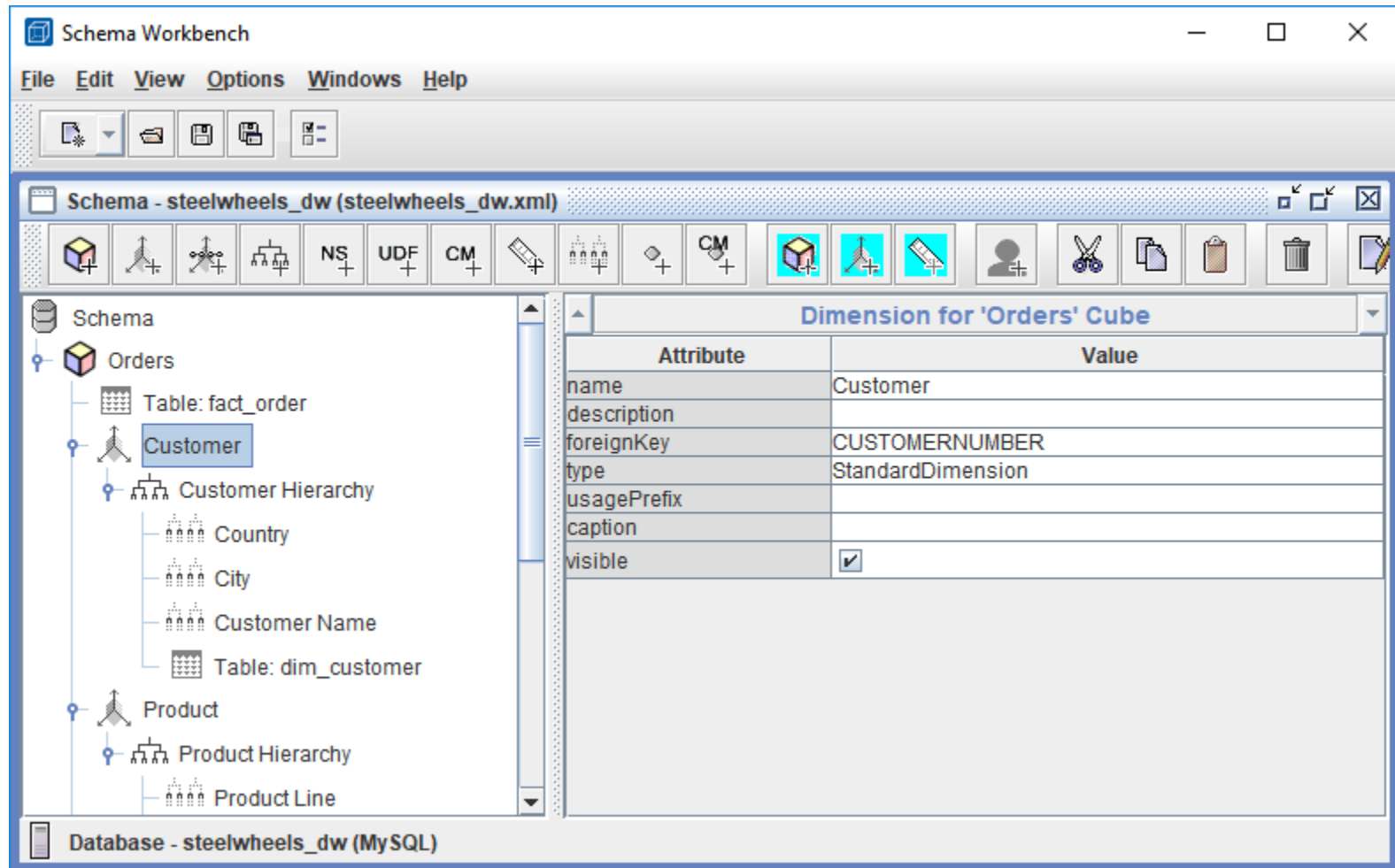
- Defining the measures

```
<Measure name="Sales" column="LINETOTAL"  
    aggregator="sum" datatype="Numeric"  
    formatString="$ #,###.00">  
</Measure>
```

```
<Measure name="Quantity" column="QUANTITYORDERED"  
    aggregator="sum" datatype="Integer"  
    formatString="#,###">  
</Measure>
```

OLAP cube

- Pentaho Schema Workbench (PSW)



OLAP cube

- Pentaho Schema Workbench (PSW)

The screenshot displays the Pentaho Schema Workbench (PSW) interface. The main window is titled "Schema - steelwheels_dw (steelwheels_dw.xml)". The left pane shows a hierarchical tree structure of the schema. The right pane shows the configuration for a measure named "Measure for 'Orders' Cube".

Schema Structure (Left Pane):

- Product Line
- Product Vendor
- Product Name
- Table: dim_product
- Time
 - Time Hierarchy
 - Year
 - Quarter
 - Month
 - Table: dim_time
- Sales
- Quantity

Measure Configuration (Right Pane):

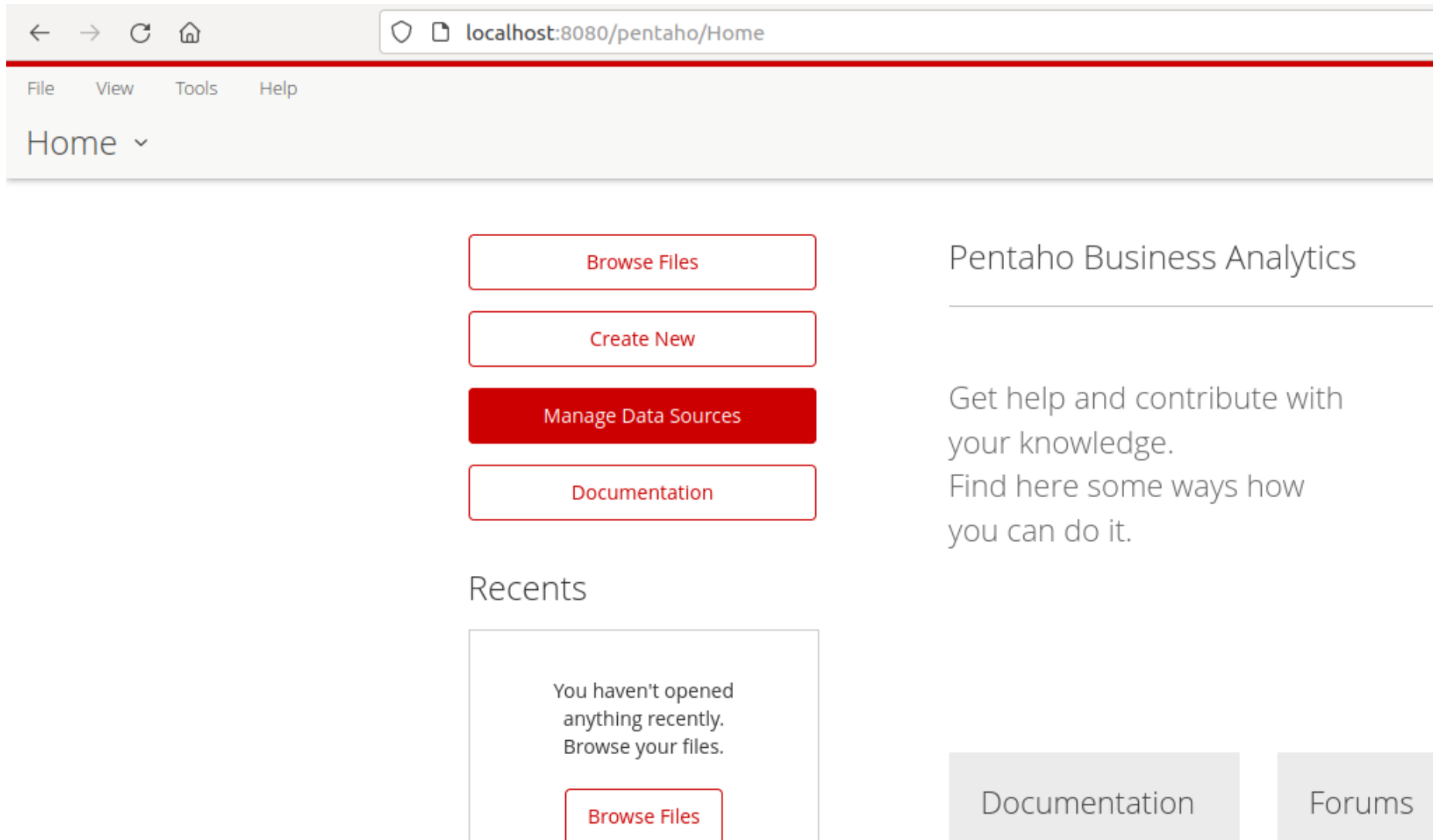
Attribute	Value
name	Sales
description	
aggregator	sum
column	LINETOTAL
formatString	\$ #,###.00
datatype	Numeric
formatter	
caption	
visible	<input checked="" type="checkbox"/>

The bottom status bar indicates the database connection: "Database - steelwheels_dw (MySQL)".

OLAP cube

- Cube definition is input to OLAP server
 - Mondrian is an OLAP server that can understand such XML cube definitions
 - Mondrian is a JAR file that can be loaded by Java apps
- Running queries over the data cube
 - requires a client tool (or front-end)
 - there are several front-ends for Mondrian
 - here we will use Saiku Analytics as a plug-in for Pentaho Server

OLAP front-end



OLAP front-end

- Manage data sources
 - database connection to the data warehouse
 - location of the XML file with the cube definition

The screenshot displays two panels from an OLAP front-end application. The 'Database Connection' panel on the left has a sidebar with 'General', 'Advanced', 'Options', and 'Pooling'. The 'General' tab is active, showing a 'Connection Name' field with 'steelwheels_dw', a 'Database Type' dropdown menu with 'MySQL' selected, and an 'Access' dropdown menu with 'Native (JDBC)' selected. A red dashed arrow points from the 'steelwheels_dw' connection name to the 'Import Analysis' panel on the right. The 'Import Analysis' panel shows a 'Mondrian File' field with 'steelwheels_dw.xml', a radio button for 'Select from available data sources' (which is selected), and a 'Data Source' dropdown menu with 'steelwheels_dw' selected.

Database Connection

General
Advanced
Options
Pooling

Connection Name:
steelwheels_dw

Database Type:
Generic database
H2
Hypersonic
MonetDB
MySQL
Pentaho Data Services
PostgreSQL
Snowflake

Settings
Host Name:
localhost
Database Name:
steelwheels_dw
Port Number:
3306
User Name:
aid
Password:
...

Access:
Native (JDBC)
ODBC
JNDI

[Adding Databases ?](#)

Import Analysis

Mondrian File:
steelwheels_dw.xml

☒ Select from available data sources.
☐ Manually enter data source parameter values.

Data Source:
steelwheels_dw

OLAP front-end

- Manage data sources
 - database connection to the data warehouse
 - location of the XML file with the cube definition

Manage Data Sources

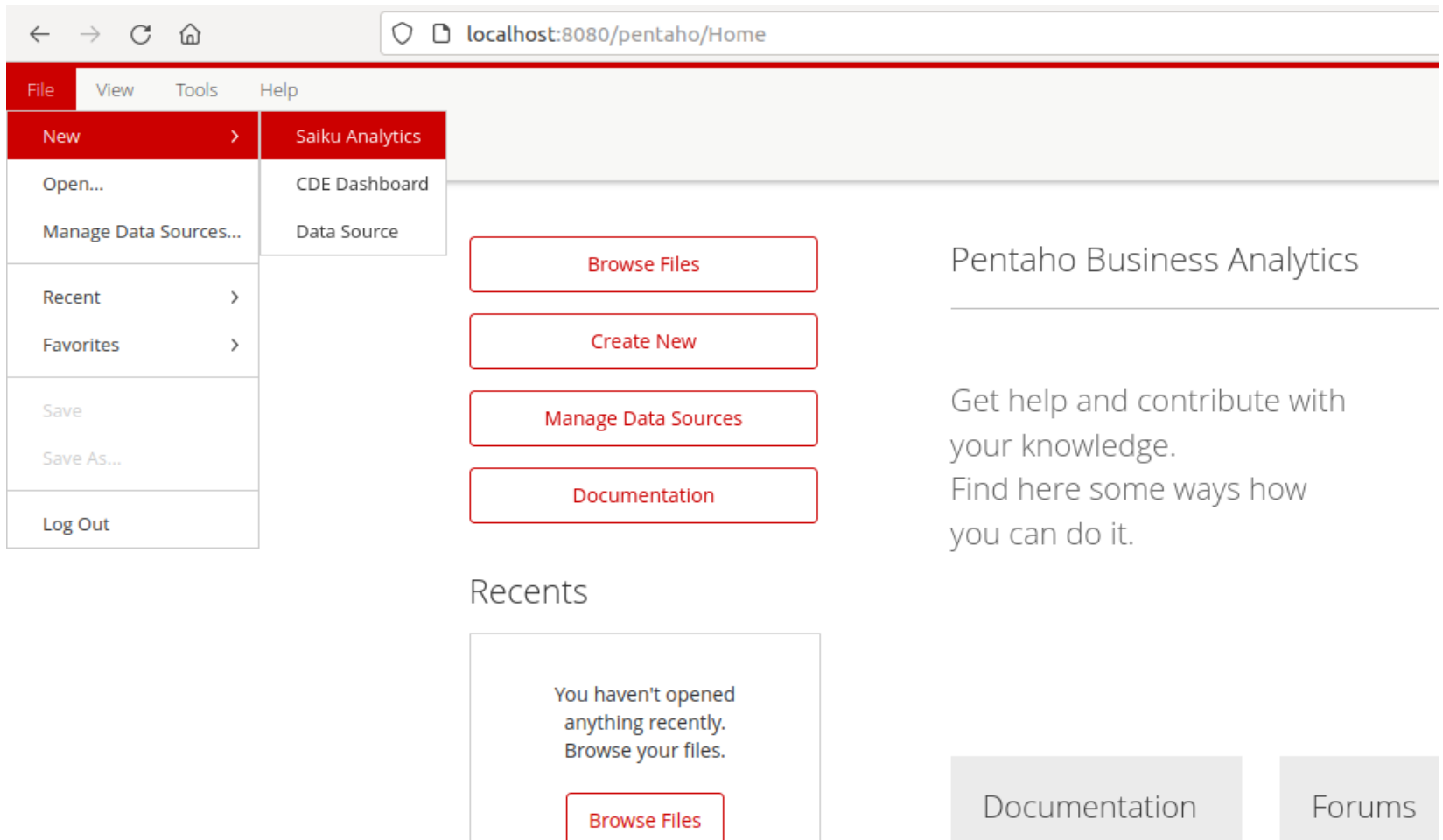


New Data Source

Datasource	Type
steelwheels_dw	Analysis
steelwheels_dw	JDBC

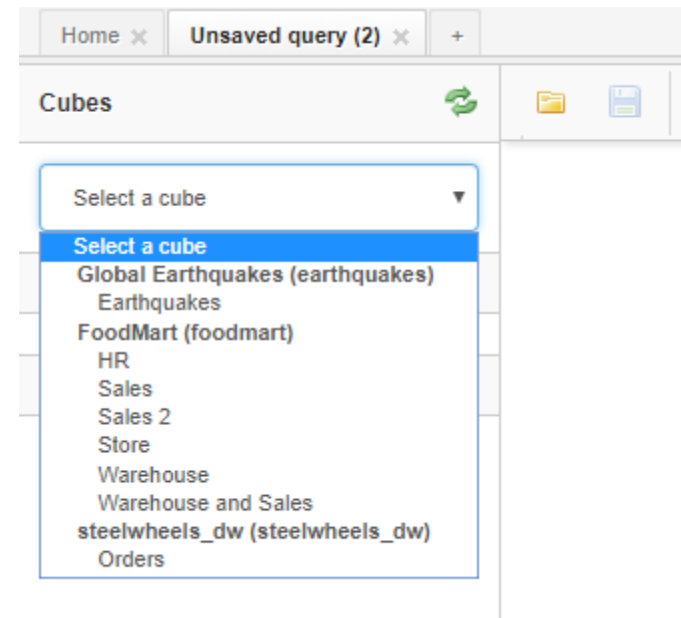
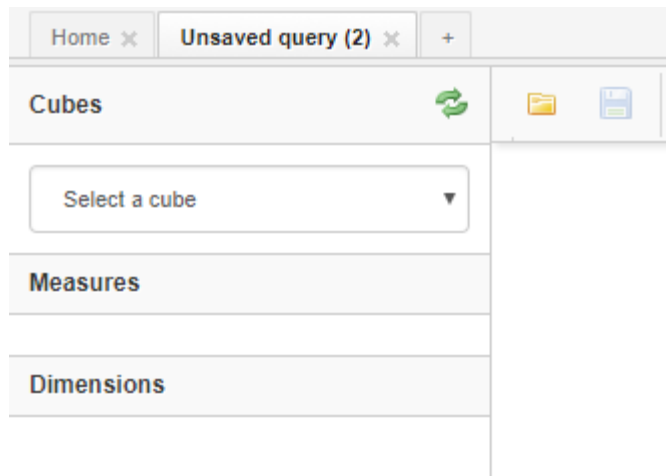
OLAP front-end

- Creating a new query



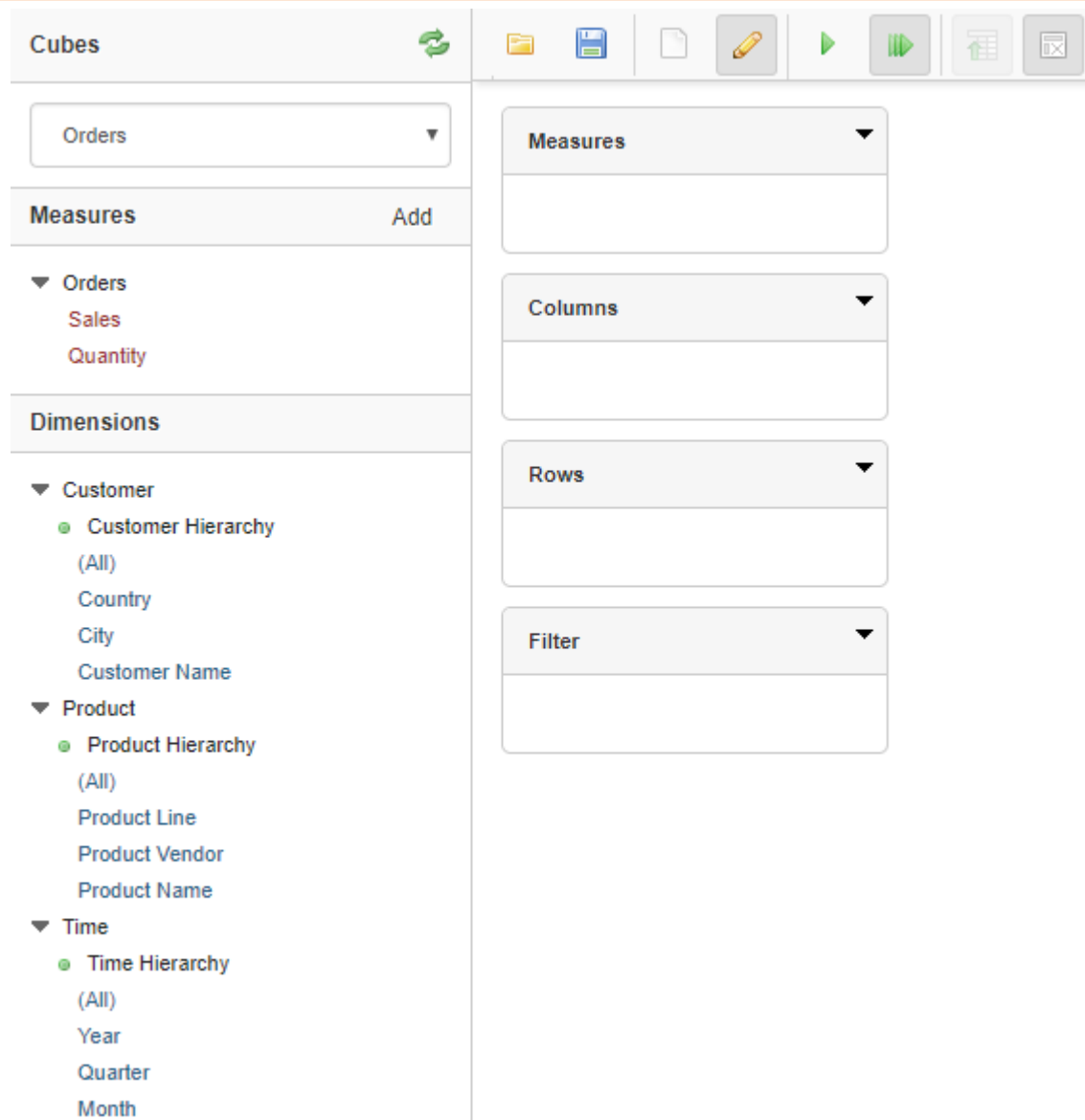
OLAP front-end

- Select the cube
 - if the cube does not show up, there is a problem in the XML
 - check for exceptions in the log file (pentaho.log)
 - go back to PSW and fix the problem



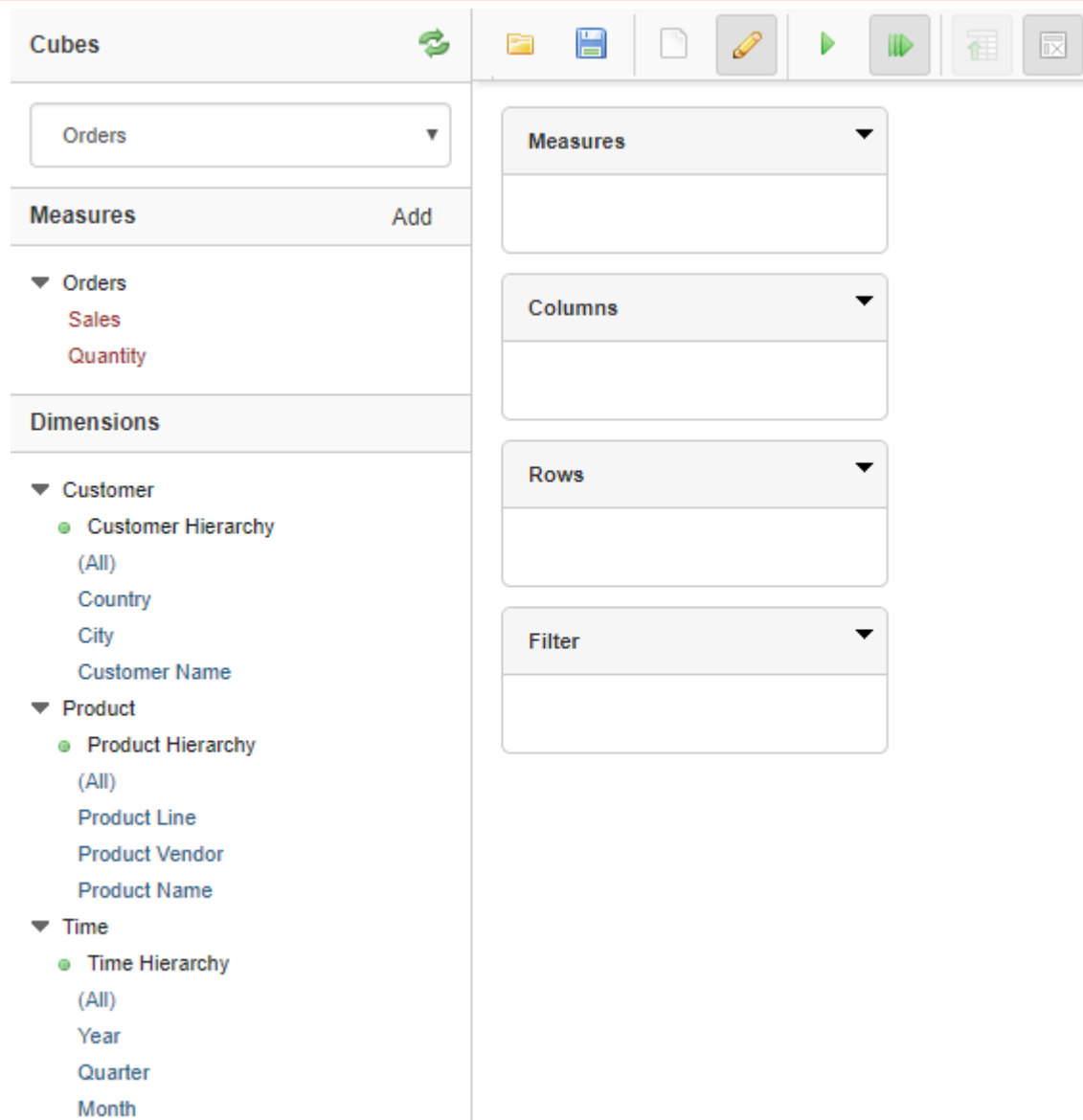
OLAP front-end

- Front-end
 - measures
 - hierarchies
 - levels
 - dimensions



OLAP front-end

- Drag-and-drop
 - drag measures to
 - Measures
 - drag dimensions to
 - Columns
 - Rows
 - Filter



Sales by country

The screenshot shows a BI tool interface with the following components:

- Cubes:** A dropdown menu showing 'Orders'.
- Measures:** A list containing 'Sales' (circled in red). An 'Add' button is next to it.
- Dimensions:** A tree view showing a hierarchy for 'Customer' (circled in red). The hierarchy includes 'Customer Hierarchy', '(All)', 'Country' (circled in red), 'City', and 'Customer Name'.
- Columns:** An empty list.
- Rows:** A list containing 'Country' (circled in red). The label 'Customer Hierarchy' is also present.
- Filter:** An empty list.

On the right side, a table displays the resulting data:

Country	Sales
Australia	\$ 630,638.00
Austria	\$ 202,089.00
Belgium	\$ 108,485.00
Canada	\$ 224,085.00
Denmark	\$ 245,582.00
Finland	\$ 329,472.00
France	\$ 1,111,022.00
Germany	\$ 220,354.00
Hong Kong	\$ 48,766.00
Ireland	\$ 57,788.00
Italy	\$ 403,896.00
Japan	\$ 188,212.00
New Zealand	\$ 535,616.00
Norway	\$ 307,332.00
Philippines	\$ 94,007.00
Singapore	\$ 288,413.00
Spain	\$ 1,215,356.00
Sweden	\$ 210,080.00
Switzerland	\$ 117,745.00
UK	\$ 478,720.00
USA	\$ 4,263,627.00

Sales by country and product line

Cubes

Orders

Measures Add

▼ Orders

Sales

Quantity

Dimensions

▼ Customer

Customer Hierarchy

(All)

Country

City

Customer Name

▼ Product

Product Hierarchy

(All)

Product Line

Product Vendor

Product Name

▼ Time

Time Hierarchy

(All)

Year

Quarter

Month

Measures

Sales

Columns

Product Hierarchy

Product Line

Rows

Customer Hierarchy

Country

Filter

Product Line	Classic Cars	Motorcycles	Planes	Ships	Trains
Country	Sales	Sales	Sales	Sales	Sales
Australia	\$ 193,013.00	\$ 89,892.00	\$ 74,818.00	\$ 4,152.00	\$ 1,683.00
Austria	\$ 101,460.00	\$ 26,060.00	\$ 17,859.00	\$ 9,028.00	-
Belgium	\$ 20,141.00	-	\$ 5,617.00	\$ 31,709.00	\$ 9,016.00
Canada	\$ 61,634.00	\$ 4,182.00	\$ 25,529.00	\$ 40,303.00	-
Denmark	\$ 157,068.00	-	\$ 7,570.00	\$ 38,696.00	\$ 11,482.00
Finland	\$ 153,537.00	\$ 47,839.00	\$ 34,387.00	\$ 29,750.00	\$ 5,136.00
France	\$ 388,888.00	\$ 226,513.00	\$ 108,184.00	\$ 66,485.00	\$ 27,349.00
Germany	\$ 148,201.00	\$ 7,501.00	\$ 23,031.00	\$ 5,484.00	\$ 5,042.00
Hong Kong	-	\$ 3,850.00	\$ 39,617.00	-	-
Ireland	\$ 31,665.00	\$ 4,972.00	\$ 11,785.00	-	\$ 3,130.00
Italy	\$ 133,185.00	\$ 11,632.00	\$ 113,836.00	\$ 17,672.00	\$ 6,260.00
Japan	\$ 47,250.00	\$ 26,564.00	\$ 49,202.00	\$ 18,831.00	\$ 3,541.00
New Zealand	\$ 167,195.00	\$ 99,844.00	\$ 46,633.00	\$ 34,235.00	\$ 8,225.00
Norway	\$ 134,687.00	\$ 51,746.00	\$ 29,513.00	-	\$ 11,316.00
Philippines	\$ 53,075.00	\$ 18,062.00	\$ 20,926.00	-	-
Singapore	\$ 132,768.00	\$ 4,180.00	-	\$ 14,182.00	\$ 13,273.00
Spain	\$ 476,009.00	\$ 74,665.00	\$ 89,966.00	\$ 124,399.00	\$ 43,356.00
Sweden	\$ 69,134.00	\$ 15,540.00	\$ 8,912.00	\$ 30,912.00	\$ 3,808.00
Switzerland	\$ 117,745.00	-	-	-	-
UK	\$ 159,295.00	\$ 40,755.00	\$ 41,187.00	\$ 72,901.00	\$ 12,628.00
USA	\$ 1,344,539.00	\$ 520,554.00	\$ 328,558.00	\$ 209,630.00	\$ 69,417.00

Sales by country, product line and year

Measures

Sales

Columns

Product Hierarchy

Product Line

Rows

Customer Hierarchy

Country

Time Hierarchy

Year

Filter

Product Line		Classic Cars	Motorcycles	Planes	Ships	Trains	Trucks and Buses	Vintage Cars
Country	Year	Sales	Sales	Sales	Sales	Sales	Sales	Sales
Australia	2003	\$ 85,355.00	\$ 42,337.00	\$ 22,316.00	-	\$ 1,683.00	\$ 11,301.00	\$ 90,133.00
	2004	\$ 76,198.00	\$ 33,077.00	\$ 41,416.00	\$ 1,080.00	-	\$ 36,171.00	\$ 44,325.00
	2005	\$ 31,460.00	\$ 14,478.00	\$ 11,086.00	\$ 3,072.00	-	\$ 29,956.00	\$ 55,194.00
Austria	2003	\$ 26,647.00	-	\$ 14,221.00	\$ 9,028.00	-	\$ 20,460.00	\$ 11,775.00
	2004	\$ 15,333.00	\$ 26,060.00	\$ 3,638.00	-	-	-	\$ 6,672.00
	2005	\$ 59,480.00	-	-	-	-	-	\$ 8,775.00
Belgium	2003	-	-	-	-	\$ 1,701.00	-	\$ 1,640.00
	2004	\$ 3,510.00	-	\$ 5,617.00	\$ 31,709.00	\$ 7,315.00	-	\$ 31,942.00
	2005	\$ 16,631.00	-	-	-	-	-	\$ 8,420.00
Canada	2003	\$ 28,896.00	-	-	-	-	\$ 10,162.00	\$ 15,526.00
	2004	\$ 20,600.00	\$ 4,182.00	\$ 25,529.00	\$ 40,303.00	-	\$ 22,351.00	\$ 22,826.00
	2005	\$ 12,138.00	-	-	-	-	\$ 19,472.00	\$ 2,100.00
Denmark	2003	\$ 60,756.00	-	-	\$ 20,444.00	\$ 4,332.00	-	\$ 13,673.00
	2004	\$ 70,338.00	-	\$ 7,570.00	\$ 18,252.00	\$ 7,150.00	\$ 9,581.00	\$ 7,512.00
	2005	\$ 25,974.00	-	-	-	-	-	-
Finland	2003	\$ 33,063.00	-	\$ 23,111.00	\$ 6,388.00	-	\$ 40,469.00	\$ 8,045.00
	2004	\$ 54,255.00	\$ 32,177.00	-	-	\$ 5,136.00	-	-
	2005	\$ 66,219.00	\$ 15,662.00	\$ 11,276.00	\$ 23,362.00	-	-	\$ 10,309.00
France	2003	\$ 141,215.00	\$ 89,175.00	\$ 19,075.00	\$ 6,660.00	-	\$ 46,057.00	\$ 10,731.00
	2004	\$ 184,359.00	\$ 95,359.00	\$ 29,755.00	\$ 38,747.00	\$ 18,394.00	\$ 40,077.00	\$ 148,502.00
	2005	\$ 63,314.00	\$ 41,979.00	\$ 59,354.00	\$ 21,078.00	\$ 8,955.00	\$ 30,844.00	\$ 17,392.00
Germany	2003	\$ 55,476.00	\$ 3,139.00	-	-	-	-	\$ 11,424.00
	2004	\$ 92,725.00	\$ 4,362.00	\$ 23,031.00	\$ 5,484.00	\$ 5,042.00	\$ 10,182.00	\$ 9,489.00

Sales by country, product line and year

Measures
Sales
Columns
Product Hierarchy
Product Line
Time Hierarchy
Year
Rows
Customer Hierarchy
Country
Filter

Product Line	Classic Cars			Motorcycles			Planes	
Year	2003	2004	2005	2003	2004	2005	2003	2004
Country	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales
Australia	\$ 85,355.00	\$ 76,198.00	\$ 31,460.00	\$ 42,337.00	\$ 33,077.00	\$ 14,478.00	\$ 22,316.00	\$ 41,416.00
Austria	\$ 26,647.00	\$ 15,333.00	\$ 59,480.00	-	\$ 26,060.00	-	\$ 14,221.00	\$ 3,638.00
Belgium	-	\$ 3,510.00	\$ 16,631.00	-	-	-	-	\$ 5,617.00
Canada	\$ 28,896.00	\$ 20,600.00	\$ 12,138.00	-	\$ 4,182.00	-	-	\$ 25,529.00
Denmark	\$ 60,756.00	\$ 70,338.00	\$ 25,974.00	-	-	-	-	\$ 7,570.00
Finland	\$ 33,063.00	\$ 54,255.00	\$ 66,219.00	-	\$ 32,177.00	\$ 15,662.00	\$ 23,111.00	-
France	\$ 141,215.00	\$ 184,359.00	\$ 63,314.00	\$ 89,175.00	\$ 95,359.00	\$ 41,979.00	\$ 19,075.00	\$ 29,755.00
Germany	\$ 55,476.00	\$ 92,725.00	-	\$ 3,139.00	\$ 4,362.00	-	-	\$ 23,031.00
Hong Kong	-	-	-	\$ 3,850.00	-	-	\$ 39,617.00	-
Ireland	-	\$ 31,665.00	-	-	\$ 4,972.00	-	-	\$ 11,785.00
Italy	\$ 43,248.00	\$ 89,937.00	-	\$ 4,046.00	-	\$ 7,586.00	\$ 54,817.00	\$ 28,563.00
Japan	-	\$ 28,412.00	\$ 18,838.00	-	\$ 26,564.00	-	-	\$ 49,202.00
New Zealand	\$ 29,675.00	\$ 71,433.00	\$ 66,087.00	\$ 18,450.00	\$ 30,037.00	\$ 51,357.00	\$ 20,375.00	\$ 26,258.00
Norway	\$ 121,028.00	\$ 13,659.00	-	\$ 31,973.00	\$ 19,773.00	-	\$ 3,944.00	\$ 25,569.00
Philippines	\$ 42,572.00	\$ 10,503.00	-	\$ 12,630.00	\$ 5,432.00	-	\$ 20,926.00	-
Singapore	\$ 78,033.00	\$ 54,735.00	-	-	-	\$ 4,180.00	-	-
Spain	\$ 129,713.00	\$ 209,484.00	\$ 136,812.00	\$ 13,647.00	\$ 21,284.00	\$ 39,734.00	\$ 21,557.00	\$ 41,496.00
Sweden	\$ 13,161.00	\$ 39,944.00	\$ 16,029.00	-	-	\$ 15,540.00	\$ 8,912.00	-
Switzerland	-	\$ 117,745.00	-	-	-	-	-	-
UK	\$ 66,636.00	\$ 92,659.00	-	-	-	\$ 40,755.00	\$ 8,990.00	\$ 32,197.00
USA	\$ 558,524.00	\$ 560,410.00	\$ 225,605.00	\$ 178,145.00	\$ 287,353.00	\$ 55,056.00	\$ 90,063.00	\$ 177,503.00

Quantity by product line and year


The screenshot shows a BI tool interface with the following components:


- Measures:** A list containing 'Quantity'.
- Columns:** A list containing 'Year'.
- Rows:** A list containing 'Product Line'.
- Dimensions:** A tree structure on the left with the following items:
 - Customer
 - Customer Hierarchy
 - (All)
 - Country
 - City
 - Customer Name
 - Product
 - Product Hierarchy
 - (All)
 - Product Line
 - Product Vendor
 - Product Name
 - Time
 - Time Hierarchy
 - (All)
 - Year
 - Quarter
 - Month


Red arrows indicate the mapping of fields from the Dimensions pane to the Measures, Columns, and Rows panes: 'Quantity' from Measures to the Measures pane, 'Year' from Columns to the Columns pane, and 'Product Line' from Rows to the Rows pane. Additionally, 'Product Line' and 'Year' are highlighted in the Dimensions pane.


Year	2003	2004	2005
Product Line	Quantity	Quantity	Quantity
Classic Cars	12,762	16,085	6,705
Motorcycles	4,031	5,906	2,771
Planes	3,833	5,820	2,207
Ships	2,844	4,309	1,346
Trains	1,000	1,409	409
Trucks and Buses	4,056	5,024	1,921
Vintage Cars	10,003	10,864	4,116

Quantity and sales by product line and year

Measures ▼
Quantity
Sales


Columns ▼
Time Hierarchy
Year


Rows ▼
Product Hierarchy
Product Line


Filter ▼


Year	2003		2004		2005	
Product Line	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	12,762	\$ 1,513,998.00	16,085	\$ 1,837,904.00	6,705	\$ 738,587.00
Motorcycles	4,031	\$ 397,392.00	5,906	\$ 590,632.00	2,771	\$ 286,327.00
Planes	3,833	\$ 347,924.00	5,820	\$ 529,129.00	2,207	\$ 200,077.00
Ships	2,844	\$ 244,652.00	4,309	\$ 375,498.00	1,346	\$ 128,219.00
Trains	1,000	\$ 72,857.00	1,409	\$ 124,885.00	409	\$ 36,920.00
Trucks and Buses	4,056	\$ 420,523.00	5,024	\$ 532,024.00	1,921	\$ 201,903.00
Vintage Cars	10,003	\$ 1,315,089.00	10,864	\$ 997,708.00	4,116	\$ 388,817.00

Quantity and sales by product line, country and year

Measures

- Quantity
- Sales

Columns

- Time Hierarchy
 - Year

Rows

- Product Hierarchy
 - Product Line
- Customer Hierarchy
 - Country

Filter

Year		2003		2004		2005	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	Australia	763	\$ 85,355.00	644	\$ 76,198.00	411	\$ 31,460.00
	Austria	248	\$ 26,647.00	180	\$ 15,333.00	509	\$ 59,480.00
	Belgium	-	-	30	\$ 3,510.00	117	\$ 16,631.00
	Canada	225	\$ 28,896.00	147	\$ 20,600.00	84	\$ 12,138.00
	Denmark	478	\$ 60,756.00	592	\$ 70,338.00	174	\$ 25,974.00
	Finland	280	\$ 33,063.00	388	\$ 54,255.00	616	\$ 66,219.00
	France	1,210	\$ 141,215.00	1,704	\$ 184,359.00	626	\$ 63,314.00
	Germany	525	\$ 55,476.00	756	\$ 92,725.00	-	-
	Ireland	-	-	202	\$ 31,665.00	-	-
	Italy	304	\$ 43,248.00	678	\$ 89,937.00	-	-
	Japan	-	-	192	\$ 28,412.00	122	\$ 18,838.00
	New Zealand	289	\$ 29,675.00	633	\$ 71,433.00	604	\$ 66,087.00
	Norway	1,001	\$ 121,028.00	157	\$ 13,659.00	-	-
	Philippines	391	\$ 42,572.00	87	\$ 10,503.00	-	-
	Singapore	507	\$ 78,033.00	536	\$ 54,735.00	-	-
	Spain	1,072	\$ 129,713.00	2,070	\$ 209,484.00	1,238	\$ 136,812.00
	Sweden	73	\$ 13,161.00	296	\$ 39,944.00	183	\$ 16,029.00
	Switzerland	-	-	1,078	\$ 117,745.00	-	-
	UK	662	\$ 66,636.00	845	\$ 92,659.00	-	-
	USA	4,734	\$ 558,524.00	4,870	\$ 560,410.00	2,021	\$ 225,605.00
Motorcycles	Australia	431	\$ 42,337.00	324	\$ 33,077.00	121	\$ 14,478.00
	Austria	-	-	197	\$ 26,060.00	-	-
	Canada	-	-	41	\$ 4,182.00	-	-
	Finland	-	-	301	\$ 32,177.00	146	\$ 15,662.00

Quantity and sales by product line, country and quarter

Measures
Quantity
Sales

Columns
Time Hierarchy
Year
Quarter

Rows
Product Hierarchy
Product Line
Customer Hierarchy
Country

Filter

Year		2003							
Quarter		Q1		Q2		Q3		Q4	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	Australia	-	-	-	-	479	\$ 52,520.00	284	\$ 32,835.00
	Austria	-	-	46	\$ 5,014.00	-	-	202	\$ 21,633.00
	Belgium	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	225	\$ 28,896.00
	Denmark	120	\$ 20,445.00	-	-	-	-	358	\$ 40,311.00
	Finland	-	-	-	-	248	\$ 28,551.00	32	\$ 4,512.00
	France	-	-	780	\$ 83,884.00	240	\$ 32,409.00	190	\$ 24,922.00
	Germany	-	-	-	-	-	-	525	\$ 55,476.00
	Ireland	-	-	-	-	-	-	-	-
	Italy	-	-	-	-	-	-	304	\$ 43,248.00
	Japan	-	-	-	-	-	-	-	-
	New Zealand	-	-	-	-	196	\$ 19,434.00	93	\$ 10,241.00
	Norway	110	\$ 15,278.00	-	-	-	-	891	\$ 105,750.00
	Philippines	391	\$ 42,572.00	-	-	-	-	-	-
	Singapore	-	-	137	\$ 20,630.00	85	\$ 16,280.00	285	\$ 41,123.00
	Spain	224	\$ 25,915.00	105	\$ 15,268.00	111	\$ 17,332.00	632	\$ 71,198.00
	Sweden	29	\$ 7,221.00	-	-	-	-	44	\$ 5,940.00
	Switzerland	-	-	-	-	-	-	-	-
	UK	297	\$ 27,795.00	33	\$ 4,389.00	-	-	332	\$ 34,452.00
	USA	212	\$ 27,419.00	636	\$ 79,050.00	1,080	\$ 132,984.00	2,806	\$ 319,071.00
Motorcycles	Australia	-	-	212	\$ 23,448.00	-	-	219	\$ 18,889.00
	Austria	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-
	Finland	-	-	-	-	-	-	-	-

Quantity and sales by product line, country and month

Measures
Quantity
Sales

Columns
Time Hierarchy
Year
Quarter
Month

Rows
Product Hierarchy
Product Line
Customer Hierarchy
Country

Filter

Year									
Quarter		Q1							
Month		Jan		Feb		Mar		Apr	
Product Line	Country	Quantity	Sales	Quantity	Sales	Quantity	Sales	Quantity	Sales
Classic Cars	Australia	-	-	-	-	-	-	-	-
	Austria	-	-	-	-	-	-	46	\$ 5,014.00
	Belgium	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-
	Denmark	-	-	120	\$ 20,445.00	-	-	-	-
	Finland	-	-	-	-	-	-	-	-
	France	-	-	-	-	-	-	145	\$ 17,983.00
	Germany	-	-	-	-	-	-	-	-
	Ireland	-	-	-	-	-	-	-	-
	Italy	-	-	-	-	-	-	-	-
	Japan	-	-	-	-	-	-	-	-
	New Zealand	-	-	-	-	-	-	-	-
	Norway	110	\$ 15,278.00	-	-	-	-	-	-
	Philippines	-	-	-	-	391	\$ 42,572.00	-	-
	Singapore	-	-	-	-	-	-	137	\$ 20,630.00
	Spain	224	\$ 25,915.00	-	-	-	-	-	-
	Sweden	-	-	-	-	29	\$ 7,221.00	-	-
	Switzerland	-	-	-	-	-	-	-	-
	UK	-	-	-	-	297	\$ 27,795.00	-	-
	USA	-	-	-	-	212	\$ 27,419.00	137	\$ 16,191.00
Motorcycles	Australia	-	-	-	-	-	-	212	\$ 23,448.00
	Austria	-	-	-	-	-	-	-	-
	Canada	-	-	-	-	-	-	-	-