DATA POINT MODEL VS. MULTIDIMENSIONAL DATA MODEL.

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Ignacio Santos
Bank of Spain

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SUMMARY

• Introduction.
• DPM vs. MDM.
• Conclusions.
INTRODUCTION I

DPM vs. MDM

DPM

MDM

XBRL Taxonomies

RDBMS

DMP vs. MDM


<table>
<thead>
<tr>
<th>Loans</th>
<th>1</th>
<th>F(5, 1, 1)</th>
<th>F(5, 1, 2)</th>
<th>----</th>
<th>F(5, 1, 5)</th>
<th>F(5, 1, 6)</th>
<th>F(5, 1, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>of which: Non-Financial corporations</td>
<td>2</td>
<td>F(5, 2, 1)</td>
<td>F(5, 2, 2)</td>
<td>----</td>
<td>F(5, 2, 5)</td>
<td>F(5, 2, 6)</td>
<td>F(5, 2, 7)</td>
</tr>
<tr>
<td>of which: Households</td>
<td>3</td>
<td>F(5, 3, 1)</td>
<td>F(5, 3, 2)</td>
<td>----</td>
<td>F(5, 3, 5)</td>
<td>F(5, 3, 6)</td>
<td>F(5, 3, 7)</td>
</tr>
<tr>
<td>Debt securities held</td>
<td>4</td>
<td>F(5, 4, 1)</td>
<td>F(5, 4, 2)</td>
<td>----</td>
<td>F(5, 4, 5)</td>
<td>F(5, 4, 6)</td>
<td>F(5, 4, 7)</td>
</tr>
<tr>
<td>Equity instruments held</td>
<td>5</td>
<td>F(5, 5, 1)</td>
<td>F(5, 5, 2)</td>
<td>----</td>
<td>F(5, 5, 5)</td>
<td>F(5, 5, 6)</td>
<td>F(5, 5, 7)</td>
</tr>
<tr>
<td>Derivatives</td>
<td>6</td>
<td>F(5, 6, 1)</td>
<td>F(5, 6, 2)</td>
<td>----</td>
<td>F(5, 6, 5)</td>
<td>F(5, 6, 6)</td>
<td>F(5, 6, 7)</td>
</tr>
<tr>
<td>Equity and debt instruments</td>
<td>7</td>
<td>XXXX</td>
<td>XXXX</td>
<td>----</td>
<td>XXXX</td>
<td>XXXX</td>
<td>F(5, 7, 7)</td>
</tr>
<tr>
<td>Other assets than equity</td>
<td>8</td>
<td>XXXX</td>
<td>XXXX</td>
<td>----</td>
<td>XXXX</td>
<td>XXXX</td>
<td>F(5, 8, 7)</td>
</tr>
<tr>
<td>Total assets</td>
<td>9</td>
<td>F(5, 9, 1)</td>
<td>F(5, 9, 2)</td>
<td>----</td>
<td>F(5, 9, 5)</td>
<td>F(5, 9, 6)</td>
<td>F(5, 9, 7)</td>
</tr>
</tbody>
</table>

“Assets by counterparty residence and currency”, Template 5 of FINREP 2012
### Sample of the template number 5 of FINREP 2012

<table>
<thead>
<tr>
<th>Loans</th>
<th>1</th>
<th>F (5, 1, 1)</th>
<th>F (5, 1, 2)</th>
<th>F (5, 1, 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Than EUR</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>EUR</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Than EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Headers**
- CT: AS/Loans
- PL: PL/Measured at fair...

**Dimensions/Attributes of Dimensions**
- Calculated Attribute
- C: = OC/EUR

**Description**
- Assets
- Basic concept

**Notes**
- GA: CR/EMU
- CU: OC/EUR
- GA: CR/Other than EMU
- CU: OC/other than EUR
- GA: CR/Other than EMU in EU
- CU: = OC/EUR

**Sample of the template number 5 of FINREP 2012**
DPM vs. MDM I

• **Element of the dictionary → Concept**
  - Concepts → period of time, type

• **Domain → Domain.**

• **Dimension.**
  - Dimension → Dimension.
  - Dimension → dimension attribute (domain-member).
  - Calculated attribute (domain-member).
• **Primary Item → Basic concept.**
  • Type of period of time.
  • Data type.
  • If data type is monetary, then Balance.

• **Base Dimension.**
  • Base Dimension → Dimension → Domain.

• **Each taxonomy has a Base Dimension.**
• Family $\rightarrow$ Group of dimensions.

  • Dimension.
  • Group of dimensions $\rightarrow$ Domains.
- **Member by default** → **concept by default.**
  - **Domain** → **Concept by default.**
  - The dimensions inherit the concept by default.

- **Concept by default** → **Attribute of dimension.**
  - **Calculated Attribute.**
DPM vs. MDM V

- DP → Fact.
  - Attribute of Dimension/Dimension.
  - Primary ítem.
  - Calculated attribute.
DPM vs. MDM VI

- Hierarchies.
  - Domains: Concepts.
  - Concepts → father, childrens.
  - Father Concept → validation children.
  - Children concept → operation (+/-).
  - Dimensions → Inheritance of domains.
DPM vs. MDM VII

Hierarchy versus aggregation.
## Fact Table

<table>
<thead>
<tr>
<th>Number of cell</th>
<th>Value</th>
<th>Basic concept</th>
<th>SDo/Concept</th>
<th>SDo/Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>Assets</td>
<td>Risk/Maturity-based approach</td>
<td>Geography/Germany</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>Assets</td>
<td>Risk/Duration-based approach</td>
<td>Geography/Germany</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>Assets</td>
<td>Risk/Normal treatment</td>
<td>Geography/Germany</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>Assets</td>
<td>Risk/Maturity-based approach</td>
<td>Geography/Spain</td>
</tr>
<tr>
<td>105</td>
<td>50</td>
<td>Assets</td>
<td>Risk/Normal treatment</td>
<td>Geography/Spain</td>
</tr>
</tbody>
</table>

Cell(3) = Cell(1) + Cell(2), and Cell(105) = Cell(100)

Hierarchy versus aggregation in the fact table.
DPM vs. MDM IX

• Type of Dimensions.
  • Explicit dimensions.
    • Dimensions.
    • Attributes of dimensions.
    • Calculated attributes.
  • Implicit dimensions.
    • Dimensions.
    • Attributes of dimensions.
    • Domains without hierarchy.
DPM vs. MDM X

• References.

• Tuples (dimensions).

• Facts:
  • $Bc \ (primary \ items) + (attribute \ of \ dimensions, \ dimensions)$.  

DPM vs. MDM XI

- **Hypercubes → Constraints.**
  - Hypercube allowed.
  - Hypercube forbidden.
### Example of fact table with calculated attributes

<table>
<thead>
<tr>
<th>N-Cell</th>
<th>Fact</th>
<th>BC</th>
<th>A</th>
<th>L</th>
<th>E</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>Assets</td>
<td>RE</td>
<td>No Fin</td>
<td>Bankia</td>
<td>Madrid</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>Assets</td>
<td>RE</td>
<td>TBitselt</td>
<td>Bankia</td>
<td>Madrid</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>Assets</td>
<td>RE</td>
<td>No Fin</td>
<td>BBVA</td>
<td>Madrid</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>Assets</td>
<td>RE</td>
<td>TBitselt</td>
<td>BBVA</td>
<td>Madrid</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>Assets</td>
<td>NRE</td>
<td>TBitselt</td>
<td>Bankia</td>
<td>Madrid</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>Assets</td>
<td>NRE</td>
<td>TBitselt</td>
<td>BBVA</td>
<td>Madrid</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>Assets</td>
<td>RE</td>
<td>CA1</td>
<td>Bankia</td>
<td>Madrid</td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>Assets</td>
<td>RE</td>
<td>CA1</td>
<td>BBVA</td>
<td>Madrid</td>
</tr>
<tr>
<td>9</td>
<td>42</td>
<td>Assets</td>
<td>CA2</td>
<td>CA2</td>
<td>Bankia</td>
<td>Madrid</td>
</tr>
</tbody>
</table>
DPM vs. MDM XIII

• Allowed:

\[(\text{Real estate, Assets\_Estate}) \cup (\text{To bank itself, Loans}) \cup (\text{Bankia, Entity}) \cup (\text{Madrid, Geography}) \cup \text{Assets} \rightarrow \varphi_5\]

\[(\text{Real estate, Assets\_Estate}) \cup \text{CA}\!t_1 \cup (\text{Bankia, Entity}) \cup (\text{Madrid, Geography}) \cup \text{Assets} \rightarrow \varphi_7\]

• Forbidden:

\[(\text{Real estate, Assets\_Estate }) \cup \text{CA}\!t_1 \cup (\text{Bankia, Entity}) \cup (\text{Madrid, Geography}) \cup \text{Assets} \rightarrow \emptyset (\varphi_7)\]
DPM vs. MDM XIV

```
  Dimension_1
    Identifier (pk)
    Name
    Period_type
    Data_type
    References (null)
    Default
    Dimension_type

  Dimension_2
    Identifier (pk)

  Dimension_3

  Fact_Table
    Fact_Id (pk)
    Dimension_1_fk
    Dimension_2_fk
    Dimension_N_fk
    Base_dimension_fk
    Fact
    Rule_1
    Rule_2
    ...
    Rule_N

  Base_Dimension
    Identifier (pk)
    Name
    Period_type
    Data_type
    Balance

  Dimension_N

```

DW of the XBRL metadata
The image shows a diagram of a data model (DM) for XBRL metadata, comparing DPM (Data Processing Metadata) and MDM (Metadata Management). The diagram includes several dimensions and fact tables, illustrating the relationships and attributes involved in the metadata structure.

Key components of the diagram include:
- **Dimension_1** with attributes such as Identifier (pk), Name, Period_type, Data_type, and References (null). It also shows a relationship to **Fact_Table_1**.
- **Dimension_2** and **Dimension_3**, both with similar attributes and relationships to fact tables.
- **Base_Dimension** with Identifier (pk), Name, Period_type, Data_type, and Balance, having relationships with multiple fact tables.
- **Fact_Table_1**, **Fact_Table_2**, **Fact_Table_3**, and **Fact_Table_N**, each with their own attributes and relationships with dimensions.

The diagram is labeled as "DM of the XBRL metadata."
CONCLUSIONS

• CWA1.

• Mapping DPM $\leftrightarrow$ MDM.

• Definitions, rules, constraints.

• Automatization of the process.

• Proof of the concept.
Ignacio Santos.
Unit of Databases.
Department of Information System.
E-mail: ignacio.santos@bde.es
Phone: + 34 91 3387192.
FAX: + 34 913386875.
Banco de España (Bank of Spain).
c/ Alcalá 522.
28027 Madrid.
España (Spain).