# ACADEMIC TRACK – XBRL WEEK 2017
# Validation of structured reports using Model Driven Architecture (MDA), proof of concept in the Platform Independent Model (PIM)

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**Frankfurt , June 8th, 2017**

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# Summary

1. Summary

2. Introduction

3. Aims

4. Metadata Design

5. Metadata Design Validation

6. Conclusion

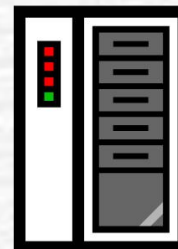7. Future Work

# Introduction I

**Cash machine**

**20110105;130105;20110105;130206;K5;3;00035829133;K384567;50;0003582;**

**20110105;130801;20110105;130900;K1;3;00035825344;K384567;237'3;0003582;**

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**Computer in the Bank**

3

# Introduction II

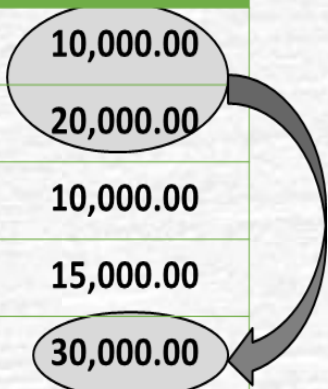**Germany**                                                                                              **Euros**

**Financial assets, period: 1st quarter, 2012**

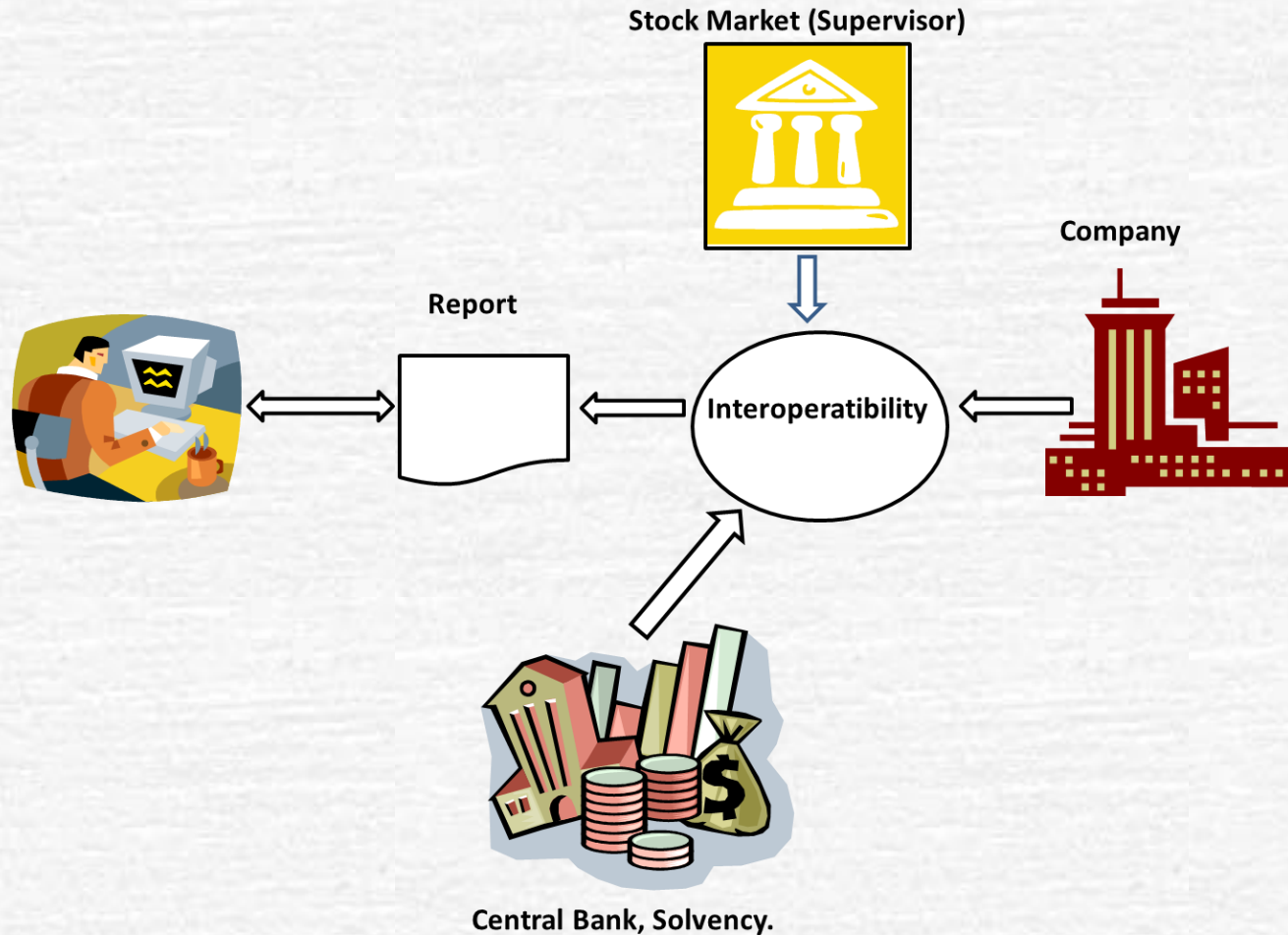| Financial institution | Type of Loan | Type of Asset | Value |
|---|---|---|---|
| BNP Paribas | The bank itself | Real Estate | 10,000.00 |
| BNP Paribas | To other banks | Real Estate | 20,000.00 |
| ING Group | The bank itself | Real Estate | 10,000.00 |
| ING Group | To other bank | Real Estate | 15,000.00 |
| BNP Paribas | To bank itself and other banks | Real Estate | 30,000.00 |

# Introduction III

**Stock Market (Supervisor)**

**Company**

**Report**

**Interoperatibility**

**Central Bank, Solvency.**

# Introduction IV

**Stock Market Supervisor**

**Airline**

**Airline Supervisor**

**Aircraft Maintenance**

# Aims I

- These reports are designed almost exclusively by economists, accountants, or financiers according to their needs.

- The specification is extended according to expert user's requirements for new elements.

- It has become larger and more complicated and is currently very actively used.

- Financial statements are governed by strict requirements.

- XBRL is used instead of XML, since reports have specific semantics of the IFRS or the GAAP.

# Aims II

- These reports can be long, since taxonomies are created with many concepts and user rules or constraints. They can generate problems in implementation (especially in performance at run-time) using existing XML technology, especially in the validation of the documents.

- Many reports present design errors and without public test cases.

- Lack of interoperability.

- Supervisors and / or regulators are continually creating larger and more complex models.

- Complexity of the specification in knowledge as well as in infrastructure.

# Metadata Design I

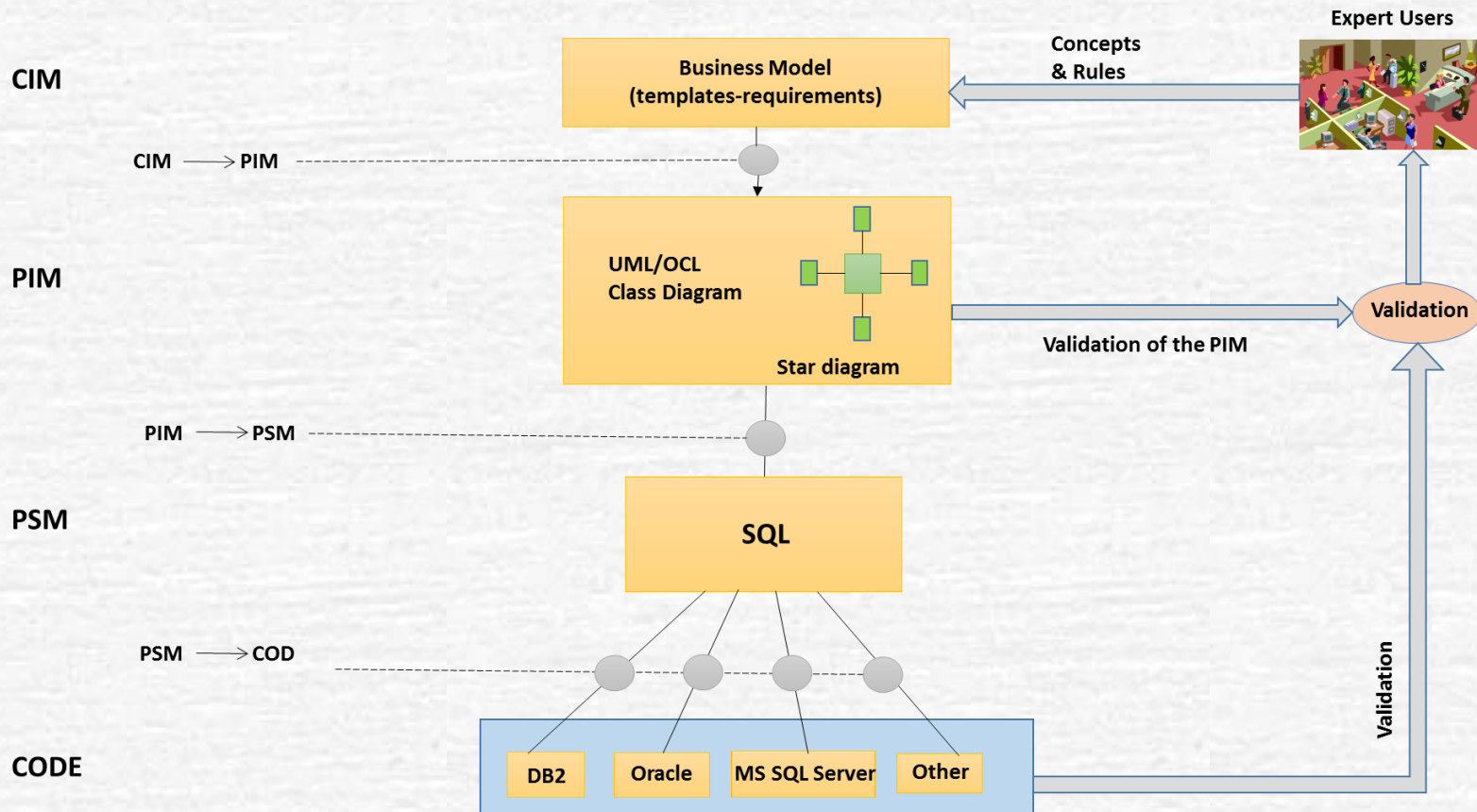**A semantic economic/financial report** is semantic if it is composed of a set of interconnected concepts, and values assigned to these concepts or group of concepts. In addition, the values must comply with certain rules and/or constraints among other values and concepts.

Germany                                                                Euros

**Financial assets, period: 1st quarter, 2012**

| Financial institution | Type of Loan | Type of Asset | Value |
|---|---|---|---|
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# Metadata Design II

**CIM**

**PIM**

**PSM**

**CODE**

CIM → PIM

PIM → PSM

PSM → COD

**Business Model (templates-requirements)**

Concepts & Rules

Expert Users

**UML/OCL Class Diagram**

Star diagram

**Validation**

Validation of the PIM

**SQL**

**DB2** **Oracle** **MS SQL Server** **Other**

Validation

10

# Metadata Design III

# Metadata Design IV

# Metadata Design V

13
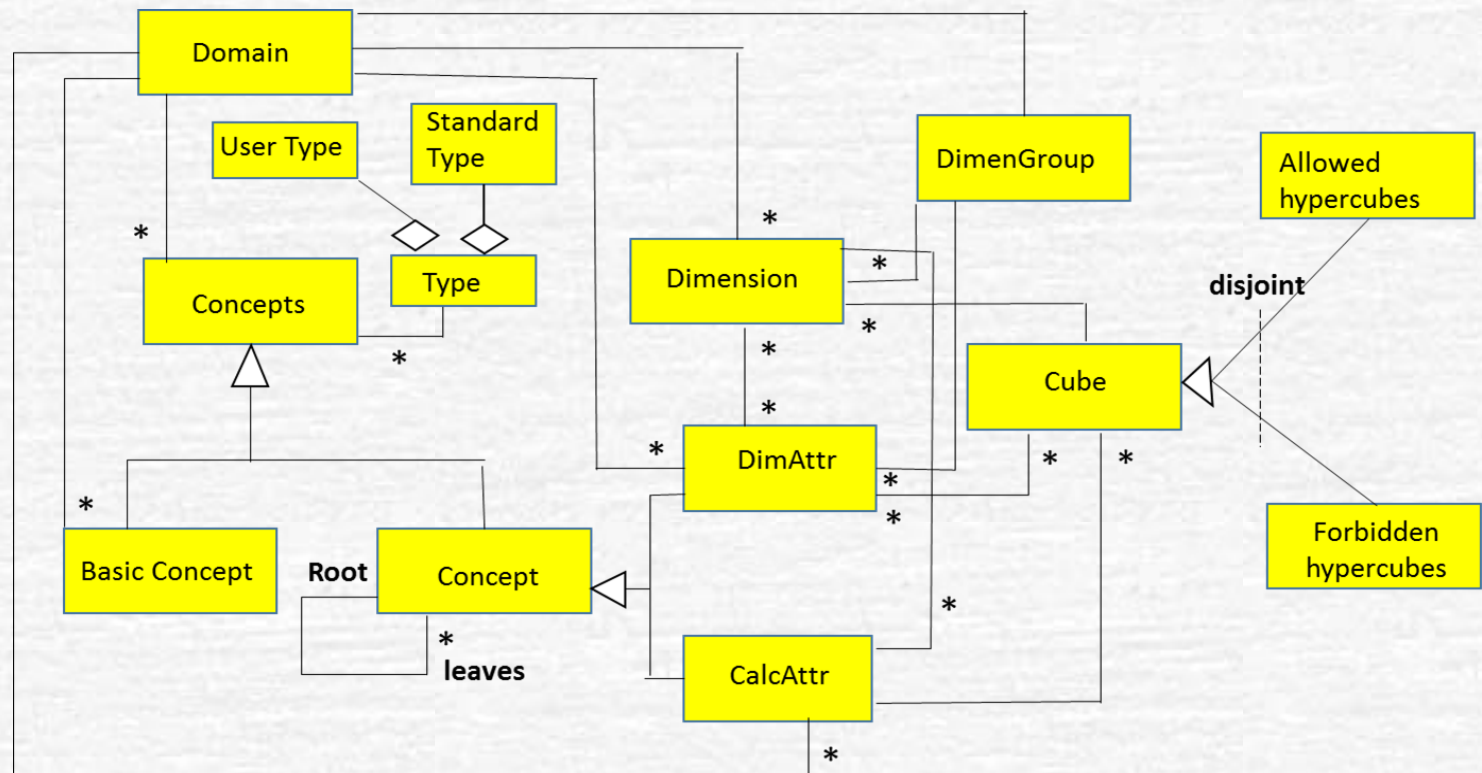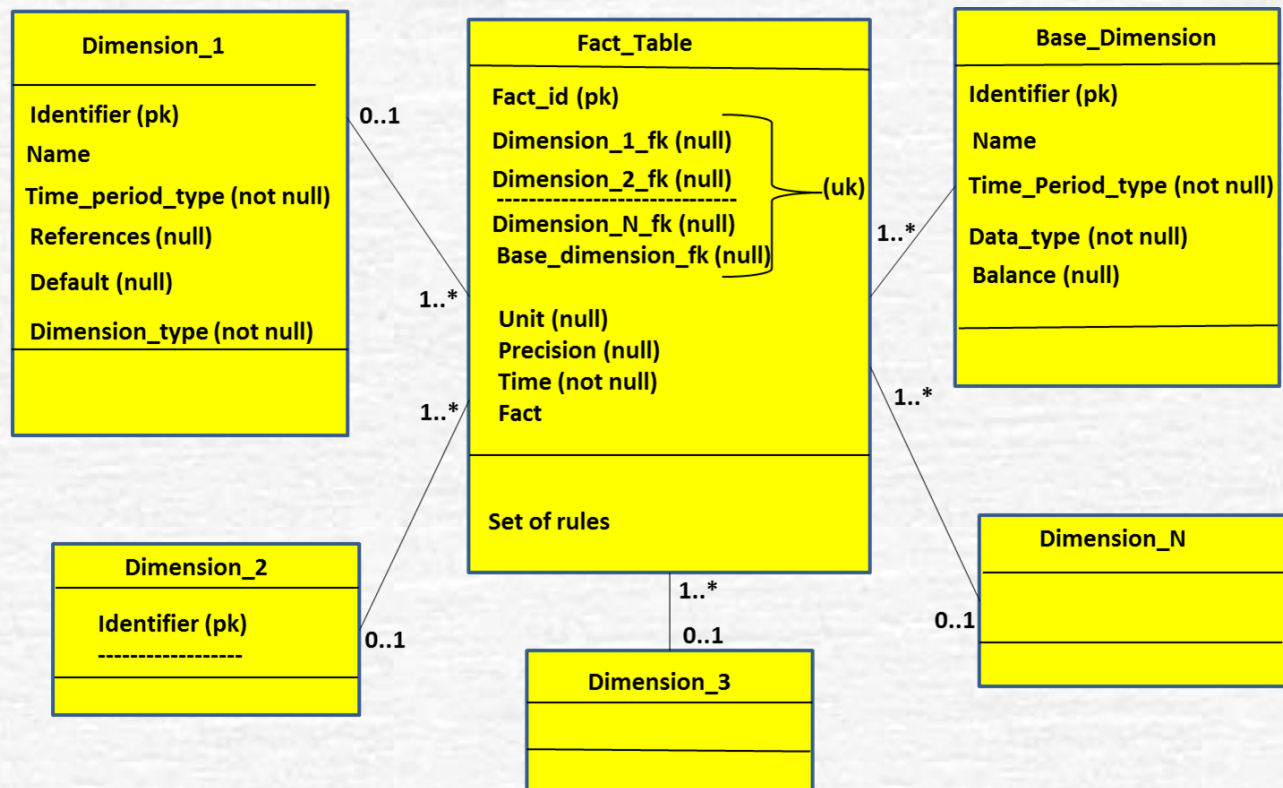
# Metadata Design VI

**Entity**

BNP Paribas
ING Group
Royal Bank of
Scotland.
Commerzbank

**Geography**

United Kingdom
France
Netherlands
Germany

**FACT TABLE**

| N-Cell | Fact | BC | A | L | E | 6 |
|--------|------|------|-----|----------------|-----|---------|
| 1 | 10000 | Assets | RE | The bank itself | BNP | Germany |
| 2 | 20000 | Assets | RE | ToOther | BNP | Germany |
| 3 | 10000 | Assets | RE | The bank itself | ING | Germany |
| 4 | 15000 | Assets | RE | ToOther | ING | Germany |
| 5 | 12000 | Assets | NRE | ToOther | BNP | Germany |
| 6 | 13000 | Assets | NRE | ToOther | ING | Germany |
| 7 | 30000 | Assets | RE | CAt1 | BNP | Germany |
| 8 | 35000 | Assets | RE | CAt1 | ING | Germany |
| 9 | 32000 | Assets | CAt2 | ToOther | BNP | Germany |

**Assets_Estate _1**

Real estate
No real estate

**Base dimension**

---------
Assets
---------

**Loans_1**

The bank itself
To other banks

14

# Metadata Design Validation I

- This set of slides looks at the validation of the development of the metadata life cycle model's development in the semantic accounting reports.

- The validation is performed in two phases:

    - Phase I:
        - The transformation of the Computation Independent Model (the CIM) to the PIM is validated.
    - Phase II:
        - The transformation of the PIM to the Platform Specific Model (the PSM) (or relational model) is correctly performed.

- Although it might seem redundant to use more than one type of validation, this has been done in order to increase confidence in the validation results.

# Metadata Design Validation II

- The validation involves testing that the data obtained in the development of this research work match up with expert users' requirements.

- FINREP 2012 and Solvency II (early draft).

- The diverse elements of the original templates are stored and validated into the set of artefacts UML, using the algorithm of the validation.

# Metadata Design Validation III

# Conclusions I

- The main purpose of this research work is the development of the entire metadata model's life cycle using a robust architecture technology such as the MDA, non-existent to date.

- Therefore, it facilitates the extension of new elements and / or modifications that are using this methodology (the MDA).

- The implementation of these reports in a database manager can avoid the limitations of processing large reports in XBRL, helping with the possibility of monitoring its performance and subsequent tuning analysis.

# Conclusions II

- The establishment of a data model design life cycle ensures fewer errors in the design, since it has been proven in concept testing and validation, and gives the possibility of making a set of test cases for analysing anomalies and other semantic questions.

- This research work has validated the interoperability of this technology by studying its design. Moreover, it shows how this model can be implemented in different databases of different vendors and even enables mapping to other platforms.

- By using the MDM and OLAP technologies, this research work simplifies complexity, without being less robust, and although the required infrastructure is not less expensive, it can be shared by other applications.

# Future Work

- Extend the life cycle software development of these reports, not only to the European model, but also to the rest, which are not purely dimensional.

- Expand the use of this specification to other environments beyond Supervision and Regulation.

- Incorporate into this research the Data Point Model (DPM), and its implementation in XBRL

- Through this life cycle development, facilitate the creation of public tests.

- Natural language processing analysis techniques to increase the semantic content of the reports.

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