

Semantic Services Opportunities in the Financial Services Industries

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New financial services are emerging



The screenshot shows the Kiva website with the tagline "loans that change lives". The navigation bar includes "LEND", "ABOUT", "JOURNALS", and "MY PORTFOLIO". A central diagram illustrates the flow from "Lenders YOU" to "Entrepreneurs" with the text: "What is Kiva? Kiva lets you lend to a specific entrepreneur in the developing world - empowering them to lift themselves out of poverty." Below this, the "Impact This Week" section reports "1,619 entrepreneurs funded." and lists a "Latest Loan" for Tom Noertrange in Luxembourg, which was funded by the Saasaai 1 Centre in Samoa. The "Featured Entrepreneurs" section highlights the YUNGUEÑITAS Group in Bolivia, with details on their activity, loan request, and repayment terms. A "Featured Lender" section identifies zazi.com as the lender for the featured loan.

loans that change lives

LEND ABOUT JOURNALS MY PORTFOLIO

Lenders YOU

Entrepreneurs

What is Kiva?
Kiva lets you **lend** to a specific entrepreneur in the developing world - empowering them to lift themselves out of poverty.

Impact This Week
1,619 entrepreneurs funded.

Latest Loan - 9:18 AM PDT


[Tom](#)
Noertrange, Wiltz Luxembourg


[Saasaai 1 Centre - Group 1](#)
Saasaai, Savaii Island, Samoa

Featured Entrepreneurs [See all fundraising entrepreneurs >>](#)


Entrepreneurs: [YUNGUEÑITAS Group](#)
Location: El Alto / La Paz, Bolivia
Activity: Food Production/Sales
Loan Request: \$272.22 per entrepreneur (18 entrepreneurs)
Repayment Term: 6 months
Loan Use: Capital for the purchase of raw materials [read more>>](#)

\$4,575.00 loaned so far
\$325.00 still needed
\$25

Featured Lender [View lender page >>](#)

zazi.com **Lender:** [zazi](#)
Location: Boynton Beach, FL United States

Financial analytics based services are shifting towards integrating business intelligence

❑ performance rating services

✓ based on balance sheets

- non-linear prediction models from BS data and financial ratios

✓ integrate additional evidence

- analyst reports (textual, tables)

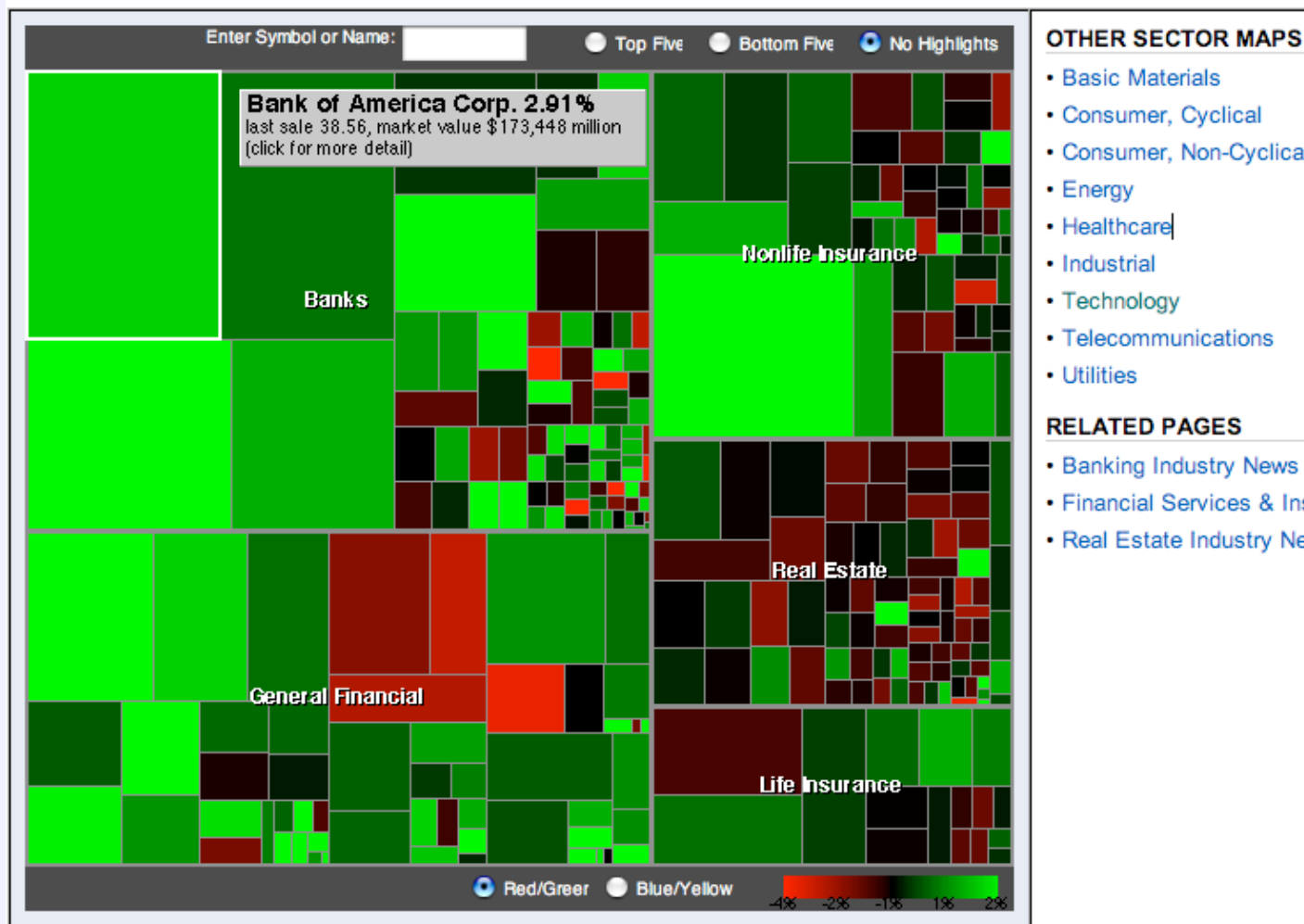
❑ credit-worthiness ratings in banks

✓ based on semi-automatic data aggregation from public / registry data sources

❑ value-added business insights

✓ in finance portals using rich user interfaces

Example Sector Map from WSJ -- integrated information at your finger tips



OTHER SECTOR MAPS

- Basic Materials
- Consumer, Cyclical
- Consumer, Non-Cyclical
- Energy
- Healthcare
- Industrial
- Technology
- Telecommunications
- Utilities

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Drilling down in WSJ reveals background information

THE WALL STREET JOURNAL.

As of 2:28 p.m. EDT Wednesday, April 9, 2008

News Today's Newspaper My Online Journal Multimedia & Online Extras

Home
News
News Main
U.S. Business
Europe
Asia
World News
Economy
Politics & Policy
Campaign 2008
Earnings
Health
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Sports
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UPDATE: S&P: No Further Mortgage Insurer Downgrades Expected

Word Count: 933

(ADDS comments from Standard & Poor's Wednesday conference call, starting in first paragraph; adds comment on capital adequacy from MGIC.)

CHICAGO (Dow Jones)--Some mortgage insurers that got involved with risky loan products during the housing boom and then saw losses skyrocket no longer deserve AA financial strength ratings, the biggest rating agency said Wednesday.

Among the loan products that got insurers and lenders into trouble are so-called low documentation loans and loans that gave borrowers the option of paying less than they owed on principal and interest each month.

Such loans "really changed the nature of the sector and we ...

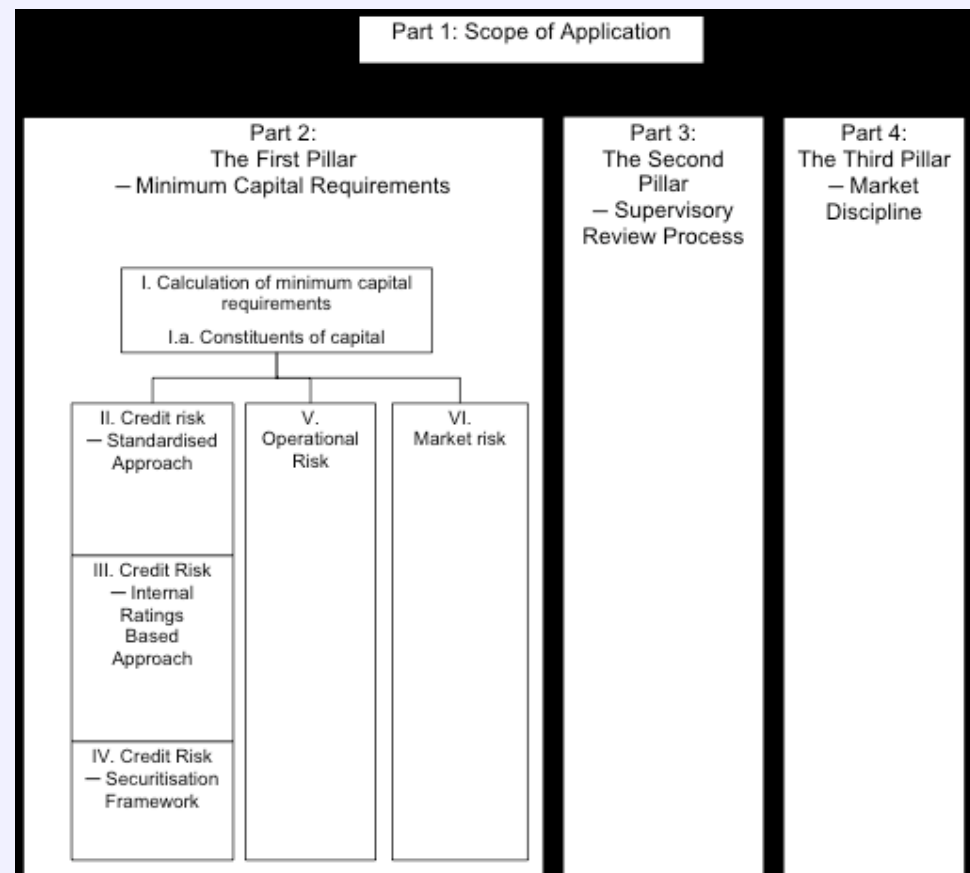
Community based financial services will exploit the potential of web 2.0 and semantic technologies

- ❑ opinion sharing and polling for consumer climate assessment
- ❑ public lending brokerage (see Kiva example)

The screenshot displays the 'yourpointofview.com' interface on the HSBC website. At the top, the HSBC logo and tagline 'The world's local bank' are visible. Below the header, there is a navigation bar with links for 'Home', 'Topic of the week', 'Polls & Data', 'Commentary', and 'eCards', along with a search box. The main content area is divided into two columns. The left column features a 'Polls & Data' menu with options for 'World', 'Work', 'Life', 'Play', and 'Also'. The right column contains two main sections: 'Polls' and 'Data'. The 'Polls' section features a hand holding a blackberry with the text 'Blackberries time saver, addictive, essential, evil...' and a 'Tell us your point of view' link. The 'Data' section features a football field with the text 'Football skillful, patriotic, boring, devotion...' and a 'View the results' link. Below these sections, there are two smaller poll cards. The first card is titled 'World' and asks 'Is wrapping paper a waste of resources? What's your point of view? >>'. The second card is also titled 'World' and asks 'Windfarms: What's your point of view? View the Results >>'. Each card includes a small globe icon.

Both kinds of services are constrained by regulatory frameworks and the demand for provable compliance

- ❑ Basel II for minimal capital requirements (risk assessment)
- ❑ XBRL based reporting regulations

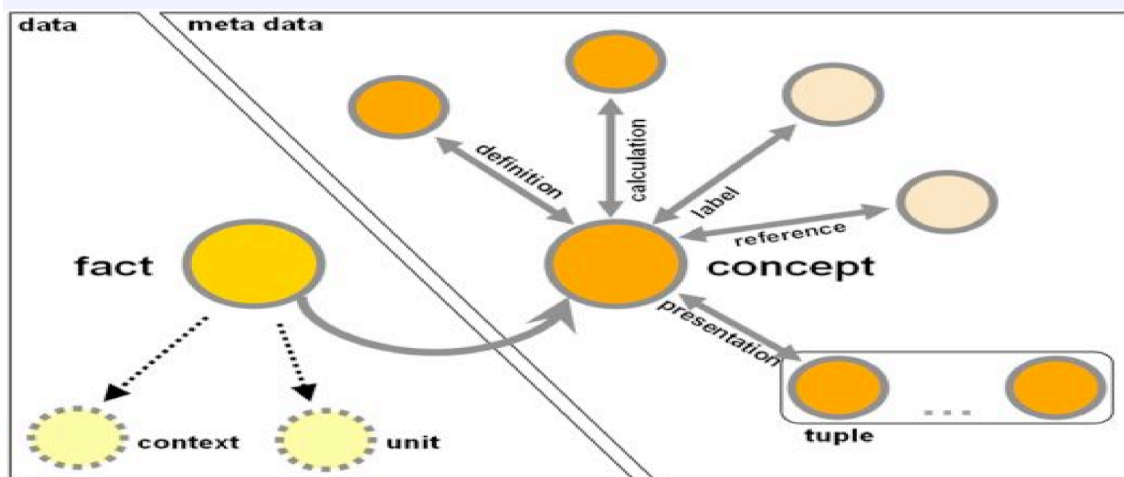


The eXtensible Business Reporting Language

- Standard for quantitative reporting data -- XBRL
 - ✓ combines normative data models with local flexibility
 - ✓ normative data models needed for regulatory compliance
 - ✓ flexibility for regional / national / industry specific reporting needs
- XBRL is under continuous development
 - ✓ bi-annual conferences, work groups, communities
 - ✓ latest specs concern inter alia
 - DWH dimensions and complex data mapping,
 - function linkbases

Financial Reporting with XBRL

- Basic idea
 - ✓ separate reporting data in instance documents
 - ✓ from metadata in linkbases
- Metadata comprise
 - ✓ reporting items taxonomy
 - ✓ legal references
 - ✓ simple calculations
 - aggregations,
 - ratios (extension)
 - ✓ labels, multilingual
 - ✓ presentation rules

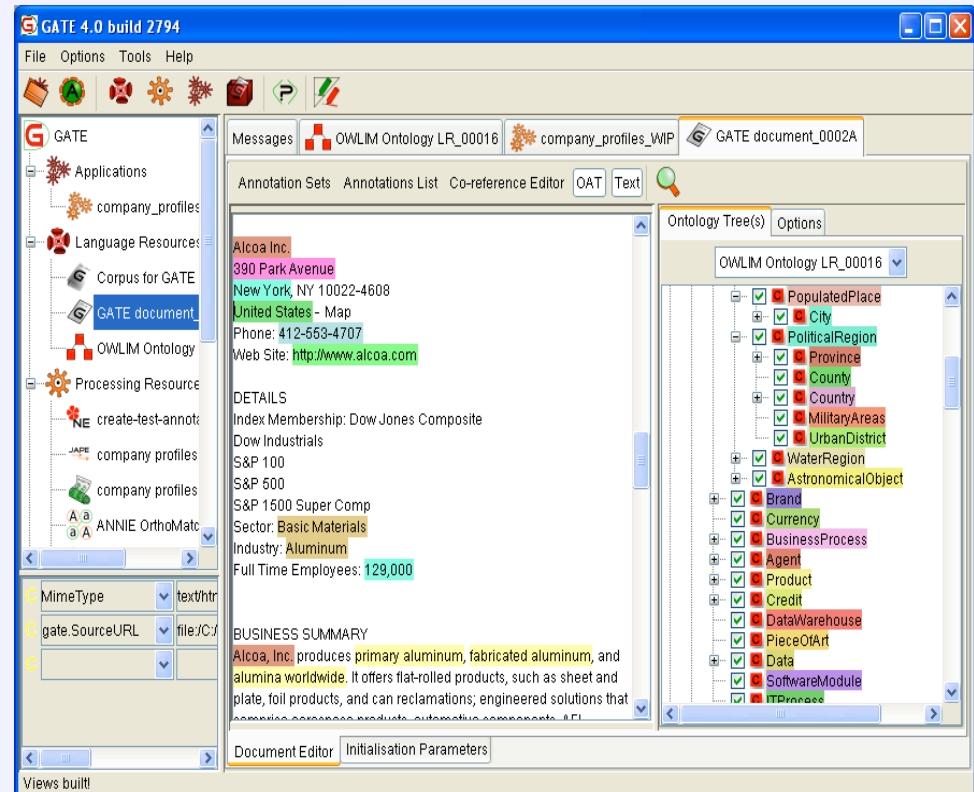


Analytics based services exploit reporting and background data

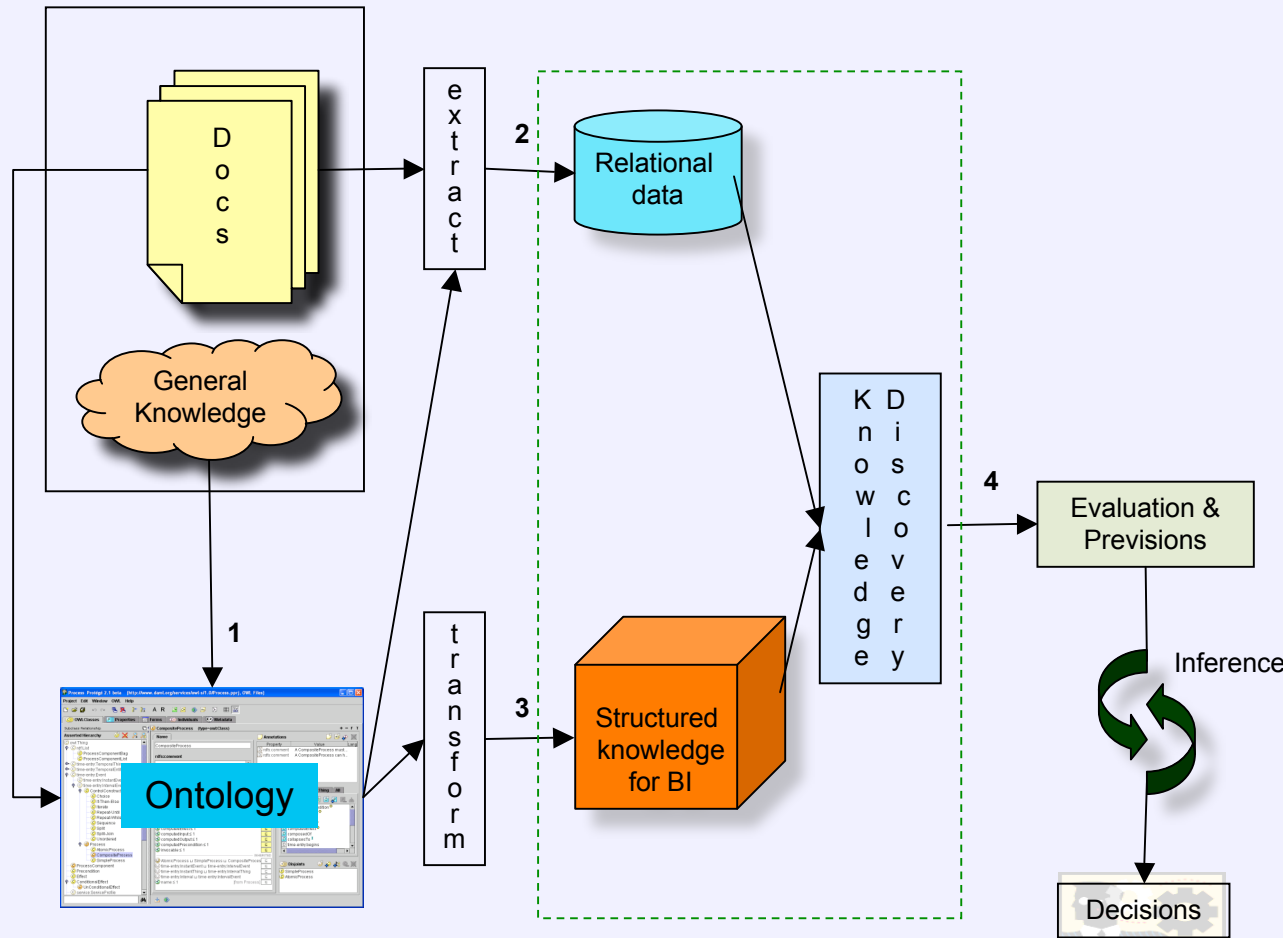
- ❑ annotate background data using ontology based text classification and concept recognition
- ❑ extract business information using fact schemes
- ❑ integrate with quantitative reporting data analysis
- ❑ these steps are one main contribution of the EU MUSING project (Multi-Industry Semantics based Next-Generation Business Intelligence)

Ontology based text annotation identifies concepts a report is based on (MUSING I)

- ❑ Extracting information about a company requires for example to identify the *Company Name*; *Company Address*; *Parent Organization*; *Shareholders*, etc.
- ❑ These associated pieces of information should be asserted as **properties values** of the **company instance**
- ❑ Statements for populating the ontology need to be created (“Alcoa Inc” hasAlias “Alcoa”; “Alcoa Inc” hasWebPage “http://www.alcoa.com”, etc.)
- ❑ GATE, Sheffield University



Combination of annotation generated information with other knowledge sources is used in BI apps (MUSING II)



- **Step 1** - Construction of an ontology that contains both general expert knowledge and meta data describing the structure of business knowledge.

- Text mining techniques;
- Knowledge acquisition techniques.

- **Step 2** – Data preparation under the guidance of the metadata provided by the ontology. (e.g., pdf2xbri tool)

- **Step 3** - Transformation of the expert knowledge into BI forms, e.g. Bayesian Networks.

- **Step 4** – Exploitation of the model.

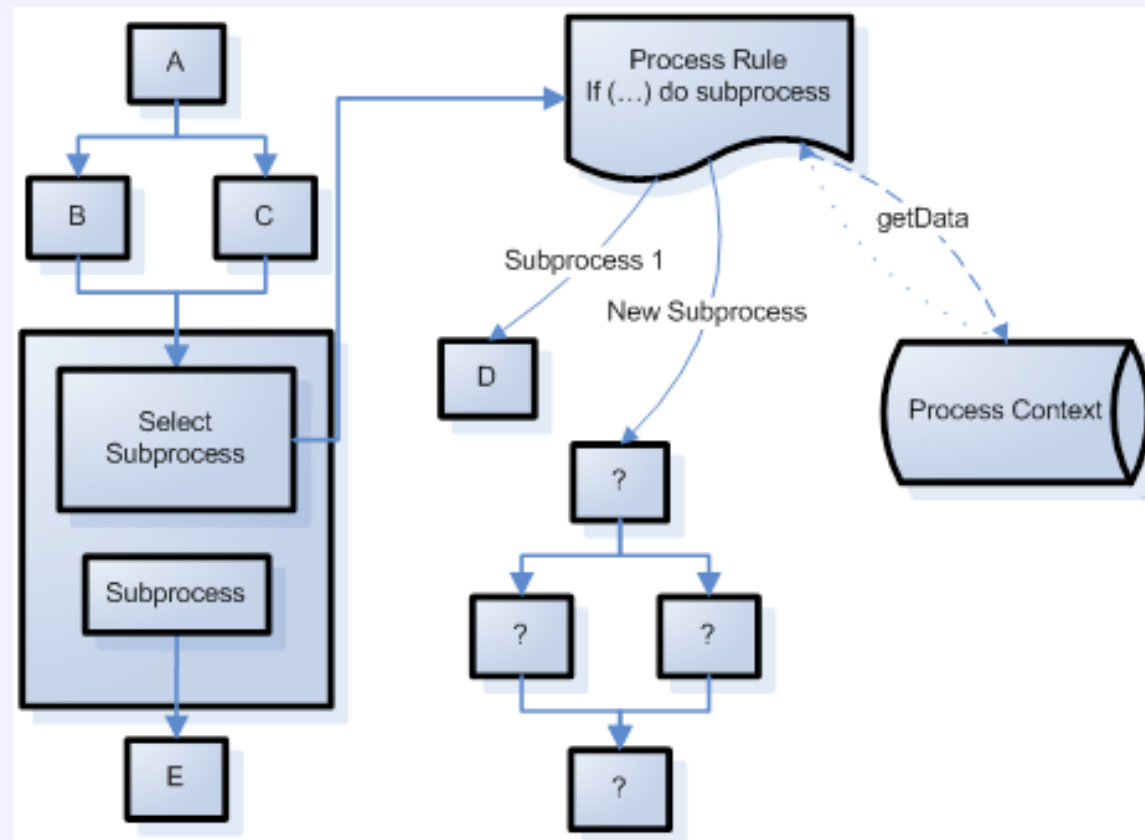
- integrate work from DFKI, Kenett Preminger Associates, Pavia University

The next generation financial services need to be composed and adapted in a highly dynamic way

- ❑ extremely short life cycles
- ❑ ad-hoc products
- ❑ composition of services for emerging markets yields added value

Business rules allow to compose services dynamically

- ❑ Research at LMU with IBM using WebSphere Process Integration Developer Toolkit



Offering these services to large customer bases requires a new generation of semantics and rules enabled service models

- ❑ information (data-centric)
- ❑ functional (or activity-centric)
- ❑ constraints / compliance (rule-centric)
- ❑ the models should be platform independent to the highest possible degree --> metamodelling is needed

A new generation of service metamodels is needed to enable a suitable service infrastructure

- ❑ we need to better represent service behavioural patterns and inherent business rules
- ❑ OMG is currently integrating two submissions
 - ✓ UPMS -- component approach (building on SCA)
 - ✓ SOA Profile -- collaboration /composite structure) approach
 - ✓ SHAPE EU project coordinated by SINTEF
- ❑ business rules formulated on the basis of business vocab's are subject of OMG SBVR
- ❑ basic requirement of integration of ontologies with relational and DWH data models --> Ontology definition metamodel (ODM)

How XBRL represents taxonomies

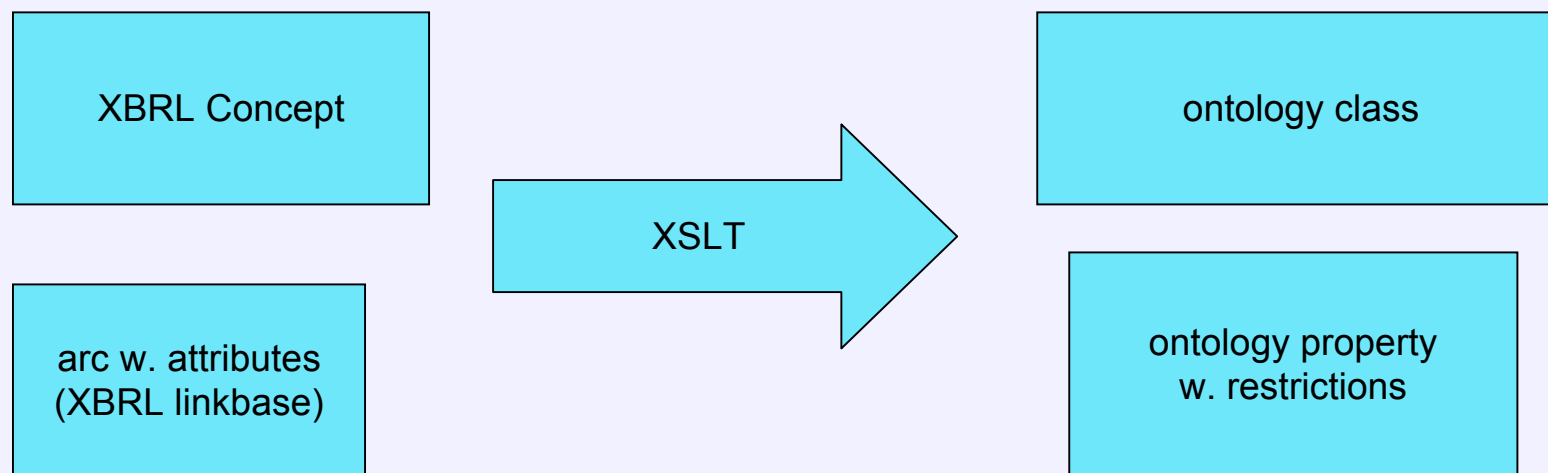
- Subconcept relationships between BS items are encoded as typed links between children and parents
 - ✓ structure on 2700+ accounting items
 - ✓ semantically richer structure than web page links
 - ✓ advantage is flexibility --
 - can have arbitrary taxonomy on top of a reporting document
 - example would be company internal data warehouse dimension definitions
 - ✓ disadvantage is missing reasoning capability
 - hard to compute transitive subconcept relationships
 - hard to compute consistency checks and to update consistently

XBRL balance sheet items

- ❑ Subconcept or subsumption relationships are coded in dotted notation
 - ✓ may coincide with linkbase relationships, but not guaranteed
 - ✓ potential source of inconsistencies, bugs
 - ✓ potential source of misunderstandings by users

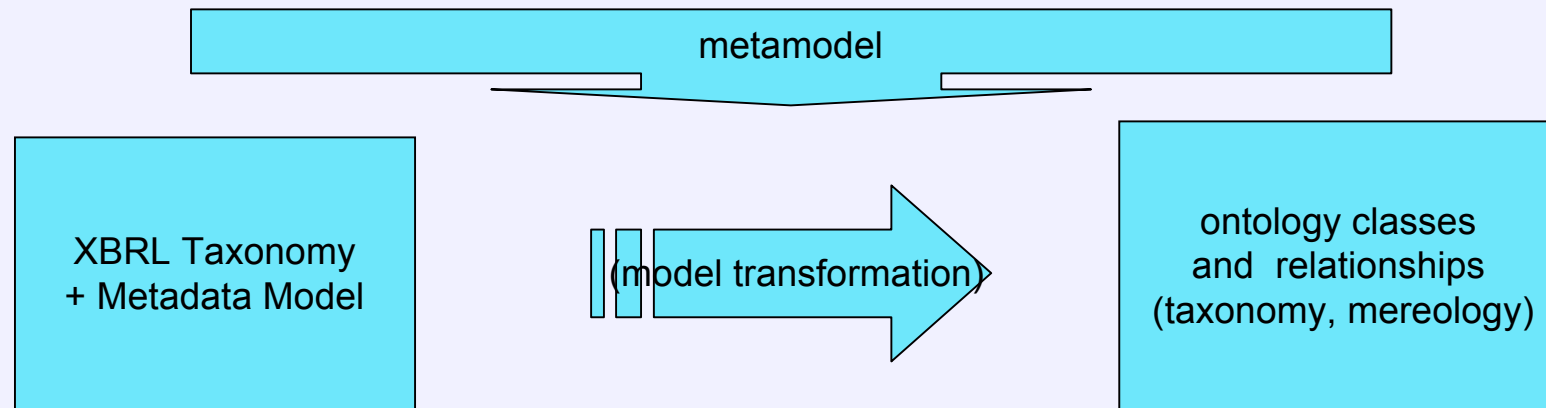
```
-bs : http://www.xbrl.org/2001/instance::tupleType
-bs.ass : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.accountingConvenience : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.accountingConvenience.changeDem2Eur : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.accountingConvenience.startUpCost : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.assInbtwFixAndCurr : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.assInbtwFixAndCurr.filmRights : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.assInbtwFixAndCurr.miningOverburden : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.assInbtwFixAndCurr.nuclFuel : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.currAss : http://www.xbrl.org/2001/instance::monetaryItemType
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-bs.ass.currAss.cashEquiv.chèques : http://www.xbrl.org/2001/instance::monetaryItemType
-bs.ass.currAss.inventory : http://www.xbrl.org/2001/instance::monetaryItemType
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Direct approach -- ontologies by document transformation



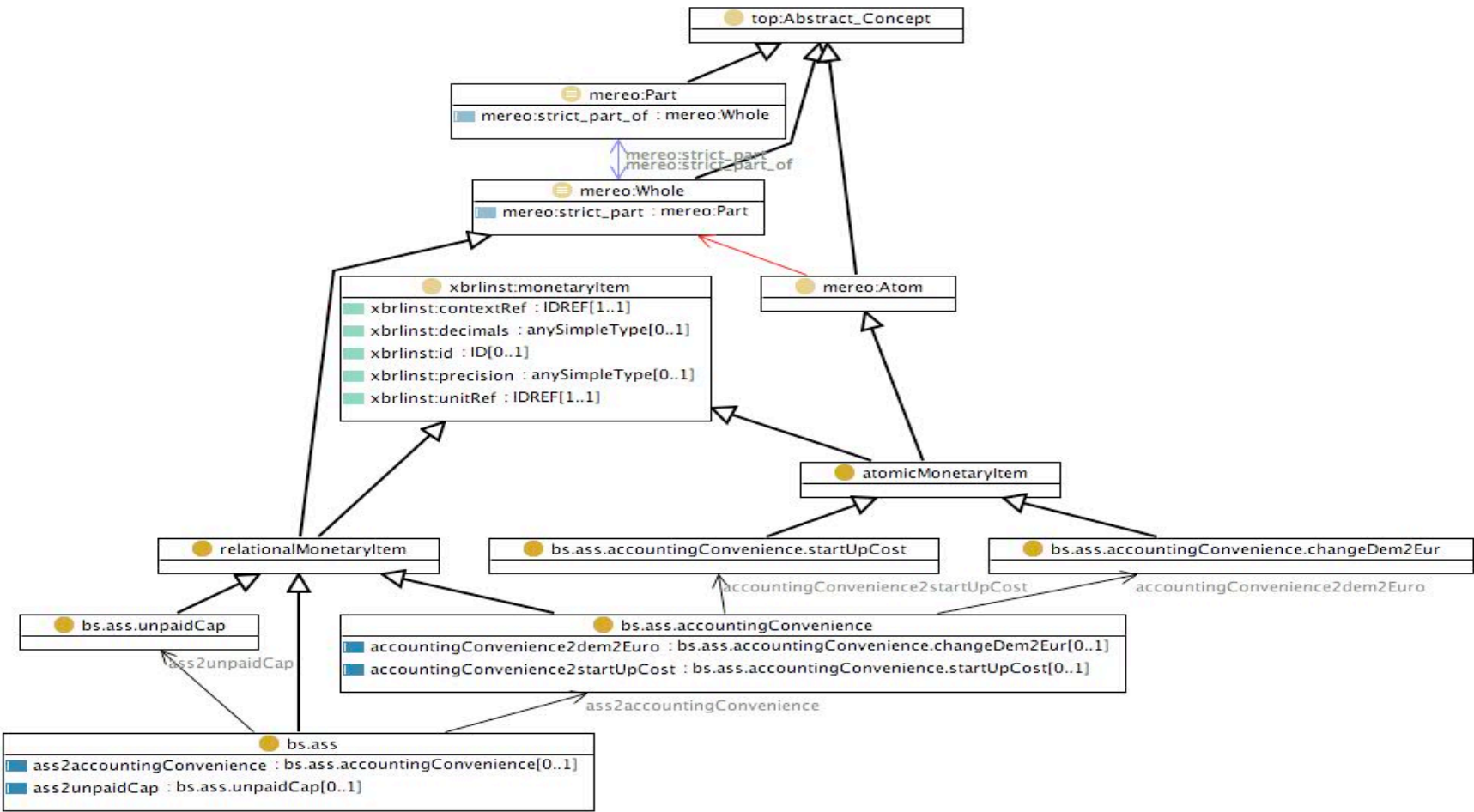
- ❑ construct ontologies directly from XBRL schemata and linkbase using XSLT based model transformations

Development towards a comprehensive model transformation approach



- model transformation is a discipline with increasing importance to enterprise information and application integration (MDA by OMG)

ODM compliant XBRL ontology



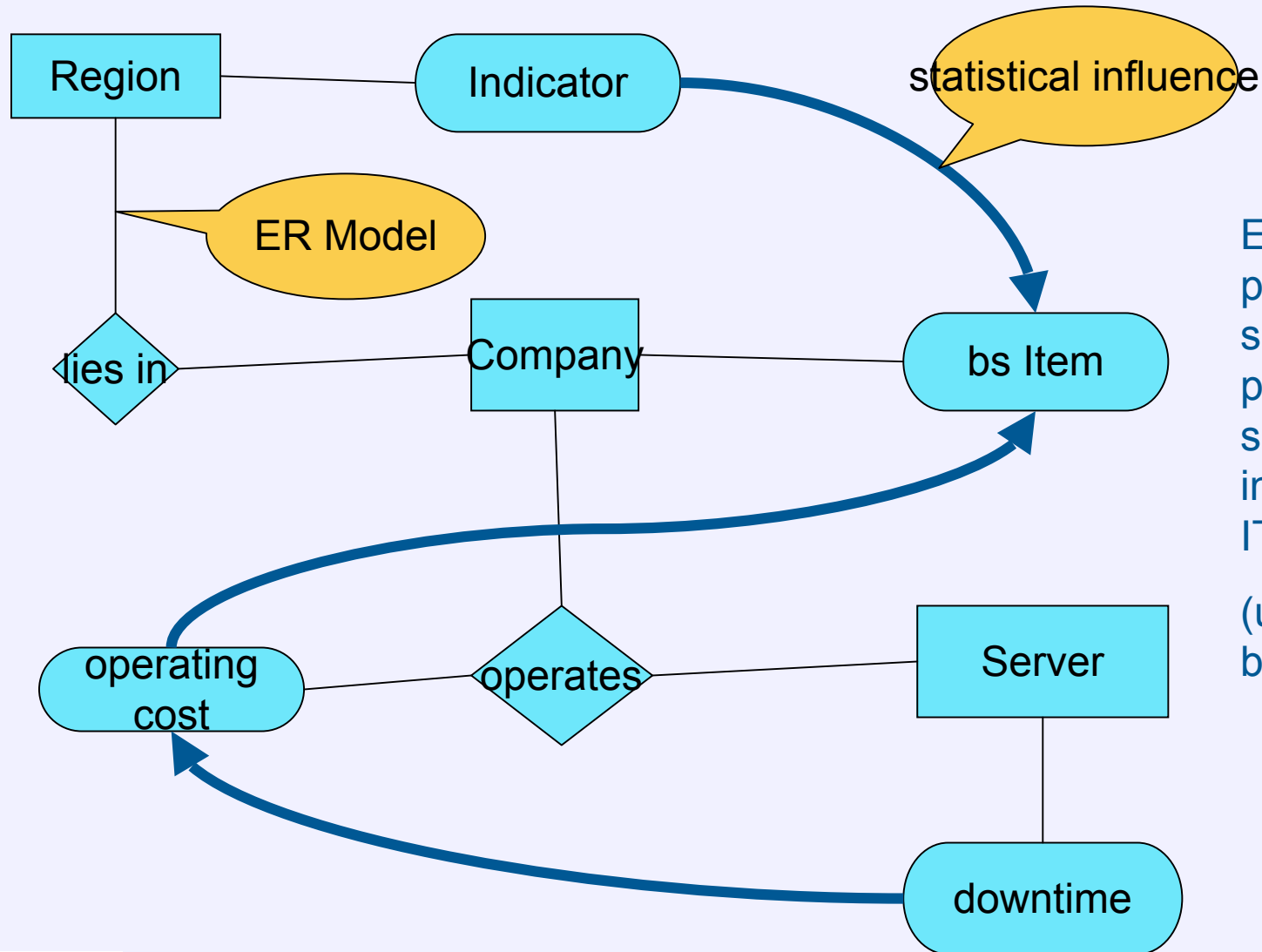
Additional description standards are integrated seamlessly

- ❑ Easy integration with other description systems standards
 - NACE codes (Nomenclature of economic activities)
 - ⊙ taxonomy without explicit classification criteria
 - BACH database information (Bank for the Accounts of Companies Harmonised)
 - ⊙ coarse version of XBRL-like taxonomies
 - Basel II loss event classification
 - ⊙ usable in very different modelling contexts
- ✓ All this is available and integrated with XBRL data in MUSING ontologies

Advantages of an ontology representation

- ❑ Advantage -- Rule based transformations from given to target taxonomy
 - ✓ e.g. transform from national GAAP to IFRS
- ❑ Advantage -- Reasoning over taxonomy relationships
 - ✓ simplifies definition of warehouse dimensions
 - ✓ simplifies definition of behavioural features in XBRL-based user interfaces
- ❑ Advantage -- Business rules expansion with inference engines

Transforming from ontologies to Bayesian networks for BI services



Example --
prediction of a
single BS
position from a
single regional
indicator and an
IT operation
(using DAPER
by Heckerman)

Use case for a Bayesian Network enabled analytic service

- User enters candidate dependencies
 - ✓ formally association classes
 - ✓ could be supported by a user interface in a future pilot
- System computes appropriate BNs
 - ✓ so called DAPER ground graphs
 - ✓ they change with new instances / individuals
 - ✓ we have implemented a rule based computation of the BNs in Flora2 (OWL round trip in preparation)
 - ✓ output is GeNIE compatible, XBN-format in preparation
 - ✓ ontology can handle prior CPTs etc if needed

Industry track at IEEE EDOC Conference in Munich

- ❑ 12th IEEE International Conference on Enterprise Distributed Object Computing
- ❑ September 15-19, 2008
- ❑ web site <http://www.edocconference.org>
- ❑ Industry track submissions open until May 09



Conclusions

- ❑ new generation of financial services is emerging
- ❑ data-driven and model-driven approaches are integrated
- ❑ unstructured information (text, social networks) is increasingly made available as BI source
- ❑ standards in reporting and compliance management are taken into account
- ❑ highly dynamic service mash-ups can become reality depending on significant progress in service engineering