

The Semantic Web Through Business Information Systems Glasses

Dr. Martin Hepp
DERI, University of Innsbruck

9th International Conference on Business Information Systems
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Klagenfurt, Austria, May 31, 2006

Martin Hepp
martin.hepp@deri.org



About the speaker: Dr. Martin Hepp



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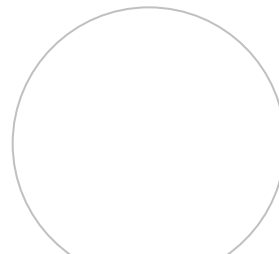
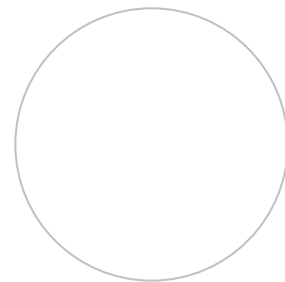
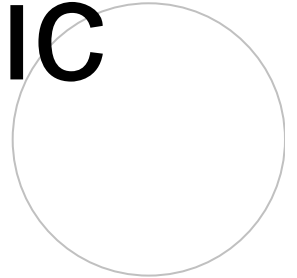
- **Senior Researcher** and Cluster Leader „Semantics in Business Information Systems“ at **DERI**, University of Innsbruck.
- Ph.D. in Management Information Systems, Bayerische Julius-Maximilians-Universität, Würzburg, Germany (2003); M.B.A., ditto, Würzburg, Germany (1999)



See <http://www.heppnetz.de> for current papers and presentations.



1. Prolog: The Semantic Web on two slides...





What is the Semantic Web?

The Gopher – HTTP/HTML Analogy



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```
Home Gopher server: gopherproject.org

THE GOPHER PROJECT

Welcome to GOPHER! Gopher is a slim, powerful, and
fast way to present information in a hierarchical catalog online.
Gopher actually predates the Web -- although most web browsers
make excellent gopher browsers too.

Good places to start are the "Why Gopher?" and "Using Gopher"
areas!

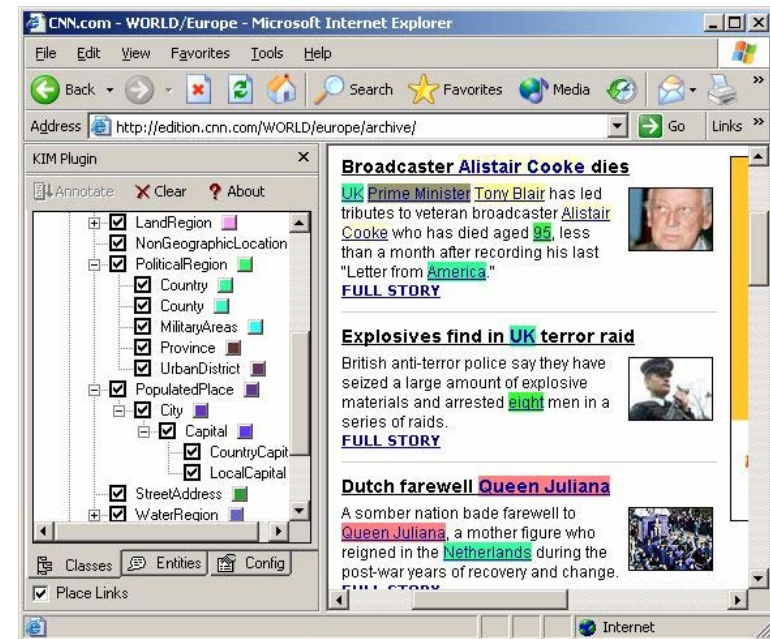
-- [12] *** GOPHER TURNS 10 / GOPHER 3.0 (FurryTerror) RELEASED ***
[13] *** GOPHER TURNS 10 . R 3.0 (FurryTerror) RELEASED *** [html] <HTML>
[14] A Brief Introduction to Gopherspace
[15] Clients, Servers, and Downloads/
[16] Home Gopher at UMN (a good place to browse)/
[17] Home Gopher at UMN (alternate)/
[18] Mailing List
[19] Mailing List Archives/
[20] Major Gopher Servers/
[21] Screenshots/

Press [h] for Help, [q] to Quit Page: 1/2
```

1990: Gopher
Textual information



mid 1990s: HTML
Multimedia added



2006 and beyond: RDF, OWL
Meaning added

Gopher screenshot courtesy of the University of Minnesota.
Semantic Web screenshot courtesy of Ontotext, <http://www.ontotext.com>



The Semantic Web: Embedding Machine-accessible Meaning



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Broadcaster Alistair Cooke dies
UK Prime Minister Tony Blair has led tributes to veteran broadcaster Alistair Cooke who has died aged 95, less than a month after recording his last "Letter from America."
[FULL STORY](#)

Explosives find in UK terror raid
British anti-terror police say they have seized a large amount of explosive materials and arrested eight men in a series of raids.
[FULL STORY](#)

Dutch farewell Queen Juliana
A somber nation bade farewell to Queen Juliana, a mother figure who reigned in the Netherlands during the post-war years of recovery and change.
[FULL STORY](#)

KIM Plugin
Annotate Clear About

- ☒ LandRegion
- ☒ NonGeographicLocation
- ☒ PoliticalRegion
 - ☒ Country
 - ☒ County
 - ☒ MilitaryAreas
 - ☒ Province
 - ☒ UrbanDistrict
- ☒ PopulatedPlace
 - ☒ City
 - ☒ Capital
 - ☒ CountryCapital
 - ☒ LocalCapital
- ☒ StreetAddress
- ☒ WaterRegion

Classes Entities Config

☒ Place Links

Internet



The Backbone of the Semantic Web: Ontologies



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- Ontology: A shared understanding of some domain of interest.
- An ontology necessarily entails or embodies some sort of world view with respect to a given domain.
- Often in the form of a set of
 - concepts (entities, attributes, processes),
 - their definitions, and
 - their inter-relationships.
- This is called a „conceptualization“.

from: Uschold/Gruninger: Ontologies: Principles, Methods and Applications, 1996



Ontologies: Degree of Formality



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- highly informal
- semi-informal
- semi-formal
- rigorously formal

from: Uschold/Gruninger: Ontologies: Principles, Methods and Applications, 1996



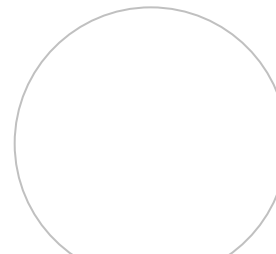
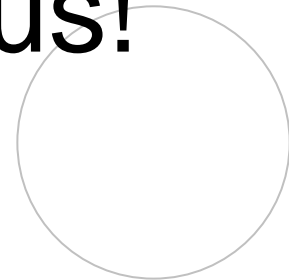
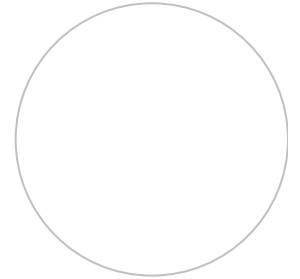
There is no myontology.com!



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Ontologies are inherently
reflecting
some degree of
community consensus!





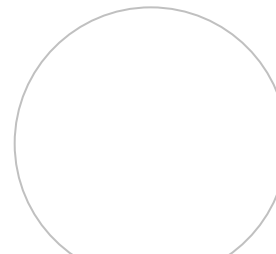
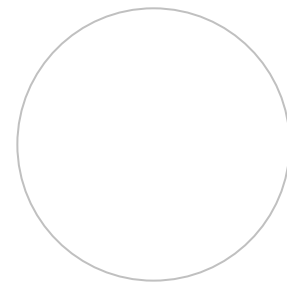
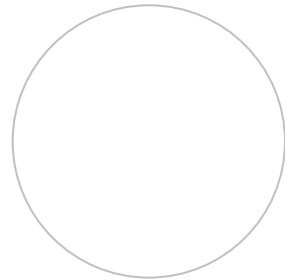
What is Information Systems all about?



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Creating consensual models of some domain!





2. What has happened so far, and why we cannot continue this way...



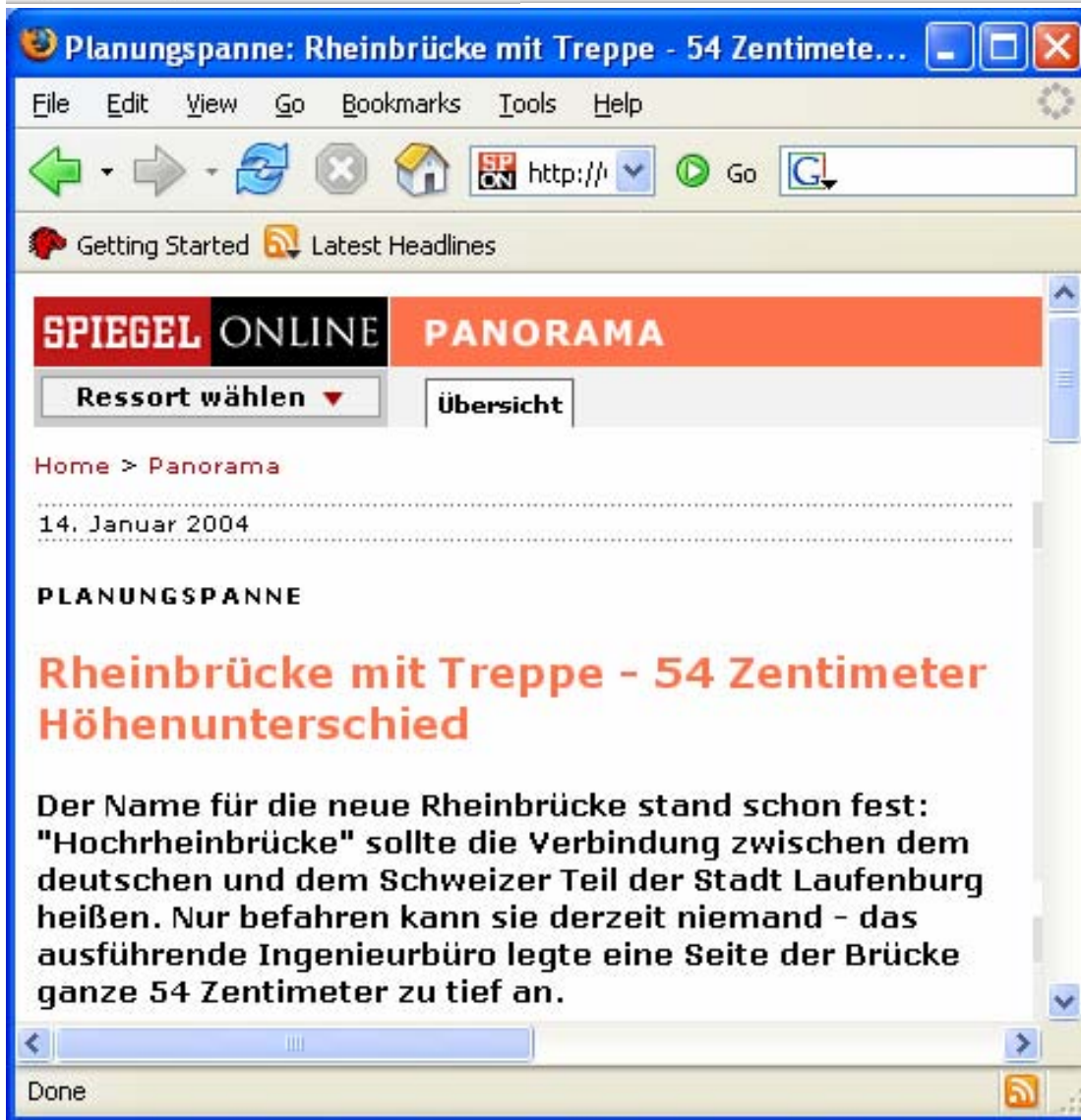


Status Quo: Lack of Formal Semantics



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CH: Altitude relative to the **sea level of the Mediterranean Sea.**

D: Altitude relative to the **sea level of the North Sea.**

Gap: 27 cm

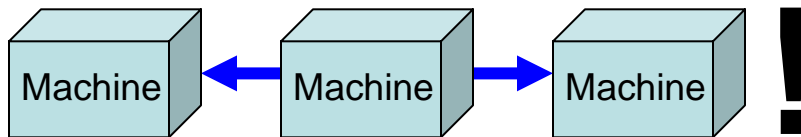
$$27 - (-27) = 54 \text{ 😊}$$



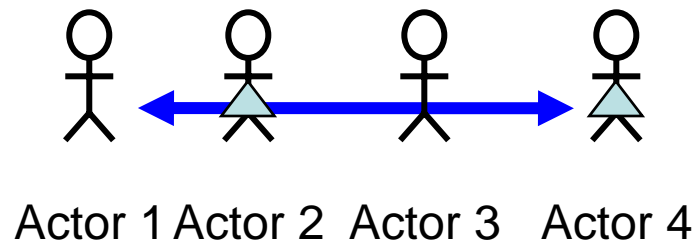
Lack of semantic consensus is a **dangerous mixture when both computers and humans are involved.**



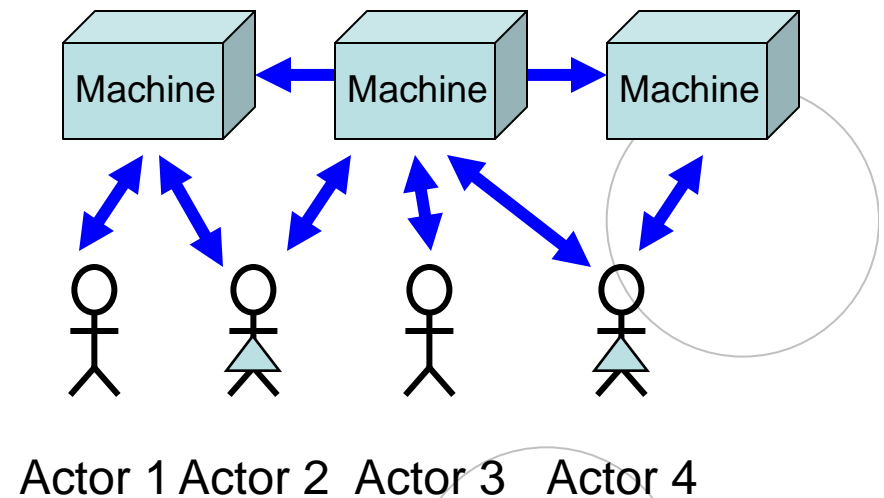
No Problem



Small Problem

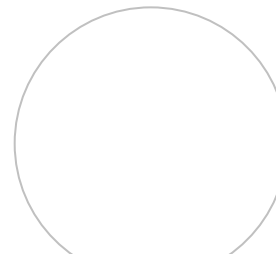
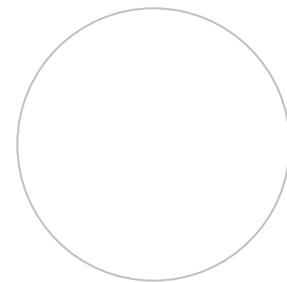
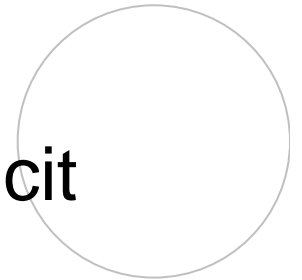


Big Problem





Ontologies: Making Representational Consensus Explicit





Milestones in Systems Integration

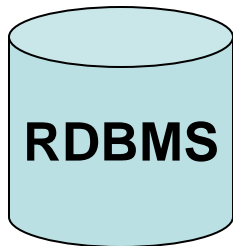


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Relational Data Model & RDBMS

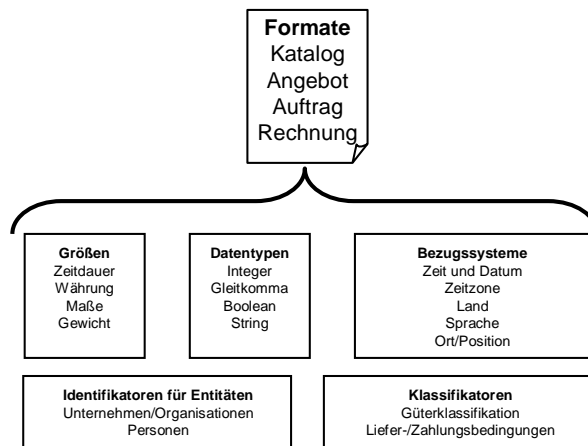
„One fact in one place“



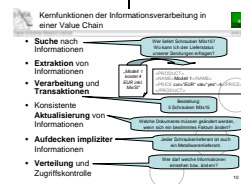
Edgar Frank
(Ted) Codd
(1923 – 2003)



Standards



- Consistent **data models** and **standardization** simplify automation.
- Very suitable inside one organization and for the integration of ***few, lasting*** partners.

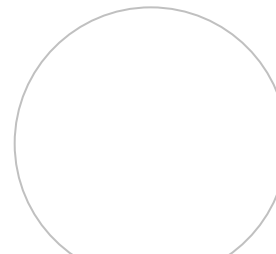
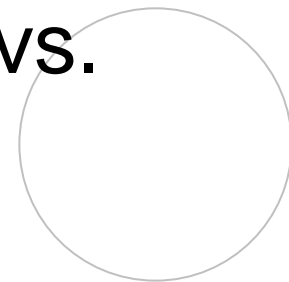
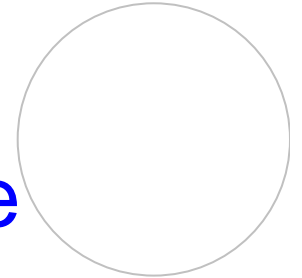




We have to live with data and protocol, in general:
modeling heterogeneity, because...



- Consensus takes **time** (vs. agility)
- Consensus costs **money** (vs. small business opportunities)
- Organizations are members of **multiple** value **chains** with possibly **conflicting requirements** (e.g. level of detail vs. bandwidth)





Information Systems as a
discipline needs what
Semantic Web technology
can offer.

...however



The Semantic Web
community will not fulfill its
promise without learning
from Information Systems
as a discipline.



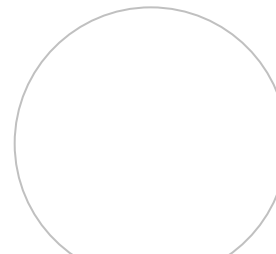
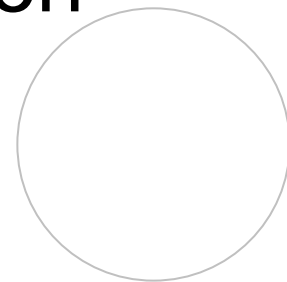
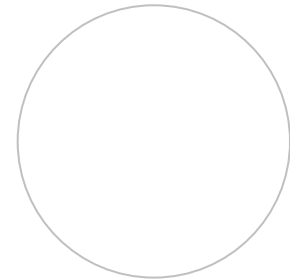
What the Semantic Web Community Didn't Cater for



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- Change
- Cost
- Lags
- Agency Problems
- The Strategic Nature of Information





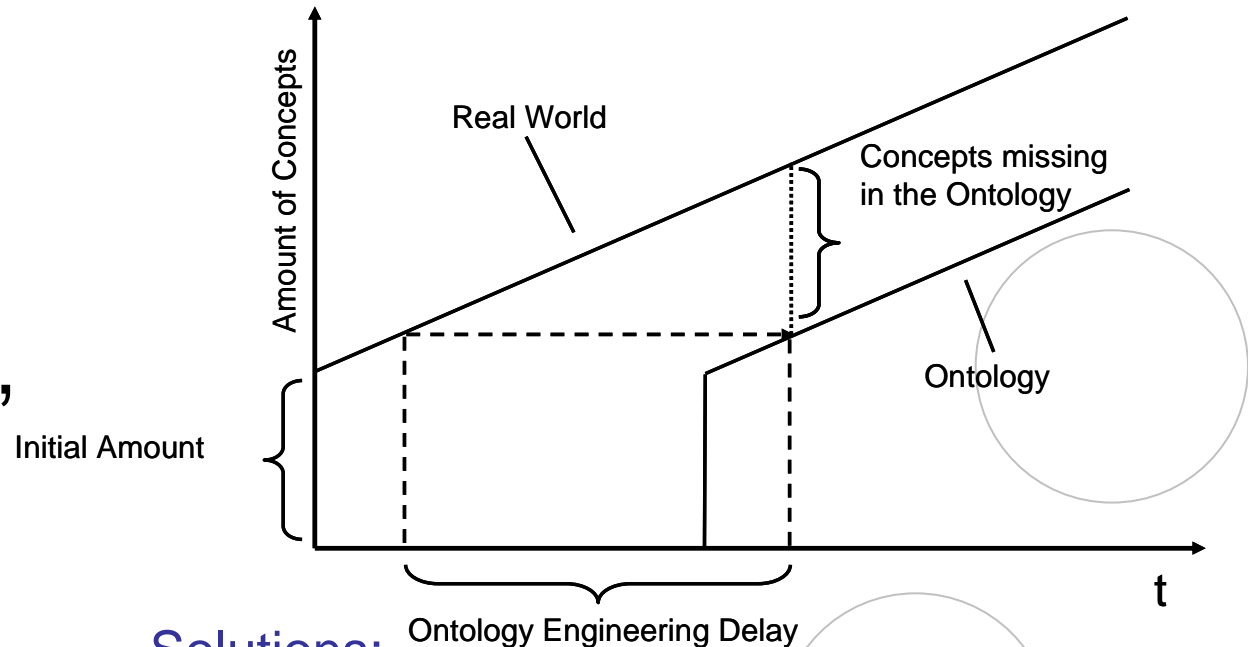
Issue 1: Conceptual Dynamics and Ontology Maintenance



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- The world keeps on turning...
- New classes, relations, instances,...
- A **really significant** problem, proven with data.



Solutions:

1. Community-driven Ontology Engineering
2. Semi-automated Ontology Engineering
3. Revise the relationship between statistical and descriptive approaches



Change Dynamics in Business Vocabularies



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	Release	Previous release	New classes per 30 days	Mean	Modified classes per 30 days	Mean
eCI@ss	5.0	4.1	865.0	279.6	157.4	1271.4
	5.0SP1	5.0	47.8		10.2	
	5.1beta	5.0SP1	131.6		4918.0	
	5.1de	5.1beta	74.1		0.0	
eOTD	10-01-2003	01-17-2003	6.1	6.2	0.0	0.0
	11-01-2003	10-01-2003	4.8		0.0	
	03-01-2004	11-01-2003	18.3		0.0	
	06-01-2004	03-01-2004	1.6		0.0	
	08-01-2004	06-01-2004	0.0		0.0	
RNTD	2.0	1.4	0.7	1.3	6.4	1.5
	3.0	2.0	2.4		1.0	
	3.1	3.0	0.0		0.1	
	3.2	3.1	0.0		0.0	
	4.0	3.2	3.4		0.0	
UNSPSC	6,0315	5,1001	907.8	233.9	135.6	47.5
	6,0501	6,0315	304.5		53.0	
	6,0801	6,0501	97.5		15.0	
	6,1101	6,0801	69.1		50.2	
	7,0401	6,1101	13.8		29.4	
	7,0901	7,0401	10.8		2.0	

This is only the amount of *actual additions* – the true need for new concepts will be much bigger!

Hepp/Leukel/Schmitz (2005)

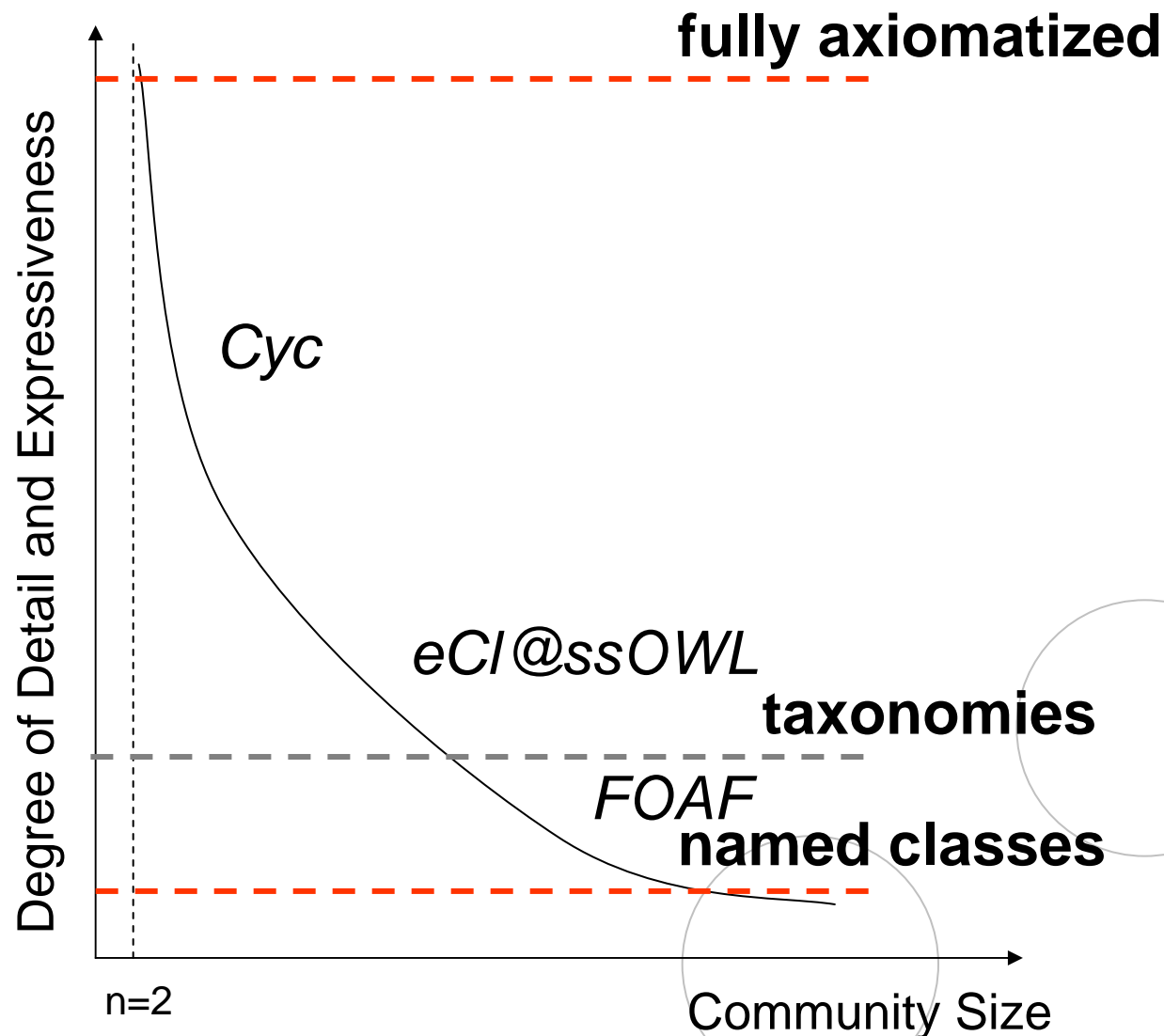


Prediction: The Expressivity-Community-Size Frontier



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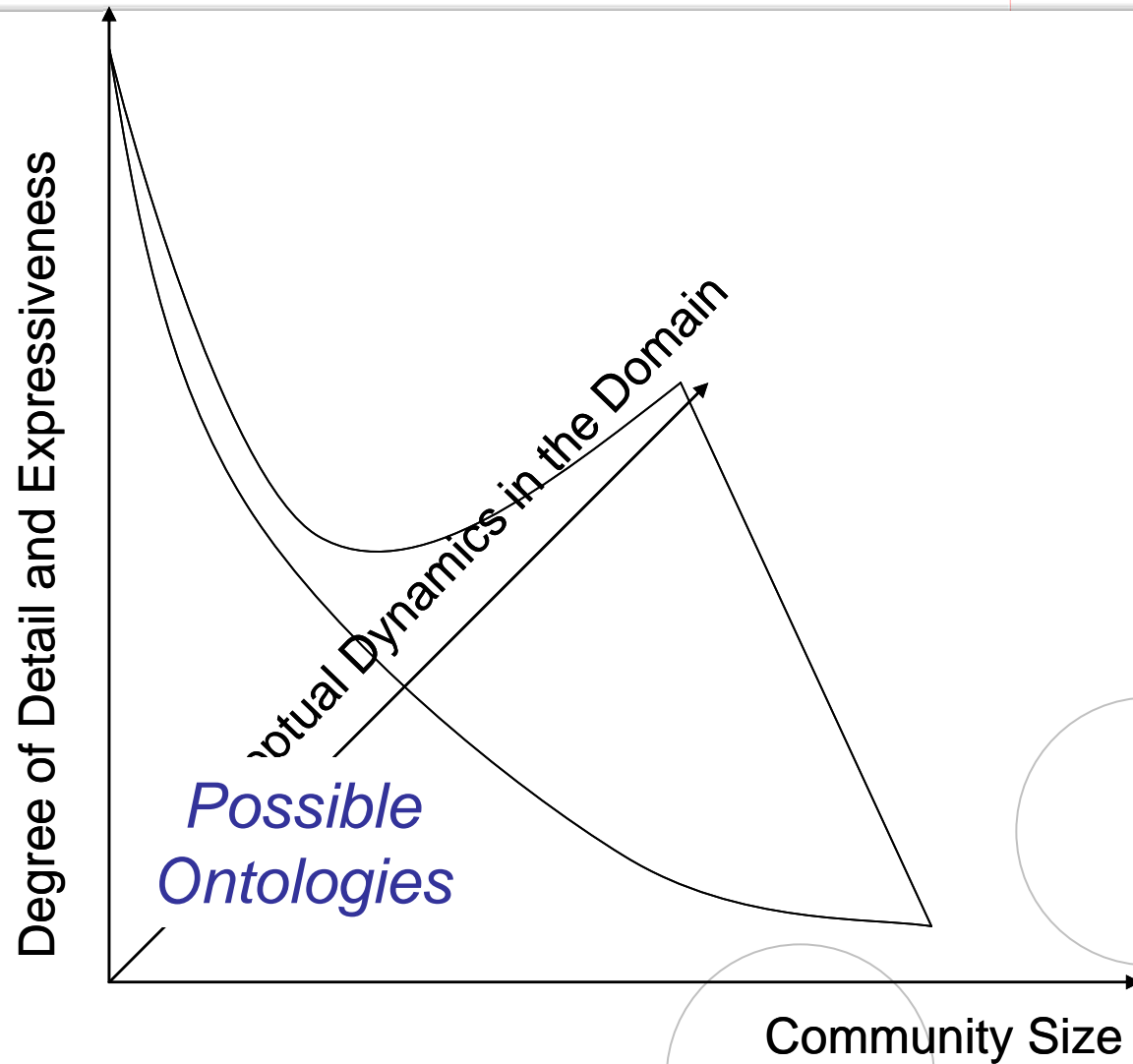


Prediction: Space of Possible Ontologies



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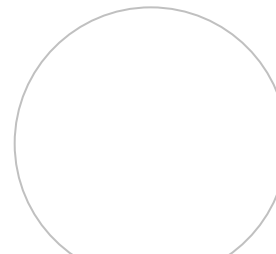
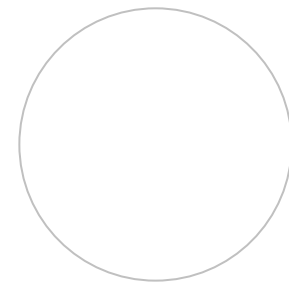
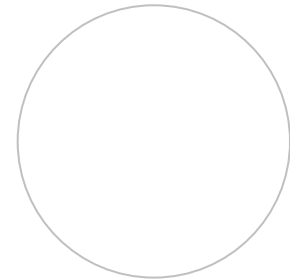
Issue 2: Cost vs. Benefit of Ontologies



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- Total Cost of an Ontology
- Agency conflicts and incentives in ontology building
- Network effects and diffusion theory



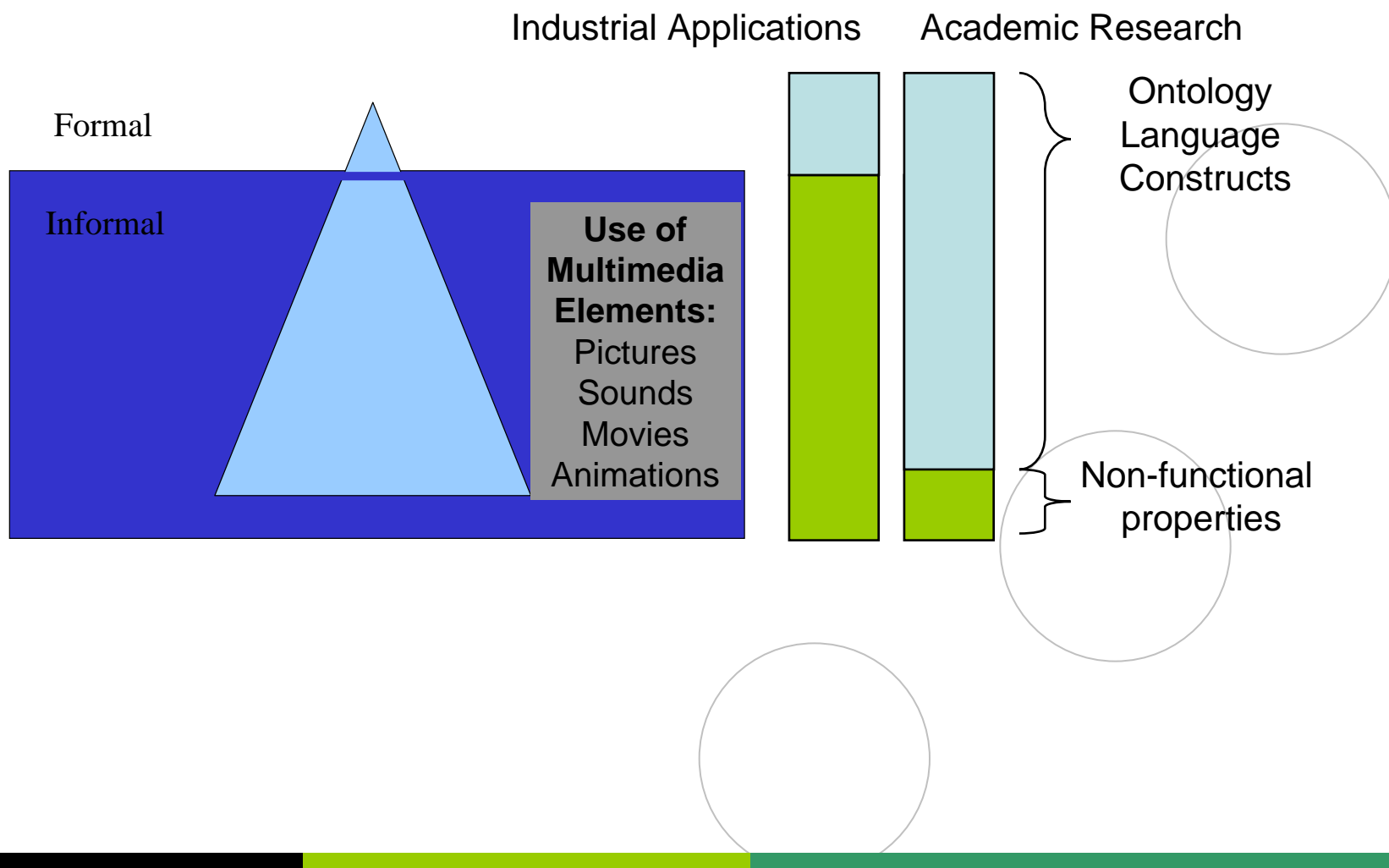


Ontologies: Formal vs. Informal



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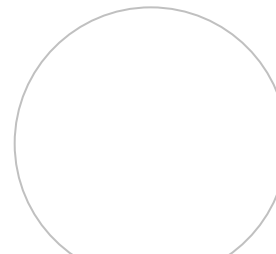
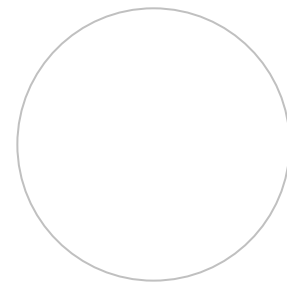
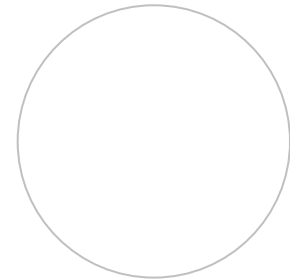
The Semantic Web Is Now



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- Languages
- Methodologies
- (Ontologies)
- Repositories
- (Reasoners)
- Tools





Example: Financial Risk Management (MUSING)



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Next Generation
Business Intelligence

- <http://musing.metaware.it/>



Example: E-Procurement Catalog Data Integration

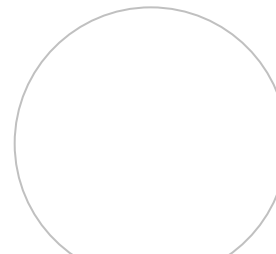
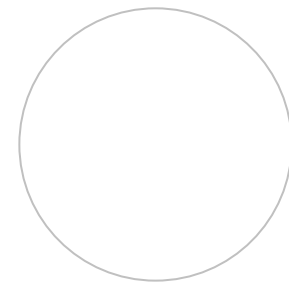
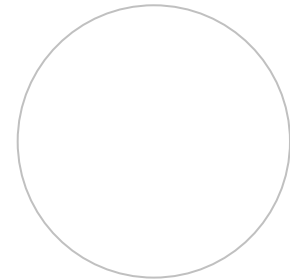


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- <http://www.heppnetz.de/eclassowl/>



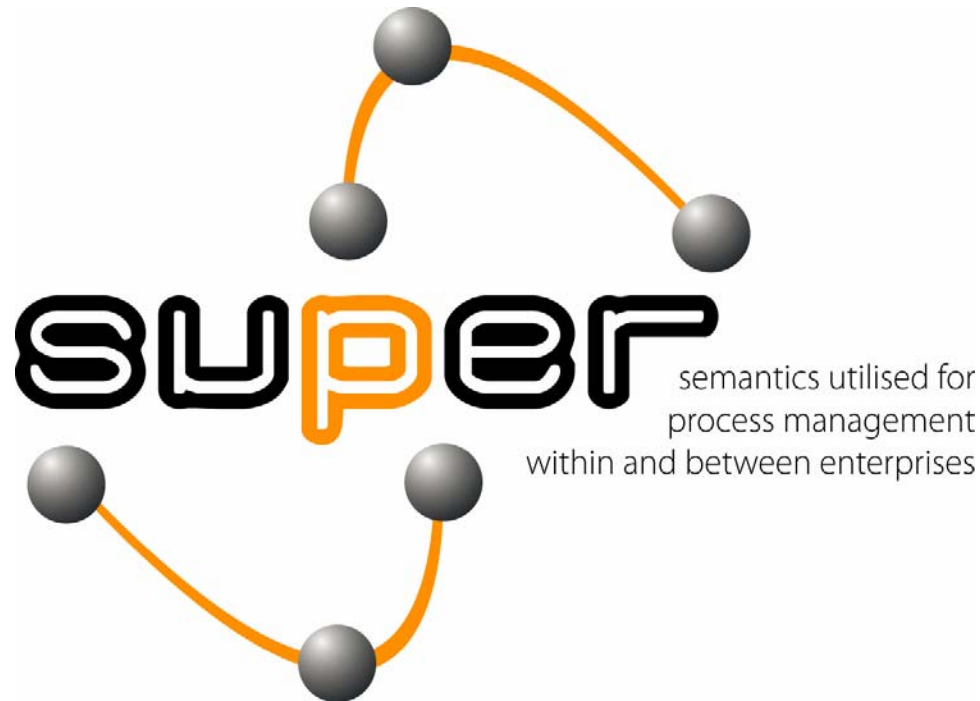


Example: Business Process Management (SUPER)



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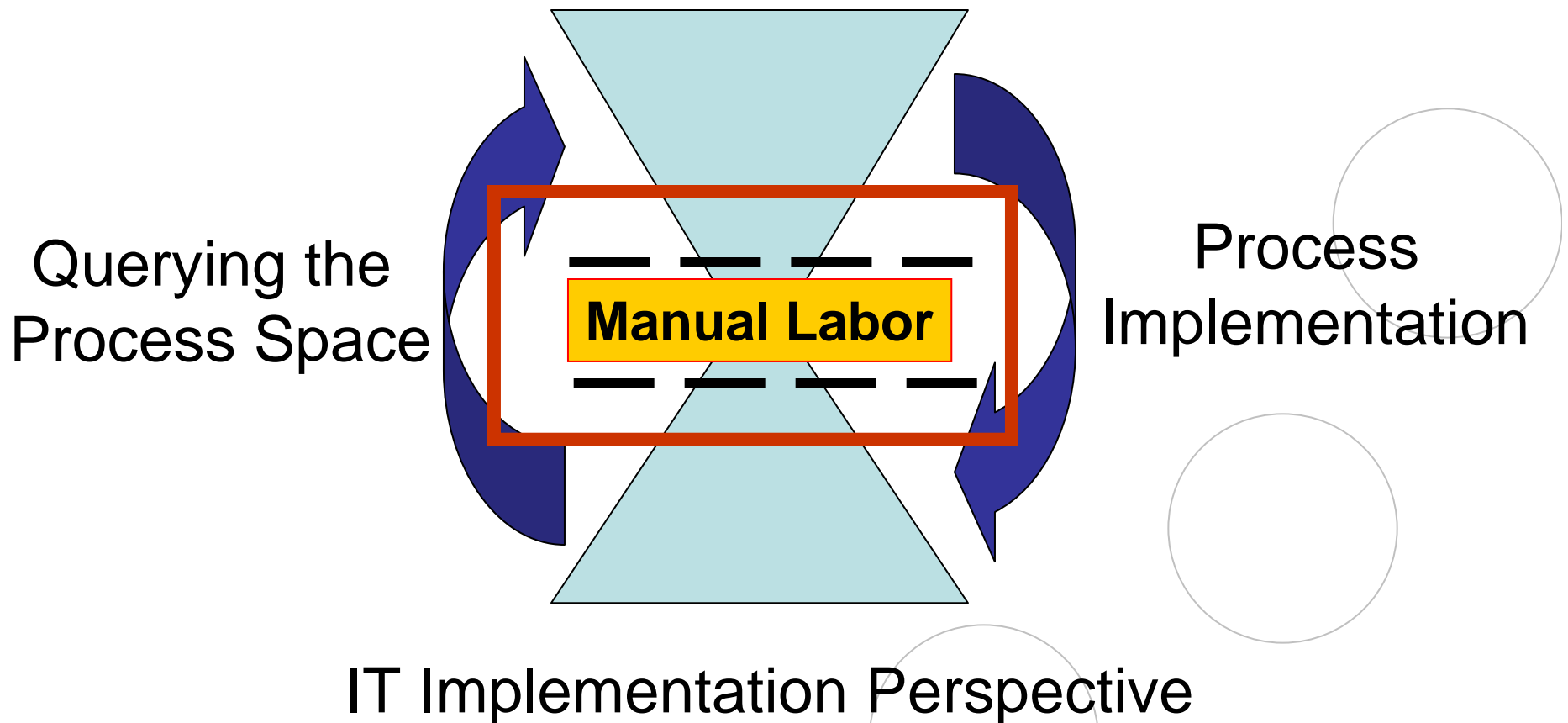


- <http://super.semanticweb.org>





Business Experts' Perspective: Processes





Querying the Process Space



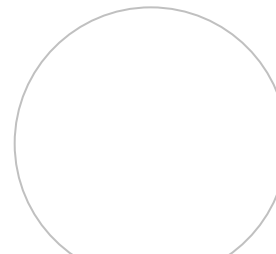
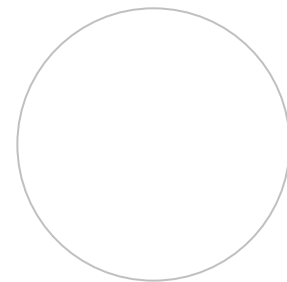
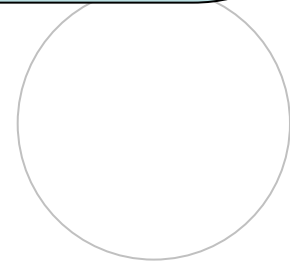
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“Do we have a cost approval process for items below \$ 200?”

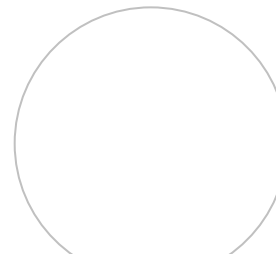
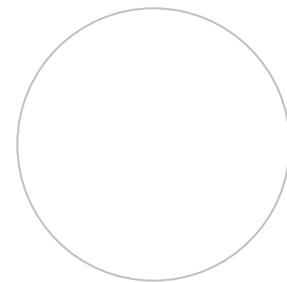
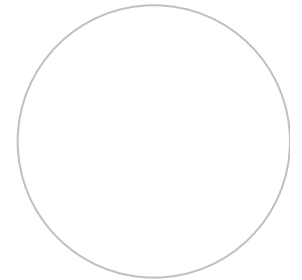
“How many inventory management methods are currently in use?”

“In which of our food manufacturing machines are we processing meat or raw eggs?”



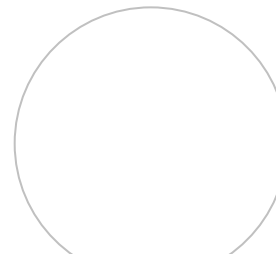
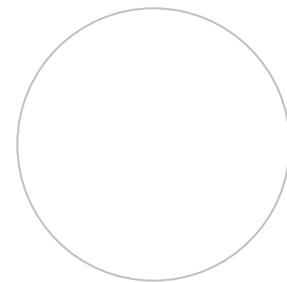
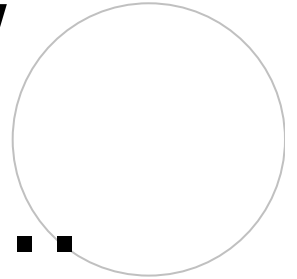


Example: Simulation Model Discovery (Industrial Project)





3. The Birth of a New Research Community...



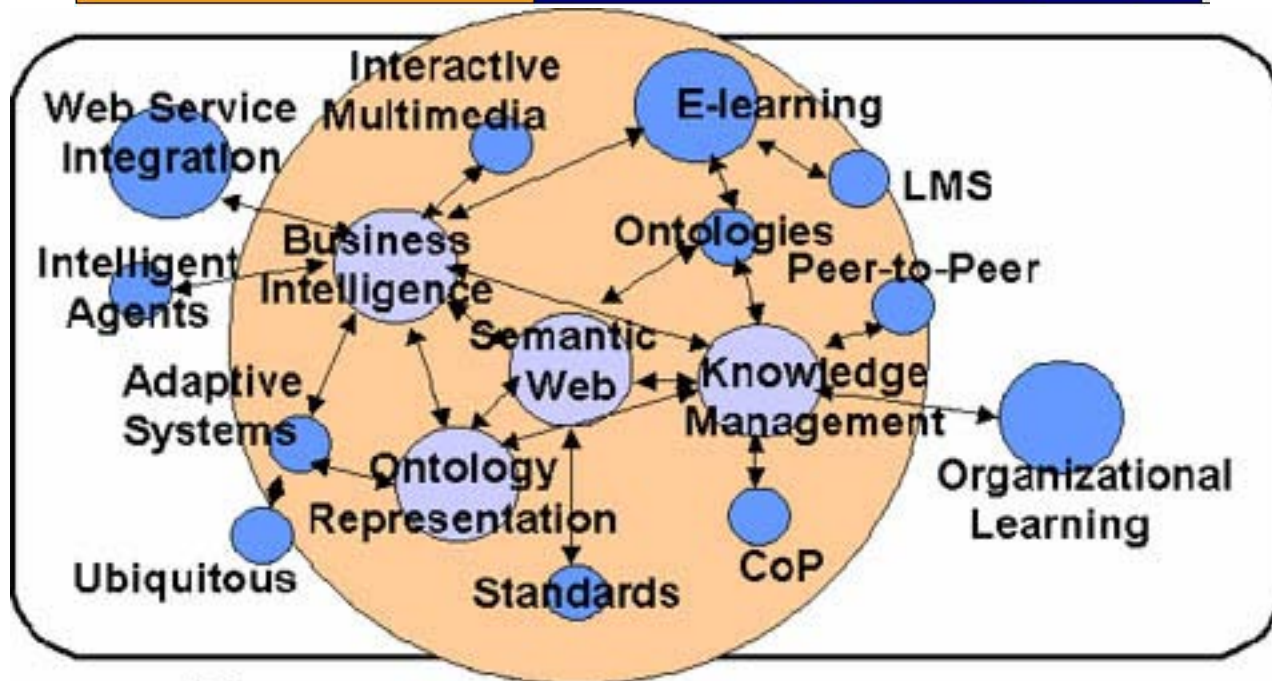


AIS SIGSEMIS: Bringing together MIS and SW communities



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SEMIS: Semantic Web & IS

- <http://www.sigsemis.org>

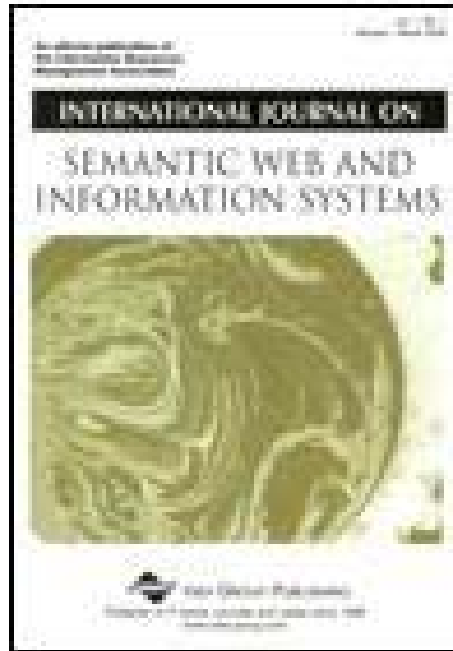


The International Journal on Semantic Web and Information Systems

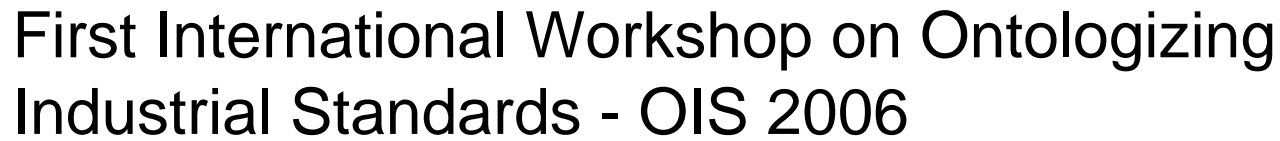


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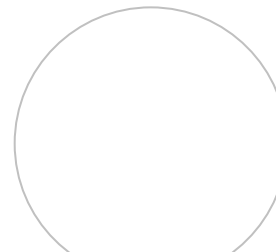
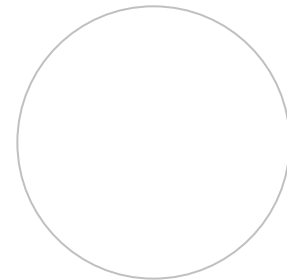
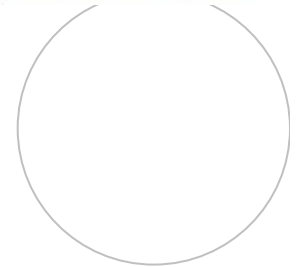
- <http://www.ijswis.org/>



www.deri.org



- <http://events.deri.at/ois2006/>





First International Workshop on Applications and Business Aspects of the Semantic Web (SEBIZ 2006)



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in conjunction with the Fifth International Semantic Web Conference (ISWC 2006), November 5 - 9, 2006, Athens, Georgia, USA

•

<http://www.ag-nbi.de/conf/SEBIZ06>



Some Colleagues in IS are not yet listening...



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- Comment from a Meistersinger¹ review report in 2004: „The Semantic Web is irrelevant for Information Systems“



¹ A German workshop for Assistant Professors



But... Innovation means to take new paths before
the masses follow 😊



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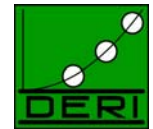
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Great Wall, Beijing, China, 2005



Industry Pick-up - DERI Partners in EU and National Research Projects

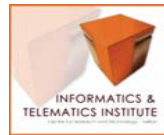


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RODAN SYSTEMS S.A.
ZARZĄDZANIE INFORMACJĄ



Ontotext
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Changing the rules of business

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VUB

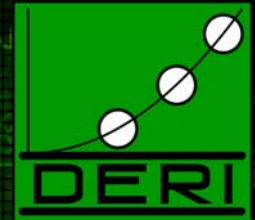


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Thank you for your attention.

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