

Enterprise Knowledge Management: Balancing Individual and Organizational Needs

Ludger van Elst

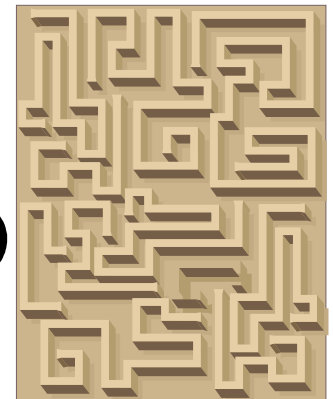
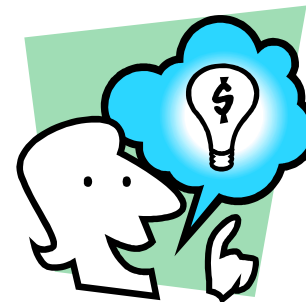
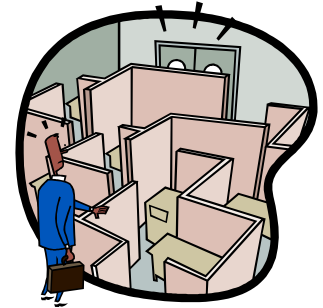
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Overview

- Some Knowledge Management Basics
- OM Information Systems for KM
 - History of KM Group @ DFKI
 - The KnowMore Project
- The FRODO Approach for Distributed OMs
 - Shared Conceptualizations in IT for KM
 - Ontology Societies
- Summary & Outlook



Where are we?

Introduction:
Some KM
Basics



History:
From XPS to
OM Systems



Distributed OMs:
FRODO &
Ontology
Societies

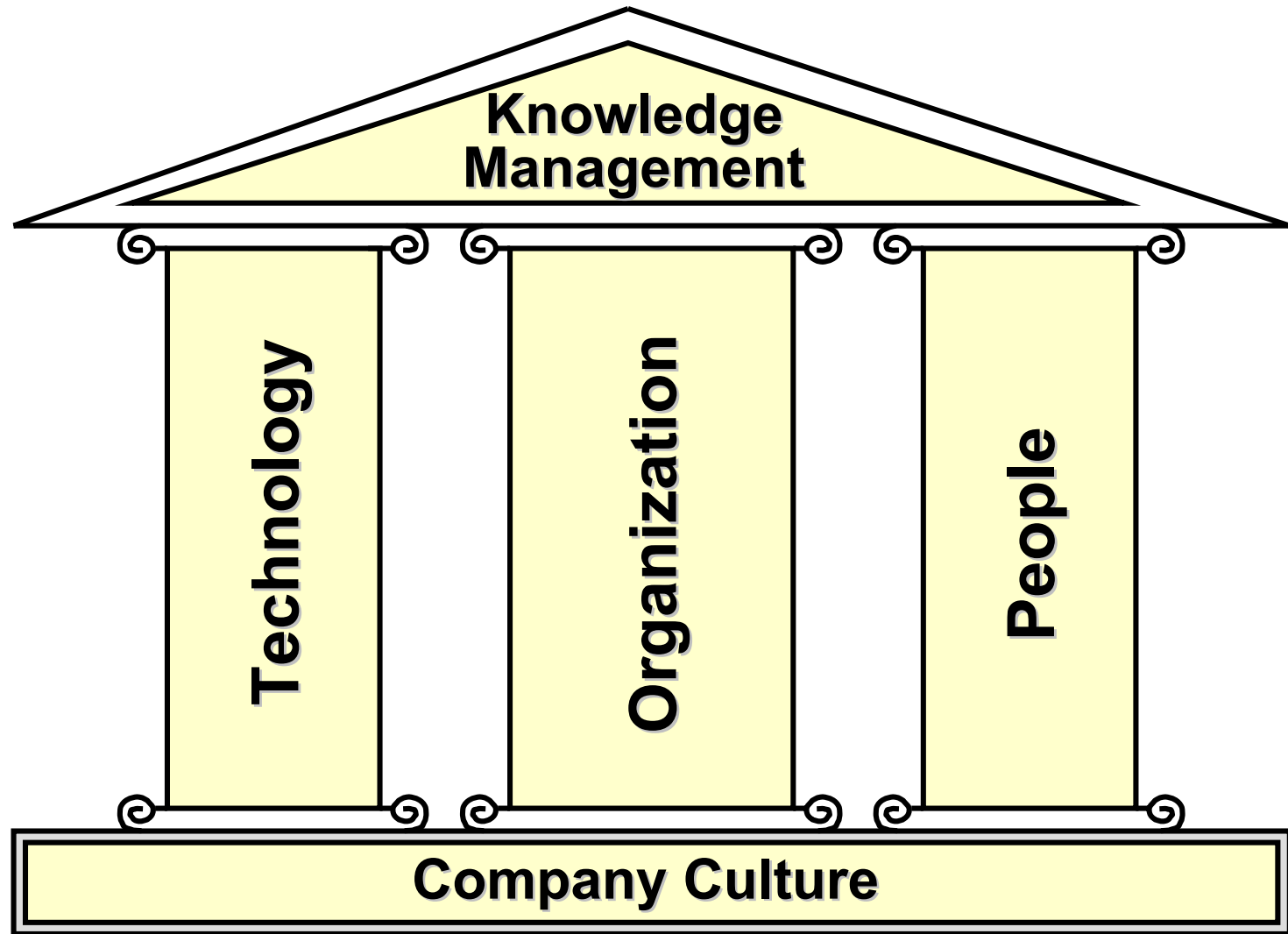


The End:
Summary &
Conclusions

Knowledge Management Research is Strongly Driven by Real World Needs of Today's Enterprises

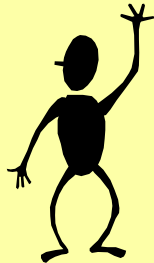
- Nonaka/Takeuchi Attribute Japan's Success Over the US Economy (in the Eighties) to Improved Knowledge Creation
- Many Companies Define Themselves As Becoming Knowledge Organizations
- ...
- Public Discussions About Knowledge Society/ Information Society

Credo: Successful KM Needs a Holistic View

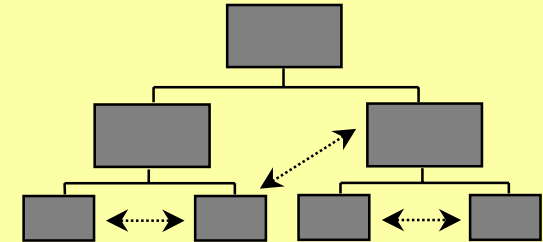


Knowledge Management Takes Place at Various Levels

**Individual
Level**



**Group
Level**



Organizational Level

**Intuition
Competencies
Knowledge
Expectations
...**

**Routines
Role allocation
Shared language
Complementary competencies
...**

**Core competencies
Myths
Secret rules
Contracts
Electronic knowledge base
...**

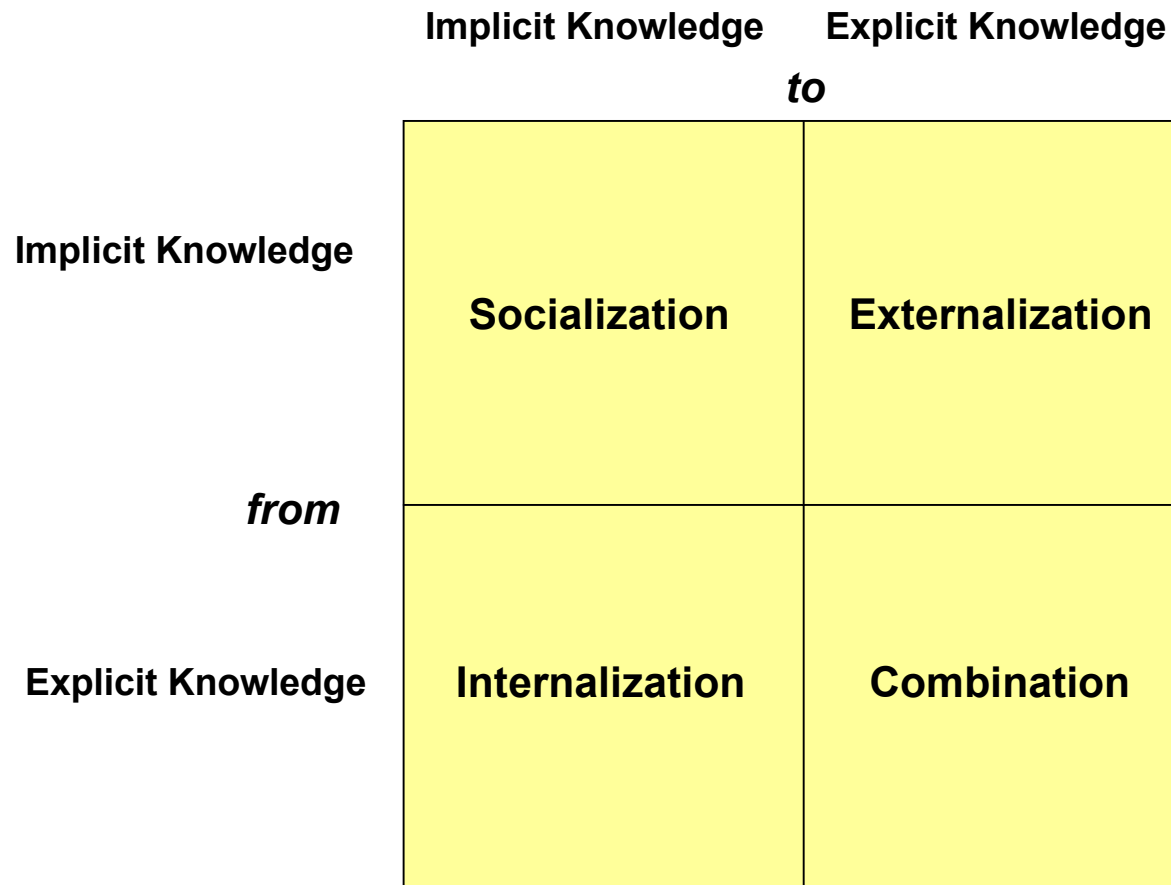
**KM as an individual
competency**

KM as a team tool

**KM as an organizational
method**

Adapted from: M. Eppler/St. Gallen

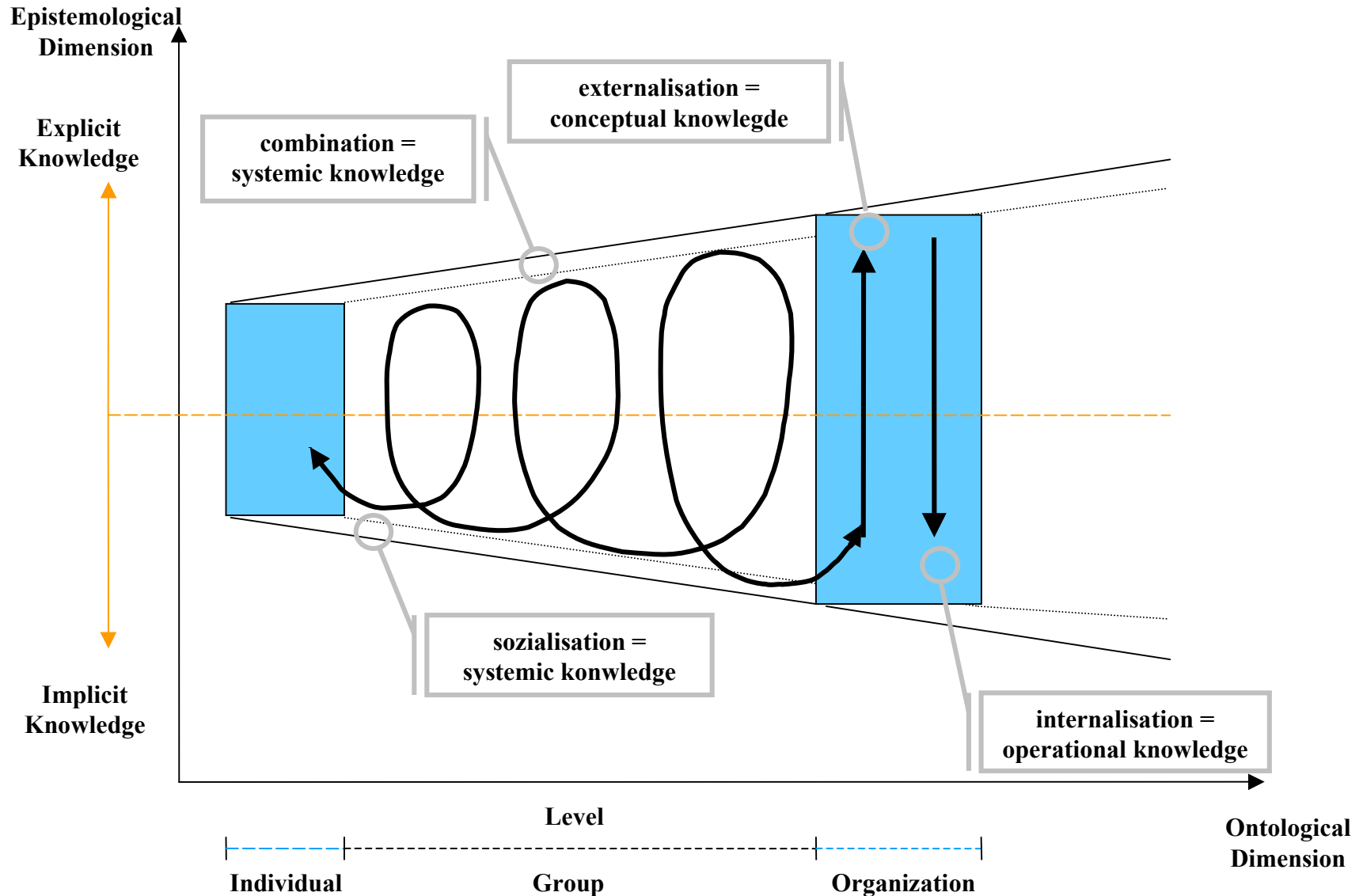
Knowledge Transformation on the Epistemological Level



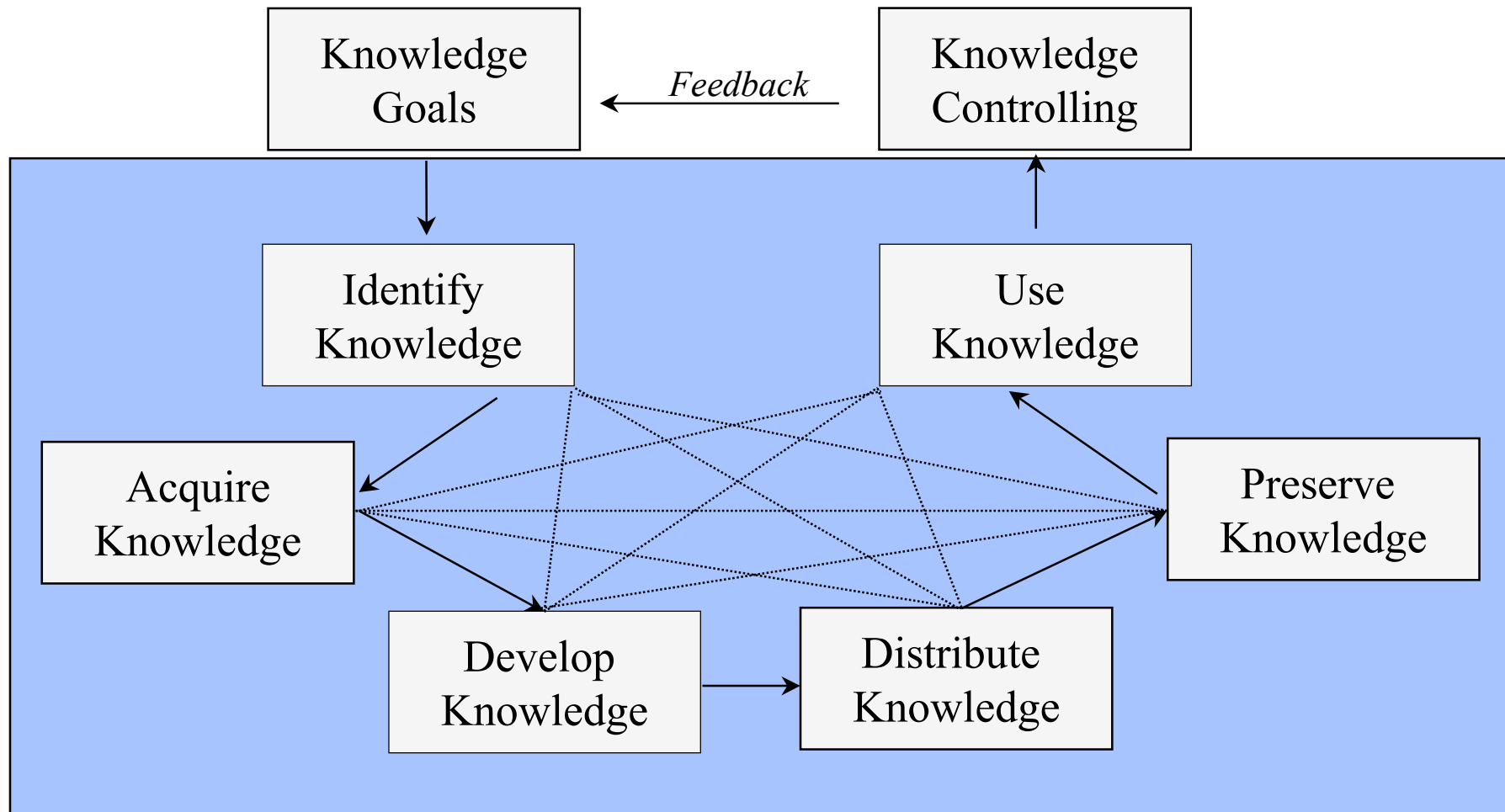
- Explicit Knowledge
 - can be codified
 - structured
 - e.g., Business Processes, Market Studies, Guidelines
- Implicit Knowledge
 - tacit
 - in people's heads
 - or bodies (?)
 - e.g., competencies, skills, experience, know-how

Source: Nonaka/Takeuchi

The Knowledge Spiral Facilitates Organizational Learning



Building Blocks for Knowledge Management Processes



Adapted from: Probst/Raub/Romhardt

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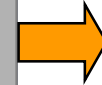
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FRODO &
Ontology
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Roots of the DFKI-KM Group

- Starting Point: *Technical Expert Systems* with their typical research questions (knowledge acquisition and representation, inferencing)
- Some Application Projects:
 - IDEAS System Design (Hoechst):
 - Explanation of Adverse Events in Clinical Studies
 - KONUS-Prototype (Stihl):
 - Suggestion/Explanation/Critiquing for Crankshaft Design
 - KARAT-Prototyp (Telekom):
 - Multi-criteria, Model-based Storage, Organization und Use of Software Requirements
- Fusion with Document Analysis & Understanding Group

Ongoing Development of DFKI-KM View on KM Systems

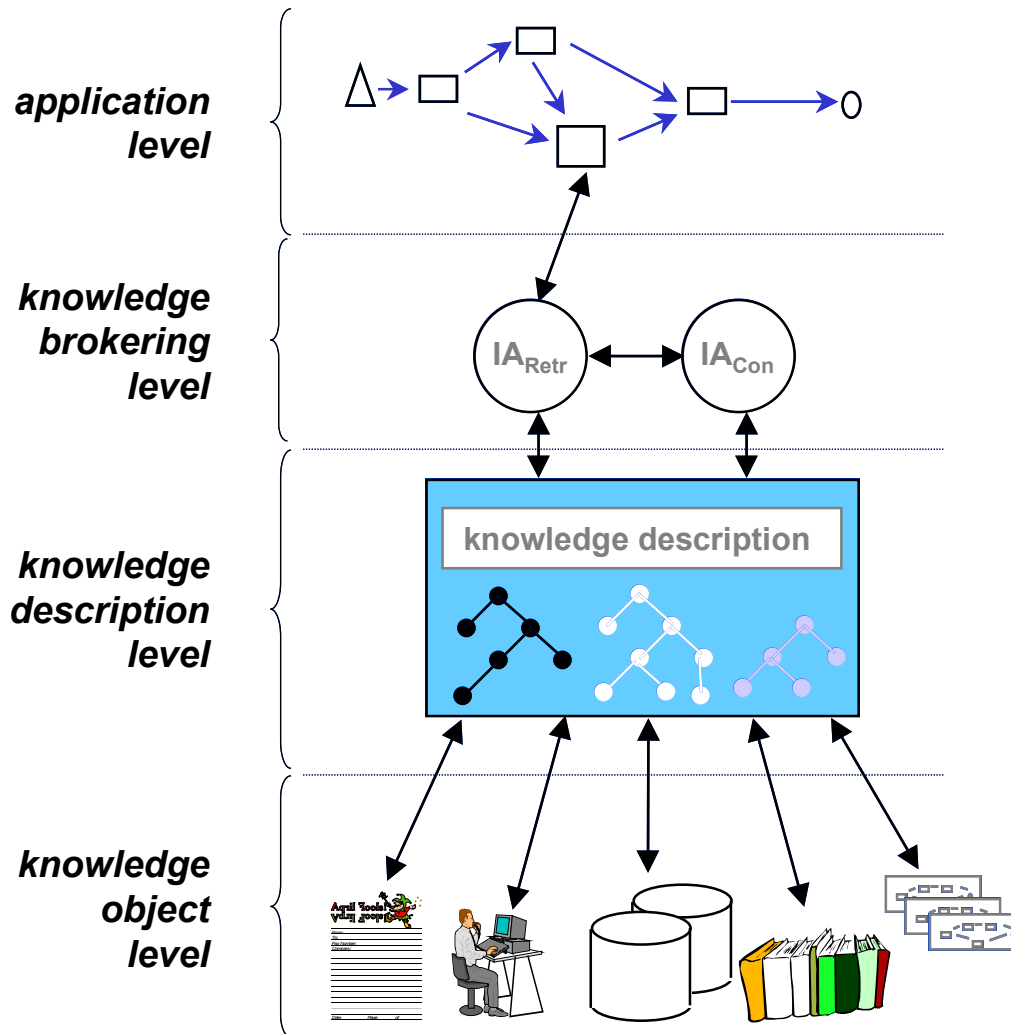
Consequences From First Application Projects

- *Assistant Systems* Instead of Expert Systems
- System as *Knowledge & Communication Medium*
- *Knowledge Evolution* as Task
- Integration of *Different Formality Levels* of Knowledge
- Integration with *Legacy Systems* and *Standard Applications*
- Links between *Heterogeneous Information Items*

This leads to a

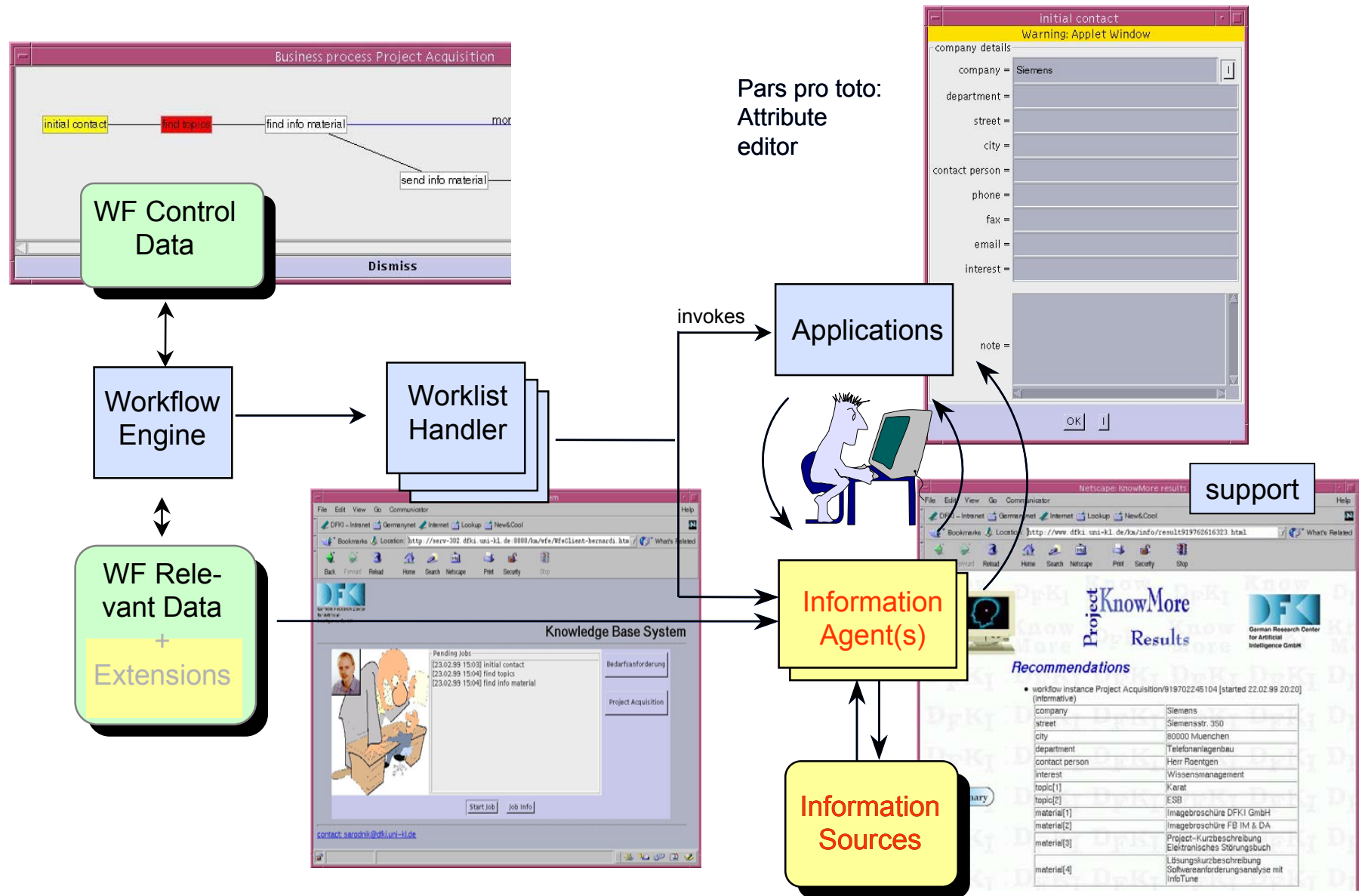
- working definition: *Knowledge = Information Made Actionable*
- basic research project: *Organizational Memories*

KnowMore: Knowledge Management as Context-Specific, Proactive Delivery of Information (1997-1999)



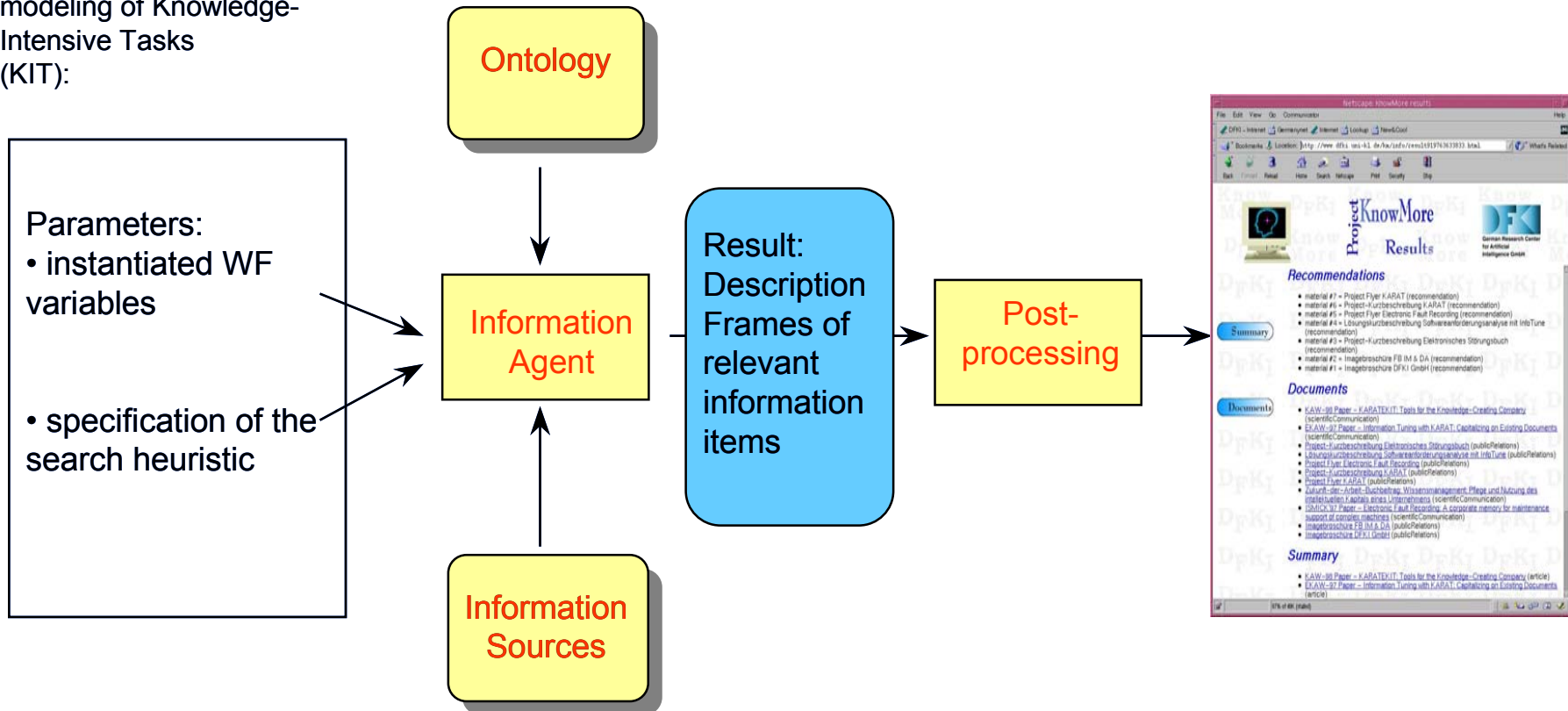
- Knowledge workers are involved in complex processes
- Process models and their enactment provide context information and facilitate proactivity
- Ontologies are the explicit basis for knowledge description
- Access to various information sources relies on formal knowledge-item descriptions

Integration into the Workflow Environment Realizes the Active Support



The *information agent* uses formal knowledge to retrieve the information relevant for the task at hand

From the extended modeling of Knowledge-Intensive Tasks (KIT):



Ontologies with complex *domain-specific relations* are traversed with *task-specific search heuristics* to retrieve the relevant information items

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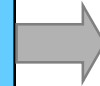
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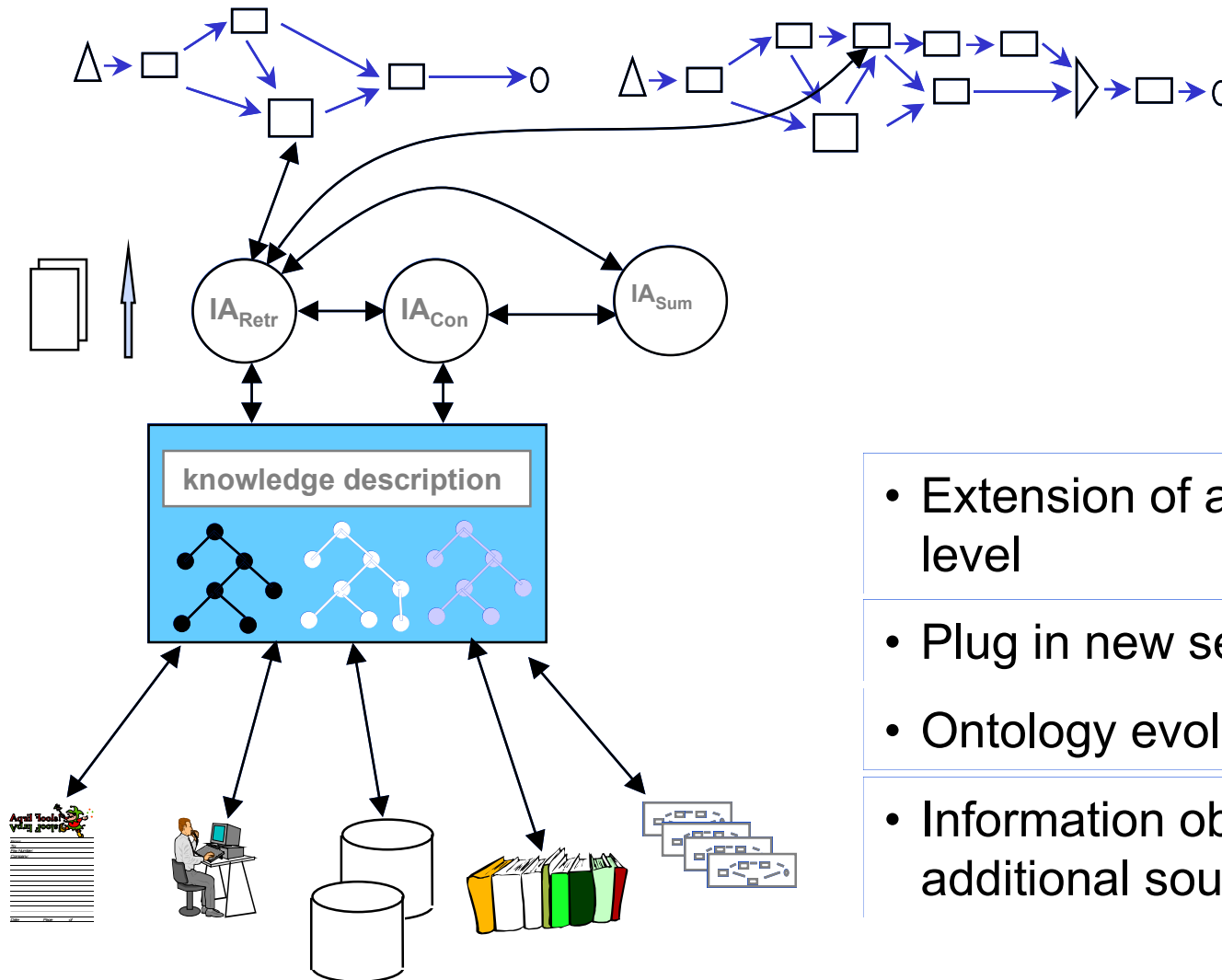
From KnowMore to FRODO

- Lessons Learnt from KnowMore and other projects:
Process-orientation is of crucial importance
- Classical workflow models seem only moderately adequate for knowledge workers
- Assumption of a central OM doesn't hold in real-world projects and companies

- Towards a Framework...
- for Scalable...
- Distributed...
- Organizational Memories!

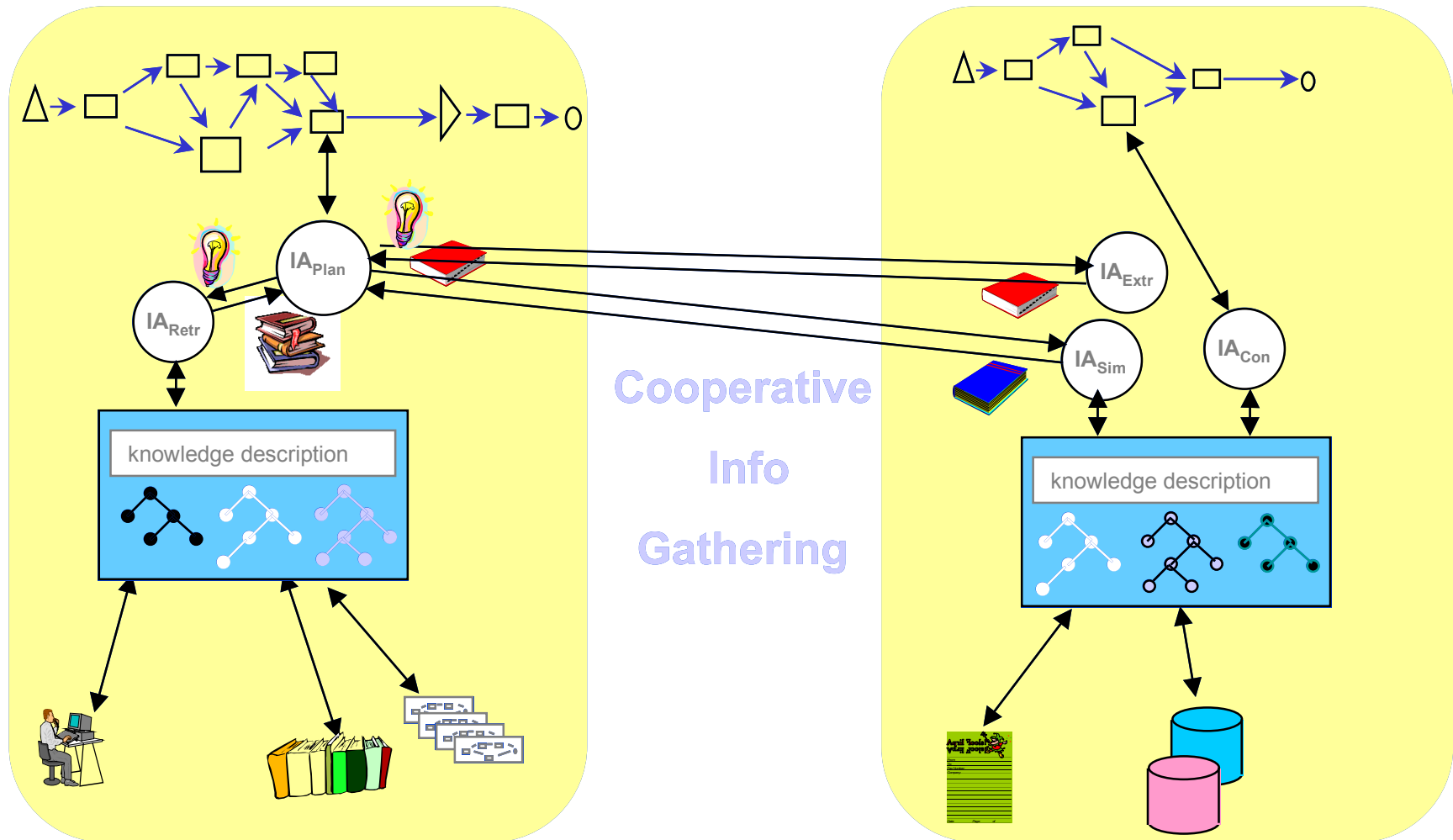


Vertical Scalability Allows to Extend One OM in All Relevant Dimensions



- Extension of application level
- Plug in new services
- Ontology evolution
- Information objects from additional sources

Horizontal Scalability Addresses Interoperability of Several OMs



Communication between OMs requires a shared conceptualization

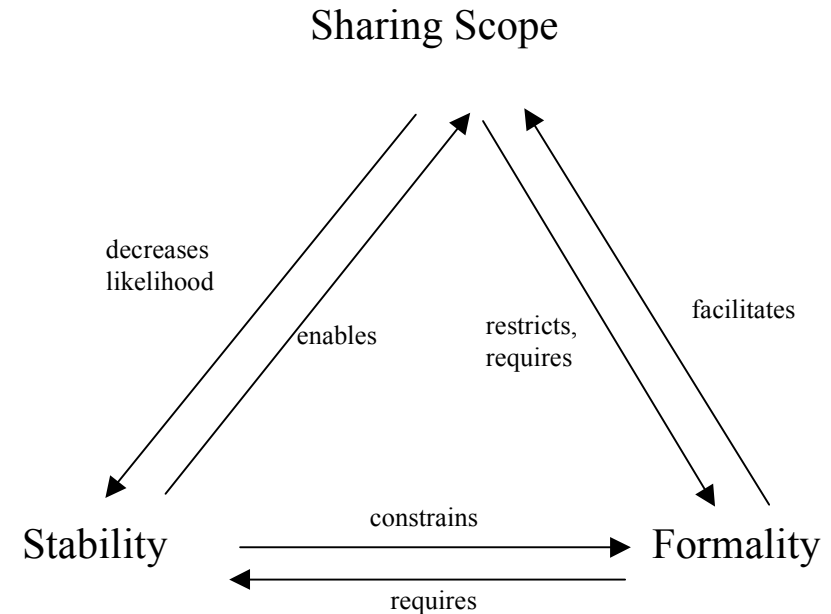
Ontologies in Knowledge Management

- *Shared conceptualizations* are of special importance in IT for knowledge management
- Formal knowledge allows for powerful services
- Shared, highly formalized knowledge is expensive due to
 - costs for dedicated formalization services
 - costs of negotiation
 - dynamic domains and environment

⇒ Information systems for KM should support ***all points of the spectrum*** and ***facilitate transitions*** towards ontological knowledge

Degree of Formality Interacts with Sharing Scope and Stability of Knowledge

- Formalization is expensive in terms of time and money
 - requires:
„use time“ >> „formalization time“
i.e. high stability required
 - but: stability mostly externally given
- Formality allows for sharing (explicitness, precision)
 - prerequisites formal training
 - possibly keeps away agents from participation
 - wide sharing scope increases costs of negotiation



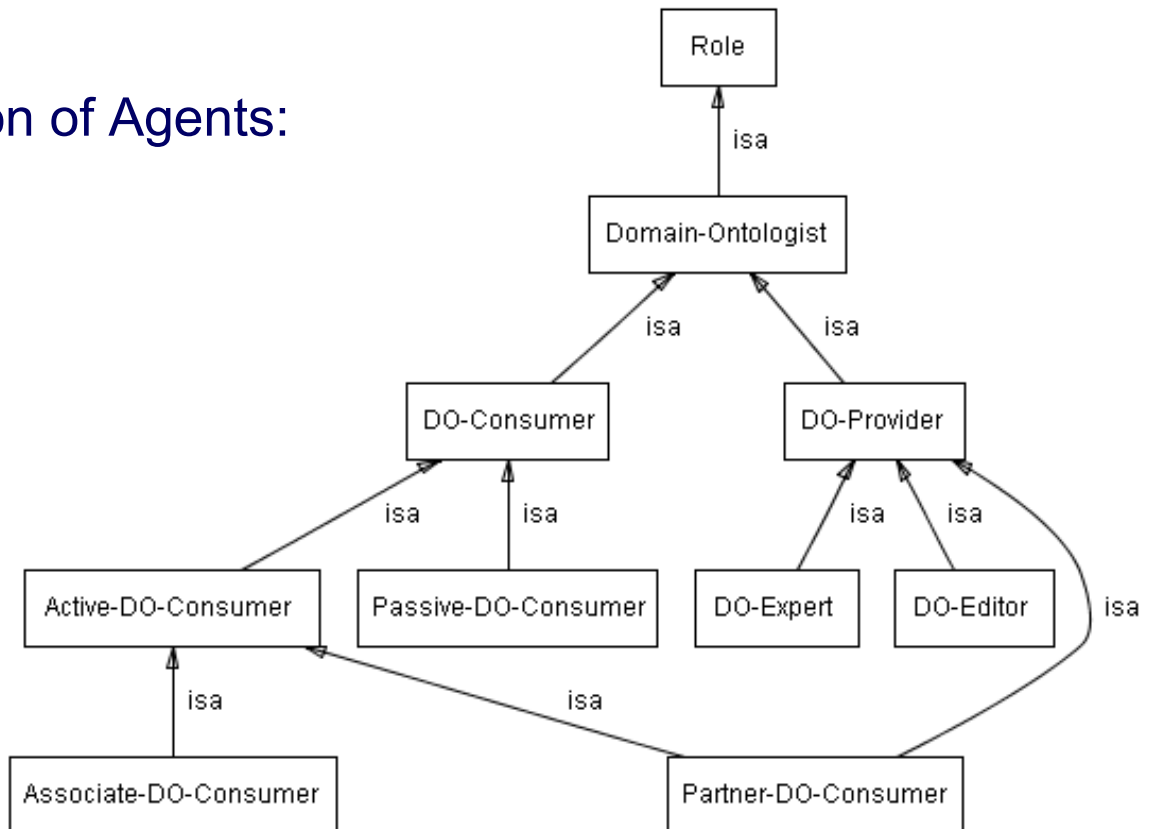
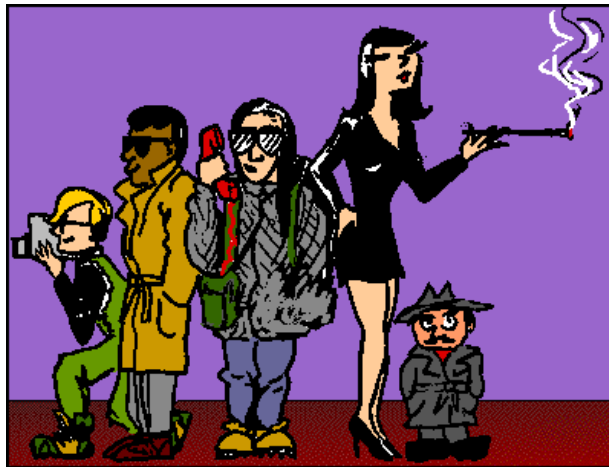
Frodo Approach

- Offer several degrees of formality,
- explicitly control sharing scope,
- monitor stability

Different Ontology Related Agents Can be Identified in the Organization

Knowledge Level Description of Agents:

- Goals
- Knowledge
- Competencies
- Rights
- Obligations



The ontology society is formed by determining *rights and obligations* of specific agents

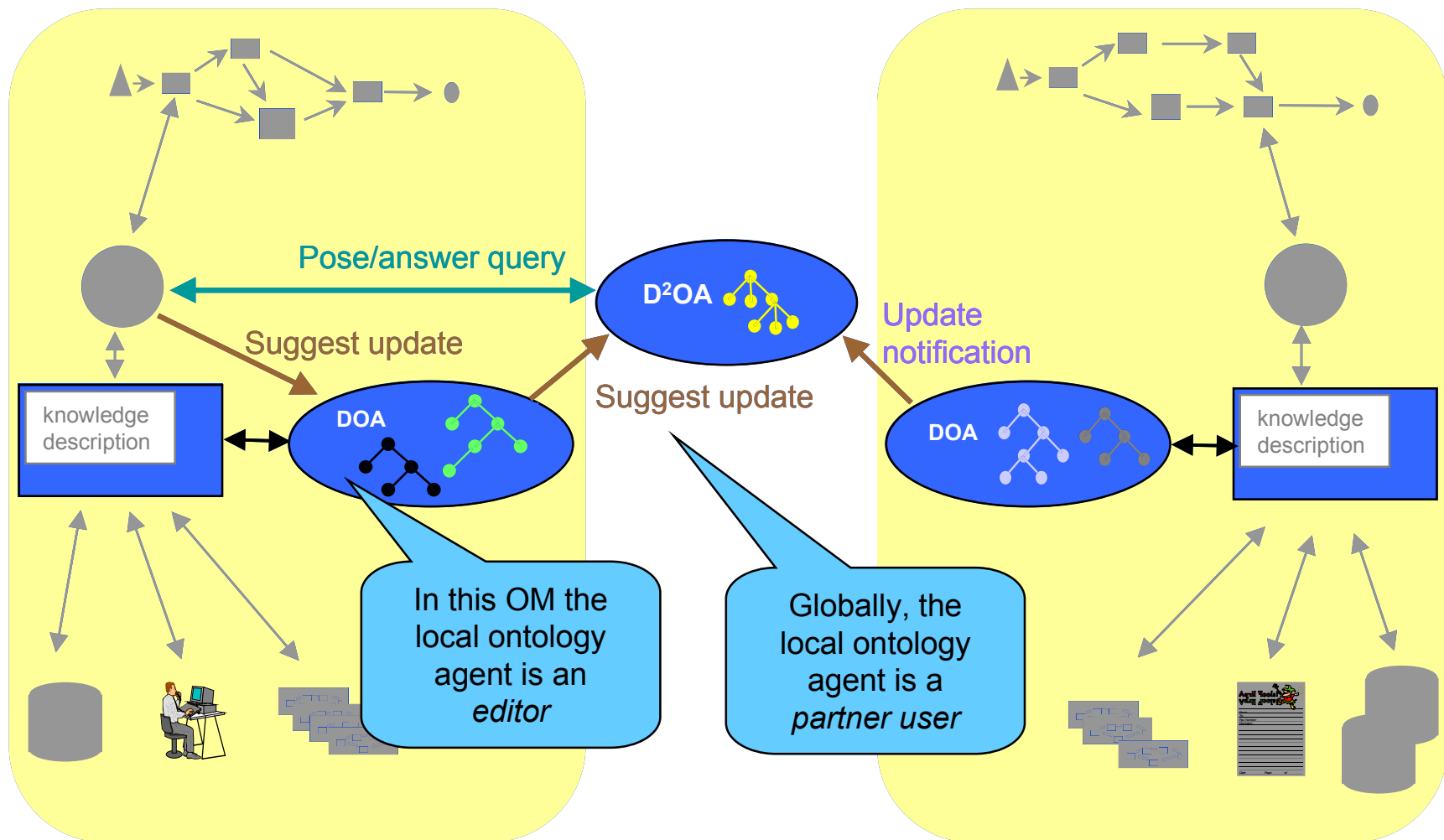
Concrete Speech Acts are Derived From Knowledge-Level Descriptions

	Non User	Passive User	Associate User	Partner User	Expert	Editor
Query		R	R	R	R	R
Answer Queries					R/O	R
Receive Update			R	R	R	R
Suggest Update		R	R	R/O	R	R/O
Edit						R
Send Upd. Notif.						R/O
ApplyForRole	R	R	R	R		
Grant Guarantees						R
Guarantee Quality						O

- Ontology Utilization
- Ontology Evolution
- Ontology Socialization

R: has-the-right-to
O: is-obliged-to

Distributed Domain Ontology Agents Mediate Between Different OMs

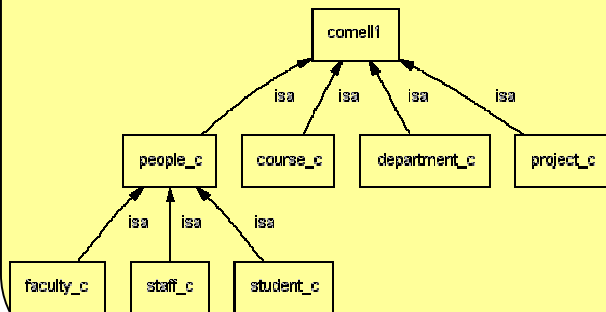


Each agent can play different roles with respect to the various ontologies

Text Classification is Used to Gain Evidence for Ontology Overlap: Level 1 „no shared concept.“

OM 1

DOA-Cornell

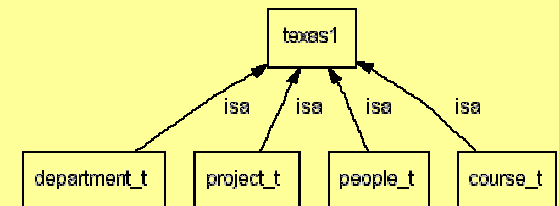


D2OA

conj: staff_c <=> people_t

OM 2

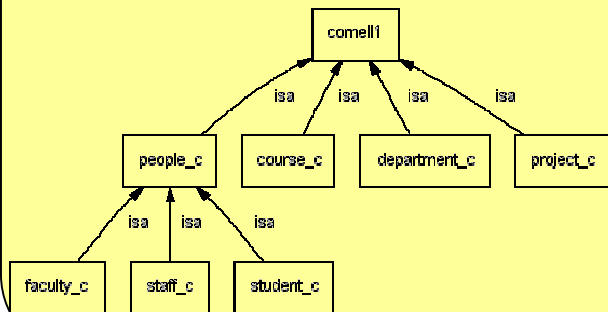
DOA-Texas



- Cornell: „Texas, give me your staff-Documents“
- Texas: „???“; suggestion: low-level communication, involve D2OA
- Cornell passes example staff-Documents to Texas and tells D2OA.
- Texas classifies examples as people-Documents and tells D2OA.
- Texas delivers documents on the basis of similarity.

Text Classification is Used to Gain Evidence for Ontology Overlap: Level 2 „mappings between OAs“

DOA-Cornell

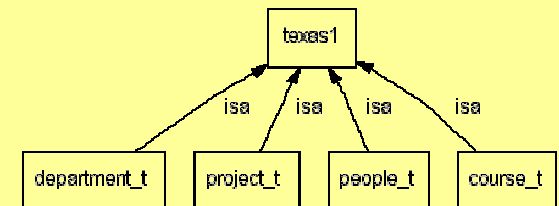


D2OA

$\text{staff_c} \Rightarrow \text{people_t}$
 $\text{faculty_c} \Rightarrow \text{people_t}$
 $\text{student_c} \Rightarrow \text{people_t}$

conj: $\text{people_c} \Leftrightarrow \text{people_t}$

DOA-Texas

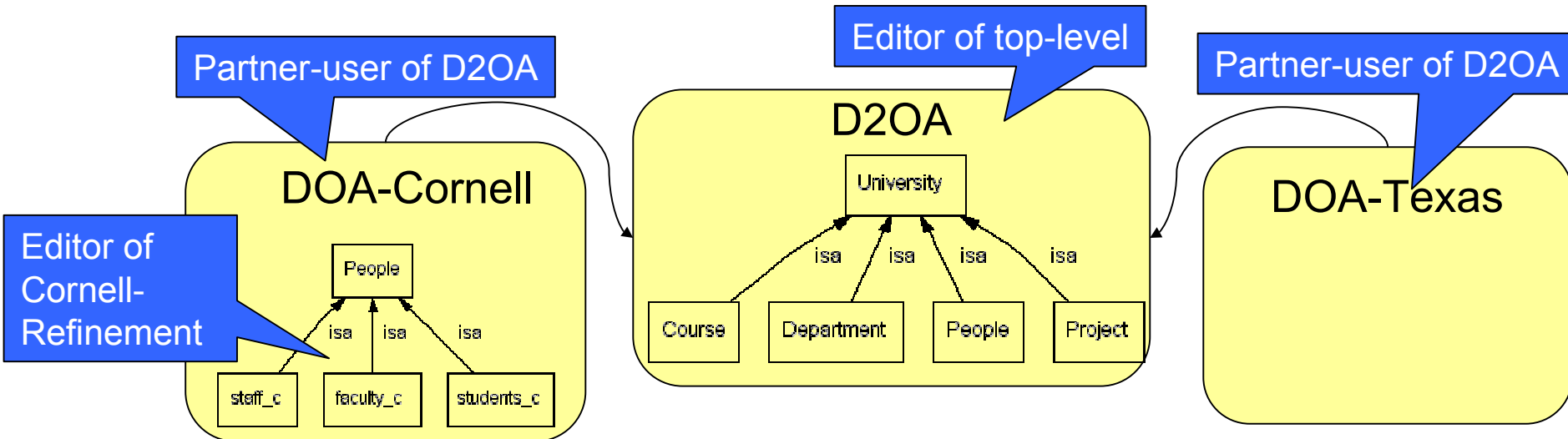


- D2OA's mapping rules are still NOT a shared conceptualization!
- But they can be used to ease communication.
- The structure defined by the mapping rules and other hints give evidence that an explicit sharing step may be worthwhile.
- Possible sharing protocols are constrained by social structure.

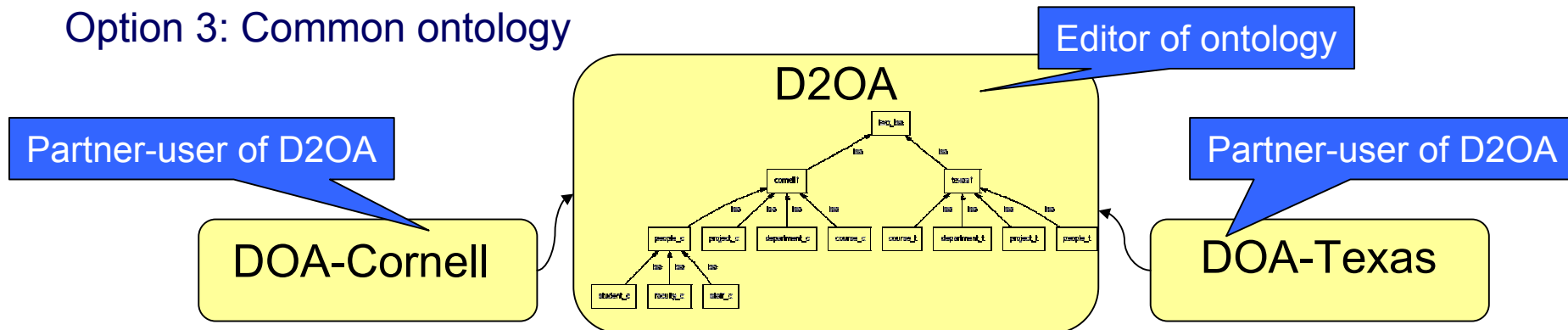
Level 3 „ontology negotiation“

Option 1: No further agreements; at least Level 2 can be utilized

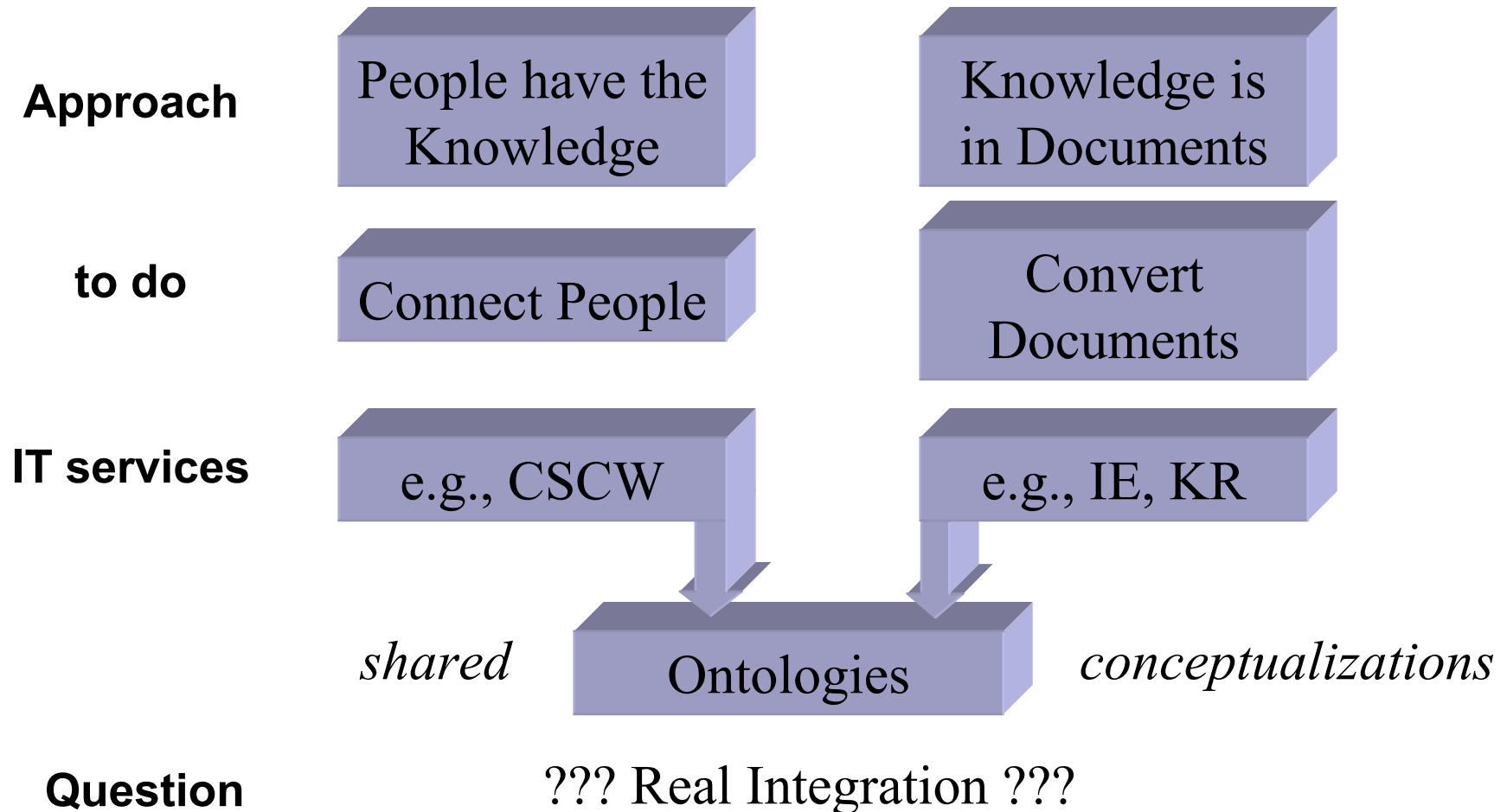
Option 2: Common top-level ontology



Option 3: Common ontology



Ontologies span two lines of action in KM



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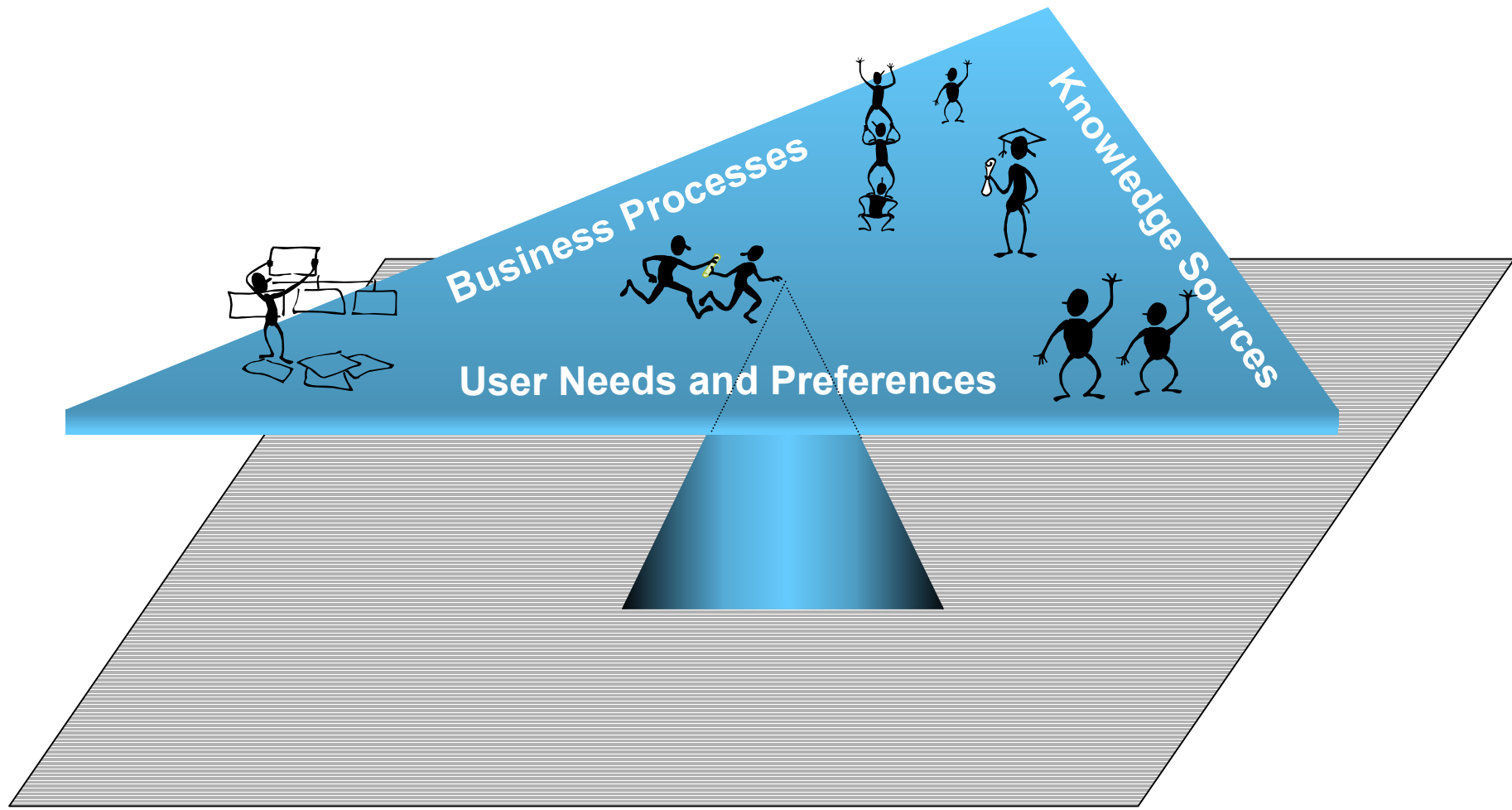


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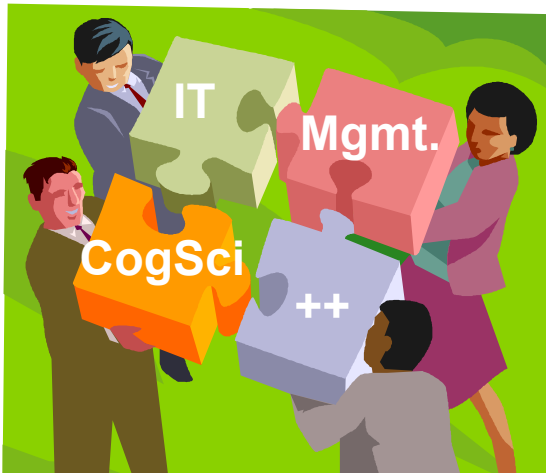
Agent-Mediated Knowledge Management



Make Societies of Agents Balance the “KM Seesaw”!

Invitation for Collaboration and Co-operation

- Knowledge Management seems to have survived the typical „Buzzword Lifecycle“
- Applied KM projects sponsored by companies (temporarily?) difficult
- Some personal topics of interest: Quality, Responsibility, Trust, More Adequate Representations, Situatedness, Intelligent Services, Tomorrow's Desktop, ...

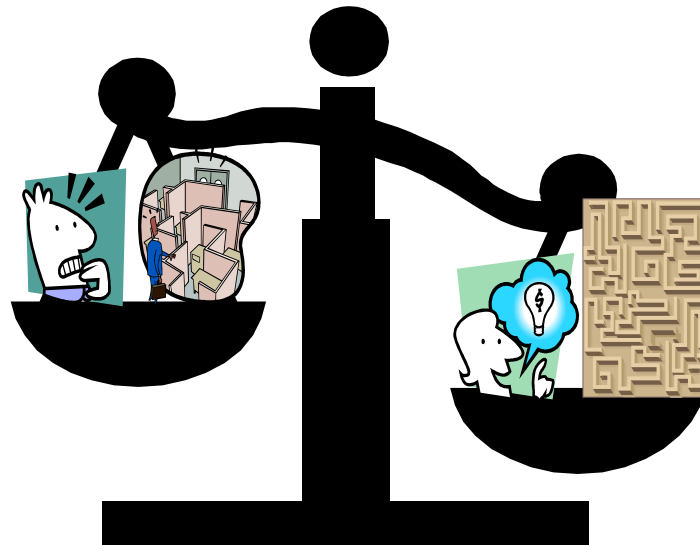


There is neither a “core KM science”
nor a primacy of one community.
Credo: Successful KM needs a holistic view.
Corollary: KM demands co-operating
research communities.

Thank you very much for your attention!



This talk would not have been possible without the work of many actual and former members of DFKI KM Group (Andreas Abecker, Ansgar Bernardi, Knut Hinkelmann, Otto Kühn, Heiko Maus, Franz Schmalhofer, Sven Schwarz, Michael Sintek, Bidjian Tschaitchian, et al.).



Some (First) Pointers

- Nonaka/Takeuchi: The Knowledge Creating Company
- Probst/Raub/Romhardt: Wissen managen: Wie Unternehmen ihre wertvollste Ressource optimal nutzen
- The Virtual Library on KM: km.brint.com
- DFKI KM Department:
 - www.dfki.uni-kl.de/km
 - www.dfki.uni-kl.de/frodo
 - www.dfki.uni-kl.de/frodo/ontologies/
- Forthcoming (April 2002) ;-)
Abecker, Hinkelmann, Maus, Müller: Geschäftsprozessorientiertes Wissensmanagement - Effektive Wissensnutzung bei der Planung und Umsetzung von Geschäftsprozessen, Springer Verlag, Xpert.press.