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Towards a Human Resource Development Ontology Combining Competence Management and Technology-Enhanced Workplace Learning



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- Why an HR Development Ontology?
- Requirements
- The ontology
 - Competency
 - Diagnosing competencies
 - Learning Opportunities
- Implementation issues OWL-DL
- Embedding it into the Enterprise
- Conclusions & Outlook

Two development directions

■ **Competence Management**

- aligning human resource development with corporate goals
- identify, secure and make use of employee competencies
 - but also development
- organizational perspective

■ **Competency-Oriented Technology-Enhanced Workplace Learning**

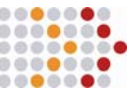
- e-learning, knowledge management & performance support
- formal and informal learning
- integration of competence development into work activities
- individual perspective

■ Both are about learning, competencies, work processes...

- ... but how to make them fit together?
- We need a **domain engineering** approach that brings them together
 - a shared domain model
 - a specification of a shared infrastructure
 - and its implementation
- First step: a shared domain model (or **ontology**)

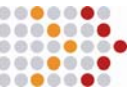
Requirements and Key Issues

- **Alignment** of human resource development with business processes & goals
 - learning needs are determined by both individual and corporate interests
- **Automatability** of learning & HR micro management
 - recommending relevant learning opportunities
 - tracking learning progress
 - supporting staffing and ensuring sufficient competence
- Smooth transition to **knowledge management** activities
 - knowledge management is about learning, too!
- **Holistic view** of human resource development
 - consists of formal training as well as informal competence development

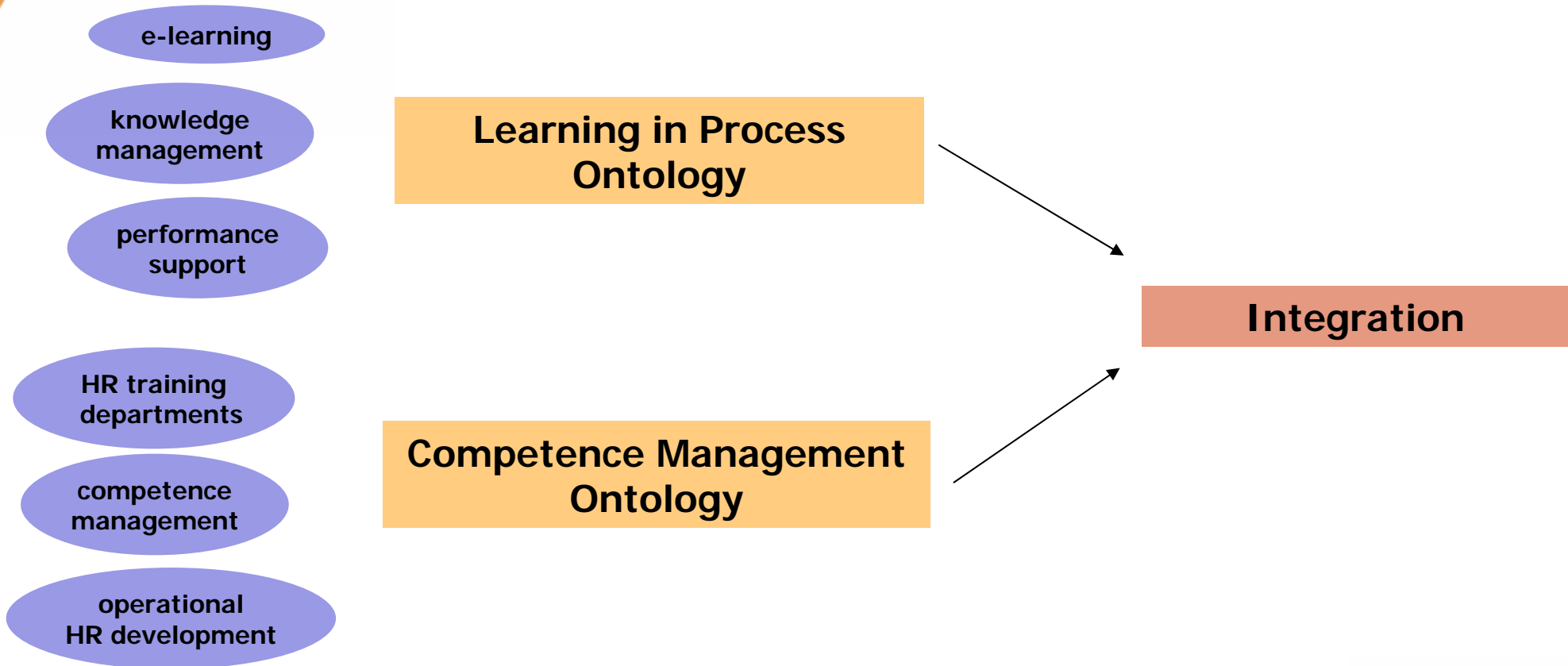


- Ontologies as models with a formal semantics are the basis for computer-supported guidance
- Several promising areas have emerged:
 - **Profile matching** with similarity measures [Biesalski & Abecker 05]
 - selecting applicants
 - team staffing
 - **Finding learning opportunities** with knowledge gap analysis and competency subsumtion
 - learning on demand [Schmidt 05]
 - training planning [Kunzmann & Schmidt 06]
 - detecting competence development pathways [Ley 06]

Developing the Ontology



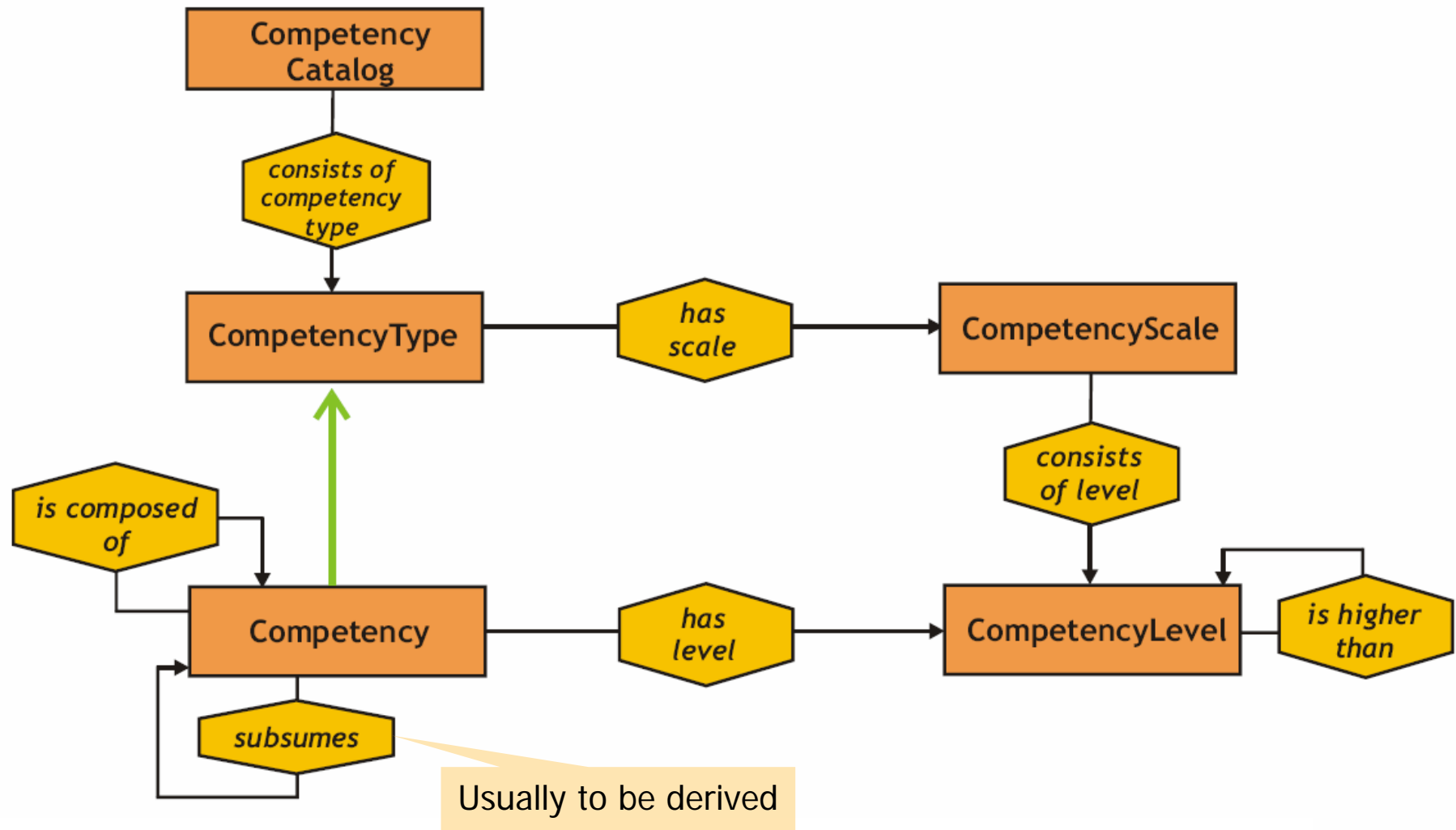
Development Process



- **Competencies** are
 - bundles of knowledge, skills and abilities
 - relevant to work performance
 - sufficiently measurable
 - and developable [Kunzmann & Schmidt 2006]
- Usually **competency scales** are used
 - *novice, beginner, intermediate, competent, expert*
 - *CEFR scales for language proficiency*
 - scales are usually specific for certain competency types
 - a competency is then an instance of an abstract competency type
 - competency type has a scale attached
- EXAMPLE: *English Language Proficiency* (TYPE), English C2 (COMPETENCY)

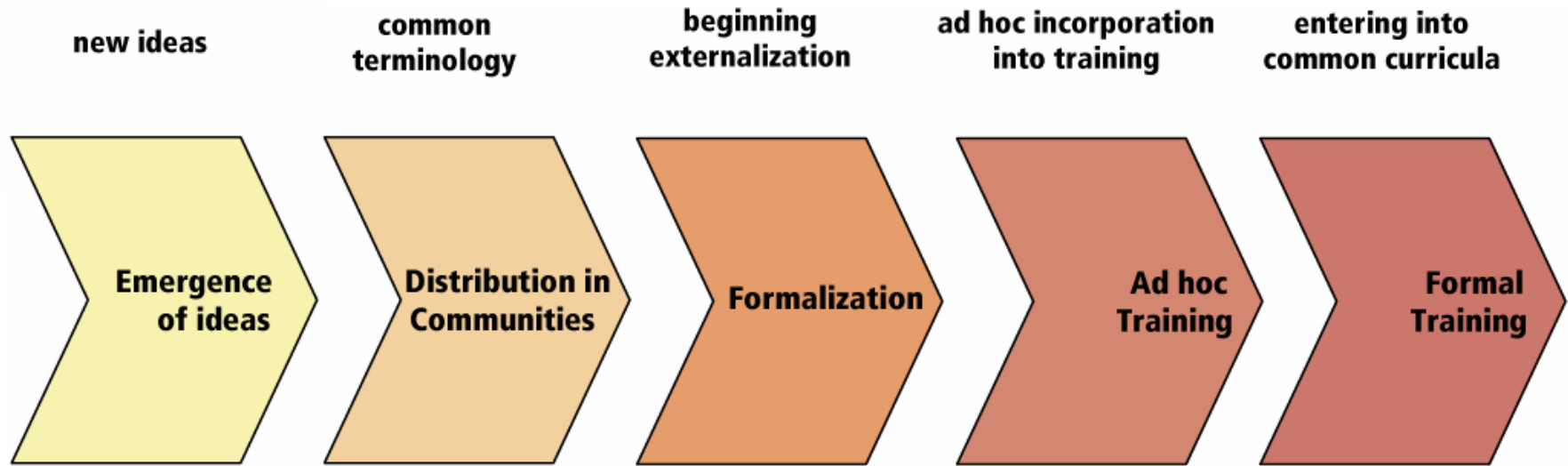
- In practice, usually competency hierarchies are used
 - mono-hierarchies
 - no well-defined semantics
- **Generalization**
 - is-a relationships
 - poly-hierarchy
 - defined on competency types (regardless of the level)
 - *Example: OWL-Modeling <is-a> Ontology Modeling*
- **Composition**
 - part-of relationships
 - curriculum-style philosophy
 - defined on competencies (level-specific)
 - *OWL-Modeling Intermediate <consists-of> { Protégé Expert, OWL Modeling Methodology Beginner }*

Competency Part of the Ontology



- Problem: Competencies are not directly measurable, but only indirectly derivable from performances
- Concept of competency evidence
 - see also HRXML
 - can be
 - an observation
 - training evidence
 - self-assessment
- Currently under discussion: clear separation into observable performance and inferred competence

Developing Competencies: The Knowledge Maturing Process



Information artifacts

personal notes

communication artifacts
FAQ entries
forum contribution

project report
case study
lessons learnt

learning objects
patents
best practices

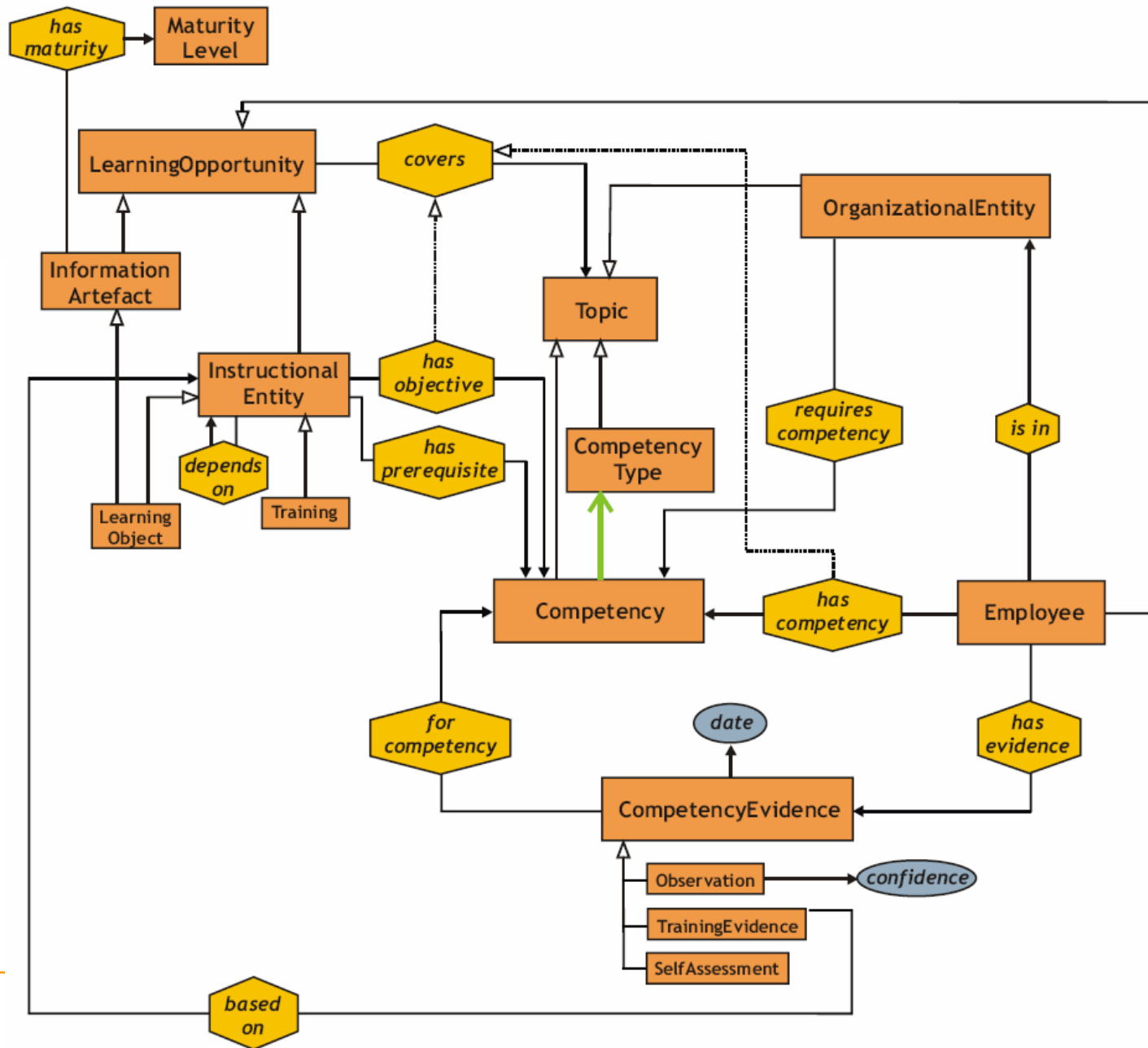
text book course
certificate
redesign of the organisation

Developing Competencies: Learning Opportunities

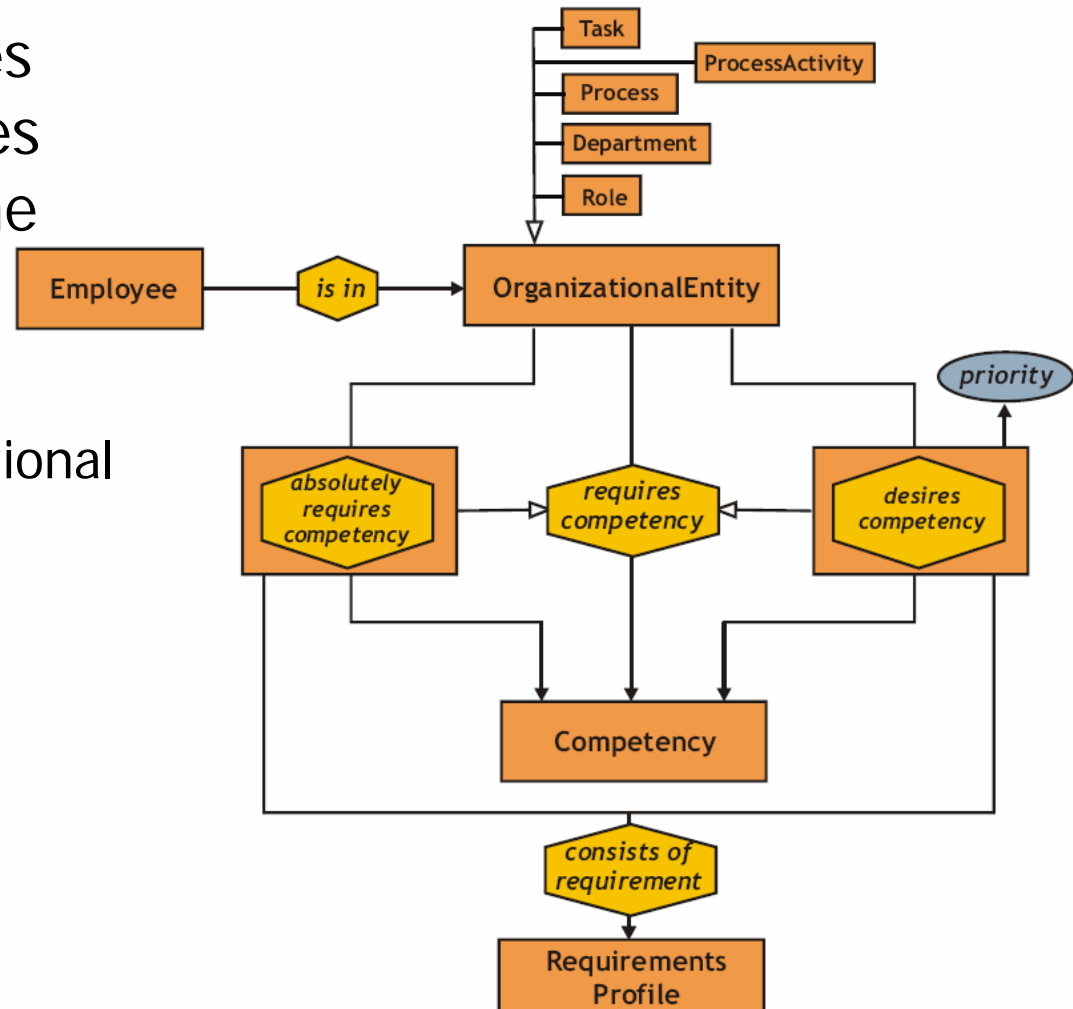
- Learning Opportunity <covers> Topic
 - Topic generalization of Competency
- Employee
 - informal communication
- Information Artifact
- Instructional Entity
 - learning goal
 - learning prerequisites

 - Traditional Training
 - Learning Object

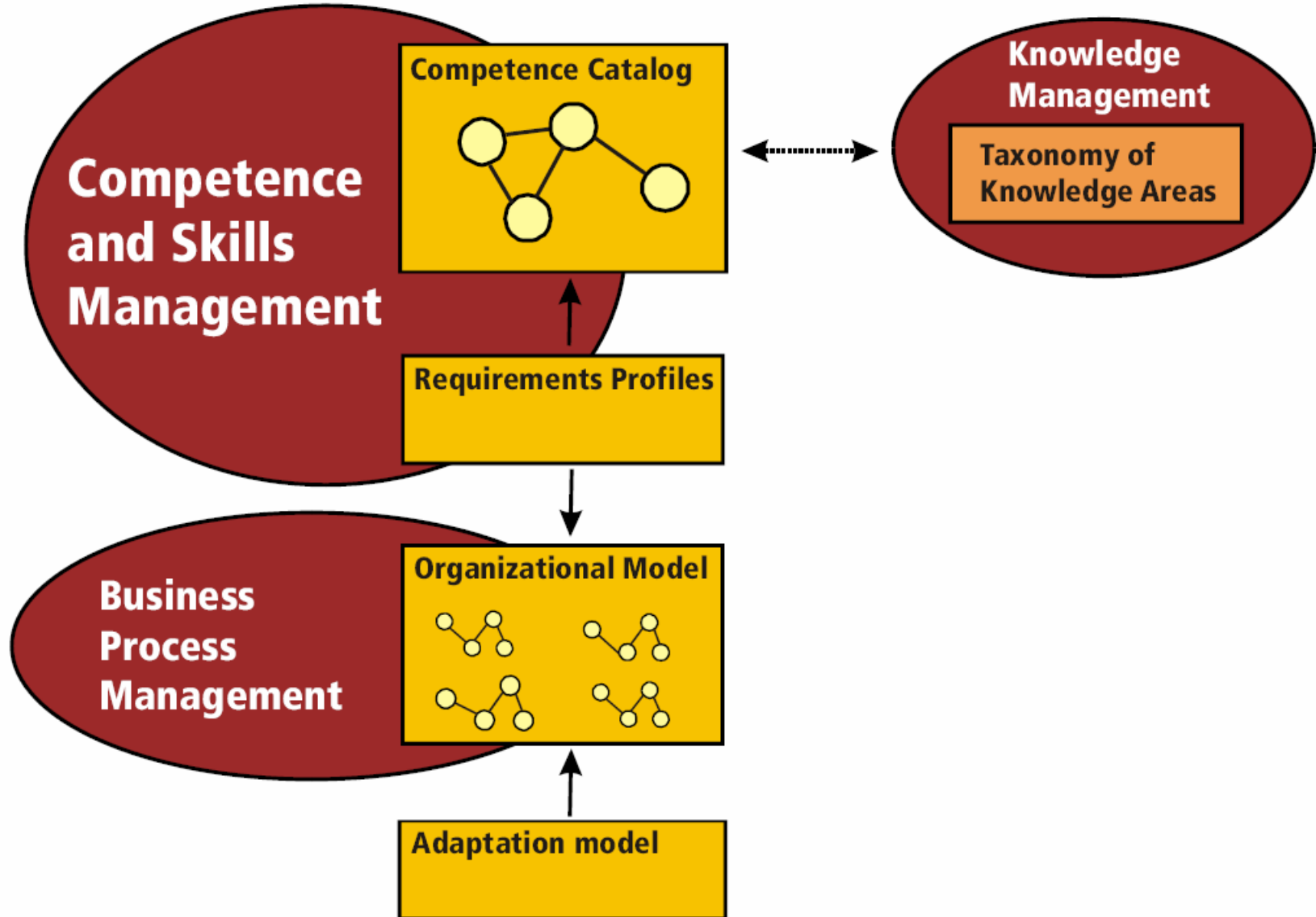
Developing Competencies



- For recommending learning opportunities within work processes we need to determine what is relevant
- Requirement profiles
 - attached to organizational entities



Embedding it into the enterprise



■ Metamodeling

- Concepts are themselves instances of other concepts
- *English E2* <instance-of> *English Proficiency* <instance-of> *CompetencyType*

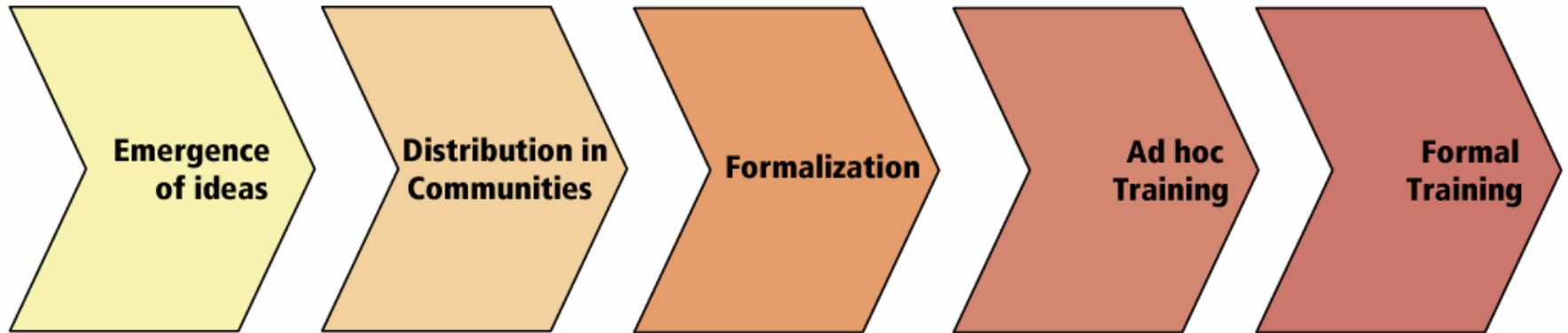
■ In **OWL-DL**:

- CompetencyTypes are concepts
- Competencies are instances with levels attached
- scales are assigned to CompetencyTypes via annotation properties

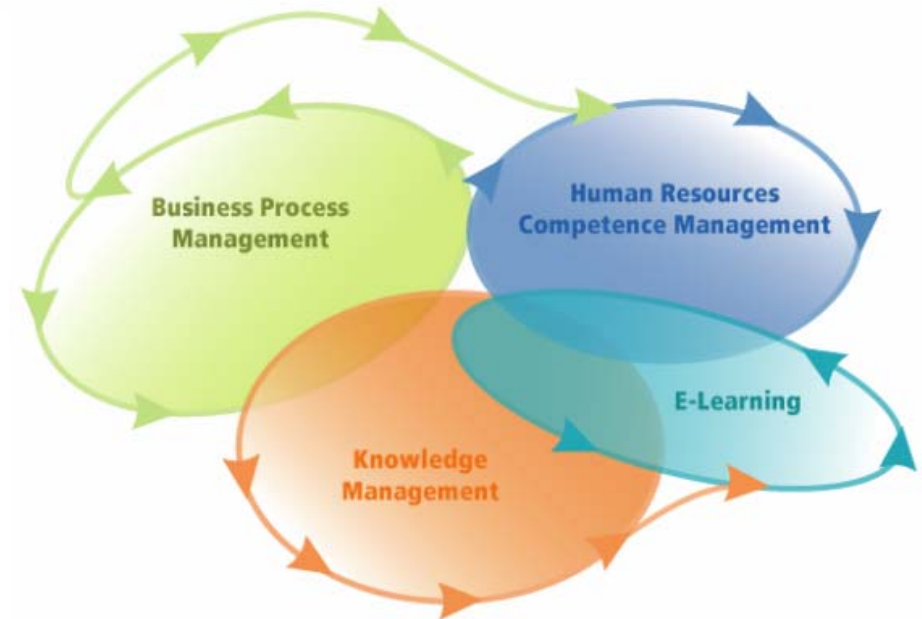
Issue of Derived Properties

- Properties can be **time-dependent** and **uncertain**
 - e.g. has-competency
 - two layers: physical and logical view
 - => ODBASE talk on Thursday 14:30!
- **Derived** properties
 - SWRL is not sufficient for complex computations like
 - subsumes
 - has-competency
- Both issues cannot be efficiently dealt with within the OWL-DL frame, but are better dealt with outside of it
 - implemented as services in an infrastructure

- Ontology presented is a first step towards a domain engineering approach integrating the different perspectives on learning in enterprises
 - experiences from Learning in Process and subsequent TEL projects
 - and competence management projects
 - current and future versions available under a creative commons license under <http://professional-learning.eu/competency.html>
 - collaboration highly welcome and invited!
- Next step is a service-oriented infrastructure offering a shared set of services.



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