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Collaborative process maturing support by mining activity streams

iKnow 2015

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Agenda

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1. Use case / context
2. Background: established research streams
3. Process mining – the SCHub way
4. Live demonstration of parts of the solution
5. Conclusion and outlook

Project: Social Collaboration Hub (SCHub)

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Federal Ministry of Education and Research

Goal: Establishing an integrated infrastructure for effective support of team collaboration, esp. for **knowledge intensive tasks** and regionally distributed employees

- direct support for knowledge and business processes
- From a user‘s perspective, a unified intranet with continuous support for working tasks without breaches in the workflow should arise.

Solution: Integration of Open Source Software from the areas portal, document management (DMS), groupware and business process management (BPM)

10/2014 - 09/2017

SCHub System Architecture

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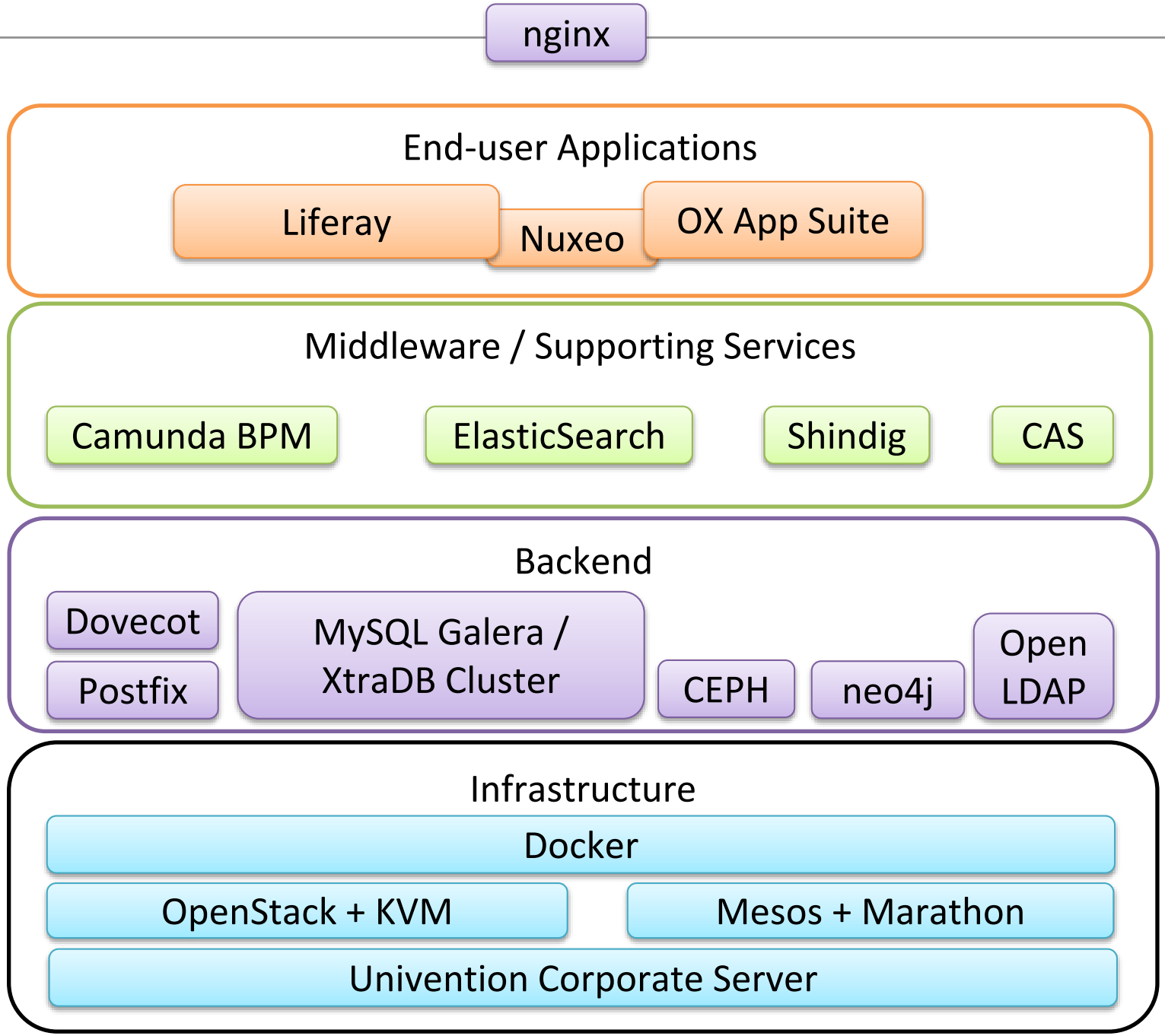
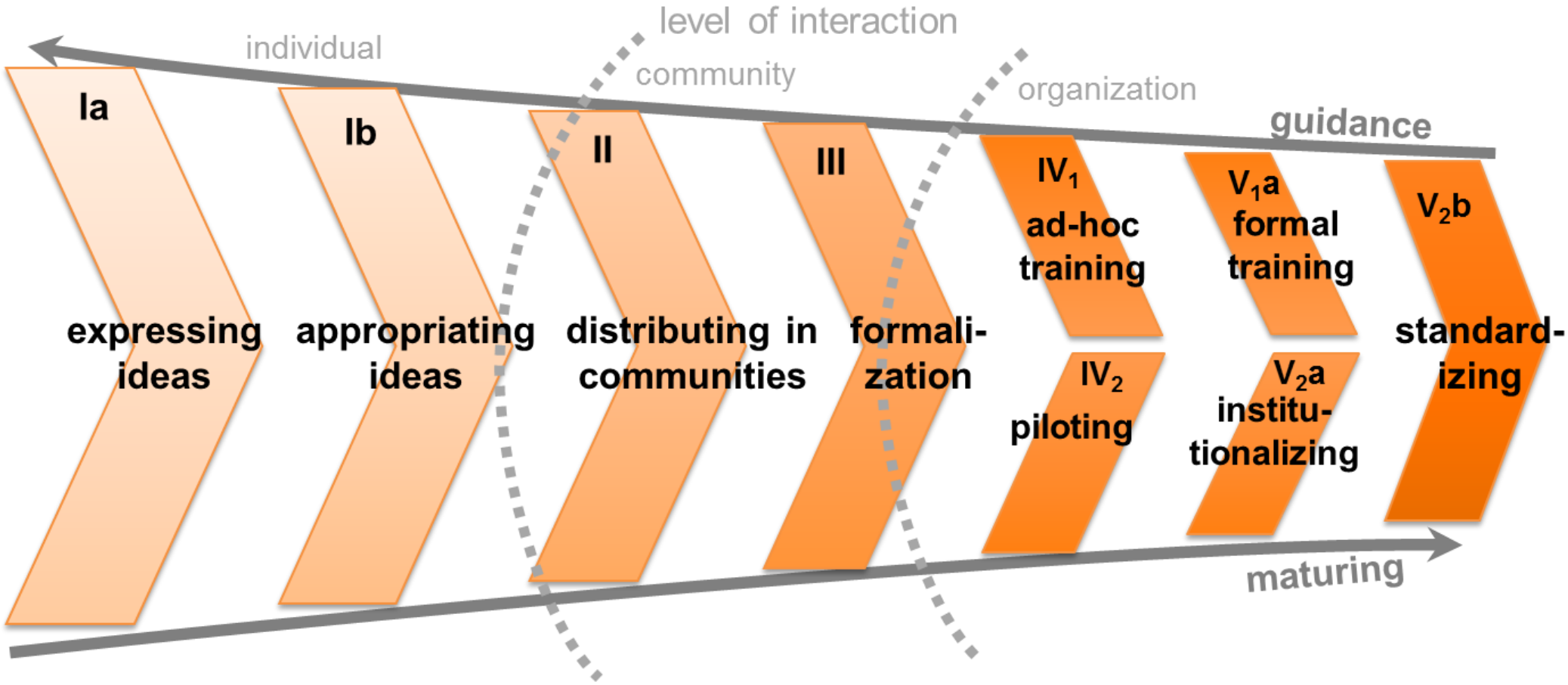


Knowledge and process maturing



Based on Maier, R., Schmidt, A (2007):
Characterizing knowledge maturing: A conceptual process model for integrating e-learning and knowledge management.
4th Conference Professional Knowledge Management-Experiences and Visions (WM'07) , Potsdam.

Goal for SCHub process maturing support

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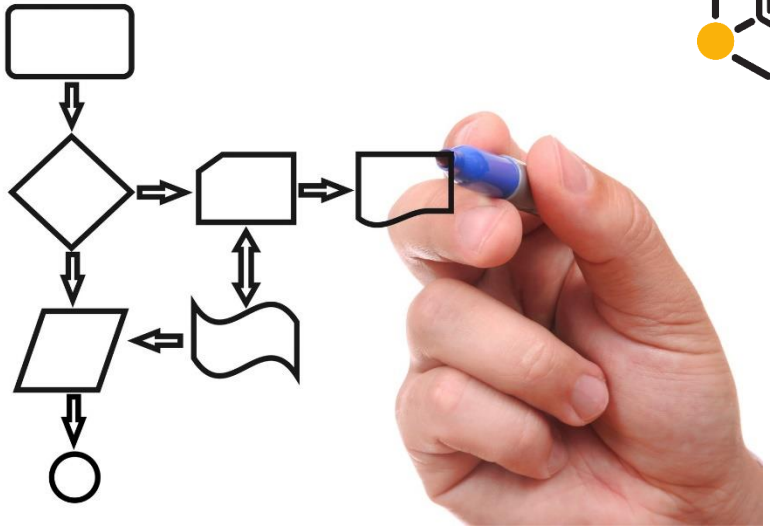
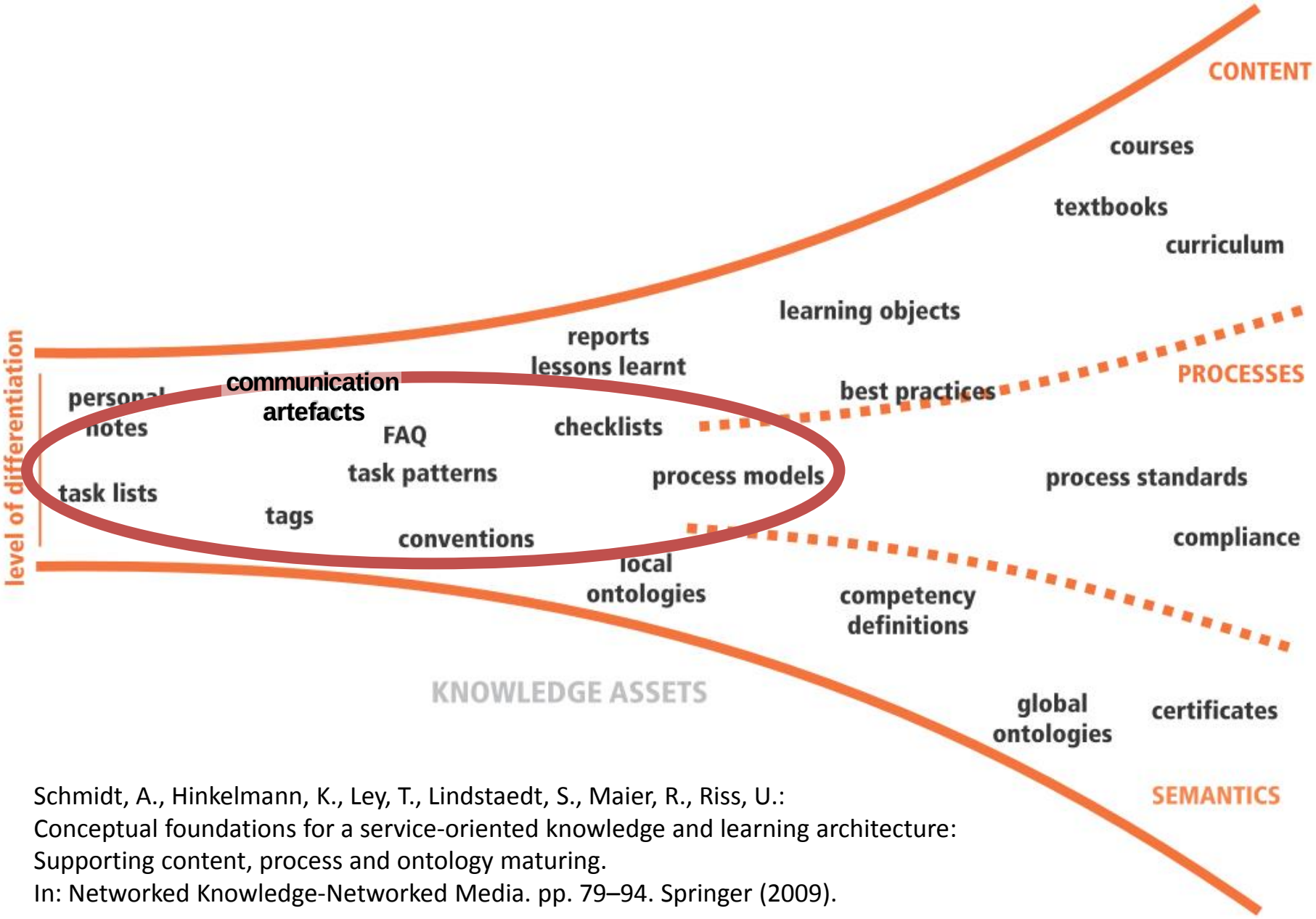
- Allows for **collaboratively enhancing document-centric processes**
- Use **Web 2.0** feature like commenting, rating, tagging in BPM
- Use information available in **activity streams** to learn about workflows
- Support **weakly structured processes** with software
- Use **open standards** and available **open source software** as much as possible



Social Collaboration Hub

Focus of the solution



Schmidt, A., Hinkelmann, K., Ley, T., Lindstaedt, S., Maier, R., Riss, U.:
Conceptual foundations for a service-oriented knowledge and learning architecture:
Supporting content, process and ontology maturing.
In: Networked Knowledge-Networked Media. pp. 79–94. Springer (2009).

Background: Adaptive Case Management (ACM)

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- ACM does not force strict workflows
- **Suggests situation-specific actions** that might be required
- Users can **adopt** suggested tasks, but can also **adapt** them
- No strict separation between design-time and runtime
- Complements Business Process Management (BPM)

- Object Management Group (OMG) Standards:
  - Case Management Model and Notation (CMMN, May 2014)
  - Business Process Model and Notation (BPMN v.2.0, January 2011)
- Camunda supports CMMN since version 7.2 (November 2014)

Example: Oracle Adaptive Case Management

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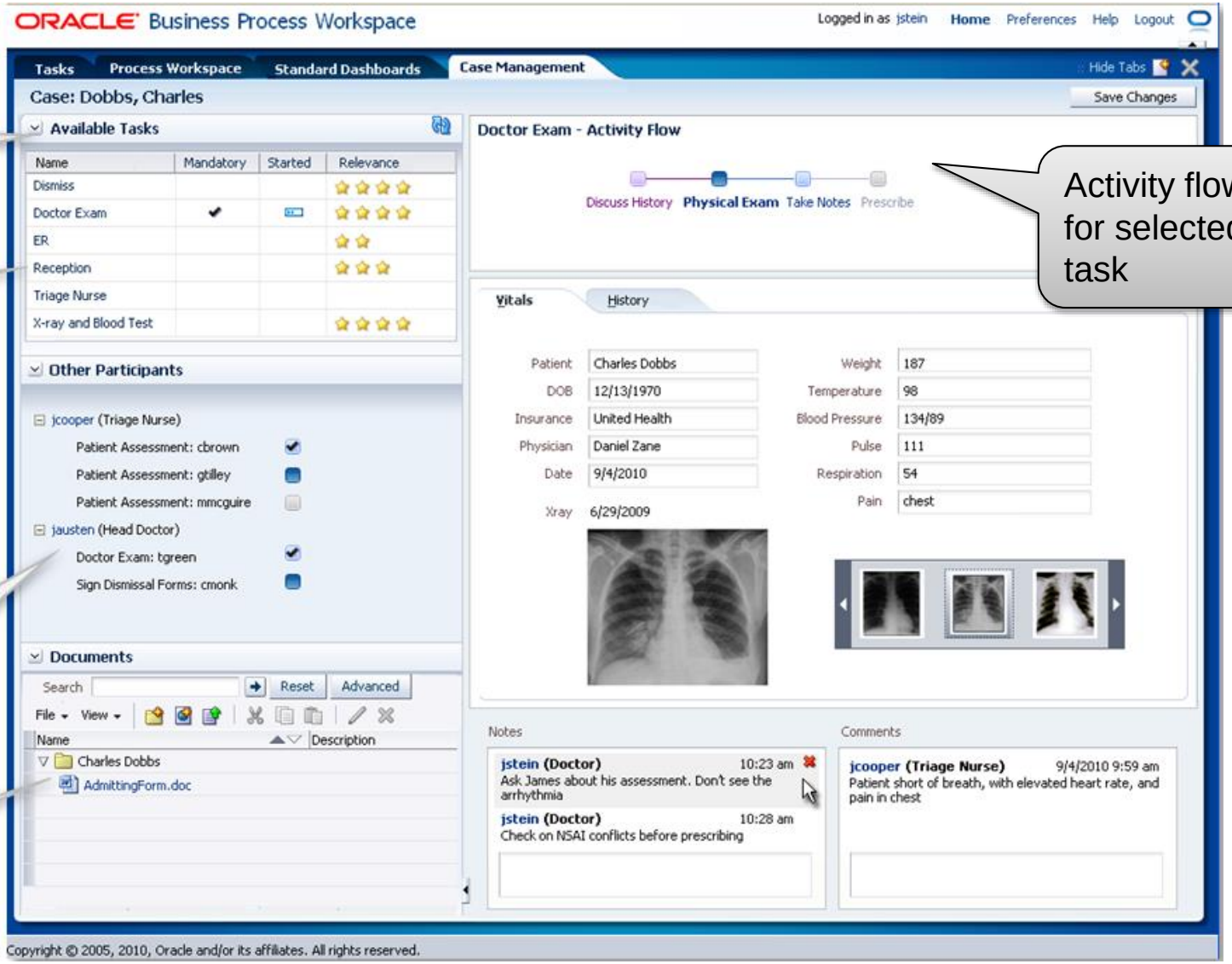
Tasks available to me at this state of case

Guidance on which Task may be more valuable to perform

What are other users/roles doing to this case

Virtual Folder



Background: BPM research streams

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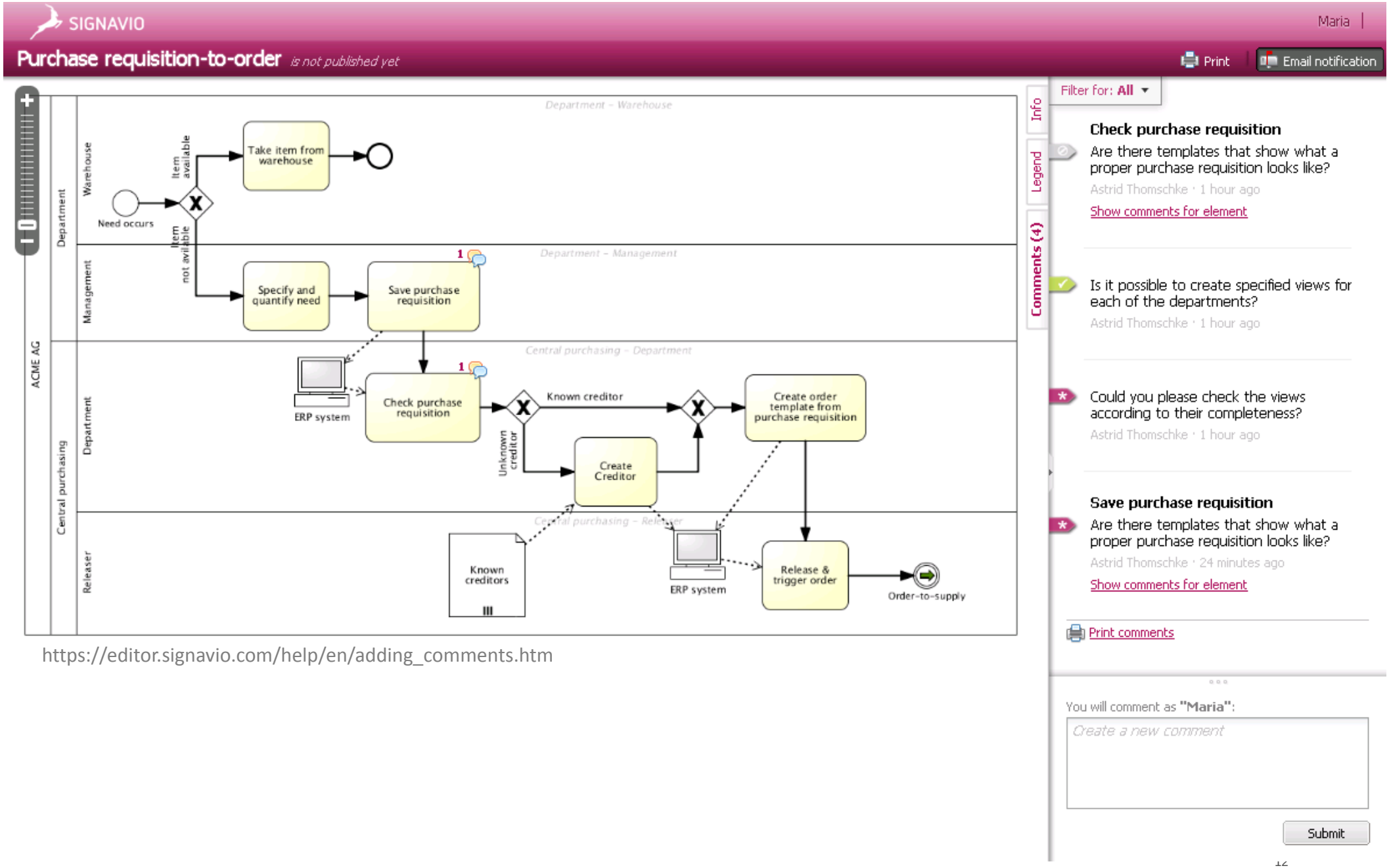
- **Subject-oriented BPM**
  - Communication-oriented
  - Very easy for end-users
  - Maybe too simple for knowledge workers
- **Social BPM**
  - Bring Web 2.0 participative approaches to BPM
  - Potential benefits: increased transparency and knowledge sharing
  - Drawbacks: possibly lower quality process models, difficult to evaluate

Example: Signavio Collaboration Portal



https://editor.signavio.com/help/en/adding_comments.htm

Background: process mining and maturing

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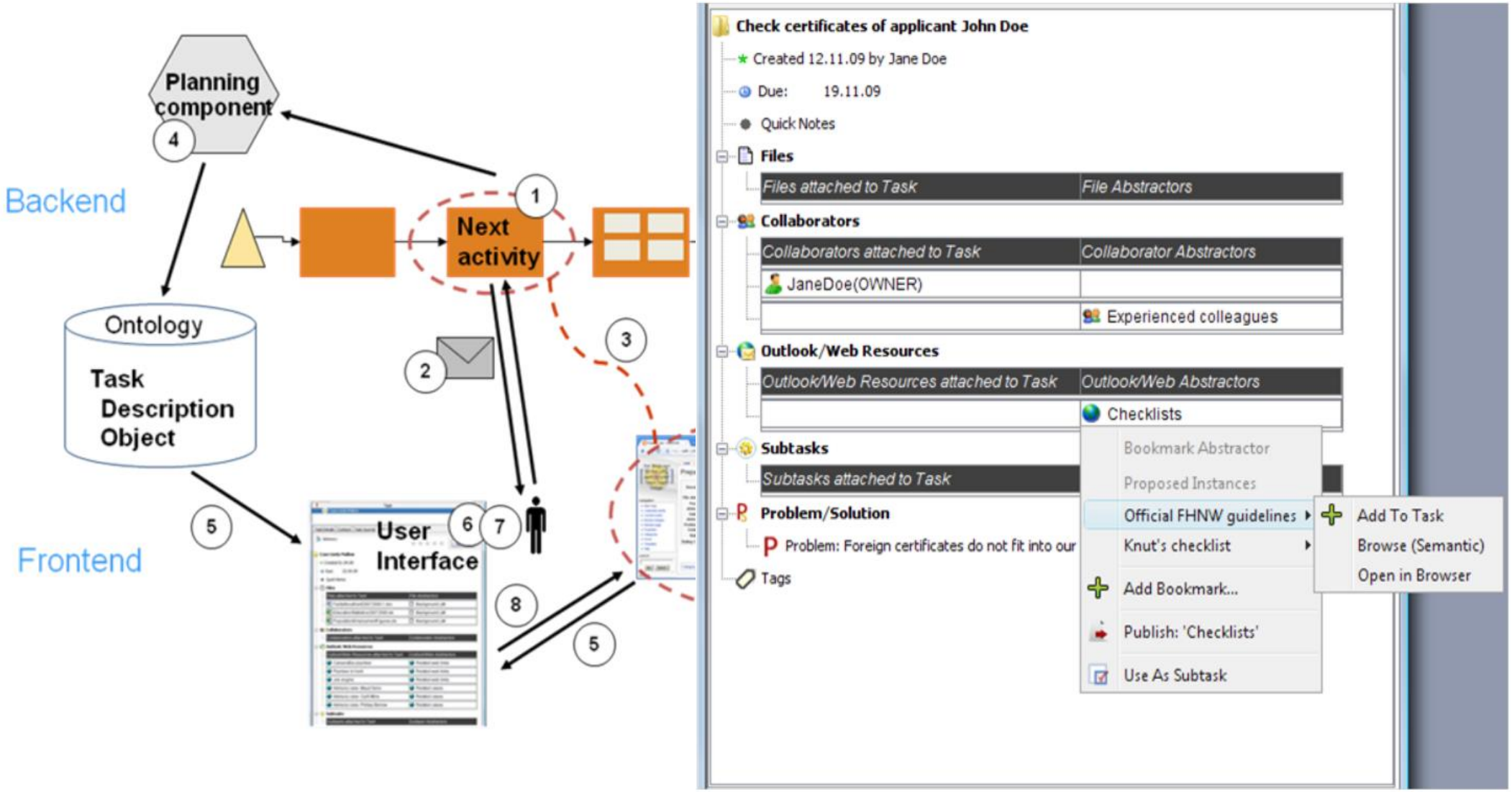
- **Process Mining**
  - **Discovery type**: event logs to process models
  - Conformance checking type: compare process model with log
  - **Enhancement type**: extend existing models with data from logs

- **Process Maturing**
  - Weakly structured process might result from missing knowledge
  - recording of the users' activities => creation & maturing of processes
  - IT support for weakly structured processes is key to link organizational and personal knowledge work

Example: KISSmir research prototype (Witschel et al. 2010)



Witschel, H.F., Hu, B., Riss, U.V., Thönssen, B., Brun, R., Martin, A., Hinkelmann, K.:
A collaborative approach to maturing process-related knowledge.
In: Business Process Management. pp. 343–358. Springer (2010).

Own approach

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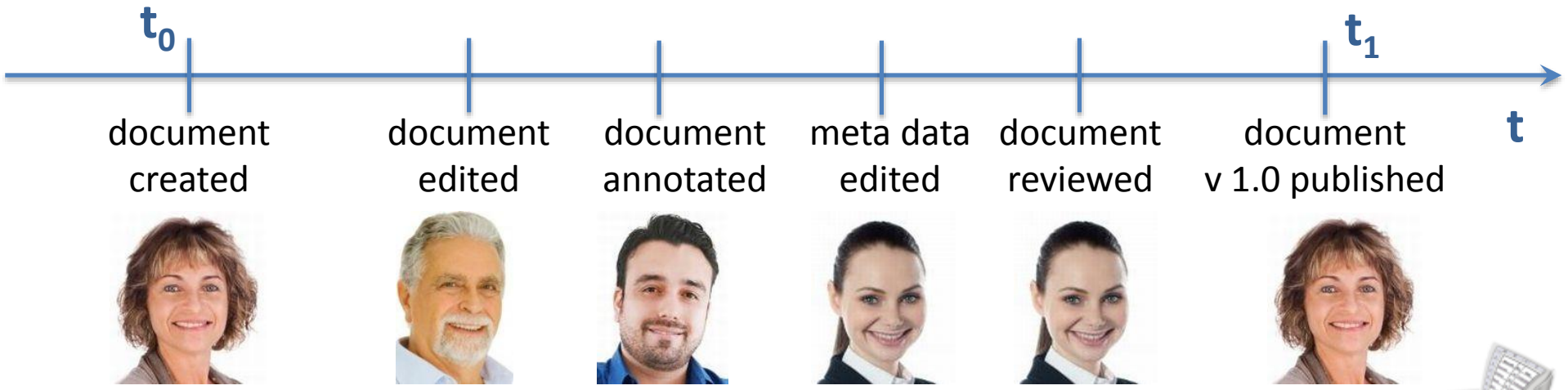
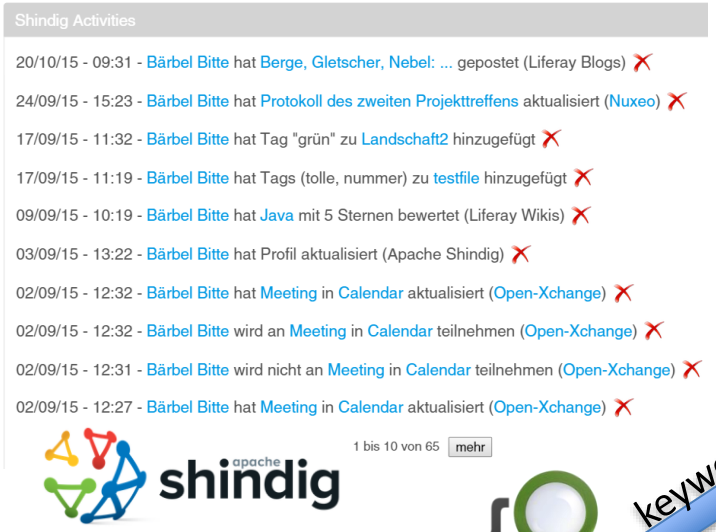
- User activities from all systems are collected in Apache Shindig (OpenSocial) and stored in neo4j (graph database)
- Document creation and publishing timestamp as a frame for the context
- Document type, title and headlines are used as semantic context
- Initial case creation
  - Suggest tasks and milestones
- Case enhancements
  - Suggest task patterns / sequences

Task recommendation algorithm explained



user group



activitites per user

elasticsearch.

keyword search

referenced content per activity

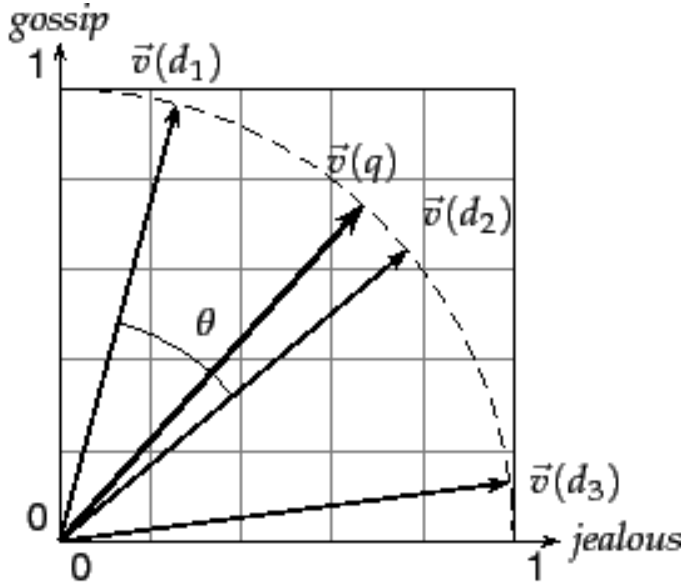
similarity

aggregated task candidates

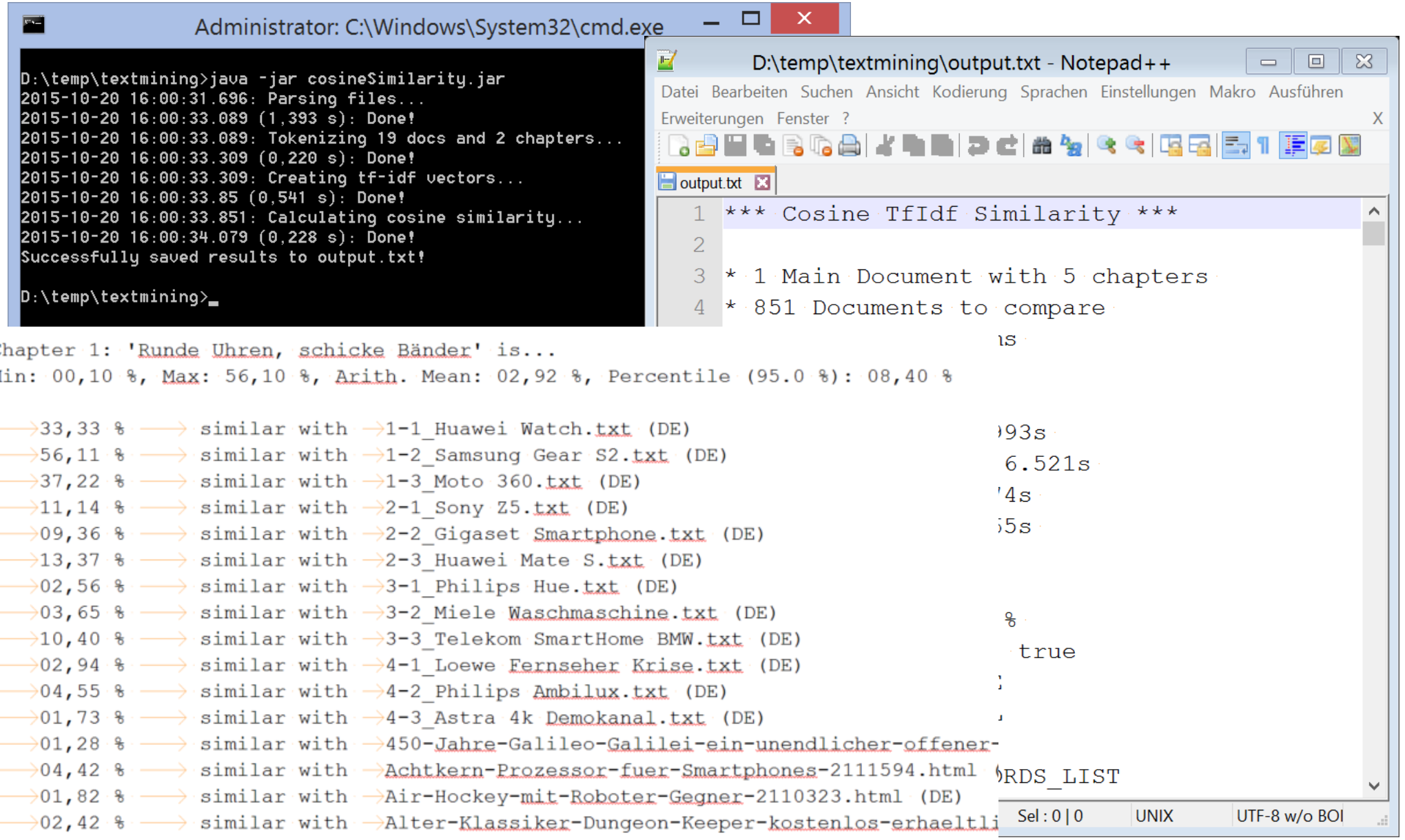
Content similarity

- One German and one English corpus for testing
- Two news sites each: heise.de, golem.de, cnn.com, bbc.co.uk
- Document consists of selected articles from one source
- Text files with news contents from both sources of the language as reference
- Text similarity is calculated for the whole document and for single chapters

- Term frequency * inverse document frequency
- For each content, calculate the vector
  of all tf*idf values
- Calculate cosine similarity of the vectors



Live demonstration



Abstracting activities into task descriptions

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- Result
  - Activities with content that is associated to a chapter of the document
  - Activity consists of verb, object (content), target (person or system)
  - List of people that contributed to the document (in-)directly

- If enough activities of a type are found, they have to be aggregated
  - Results are generic task descriptions

  + content-specific parts based on headlines of the document or titles / keywords of the referenced content

  + role descriptions of the people (contributors) in relation to the document author (e.g. department head) or in general (e.g. KM expert)

From people to roles

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- Possible relations on organizational level
  - Same department, same level
  - Same department, Superior/subordinate
  - Specific department (e.g. marketing)
  - Specific role / job description (e.g., project manager)

- Possible relations on the skill level
  - Same skill
  - Different skill
  - Specific skill set

People similarity / role abstraction

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- Information from LDAP user directory are synchronized to neo4j
  - Result: graph with **roles/job descriptions** and org hierarchy derived from „**manager**“ relationships and **department** field
- Information from skill management system (Apache Shindig / neo4j)
  - Result: **people – skill tag** relationships

- Typical graph operations like shortest path between two people show relation in the organization hierarchy.
- Drawback: user directory and skill mgmt system have to be filled properly

Components and their roles

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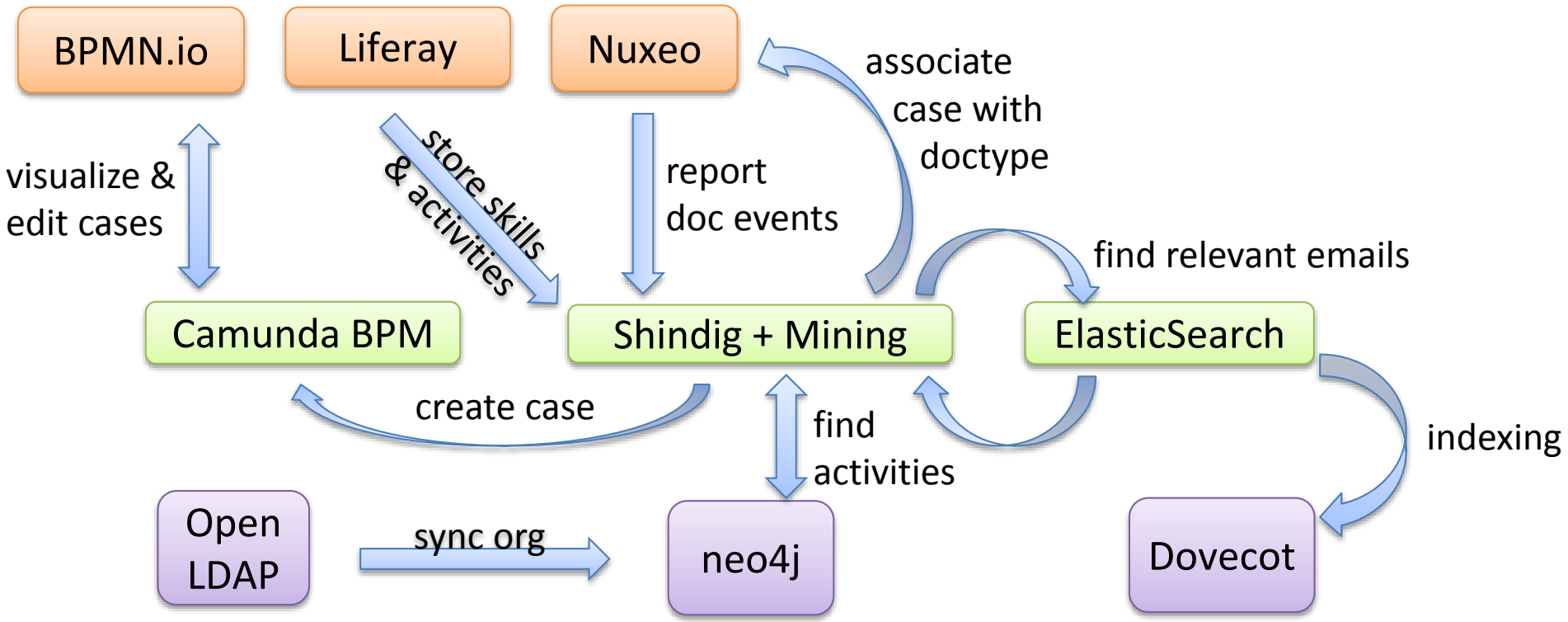

Conclusion

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- Combination of manual maturing steps (Web 2.0) and semi-automatic maturing (activity mining) seems promising
- Major challenges
  - Abstraction of concrete activities to general tasks
  - Abstraction of concrete users to formal roles
- (German) data protection laws have to be considered
  - Our solution does not present person-related data
- Evaluation with real life data is hard to perform
- CMMN editing capabilities for BPMN.io are on Camunda‘s roadmap

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BPM + ACM + Web 2.0 + Data Analytics!

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