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Pattern-based competence management: On the gap between intention and reality

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Modeling and Managing Competencies Session

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Agenda

- Motivation
- Competencies and Patterns
- Social Network Analysis Overview
- Agent and Goal-Oriented Modeling
- Modeling of Intention and Reality
- Pattern-based Competence Management
- Conclusions and Outlook

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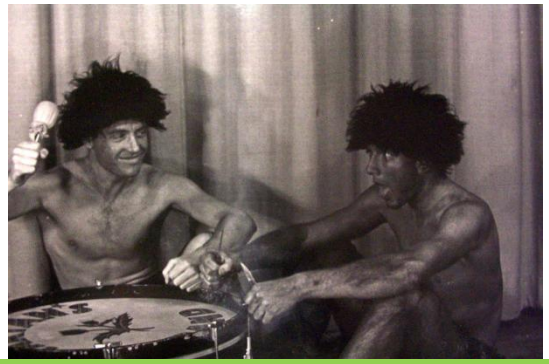
Intentions-Reality Gap



No students which are appropriate to organize an event

Teacher wants to organize an event for students with a high number of participants

Goals
Intentions

Gap identification

Activities
Interactions

The teacher asks students to organize an event

How to identify the Intention-Reality Gap?

- How should a collaborative network (CN) be modeled?
- Who are the actors in a CN and which dependencies exist between them?
- How to identify absence / presence of competencies in CN?
- Which competencies are required to bridge the gap?

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Competence Management

Identify the gap:

Competence management:

- Identify competencies
- Attach competencies to tasks

Bridge the gap:

Competence development =

Extending and Acquiring Expertise

Authors	Definition of competence
McClelland (1973)	*The knowledge, skills, traits, attitudes, self-concepts, values, or motives directly related to job performance or important life outcomes and shown to differentiate between superior and average performers.*
Kupper and van Wulfften Palthe (2001)	*The capability of people to perform in a function or a profession according to the qualifications they have. These qualifications should be expressed in terms of knowledge, skills and attitude.*

→ Detection of knowledge, skills, attitudes, and values of CN members

→ Definition of a set of competence needed for a particular task

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Patterns as Input of Competence Management

Pattern describes the problem that appear over and over again in our environment [Alex78]

Pattern name: ← Communicator

Pattern disturbance: Has interactions with many other CN members

Pattern description: A Communicator „reaches“ others in a few steps

Pattern forces: A Communicator, a CN, an Interaction, a Medium, a Person

Pattern forces relations: A Communicator and a Person are parts of a CN, a Communicator Interacts with a Person using a Medium

Pattern solution: ← Contact a Communicator to spread the word

Pattern rationale: ← reasoning about the forces and disturbances

Pattern relations: ← make the structure of pattern language clear

[KSD06]

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Social Network Analysis view on Collaborative Networks

i and *j* are collaborators in a collaborative network $\Gamma=(N,L)$, $(i, j) \in L$, where *L* is a set of links = interactions between collaborators

- The total distance $\sum_{j \in N} d(i, j)$, where *N* is a set of nodes
- The *closeness* is defined as: $c(i) \equiv \frac{1}{\sum_{j \in N} d(i, j)}$

→ How close is the node to the other nodes?
How *communicative* is the node *i*?

- Let Γ be connected, let the length of the shortest path be $v(j, k)$, and $v^i(j,k)$ be the shortest path through i.
  Then the *betweenness* of node *i* is $b^i \equiv \sum_{j \neq k} \frac{v^i(j, k)}{v(j, k)}$

→ How *influential* is the node *i*?
How often do the paths from the node *j* to the node *k* pass through the node *i*?

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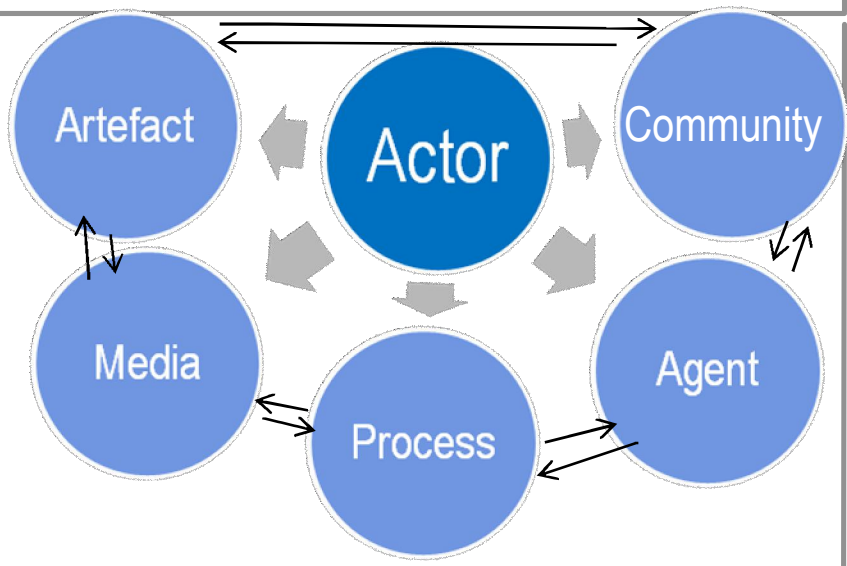
Methodology of Collaborative Network Modeling

Flaws of modeling techniques:

- Static relationships
- Without the context of the environment
- Focused on machine operations



[KlPe08]

Premises and features of i* [Yu09]

- actor autonomy
- intentionality
- sociality
- rationality
- boundaries and identities
- strategic reflectivity

Actor Network Theory [Lato87]:

- Extendable model (everything is an actor)
- Actors can be aggregated

Community of Practice [Weng98]

- Interactions
- Same goals
- Domain of knowledge

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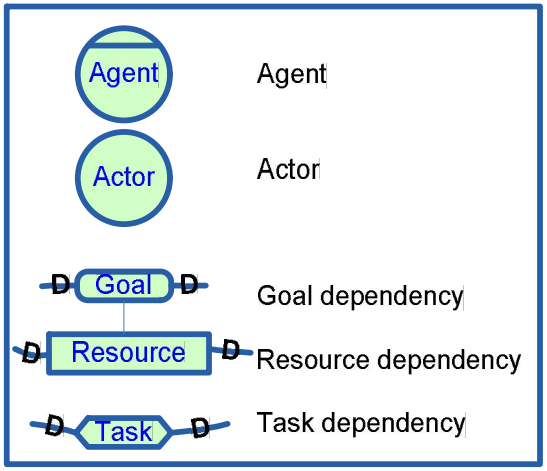
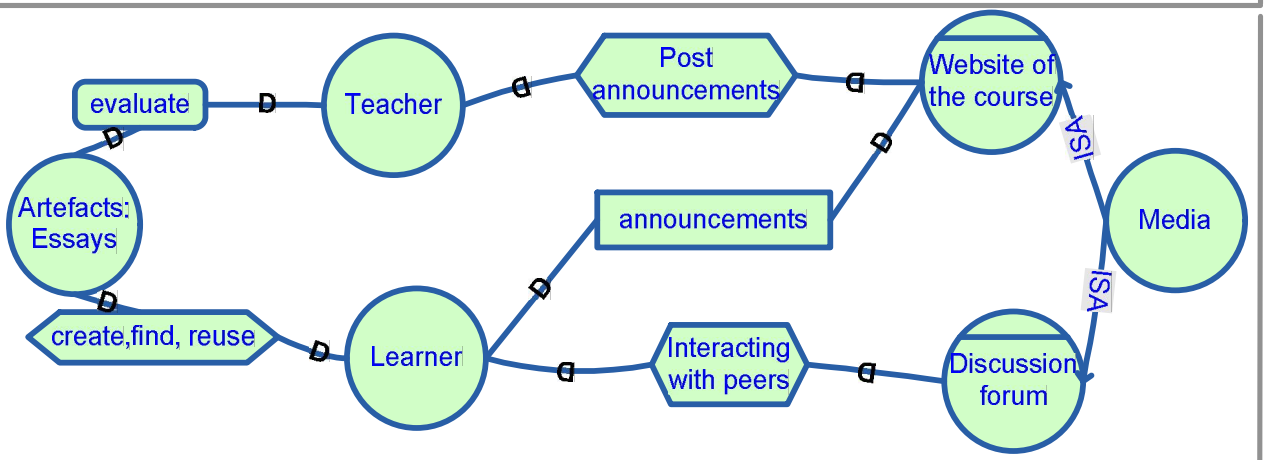
Modeling Collaborative Network Reality





Actor autonomy: actors are in the center; actors are autonomous

Intentionality: intentional properties and behaviors – Interacting with peers

Sociality: actors depend on other actors – Media –Learner

Rationality: actor actions are related to goals and motives - Evaluate

Strategic reflectivity: each actor reflects upon its relationships with other actors

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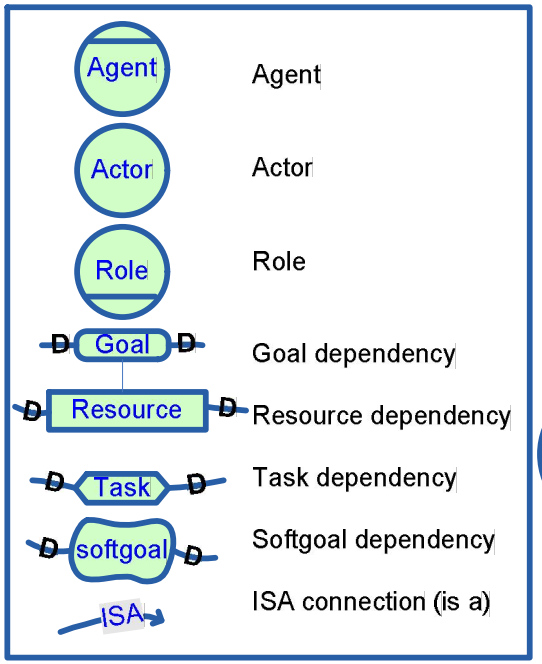
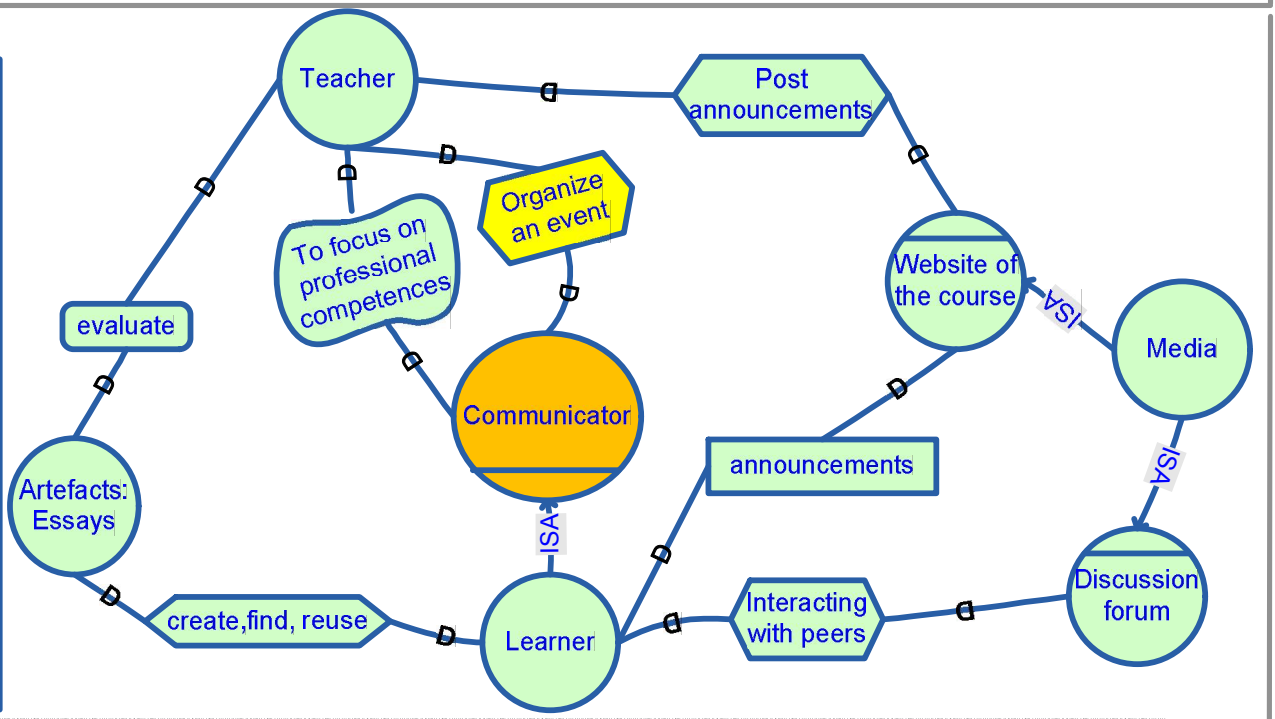
Modeling Collaborative Network Intention





Intentionality: Teacher wants to organize an event for students

Sociality: Teacher depends on Communicator in organizing an event

Rationality: Looking for a student with an organizing event competence

Strategic reflectivity: Give a task related to the event organization

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Pattern-Based Competence Management

1. Model a collaborative network
   - Define actors and their dependencies
   - Define actors‘ intentions
2. Analyze the network with Social Network Analysis
3. Define patterns using SNA measures
4. Based on SNA patterns and a CN model:
   - Possible to extract the competencies of the members
   - Identify the competencies that need to be acquired

Conclusions and Outlook

- i* Modeling fills the gap between intention and reality of collaborative networks
- Patterns serve as input of competence management
- Patterns should be based not only on structure of collaborative networks but as well take context and domain of knowledge into consideration
- Patterns should be empirically evaluated