Analyzing Knowledge Transfer Effectiveness – An Agent-Oriented Approach

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The „Knowledge Aspect“

Knowledge refers to

- Skills, heuristics and experiences of actors

Distinctions

- Implicit vs. explicit
- Pragmatic vs. scientific
- Inter-subjective vs. objective

Knowledge Management is concerned with the development of [organizational|technological|cognitive|...] tools for

- the identification, acquisition, generation, transfer application and storage of knowledge

Knowledge Transfer: Effective sharing of ideas, knowledge, or experience between units of a company or from a company to its customers. The knowledge can be either tangible or intangible. (MIT, Definitions for Inventing the Organization)
Knowledge Transfer
Background and State of the Art

Research on Knowledge Transfer focuses on:

- **Theories** [14, 21]
  - Focus on the Nature of Knowledge Transfer
  - Example: Knowledge Flow Theory

- **Modeling Languages** [10,11]
  - Identification, Visualization and Analysis of Knowledge Transfer Situations
  - Examples: B-KIDE, KODA, KMDL

- **Instruments** [3,6,17]
  - Improve and Facilitate Knowledge Transfer
  - Examples: Wikis, mentoring, experience factory
The Problem

Why is Knowledge Transfer Effectiveness difficult to assess?
Questions Related to Knowledge Transfer Effectiveness

- Who depends on knowledge of others?
- How is knowledge transfer executed and facilitated?
- What is the purpose and structure of knowledge transfer instruments?
- Under which conditions can a knowledge transfer instrument fail?
- What are the effects of knowledge transfer failure?
Example:  
A Knowledge Transfer Instrument

**Experience Factories** (EF) focus on the facilitation of Knowledge Transfer between Software Developers

Experience Base

- “Packages Experiences”

Goals

- Knowledge Transfer
- Knowledge Reuse

[3,17]
Barriers to Knowledge Transfer

Issues with the Experience Factory [7]:
- Lack of awareness, low information quality, low usage, expensive maintenance, context dependent

Issues with Knowledge Management in general [8]:
- Failure to align KM to org. goals, failure to connect KM to individuals, creation of repositories without defining the goals behind them, etc
Observations

Knowledge transfer effectiveness is related to the **participants** of knowledge transfer, and their **goals**

**Knowledge transfer instruments** themselves serve a purpose, and thereby pursue goals as well.

Therefore analyzing the goals of knowledge transfer participants is **critical to KM**, but difficult [9].

However, goal-modeling and analysis has received little attention so far in this context.
The Knowledge Transfer Agent Method

Proposes a three tiered approach to modeling Knowledge Transfer (KT) Participants and Instruments as Agents

Based on the intentional modeling framework i* [13]

Which enables

- Reasoning and arguing about KT participants’ goals
- Evaluating different degrees of KT effectiveness
- Understanding how and why KT instruments fail or succeed
The i* Framework [13]

An *agent oriented* early requirements modeling approach

- Strategic Dependency Diagrams (Agents’ Externals)
- Strategic Rationale Diagrams (Agents’ Internals)

Beneficial to KM

- Social actors
- Implicit knowledge / ability analysis
- Actor / Role Abstractions

However, no specific notion of "knowledge" — *Extensions necessary*
The i* Framework

Excerpt of the i* framework meta model

Based on [Den06]
How can we analyze effectiveness of knowledge transfer instruments?
The 3 Levels of Analysis
Extending the i* Framework

Level 1:
Identification of Knowledge Dependencies

Level 2:
Identification of Supportive Means per Knowledge Dependency

Level 3:
Reconceptualizing Supportive Means as Agents
A reconceptualization of Knowledge Transfer Instruments as Agents:

Definition: A knowledge transfer agent is an intentional human, organizational or technological actor that focuses on the facilitation of knowledge transfer between two or more other actors.
The Experience Factory Case

Experience Factories (EF) focus on the facilitation of Knowledge Transfer between Software Developers

Experience Consumer $\leftrightarrow$ Experience Factory $\leftrightarrow$ Experience Provider

EF constitute a Knowledge Transfer Agent

<table>
<thead>
<tr>
<th>KTA Concept</th>
<th>Experience Factory Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentional Actor</td>
<td>„Separate Organizational Entity“</td>
</tr>
<tr>
<td>Goal</td>
<td>„Facilitate Knowledge Transfer“</td>
</tr>
<tr>
<td>Participants</td>
<td>„Two or more software developers“</td>
</tr>
</tbody>
</table>
The Experience Factory Case

Questions

- Who **depends** on knowledge of others?
- How is knowledge transfer **executed** and **facilitated**?
- What is the **purpose** and **structure** of the experience factory concept?
- Under which **conditions** can the Experience Factory concept fail?
- What are the **effects of failure** to providing experiences?

Questions that can *not* be answered with traditional approaches
The Experience Factory Case
Level 1 Analysis

Identification of Knowledge Dependencies

Who depends on the knowledge of others?
The Experience Factory Case
Level 2 Analysis

Identification of Supportive Means per Knowledge Dependency

How is knowledge transfer executed and facilitated?
Reconceptualizing Supportive Means Agents

The Experience Factory Case
Level 3 Analysis

Experience consumer

n\textsuperscript{th} Label Propagation

Knowledge Transfer Agent

Experience factory

nth Label Propagation

2nd Label Propagation

Experience provider

What are the effects of failure to providing experiences?

Initial Assessment Label

1st Label Propagation

Experience factory

Initial Assessment Label

Experience provider

Develop and maintain software efficiently

Facilitate Inter-Project Experience Transfer

Provide project characteristics

Select adequate experience package

Develop and maintain software efficiently

Transfer experiences

Execute project

Project characteristics

Experience packages

Package experience packages

Less Lessons Learned

Experience Base

Analyze projects

Provide project support

What is the purpose and structure of employed knowledge transfer instruments?

What are the effects of failure to providing experiences?

Experience consumer

Develop and maintain software efficiently

Plan project

Provide project characteristics

Select adequate experience package

Initial Assessment Label

Less Lessons Learned

Less Lessons Learned

Less Lessons Learned

2nd Label Propagation

Experience consumer

nth Label Propagation

Knowledge Transfer Agent
The Experience Factory Case Additional Analysis

Under which conditions can the Experience Factory concept fail?
The KTA Method
Contributions

Enables Knowledge Analysts to

- Analyze knowledge transfer effectiveness in the light of (potentially conflicting) stakeholder goals
- Analyze how knowledge transfer instruments work, and why they can succeed or fail
- Transform KM problems into requirements engineering problems
Limitations

- Application so far only on a conceptual level
- Conclusions already known about the experience factory concept
- Validity of models
- Scalability
The KTA Method
Current & Future Work

An Empirical Case Study

- In cooperation with Bell Canada / Kids Help Phone
- Applying the KTA Method to the Kids Help Phone Counseling Centre Toronto (~100 employees)
- Deduction of implications for the design of the Kids Help Phone’s knowledge infrastructure,
  - incl. organizational and technological aspects
Thank You.

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Literature 1/2


