From Software Experience Databases to Learning Organizations

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Panel introduction at SEKE’99

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The four panel position papers are:

- **Kristin Halvorsen, ISI, Norway**: A Successful Software Knowledge Base.
- **Henrik M. Giaver, DNV, Norway**: Collecting, storing and utilising information about "improvement opportunities": A discussion of the non-technological barriers to success.
- **Dieter Rombach, Univ. Kaiserslautern, Germany**: The Software Factory Approach.
- **Reidar Conradi, NTNU, Norway**: From Software Experience Databases to Learning Organizations.
Introduction

- Knowledge management by experience databases (EXDBs): is gradually getting into use.
- Ex. in banking, oil production and ship building, as well as for software engineering.
- I.e. create and sustain a learning organization, to achieve better quality = satisfied customers.
Some useful definitions

**Knowledge**: use of facts, truths or principles from studies or investigations – i.e. *operational info* by a person or group.

– **Explicit knowledge**: can be formalized,  
  e.g. as process models in a quality system.
– **Tacit knowledge**: operational skills among practitioners,  
  including “intuition”.

**Ease of transfer** of local vs. global knowledge.

**Ease of use** of programmable (often explicit) vs. unique (often tacit) knowledge:

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<thead>
<tr>
<th>Type</th>
<th>Local</th>
<th>Global</th>
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| Programmable| *Easy to transfer,*  
  *fits only certain cases.*  
  Ex. Bill prefers C++. | *Easy to transfer,*  
  *fits in many cases.*  
  Ex. Filling in time-sheets. |
| Unique      | *Difficult to transfer,*  
  *fits only certain cases.*  
  Ex. Unix maintenance.     | *Difficult to transfer,*  
  *fits in many cases.*  
  Ex. Running big projects. |
Knowledge transfer between one/many senders and one/many receivers:

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Sender</th>
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<tbody>
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<td>One</td>
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<td>* Talks</td>
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Sum-up on knowledge and learning:

Many types of knowledge and knowledge transfer. Which of these facilitate or represent learning? Learning requires formal training & informal info exchange.

Many theories of learning, e.g. Senge book from 1995. Often a learning process (cycle):
Some reflections:

Much effort spent in the “upward, externalizing” direction.

The **hard part** is the **“downward, internalizing” flow**. That is, how to make an impact on current practice?
⇒ Encourage unselfish recording, synthesis and sharing of experiences.

**Organizational learning**: the ability of groups to improve their results based on new knowledge – but how?

1. **Internal knowledge organizations** (Experience Factories, EFs) can structure and facilitate knowledge transfer at the Project-Organizational level, e.g. by training and consulting.

2. **Goal-Question-Metrics (GQM) method** can facilitate knowledge management at the Individual-Person level, e.g. by regular feedback sessions.
Some examples of experience databases in SPIQ

Six companies design, implement and deploy simple EXDBs, e.g.:

- **Company X1**, consultancy house: 140 developers mostly with MSc/PhD degrees. Much OO, AI, GUI.
  A web-based **corporate memory**, storing administrative information, personnel competence profiles, overall project routines (not a full quality system), and news.

- **Company X2**, telecom software house: 600 developers.
  Administrative systems for telecom.
  A web-based **quality system**, and an **estimation tool** using data from 50 previous projects.
  The former: mostly introduced “over the head” of people, with little after-use of reported, project experiences.
  The latter: aimed at project managers, but hard to get into actual use. And SPI efforts hampered by major reorganizations.

- **Company X3**, consultancy house: 500 developers.
  A web-based **Information Well** using Microsoft Exchange. Stores general company and personnel information, as well as domain/dev.method information. Each method or domain subarea has a responsible person.
  Increasingly used by managers and consultants; but versioning problems (.doc/.xls/.ppt files vs. tools). Also reorganizations lately.
Organizational Learning by Experience Databases?

- General precursor for all organizational change and SPI is commitment and consensus.
  Needs a rather flat organization with a democratic culture?
- Another precursor is sufficient organizational stability, say, for 4-5 years.
  Big market/technological changes: what about organizational ones?
  Ex. Ericsson, Norway: 70% new IT products in 3 years.

- Long-term goal: an egoless approach to share experiences, good or bad.
  But respect high-risk projects and privacy issues.

- Web: an excellent vehicle to store and disseminate info.
  But avoid data cemeteries and old/irrelevant info.
  Use more sophisticated search methods (data mining)?

- An experience base is not a technical gadget,
  a vehicle for organizational learning and SPI.
  Ex. Do software engineers have necessary “social” competence?
• **Validity**: Must compare present and previous status, e.g. fuzzy baselines and evolving processes?

• **Start slowly**: get commitment, select promising areas (estimation, risk analysis etc.), and provide early feedback.

• **Costs and benefits of an EXDB**: assess regularly. Requires a common, internal investment rate?
EF costs: the 11% at NASA-SEL is unrealistic – try 1-2%?

Normal developers may play parts of EF role in SMEs?