Consideration of Dynamics in Knowledge Prioritization - Preparing an Efficient Company-Internal Knowledge Transfer

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Agenda

• Introduction in the Institute and its focus

• Background of the project

• Representing knowledge and its structure with knowledge maps

• How to prioritize knowledge preparing a successful transfer

• Future work
TUM Faculties

Center of Life and Food Science
Weihenstephan

Mechanical Engineering
Mathematics
Physics
Informatics
Electrical Engineering and Information Technology

Sports Science
TUM SCHOOL OF EDUCATION

Medicine
Chemistry
Architecture

Business Administration
Civil Engineering and Surveying
Activities of the Institute

Processes

Methods

Situation

Tools

Research

Teaching
Research Areas

Innovation & Creativity
Systems Engineering
Engineering Processes
Knowledge Transfer & Knowledge Management
Cost Management
Background of the research project

Why an efficient knowledge transfer is necessary!?
Industry partners

• 2 companies from Bavaria

• OEM for banknote counting and inspecting machines (Large company)

• Supplier for electric circuit protection devices (SME)
Procedure and objectives of the project

• Procedure
  1. Institute advertised the governmental-funded knowledge transfer project and won the two industry companies for participating
  2. Researchers developed the transfer methodology and adapted the contents of the work packages after periodic workshops with representatives from the companies
  3. Methodology is evaluated and documented currently (finishes 2-year project)

• Objectives
  – Improvement and enhancement the found knowledge domains
  – Development of a way to elicit knowledge and create knowledge maps without additional staff – by employees themselves
  – Development of the holistic knowledge transfer methodology
  – Consideration and integration of practically relevant circumstances
Improving the company-internal knowledge transfer with knowledge maps

Knowledge Map
- Graphical representation of knowledge (of an employee) in the form of a map
- Different types of knowledge elements
- Relations between knowledge elements
Improving the company-internal knowledge transfer with knowledge maps

Rough procedure of developed methodology for knowledge transfer:
1. Elicitation of knowledge and representing it with knowledge maps
2. Comparison of knowledge maps for identifying knowledge lacks
3. Prioritization of knowledge to be transferred due to scarce resources
4. Use of knowledge based company-internal systems where possible to reduce face-to-face effort
5. Personal knowledge transfer of remaining knowledge between mentor and mentee
How to generate a knowledge map:

- Generating knowledge map with interview dialog running in open source software Gephi and Python
- No moderator needed (costs)
Exemplary knowledge map from case study

- 100 knowledge elements
- 190 relations
- Highly interconnected

The labels of knowledge elements are hidden due to secrecy!
Previous work in knowledge prioritization

- Knowledge element 1 Requires Task 1
- Knowledge element 2 Requires Task 2 and Task 3
- Knowledge element 3 Requires Task 2 and Task 3
- Knowledge element 4 Requires Task 2 and Task 3

Graph:
- Input vs. Output
- Efficiency = Output / Input

 Criticism: static consideration of prioritization ranking
Enhancement of the Approach and Dynamization

Which element will get the highest prioritization after transferring this highest ranked knowledge element? (Highly interconnected elements!)

One or both of these second highest ranked elements or will another element get the highest prioritization?
Enhancement of the approach and dynamization – exxemple

t = 0

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
<th>Efficiency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>10</td>
<td>2</td>
<td>0,20</td>
</tr>
<tr>
<td>K2</td>
<td>8</td>
<td>1</td>
<td>0,13</td>
</tr>
<tr>
<td>K3</td>
<td>8</td>
<td>2</td>
<td>0,25</td>
</tr>
<tr>
<td>K4</td>
<td>0</td>
<td>0</td>
<td>0,00</td>
</tr>
<tr>
<td>K5</td>
<td>10</td>
<td>4</td>
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<tr>
<td>K6</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>K7</td>
<td>9</td>
<td>2</td>
<td>0,22</td>
</tr>
<tr>
<td>K8</td>
<td>9</td>
<td>1</td>
<td>0,11</td>
</tr>
<tr>
<td>K9</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>K10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Enhancement of the approach and dynamization – example

$t = 1$

K1 \rightarrow K8 \rightarrow T3 \rightarrow K7

\begin{tabular}{|c|c|c|c|c|}
\hline
INPUT & OUTPUT & Efficiency & Rank \\
\hline
K1 & 7 & 2 & 0.29 & 3 \\
K2 & 5 & 1 & 0.20 & 5 \\
K3 & 5 & 2 & 0.40 & 2 \\
K4 & 0 & 0 & 0.00 & 6 \\
K5 & & & & \\
K6 & & & & \\
K7 & 4 & 2 & 0.50 & 1 \\
K8 & 4 & 1 & 0.25 & 4 \\
K9 & 0 & 0 & 0 & 6 \\
K10 & & & & \\
\hline
\end{tabular}

K Knowledge element
T Task
Depiction in the input-output-portfolio

\[ t = 0 \]

\[ t = 1 \]

- K7 gets a higher efficiency rate

➢ Note: Elements don’t have to but they can change their positions due to their interrelations after transferring a certain other one!
Future Work

• Weighting of added output depending on enabling “only” another knowledge element or a task
  \[ K \leftarrow K \Rightarrow 0.5 \]
  \[ K \leftarrow T \Rightarrow 1.0 \]

• Enhancing the totally numerical approach through integrating the effort for learning specific knowledge elements estimated by mentors
Thank you for your attention!

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