Applying the Structural Complexity Management to Knowledge Transfer in Small and Medium-Sized Companies

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FESTO

TESEON
complexity under control

Produktentwicklung

TLM
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Initial situation

- Products & services become more knowledge driven

- Transfer of personnel knowledge represents a competitive factor

- Knowledge assures the company's core competences and unique characteristics

- Need for safeguard organizational memory

- Technical-driven solutions for knowledge transfer gain more economical importance

- Such solutions often neglect dependencies that make bits of information useful

- **FESTO introduced additional forms of transfer to stimulate communication of knowledge**

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Problem

- Employees are forced to acquire more knowledge in shorter time
- Half-life of existing knowledge is decreasing
→ **Necessity of lifelong learning**

- Knowledge management systems inadequate for SMEs
→ **Knowledge about dependencies difficult to communicate**

- Less available specialists remain at a company for less time, but generate more complex knowledge during their employment

- **Need for a highly effective and efficient method of knowledge transfer that can be applied without intense prior preparation**
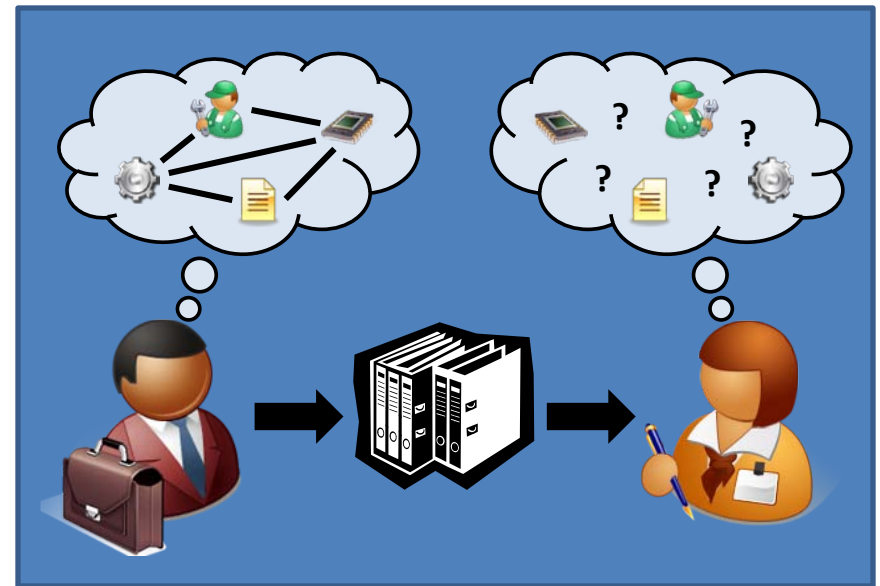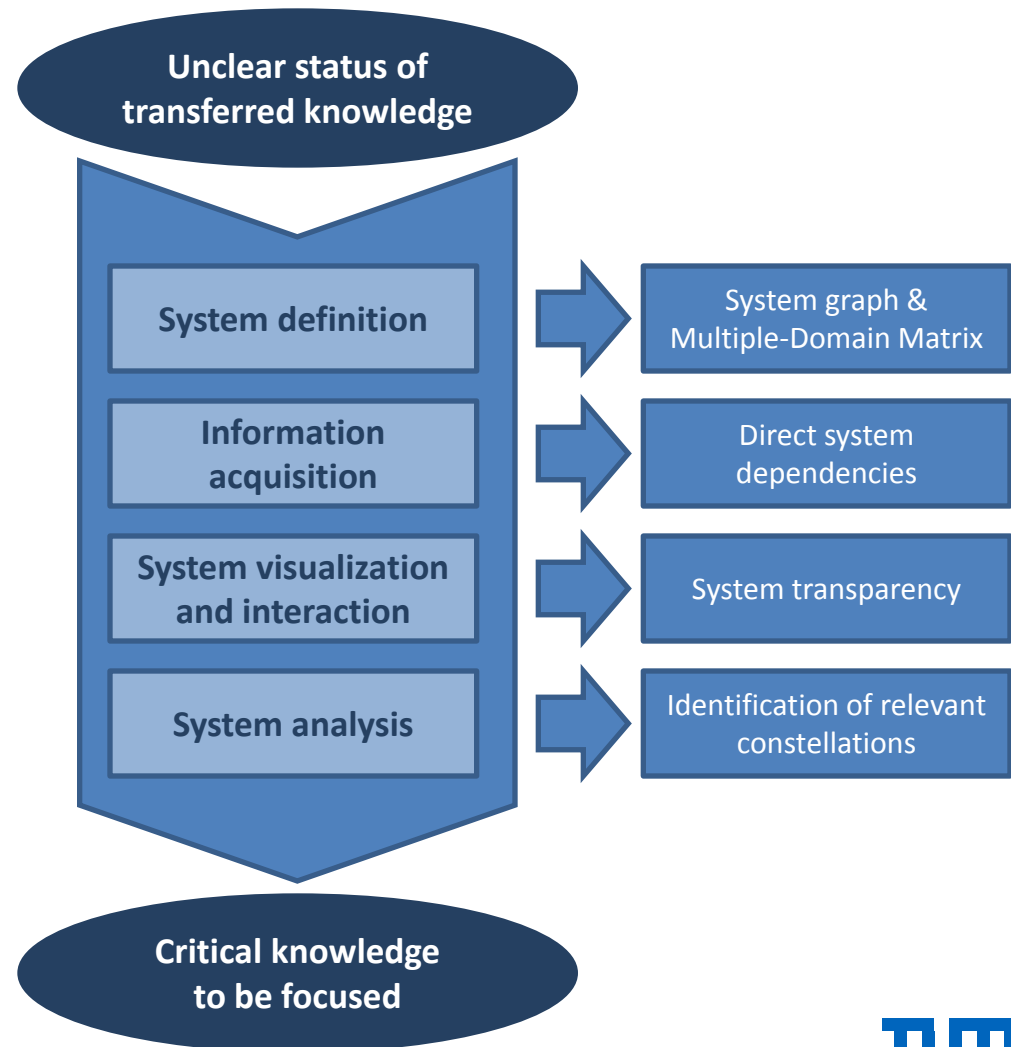
Approach: Basic idea

- Specific requirements for knowledge transfer in SMEs
    - High transfer frequency
    - Short time slots
    - Maintaining a high quality of transferred knowledge

→ **Transfer method must be easy to apply**

→ **Involvement of a moderator**

→ **Software support for**
    - **Information acquisition**
   - **Visualization**
    - **Analysis**
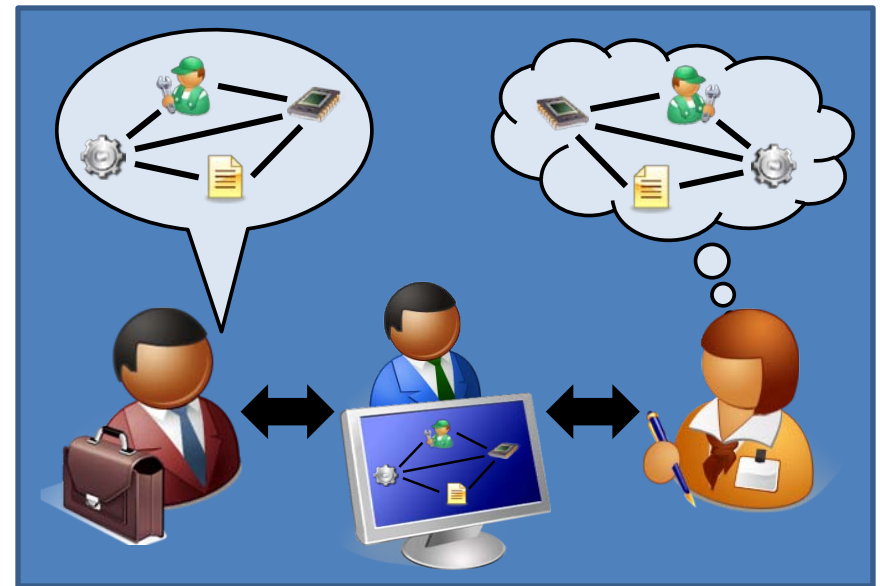
Approach: Four-step model

- Which knowledge components receptors require for executing relevant tasks?

- Which differences exist between the expert and the knowledge receptor in the handling of tasks and competences?

→ **Systematic approach based on the "Structural Complexity Management"**

Unclear status of transferred knowledge

System definition	System graph & Multiple-Domain Matrix
Information acquisition	Direct system dependencies
System visualization and interaction	System transparency
System analysis	Identification of relevant constellations

**Critical knowledge to be focused**

System definition

- Identification of relevant domains
- Definition of general dependencies → system graph
- MDM form is basis for the information acquisition
- Generic model can be adapted to specific use cases
- → **The adequate system definition is highly decisive for subsequent effort and quality of the transfer process**
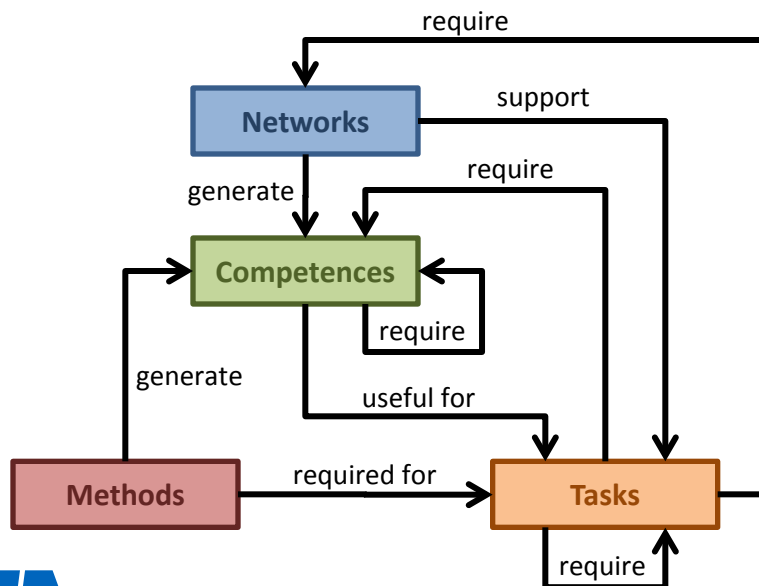
	Tasks	Compe-tences	Networks	Methods
Tasks		require	require	require
Competences	useful for		require	
Networks	support	generate		
Methods	required for	generate		

Information acquisition

- Interviews with experts required
- Mind map as basic collection of elements
- ~100 knowledge elements
- 6000 possible dependencies
- Half of the matrix can be excluded from consideration
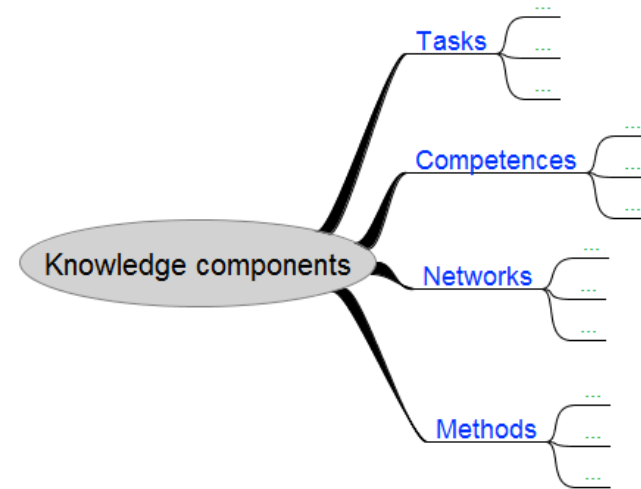
→ **Information acquisition represents the most time-demanding part of the presented approach**

→ **Resulting network quality depends on the quality of information acquisition**

	Tasks	Competences	Networks	Methods
Tasks	X	X	X	
Competences	X	X		
Networks	X			
Methods	X			

|	T1	T2	T3	...
N1		X		
N2	X			X
...		X	X	

System visualization and interaction

- Knowledge components arranged in four domain blocks

- Expert specified more than 800 dependencies

→ **entire network can not provide deeper insight**

- But: local surrounding of specific knowledge components can be helpful

- Interaction with graph representation allows problem specific access to the knowledge network.
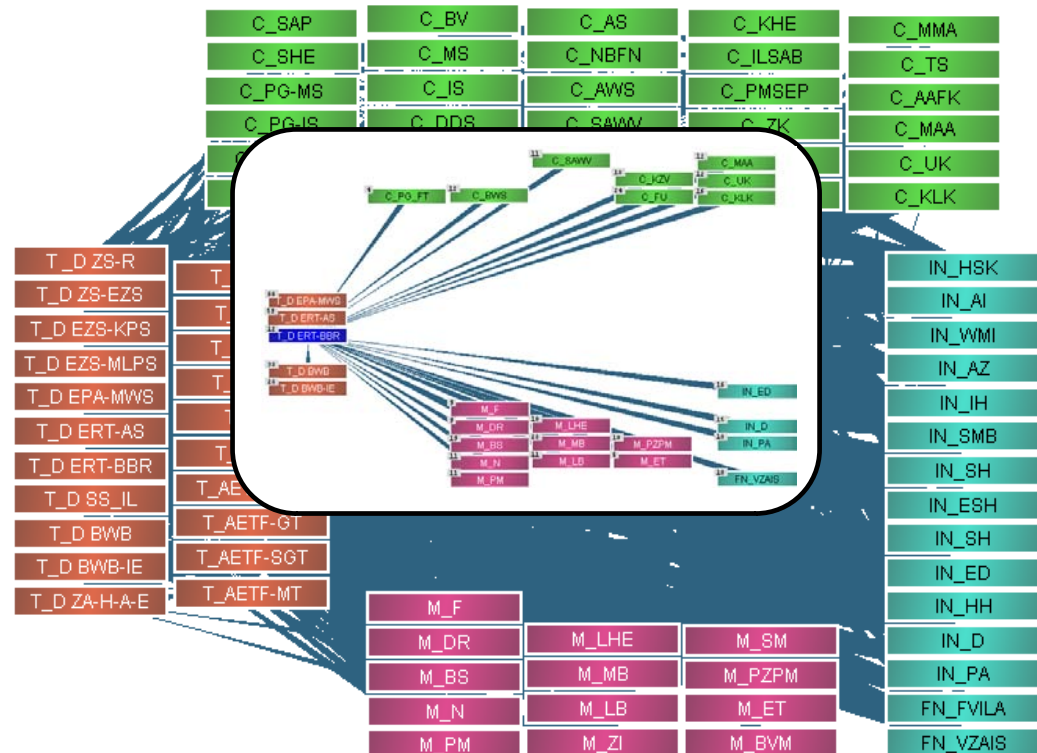
System analysis: Required knowledge packages

- **Which knowledge components does the receptor require for executing relevant tasks?**

- Visualization of non-familiar knowledge components (knowledge receptor)
- Non-familiar tasks not linked to further components
  → Learning by doing
- Non-familiar tasks linked to further components
 **→ Combined teaching (package)**
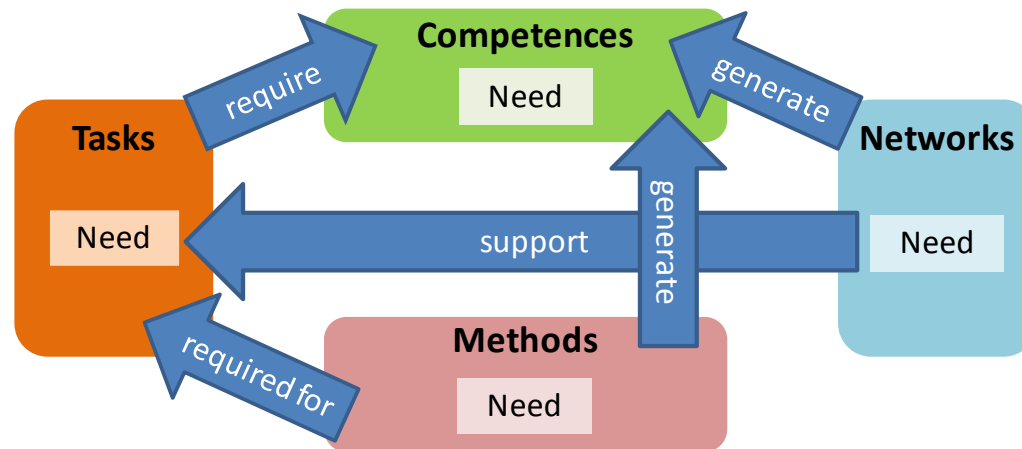
System analysis: Different management of tasks

- **Which differences exist between the expert and the knowledge receptor in the handling of tasks and competences?**

- Visualization of familiar tasks and competences (knowledge receptor)
- Visualization of non-familiar networks and methods (knowledge receptor)
- Familiar task connected to non-familiar network or method
  → **Discrepancy in task processing**

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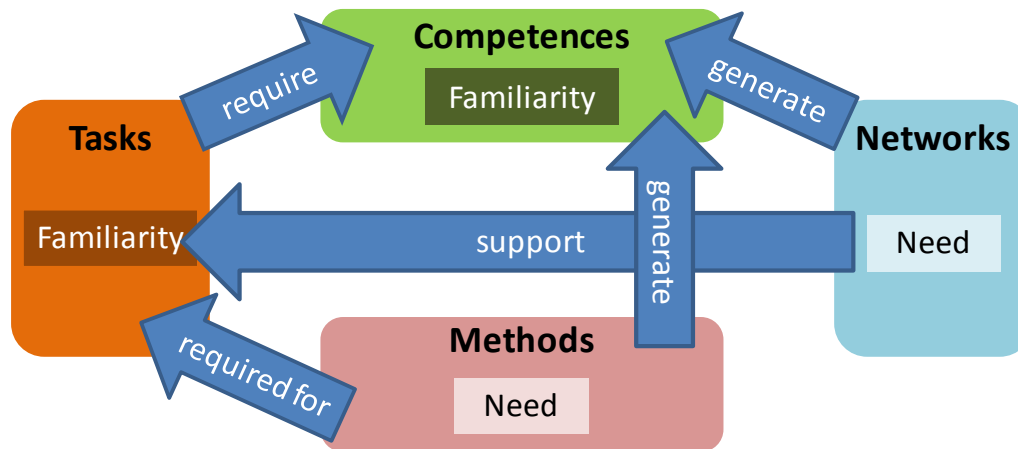
Project application

- **Scope:** ~100 knowledge components

- **Invest on knowledge network**
  - Knowledge owner: 2 days for network compilation
  - Knowledge receptor: 1 hour for specification of knowledge level
  - Moderator: 4 days for workshops and preparation

- **Result**
  - Determination of teaching strategies for knowledge components
    - Learning by doing
    - Packaging
  - Identification of discrepancies in handling specific tasks
  - → **Focus on relevant points of discussion**
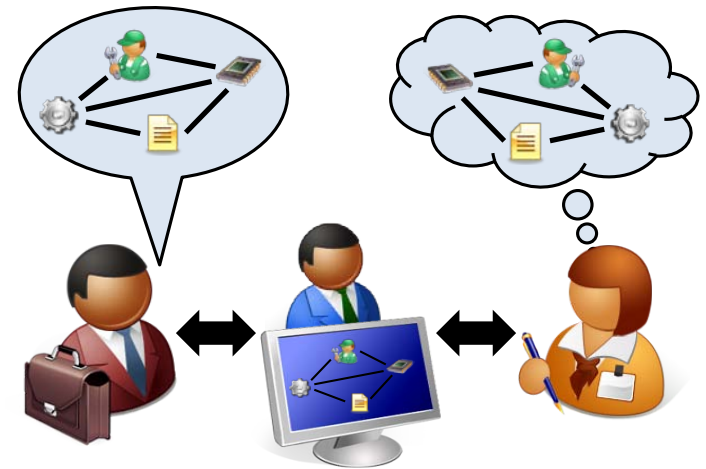
Conclusion and outlook

- Methodical knowledge transfer process has to meet specific requirements
    - High transfer frequency
    - Short time slots for transfers
    - Remain high quality of transferred knowledge

- Newly created approach displayed good usability in practice
    - Involved employees did not need intense method training
    - Only little time required for information acquisition
    - Identification of significant knowledge packages for closer consideration
    - Identification of discrepancies in task handling

- **Simplification and acceleration for the knowledge transfer process**
- **Required amount of effort acceptable for SMEs**