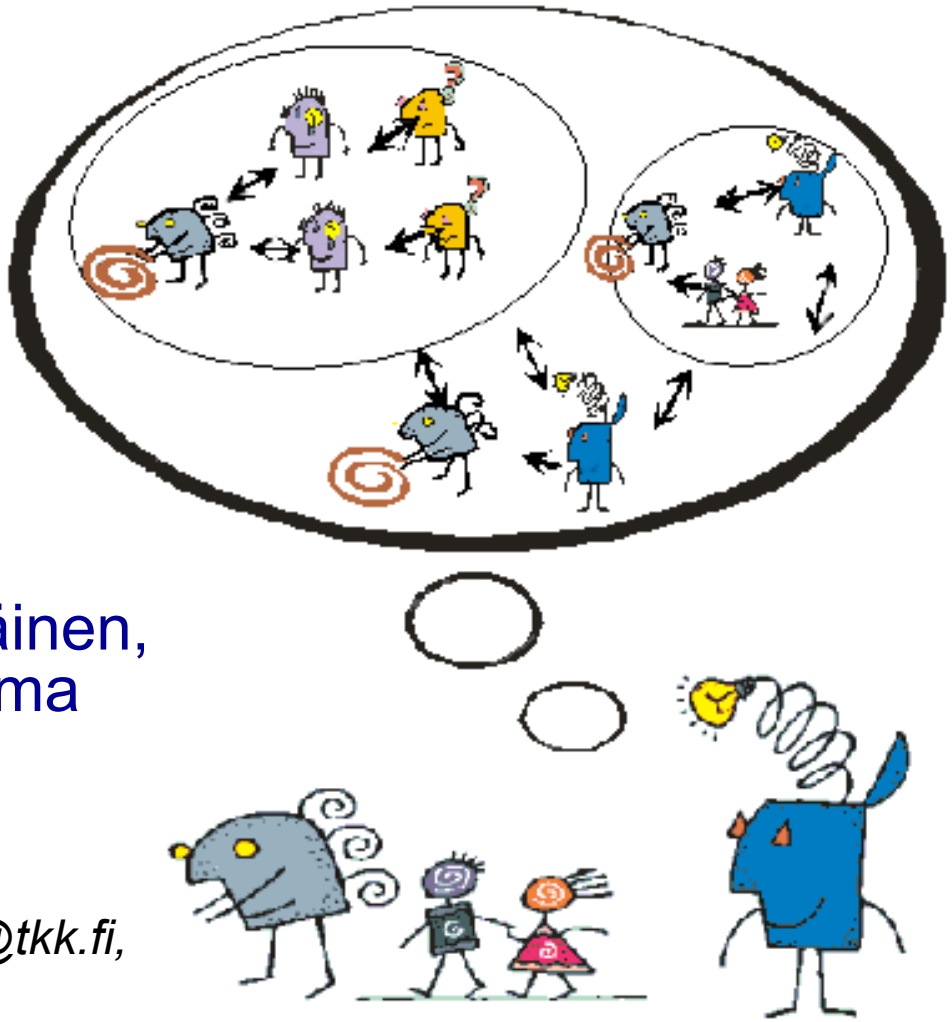
Systems Intelligence Thinking as Engineering Philosophy



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Our message

- Systems thinking and systems intelligence provide a fruitful lens through which to look at what engineering philosophy really is:
- Engineers face systemic challenges in systemic environments
- Expanding the concept of heuristics to include explicit heuristics, implicit heuristics-in-use, and metaheuristics
- Playing is an essential part of the engineering mindset

Systems intelligence (SI)

- Intelligent behaviour in the context of complex systems involving interaction, dynamics and feedback
- A subject acting with **Systems Intelligence** engages successfully and productively with the holistic feedback mechanisms of her environment

Systems intelligence

- An endowment people/engineers have and use
- Involves both cognitive and rational as well as affective and sensitivities-based components

→Ability to act intelligently even when we are lacking objective description of the system

Engineering philosophy

- Explicating and using the mindset of an engineer
- Cornerstone text:
- **Billy V. Koen: Discussion of the Method – Conducting the Engineer's Approach to Problem Solving (2003)**

Koen's perspective

- Engineering method: "The use of heuristics to cause the best change in a poorly understood situation within the available resources"
- Engineering thinking as a mode of being-in-the-world that emphasizes **improvement and action**

Engineering thinking as the Universal Method

- The human condition is to live in a world where change is necessary but uncertainty is inevitable

→To be human is to be an engineer

- Heuristic as the ultimate and necessary tool in realizing change

Systems thinking in engineering philosophy

- Engineers work with and from within systems
- How one frames the system defines what the problem is and what solutions one sees
- Today the engineering challenges are increasingly systemic

→The call for systemic perspective in describing engineering philosophy

Widening the concept of heuristics

- *Heuristic* as explicit and tool-like object (Koen) is not enough
- Often the heuristic-in-use is actually tacit

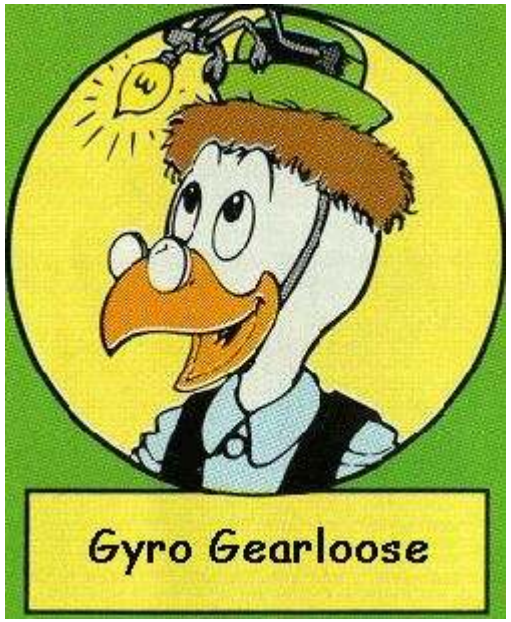
→*Heuristics-in-use* as implicit and tacit

- The choice of heuristics must be made using something wider than an explicit heuristic

→*Metaheuristics* as heuristics for choosing among heuristics

Playing

- Is a deeply human way of learning
- Playfulness enhances creativity and broadens the perspective
- A method for engineers to reframe the problem definition and heuristic for an innovation



Frame: Too long waiting time for an elevator

Frame: Pleasant elevator experience

Systems intelligence as a metaheuristic

- Action-orientedness
- Change for the better
- The incompleteness of all models and frameworks
- Actors' embeddedness in the system
- Our natural ability to act intelligently in complex systems

SI as a metaheuristic to screen available heuristics

- Systems intelligence thinking is a way to screen available heuristics and possibly develop a new one
- In systemic environment it is often not obvious what is the best strategy for causing the best possible change

SI as a metaheuristic to take the implicit into account

- Engaged in the world we need to act using what seems like the best heuristic
- The best available heuristics can in many cases turn out to be instinctual and pre-rational
- Systems intelligence legitimates the use of these tacit heuristics-in-use

SI as a metaheuristic includes learning by playing

- The engineering method includes letting go of narrow task-orientation
- Playing with the problem often results in innovative engineering
- Is the engineering philosophy the interplay of task-oriented and playful modes-of-being?

Conclusion

- **Systems intelligence** as a metaheuristic complements the description of engineering philosophy
- The engineer is always in a systemic environment

→Testing the need for reframing is essential

- Improvement can be brought about also by:

→spontaneous heuristic-in-use (and not only by deliberately chosen explicit heuristic)

→learning through playing

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