Shared Visions and Visualization
–
Enabling Forces for Individuals, Teams, and Organizations

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Shared Visions and Visualization

Some scattered personal reflections after spending a life in academic environments, teaching several engineering disciplines, and researching several industrial organizations and projects.

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I think most people have made similar observations and arrived at about the same conclusions. However, with very little impact on our actions or our behavior.

Shared Visions and Visualization

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- The complexity of our social, organizational, and technical systems is at such a level that contributions from experts and practitioners from many disciplines, sectors, and cultures, will be needed to understand and jointly solve the evolving problems.
- The development speed. In most cases, you have to frequently expand what you have understood and experienced before, to include new and unknown concepts and components.

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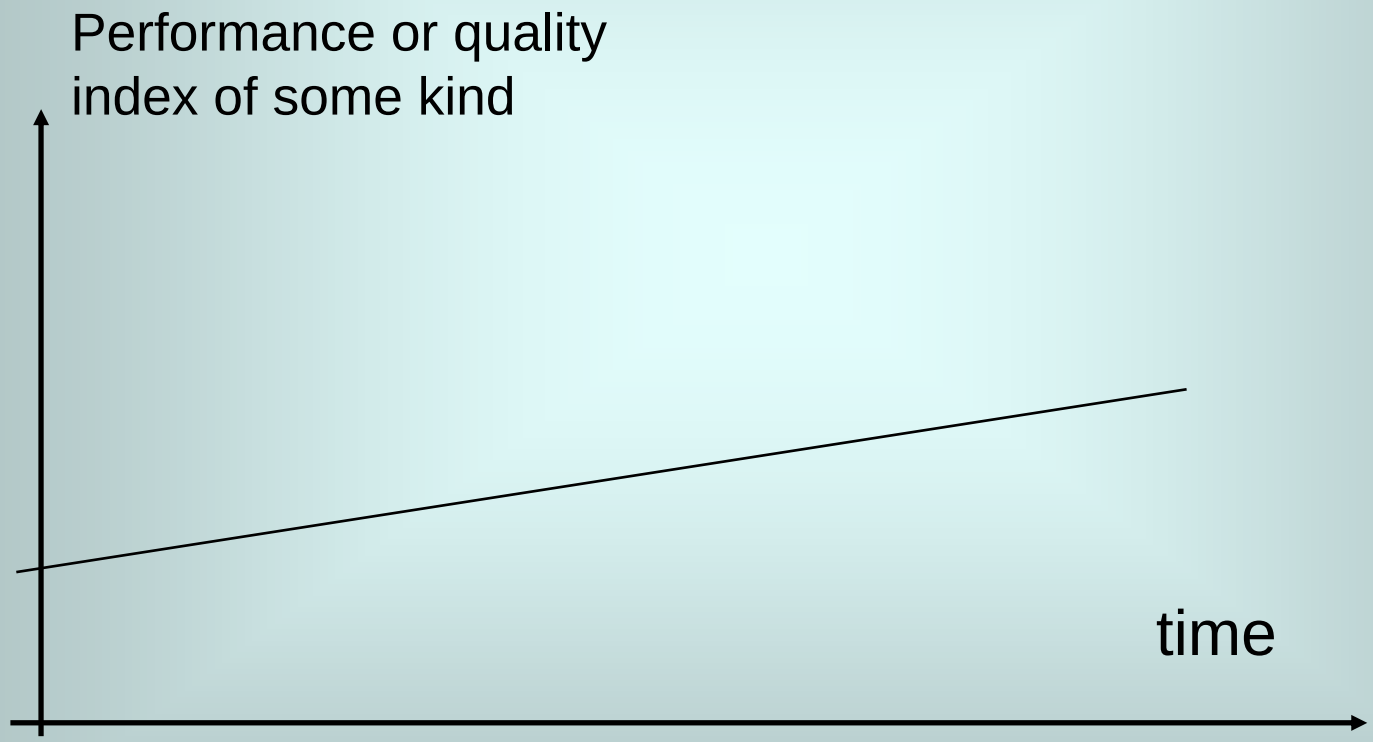
- The development of World Wide Web with Wikipedia, Google, YouTube *etc*. as components in a continuously growing and always available global multimedia library.
- By means of visualization, maybe in the shape of 3-D virtual reality, we are able to make our imagination available to be explored interactively by others
- Achievements in cognitive science based on *e.g.* better instruments like *Magnetic Resonance Imaging*, MRI, to study brain processes, and *Artificial Neural Networks*, ANN. to model and simulate them, have enabled an emerging understanding of the biological basis for the learning and thinking processes.

Shared Visions and Visualization

Accumulation of knowledge and experience.
The *process improvement* paradigm



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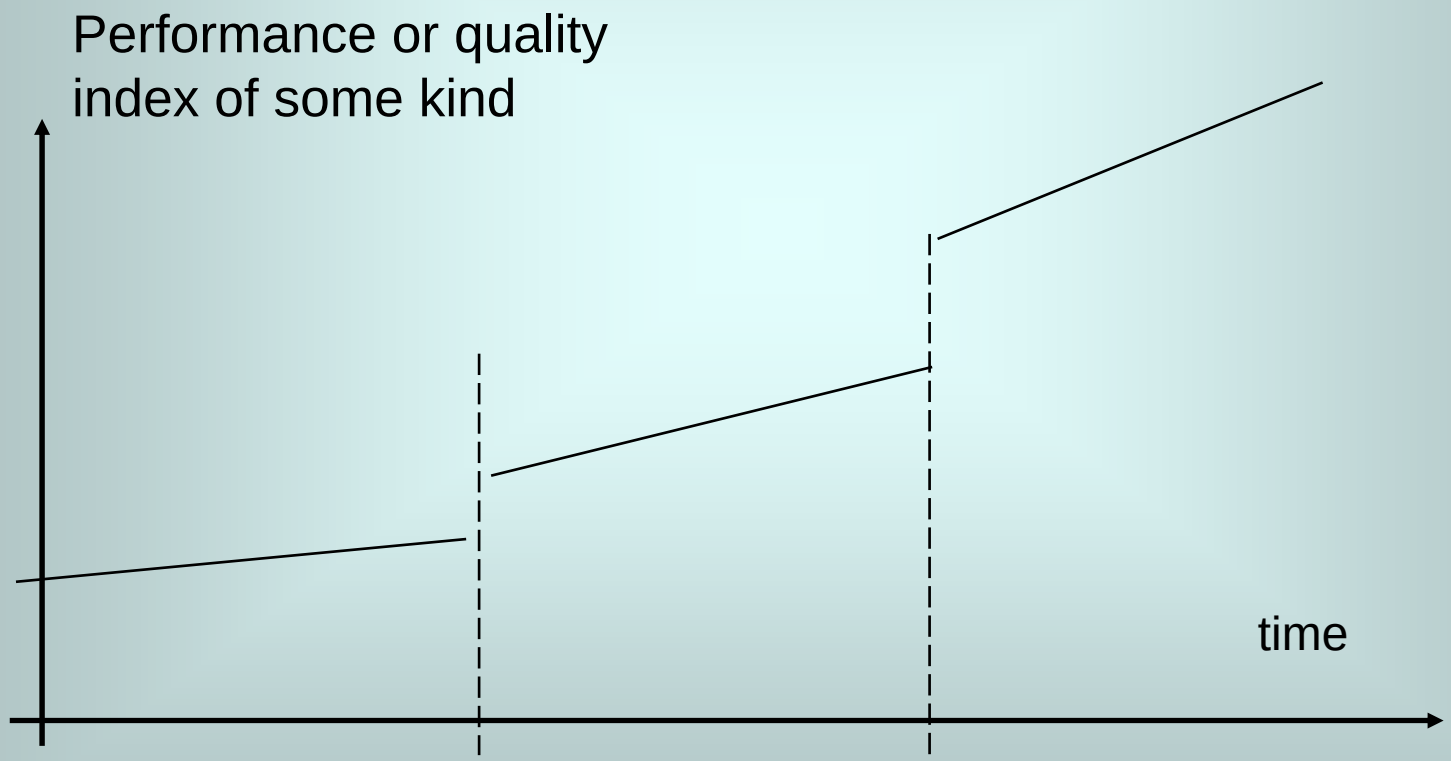
Improvement by paradigm or technology shift *(kairyo).*



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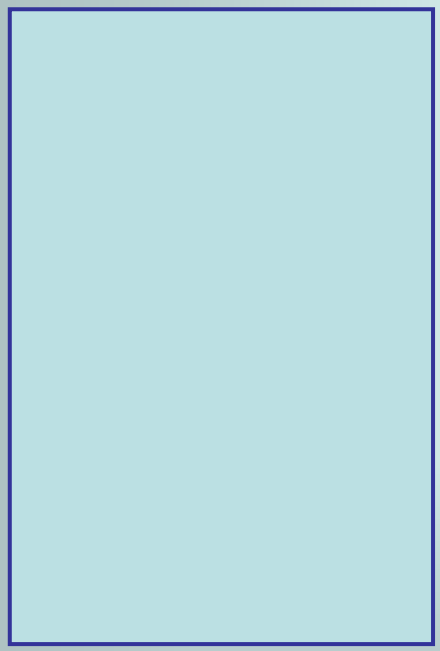
The Taxén study of AXE-10 development subprojects at Ericsson during the 1990s.

Initial requirements,
defined after screening:



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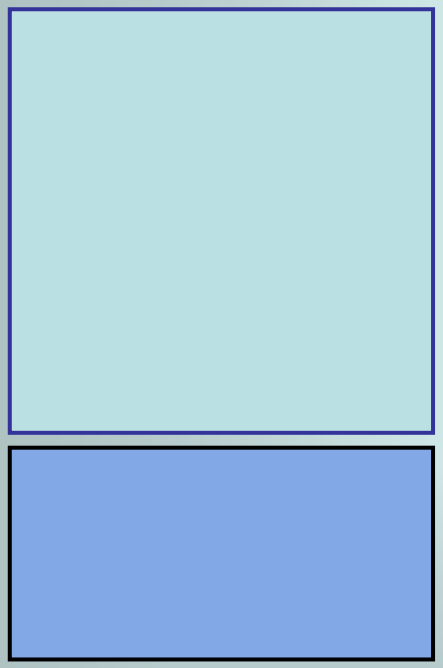

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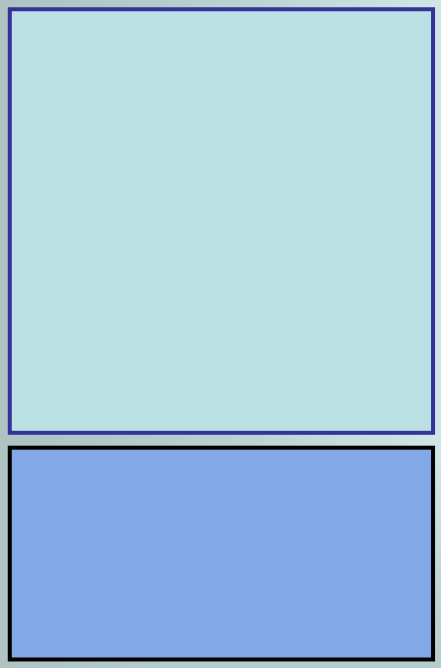

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About two thirds of the requirement spec. survived.

Functionality delivered at the end of project.

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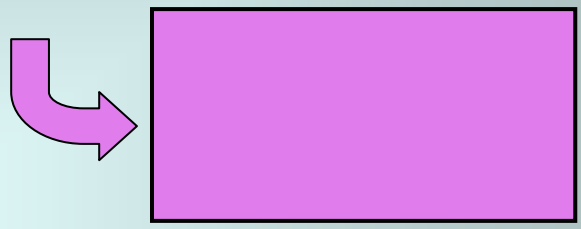
Typically about 30% of the functionality delivered was not considered in the initial requirements.



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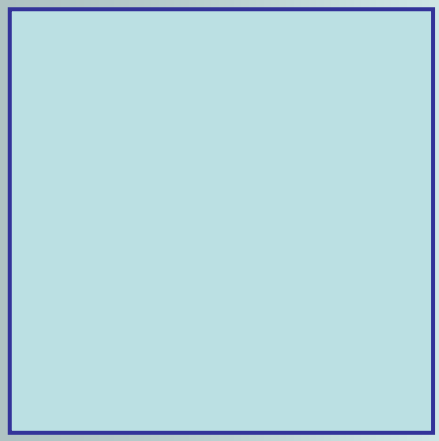

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Ground-breaking project:

- New hardware architecture, distributed, Ethernet based.
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Use of traditional document based development model, DOD-STD-2167A, was prescribed.

Development of all the specification documents required was a major effort.

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They found, that despite all the documents required were in place, these didn't answer the question arising in the later phases, simply because the team responsible could not possibly foresee these matters at specification time.

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However, this team was still available within the company.

They had, in their previous specification task, developed a broad and deep general understanding, and had now, as a team, jointly the capacity to answer the new questions.

Hence, all the specification files required were as such of little value, but the requirement to produce them had enabled the team to solve the new problems and answer the new questions

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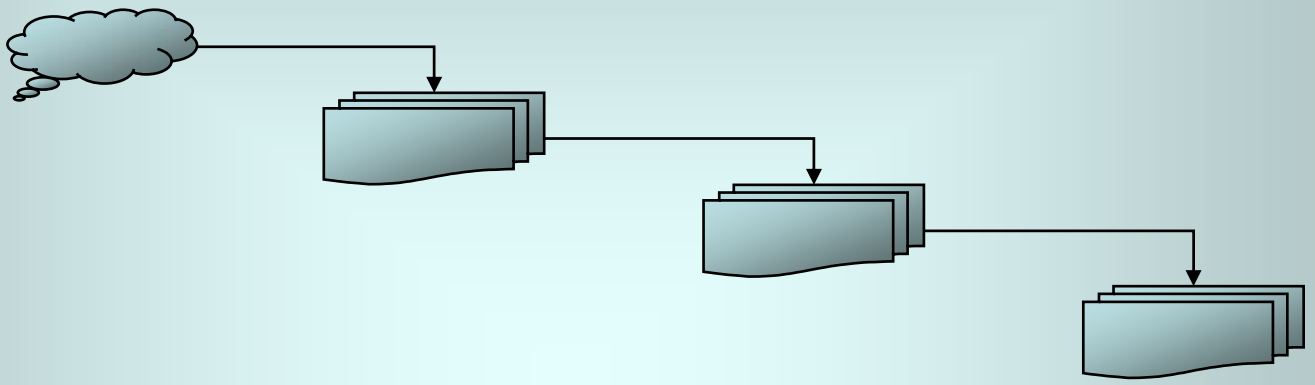
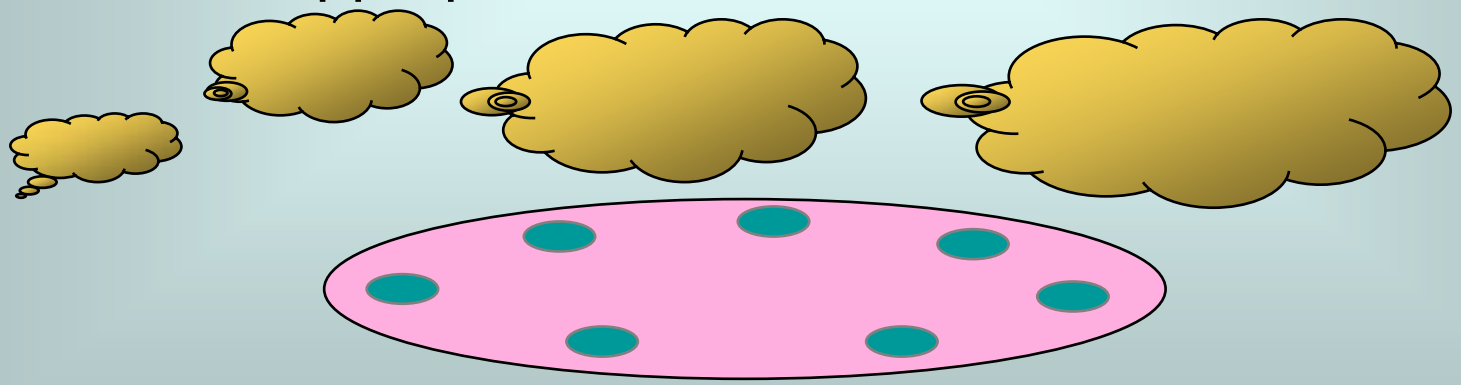
Document based models didn't work in the PEAB case



A model based on team learning and shared understanding was more appropriate



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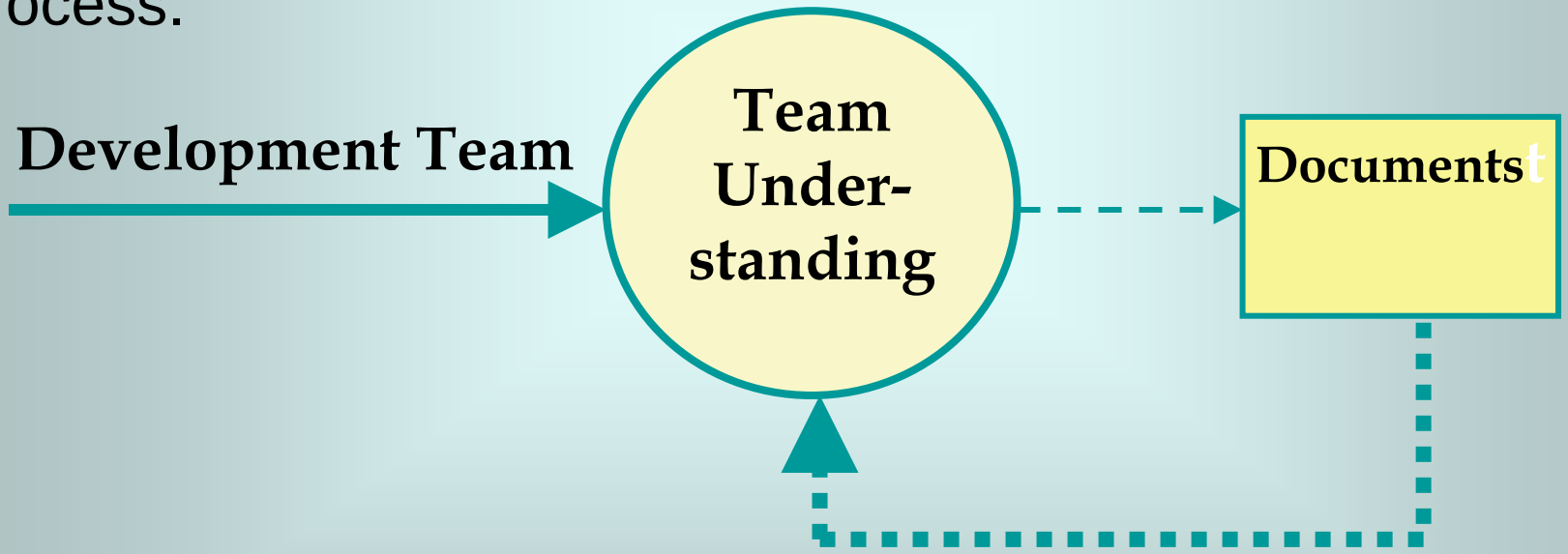
The new System Development Model based on the development, supply, and maintenance of shared visions and shared understanding. The main purpose of the documents is not to convey information, but to activate the team learning process.



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Whirlpool, Microwave Oven Business Unit. Case study 1997-2001, Lennartsson *et.al.* 2004, Ekinge 2001.

There were two interesting activities to study:

1. The establishment of *socratic leadership* locally in the development group in Norrköping

2. The communication in the heterogeneous global team of marketing and sales managers.

Shared Visions and Visualization

Whirlpool. *Socratic leadership*.

One observation in the first case was that the process to change the mind-set in the group was a very ambitious one. The transfer from the mental model of doing what one was told to do, to a role where thinking and questioning were as essential as doing.
This was really a group process where everybody had to be involved. When a new member was hired to the group, the process had to re-start almost from the beginning. The results achieved, in terms of shared understanding and mental models, could not easily be captured by words and diagrams and transferred to the new member.

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Whirlpool. Communication in the heterogeneous team.

The members of this team came from different countries, had different mother tongues, different ages, had different cultural, religious, and educational backgrounds, and had a balance of women and men. What was interest was that the difference in language as such was a minor problem. Cooking and meal preparation in general were very different in different cultures. It was obvious that the different views of cooking could not be conveyed by words. Rather, a shared experience as recorded by all senses, from the different real meal preparation processes would have been needed, to enable understanding of other person's comments and arguments.

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Ericsson's Mega-project: GSM development. Taxén 2003, 2009.

Just as in the PEAB case presented earlier, the major difficulty in this case, was the lack of prior experience from similar projects or similar systems. However, the two cases differed in the orders of magnitude.

Ericsson had over 10,000 people involved in the GSM development, spread in many different countries.

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Ericsson's Megaproject: GSM development. Taxén 2003, 2009.

Needed: A model and related tools to enable *dynamic and global coordination* of all the people, subprojects and subsystems involved.

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Constraint: This coordination had to be distributed and highly participatory, as the required experience and understanding was gathered by all the people involved, and displayed, discussed and accumulated in the global organization. The process could not possibly be controlled top-down hierarchically by traditional means, as the experience, terms, concepts or understanding reguired, were not yet available.

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Ericsson's Megaproject:
GSM development. Taxén 2003, 2009.

Approach:

A model, *functional anatomies,* with *entities* (terms, concepts, activities, components, units, events, deliveries, etc.), *attributes* (anything appropriate) and *relations* (anything appropriate). The major concern in the model is *the resources* (of all kinds) needed for the different activities.

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An existing tool, *Matrix*, able to store, display and instantly update the model and to focus on a selected subfokus.

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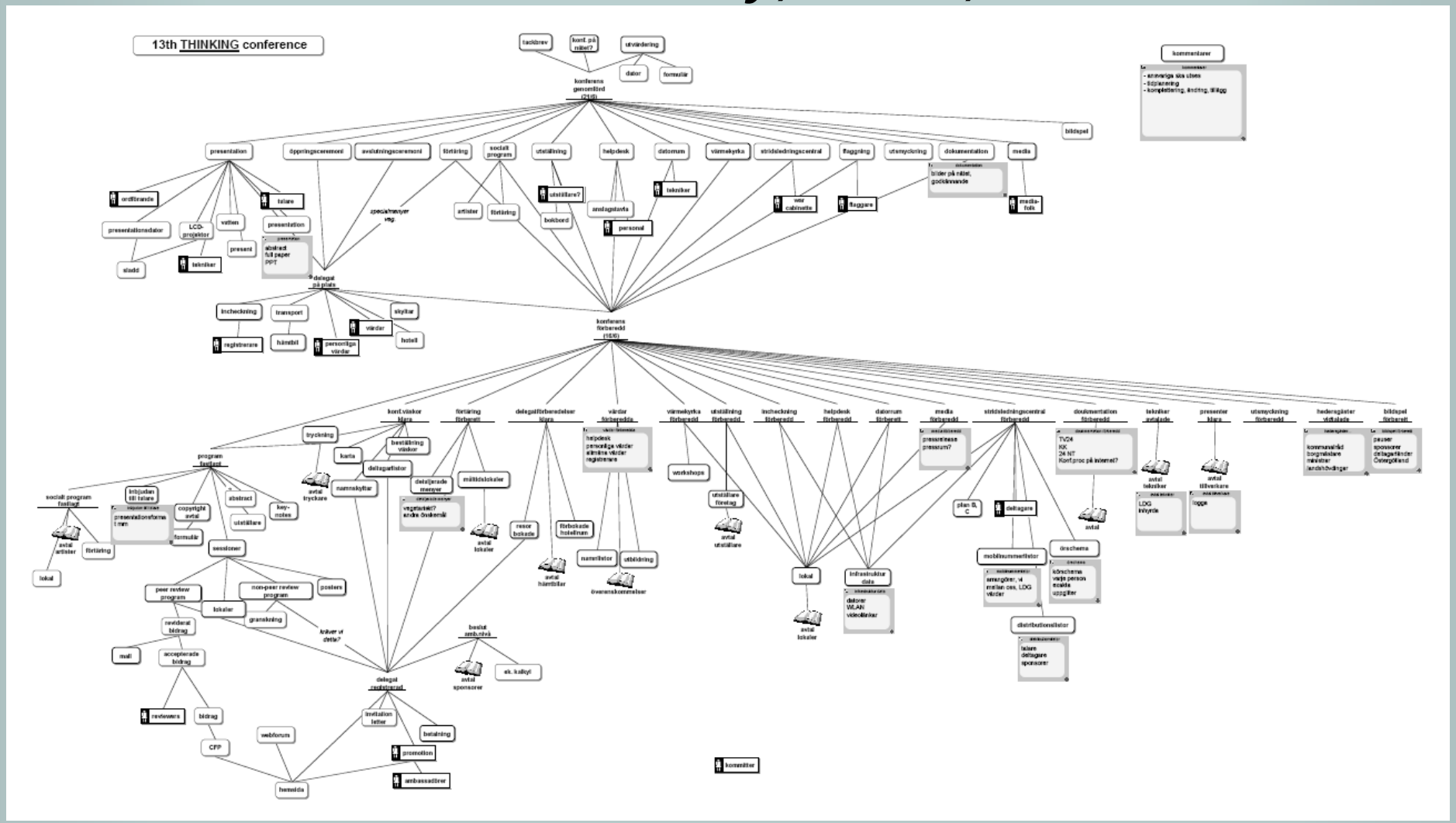
Theoretical foundation: *Activity domain theory*.
Taxén, L. (in press, Nov-2009): *Using Activity Domain Theory for the Management of Complex Systems*. Hershey, USA.

Planning the 13th ICOT June 2007.

Functional anatomy, Dec.19, 2006.



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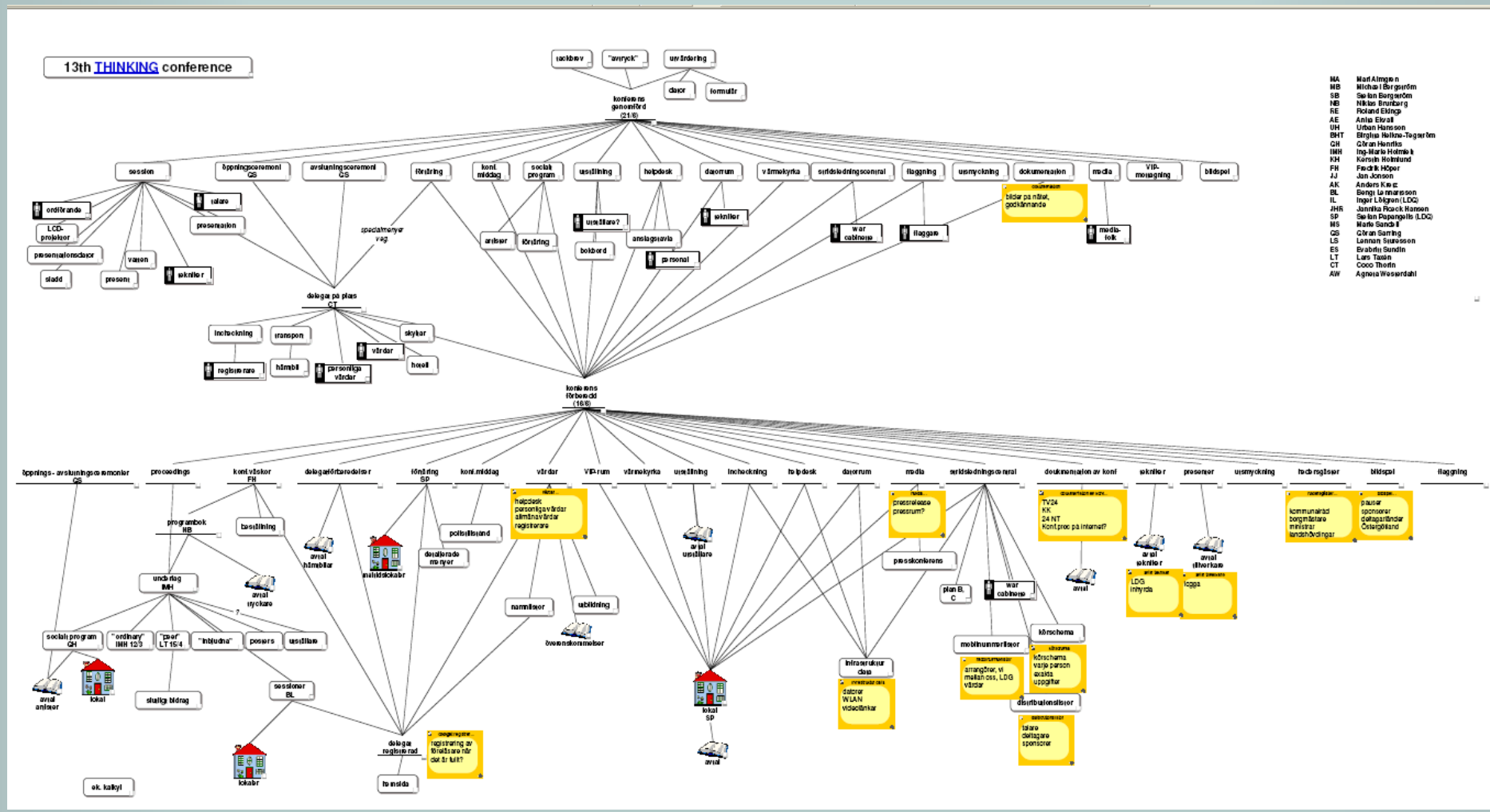
Functional anatomy, March. 8, 2007.



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Bottom-up vs. Top-down learning

Traditionally the scientific approach, or maybe the systematic one in general, has been bottom up. Basic concepts and phenomena are introduced first, and from them more complex structures have been build in a logical and consistent way.

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Bottom-up vs. Top-down learning

Traditionally the scientific approach, or maybe the systematic one in general, has been bottom up. Basic concepts and phenomena are introduced first, and from them more complex structures have been build in a logical and consistent way.

The alternative, top-down, is common in social science. You observe the totality, categorize objects, record data, try to recognize familiar patterns, etc.

One drawback with bottom up is that it will take long time until you reach the ”real world” at the top. It may take more than a life-time.

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Bottom-up vs. Top-down learning

Object Oriented system development evolved in the early 1960s and gained a widespread acceptance in the 1990s.

Programming languages Simula, Smalltalk, C++, java allow top-down as well as bottom-up approaches.

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Bottom-up vs. Top-down learning

Which of the two strategies is used in our brains?

What is ”top” and what is ”bottom”?

Conscious and sub-conscious brain processes?

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Common practical teaching experience:

- Using all senses
- Learning by doing, sometimes by imitating
- *Dialogs* and *group discussions* to clarify and resolve different views and interpretations.
- Individualize
  - Consider different *learning styles* and *mental models*
  - Consider and build upon prior *experience, knowledge*, *cultural background, etc.*

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Fragments from neuroscience and behavior science

Microscopic: Proteins, chemical and electrical interaction between the different kinds of brain cells, neurons, etc.

Macroscopic: Perception, automatic responses, conscious thinking, emotions, concious actions, behavior, learning, communication and social interaction, creative ability, etc.

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Some known subconscious processes:

- Knee, eye *etc*. reflexes
- Blind sight
- Processing of lexemes and phonemes
- Sixth sense (pheromones) ??
- *etc.*

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Fragments from neuroscience and behavior science, relating macro to micro

- Impacts from different brain damages
- Microscopic measurements and interventions on mammal brains
- EEG, human brain scanning, etc
- Reflexes, subconscious responses
- *Artificial Neural Network*, ANN, modeling

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Hypothesis:

Our learning and (re-)thinking are ***not*** primarily in terms of verbal concepts, rather on associations with and between recorded perceptions from previously experienced situations.

The focus on reading textbooks, and written examinations in university education, as well as project models based on delivery of text documents, may not me optimal.

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Many of us can probably agree, verbally, but we have resisted real learning, *i.e.* changing our mental models and our behavior.

Thanks for your attention!

Footprints of the 13th ICOT

The 13th International Conference on Thinking

Norrköping, Sweden
17-21 June 2007

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