Co-creative Companions for Cyber-Social Teaming

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Agenda

- Some Words about Digitalization and the Age of Smart X
- What does it mean to make people and things smart?
- Co-Creative Companions
- Summary and Conclusion
Digitalization generates a new quality of interconnectedness.

We are now at the verge where any real life event becomes instantly globally connected to the digital domain.
However, facing the implications of the digital change are a challenge.

- **Structural Complexity**
  - Trend towards specialization together with the increasing degree of connectivity

- **Data Complexity**
  - Information overload in production and logistics is growing disproportionately high

- **Product Complexity**
  - Demand for individuality is growing with its opportunities that «batch size one» is getting reality

- **Interaction Complexity**
  - Participation in virtual life is increasing due to more open systems and interconnectedness

There is a need for a paradigm shift towards **simplicity** where smart systems support us to manage complexity.

Source: inspired by Michael ten Hompel

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The world is getting “smart” ...
But what is smart ...
Smartness addresses many aspects but it starts from the level of data

- **‘War for Talents’**  The European market will have a shortage of skilled workers of some 50 million in 2030¹

- **Economic Nomadism**  Beside cost aspects enterprises will locate where the are most likely to find suitable and high qualified employees and partners

- **Digital Taylorism**  Tendency towards segmentation of knowledge work with the effect that factual knowledge is partially transferred to machines

Sources:  
(1) Study on "8 Billion Business Opportunities – HR goes global", Roland Berger Consulting (2012)  
(2) Study on „The Future of Manufacturing“, Deloitte Consulting (2014)
Competence building is on central interest for each business unit, but it is not only limited to human beings anymore.
Classical pool learning loses its impact because of shorter innovation cycles.

New products and services at the same time increase communication intensity.

Technology affects information need affects new technologies.

„Artificial Intelligence as a power amplifier“
- Analyzing given problems
- Validating facts
- Capture knowledge
- Acquire abilities and skills

Co-creative companions support memory, decision making and acting.

Important Drivers
- Multimedia Content
- Multimodal Interaction
- Smart Data Analytics
- Web of Things and Services
- Linked Open Data
- Augmented Reality

Teaching via virtual coaches in cyber-social partnerships.
Some Words about Digitalization and the Age of Smart X

What does it mean to make people and things smart?

Co-Creative Companions

- Memory and Forgetfulness
- Relevance and Attention
- Observation and Imitation

Summary and Conclusion
Subjective relevance of content decides about its capturing in our long term memory

Starting Point:

- A human being continuously perceives information. According to the motto „good mood or bad mood“ the information is added to our memory

- Boring events will be forgotten soon, exciting happenings are searching for docking station in our memory, i.e., known patterns, similar schemata or categories

- „Fishing“ frequently for information brings it back to the surface of our mind and we may contextually employ it

Problem:

- The longer information will not be accessed, the further it sinks down into the „deep sea of forgetfulness“
Knowledge extension and learning is facing different challenges

Example 1

- Heiko has changed his professional environment and accepted an event management position at DFKI. His predecessor surprisingly became ill so that he has to take over the various information sources without any introduction.

- Heiko has serious trouble to combine the various events, persons, topics, projects, etc. described because on the desktop he found about 6,000 files organized in about 500 folders and based on different applications and formats.

- Not to fritter away all of his valuable time by nerve-racking searching he needs support to explore the various relations between the information resources.
Co-Coaching using associative memory aids

The Semantic Desktop
Knowledge workers, like Heiko, have to remember much more than they are able to.

I have to organize the visit of Prof. Tanigalli on March 28th!

For solving his tasks, Heiko has to consider various aspects of information from different applications.
The limits of today's desktop information management lead to a cut between mental models and document contents

- Different applications manage different data
- Emails is filed in Email folder
- Attachments are stored in file folder
- Sender of an Email is stored in an independent address repository
- Related Websites are disregarded
Heiko’s Semantic Desktop assists him in remembering the multi-perspective aspects of his work

- **Information objects** at the workspace are semantically interconnected

- The Semantic Desktop makes use of **WWW-Standards** for describing meaning by simple sentences (**Subject-Predicate-Object**)

- The uniqueness of resources is guaranteed by using their **URI** (**Uniform Resource Identifier**)

- All **information objects** (resources) may be categorized according to a class such as Person, Event, Locations, Topics, Tasks or Organization

(see next slide)
Based on such a consideration, Heiko establishes a Personal Information Model (PIMO)
The Semantic Desktop acts as an anticipating information butler

Let’s go back to July 29th, 2014

- Besides his many other tasks, Heiko is the coordinator of the EU project ForgetIT
- For that reason he is planning to have a workshop in Istanbul, Turkey on July 30th, 2014
- One day before the workshop he is preparing some topics he intends to talk about
- While doing so, his PIMO is continuously employed to support him
… and is used in daily life (at least within DFKI)
A PIMO may be connected to the Linked Open Data Cloud
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Summary and Conclusion
Our visual memory is an fundamental means for knowledge acquisition

Starting point:

- Curiosity is an important factor for learning
- Every human has a different way of learning based on individual speed and preferences (there are various types of learners)
- However: Our visual sensors are dominant. It is estimated that about 80% of all knowledge stored in memory is captured via the eyes.

Problem:

- How to measure situational relevance so that we may support knowledge acquisition via our visual senses?
Knowledge extension and learning is facing different challenges

Example 2

Susan is an analyst. As of late she not only has to monitor and evaluate German and English news from the financial market but additionally Spanish and French ones. Some years ago she in fact visited some language courses but does not feel completely comfortable any more.

Every day on her desk Susan finds a huge amount of articles and news she has to explore, to filter, and to aggregate. Her task is to differentiate relevant from non-relevant information to support her company in making the right decisions.

Susan wants to better and faster solve this task. Therefore she demands for support in translating, understanding context and accessing background data.
Co-Coaching anticipates the information need

„What if a text would know that it is read!?“
Attention and relevance can be measured via state-of-art eye trackers
Gaze data from the eyetracker allows to analyze user behaviour

... but we may do much more with it!?
The basic idea is to understand the textual relevance in a given situation or for a given task.

When a person is reading a sentence silently, the eye movements show that not every word is fixated. Every once in a while, a regression (an eye movement that goes back in the text) is made to re-examine a word that may have not been fully understood the first time. This only happens with about 10% of the fixations depending on how difficult the text is. The more difficult the higher the likelihood that regressions are made.
Text 2.0 provides a simple-to-use framework for constructing gaze-attentive and gaze-responsive applications.

- Reading the text via an eye tracker
- Data filtering and normalization
- Determination of saccade lengths
- Data Clustering for fixation recognition
- Effect generation

http://text20.net/
Text 2.0 was one of 4 selected recent megatrends presented on the Google Zeitgeist conference 2010.

...
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Summary and Conclusion
Learning by example generates cognitive process knowledge and improves handling capabilities

Starting Point:

- "First I do, then you do" is an appropriate means for self-directed capacity building ("to get a picture of something") and is in many cases more effective than guidelines and manuals.
- Learning by observation or by example increases the application orientation and promotes self-dependent education.
- The acquisition of behavioral processes combines motoric capabilities and mental training.

Problem:

- The shorter innovation cycles and inherent complexity of technical systems are adventuring the learning success.
Knowledge extension and learning is facing different challenges

Example 3

Harry works as a service engineer in the area of factory systems. He is patient though he is tackled by constant multi-tasking craziness. Until tonight he has to finish another three maintenance tasks.

Surprisingly, one of his Prio-1 customers asks for an urgent support because of the breakdown of his brand new production line. In this case, Harry has to react because this case generates high costs and irritations on the customers side.

Harry knows the respective production line only from pictures. He of course has got a printed maintenance guideline, which is very complex. He is longing for an expert who is able to intuitively show him what grips have to be done.
Co-Coaching via interactive guidelines

The Vivid Augmented Reality Manual
„Best Practices“ are recorded, analyzed and semi-automatically annotated.
How does it look like in practice?
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Conclusion and Summary

In the coming ten years, computers are transformed into active and co-creative learning companions supporting processes for competence building and tutoring. In this context, several trends are of essential importance:

- the employment of intuitive interaction and visualization technologies specifically in the domain of augmented reality,
- the incorporation of semantic technologies as well as machine learning capabilities,
- a basic comprehension of digital identities (“Web of Things and Services”),
- the consideration of computer-resident cognitive capabilities, and
- the co-coaching by a computer as a personalized “Information Butler”.
Thank you!

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