Challenges for Future Research Activities and Projects focused on "Software Tools and Socio-Technical Environments to Enhance Creativity"

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The goal of this summary statement is to provide initial objectives for stimulating scientific research and education projects focused on *creativity*. The challenge for the educated knowledge workers of the future is *"not to work harder, but to work smarter"*. As intellectual work based on routine cognitive skills is distributed and outsourced around the world, the challenge will be to raise the level of creativity contributions.

The challenges for future research activities and projects focused on "Software Tools and Socio-Technical Environments to Enhance Creativity" include:

- evolving existing and developing new theories of creativity (incorporating social, technical, and organizational dimensions) grounded in a deep understanding of *creativity;*
- identifying the fundamental role of creativity in *all* disciplines (science, design, engineering, art, business, education..);
- radically new *creativity support tools* that facilitate and enhance the development of creative thinking and creative expression grounded in the ongoing technology changes that will impact creativity;
- exploration and impact of these new creativity support tools in a broad spectrum of intellectual activities, including: problem framing and problem solving, decision making, collaboration, composition, visualization;
- design of *processes* supporting creativity (based on what enhances or hinders creativity) including: the development of organized approaches to creativity that are grounded in the multi-dimensional character of creativity; the importance of end-user development for creativity; the impact of creativity on *new divisions of labor*;
- design of *socio-technical environments* to support and enhance creativity;
- *systematic foundations* for the design, assessment, and wide-spread distribution of creativity support tools;
- development of *new assessment approaches* (what should be measured and what can be measured) including: differentiation between quantifiable and qualitative dimensions; identification of qualitative dimensions such as: personally meaningful activities, mindsets, relevance; evaluation techniques applicable to ill-defined, open-ended problems;
- exploration and use of assessment and evaluation frameworks from different disciplines including: formal user studies, ethnographic studies analysis of social impact, cultural meaning;
- frameworks to *educate the creative minds of the future* by integrating knowledge about creativity into educational curriculum and professional training;
- new *inter- and transdisciplinary collaborations* focused on creativity including social and technological infrastructures to identify common ground and to create a shared understanding;
- understanding the role of *diversity* and *distances* (spatial, temporal, conceptual, technological) in creativity;
- studies of *creative people* and *creative artifacts*;
- creating repositories of *creative artifacts to be studied* and *further evolved;*

- understanding the importance of creativity in knowledge work, lifelong learning, and integration of working and learning.

Exemplary Research Activities

The following are illustrations of research activities that might be incorporated into a project:

- **Empirical studies of creativity, creative people, and creative artifacts**
  - study of exemplary successes and best practices;
  - novel methodologies for empirical design research;
  - understanding the relationship between individual and social creativity.
- **Integrating research and education**
  - development and documentation of knowledge relevant to all aspects of creativity, e.g., principles, experiences, guidance, and problem-solving processes;
  - a strong emphasis on education and learning by exploring questions such as: how can we help people (across their whole lives) learn to think and act more creatively? How can we help people develop the "habits of mind" or "dispositions" (e.g., willingness to take risks, persevere when things go wrong) that are key to creativity?
  - formulation of teachable creativity knowledge, experiences, and best practices
- **Creativity enhancing socio-technical environments for specific communities**
  - creation and study of design environments supporting specific communities;
  - creation and study of design environments supporting inter- and transdisciplinary communities.
- **Centers of Excellence for Creativity Research, Practice, and Education**
  - exploring and creating the necessary conditions for such centers in the 21st century;
  - creation of test beds for creativity research