Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

Beyond Binary Choices: Integrating Individual and Social Creativity

Gerhard Fischer, Hal Eden, and Holger Dick — Fall Semester 2010
gerhard@colorado.edu; haleden@colorado.edu; holger.dick@gmail.com;
October 13, 2010

The Basic Message

- Individual **versus** Social Creativity → Individual **and** Social Creativity

- **why:** the **complexity** and **uniqueness** of design problems transcends the unaided, individual human mind → it requires **social creativity**

- **example:** a movie (director and 300 contributors)
Research in Creativity

- **a timely and hot topic**
  - September 2010: “Re/Search: Art, Science, and Information Technology”, A Joint Meeting of the National Science Foundation and the National Endowment for the Arts

- **workshop** supported by the National Science Foundation, June 2005
  http://www.cs.umd.edu/hcil/CST/

- **conference series**: “Creativity & Cognition”,
  - October 2009: http://www.creativityandcognition09.org/

- **new program** “CreativeIT: Creativity and IT”; National Science Foundation (2007) → http://swiki.cs.colorado.edu:3232/CreativeIT
One of the Grand Challenges for the Future of Computer Science: Beyond Productivity: Innovation and Creativity

- challenge for the 21st century: “work smarter, not harder”

- explore collaborative efforts between information technologies (IT) and creative practices (CP; fine arts, movie making, architecture, urban planning, software design) → artists and technologists should find common ground

- **objective-1 (IT → CP):** how can IT provide new tools and media for artists and designers that enable new types of work?

- **objective-2 (CP → IT):** how can CP raise important challenges for IT (new tools, new representations)?

- **objective-3 (IT + CP):** how can a successful collaboration of IT and CP be established? → check out the ATLAS Institute at CU http://www.colorado.edu/ATLAS/
Creativity: Four Essential Attributes

- **originality** means people having unique ideas or applying existing ideas to new contexts.

- **expression** — ideas or new applications are of little use if they are only internalized; they need to be *expressed and externalized*.

- **social evaluation** — externalizations allow other people (with different backgrounds and perspectives) to understand, reflect upon, and improve them.

- **social appreciation within a community** — rewards, credits, and acknowledgements by others that motivate further creative activities.
Historical versus Psychological Creativity

- **historical creativity** = ideas and discoveries that are fundamentally novel with respect to the whole of human history

- **psychological creativity** = ideas and discoveries in everyday work practice that are novel with respect to an individual human mind or social community
  - a capacity inherent to varying degrees in all people
  - needed in most problem-solving situations
  - knowledge workers and designers have to engage in creative activities to cope with the unforeseen complexities of real-world tasks
Creativity —The “Wrong” Image?

“The Thinker” by Auguste Rodin
Human Creativity = f{Medium}

- Neil Postman, “Amusing Ourselves to Death”:
  “you cannot use smoke signals to do philosophy. Its form excludes the content”

- **claim:** we cannot use most current computer systems to be creative

- **challenge:** design of socio-technical environments supporting creativity by allowing us
  - to think previously *unthinkable thoughts*
  - to do previously *undoable actions*, and
  - to explore previously *unfeasible questions*
Individual Creativity

- creative individuals can make a huge difference — for example: movie directors, champions of sports teams, leading scientists and politicians, architects and urban planners, ……….

- **foundations** for individual creativity:
  - grounded in the unique perspective that an individual brings to bear in a specific problem
  - results from the life experience, culture, education, and background knowledge of an individual

- **support mechanisms** for individual creativity:
  - breakdowns as a source for creativity (“critiquing”)
  - reflection-in-action (“making argumentation serve design”)
  - domain-oriented design environments (DODEs) empower skilled domain workers by bringing task to the front with the support of human problem-domain interaction
  - make information relevant to the task at hand
  - seeding, evolutionary growth and reseeding (SER) process model (honor emerging phenomena)
A DODE for Kitchen Design: Construction

Messages
- The length of the work triangle (Double-Bowl-Sink-1, Four-Element-Stove-1, Single-Door-Refrigerator-1) is greater than 23 feet.
- Single-Door-Refrigerator-1 is not near Four-Element-Stove-1.

Commands
- Critique All
A DODE for Kitchen Design: Argumentation

Figure 10: the work triangle

Argument (Walking Distance)
The work triangle is an important concept in kitchen design. The work triangle denotes the center front distance between the three main appliances: sink, stove and refrigerator. This length should be less than 25 feet to avoid unnecessary walking and to ensure an efficient work flow in the kitchen.

Argument (Small Room)
In small kitchens where the work triangle is less than 16 feet,

Viewer: Default Viewer
Creativity oriented Assessment / Evaluation Issues in DODEs

- do critics enhance or hinder creativity (e.g., Fosbury Flop)? — Stravinsky: “without constraints, there can be no creativity”

- differences in performance, quality, and creativeness as a function of critics, catalog, simulation component?

- trade-offs between critiquing (breakdowns occur) versus constraint (breakdowns are prevented)

- trade-offs between different intervention strategies (active versus passive)

- does “making information relevant to the task at hand” prevent serendipity?

- under which conditions will designers challenge or extend the knowledge represented in the system?
Individual Creativity has Limits

- in today’s society, the Leonardesque aspiration to have people who are competent in all of science fails because the individual human mind is limited (“symmetry of ignorance”)

- “An idea or product that deserves the label ‘creative’ arises from the synergy of many sources and not only from the mind of a single person” — Mihaly Csikszentmihályi

- “Great discoveries and improvements invariably involve the cooperation of many minds!” — Alexander Graham Bell


- “Linux was the first project to make a concious and successful effort to use the entire world as a talent pool” → Raymond, E. S. & Young, B. (2001) The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary, O'Reilly & Associates, Sebastopol, CA.
Social Creativity

- the Renaissance scholar (who knows “everything”) does not exist anymore
  - the individual, unaided human mind is limited
  - the great individual → the great group/community

- distinct domain of human knowledge exist → of critical importance: mutual appreciation, efforts to understand each other, increase in socially shared cognition and practice

- exploit the “symmetry of ignorance” as an opportunity
  - none of the stakeholders solving a complex problem can guarantee that their knowledge is superior or more complete compared to other people’s knowledge
  - to overcome the “symmetry of ignorance” → activate as much knowledge from as many stakeholders as possible with the goal of achieving mutual education and shared understanding
Individual versus / and Social Creativity

“The strength of the wolf is in the pack, and the strength of the pack is in the wolf.” — Rudyard Kipling

- **individual:**
  - human collaboration is not only needed but central to social creativity
  - individuals participating in collaborative inquiry and creation need the individual reflective time depicted by Rodin's sculpture
  - without such reflection it is difficult to think about contributions to social creativity

- **social**
  - Rodin's sculpture "The Thinker" dominates our collective imagination as the purest form of human inquiry — the lone, stoic thinker
  - the reality is that scientific and artistic forms emerge from joint thinking, passionate conversations, and shared struggles
The Fish-Scale Model for Social Creativity

Conceptual Framework

- **distances in social creativity**
  - spatial
  - temporal
  - conceptual
  - technological

Distance “Spatial Dimension” — Voices from Far Away

- bringing spatially distributed people together: supports the shift that shared concerns rather than shared location becomes the prominent defining feature of a group of people interacting with each other.

- allows more people to be included, thus exploiting local knowledge.

- success model: open source communities.

- transcending the barrier of spatial distribution is of particular importance in locally sparse populations.
Distance “Temporal Dimension” — Voices from the Past

- design processes often take place over many years, with initial design followed by extended periods of evolution and redesign

- importance of
  - design rationale
  - redesign and reuse (“complex systems evolve faster if they can build on stable subsystems”)

- compare: Lecture on Sept 29 about SER Model
Distance “Conceptual Dimension” — Voices from Collaborators

- **Communities of Practice (CoPs)**

- **Communities of Interest (CIs)**

- *more in lecture on October 27, 2010*
Distance “Technological Dimension”
—
What are good Creativity Support Tools?

- Searching & browsing large information repositories (e.g.: Google Search)

- Visualizing Data & Processes

- Thinking by Free Associations

- Exploring Solutions - What If Tools (Spreadsheets, Simulations)
Examples of Environments Supporting Creativity

- **Craft Technology Group** (Michael Eisenberg)
  http://l3d.cs.colorado.edu/~ctg/Craft_Tech.html

- **Envisionment and Discovery Collaboratory and Caretta** — focused on social creativity in urban planning → **class meetings on October 18 and 20**


- **SketchUp, 3D Warehouse and Google Earth** — exploiting the power of mass collaboration (and Web 2.0 technologies) → **Guest Lecture in class meetings on October 25**
Craft Technology Group

Craft technology is our term for the interweaving of computation with craft materials. This blending can take many forms, including the application of specialized software to aid in the design and construction of crafts (such as mechanical toys and paper sculpture) and in the creation of craft objects with embedded intelligence. Our particular interests lie in the educational realm - that is, we are especially interested in extending the landscape of children’s craft activities.
The Envisionment and Discovery Collaboratory (EDC)
Boulder City Council and University of Colorado Regents
Integrating Individual and Social Creativity: Caretta
SketchUp + 3D Warehouse + Google Earth:
CU Boulder in 3D
Downtown Denver in 3D
Creativity and Productivity
—
Implications for Students in Computer Science

- creativity and outsourcing

- exploiting the long tail for creativity, discovery, and innovation → details in lecture on November 3, 2010

- transdisciplinary education and collaboration → details in lecture on December 1, 2010
Outsourcing → Economic Implications

- **US tax returns in India** (tax returns: knowledge work, but rule-based)
  - 2003: 25,000
  - 2004: 100,000
  - 2005: 400,000

- **the changing world** (in less than 50 years):
  - sold in China
  - made in China
  - designed in China
  - dreamed up in China

- **basic assumption**: the more “creative work” will stay in the USA → combine technical knowledge (e.g., how to write computer programs) with business, scientific knowledge, and take advantage of local contexts

- **question**: what are the **educational implications** of these changes? how do we educate students for finding a job in the world of tomorrow?
Democratizing Creativity — with Cultures of Participation and Meta-Design


- creativity and innovation are being democratized — meaning: users of product and services are increasingly able to innovate for themselves.

- integrate and complement manufacturer-creativity and user—creativity.

- the needs of users for products are highly heterogeneous in many fields.

- users may value the process of innovating and being creative because of the enjoyment and learning that it brings them → in personally meaningful problems.

- claim: users’ ability to innovate is improving radically and rapidly as a result of the steadily improving quality of computer software and hardware, improved access to easy-to-use tools and components for innovation, and access to a steadily richer innovation commons.
Assessment of Social Creativity

- **what will make people want to engage in social creativity?**
  - requires: culture change, new mindsets, new reward systems
  - organizational rewards
  - social capital

- **self-application of this idea to L^3D:**
  - value gained by the individual to contribute to the social is greater than the effort expended
  - barriers with creating and evolving organizational memories:
    - individuals must perceive a direct benefit
    - the effort required to contribute must be minimal so it will not interfere with getting the real work done

- **“collaborative systems will not work in a non-collaborative society”**
  - a student’s observation in one of our classes using technologies to enhance peer-to-peer learning, sharing of information, self-evaluation, etc.
  - collaboration should not be considered as cheating
Conclusions

- **the basic message**
  - the complexity and uniqueness of design problems transcends the unaided, individual human mind
  - support individual and social creativity

- linkage of **creativity** to **meta-design**, **cultures of participation**, and **human-centered computing**:
  - creative people should use their creativity to create socio-technical environments in which other people can be creative