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

Themes for Collaboration: Reflective Communities, Communities of Practice and Communities of Interest, Distances in Collaboration, Interdisciplinary and Transdisciplinary Collaboration

Gerhard Fischer and Hal Eden
Spring Semester 2006, April 12, 2006
Collaboration — Why?

- the world has become **too complex** for individuals to have enough knowledge to tackle complex problems by themselves — even when they are educated and act as reflective practitioners

- **a viable alternative** is to create and sustain reflective communities

- bringing people
  - with different background knowledge and different value systems together
  - overcoming the biases and barriers of their separate languages
  - integrating different educational experiences, and
  - eliminating the lack of reward structures
  - will not be an easy undertaking

- but there is **little choice**: unless we meet these challenges, we will be unable to cope with the complexities and needs of the 21st century
Collaboration: Why?
—
Exploiting the Symmetry of Ignorance


- example: symmetry of ignorance in software design
  “System development is difficult not because of the complexity of technical problems, but because of the social interaction when users and system developers learn to create, develop and express their ideas and visions” (Greenbaum, J. & Kyng, M. (Eds.) (1991) “Design at Work: Cooperative Design of Computer Systems”, Lawrence Erlbaum Associates, Inc., Hillsdale, NJ)
Individual Perspectives

- “Am I interested enough and am I willing to make the additional effort and time so my voice is heard?” → personally meaningful problems

- “Do I have something relevant to say?” → local voices and unique expertise in a global world

- “Am I able to express what I want to say?” → owners of problems need to be independent of high-tech scribes (digital fluency)

- “Am I able and willing to express myself in a way that others can understand me?” → participatory design processes, public understanding of science
Social Perspective

- “How can we encourage individuals to contribute to the good and progress of all of us?”  
  → open source, social capital, and gift cultures

- “How can we support and exploit cultural and epistemological pluralism as an advantage rather than as a disadvantage?”  
  → local and regional identities as strengths or as weaknesses; communities of interest (bringing different communities of practice together)

- “How do we avoid the situation that voices get lost because there is too much information or their input does not get recorded?”  
  → context awareness, relevance to the task at hand; if company X only knew what company X knows

- “How do we avoid illegitimate voices?”  
  → spam, violation of privacy

- “How do we avoid getting stuck in group think?”  
  → controversy as an asset rather than as a limitation

- “How do we eliminate sources of exclusion?”  
  → design for all
Collaboration: Some Reflections

- “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 (→ “In Defense of Cheating”)

- 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 L3D:
  - 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
### Different Perspectives on Collaborative Knowledge Construction

<table>
<thead>
<tr>
<th></th>
<th><strong>Commodity Perspective</strong></th>
<th><strong>Community Perspective</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>creation</td>
<td>specialists (e.g., knowledge engineers)</td>
<td>everyone (e.g., people doing the work), collaborative activity</td>
</tr>
<tr>
<td>integration</td>
<td>at design time (prior to system deployment)</td>
<td>at use time (an ongoing process)</td>
</tr>
<tr>
<td>dissemination</td>
<td>lecture, broadcasting, classroom, decontextualized</td>
<td>on-demand, integration of learning and working, relevant to tasks, personalized</td>
</tr>
<tr>
<td>learning paradigm</td>
<td>knowledge transfer</td>
<td>collaborative knowledge construction</td>
</tr>
<tr>
<td>tasks</td>
<td>system driven (canonical)</td>
<td>user/task driven (situated)</td>
</tr>
<tr>
<td>social structures</td>
<td>individuals in hierarchical structures, communication primarily top-down</td>
<td>communication primarily peer-to-peer in communities</td>
</tr>
<tr>
<td>work style</td>
<td>Standardize</td>
<td>improvise</td>
</tr>
<tr>
<td>information spaces</td>
<td>closed, static</td>
<td>open, dynamic</td>
</tr>
<tr>
<td>breakdowns</td>
<td>errors to be avoided</td>
<td>opportunities for innovation and learning</td>
</tr>
</tbody>
</table>
## A Comparison Between Different Social Networks

<table>
<thead>
<tr>
<th></th>
<th>Communities of Practice (CoPs)</th>
<th>Communities of Interest (CoIs)</th>
<th>Teams</th>
<th>Intensional Networks</th>
<th>Knotworking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>example domains</strong></td>
<td>claims processor (Wenger)</td>
<td>complex design problems (L3D)</td>
<td>units in organizations assembly line work</td>
<td>particular work projects cutting across organizational boundaries (Nardi et al)</td>
<td>flight crews operating room teams (Engeström et al)</td>
</tr>
<tr>
<td><strong>how do they come into existence</strong></td>
<td>Co-evolve with practice</td>
<td>solving complex design problems require multiple expertise</td>
<td>organizational planning and structuring</td>
<td>Active cultivation by those who need their support</td>
<td>patterns in a work configuration</td>
</tr>
<tr>
<td><strong>working conditions</strong></td>
<td>well-defined professions</td>
<td>Confluence of multiple practices, other interested parties</td>
<td>Problem oriented situation focus on solving problem/task</td>
<td>flux and instability</td>
<td>responsibilities are distributed,</td>
</tr>
<tr>
<td><strong>well-established roles</strong></td>
<td>masters and apprentices</td>
<td>stakeholders from different disciplines</td>
<td>Team as unit Team leader</td>
<td>collaboration across organizational boundaries</td>
<td>roles well defined collaborative practice is “plug and play”</td>
</tr>
<tr>
<td><strong>duration</strong></td>
<td>long-term</td>
<td>associated with specific projects</td>
<td>created and terminated from the outside</td>
<td>evolving over time</td>
<td>for specific tasks</td>
</tr>
</tbody>
</table>
# A Comparison Between Different Social Networks

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Communities of Practice (CoPs)</th>
<th>Communities of Interest (Cols)</th>
<th>Teams</th>
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<th>Knotworking</th>
</tr>
</thead>
<tbody>
<tr>
<td>defined by a shared and well-established practice</td>
<td>Cols = communities of CoPs</td>
<td>defined by management</td>
<td>defined by a shared concern</td>
<td>non-negotiable roles in specific teams operational units</td>
<td></td>
</tr>
<tr>
<td>challenges</td>
<td>identity; well established centers</td>
<td>shared understanding; boundary objects shifting centers</td>
<td>flexible, less predictable configuration of workers</td>
<td>“who do I tell” and “who do I ask”</td>
<td>working together without knowing each others as persons</td>
</tr>
<tr>
<td>learning</td>
<td>legitimate peripheral participation; working shops</td>
<td>exploit symmetry of ignorance as a source of power</td>
<td>Workshops Feedback to/interaction with design process</td>
<td>“who do I ask” and “who do I tell”</td>
<td>plays little role in flight crews → highly trained professionals</td>
</tr>
<tr>
<td>problems</td>
<td>“group think”</td>
<td>lack of shared understanding</td>
<td>too much “formally” defined; inflexible</td>
<td>Need to continually maintained, updated</td>
<td>only applicable to environments in which people are highly trained</td>
</tr>
<tr>
<td>technological support</td>
<td>DODEs</td>
<td>EDC</td>
<td>group memories</td>
<td>Web2gether; Eureka</td>
<td>workflow systems</td>
</tr>
</tbody>
</table>
The “We in the Web”

source: Newsweek Title Story, April 3 2006

- next frontiers: user-generated sites

- examples:
  - **MySpace**: a place for friends — lets you share photo, journals, and interests with your growing network of mutual friends (owned by Robert Murdoch)
  - **Flickr**: the best online photo management and sharing application in the world. Show off your favorite photos to the world securely (owned by Yahoo)
  - **YouTube**: Don't Just Watch, Dive in. Take control of YouTube! When you register, you can create a personal video collection, hook into the YouTube community, and share your work with the world. (35,000 videos added to the site every day) — Collect + Commune + Create
  - **Craigslist**: local community classifieds and forums - a place to find jobs, housing, goods & services, social activities, a girlfriend or boyfriend, advice, community information, and just about anything else -- all for free, and in a relatively non-commercial environment.
  - **Wikipedia**: will it (has it already) outperformed Britannica?
Example: Web 2.0

- **source:** Tim O’Reilly “What is Web 2.0 — Design Patterns and Business Models for the Next Generation of Software”

<table>
<thead>
<tr>
<th>Web 1.0</th>
<th>Web 2.0</th>
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<tbody>
<tr>
<td>Britannica Online</td>
<td>Wikipedia</td>
</tr>
<tr>
<td>personal website</td>
<td>blogging</td>
</tr>
<tr>
<td>publishing</td>
<td>participation</td>
</tr>
<tr>
<td>content management systems</td>
<td>wikis</td>
</tr>
<tr>
<td>scheduled software releases</td>
<td>continuous improvements</td>
</tr>
<tr>
<td>individual contributions</td>
<td>collective intelligence</td>
</tr>
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</table>

- **claim:** network effects from user contributions (= knowledge sharing) are the key to market dominance in the Web 2.0 era
WWW: From Broadcast to Collaboration Medium

- **M1**: The Web as Broadcast Medium
- **M2**: Broadcast with Feedback
- **M3**: Evolutionary and Collaborative Design
Our Models

- **locate + comprehend + modify (LCM)** — applied to software reuse

- **seed + locate + comprehend + modify + share (sLCMS)**

- **seeding, evolutionary growth, reseeding (SER)**
Socio-Technical Environments in Support of Collaboration

- **Courses-as-Seeds**
  - an educational model with the goal to create a culture of informed participation
  - courses are conceptualized as seeds, rather than as finished products
  - students are knowledge workers who play an active role in defining what they will learn
  - the role of technology (e.g.: Swikis): to form and sustain active communities of learners who can make their voices heard by contributing ideas from their own unique viewpoints, and to connect them in new ways

- **Envisionment and Discovery Collaboratory**
  - supports Cols with an environment in which participants collaboratively solve problems of mutual interest
  - problem contexts (such as urban transportation planning, flood mitigation, and building design): open-ended design problems
  - empowers users to act as designers in problem-solving activities by supporting face-to-face collaboration
Reflective Practitioners


- **reflective practitioners:**
  - are needed to make sense of uncertain, unique or conflicted situations
  - why routine applications of existing rules for particular situations is limited
  - engage in reflection-in-action, situated action

- **Schön’s interest:**
  develop a descriptive account of design activities
  - illustrating and explaining what designers do
  - identifying the importance of human collaborations in this process
  - arguing for educational changes

- our work transcends Schön developing computational media change the nature of the *reflective conversation between designer and the materials of the situation*? unlike paper, computational media can provide active design materials (including critics, visualizations, simulations) that allow the situation to talk back to the designer in an explicit manner
Reflective Communities

- **claims:**
  - individual, disciplinary competence is limited
  - to educate “Renaissance Scholars” such as Leonardo da Vinci, who was equally adept in the arts and the sciences [Shneiderman, 2002]) is not a reasonable objective for the 21st century
  - to cope with the demands of knowledge work requires the creative potential of “Renaissance Communities.”

- “even within disciplines, disciplinary competence is not achieved in individual minds, but as a collective achievement made possible by the overlap of narrow specialties” [Campbell, 1969]

- “while the Western belief in individualism romanticizes this perception of the solitary creative process, the reality is that scientific and artistic forms emerge from the joint thinking, passionate conversations, emotional connections, and shared struggles common in meaningful relationships” [John-Steiner, 2000]
Reflective Communities

- “nobody knows who the last Renaissance man really was, but sometime after Leonardo da Vinci it became impossible to learn enough about all the arts and the sciences to be an expert in more than a small fraction of them” [Csikszentmihalyi, 1996]

- “none of us is as smart as all of us” [Bennis & Biederman, 1997]

- “Linux was the first project to make a conscious and successful effort to use the entire world as a talent pool” [Raymond & Young, 2001]
Reflective Communities: Common Ground and Shared Understanding

see lecture on Jan 30: “Overview of Collaboration”

Large Conceptual Distance — Limited Common Ground
Software Professionals Acquiring Domain Knowledge
Domain Experts Acquiring Media Knowledge

software professionals

model 1

model 2

domain experts with software knowledge

acquire software knowledge

domain experts
From Reflective Practitioners to Reflective Communities
Distribution Creates Distances — Overview of Distances


<table>
<thead>
<tr>
<th>Dimension</th>
<th>Rationale</th>
<th>Addressed by</th>
<th>Media / Technologies</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>spatial</strong></td>
<td>participants are unable to meet face-to-face; low local density of people sharing interests</td>
<td>computer-mediated communication</td>
<td>e-mail, chat rooms, video conferences, local knowledge in global societies</td>
<td>achieve common ground; involve large communities (&quot;the talent pool of the whole world&quot;);</td>
</tr>
<tr>
<td><strong>temporal</strong></td>
<td>design and use time: who is the beneficiary and who has to do the work?</td>
<td>long-term, indirect communication; meta-design</td>
<td>group memories, organizational memories</td>
<td>build on the work of the giants before us; design rationale, reflexive CSCW</td>
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### Overview of Distances — Continued

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<td>shared understanding</td>
<td>communities of practice (CoPs), legitimate peripheral participation (LPP)</td>
<td>domain-oriented design environments (DODEs)</td>
<td>innovation; avoid group-think</td>
</tr>
<tr>
<td><strong>conceptual between domains</strong></td>
<td>make all voices heard</td>
<td>communities of interest (Cols); boundary objects</td>
<td>Envisionment and Discovery Collaboratory</td>
<td>common ground; different ontologies; integration of diversity</td>
</tr>
<tr>
<td><strong>technological</strong></td>
<td>things are available; complement human abilities</td>
<td>distributed cognition, socio-technical environments; meta-design</td>
<td>agents, critics, simulations</td>
<td>formalization; human-problem-domain interaction; digital fluency</td>
</tr>
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Mono-, Inter- and Trans-disciplinary Collaboration

- **mono-disciplinary**: communities of practice

- **inter-disciplinary**: bringing different communities of practice together and focusing on the issues, problems, ideas in the intersection of the different disciplines

- **trans-disciplinary**: by engaging in inter-disciplinary collaboration, representatives from the individual disciplines change their own world-views and mindsets
  - “in transdisciplinary research, the point is not just the application of given methodologies but also implication — a result of imaging entirely new possibilities for what disciplines can do”
  - providers and clients → peers, collaborators: “in a transdisciplinary situation, artists and designers are not clients from computer scientists but instead interact with them as peers.”
Beyond the Unaided, Individual Human Mind

[Graph showing the power of the collective human mind, aided by technology, from 2500 BC to 2006. Key milestones include the invention of reading and writing, the printing press, personal computers, the Internet, and wireless and mobile technologies.]
Impact of New Technologies and New Media

- **claim:** all important technologies are “**Faustian bargains**”: they give and take away → technological change always produces winners and loosers

- while the growth of technology is certain, the **inevitability of any particular future is not** → therefore: we can envision a number of different futures that might be

- the **visions** for possible futures:
  - **techno-utopians** romanticize the future → things will be wonderful with new technologies, technology will liberate us
  - **techno-pessimists** glorify the past → technologies will oppress us
  - **basic belief:** the deep and enduring changes of our ages are not technological but social and cultural