



Center for  
**LifeLong  
Learning  
& Design**

University of Colorado at Boulder

**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 21<sup>st</sup> century

# Collaboration: Why?

—

## Exploiting the Symmetry of Ignorance

- **distinct domain of human knowledge exist** → of critical importance: mutual appreciation, efforts to understand each other, increase in socially shared cognition and practice (source: Snow, C. P. (1993) “The Two Cultures”, Cambridge University Press, Cambridge, UK)
- **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

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

# A Comparison Between Different Social Networks

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



# A Comparison Between Different Social Networks

	<b>Communities of Practice (CoPs)</b>	<b>Communities of Interest (CoIs)</b>	<b>Teams</b>	<b>Intensional Networks</b>	<b>Knotworking</b>
characteristics	defined by a shared and well-established practice	CoIs = communities of CoPs	defined by management	defined by a shared concern	non-negotiable roles in specific teams operational units
challenges	identity; well established centers	shared understanding; boundary objects shifting centers	flexible, less predictable configuration of workers	“who do I tell” and “who do I ask”	working together without knowing each others as persons
learning	legitimate peripheral participation; working shops	exploit symmetry of ignorance as a source of power	Workshops Feedback to/interaction with design process	“who do I ask” and “who do I tell” “not what you know but who you know”	plays little role in flight crews → highly trained professionals
problems	“group think”	lack of shared understanding	too much “formally” defined; inflexible	Need to continually maintained, updated	only applicable to environments in which people are highly trained
technological support	DODEs	EDC	group memories	Web2gether; Eureka	workflow systems

# 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”*

### Web 1.0

Britannica Online

→

personal website

→

publishing

→

content management systems

→

scheduled software releases

→

individual contributions

→

### Web 2.0

Wikipedia

blogging

participation

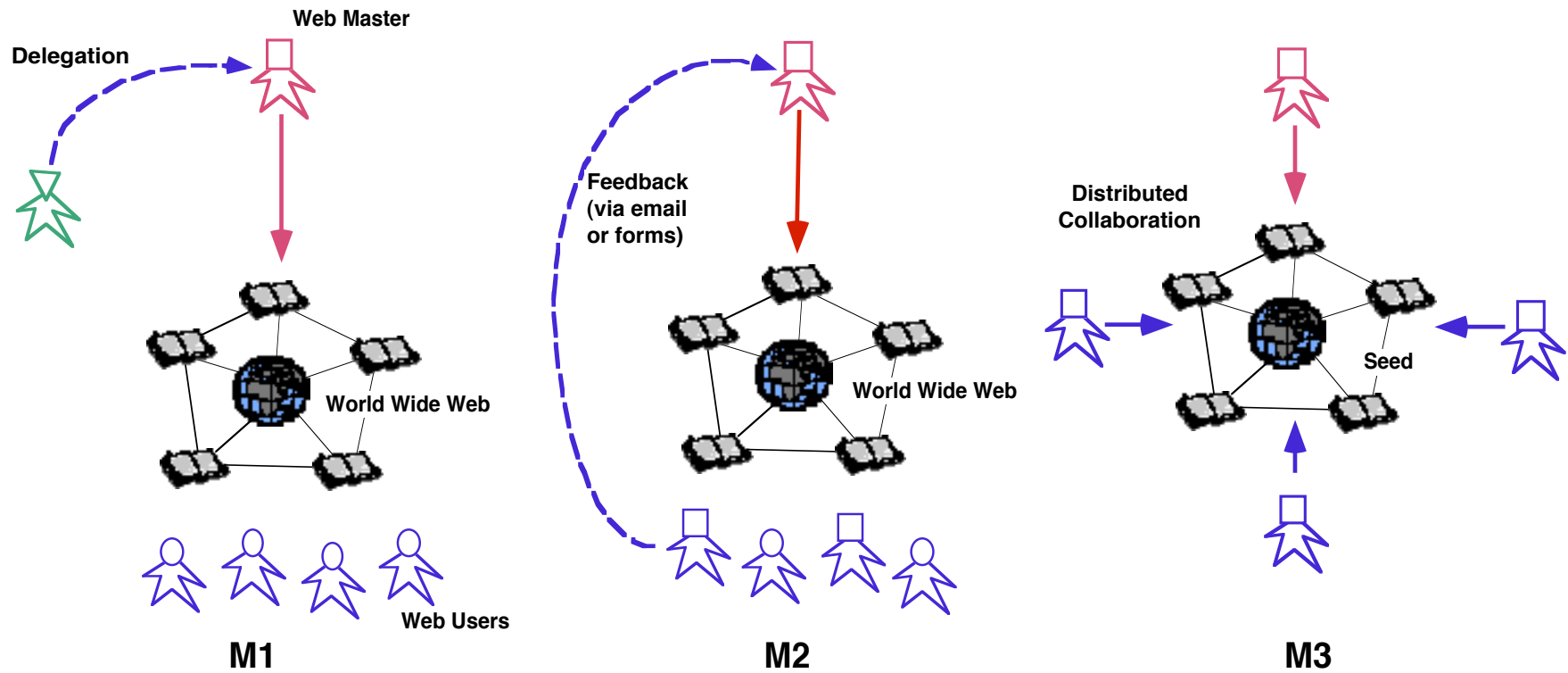
wikis

continuous improvements

collective intelligence

- **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



■ The Web as Broadcast Medium

Broadcast with Feedback

Evolutionary and Collaborative Design

# Our Models

- **locate + comprehend + modify (LCM)** — applied to software reuse  
source: Fischer, G., Henninger, S. R., & Redmiles, D. F. (1991) "Cognitive Tools for Locating and Comprehending Software Objects for Reuse." In *Thirteenth International Conference on Software Engineering (Austin, TX)*, IEEE Computer Society Press, Los Alamitos, CA, pp. 318-328.
- **seed + locate + comprehend + modify + share (sLCMS)**  
source: Ye, Y., & Fischer, G. (2005) "Reuse-Conducive Development Environments," *International Journal Automated Software Engineering*, Kluwer Academic Publishers, Dordrecht, Netherlands, 12(2), pp. 199-235.
- **seeding, evolutionary growth, reseeding (SER)**  
source: Fischer, G., Grudin, J., McCall, R., Ostwald, J., Redmiles, D., Reeves, B., & Shipman, F. (2001) "Seeding, Evolutionary Growth and Reseeding: The Incremental Development of Collaborative Design Environments." In G. M. Olson, T. W. Malone, & J. B. Smith (Eds.), *Coordination Theory and Collaboration Technology*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 447-472.

# 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

**source:** Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*, Basic Books, New York.

- **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]



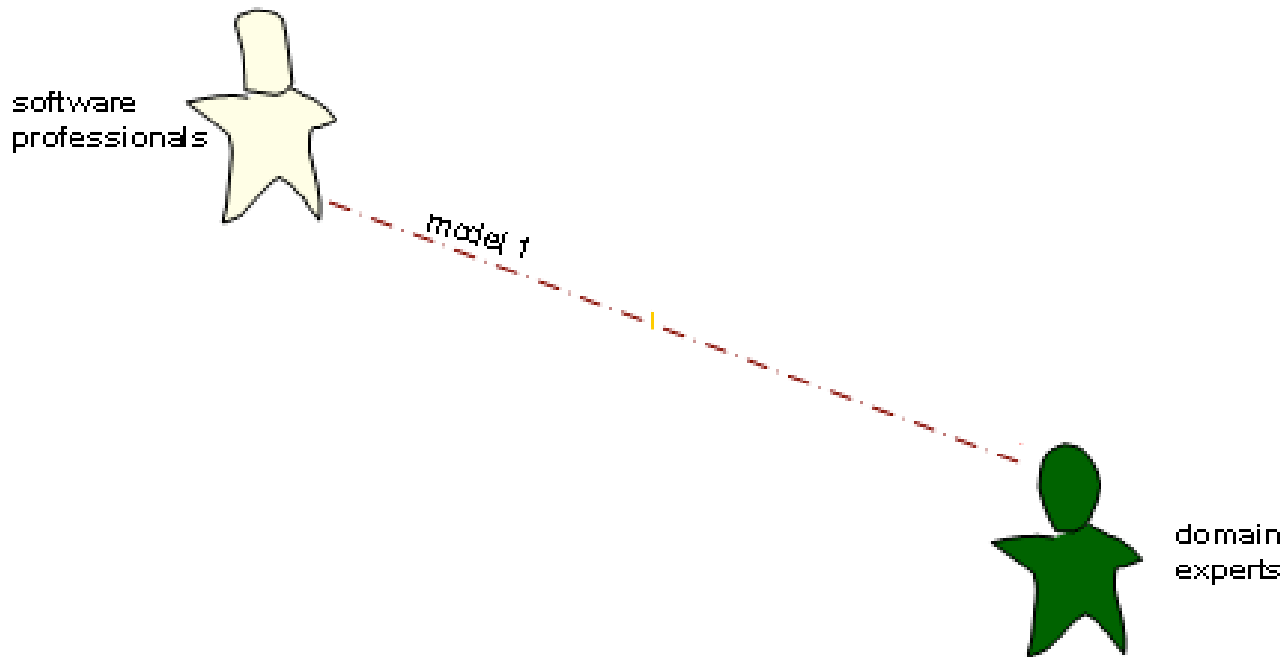
# Reflective Communities

- “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]

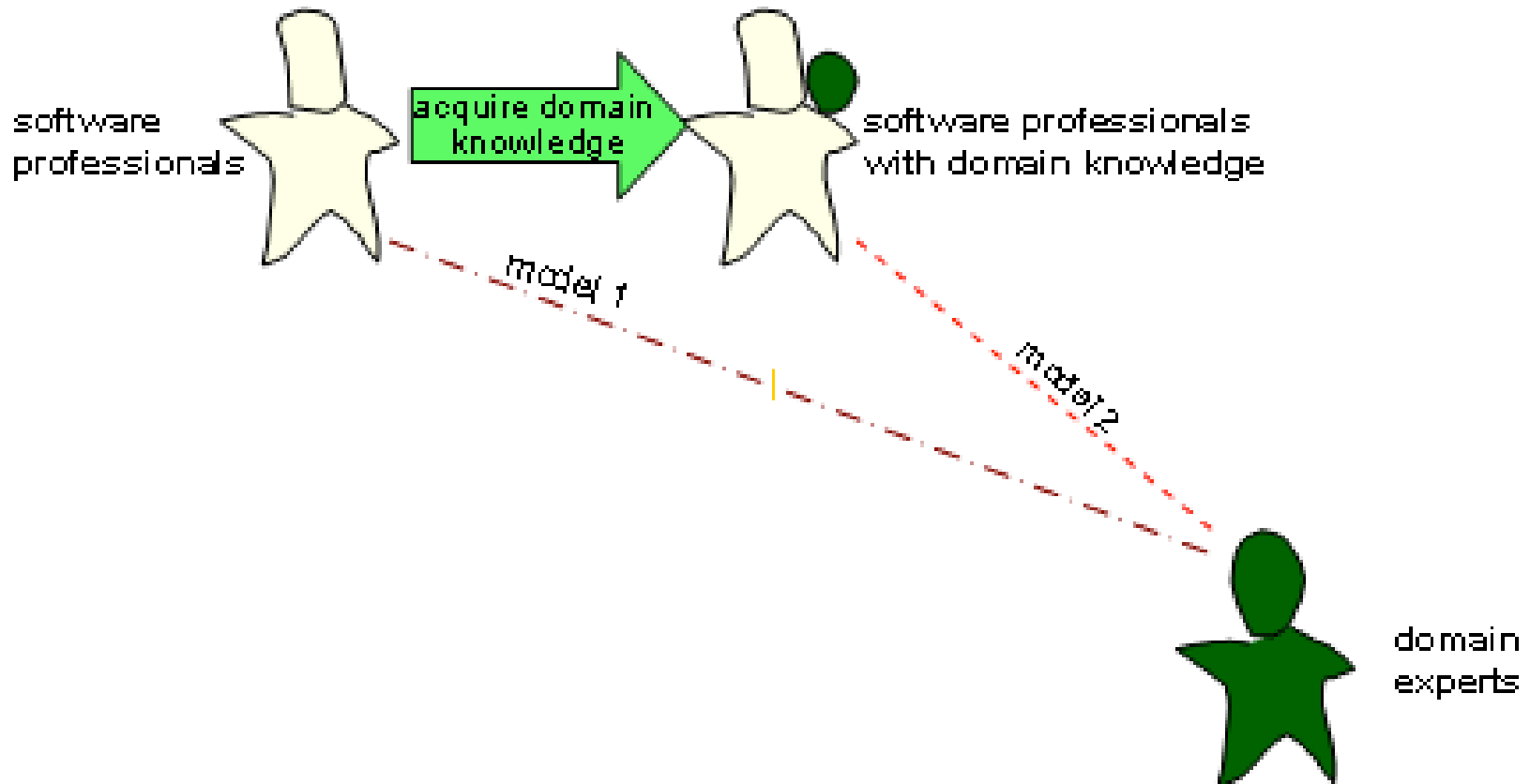
# Reflective Communities: Common Ground and Shared Understanding

see lecture on Jan 30: “Overview of Collaboration”

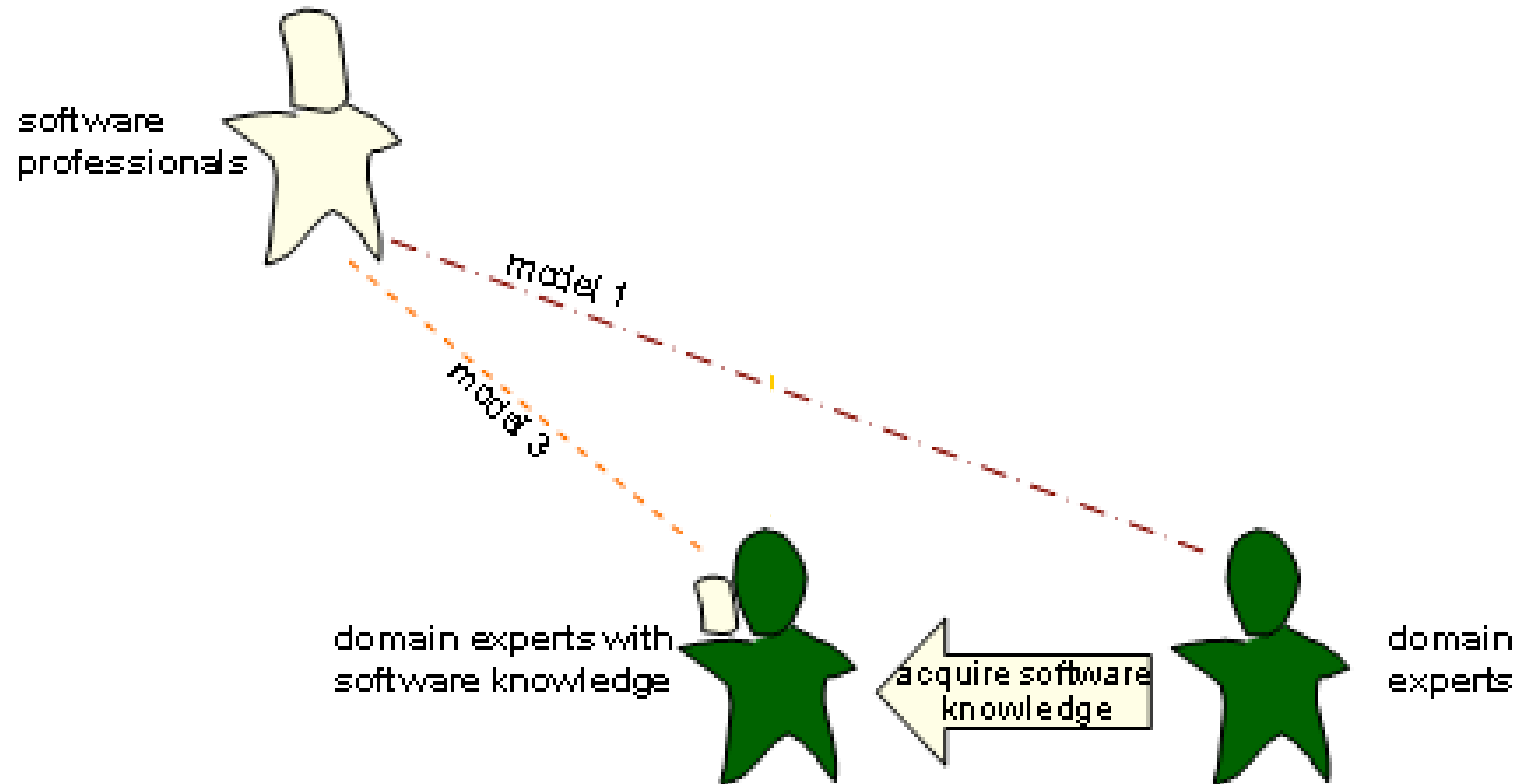
## Large Conceptual Distance – Limited Common Ground



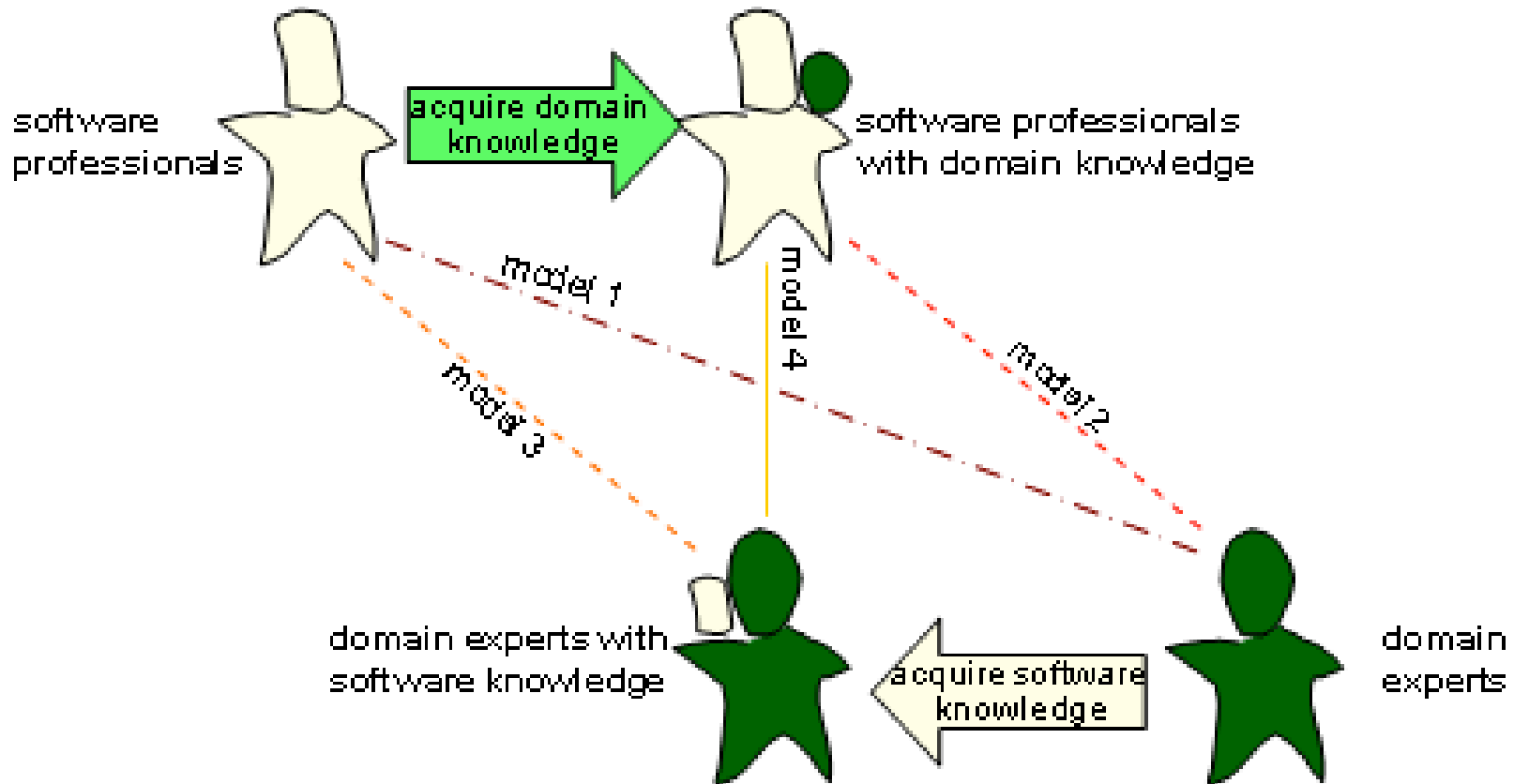
# Software Professionals Acquiring Domain Knowledge



# Domain Experts Acquiring Media Knowledge



# From Reflective Practitioners to Reflective Communities



# Distribution Creates Distances – Overview of Distances

- source: Fischer, G. (2005) "Distances and Diversity: Sources for Social Creativity," *Proceedings of Creativity & Cognition*, London, April, pp. 128-136.

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

## Overview of Distances – Continued

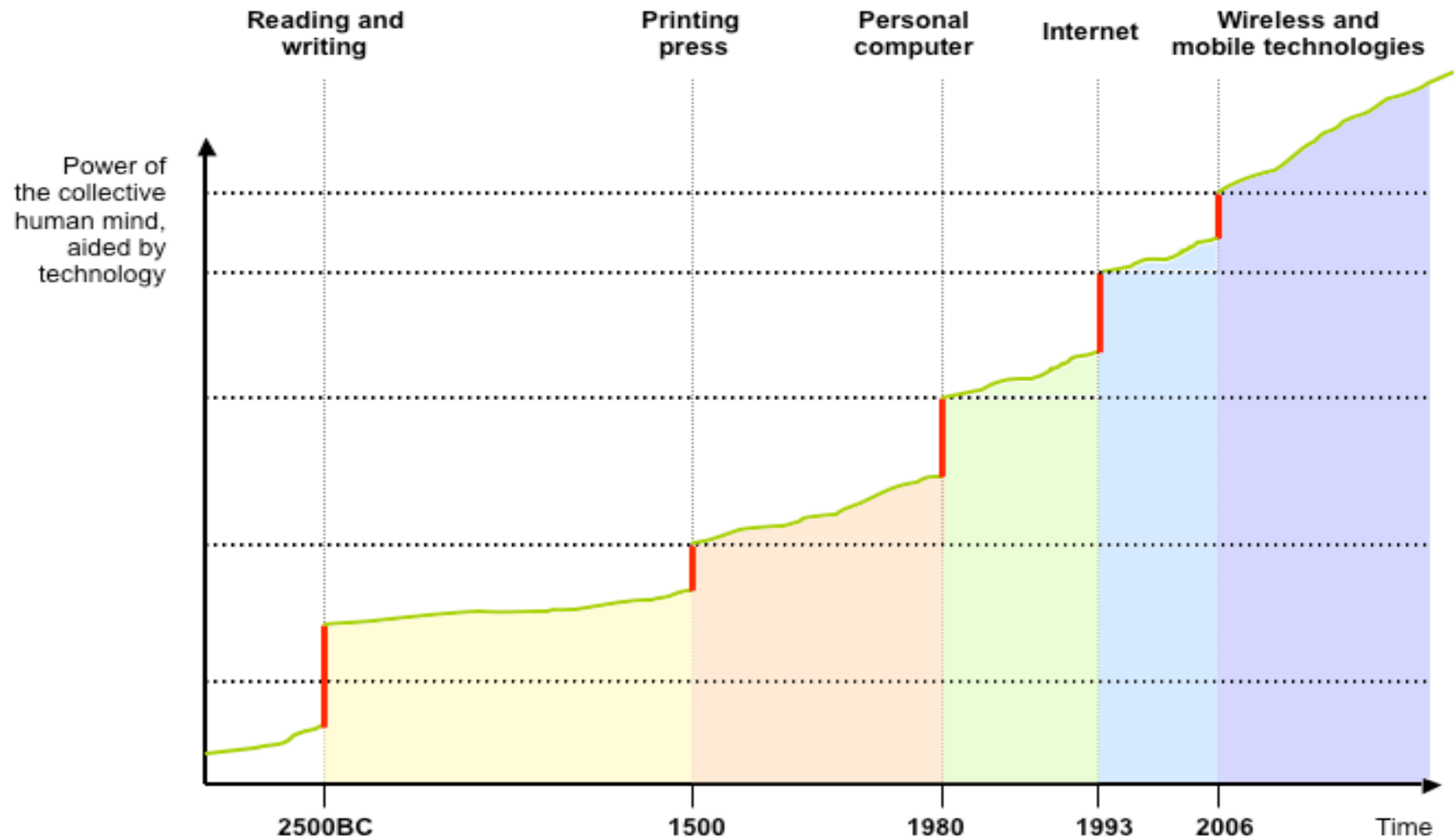
Dimension	Rationale	Addressed by	Media / Technologies	Challenges
<b>conceptual within domains</b>	shared understanding	communities of practice (CoPs), legitimate peripheral participation (LPP)	domain-oriented design environments (DODEs)	innovation; avoid group-think
<b>conceptual between domains</b>	make all voices heard	communities of interest (ColS); boundary objects	Envisionment and Discovery Collaboratory	common ground; different ontologies; integration of diversity
<b>technological</b>	things are available; complement human abilities	distributed cognition, socio-technical environments; meta-design	agents, critics, simulations	formalization; human-problem-domain interaction; digital fluency

# 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.”*
  - source: National-Research-Council (2003) *Beyond Productivity: Information Technology, Innovation, and Creativity*, National Academy Press, Washington, DC.



# Beyond the Unaided, Individual Human Mind



# 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 losers
- 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