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

Overview of Collaboration

Gerhard Fischer and Hal Eden
Spring Semester 2005

January 24, 2005
The Aided, Collective Human Mind — Exploiting the Social Power

Power of Collective Human Minds, Aided by Technology

- 2500 BC: Reading & Writing
- 1500: Printing Press
- 1980: Computers
- 2000: Collaborative Systems

Collaborative Systems
Collaboration —With Whom?

- **ourselves** — e.g., capturing our thoughts of the past → reflexive CSCW

- **all stakeholders** — e.g., clients, designers, customers, users → symmetry of ignorance, communities of interest (CoI)

- **colleagues** — e.g., supporting long-term, indirect collaboration → collaborative work practices, design rationale

- **tools** — e.g., knowing which tools exist, how they can be used, how they can be tailored to our specific needs → high-functionality applications

- **domains** — e.g., domain abstractions (ontologies), standard examples → communities of practices (CoP), catalog examples, cases

- **critics and agents** — e.g., shared knowledge of the task at hand, information volunteering → intrusiveness, information volunteering
Distributed Intelligence

- **between:**
  - spatially (across space)
  - temporally (across time)
  - socially (within communities of practices and communities of interest) →
    - challenge: increase in socially shared cognition and practice — Wittgenstein: “If a lion could speak would we understand him?”
  - technologically (humans and things/computational artifacts)

- **advantage of humans:**
  - shared understanding
  - background knowledge

- **advantage of things** (Ivan Illich, ):
  “a thing is available at the bidding of the user — or could be — whereas persons formally become a skill resource only when they consent to do so, and they can also restrict time, place, and methods as they choose.”
  → the “Nobel Prize Winner” fallacy
Classification of Collaborative Systems

- **Distributed Computing / Distributed AI (DAI)**
  - computers and computers
  - all information must be interpretable by computer

- **Collaborative (Design) Environments (CPS)**
  - computers and humans
  - mixture between interpretable and computer-mediated information structures

- **Computer-Supported Cooperative Work (CSCW) and Learning (CSCL)**
  - humans and humans
  - computer-mediated
  - most information is not interpretable by computers
Classification of Collaborative Systems

DAI

CPS

CSCW

Formal

Semi-Formal

Informal
Two Major Approaches in Human-Computer Collaboration


- **complementary approach**
  - based on the asymmetry between human and computer
  - claim: the design of the collaboration is not only a problem of simulating human to human collaboration but of inventing engineering alternatives to interaction related properties

- **emulation or replacement approach** (for example: use of natural language, speech, .......)

- **collaborative human-computer systems require**
  - to specify a division of labor between human and computer (what part of the task should be exercised by human beings and/or by the computer?)
  - to design a communication protocol that can be used to coordinate and mutually enhance the efforts of the participants
Example: Principles of Human-Centered Aircraft Automation

- **Premise:** The pilot bears the ultimate responsibility for the safety of any flight operation.

- **Axiom:** The pilot must be in command

- **Corollaries:**
  - to command effectively, the pilot must be involved
  - to be involved, the pilot must be informed
  - the pilot must be able to monitor the automated systems
  - automated systems must therefore be predictable
  - the automated systems must also be able to monitor the pilot
  - each element in the system must have knowledge of the other’s intent
Dimensions of “Human-Centered Automation”

- Direct Manual Control
- Assisted Manual Control
- Shared Control
- Management by Delegation
- Management by Consent
- Management by Exception
- Autonomous Operation

Dimensions of Human-Centered Automation:
- High Automation
- Low Automation
- High Human Involvement
- Low Human Involvement
Supporting Indirect, Long-Term Collaborative Design

- why
  - direct communication is impossible, impractical or undesirable
  - communication is shared around artifacts and information space evolution
  - designers need to be informed within the context of their work on real-world design problems

- lessons learned
  - people do not know what they do not know → information delivery techniques need to complement information access techniques
  - information access: browsing is not good enough in large information spaces and queries cannot be articulated → use the artifact itself as a query

- more information:
Different Dimensions of CSCW

- **Place**
  - **Same**
    - meeting rooms
    - work shifts
  - **Different Predictable**
    - tele-conferencing
    - email
  - **Different Unpredictable**
    - broadcast seminars
    - computer conferences

- **Time**
  - Different Predictable
  - Different Unpredictable

- **Long-term indirect collaboration**
  - Collaborative writing
  - Team rooms
WWW: From Broadcast to Collaboration Medium

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

Feedback (via email or forms)
Example of Shared Evolvable Information Repositories

- **DynaSites** at [http://Seed.cs.colorado.edu/dynasites.documentation.fcgi](http://Seed.cs.colorado.edu/dynasites.documentation.fcgi)

- **Swiki** (collaborative websites) → [http://swiki.cs.colorado.edu:3232/dlc/40](http://swiki.cs.colorado.edu:3232/dlc/40)


- **Place for Children**: [http://www.mamamedia.com](http://www.mamamedia.com)

- **Open Source — Eric Raymond** → see: [http://www.tuxedo.org/~esr/writings/cathedral-bazaar/](http://www.tuxedo.org/~esr/writings/cathedral-bazaar/)

- **Open Systems** = “*open source for the rest of us*”
Open Systems

- **model: open source an intellectual paradigm requiring a new mindset**
  - an intellectual paradigm requiring a new mindset
  - objective: leverage is gained by engaging the whole world as a talent pool
  - from users/consumers → co-designers/active contributors

- **some examples of decentralized, evolvable information repositories**
  - open source: collaborative development of software
  - the scientific method/enterprise itself
  - insight: “software/knowledge is not a commodity to be consumed but is a collaboratively designed and constructed artifact”

- **some characteristics:**
  - evolutionary design of complex systems → seeding, evolutionary growth, reseeding (SER) model
  - success stories so far: with technically sophisticated developers (e.g., Unix Shell, Linux), not end-users

- **social capital and gift cultures:** social status is determined not by what you control but by what you give away
Self-Analysis of L3D as a Learning Organization

- homogenous versus heterogeneous computing environment

- collaborative work practices (power-user, local developers)

- jointly created and evolved information repositories:
  - Dynagloss
  - Endnote
  - Websites of Center, Research Project
  - Websites of Courses

- establish and share work practices and information:
  - information producers: “who do I tell?”
  - information consumers: “who do I ask?”
Reinterpreting Motivation at a Collaboration Level

- who is the beneficiary and who has to do the work?

- organizational memories: what will make employees want to share?

- people need to make explicit what they know and take the trouble to enter it into the system

- collaboration depends on a social and economic system which values altruism
  - capitalism is selfish
  - claim: “until the free distribution of knowledge is rewarded economically, there is little incentive for individuals and organizations to share information”
Questions about Collaboration

- how do we get people to share, and what should they share?
- what is the relation between collaborative learning and individual learning?
- what are success stories for collaboration?
- which kind of processes and artifacts are needed to support collaborative learning?
- learning organization (but: individuals learn) → how exactly does the organization learn?
  - collaborative work practices (complement each other’s knowledge)
  - external artifacts (products, processes, group memories)
- how much can we get a "free lunch" by capturing and repackaging information that already exists? (e.g., recommender systems (such as PHOAKS), extracting information from bookmarks, social network analysis.....)
References


