


**User Interface Design, Prototyping, and Evaluation**

## Computer-Supported Cooperative Work (CSCW)

Prof. James A. Landay  
University of Washington  
Winter 2009


\*based on slides by Prof. John Canny, UC Berkeley & Kate Everitt, UW

### Fame or Shame?



The screenshot shows the Windows 'Display Settings' window. At the top, it says 'Monitor' and 'Drag the icons to match your monitors.' Below this, there are two black boxes with white numbers '1' and '2'. Underneath, it lists '1. Generic PnP Monitor on Radeon X300 Series (Microsoft Corporation - W...'. There are checkboxes for 'This is my main monitor' and 'Extend the desktop onto this monitor'. Below that are sliders for 'Resolution' and 'Color' (set to 'Highest (32 bit)'). At the bottom, it says '1360 by 1024 pixels' and has buttons for 'OK', 'Cancel', and 'Apply'.

### Fame



- Interface maps to physical world
- Allows for a high degree of flexibility, but hides this complexity
- Provide good user feedback with "Identify Monitors" function

**User Interface Design, Prototyping, and Evaluation**

## Computer-Supported Cooperative Work (CSCW)

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### Outline

- Review of Mobile UI Design
- Definitions of CSCW & group work
- Implementation issues
- Success/Failures
- Media

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### Mobile UI Design REview

- Many Design Choices
  - Think different from GUI/Web
  - Swiss army vs. dedicated
  - Pen/speech modalities
  - Integrate with other tasks
  - Social apps
- Always in your pocket & networked
- Context is very different from desktop

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### Collaboration

- **Current work environments**
  - several people working on personal computers
- **Frequently people need to cooperate**
  - create/modify documents, drawings, designs
- **Two key ways**
  - at different times (asynchronously)
    - see changes previous workers have made
  - simultaneously (synchronously)
    - actions taken by user must be seen immediately

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### Computer-Supported Cooperative Work (CSCW)

- **Def.:** “the study of how people work together using computer technology”
- **Examples of systems**
  - email
  - shared databases
  - web sites (social, shared)
  - video conferencing
  - chat systems
  - real-time shared applications
    - collaborative writing, drawing, games

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### Groupware

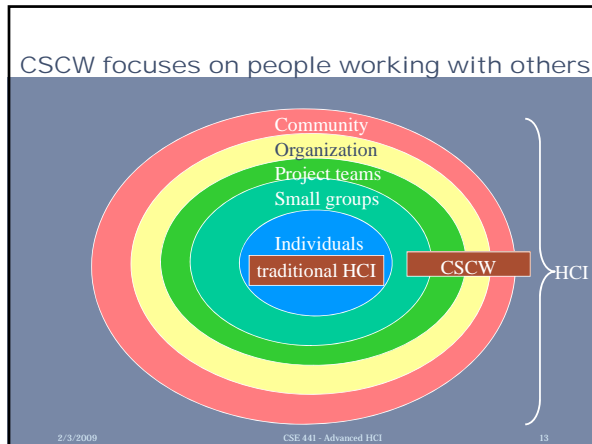
- **Groupware** denotes the technology that people use to work together
  - “systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment.”
- **CSCW** studies the use groupware
  - “CSCW is the study of the tools and techniques of groupware as well as their psychological, social, and organizational effects.”

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### Background

- CSCW grew from discontent with single user HCI methods applied to multi-user technologies and settings
- **Focus on**
  - Workplace activity
  - Understanding nature of collaborative tasks
  - Co-evolution of technologies and communities
- **Early apps**
  - CAD, computer integrated manufacturing, computer aided software engineering, office automation

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### What is CSCW?

- **Work is a social activity**
  - People and their activities are integral to design of technology
- **Workers may have social proximity despite physical/temporal distance**
  - The water cooler effect

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### Types of Cooperation

- **Focused partnerships**
  - users who need each other to complete a task
    - often a document or image to work on
    - e.g., joint authors of a paper
- **Lecture or demo**
  - person shares info. with users at remote sites
    - questions may be asked
    - may wish to keep history and be able to replay

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### Types of Cooperation (cont.)

- **Conference**
  - group participation distributed in space
    - at same time or spread out over time
- **Structured work process**
  - a set of people w/ distinct roles solve task
    - e.g., hiring committee accepts applications, reviews, invites top for interviews, chooses, informs
  - aka “work flow” or “task flow”

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### Types of Cooperation (cont.)

- **Meeting and decision support**
  - meeting w/ each user working at a computer
    - e.g., PDA Brainstorming tool
- **Tele-democracy**
  - online town hall meetings

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### Dimensions of Cooperation

		Location	
		Same Place	Different Place
Time	Same Time	Synchronous Local	Synchronous Remote
	Different Time	Asynchronous Local	Asynchronous Remote

What are examples of applications in these areas?

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### Dimensions of Cooperation

		Location	
		Same Place	Different Place
Time	Same Time	Face to Face conversation	Telephone
	Different Time	Post-it note	Letter

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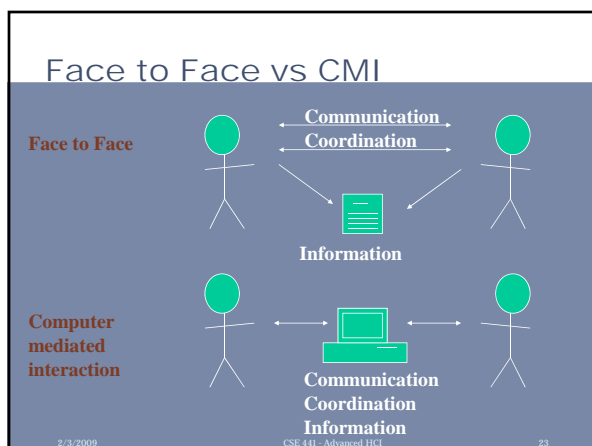
### Where would google docs fit?

		Location	
		Same	Different
Time	Same	Meeting rooms	Video Conference IM Games ATC
		Shared work surfaces and editors Shared PCs and windows	
	Different	Augmentation tools -"Where were you?" Project Scheduling In/Out Board	Email Electronic conferences Blogs/Netnews
		Co-authoring systems Shared calendars	

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- ### Related Fields to CSCW
- Behavioral Science
    - Social psychology
    - Organizational science
    - Anthropology
    - Sociology
  - Computer Science
    - Distributed computing
    - Networking
    - User interface/visualization
    - Mobile & wireless
  - Telecommunications
    - Telephony
    - Video
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- ### Face to Face Communication
- Personal Space
  - Eye contact and gaze
    - Can convey interest, confusion, boredom
  - Gestures and body language
  - Back channels, confirmation, interruption
    - Back channels = nods, shrugs, small noises
  - Turn Taking
    - Ums, ahs, pauses
  - **What happens when these channels are unavailable?**
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- ### Beyond Being There
- **What are some advantages of computer mediated collaboration over face to face?**
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## Questions

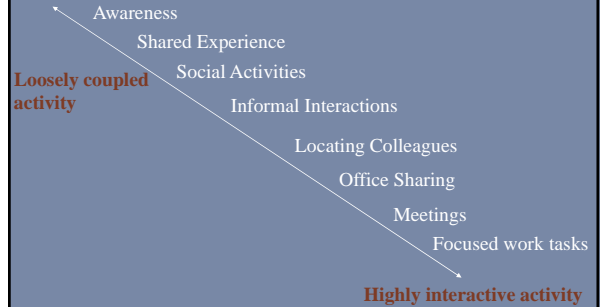
- When is a text better than a phone call?
- What is the difference between IM and Email?

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## Activity Spectrum



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## The Awareness Orb



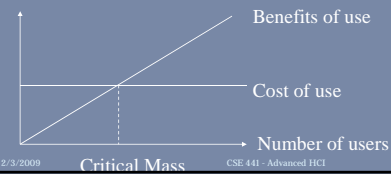
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## Organizational Issues

- Who benefits?
- Free rider problem
- Critical mass
- Changing power structures



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## Organizational Issues

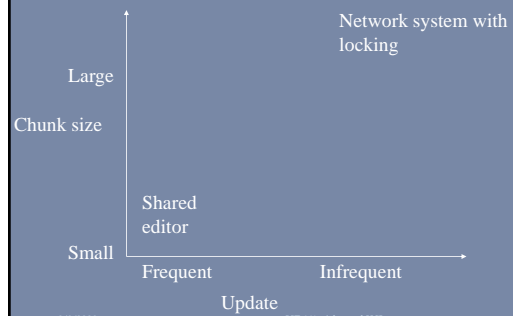
- Reciprocity / Symmetry
  - If you do work for a system, you should get some benefit
- Fitting in with organizational structure and values
- Flexibility
- Cost
  - Setup
  - Maintenance

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## Granularity



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### Email

- Where does it fit?
 

		Place/Space	
		Same	Different
Time	Same	Synchronous Local	Synchronous Remote
	Different	Asynchronous Local	Asynchronous Remote
- Why is it successful? Where has it failed?

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### Videoconferencing

- Where does it fit?
 

		Place/Space	
		Same	Different
Time	Same	Synchronous Local	Synchronous Remote
	Different	Asynchronous Local	Asynchronous Remote




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### Videoconferencing

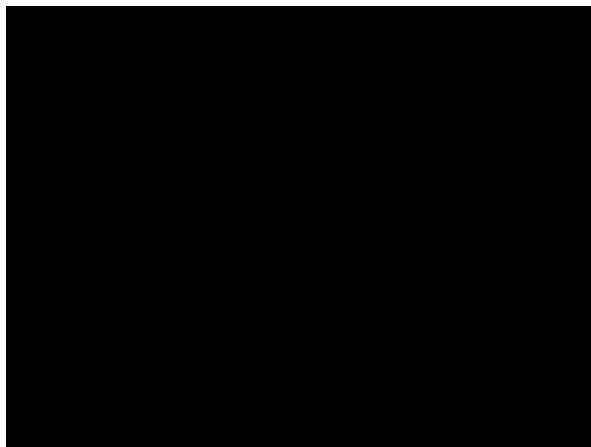
- What are the difficulties?
- How has it failed?
- How has it succeeded?
- How could it be improved?
  - Clearboard/Teamworkstation (Ishii et al)
  - VideoWhiteboard (Tang et al)

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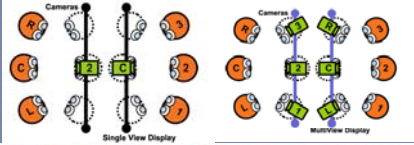

### ClearBoard

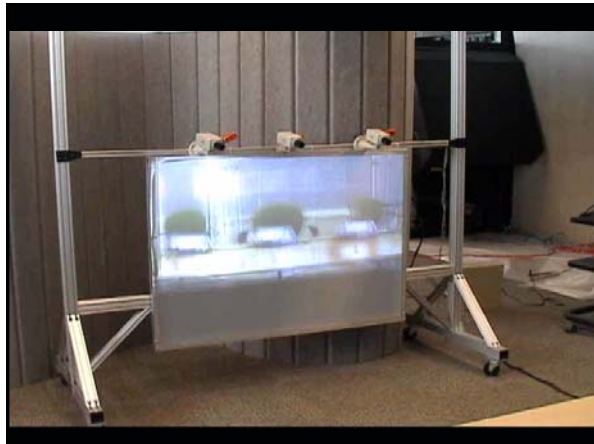
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### MultiView

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### Pebbles / Remote Commander

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### DiamondTouch

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### CSCW Topics

- Social Tagging
- Concurrent Editing
- Displays
- Social Networks
- Privacy
- Wikis

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### Key Issues

- **Group awareness**
- **Multi-user interfaces**
  - hard to design/conduct controlled experiments
- **Concurrency control**
  - consistency and reconciliation
- **Communication & coordination**
  - can't see each other -> lose visual cues
  - floor control

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### Key Issues (cont.)

- **Latency**
  - e.g., user points at an object and talk
- **Security and privacy**
- **more...**

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### Asynchronous Implementation Issues

- Each user may have own copy of data
- Must integrate changes at some point
  - example: programmers working on source
- Problems when conflicts between changes
  - lock portions of work
    - keeps state well defined, although doesn't stop semantically incompatible changes
  - resolve conflicts via integration mechanism

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### Synchronous Implementation Issues

- $\geq$ Two users working on same data, at the same time, in cooperation
- Extend Model View Controller (MVC)
  - views & copies of the model are distributed
- Propagate command history
  - must resolve conflicts among N histories
  - at what level are commands?
    - mouse position not good enough (e.g., different font sizes, etc.)

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### Social Issues

- Can these technologies replace human-human interaction?
  - can you send a “handshake” or a “hug”
  - how does intimacy survive?
- Are too many social cues lost?
  - facial expressions and body language for enthusiasm, disinterest, anger
  - will new cues develop? e.g., :)

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### Groupware Successes

- Email
  - ubiquitous (your grandparents have it?)
- Newsgroups and mailing lists
- Videoconferencing
  - growing slowly but steadily

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### Groupware Successes (cont.)

- Lotus Notes
  - integrates email, newsgroups, call tracking, status, DB searching, document sharing, & scheduling
  - very successful in corporations
  - will the Web erode? Notes is more structured

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### Groupware Failures

- Shared calendars
  - making a come back? web-based?
- Why does groupware fail? (Grudin)
  - disparity between workers & beneficiaries
  - threats to existing power structures
  - insufficient critical mass (Web reduces)
  - violation of social taboos
  - rigidity that counters common practice or exceptions

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## Success/Failure of Groupware

- Depends on competing alternatives
  - collaborators down the hall or across country?
- If users are committed to system, etiquette & conventions will evolve
  - tend to arise from cultural & task background
  - users from different orgs or cultural contexts may clash
- Synchronous systems that work well for 2 users may be less effective w/ more users

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## Media

- Video: Rich, but problems with gaze, gesture, non-verbal communication.
- Audio: Conveys meaning well but not necessarily location
- Text: Good for synchronous or asynchronous communication
- Ink: Good for expressing ideas and brainstorming

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## Video

- Eye contact problems:
  - Offset from camera to screen
  - “Mona Lisa” effect



- Gesture has similar problems: trying pointing at something

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## Audio

- Good for one-on-one communication



- Bad for meetings. Spatial localization is normally lost. Can be put back but tricky.

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## Turn-taking, back-channeling

- In a face-to-face meeting, people do a lot of self-management
- Preparing to speak: lean forward, clear throat, shuffle paper
- Unfortunately, these are subtle gestures which don't pass well through today's technology
- Network delays make things much worse

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## Breakdowns

- Misunderstandings, talking over each other, losing the thread of the meeting
- People are good at recognizing these and recovering from them “repair”
- Mediated communication often makes it harder
- E.g. email often escalates simple misunderstandings into flaming sessions

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### Usage issues

- Communication in the real world has both structured & unplanned episodes
  - meeting by the Xerox machine
- Much face-to-face communication is really side-by-side, w/ some artifact as focus

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### Solutions

- Sharing experiences is very important for mutual understanding in team work
- Context-based displays (portholes) work well
- Video shows rooms & hallways, not just people or seats



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### Solutions

- Props (mobile presences) address most of these issues. They even support exploration.



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### Solutions

- Ishii's Clearboard: sketching + presence



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### Face-to-Face: the ultimate?

- It depends
- Conveys the maximum amount of information, mere presence effects are strong. But...
- People spend a lot of cognitive effort managing perceptions of each other
- In a simple comparison of F2F, phone and email, most subjects felt most comfortable with the phone for routine business contact

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### Face-to-Face: the ultimate?

- Kiesler and Sproull found email-only programming teams were more productive than email+F2F teams in a CS course
- There you want coordination, commitment, recording
- Conclusion: Match the medium to the mission

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### CSCL: Computer-Supported Collaborative Learning

- Sub-area of CSCW concerned with learning & collaboration
- Peer interaction is a powerful source of learning, especially in universities
- Three powerful models:
  - TVI, DTVI: recorded instructor, team review
  - Peer instruction: pauses for group discussion
  - PBL: Problem-based learning, team problem-solving

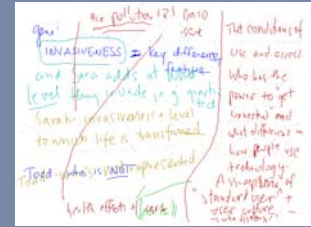
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### Livenotes

- Designed to include other learners perspectives into note-taking



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### Review

- CSCW vs. groupware
- Taxonomy based on space and time
- Key issues
  - awareness, multi-user UIs, concurrency, communication & coordination, latency
- Implementation and social issues
  - extend MVC
  - are social cues lost?
- Successes (email) & failures (scheduling)

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### Next Time

- Presentations
- Midterm next Tuesday
  - covers assignments, lectures, & readings

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