Computer-Supported Cooperative Work (CSCW)

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Agenda

• Issues & Concepts
• Groupware
• Social issues
• Evaluation
CSCW

- Computer Supported Cooperative Work
  - Study of how people work together as a group and how technology affects this
  - Support the social processes of work, often among geographically separated people

*Mark Guzdial provided input on this presentation

Paradigm Shift

- Before: System was a tool that was applied to work
- After: Multitasking paradigm shift
  - The “system” became the medium, the moderator, rather than “just” a tool
Examples

• Scientists collaborating on a technical issue
• Authors editing a document together
• Programmers debugging a system concurrently
• Workers collaborating over a shared video conferencing application
• Buyers and sellers meeting on eBay

Research Focus

• Often divided into two main areas
  – Systems - Groupware
    • Designing software to facilitate collaboration
  – Social component
    • Study of human and group dynamics in such situations
Groupware

• Software *specifically* designed
  – To support group working
  – With cooperative requirements in mind

• **NOT just tools for communication**

• Groupware can be classified by
  – *Then* and *where* the participants are working
  – The *function* it performs for cooperative work

• **Specific and difficult problems with groupware implementation**

Classifying Groupware

• **Time/Space matrix**
  – When and where the participants are working

• **People-Artifact Framework**
  – The function it performs for cooperative work
The Time/Space Matrix

Classify groupware by:

- *when* the participants are working, at the same *time* or not
- *where* the participants are working, at the same *place* or not

Common names for axes:
- **time:**
  - synchronous/asynchronous
- **place:**
  - co-located/remote

Applied to “Traditional” Technology

<table>
<thead>
<tr>
<th></th>
<th>same time</th>
<th>different time</th>
</tr>
</thead>
<tbody>
<tr>
<td>same place</td>
<td>face-to-face conversation</td>
<td>post-it note</td>
</tr>
<tr>
<td>different place</td>
<td>phone call</td>
<td>letter</td>
</tr>
</tbody>
</table>
### Applied to Computer Technology

<table>
<thead>
<tr>
<th>Time</th>
<th>Co-located Place</th>
<th>Remote Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchronous</td>
<td>Face-to-face</td>
<td>Phone call</td>
</tr>
<tr>
<td></td>
<td>E-meeting room</td>
<td>Video window,wall</td>
</tr>
<tr>
<td>Asynchronous</td>
<td>Post-it note</td>
<td>Letter</td>
</tr>
<tr>
<td></td>
<td>Argument. tool</td>
<td>Email</td>
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### A More-fleshed Out Taxonomy

<table>
<thead>
<tr>
<th>Same Place</th>
<th>Different Time</th>
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</thead>
<tbody>
<tr>
<td>Same Time</td>
<td>Synchronous</td>
</tr>
<tr>
<td></td>
<td>Distant</td>
</tr>
<tr>
<td>Face to face interactions</td>
<td>Ongoing tasks</td>
</tr>
<tr>
<td>conference tables with embedded computers</td>
<td>team rooms</td>
</tr>
<tr>
<td>public displays</td>
<td>group displays</td>
</tr>
<tr>
<td>dedicated tools for e.g., voting and brainstorming</td>
<td>shift work groupware</td>
</tr>
<tr>
<td></td>
<td>project management</td>
</tr>
<tr>
<td>Different Places</td>
<td>Distributed real time interactions</td>
</tr>
<tr>
<td>chat systems</td>
<td>Communication and coordination</td>
</tr>
<tr>
<td>transparent sharing of single user applications</td>
<td>unstructured or semi-structured electronic mail</td>
</tr>
<tr>
<td>collaboration-aware groupware</td>
<td>electronic bulletin boards</td>
</tr>
<tr>
<td>video conferencing</td>
<td>asynchronous conferencing</td>
</tr>
<tr>
<td>media spaces</td>
<td>list servers</td>
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<tr>
<td></td>
<td>workflow systems</td>
</tr>
<tr>
<td></td>
<td>schedulers</td>
</tr>
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<td></td>
<td>collaborative hypertext</td>
</tr>
</tbody>
</table>

Table 1. A typical space/time matrix (after Baecker, Grudin Buxton and Greenberg 1995 p.742)
**Styles of Systems**

- 1. Computer-mediated communication aids
- 2. Meeting and decision support systems
- 3. Shared applications and tools

**Classification by Function**

- Cooperative work involves:
  - **Participants** who are working
  - **Artefacts** upon which they work
What interactions does a tool support?

- Meeting and decision support systems
  - Common understanding

- Computer-mediated communication
  - Direct communication between participants

- Shared applications and artefacts
  - Control and feedback with shared work objects

Communication via an artifact

- **Deixis**
  - Reference to work objects

- **Feedthrough**
  - Communication through the artefact
Many aspects of communication

- Good groupware – open to all aspects of cooperation
  - e.g., annotations in co-authoring systems
  - embedding direct communication

- Bar codes / RF ID
  - Form of deixis
  - Aids diffuse large scale cooperation

Awareness

- What is happening?
- Who is there
  - e.g. IM buddy list
- What has happened
  - ... and why?
1. Computer-mediated Communication Aids

- **Examples**
  - Email, Chats, MUDs, virtual worlds, desktop videoconferencing
  - Example: CUSee-Me, iChat, Skype

2. Meeting and Decision Support Systems

- **Examples**
  - Corporate decision-support conference room
    - Provides ways of rationalizing decisions, voting, presenting cases, etc.
    - Concurrency control is important
  - Shared computer classroom/cluster
    - Group discussion/design aid tools
3. Shared Applications and Tools

• Examples
  – Shared editors, design tools, etc.
    • Want to avoid “locking” and allow multiple people to concurrently work on document
    • Requires some form of contention resolution
    • How do you show what others are doing?

Example

• Teamrooms - Univ. of Calgary, Saul Greenberg

http://www.cpsc.ucalgary.ca/grouplab/projects/index.html
Example

- **Peepholes (same lab at Calgary)**
  - Contact facilitation system that lets you know who is around on the Internet by illustrating their presence through iconic indicators
Using the CoWeb

Features to support collaboration:
Recent Changes and Attachments
Handling contention in CoWeb

- No locking
  - On the Web, how do you know if someone walks away?

- But if person A edits, then person B starts and saves edit before A saves, how do you deal with it?
  - Old way: A “wins,” but B’s is available in history for retrieval
  - Current way:
    - Each edit time is recorded
    - If incoming edit time is earlier than last save, then note collision. Provide user with both versions for resolution.

Security

- Save everything,

- But it’s mostly social pressure that keeps it working

- Problems (finally) reared ugly head after a while
  - Passwords
Social Issues

- People bring in different perspectives and views to a collaboration environment
- Goal of CSCW systems is often to establish some common ground and to facilitate understanding and interaction

Turn Taking

- There are many subtle social conventions about turn taking in an interaction
  - Personal space, closeness
  - Eye contact
  - Gestures
  - Body language
  - Conversation cues
**Geography, Position**

- In group dynamics, the physical layout of individuals matters a lot
  - “Power positions”

- “Proxemics” – Proximity and body alignment as social cues
  - Video: “Stitching” CSCW ’04

**Case Study: WikiPedia**

Baseball is a team sport that is popular in the United States, and the total attendance for Major League games is more than that of all other American professional sports combined. In Japan, the Dotonbori Stadium, glove South Korea, and several other clubs continue.
Case Study: WikiPedia

- Consider the tools available
- Who are the users?
- “Community”?
- How does all this affect the content?

- What to do about it?
- Broader issues of trust, anonymity, validity, responsibility, authority...

Evaluation

- Evaluating the usability and utility of CSCW tools is quite challenging
  - Need more participants
  - Logistically difficult
  - Apples - oranges

- Often use field studies and ethnographic evaluations to assist
  - Video: ESPACE (CSCW’04)
  - Video: Dynamo (CSCW’04)
Evaluation Efforts at Calgary

- Uses modified heuristic evaluation techniques

- Heuristics (reformulated):
  - Support intentional & appropriate communication
    - Verbal communication (content)
    - Gestural communication (deixis)
  - Support communication of individual’s embodiment (attitude)
  - Support sharing of artifacts
  - Provide protection of shared resources
  - Switch between loosely and tightly coupled coordination
  - Support establishment of contact

Interested in More...?

- **CS 7460: CSCW**
  - Readings, discussion, research-oriented
  - ’08-’09

- **CS 6470: Online Communities**
  - Students study an existing community in depth, and then develop a new community design
  - ’08-’09

- **CS 7467: Computer-Supported Collaborative Learning**
  - CSCW-like concepts and ideas but in learning and education context
  - ’07-’08
Upcoming

- Ubiquitous Computing
- Project presentations 1
- Project presentations 2 / Final exam