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

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>Same Time</th>
<th>Different Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Place</td>
<td>face-to-face conversation</td>
</tr>
<tr>
<td>Different Place</td>
<td>phone call</td>
</tr>
</tbody>
</table>
Applied to Computer Technology

Time

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

A More-fleshed Out Taxonomy

<table>
<thead>
<tr>
<th>Same Place</th>
<th>Different Place</th>
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</thead>
<tbody>
<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>Distributed real time interactions</td>
<td>project management</td>
</tr>
<tr>
<td>chat systems</td>
<td>unstructured or semi-structured electronic mail</td>
</tr>
<tr>
<td>transparent sharing of single user applications</td>
<td>electronic bulletin boards</td>
</tr>
<tr>
<td>collaboration-aware groupware</td>
<td>asynchronous conferencing</td>
</tr>
<tr>
<td>video conferencing</td>
<td>list servers</td>
</tr>
<tr>
<td>media spaces</td>
<td>workflow systems</td>
</tr>
<tr>
<td>Table 1. A typical space/time matrix (after Baecker, Grudin Buxton and Greenberg 1995 p.742)</td>
<td>schedulers</td>
</tr>
<tr>
<td></td>
<td>collaborative hypertext</td>
</tr>
</tbody>
</table>
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 a document.
    - Requires some form of contention resolution.
    - How do you show what others are doing?

**Example**

- **Teamrooms - Univ. of Calgary, Saul Greenberg**

  - Video, CHI '97
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

What about in online collaborations?

Case Study: WikiPedia
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