3012 / GC25 Interaction Design
Collaborative Systems

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Jan 09
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Collaborative Systems

Some definitions…

Collaborative Software is “software that allows people to work together on the same documents and projects over local and remote networks” (The Free Dictionary)

Computer-Supported Collaborative Work (CSCW) addresses “how collaborative activities and their coordination can be supported by means of computer systems” (Carstensen & Schmidt, 2002)

Computer-Supported Collaborative Learning (CSCL) focuses “on the use of technology as a mediational tool with collaborative methods of instruction.” (Koschmann, 1996)

Social Computing is “based on creating or recreating social conventions and social contexts online through the use of software and technology”. (Microsoft)

Background

• In early days, the Personal Computer (PC) was regarded as alienating
• With the Internet, the PC transformed into a tool that facilitates communication (and access to information)
• Changes in business organisations and world economics:
  – Global markets: multinational, multilingual organisations
  – Rising cost: strategic cooperation, opportunistic alliances
• Emergence of a worldwide infrastructure:
  – Increased bandwidth → Information Superhighway (Broadband)
  – Spread of Connectivity → Global Village (Flat rates)
  – Merging of telephony, television, computing (triple play)
• Growth of mobile computing
  – e.g. the success of Blackberry, PDA, Smartphone

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Some examples…

• Email
• Calendaring
• Chat / IM
• Online conferencing
• Wiki
• Online Dating
• Online Gaming
• Social Networks
• Forums / Discussion boards
• Project management
• Workflow management
• Knowledge Management
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Some examples...

http://www.youtube.com/watch?v=qmmdGonQW4&feature=related

http://www.blinkenlights.de/

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First ever SMS vote in Switzerland:
“…voting will bring Swiss voting technology into the 21st century, following a successful internet voting trial in Anières, canton Geneva, in January 2003. … the new technology will change voting habits in Switzerland. “We forecast that particularly younger people will take advantage of e-voting, but we have seen in Bülach that many middle-aged people regularly use SMS too,” he said. “I don’t necessarily think that more people will vote as a result of e-voting but I do believe that many people who used to send their votes in the post will switch to SMS… Each user will be sent a unique user ID through the post. They also have to enter a personal code and their date of birth before they can send their vote, which is recorded to prevent repeat voting.”

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Collaboration vs. Cooperation

• No clear distinction is made across diverse dictionary definitions
  – Both are used side by side
  – If distinction is made, it is mainly one of quality…
  – Cooperation might be used in more formal contexts than collaboration

• It is important to understand cooperation as process, in which stakeholders communicate with each other and coordinate their work to achieve a (common) goal:

  Communication → Coordination → Cooperation

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Cooperation

Types of Cooperation

• Focused partnerships
  – Collaborations between 2 or 3 people to complete a common task (e.g. joint authors of a report)
  – Document sharing increasingly important
  – Strong needs for communication

• Lecture or demo
  – 1 to many sharing of information (e.g. remote lecturing)
  – Usually same time but sometimes with recording capabilities

• Conference
  – Many to many communications
  – Blogs and wikis as new forms to supplement or even replace conferences
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Types of Cooperation

- **Structured work process**
  - People with distinct organisational roles collaborate on the same task (e.g. University admission: register, review, choose and inform applicants)

- **Meeting and decision support**
  - Face-to-face meetings, using personal and shared displays (e.g. for anonymous participation or voting)

- **Electronic commerce**
  - B2C (e.g. user ratings, comments) and B2B (e.g. negotiations - can be distributed over time and space)

- **Tele-democracy**
  - Online debates, voting, etc.

- **Collaboratories**
  - Novel organisational form for groups to work together across time and space (e.g. sharing expensive equipment), share interests but may have distinctive goals

- **Telepresence**
  - Immersive 3D virtual environments (e.g. using DataGloves, goggles, CAVE’s, etc.)

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Dimensions of Cooperation (1)

Shneiderman’s Time/Space Matrix

- **Face to face interactions**
  - Synchronous: office rooms, small display groupware, shared table, wall displays, roomware, ...

- **Continuous task**
  - Asynchronous: team rooms, large public display, shift work groupware, project management, ...

- **Remote interactions**
  - Video conferencing, instance messaging, chats/MUDs/virtual worlds, shared screens, multi user editors, ...

- **Communication & coordination**
  - Email, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis, ...

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Face-to-face interfaces:

Same place, same time

- Innovative approaches to work and learning include:
  - Shared display from lecturer workstation
  - Audience response units
  - Text-submission workstations
  - Brainstorming, voting, and ranking
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Face-to-face interfaces: Same place, same time

- File sharing
- Shared workspace
- Group activities
- Colab and Liveboard
- SMART Board
- Public spaces facilitate sharing
- Sharing photos is very popular
- Notification systems

Benefits of electronic meeting systems:

- **Democracy:**
  - Parallel communication promotes **broad input** into the meeting process and reduces the chance that a few people dominate the meeting.
  - Anonymity mitigates evaluation apprehension and conformance pressure, so that issues are discussed more candidly.
- **Reflection:**
  - The **group memory** constructed by participants enables them to pause and reflect on information and opinions of others during the meeting and serves as a permanent record of what occurred.
- **Focus:**
  - **Process structure** helps focus the group on key issues and discourages irrelevant digressions and unproductive behaviors.
  - **Task support** and structure provides information and approaches to analyze it.

Continuous Tasks: Same place, different time

- Team rooms
- Project management
- Shift work groupware
- Large public displays

Synchronous distributed interfaces: Different place, same time

**Video conferencing – potential problems:**

- slow response times for entering and leaving session
- distracting background audio
- difficulty in determining who is speaking
- inadequate lighting
- difficulty in making eye contact
- changed social status
- small image size
- potential invasion of privacy
- need for convenient turn taking
- need for document sharing

High-definition video conferencing
Cisco’s TelePresence system

Synchronous distributed interfaces:
Different place, same time
• Chat, instant messaging, and texting
• Texting and cell phones

→ Corporate Messaging increasingly important (e.g. Traders can discuss rumors very efficiently)
http://www.guardian.co.uk/media/2007/jan/22/yahoo.reuters

Asynchronous distributed interfaces:
Different place, different time
• Wikis
  – Tool for collaborative creation of websites using easy online add and edit functionality
  – Vandalism is a problem → lack of social awareness
  – Monitoring changes (version controls) is a main feature

• Wiki building tools (wiki engines)
  – Large list of engines: http://c2.com/cgi/wiki?WikiEngines
Asynchronous distributed interfaces: Different place, different time

- Newsgroups, discussion boards
  - focused electronic discussions by group of people
- online magazines and newsletters
- Web-logs/blogs and wikis

Online and networked community examples:
- Group identity
  - Patient support groups
    - dieting and health advice increasingly popular on the Web
  - Patient support groups
- Impact on offline communities
- Network communities can be controversial
  - hackers
  - hate groups
  - para-military groups
- Distance education courses

Seti@home project
- Mainly to share the processing power of internet-connected PC’s
- Collaboration with minimal human effort
- See: http://setiathome.berkeley.edu/
**Collaboration across cultures:**
- collaborators may not share same assumptions and beliefs.
  - Cultures can be national, geographical, ethnic, social, educational, organisational.
  - **Think about Wikipedia**

**Collaboration across contexts:**
- the situational context (environment, conditions) may change during task. Context can be temporal, geographical, social.
  - e.g. on the go, using mobile devices

Both culture and context influence how users interpret and react to information.

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**Dimensions of Cooperation (2)**

**[Bannon & Schmidt]**

- **Indirect** collaboration, individuals or groups work on similar or interdependent tasks, and are aware of this to some extent. In **distributed** collaboration, collaboration is seen as beneficial, but goals of collaborations are not clearly specified (“we should talk more often”).

“Collaboration at arm’s length”

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Integration of tools and work procedures:
- Collaboration becomes cumbersome when new tools have to be learned, and/or different tools have to be used for the same task in collaborative mode than in non-collaborative mode. Never underestimate users' fondness for their existing tools.
- Another irritance factor is when data has to be translated into special formats to be used in collaboration mode. Just automating and sharing existing work procedures may not be the answer.

Lack of awareness:
- Significant developments may go unnoticed because state changes are not perceived or interpreted incorrectly. Lack of specific goals of collaboration, and lack of explicit tasks means responsibility is diffused (virtual bystander phenomenon).

Dimensions of Cooperation (3)
Buxton's activity focused categorisation

- **Background**
  - High bandwidth, transient natural language
  - Low bandwidth, persistent natural language

- **Foreground**
  - Human-Human
    - Conversation, Phone call, Video conferencing
    - e.g. "portholes" system
  - Human-Computer
    - Interaction with GUI's
    - e.g. Smart house technology

Source: Buxton

**Cooperation Obstacles (3)**

(Buxton)

- Security & privacy
  - accidentally drifting from private to public space/directory/conference; not being aware what others can do with your data.
  - think about UK Government’s data handling

- Styles of communication
  - Human-human dialogue is very different from human-computer dialogue; trying to ease the transition by humanizing the computer is not the solution, since that model of communication will break down eventually (see Winograd & Flores (1986): Understanding Computers and Cognition.)

**General Cooperation Obstacles**

Overhead Work

We need to acknowledge that cooperative working carries an overhead in terms of

1. Communication
2. Coordination

...as well as potential benefits through resource sharing and improved quality.

- It is important that cooperative software is integrated as seamless as possible into the normal workflow and overhead is kept at a minimum!
  - (e.g. tagging, shared calendars, blogs, etc...)

- Early CSCW/Groupware applications followed the motto: “Any cooperation is good cooperation.”
  - Designers and potential users must be aware that collaboration activity carries cost (overhead in communication and coordination) as well as benefits (sharing of resources, better quality product).

- Designing Communication within Collaborative Software needs to consider:
  - Turn-taking
  - Backchannels

- Designing Cooperation within Collaborative Software needs to consider:
  - Granularity of shared objects
  - Level of sharing
  - Synchronised or unsynchronised
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Utilizing Social Systems for Collaboration

Collective Intelligence

- Combine the behaviour, preferences, or ideas of a group of people to create novel insights
- User-driven vs. system-driven collective intelligence
- Users clicking, rating, tagging, buying, etc. generate a database of intentions:
  "The aggregate results of every search ever entered, every result list ever tendered, and every path taken as a result [...] This information represents, in aggregate form, a place holder for the intentions of humankind - a massive database of desires, needs, wants, and likes that can be discovered, subpoenaed, archived, tracked, and exploited to all sorts of ends."

Crowd sourcing

- Outsourcing a task to an undefined, generally large group of people
  - E.g. develop a new technology, carry out a design task, refine an algorithm or help capture, systematize or analyze large amounts of data
  - Labor may be well-compensated, but mostly no direct rewards
    - Intrinsic motivation, or to gain recognition in a community – see: social tools such as Flickr.com, digg.com, youtube.com, wikipedia.com
- Perceived benefits of crowd sourcing include:
  - Problems can be explored at comparatively little cost
  - Payment is by results (e.g. purchasing images through Flickr).
  - The organization can tap a wider range of talent than might be present in its own organization.

Synchronous distributed interfaces

Google Image Labeler “Game”

Intentional Collaboration

Wikipedia

Wiki

A wiki (STA: [wɪki]  or “wik-i”) is a type of website that allows users to add and edit content easily and is easily suited for collaborative writing.

The name is based on the Hawaiian term wiki, meaning "quick", "fast", or "to hasten" (hawaiian dictionary). Sometimes the web application wikividi (or Wikividi) is used instead of wiki (hawaiian dictionary).

The term Wiki also sometimes refers to the collaborative software itself (wiki engine) that facilitates the operation of such a website (see wiki software).

In essence, wiki is a simplification of the process of creating HTML web pages combined with a system that records each individual change that occurs over time, so that at any time, a page can be revealed to any of its previous states. A wiki system may also provide various tools that easily allow the user community to monitor the constantly changing state of the wiki and discuss the issues that emerge in trying to achieve a general consensus about wiki content. Wiki content can also be misleading as users may add incorrect information to the Wiki page.

Some wikis will allow completely unrestricted access so that people are able to contribute to the site without necessarily having to undergo a process of registration, as had usually been required by various other types of interactive websites such as Internet forums or chat sites.

The first wiki, WikiWikiWeb, is named after the "Wiki Wiki" line of Chance RT-52 buses in Honolulu. 37

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40
Social Search

- determines relevance of search results by considering interactions or contributions of users
  - social bookmarking (folksonomies)
  - tagging of content with descriptive labels
  - Rating “search” results by promoting or demoting them
- contrasting to established machine-based approaches that determine relevance by algorithmic analysis of texts and link structure of documents (see: Google’s PageRank)

Summary points

- Cooperation between individuals, groups and organisations is still increasing, so the demand for Groupware / CSCW systems is likely to increase
- In order to design successful CSCW applications, designers need to
  - Understand cooperative task
  - Perform cost/benefit analysis
- Make cooperation and communication as seamless as possible

References

- Schneiderman, Designing the User Interface, Chapter 10 “Collaboration”.
- Bill Buxton’s papers: http://www.dgp.toronto.edu/people/BillBuxton/
References
CSCW 08 Conference

Core Topics:
– **Social Systems**: Social Network Sites and Collective Intelligence
– Computer Supported Cooperative Care/Health
– **Multi-player gaming** and Virtual Environments
– **Web 2.0**, Enterprise 2.0, Mashups
– Human Robotic Collaboration (HRC)
– Collaboration with and through advanced sensing systems

More traditional topics:
– Innovative **installations**: CSCW and the arts, media, museums, etc.
– Innovative technologies and architectures to support group activity, **awareness** and **telepresence**
– Emerging issues for global coordination and communication
– Studies exploring the appropriate balance between individual and collaborative work.
– Systems for emergency preparedness and large-scale rapid deployment (e.g. **disaster relief**)
– ...