Computer-supported cooperative work: An introduction

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Outline

• Historical development of groupware
  – Research areas and concepts
  – Components of groupware
• From CSCW to social media
• Basic concepts
  – Coordination, cooperation, collaboration
• Later concepts and technologies
  – Awareness
  – Critiquing
  – Recommender systems
Goal and disclaimer

• Each lecture consist of
  – Basic concepts,
  – Tools (technology), and
  – Empirical studies (in use of the tools)

• The comprehensive coverage will inadvertently skip some of the details for each of the three aspects

• The attached papers go into more depth for the interested reader
The starting point for the course is a survey of the field

.. and the notion of “common information space”


Current trends

• Social media as platform for CSCW
• The challenge with social media from a CSCW point of view is to transcend socializing and engage in cooperative problem solving
• This requires innovation in technology, work organization and research methods
What is CSCW?

CSCW: Computer Supported Cooperative Work is a term introduced by Irene Greif and Paul Cashman in 1984, meaning:

- “A set of concerns about supporting multiple individuals working together with computer systems”
- Can be divided into two main areas, associated with 1) CS and 2) CW, respectively
- The series of CSCW conferences started in 1986, it has since alternated between USA (even years) and Europe (odd years)
- By many thought of as a “spin off” from HCI
From problem solving to cooperation

• The historical “spin off” of CSCW from HCI was explained by Ellis et al., as:

• At that time HCI was concerned about using the computer to *solve problems*, whereas CSCW was concerned about using the computer to *mediate human interaction*

• Mediation as key concept (we come back to this later)
The move from HCI to CSCW in 1980s

- HCI is concerned about supporting individuals, and CSCW how to facilitate co-located and distributed groups working together.
The move from CSCW to social media

- From small groups to large groups (crowd sourcing)
- In large groups people may not have met each other before
- Both HCI and CSCW are important for full understanding of both technology and use
- Also learning becomes an issue to overcome differences and build common understanding
Relationship between HCI, CSCW, and CSCL (simplified view)
What is groupware?

• Associated with the CS part of CSCW
• The term groupware was first used in 1982 in a paper by Johnson-Lentz in context of computer-mediated communication (CMC)
• Defined by Ellis et al. as: “computer-based systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment”
• This creates a need for concepts to describe the various aspects of groupware, e.g. common task/goal, interface to a shared environment, etc.
Characteristics of groupware

• Common task / goal
• Interface to a shared environment
• Information sharing and coordination
• In addition, because there are more than two users, we also need to be concerned about
  – Communication support
  – Division of labor, role assignment (e.g. access control)
  – Support for joint design of a common artifact
  – Awareness of other users who are also interacting within the same shared environment
1<sup>st</sup> generation groupware (pre web)

- Ellis et al identifies the following type of groupware (1991)
  - Message systems (e.g. email)
  - Multi-user editors (e.g. Grove for collaborative text editing, used in paper by Ellis as example)
  - Group decision support systems (e.g. discussion forums)
  - Early video conferencing systems
  - Intelligent information sharing systems (Information Lens)
  - Workflow coordination systems (The Coordinator)
Common information space (2\textsuperscript{nd} gen.)

• Proposed by (Schmidt & Bannon (1992); Bannon & Bødker, 1997):

• .. the construction and management of what we term a “common information space” has, in our view, been somewhat neglected, despite its critical importance for the accomplishment of many distributed work activities. Here the focus is on how people in a distributed setting can work cooperatively in a common information space - i.e. by maintaining a central archive of organizational information with some level of ‘shared’ agreement as to the meaning of this information (locally constructed), despite the marked differences concerning the origins and context of these information items. The space is constituted and maintained by different actors employing different conceptualizations and multiple decision making strategies, supported by technology. Schmidt & Bannon (1992)
Examples: BSCW and Dropbox

BSCW version 4.3 (2nd generation)

Dropbox Website (3rd generation)
3rd generation groupware

- A new generation of groupware, which are often simpler to use than the previous generation
- Example: Dropbox
- Characterized by shared and local spaces, integrating personal and shared perspectives
- Realized as a shared website (in the cloud) and a conventional desktop on personal computer
Social media as 3rd generation groupware?

- Not all social media media are groupware, but some of them qualify
- Social media follows the web 2.0 philosophy of the read/write (interactive) web
- Social media are distinguished by crowdsourcing, being host for a large number of users, who has the possibility to contribute with content (text, pictures, videos, etc.) to a shared web site
- Examples: Facebook, Twitter, YouTube, Fliqer, LinkedIn, Dropbox, etc.
What is group work?

• Related to the CW part of CSCW
• Grudin (1994) suggests the following:
  – Small group usually consisting of 2-3 people who works together to reach a common goal
  – There are also larger groups, but they are less efficient when supported by technology
• Whether or not larger groups are less efficient is today a debated theme as social media cater to many users
• Two examples: Google Docs and GetSatisfaction
Example: Google Docs

- Supports synchronous (real-time) collaborative writing,
- Arguable more efficient for small groups than large groups
Example: GetSatisfaction

- Supports asynchronous cooperative problem solving, often used by commercial companies for interacting with customers
- Arguable more stimulating to use for large groups than small groups
Basic concepts in CSCW

Ellis et al. suggest the following three concepts are basic for CSCW research and groupware design:

- Communication
- Coordination
- Collaboration (sometimes divided into:)
  - Cooperation (default in CSCW)
  - Collaboration (default in CSCL)
    - Priority on process rather than outcome
    - Joint interaction on common goal rather than strict division of labor into subtasks
- This distinction leads to a differentiation of real-time vs. different-time
Supporting communication

• Groupware can be divided into two types, depending on the kind of communication it supports:
  – Synchronous communication (real time)
  – Asynchronous communication (different time)

• This led to the time/place matrix, originally proposed by Johansen (1988)
Time/place matrix with examples

- **Same time - synchronous**
  - **Face to face interactions**
    - decision rooms, single display groupware, shared table, wall displays, roomware, ...

- **Different time - asynchronous**
  - **Continuous task**
    - team rooms, large public display, shift work groupware, project management, ...

- **Same place - colocated**
  - **Remote interactions**
    - video conferencing, instance messaging, chats/MUDs/virtual worlds, shared screens, multi-user editors, ...

- **Different place - remote**
  - **Communication + coordination**
    - email, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis, ...

URL: http://en.wikipedia.org/wiki/CSCW
Synchronous communication

• Advantages
  – Good support for awareness (adopting f2f resources)
  – Appropriate for many kinds of situations resembling f2f

• Disadvantages
  – Complexity of developing from scratch technology to support this form of communication can outweigh its advantages
  – Work that require high amount of individual concentration (i.e. time consuming individual work) is not well supported (e.g. collaborative writing a paper)
  – Sometimes it leads too much time “talking” and too little time for “doing” (e.g. instant messaging and chat in projects)
Asynchronous communication

• Advantages
  – Allows time for individual reflection before making a next move while interacting (over time) with others
  – Good for tasks that naturally lend themselves to clear division of labor

• Disadvantages
  – Social interaction is minimal (in its f2f form)
  – Motivation to work together over an extend period of time may be lower and requiring incentives to work
  – Misunderstandings are likely to happen, which is difficult to resolve without synchronous communication
Exercise 1

• Two and two group up
• You have been asked to extend the time/place matrix by a third dimension, what would it be?
• Make a proposal and argue based on a CSCW system you know of, and/or your own interest and PhD project (if applicable)
Awareness

• Dourish and Bellotti (1992) defined awareness in real-time, distributed environments as “the understanding of the activities of others, which provide a context for our own activity”
• Originally developed in the context of a studying the use of shared writing environment (ShrEdit)
• Awareness ranges from detailed information of actions in the GUI to higher level representations of matters relevant to all in a group, supported by shared feedback
• Based on the follow up research, we can distinguish between social awareness and conceptual awareness
Origin of two types of awareness

• The philosopher and chemist M. Polanyi made a distinction between focal and subsidiary awareness in “The tacit dimension” book.

• Focal (or foreground) awareness
  – The (direct or indirect) objects of our attention

• Subsidiary (or background) awareness
  – Memories of past attempts to achieve the object

• Example: Driving a nail with a hammer
  – Need attention to both types of awareness
Social awareness

• Status information about friends and colleagues’ doings

Facebook activity update

LinkedIn weekly update
Conceptual awareness

- Integrating domain knowledge (top down) and user conceptualization (bottom up)
- Distinguished from social awareness by being goal-oriented and normative
- Think about it as “how things ought to be” rather than “how things are”

A tag cloud with user defined keywords (tags) related to Web 2.0
Critiquing

- Critiquing is the presentation of a reasoned opinion about a product, item or action
- Supports both critique and praise
  - Critique: What can be improved
  - Praise: What is good about a design
- Modeled after how design critics in design studios observe and provide feedback to students by “looking over their shoulder”
- Automated critiquing systems have been built to support novice designers in many domains
Critiquing cont’d

• Critiquing process
  – Action-breakdown-repair (Schön, 1983; Fischer et al. 1991)
  – Advice-improve (Robbins, 1998)
  – Construct-parse-check-critique-maintain (Gross et al., 2004)

• Critiquing rules
  – Condition-action rules to identify suboptimal designs

• Intervention techniques
  – Timing of feedback: proactive, reactive, passive
Critiquing cont’d

• Critiquing is related to learning by a method called “learning on demand” (Fischer, 1995):
  – Learning by doing, making mistakes, and being informed

• Three stages of being informed (from shallow to deep)
  1) Hint, prompt, feedback message
  2) Examples, counterexamples
  3) Argumentation

• Developed for design activities, originally for individual design, later for cooperative design
Critiquing and learning (learning by doing, making mistakes, and getting feedback)

Figure 5: JANUS-CRACK: A learning example from the Catalog

The critics in JANUS detect the following suboptimal features of the kitchen shown in this figure: The width of the door is less than 36 inches, the dishwasher is not next to a sink, the stove is next to a refrigerator, the refrigerator is next to a sink, and the sink is not in front of a window.

From Fischer et al., 1991
Example: ArgoUML

Retrieved from: http://argouml.tigris.org/
Recommender systems

• A system that can “anticipate” the preferences a user would have towards an item (music, book, movie, etc.) before he or she has seen it
• It is based on ratings that other users have given those items, and the implied relationship of these users
• A data mining technique known as “collaborative filtering” is used for computing preferences
• Extensively applied in e-commerce for marketing and advertisement, but can also be non-profit
Example recommender systems

Rating movies with MovieLens, a system developed by GroupLens, Univ. of Minnesota, (http://movielens.umn.edu/html/tour/movies.html)

Amazon.com: Recommendations for books to purchase, based on books already purchased
Virtual ethnography

- Virtual Ethnography is ethnography applied to online communities and cyber culture (Hine, 2000)
- According to Hine, conventional ethnography ignores certain aspects of technological culture
- Virtual ethnography can help us understand the behaviors and knowledge of participants in online communities
- It is also concerned with the artifacts produced in cyber cultures and the methods in which these cultures share, use, and iterate on them
- A goal of virtual ethnography in the work pursued here is
  - to make implications for design to the extent possible, and
  - to understand interaction in social media in order to analyze outcomes relating to learning and knowledge development