



# 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

- Ellis, C. A., Gibbs, S. J. and Rein, G. L. (1991). Groupware: Some Issues and Experiences, 1991. *Communications of the ACM*, 34(1), 39-58.
- Grudin, J. (1994). Computer-Supported Cooperative Work: History and Focus. *IEEE Computer*, 27(5), 19-25.

## .. and the notion of “common information space”

- Schmidt, K. & L. Bannon, (1992). Taking CSCW Seriously: Supporting articulation work. *Computer Supported Cooperative Work, vol. 1, nos 1-2. Pages 7-40.*
- Bannon, L. and Bødker, S. (1997). Constructing common information spaces. In *Proceedings of the fifth conference on European Conference on Computer-Supported Cooperative Work (ECSCW'97)*. Kluwer Academic Publishers, Norwell, MA, USA, pp. 81-96.
- Bentley, R., Horstmann, T. and Trevor, J. (1997). The World Wide Web as Enabling Technology for CSCW: The Case of BSCW. *Comput. Supported Coop. Work* 6(2-3), pp.111-134.

## 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

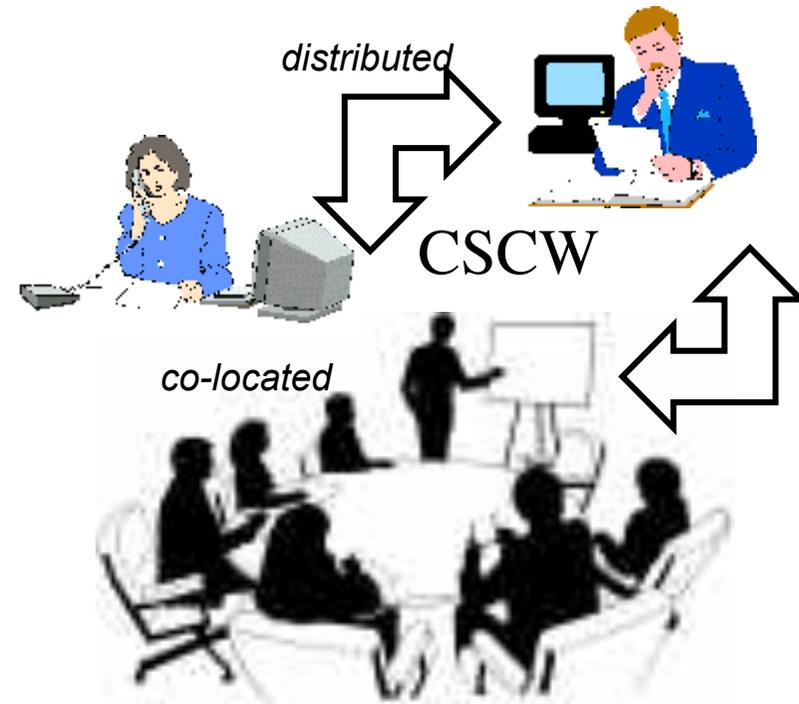
- The historical “spin off” of CSCW from HCI was explained by Ellis et al., as:
- At that time HCI was concerned about using the computer to *solve problems*, whereas CSCW was concerned about using the computer to *mediate human interaction*
- Mediation as key concept (we come back to this later)

## 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



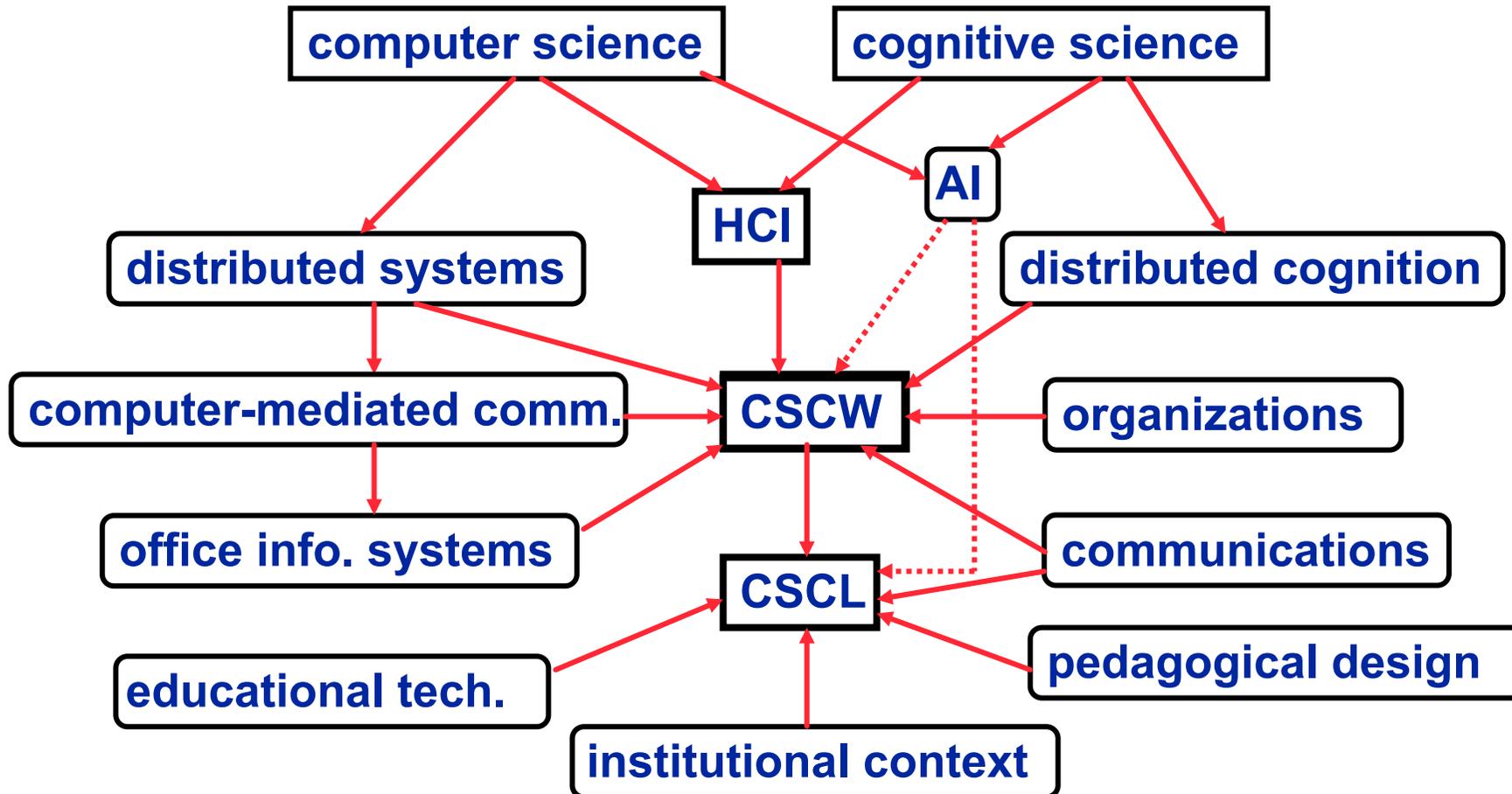
*HCI (human-computer interaction)*



## 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)

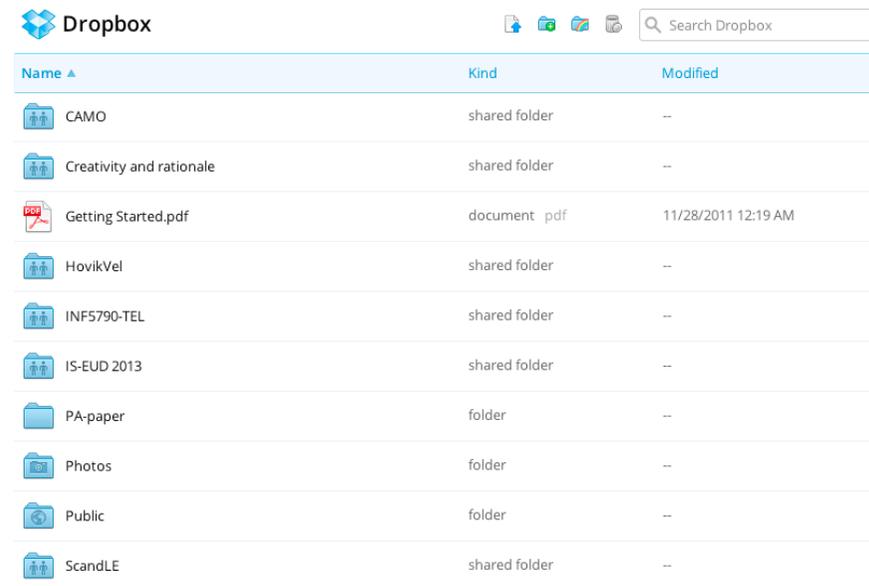
# Common information space (2<sup>nd</sup> gen.)

- 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



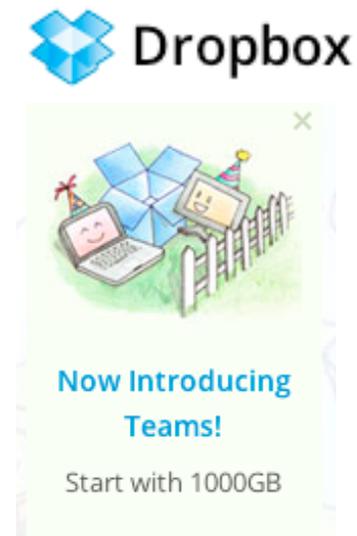
BSCW version 4.3 (2<sup>nd</sup> generation)



Dropbox Website (3<sup>rd</sup> generation)

## 3<sup>rd</sup> 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 3<sup>rd</sup> generation groupware?

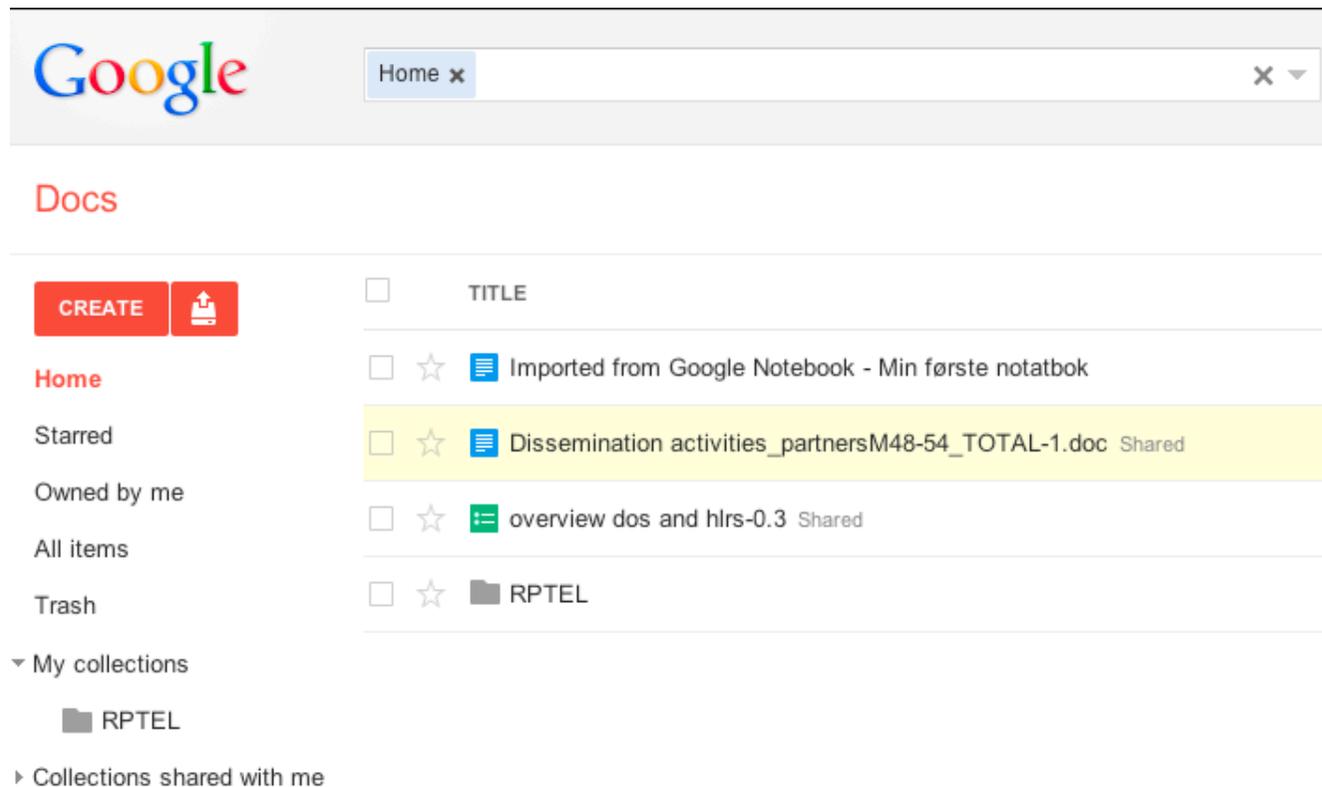


- Not all social media media are groupware, but some of them qualify
- Social media follows the web 2.0 philosophy of the read/write (interactive) web
- Social media are distinguished by crowdsourcing, being host for a large number of users, who has the possibility to contribute with content (text, pictures,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

The screenshot displays the GetSatisfaction website interface. On the left is a sidebar with navigation options: All Topics, Questions, Ideas (with sub-options: Popular, Under consideration, Planned, Completed, Not planned, Recent), Problems, Praise, and Updates. The main content area is divided into sections: 'IDEAS UNDER CONSIDERATION' and 'COMMON PROBLEMS'. Each item includes a user profile picture, a title, a brief description, the number of replies, and a star rating. The 'IDEAS UNDER CONSIDERATION' section includes: 'Offer a way to split/fork replies into new topics' (80 stars), 'Offer "sticky" or "featured" topics.' (53 stars), and 'Create a "How To/FAQ/Tutorial" topic type' (46 stars). The 'COMMON PROBLEMS' section includes: 'Long topics are cut off to the last 15 replies.' (62 stars), 'Can only delete some products.' (29 stars), and 'Widget throws back unclear error message when subject line is blank' (22 stars). On the right side, there is a Facebook social plugin for 'Get Satisfaction on Facebook' with 14,181 likes and a grid of user avatars. Below this is a 'Facebook social plugin' section and a 'COMMUNITY STATS' table. The 'Join the community' section offers several options: Rate Get Satisfaction, Get updates about Get Satisfaction, Have your answers featured here, and Show it off with a logo on your dashboard.

COMMUNITY STATS	TOTAL
Topics posted	13,512
People	259,119
Employees	43

- 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

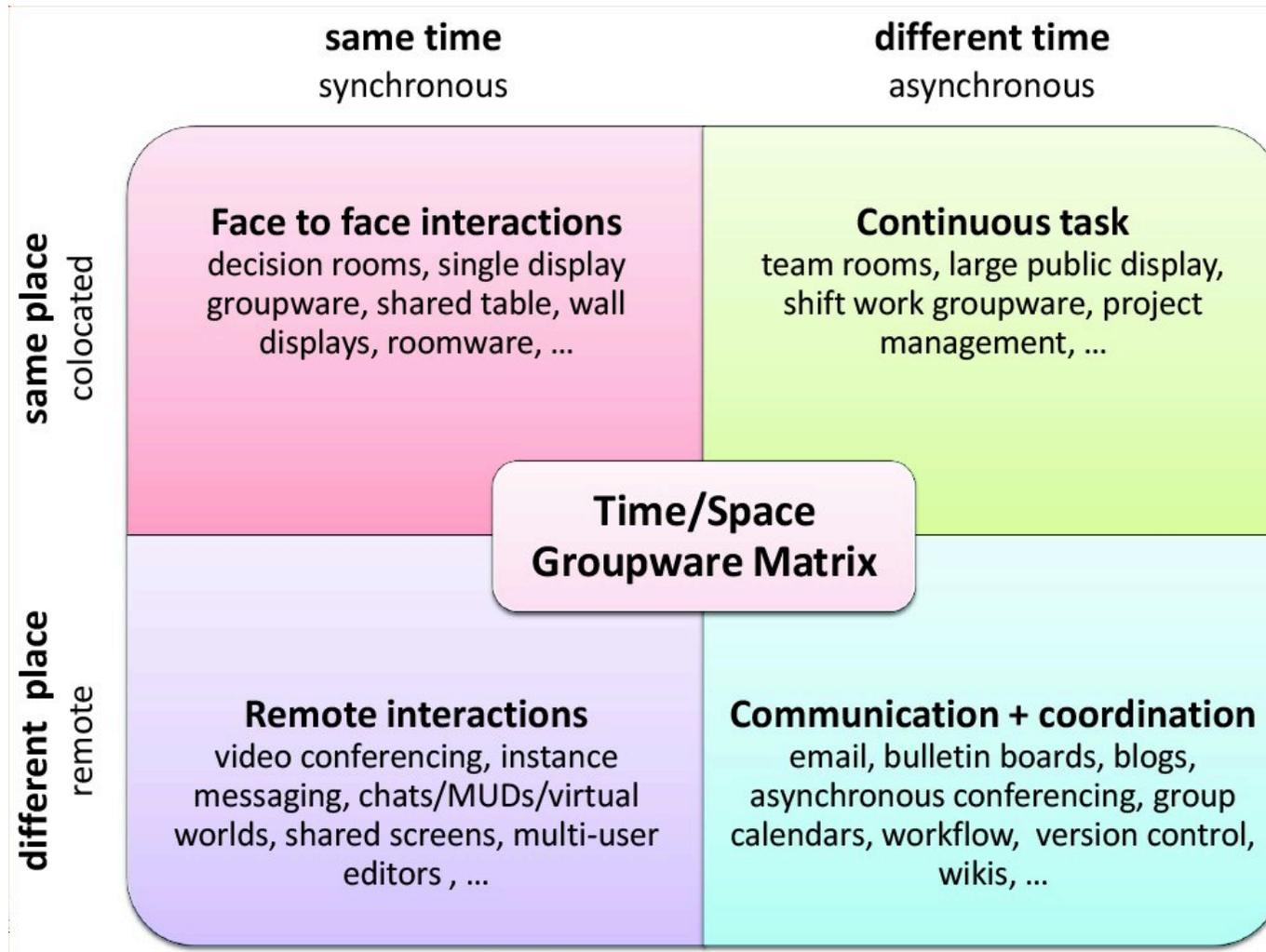
# Basic concepts in CSCW

- 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



# 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

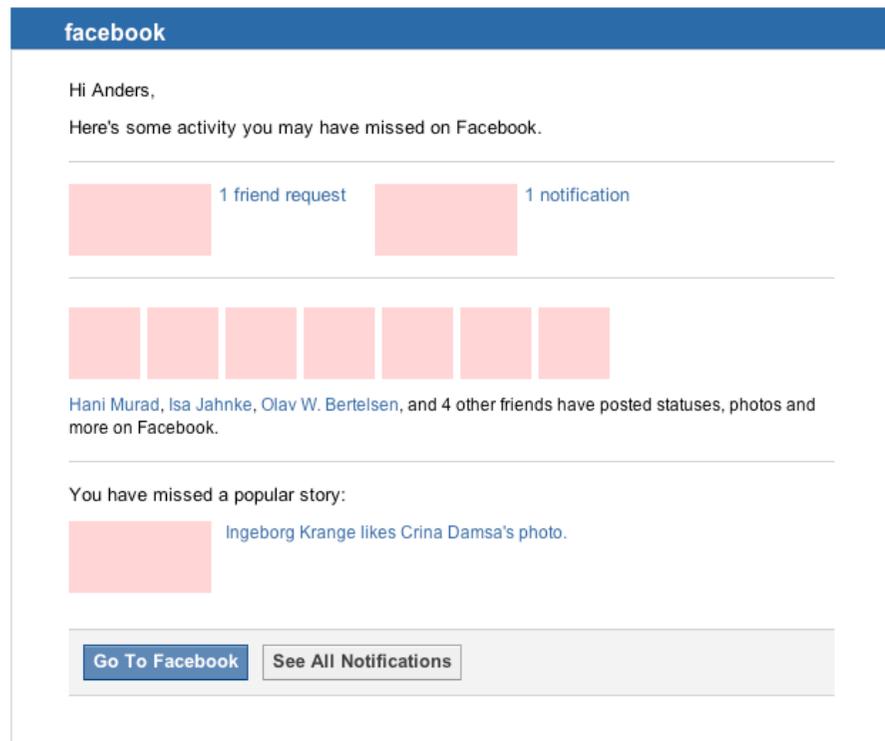
- Dourish and Bellotti (1992) defined awareness in real-time, distributed environments as “the understanding of the activities of others, which provide a context for our own activity”
- Originally developed in the context of a studying the use of shared writing environment (ShrEdit)
- Awareness ranges 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

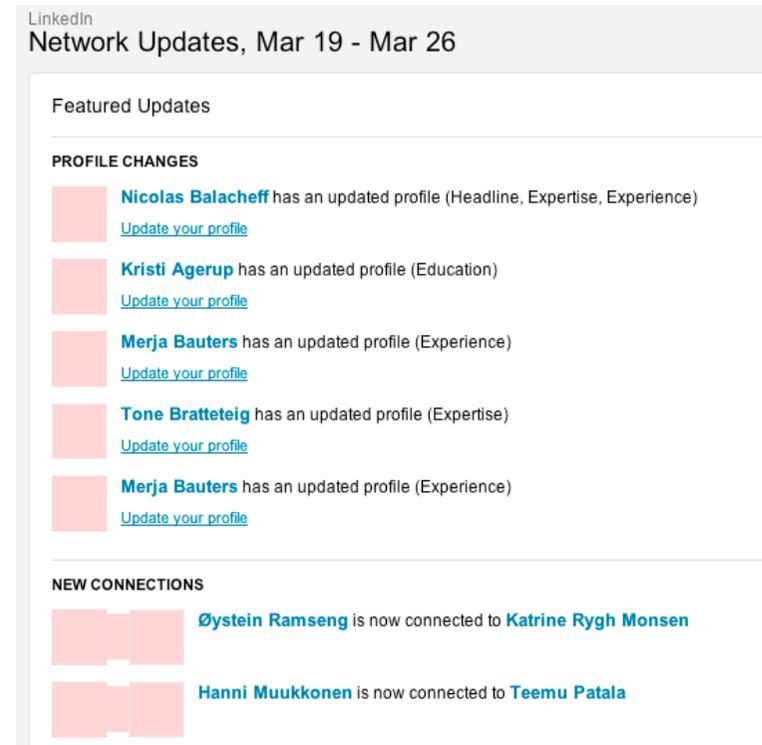
# Social awareness

- Status information about friends and colleagues' doings



The screenshot shows a Facebook notification interface. At the top, it says "facebook" in a blue header. Below that, it greets the user with "Hi Anders," and says "Here's some activity you may have missed on Facebook." There are two notification items: "1 friend request" and "1 notification", each with a redacted profile picture. Below these, there are seven more redacted profile pictures. A text line says "Hani Murad, Isa Jahnke, Olav W. Bertelsen, and 4 other friends have posted statuses, photos and more on Facebook." Underneath, it says "You have missed a popular story:" followed by "Ingeborg Krange likes Crina Damsa's photo." At the bottom, there are two buttons: "Go To Facebook" and "See All Notifications".

Facebook activity update



The screenshot shows a LinkedIn "Network Updates" notification for the period "Mar 19 - Mar 26". It is divided into two sections: "PROFILE CHANGES" and "NEW CONNECTIONS". Under "PROFILE CHANGES", there are five entries, each with a redacted profile picture, a name, and a description of the update (e.g., "Nicolas Balacheff has an updated profile (Headline, Expertise, Experience)"), followed by a "Update your profile" link. Under "NEW CONNECTIONS", there are two entries, each with two redacted profile pictures and a text description of the new connection (e.g., "Øystein Ramseng is now connected to Katrine Rygh Monsen").

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

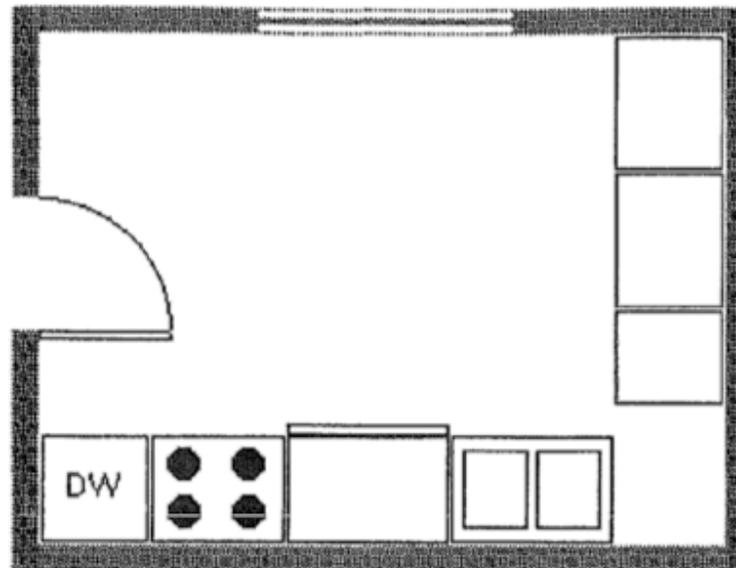
# Critiquing cont'd

- 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)

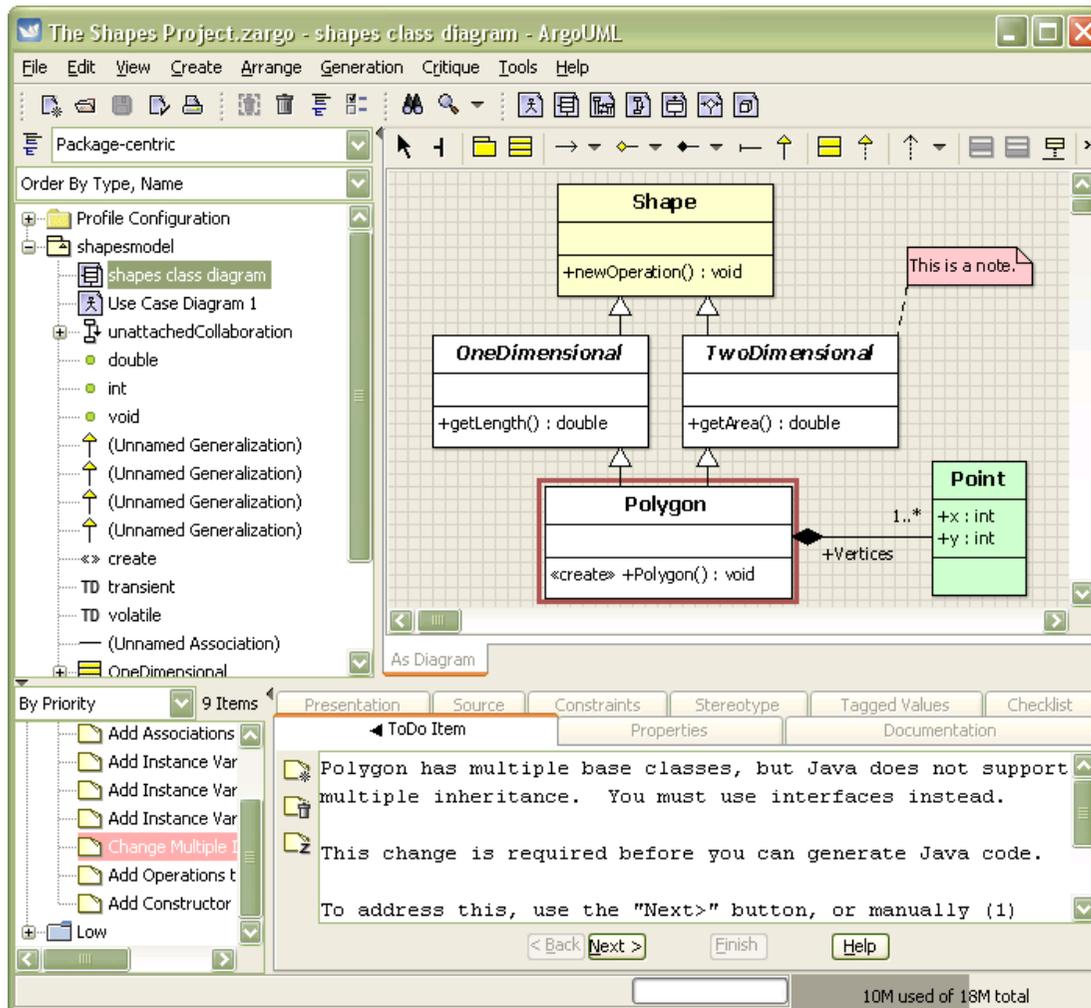


**Figure 5:** JANUS-CRACK: A learning example from the Catalog

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

Predictions for you ↴	Your Ratings	Movie Information	Wish List
★★★★★	Not seen	<b>About a Boy (2002)</b> DVD, VHS, info   imdb Comedy, Drama	<input checked="" type="checkbox"/>
★★★★★	Not seen	<b>Chicago (2002)</b> info   imdb Comedy, Crime, Drama, Musical	<input checked="" type="checkbox"/>
★★★★★	0.5 stars	<b>And Your Mother Too (Y Tu Mamá También) (2001)</b> DVD, VHS, info   imdb Comedy, Drama, Romance	<input type="checkbox"/>
★★★★★	1.0 stars		
★★★★★	1.5 stars		
★★★★★	2.0 stars		
★★★★★	2.5 stars		
★★★★★	3.0 stars	<b>Monsoon Wedding (2001)</b> DVD, VHS, info   imdb Comedy, Romance	<input type="checkbox"/>
★★★★★	3.5 stars	<b>Talk to Her (Hable con Ella) (2002)</b> info   imdb Comedy, Drama, Romance	<input type="checkbox"/>
★★★★★	4.0 stars		
★★★★★	4.5 stars		
★★★★★	5.0 stars		

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

The screenshot shows the Amazon.com homepage for user Anders Morch. At the top, there's a navigation bar with 'Shop All Departments', a search bar, and links for 'Your Amazon.com', 'Your Browsing History', and 'Recommended For You'. Below the navigation bar, there's a personalized greeting: 'Hello, Anders Morch. We have recommendations for you. (Not Anders?)'. A secondary navigation bar includes 'Anders's Amazon.com', 'Today's Deals', 'Gifts & Wish Lists', and 'Gift Cards'. The main content area features a section titled 'Today's Recommendations For You' with the text: 'Here's a daily sample of items recommended for you. Click here to see all recommendations.' Three book covers are displayed with 'LOOK INSIDE!' banners: 'The Social Construction of Reality' by Peter L. Berger (31 reviews, \$9.62), 'Stigma: Notes on the Management of Spoiled Identity' by Erving Goffman (17 reviews, \$10.17), and 'The Presentation of Self in Everyday Life' by Erving Goffman (19 reviews, \$9.80). Each book has a 'Fix this recommendation' link below it.

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