Computer Supported Cooperative Work
(Datorstöd för samarbete)

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About me

- Lecturer in Human-computer interaction (HCI)
- Cognitive Psychology and HCI
- Interested in the usage of computer systems, in the study of computer-mediated activities and in the concept of the user
  - Computer-mediated communication
  - Computer support for collaborative writing,
  - Computer support for learning

Outline

- A paradigm shift : from HCI to CSCW
- Defining Groupware
  - Conditions encouraging the emergence of groupware
- Groupware applications : designing technologies to support:
  - conversation
  - coordination
  - awareness
- Conceptual frameworks
- Research methods

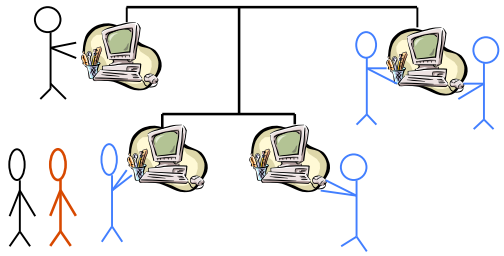
Terminology

• **CSCW** (computer support for cooperative/ collaborative work) refers to a research field

• **Groupware** refers to computer support for groups

• In the mid-1980s, the terms groupware and CSCW were coined

Paradigm shift



CSCW and groupware reflects a change in emphasis from using the computer **to solve problems** to using the computer **to facilitate human interaction**

Defining Groupware

- The goal of Groupware is to assist groups in communicating, in collaborating and in coordinating their activities
- Groupware can be viewed 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

(Ellis et al. 1991)

Conditions

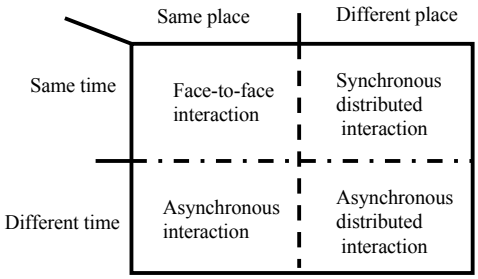
Conditions that emerged in workplaces to encourage CSCW and groupware:

- computation inexpensive enough to be available to all members of some groups;
- a technological infrastructure supporting communication and coordination, notably networks and associated software;
- a widening familiarity with computers, yielding groups willing to try the software;
- maturing single-user application domains that pushed developers to seek new ways to enhance and differentiate products.

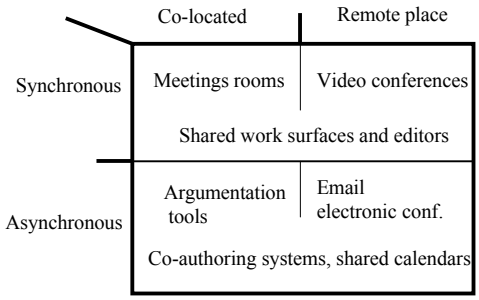
Challenges

- How should we design systems to support group of users and their work and,
- How should we understand the impact of computer systems on their work habits?
- New “problems” for product developers
- Learning more about how people work in groups and organizations and how technology affects that

Taxonomy of Groupware Systems



Taxonomy of Groupware Systems



Groupware applications

- **Text-based communication**
  - e-mail
- **Virtual communities**
  - MUD (Multi-user dungeons/dimensions)
- **Videoconference**
  - Video-wall video conference
  - Desktop-video conferences
- **Meeting rooms**
- **Co-authoring systems**
  - Shared editors
- **Shared calendars**

Designing technologies to support conversation

E-mail

Information overflow causes users to :

- answer only parts of the incoming mail,
- ignore incoming information systematically, and even
- stop using the email system (Hiltz and Turoff, 1985)

What's the remedy for overloaded users?

- Delegating tasks?
- Filters?
- Agents?

E-mail

Suggestions:

- Palme (1984) proposed structuring the messages into : *conferences, keywords, subject, selection by others, author,* in order to achieve control,
- Arensburger & Rosenfeld (1995) suggest the categories *personal, listserv, ccs*, and *others*,
- Marx (1995) defines *timely* messages as messages containing calendar information (in the header) or as responses to recent messages,
- Boone (1998) describes how users organized their messages into *high priority, low priority, social* and *announcements*.

E-mail

User Study (Bälter & Sidner, 2002)**:**

☒Messages related to events in the calendar for the day are important, regardless of arrival date.

☒Users marked opened messages as unread as a reminder that they were unfinished tasks.

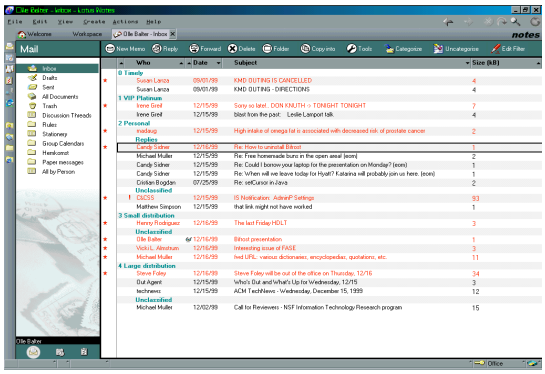
☒More than half of the users did not read all of their messages.

☒Some users feared that they would miss important messages during their scanning of the new messages.

☒Users who mentioned filtering feared that filtering would move messages out of sight.

☒For most users, carbon copies were judged by their receivers as less interesting than other messages.

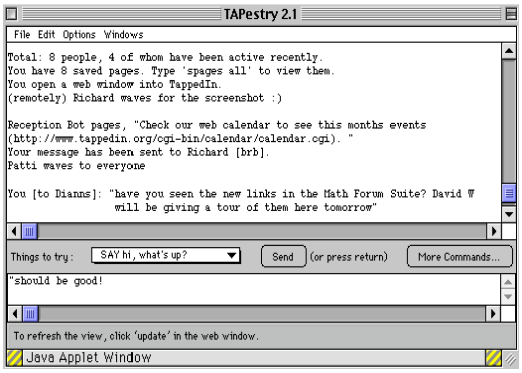
Bifrost



Virtual Community

Graphic interface

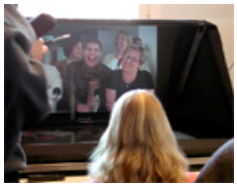
Text interface



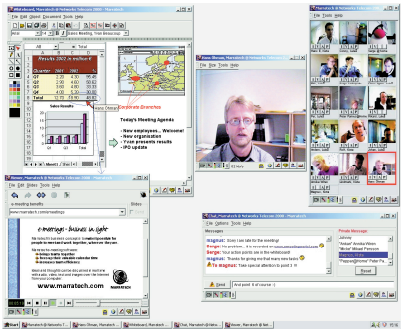
- Difficulty related to **turn-taking**.
  - How is it decided who should speak (and when) in a synchronous environment?
- Difficulty related to **feedback**
  - How is it possible to recognise when my message has been understood or when a repair is needed?
- Difficulty related to **navigation**
  - How can I join my friend who is in the system?
  - How can I guide someone in the virtual space?

Window-wall or video-wall

- Lack of reciprocity
- Lack of eye contact
- The problem of camera positioning and focusing



Desktop-video conference

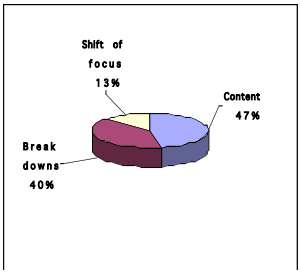


Desktop-video conference

User study :

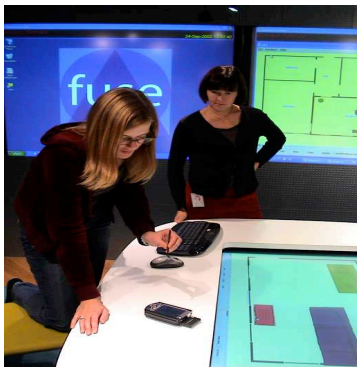
- Being dependent
- Loosing control
- Loosing attention
- Lacking feedback
- Getting tired
- Feeling inefficiency

(Lantz & Cerratto Pargman, 2002)

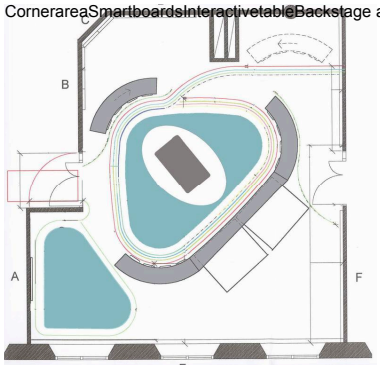


Distribution of messages of a participant s activity

The smart room (Ilounge)



The smart room



The smart room

User study (Sundholm et al., 2003):

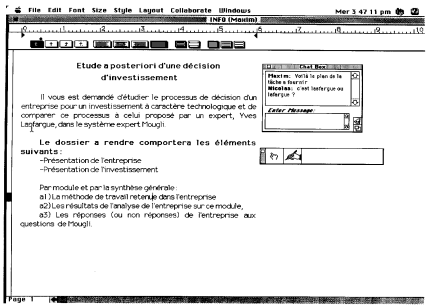
- The large displays provide a common view of the work in progress,
- Touch-sensitive surface can not handle multiple users interacting simultaneously with them,
- There is a problem whit multiple and simultaneous input,
- Difficulties knowing where the pointer was, since it "disappears" when one hits one of the boarders on the screen,
- Difficulties in "starting" the room

Designing technologies to support conversation

- Overload of information : How should users handle the great amount of messages?
- Categorization of messages : How should users sort, save and seek messages?
- Dialogue organization : Should designers impose conversational structures and constraints or not? Why?

Designing technologies to support coordination

Shared editor

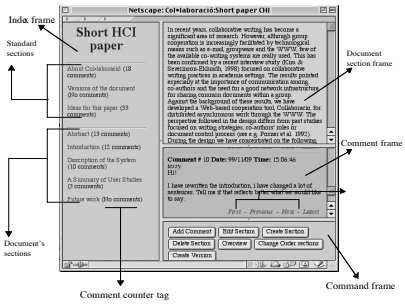


A shared editor

User study (Cerratto, 1999)

- Groups using the shared editor exchanged very few messages compared to the groups working face- to-face,
- Groups using the shared editor focused their attention largely on the organization of their actions while the face-to-face groups focused their attention on the content of their texts,
  - The content of the document was dissociated from the communication about the content,
  - Individual writing spaces were dissociated from collaborative spaces
  - Individual writing pace was dissociated from a collective writing pace

A shared editor



A shared editor

User study (Cerratto-Pargman & Rodriguez, 2002)

- allowing users having different views of the document in relation to his/her interest on the document.
- informing about co-authors' activity and about the writing pace of co-authors.
- Collaborative writing tools should not detached authors from their working environment and allow them to continue to use the word processor they are used to

Designing technologies to support coordination

- **The problem of concurrency control**
  - locking mechanisms or social protocols? notification mechanisms? agents?
- **The problem of : "I think *that* you should go *there*"**
  - pointing or so called deicitic reference or deixis. Group pointing? which characteristics?
- **The problem of having several insertion points**
  - do you just see your own or do you see your colleagues' insertion points as well and if you can see them should they be identified by the user's name or be anonymous? What you should see? Do all the participants see the same part of the screen, so if one participant scrolls, so do all the rest?

Designing technologies to support awareness

- Users do not necessarily see the same screen but you use terms which relate to the context you can see, called **indexical expressions**

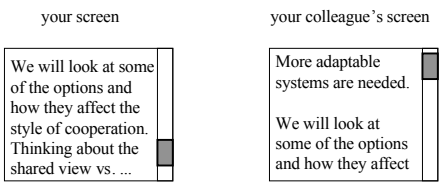
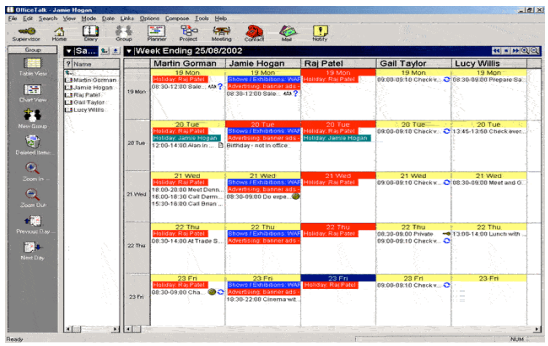


Fig. Shared editor with separate insertion points and different views

Shared calendars

Designing technologies to support awareness



Shared calendars

Trade-off between privacy and cooperation

- Are people allowed to look at your calendar to find free slots?
- If so, do they just see "busy" or can they see exactly what you plan to do?
- If someone wants to book a meeting with you, can they fill in a slot or must they ask you?

Summarizing

Many expensive failures in developing and marketing software to support groups are not due to technical problems. They result from not understanding the unique demands that this class of software imposes on developers and users (Grudin, 1994).

Crucial questions

- What's cooperative work?
- Is always work cooperative?
- Does cooperation include conflicts?
- Why do people cooperate? When? How do we cooperate?
- What makes a group to be a group?
- How do we communicate?
- How do we interact?

Conceptual frameworks

- **Language/action framework** (Winograd and Flores, 1986)
  - people act through language (cf. Speech act theory- Austin 1962; Searle 1969)
- **Situated action** (Suchman, 1987)
  - human interaction is coherent to a specific situation
- **Activity theory** (Engeström, 1989 and others)
  - human interaction is coherent to motives and intentions
- **Distributed cognition** (Hutchins, 1995)
  - cooperation is viewed as a cognitive system in which information is propagated through different media

Research methods

- Ethnographic studies
- Field studies
- Experiments
- Semi experiments
- Participant observation

Textual based communication

Four types of textual based communication in current groupware:

- **discrete**: directed message as in email. There is not explicit connection between different messages
- **linear** : participants' messages are added in (usually temporal) order to the end of a single transcript
- **non-linear** : when messages are linked to one another in a hypertext fashion
- **spatial**: where messages are arranged on a two dimensional surface

How can awareness of colleagues' activities be enhanced?

Can video communication be an alternative for face-to-face meetings?

How can data and spaces be shared in a program/system/network

Explorations of the latest "killer applications", currently (2000-2001) instant messaging (ICQ), text messages, SMS through mobile phones.

How can presence of others be visible in shared computer systems?

How can data be organized - infrastructures and trees for communicative tools (e.g. in chats?)?

Is distance learning through cooperative effort a possibility?

How can we handle different versions of files when sharing data?

What tasks are helped by mobile solutions

What kind of problems/work is done in practice (workplace/user studies)?

How can open source solutions (non-commercial development through free code sharing) be of help for developing cooperative systems?

Systems that control the workflow - are they useful or not?

Can wearables (digital tools that can be worn as accessories) be useful and how?

How can knowledge in organizations be more effectively shared?

How and what can virtual communities be used (for)?

How can we intertwine the user orientation perspective in design projects?

Teknikanvändning

- Lucy Suchman (Plans and Situated Actions, 1987, Xerox Parc)
  "insofar as actions are always situated in particular social and physical circumstances, the situation is crucial to actions's interpretation." (Sid 178)
  "The aim /…/ is not to produce formal models of knowledge and action, but to explore the relation of knowledge and action to the particular circumstancs in which knowing and acting invariably occur." (sid 179)
- Lancaster (Hughes, Randall, Harper mf, etnografi för design, COMIC projektet)
  "What the approach here at least offers is one way of throwing light on what kinds of flexibility are needed, what kind of technological support is appropriate, in what kinds of work: in a word, re appraising the distinction between the system and the user." (sid 143)

Kjeld Schmidt:

"/.../cooperative work arrangements arise from and dissolve into individual work. More than that, the boundary between the individual and cooperative work is dynamic in the sense that people enter into cooperative work arrangements and leave them acoording to the requirements of the current situation and the technical and human resources at hand."