

# Computer-Supported Cooperative Work

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Thanks to Nicolas Roussel, Inria

# Humans are social beings ...

Groups structure human activity

Professional life: teams, management chain,

Private life: family, friends, sport teams, choir, etc.

Groups are more than the sum of their parts

- Division of labor

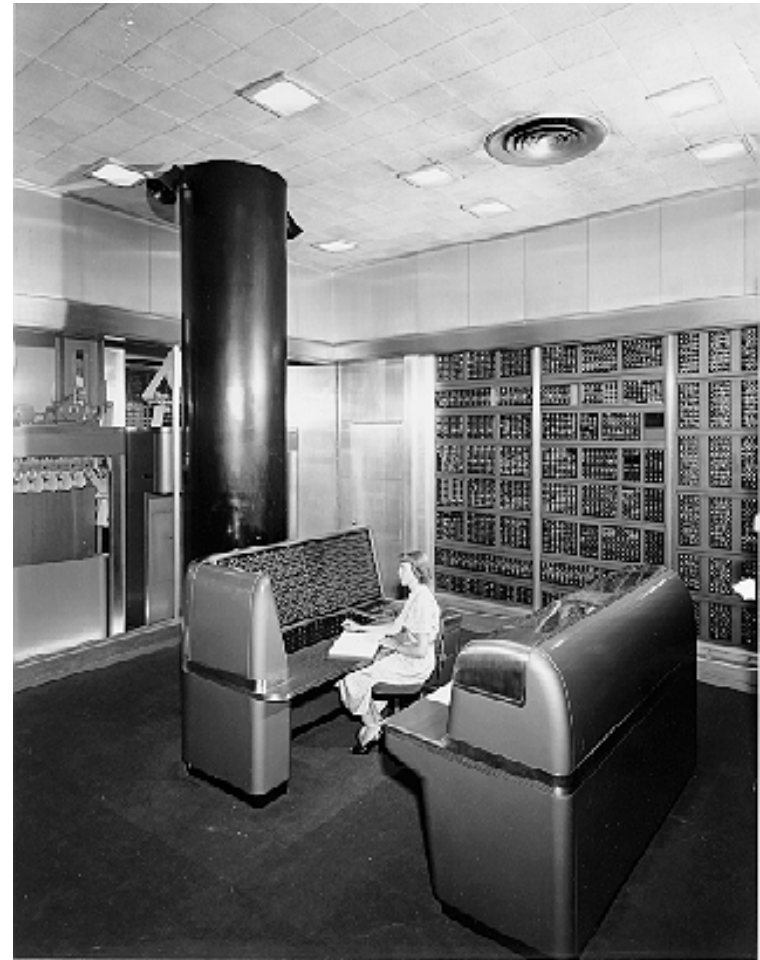
- Take advantage of different expertise

- Transfer of skills: learning

# ... but computers are (mostly) personal

Time-sharing systems create the illusion that each user has access to all the resources and do not support awareness of what other users are doing.

Example: file system



IBM SSEC, 1948

# Don Norman



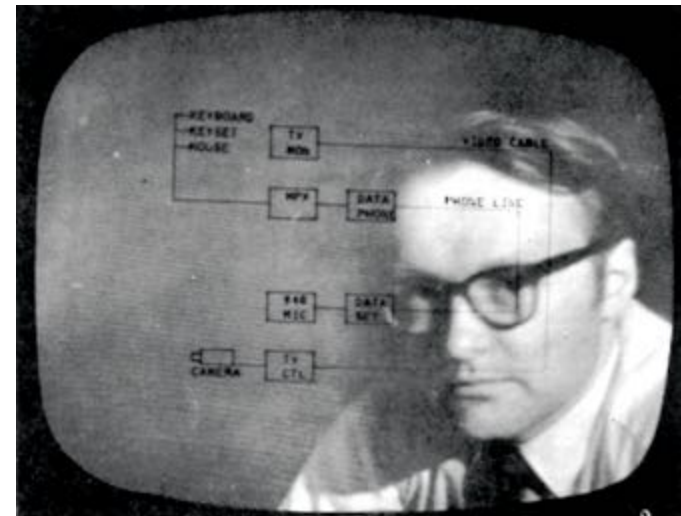
*"Most work done on any complex entity  
is done by more than one person"*



*"Social impact of technology is hard to predict"*

# *Augmenting the human intellect*

1968 : Engelbart and his colleagues NLS/Augment, a system that supported file sharing, personal annotations, electronic messaging, videoconferencing, screen sharing, telepointers, etc.





# NLS / Augment - Douglas Engelbart (1968)



# Emergence of a field

Software that supports group work

- Groupware (Johnson-Lenz, 1982)
- Computer Supported Cooperative Work (Greif & Cashman, 1984)

*In French:*

- *Collecticiel*
- *Travail Coopératif Assisté par Ordinateur (TCAO)*

Conferences: CSCW (ACM) and ECSCW since 1986

Journal of CSCW

# Social definition

CSCW should be conceived as an endeavor to understand the nature and characteristics of cooperative work with the objective of designing adequate computer-based technologies. [...]

The focus is to *understand*, so as to *better support*, cooperative work.

*Bannon et Schmidt, 1989*



# Engineering definition

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, Gibbs & Rein, 1991*

# Software definition

Groupware is distinguished from normal software by the basic assumption it makes:  
groupware makes the user aware that he is part of a group, while most other software seeks to hide and protect users from each other.

*Lynch, Snyder & Vogel, 1990*

# Challenges

What should groupware systems do?

How to design them?

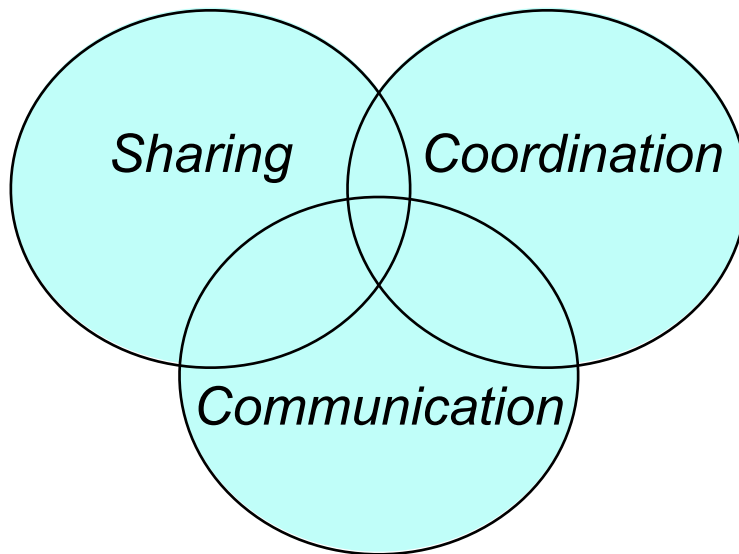
How do they affect use?

A multidisciplinary endeavor: sociology, ethnography, anthropology, design, computer science, etc.

Problems are both technical and human

Solutions are both technical and human

# Functional taxonomy



**Communication**  
exchanging information  
among participants

**Sharing**  
creating and computer  
artifacts and actions for  
editing them

**Coordination**  
organization of labor  
among participants

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# A sample of groupware systems

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# Some groupware systems

- e-mail, distribution lists
- discussion groups (EMISARI, 1976)
- chat, talk, IRC
- workflow systems
- group calendars
- shared editors
- audio-video communication systems
- argumentation tools
- roomware, collaborative buildings
- etc.

# Information lens

Malone et al., 1987

To:  
From: Thomas Malone  
Cc: Anyone  
Subject : LENS Meeting This Monday  
Topic : Lens  
Day: Monday  
Meeting Date: Time: 3:00  
Place: E53-301  
Text:

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# Colab

Stefik et al., 1987

Meetings of small group in a specially-equipped room

“Shared external memory”

Boardnoter : hand drawing

Cognoter : outlining ideas

Argnoter : argumentation spreadsheet



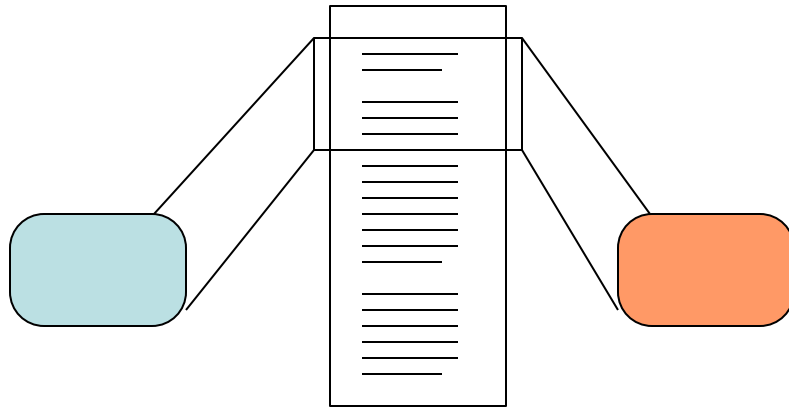
View, space and time congruence

What You See is What I See

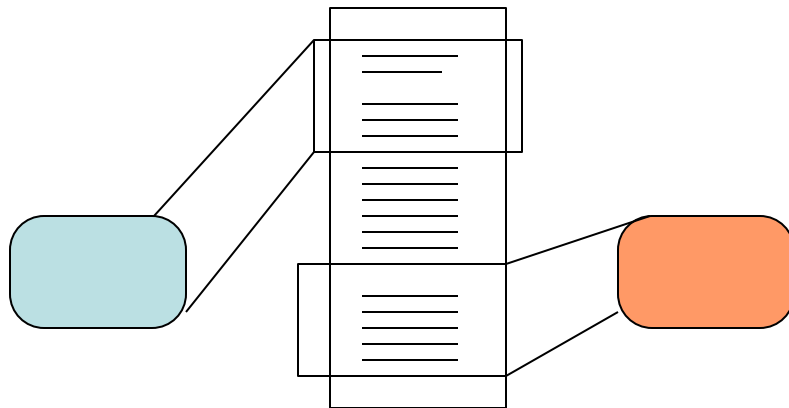
What You See Is Almost What I See



# WYSIWIS / WYSIAWIS



WYSIWIS  
Strict view congruence

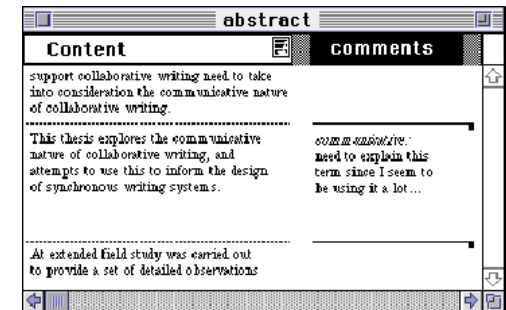


WYSIAWIS  
Relaxed congruence

# Shared editing

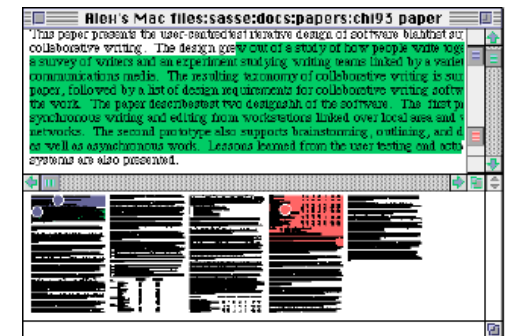
## Text, asynchronous

- Quilt (Leland, Fish & Kraut, 1988)
- Prep (Neuwirth et al., 1989)



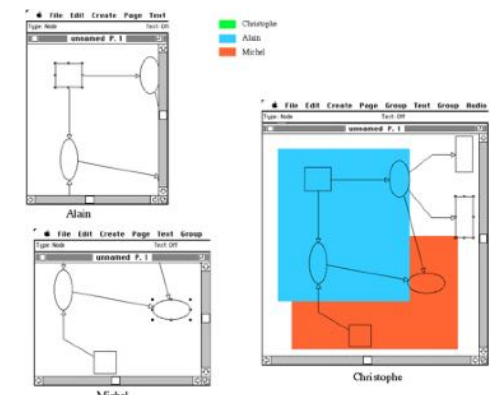
## Text, synchronous

- Grove (Ellis, Gibbs & Rein, 1989)
- ShrEdit (McGuffin & Olson, 1992)
- SASSE (Baecker et al., 1993)



## Graphics, synchronous

- GroupDesign (Karsenty & Beaudouin-Lafon, 1992)



# Workflow systems

Managing a document across an organization

Example : a document includes metadata describing its path through an organization

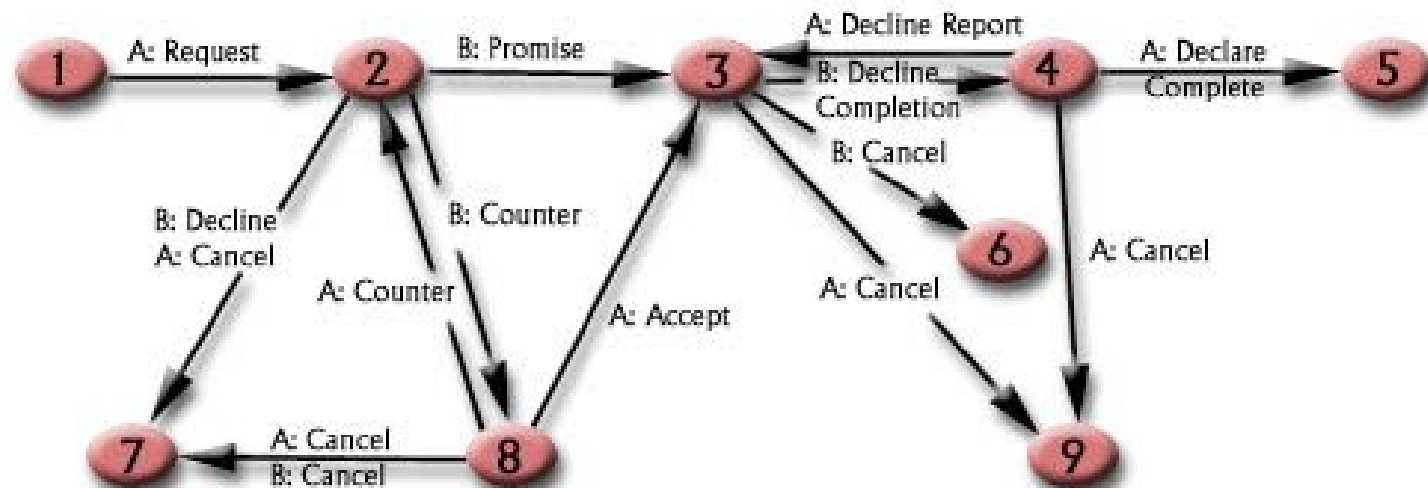
- must be written by Anne by April 15
- must be proofread by Bob by April 22
- must be approved by Charlie by April 29
- must be sent to Charlie by May 4

The document "knows its way" and can send reminders to the various people involved

# The Coordinator

Winograd &amp; Flores, 1988

Based on the theory of speech acts



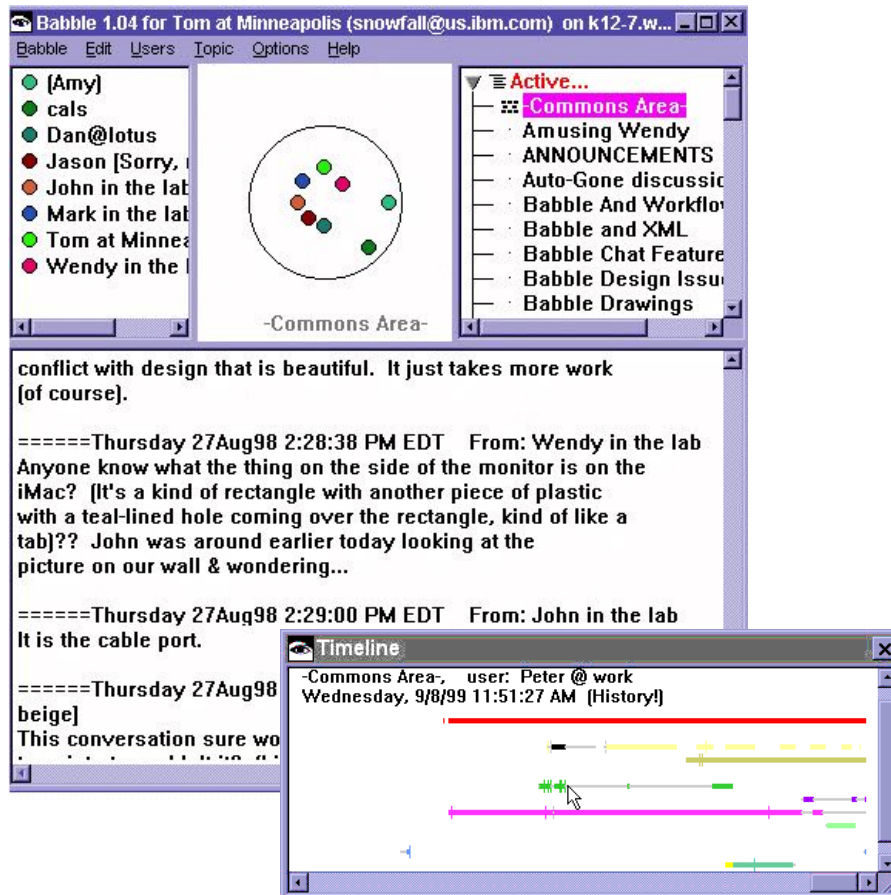
# From communication to social networking

```
[No connection yet]
[Connection established with hipo@localhost.]
hi glad to talk ya t00
how iz life ??
```

```
hi hi ;)
Glad to talk you here.
```

Unix talk

# Chat rooms



Babble (Bradner et al., 1988)

<http://www.research.ibm.com/SocialComputing/babble.htm>

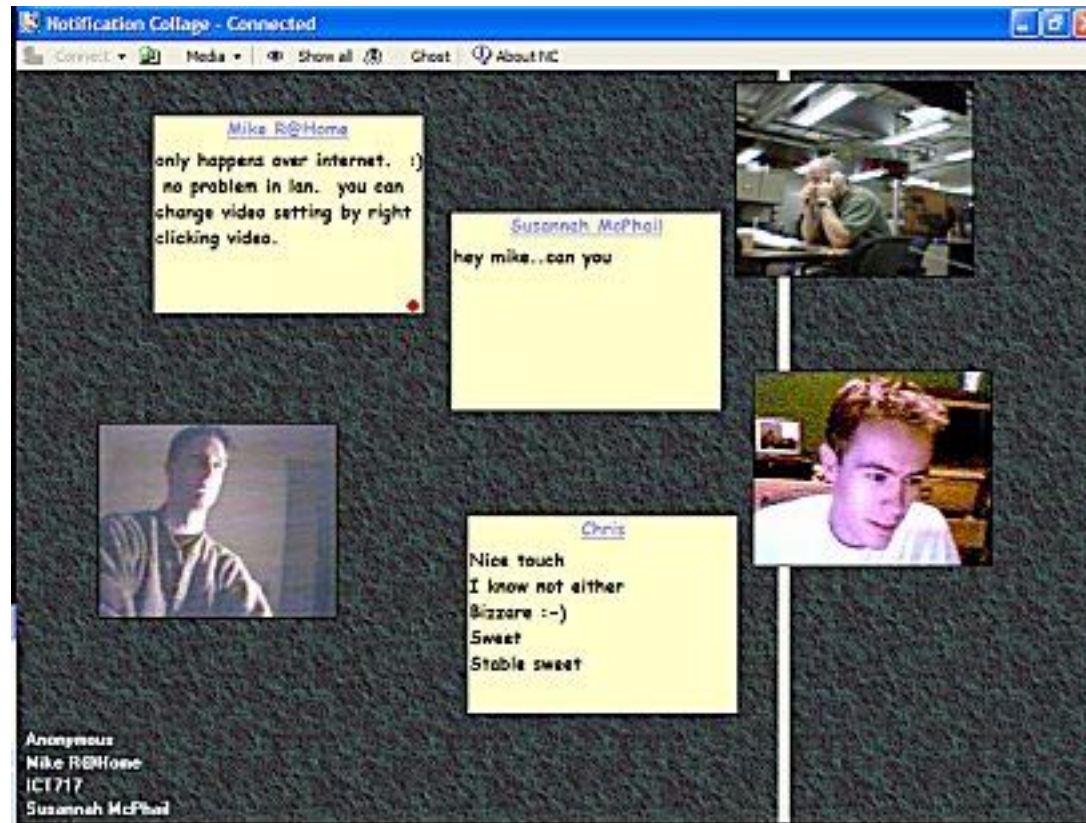


Chat circles (Viégas et al., 1999)

<http://web.media.mit.edu/~fviegas/circles/>  
<http://web.media.mit.edu/~fviegas/CC2/>

# Notification Collage

Greenberg & Rounding, 2000



# Social networks





# Networked games



Civilization

# Video-mediated communication systems

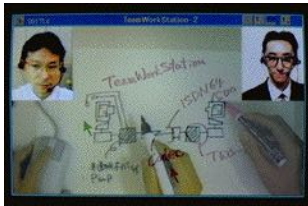
Hole-in-Space (1980)



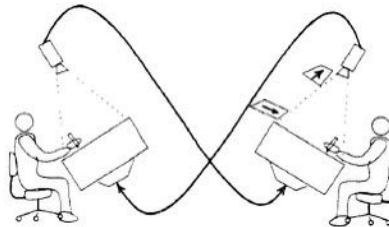
Mediaspaces (1983-)



TeamWorkStation (1990)



VideoDraw (1991)



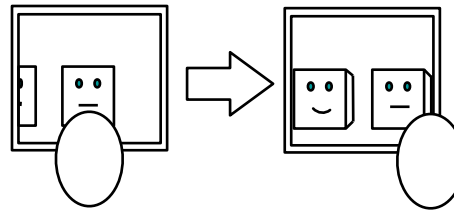
ClearBoard (1991-94)



Videoplace (1974-85)

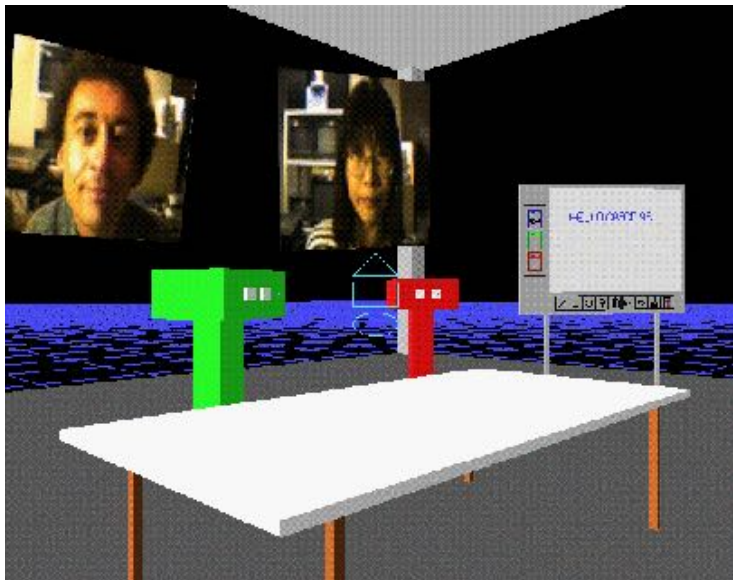


Virtual window (1995)



# Collaborative Virtual Environments

Represent participants by avatars in a virtual world



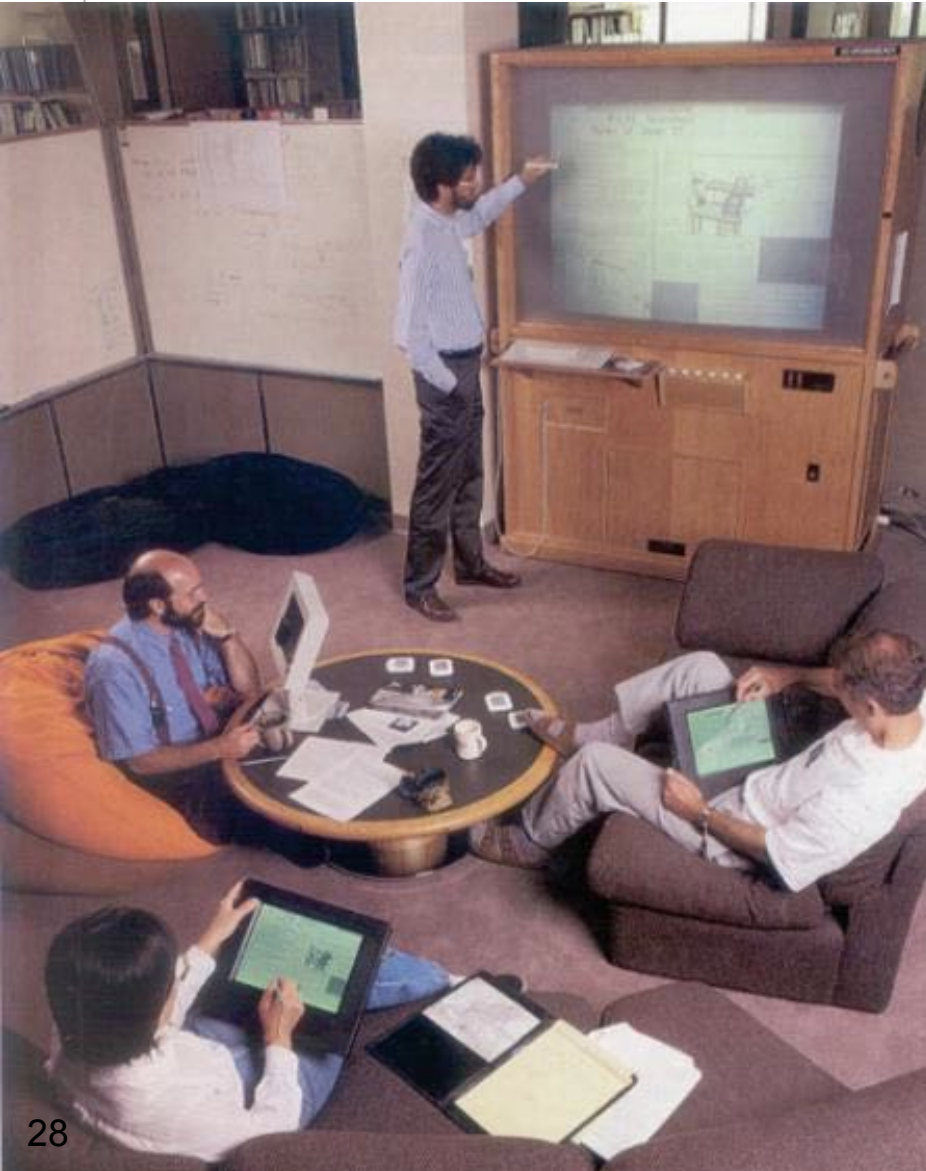
DIVE (1991)



Second Life (2005)



# CSCW infrastructure



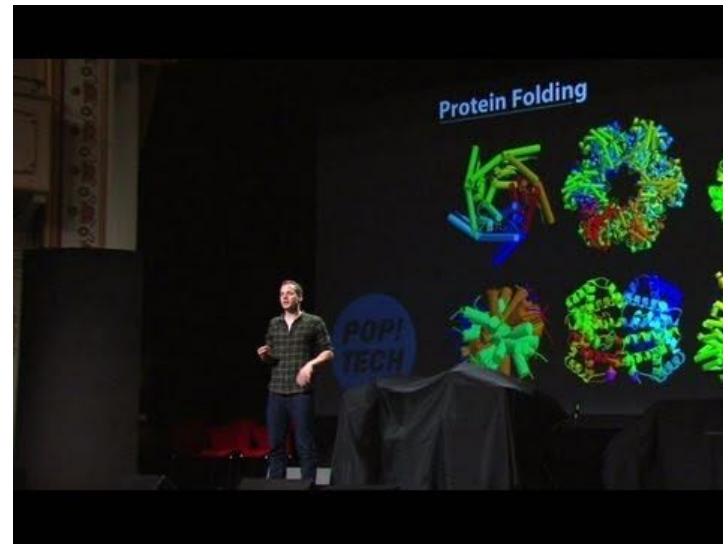
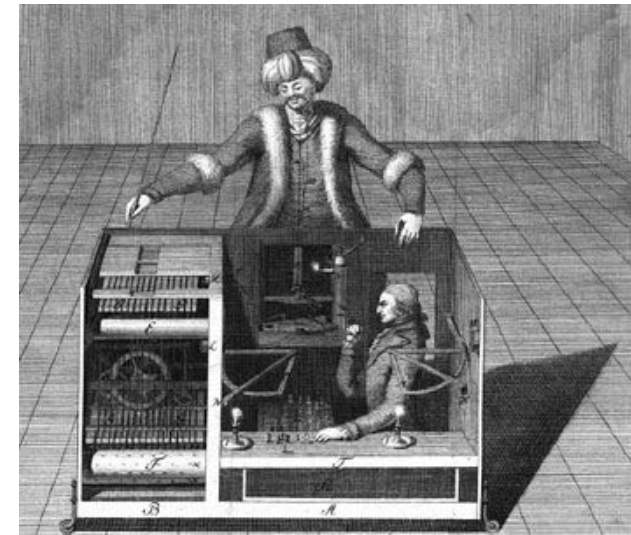
Cooperative buildings  
(Streitz et al., 1998)

Ubicomp (Weiser, 1991)

# Crowdsourcing

Harness the power of the crowd

Combine human intelligence  
with machine computation



# Taxonomies

Several ways to classify systems:

- Time, space and size of the group
- Sharing (e.g., editors) vs. exchanging (e.g., email)
- Structured (e.g., workflow systems),  
vs. open (e.g., whiteboards)
- Strong vs. weak computer support

# Time-space matrix

Johansen, 1988

	Same place	Different place
Same time	face-to-face conversation	telephone call
Different time	Post-it note	letter

# Challenges for groupware developers



Jonathan Grudin

- Who does the work vs. who gets the benefit
- Critical mass and Prisoner's dilemma problems
- Disruption of social processes
- Exception handling
- Unobtrusive accessibility
- Difficulty of evaluation
- Failure of intuition
- Careful adoption process



# Privacy, and other social behaviors



*"On the Internet, nobody knows you're a dog."*

Plausible deniability



# Some references

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J. Grudin. "Groupware and social dynamics: Eight challenges for developers". *Communications of the ACM*, 37(1):92-105, January 1994.

R. Baecker, editor. *Readings in Groupware and Computer-Supported Cooperative Work : Assisting Human-Human Collaboration*. Morgan-Kaufmann, December 1992. 882 pages.

M. Beaudouin-Lafon, editor. *Computer Supported Co-operative Work*. John Wiley & Sons Ltd, 1999. 258 pages.  
<http://www.lri.fr/~mbl/Trends-CSCW/>