Collaborative Computing

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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.

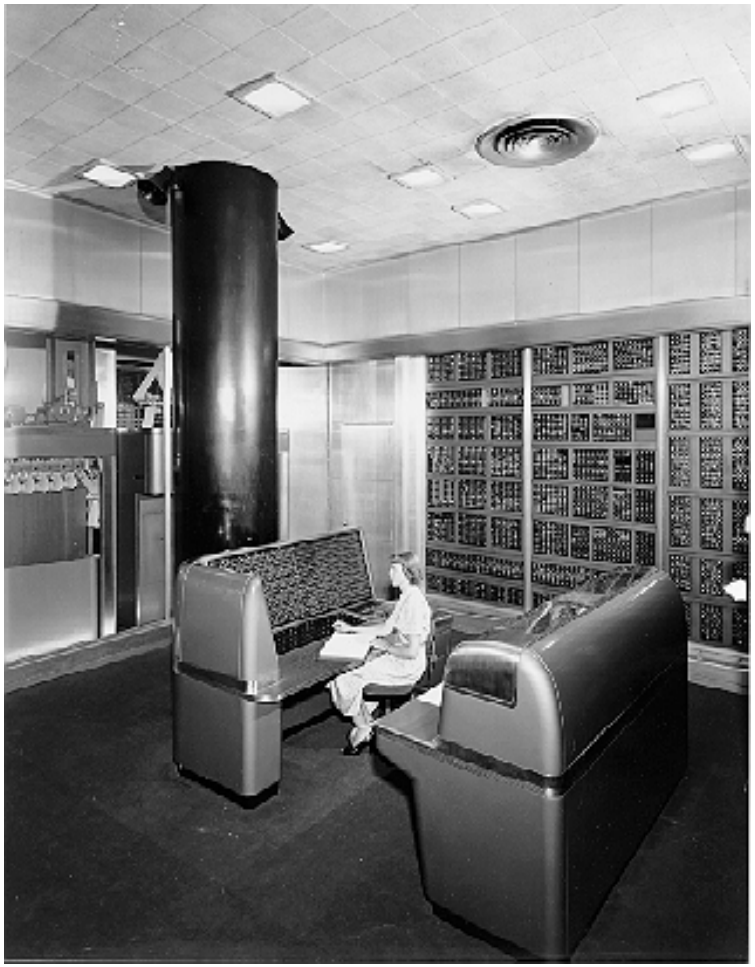
Groups are more than the sum of their parts

- 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

We still live in the era of the Personal Computer

One user

One computer

One task at a time

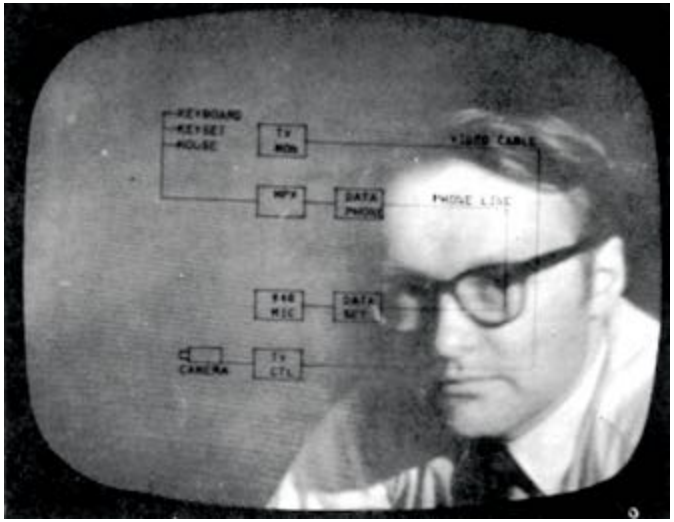
Don Norman

"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 create NLS/Augment, a system that supported file sharing, personal annotations, electronic messaging, videoconferencing, screen sharing, telepointers, etc.

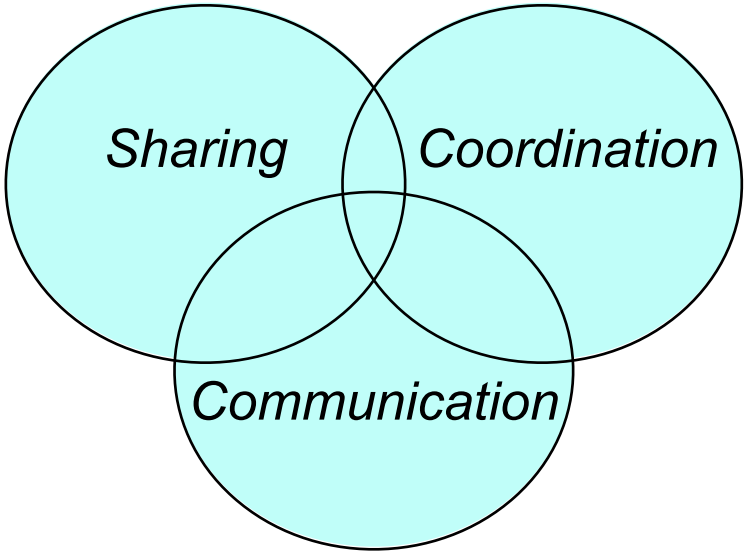


Collaborative computing

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

Functional taxonomy



Communication
exchanging information among participants

Sharing
creating and editing digital artifacts

Coordination
division of labor among participants

A sample of collaborative computing systems

Some groupware systems

- e-mail, distribution lists
- discussion groups
- chat, talk, IRC
- workflow systems
- group calendars
- shared editors
- audio-video communication systems
- argumentation tools
- roomware, collaborative buildings
- social networks
- 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:

Colab

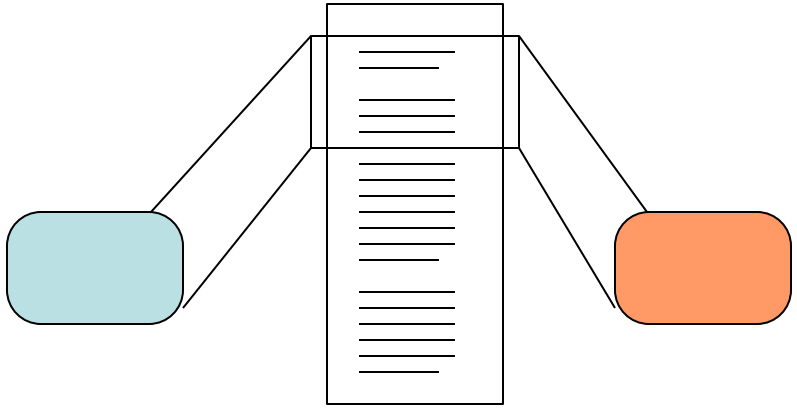
Stefik et al., 1987

Meetings of small group in a specially-equipped room

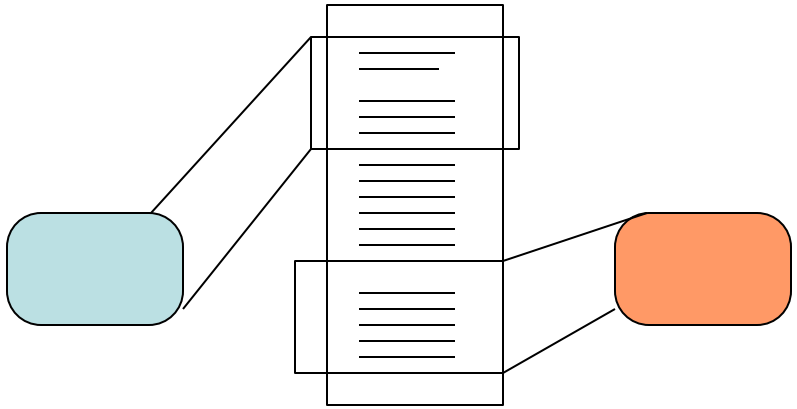
“Shared external memory”
- Boardnoter : hand drawing
- Cognoter : outlining ideas
- Argnoter : argumentation spreadsheet

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

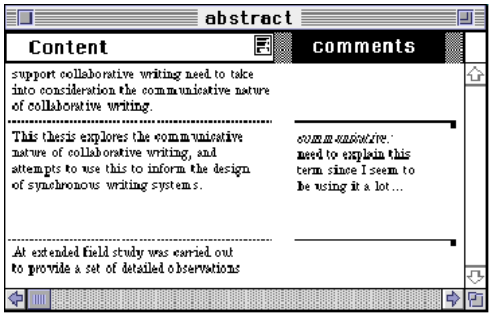


WYSIAWIS
Relaxed congruence

Shared editing

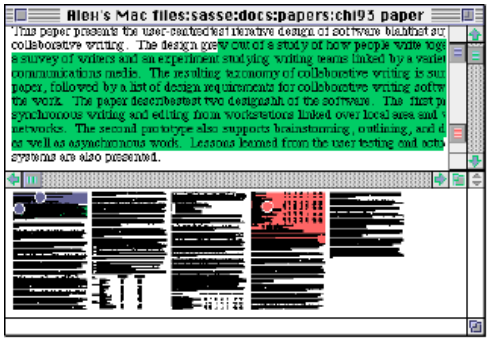
Text, asynchronous

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



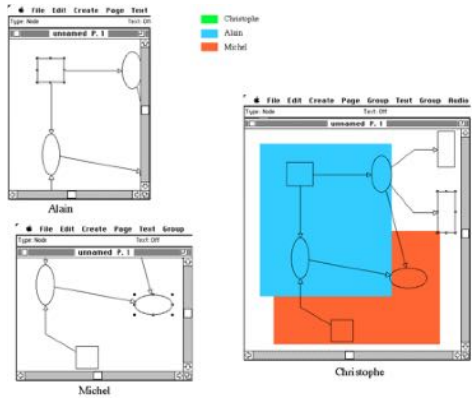
Text, synchronous

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



Graphics, synchronous

- GroupDesign
  (Karsenty & Beaudouin-Lafon, 1992)



Webstrates

Klokmose, Eagan, Baader,
Mackay, Beaudouin-Lafon, 2015

Workflow systems

Managing a document across an organization

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

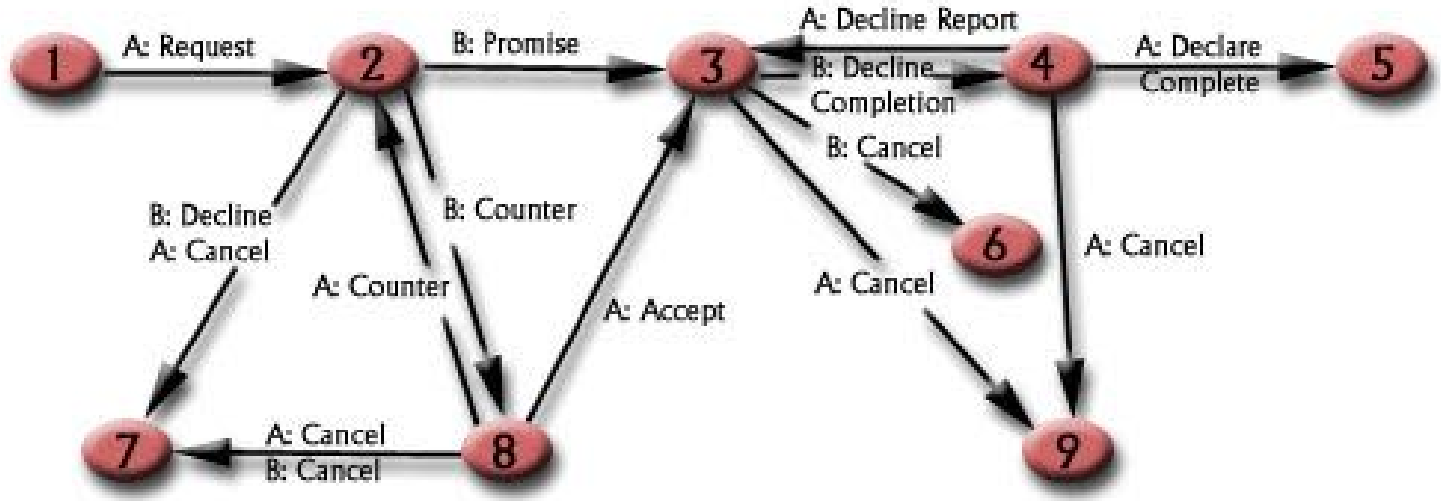
- must be written by Anne by April 15
- must be proofread by Bob bt April 22
- must be approved by Charlie by April 29
- must be sent to Charlie by May 4

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

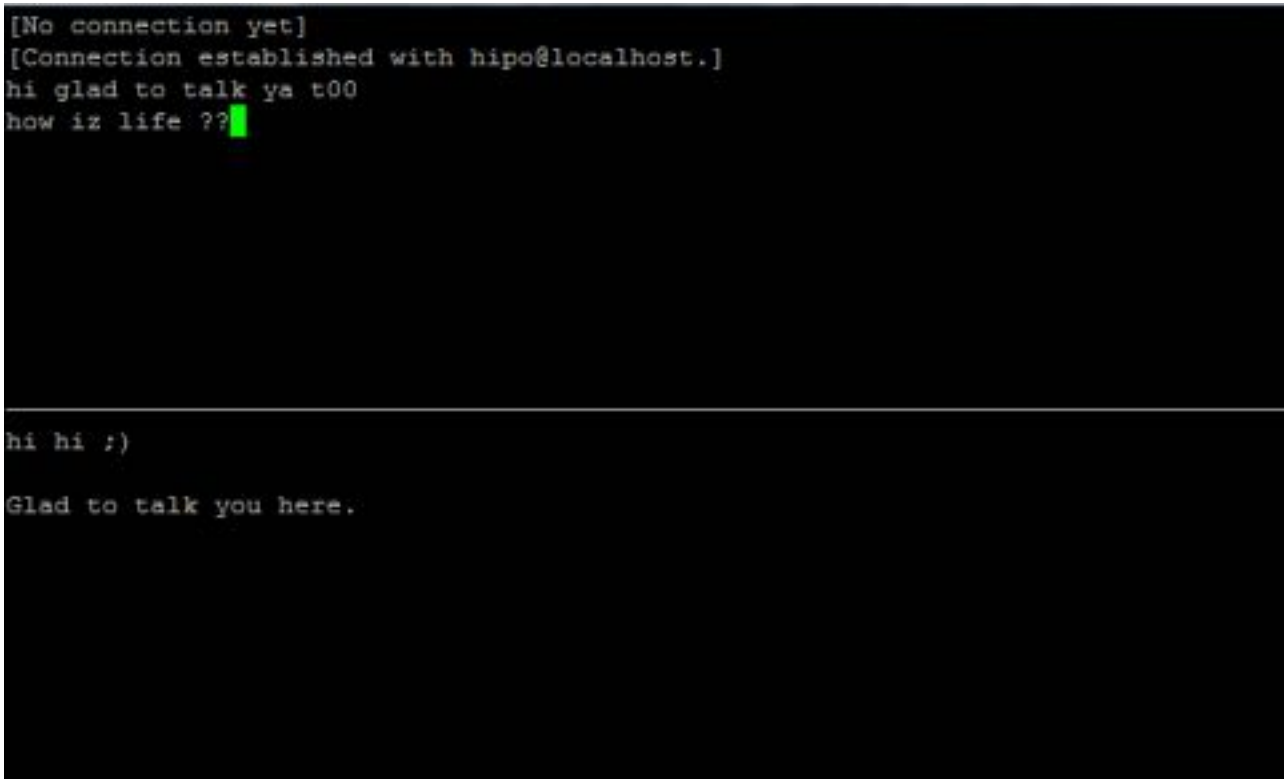
The Coordinator

Winograd & Flores, 1988

Based on the theory of speech acts

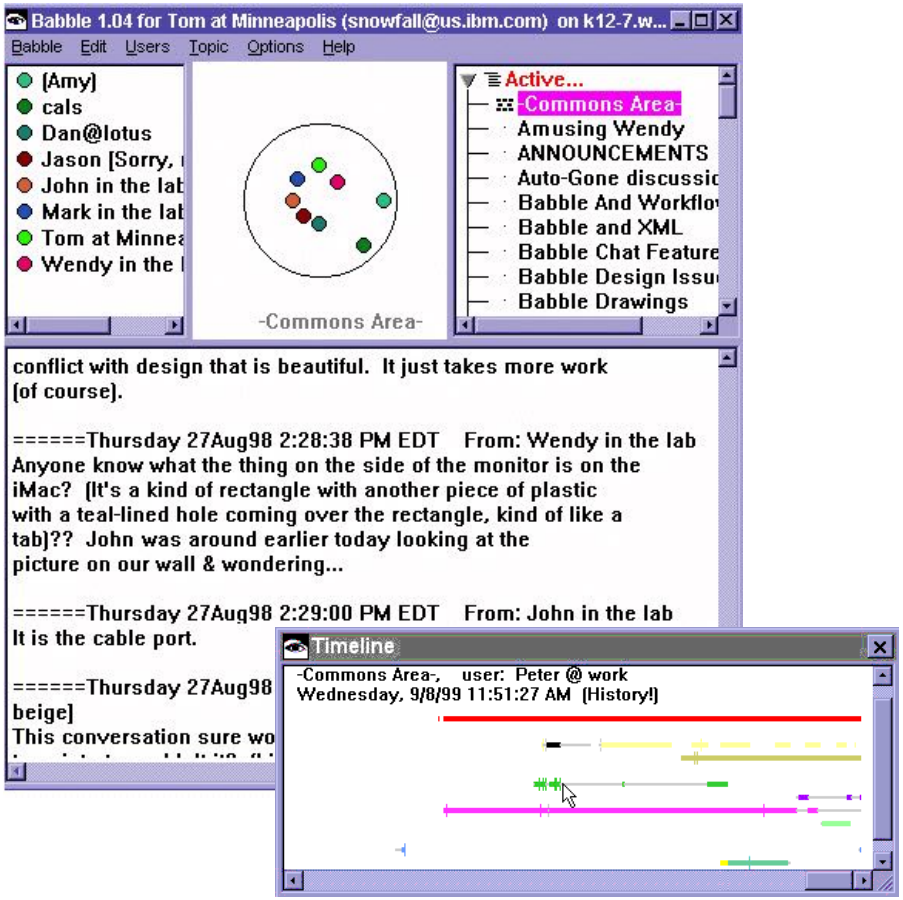


From communication to social networking

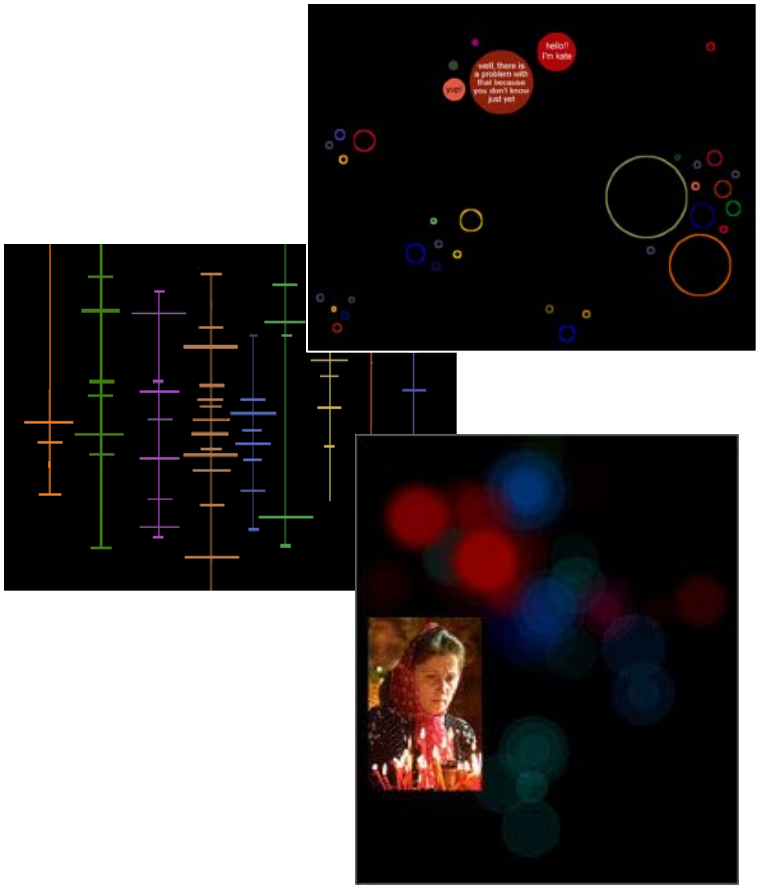


Unix talk

Chat rooms



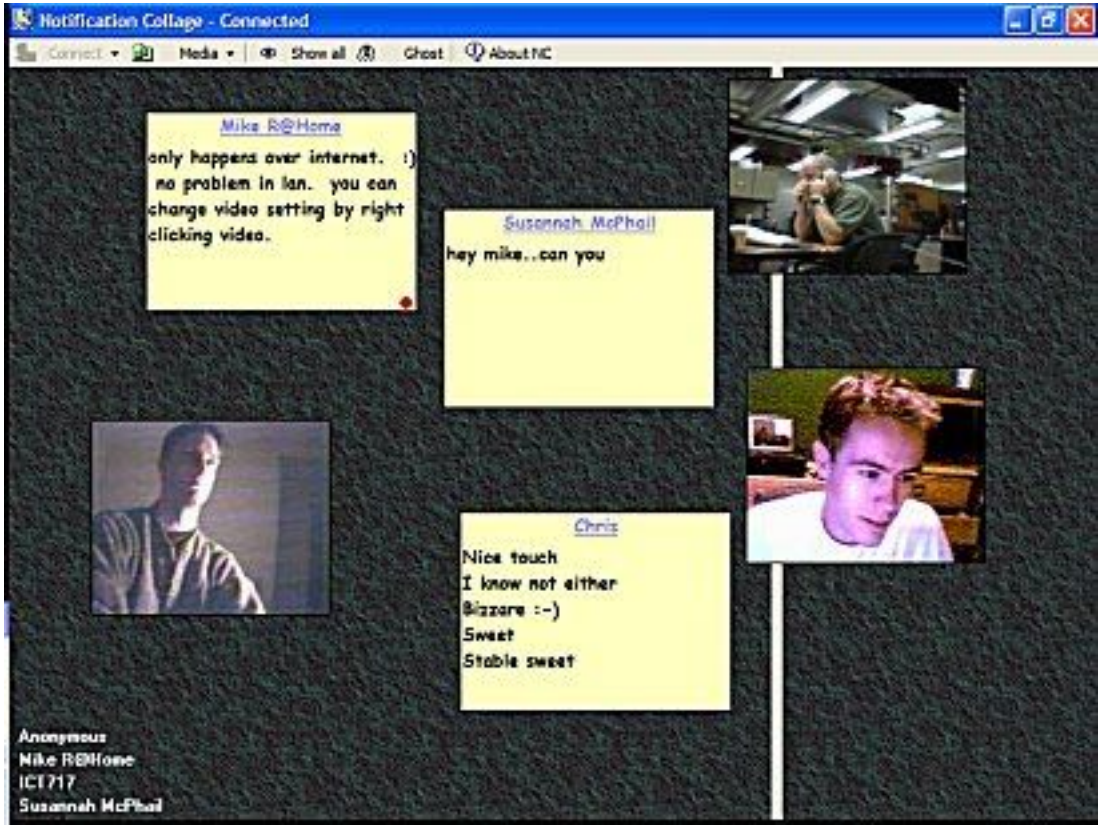
Babble (Bradner et al., 1988)
http://www.research.ibm.com/SocialComputing/babble.htm



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

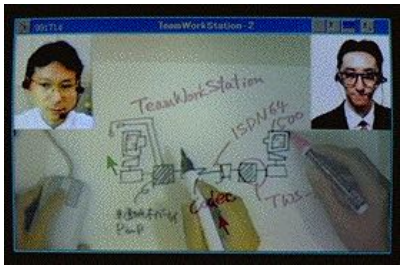
Interoperability vs lock-in

Video-mediated communication systems

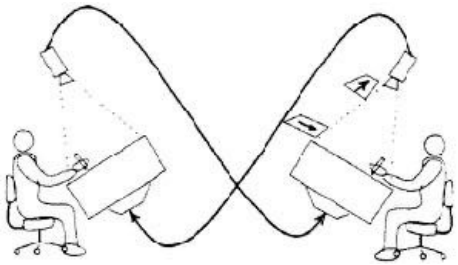
Hole-in-Space (1980)

Mediaspaces (1983-)

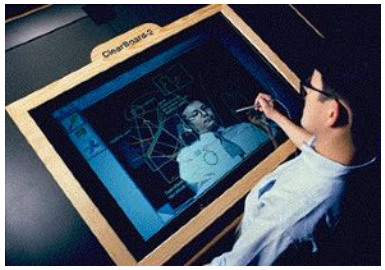
TeamWorkStation (1990)



VideoDraw (1991)

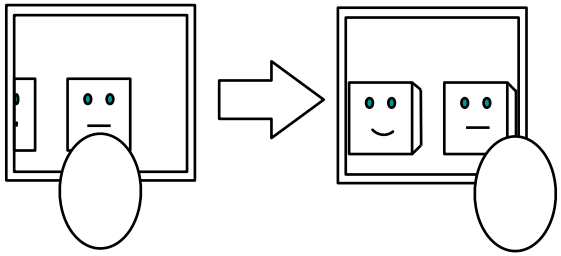


ClearBoard (1991-94)



Videoplace (1974-85)

Virtual window (1995)

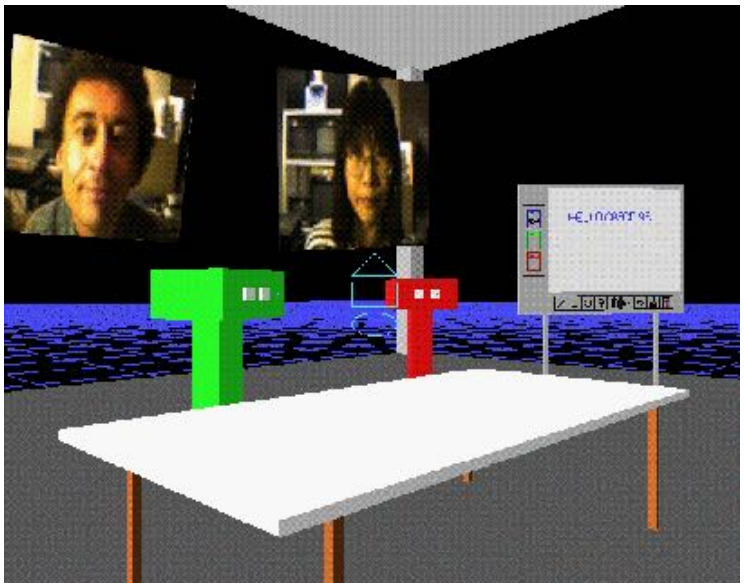


Clearboard

Ishii et al., 1992

Collaborative Virtual Environments

Represent participants by avatars in a virtual world



DIVE (1991)

Second Life (2005)

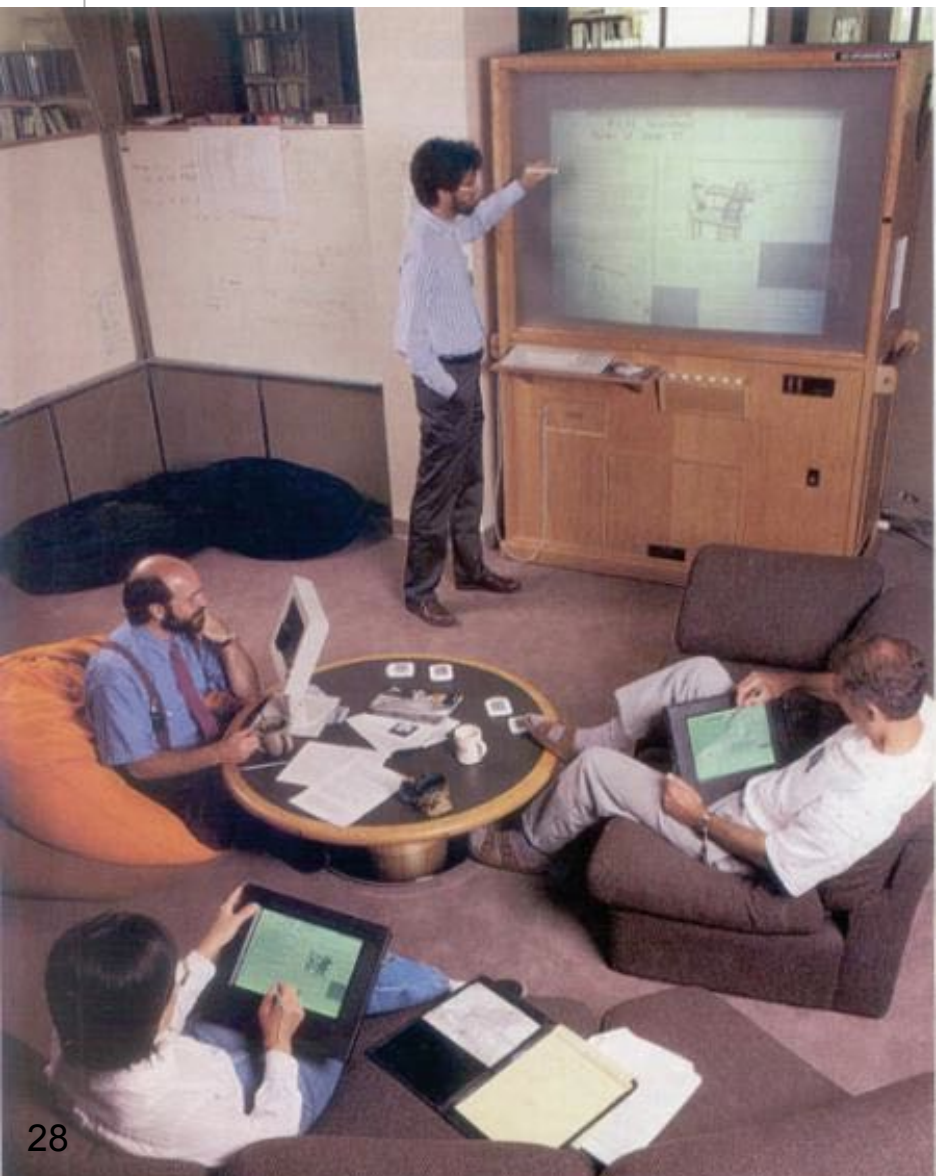
Networked games

Civilization

The metaverse

Horizon Worlds

Ubiquitous computing



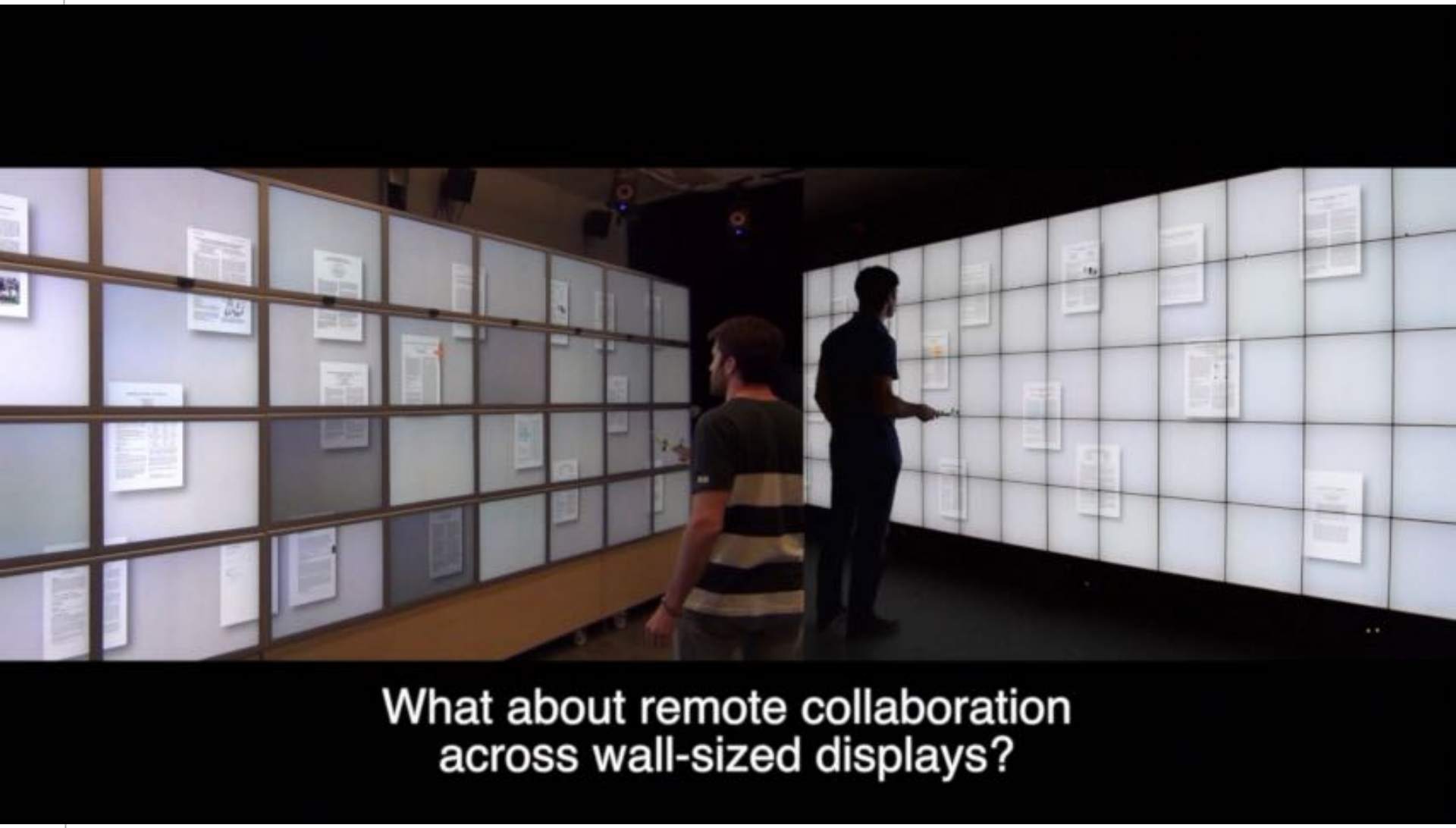
Cooperative buildings
(Streitz et al., 1998)

Ubicomp (Weiser, 1991)

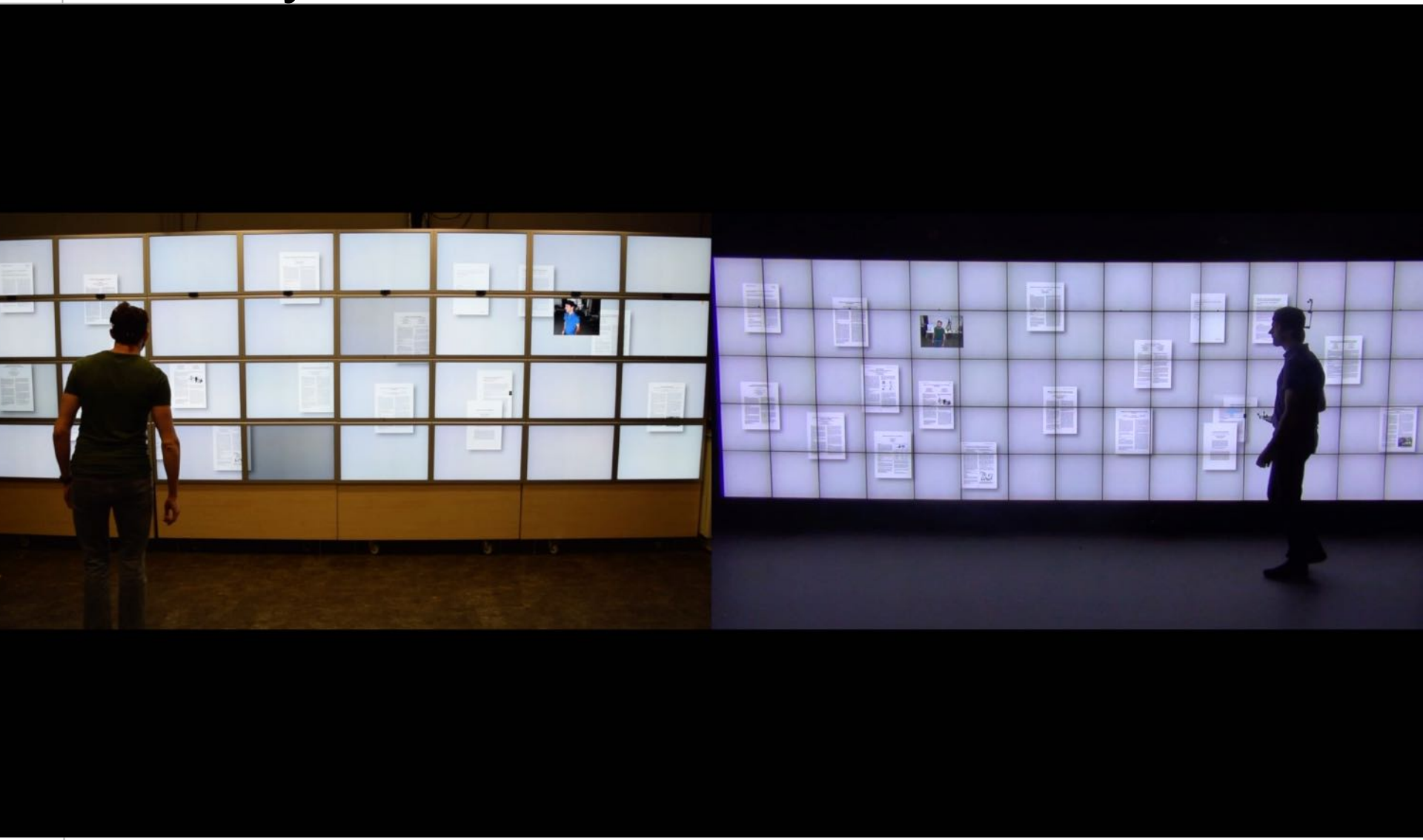
Interaction in the large

CamRay

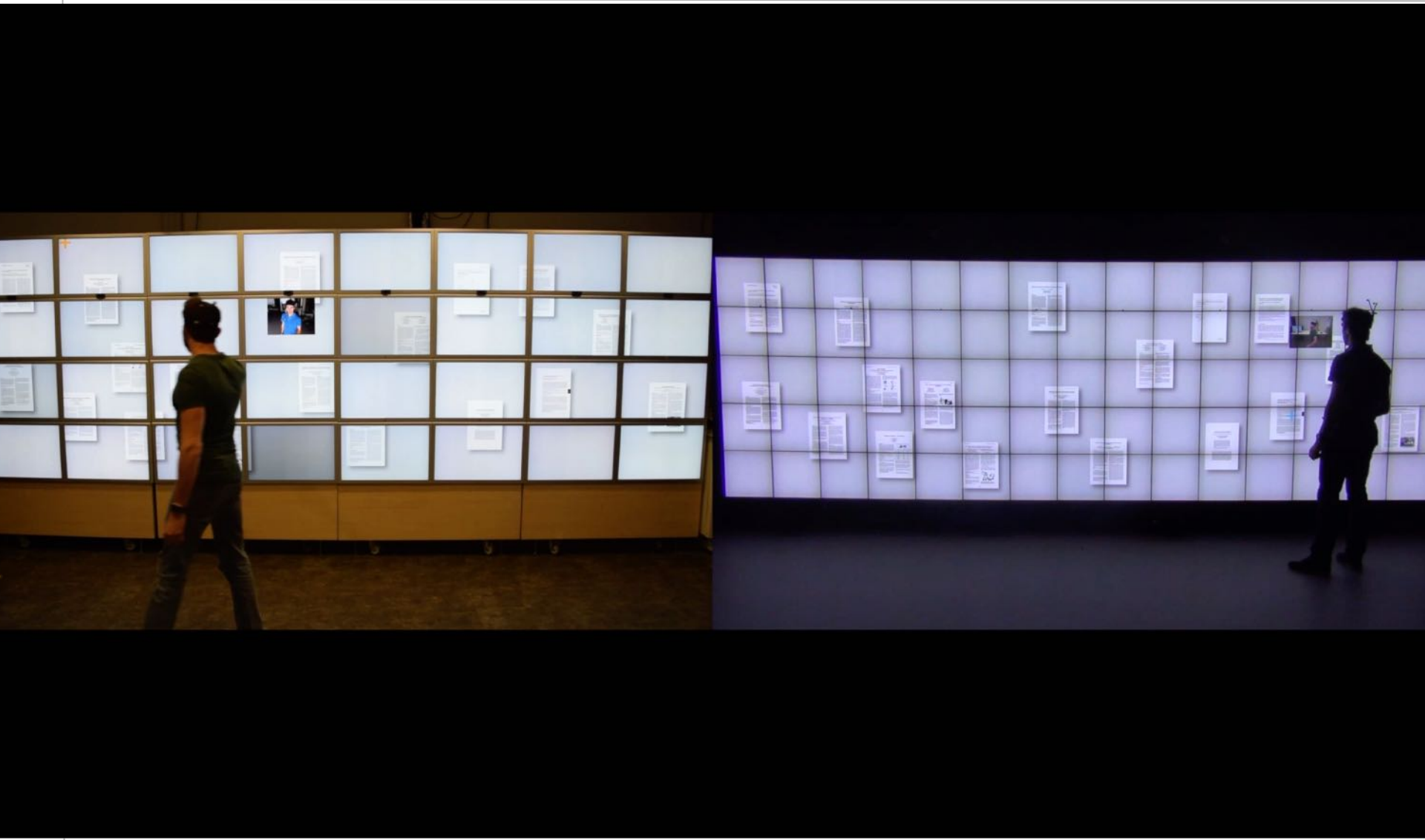
Avellino, Fleury, Mackay, Beaudouin-Lafon, 2017



CamRay: folllow-remote



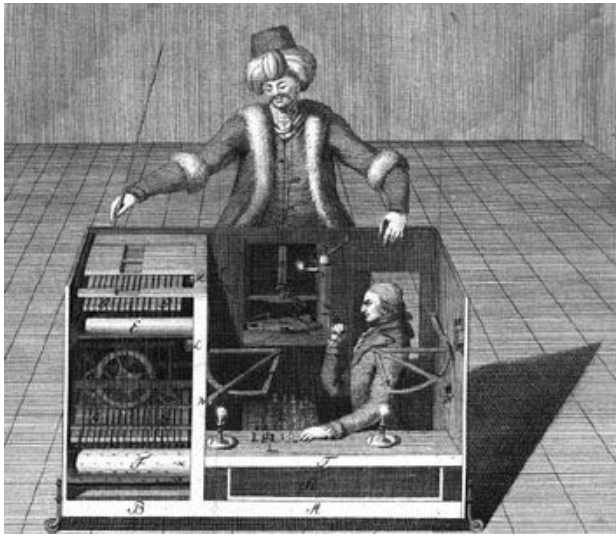
CamRay: folllow-local

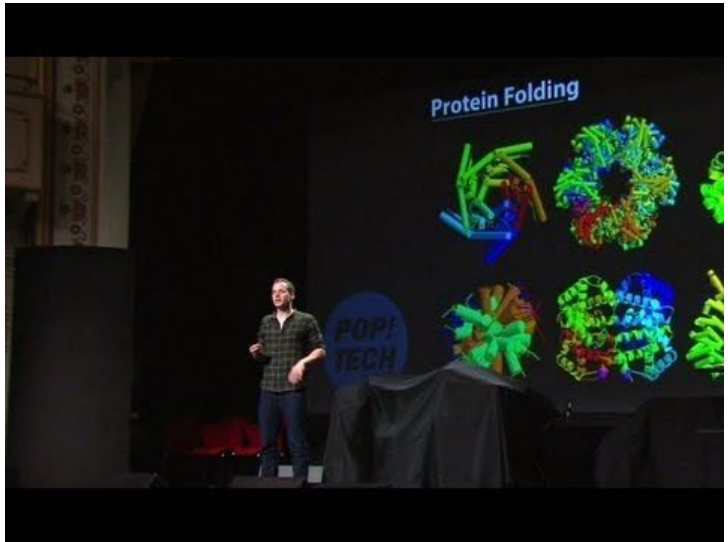


Crowdsourcing

Harness the power of the crowd

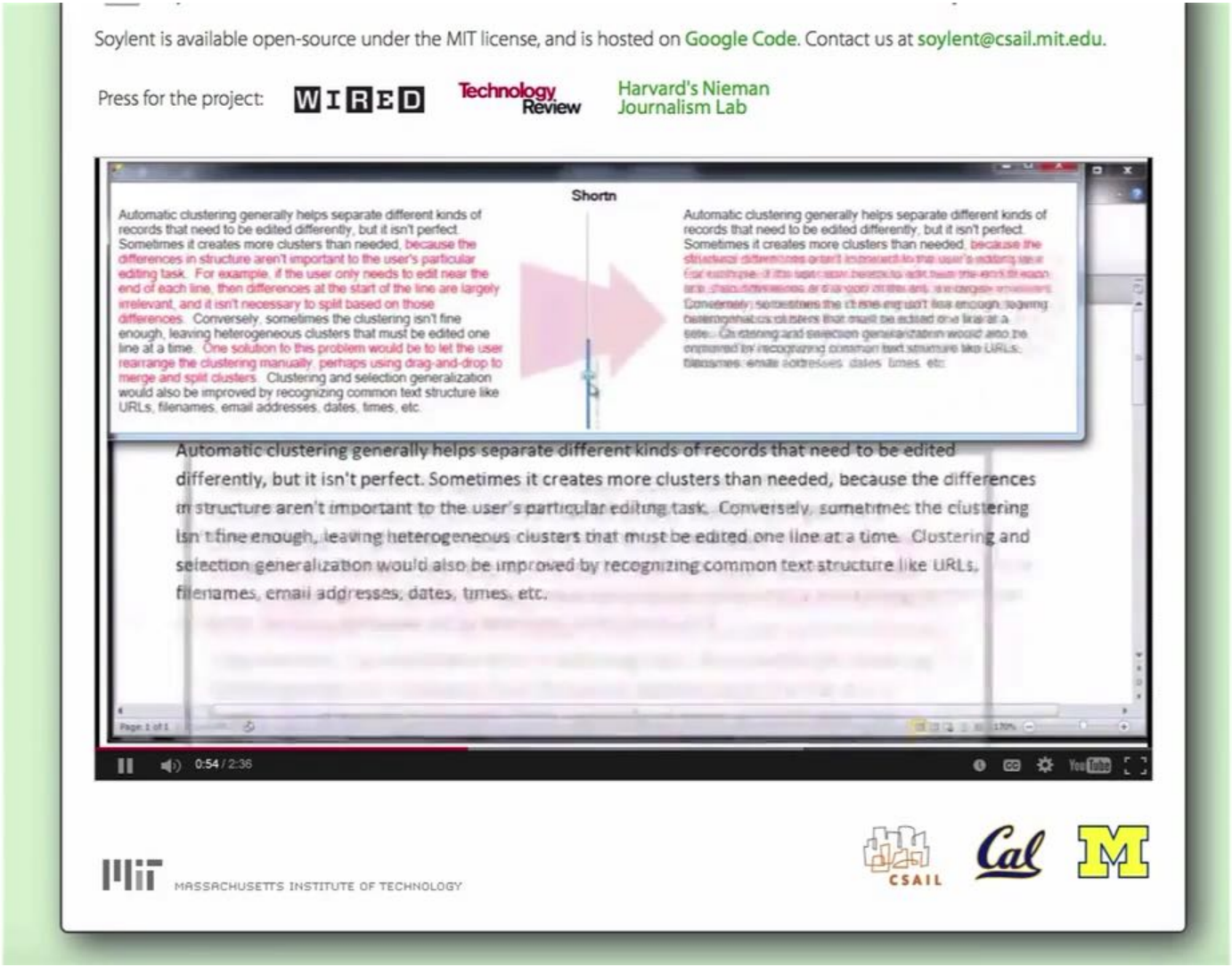
Combine human intelligence
with machine computation





Soylent: a computer with a crowd inside

Bernstein, 2010



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

C.A. Ellis, S.J. Gibbs, and G. Rein, "Groupware, some issues and experiences". *Communications of the ACM*, 34(1):39-58, January 1991.

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

K. Finn, A. Sellen and S. Wilbur, *Video-Mediated Communication*, 1997

M. Beaudouin-Lafon, editor. *Computer Supported Co-operative Work,* 1999
http://www.lri.fr/~mbl/Trends-CSCW/

S. Harrison, *Media Spaces – 20+ Years of Mediated Life*, 2009

J. Gleick, *The Information*, 2012