# Collaborative Software

Ben Bederson
CMSC434 - Intro to HCI
Spring 2011

Slides (slightly) modified from Scott Klemmer

**Questions?**

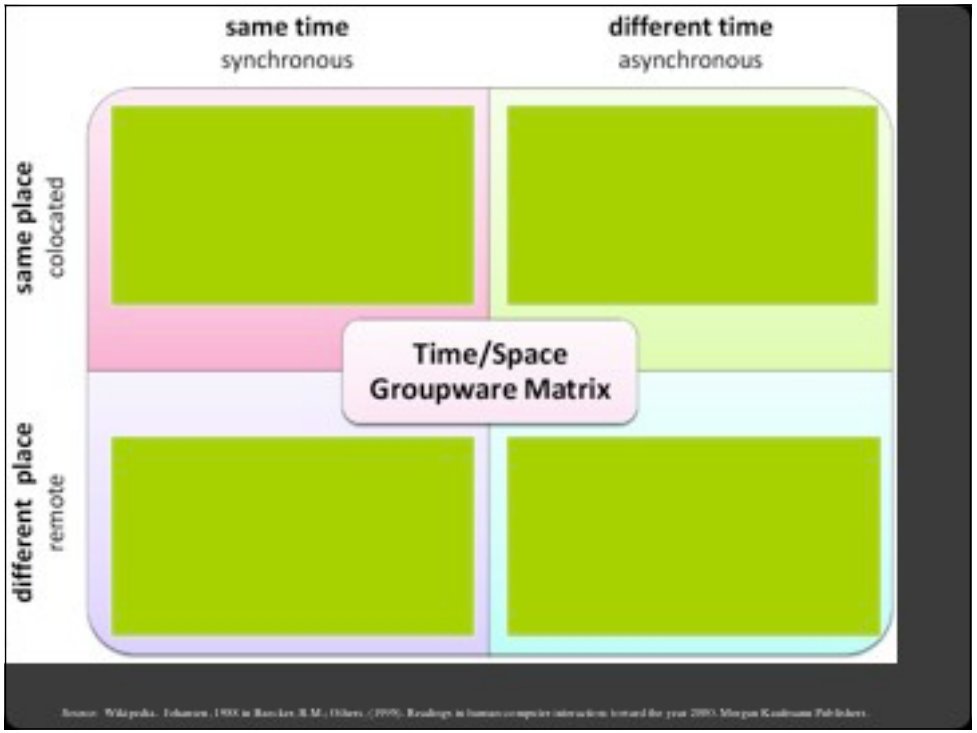
www.CourseEvalUM.umd.edu

No class May 9

HOF/S presenters upload slides, but no presentation

Presentations next week in order on website

(How) can we design software to facilitate collaboration?



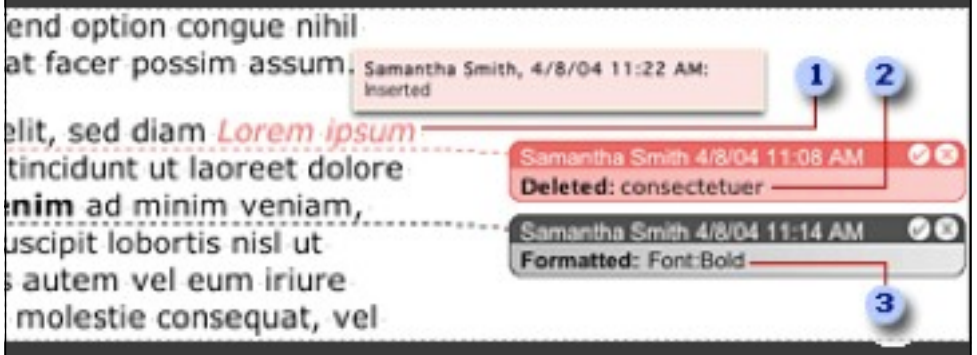

# Different time / different place

- Communication + Coordination
- Wiki
- Blogs
- Workflow
- Version Control

- Shared participation over time
- Geographically world wide

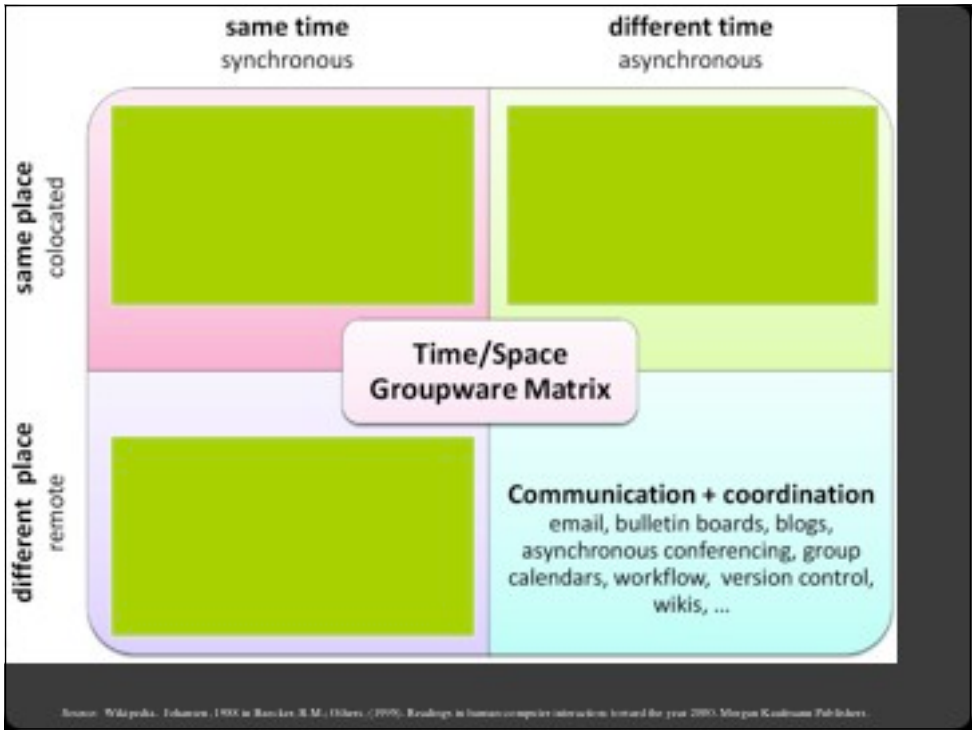
- Traditional focus of "CSCW" work

# Track Changes




# Document Collaboration

- How many of you have used Google Docs to collaborate on document?
- Can range from same time to different time, depending on use case
- Challenge: make it more than just Microsoft Word with the network added

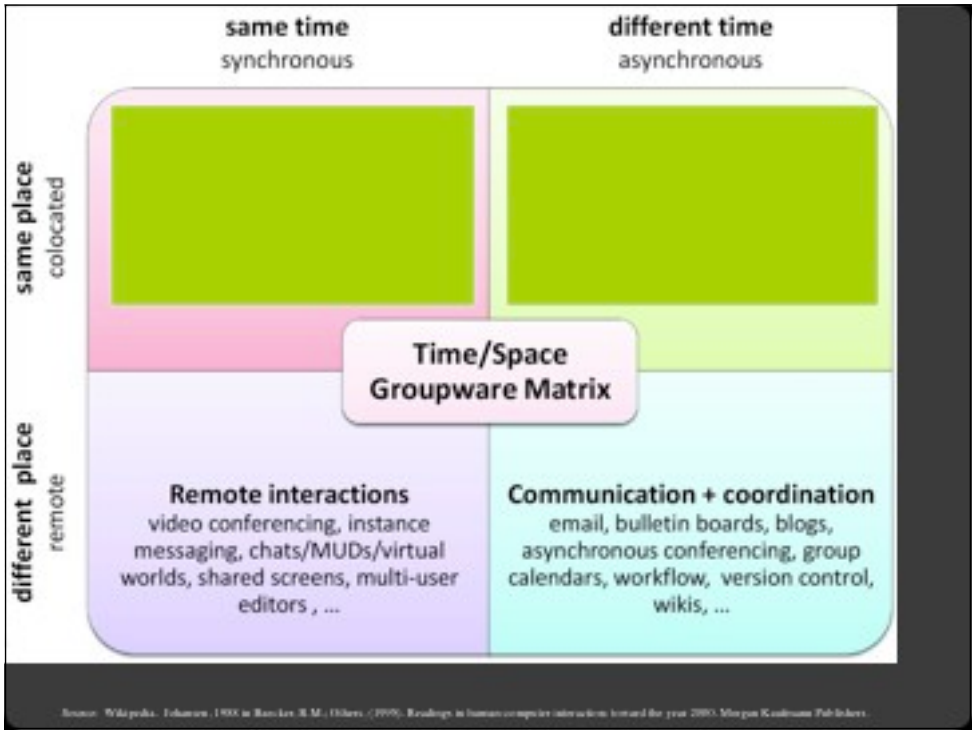



## Same time / different place

- Remote interaction
- Video-Conferencing,
- Real-time groupware
- Messaging (Instant messaging, Email)
- Virtual worlds
- Multi-User editors
- Shared Screen (vnc)

- Multi-user participation
- Nonverbal cues

# Example: recent enhancements in same time / different place



# Different time / same place

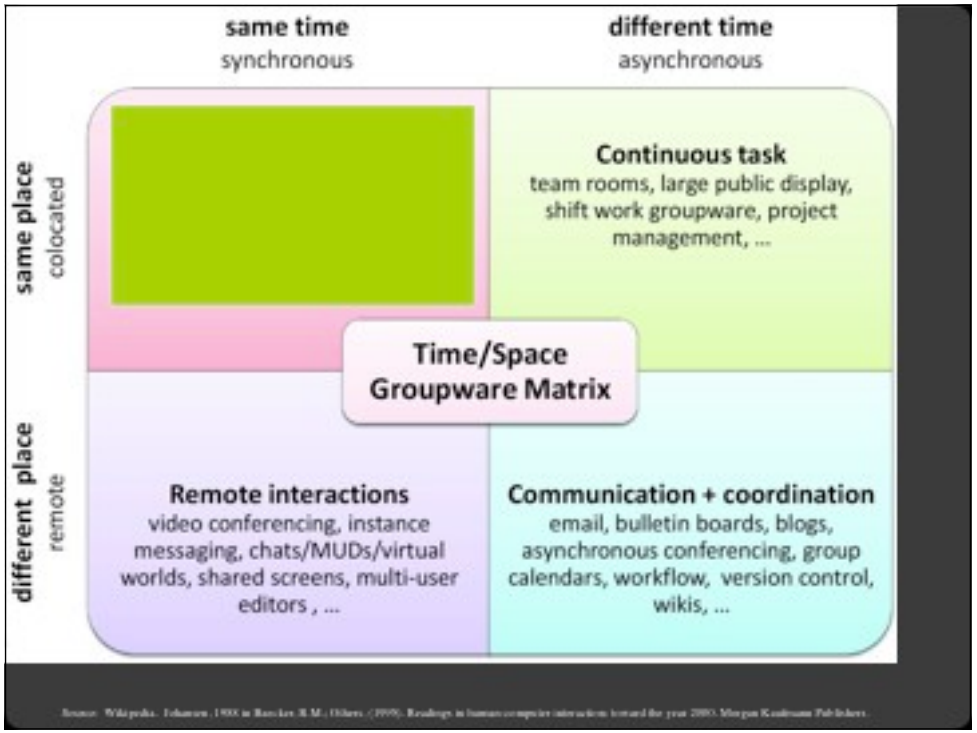
- Continuous task
- Team rooms
- Large displays

Source: Wikipedia

# Example: ideas for different time / same place

Lean Manufacturing:
Visible System Metrics

Source: http://www.usagmag.com/, http://www.adaptivedisplays.com/




## Same time / same place

- Face to face interaction
- Roomware
- Shared tables, wall displays
- Group Decision Support Systems (GDSS)
- Single display groupware

# The original example: same time / same place

With "PowerPoint Slides"

Without "Slides"

Source: http://www.presentationzen.com/presentationzen/2006/03/index.html

# Example : same time / same place

Microsoft Surface

Source: Microsoft Surface, http://www.microsoft.com/surface/

# Single Display Groupware

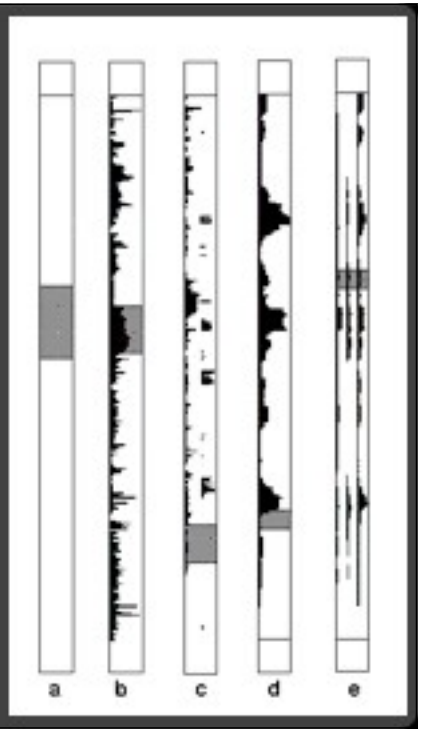
| | **same time**<br>synchronous | **different time**<br>asynchronous |
|---|---|---|
| **same place**<br>colocated | **Face to face interactions**<br>decision rooms, single display groupware, shared table, wall displays, roomware, ... | **Continuous task**<br>team rooms, large public display, shift work groupware, project management, ... |
| **different place**<br>remote | **Remote interactions**<br>video conferencing, instance messaging, chats/MUDs/virtual worlds, shared screens, multi-user editors , ... | **Communication + coordination**<br>email, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis, ... |

**Time/Space Groupware Matrix**

Source: Wikipedia. Johansen, 1988 in Baecker, R.M., Others, (1995). Readings in human-computer interaction: toward the year 2000. Morgan Kaufmann Publishers.

# Beyond Being There

# History Enriched Digital Objects




## What succeeds today?

- Collocation for tightly coupled work
  - because you get common ground and rapid rich interaction for free
- Remote work that is loosely coupled
  - because it doesn't require high interaction
  - use video and other high bandwidth to overcome loss of common ground
  - travel often
- Ideally some initial face-to-face meetings

# Distance Work will Only Increase

- 67% of companies anticipate increased reliance on virtual teams
  - 80% for companies with 10,000+ employees
- 35% of respondents rated difficulty of management as top challenge for virtual teams
- 92% said trust is critical for virtual teams
  - Survey by Institute for Corporate Productivity

## Geographic dispersion & software development

- Software outsourcing is increasingly common
- But software development takes longer when performed by geographically distributed teams
  - Compare software development efficiency, when all developers are at one location or distributed across sites
  - Two different software development organizations
  - Time to complete an "MR" (Modification Request)

| | Team type | | |
|---|---|---|---|
| Study | Single site | Multiple site | Ratio |
| Herbsleb | 5.0 | 12.7 | 2.5 |
| Espinosa | 48.2 | 97.2 | 2.0 |
| | | | |
| Days from start to completion of MR | | | |

## Collocation supports awareness & increased frequency of communication

- Visual information supports information pick-up without explicit communication ➔
  - Common ground
  - Trust
  - Opportunities for communication
  - Identification of appropriate times for communication
- Examples of walking down corridor



## Live video to support informal interaction

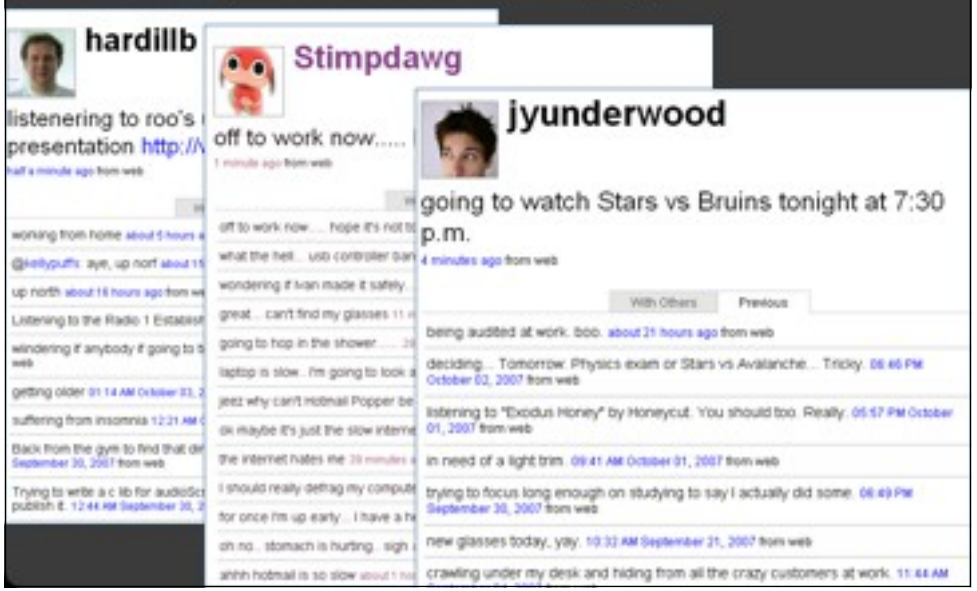
- Early systems for distributed work tried to leverage affordances of the visual channel
  - Video Window
  - Montage
- => Pretty consistently ineffective

# Change the metaphor

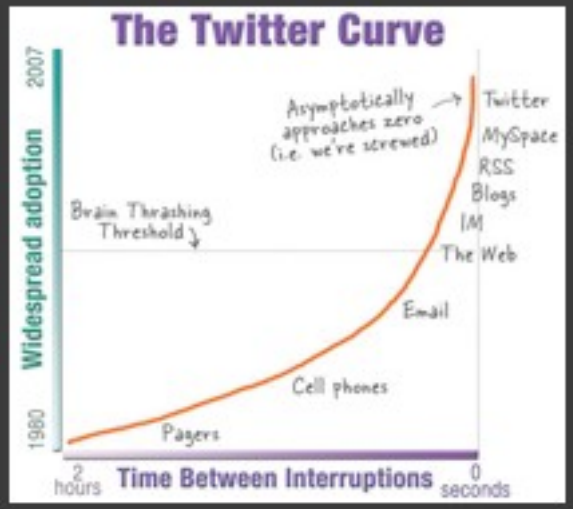
Goal should be to support the ***functions*** of collocation and not the ***form***



# Lower tech solutions: Text based, manual awareness displays



# Raises it own problems





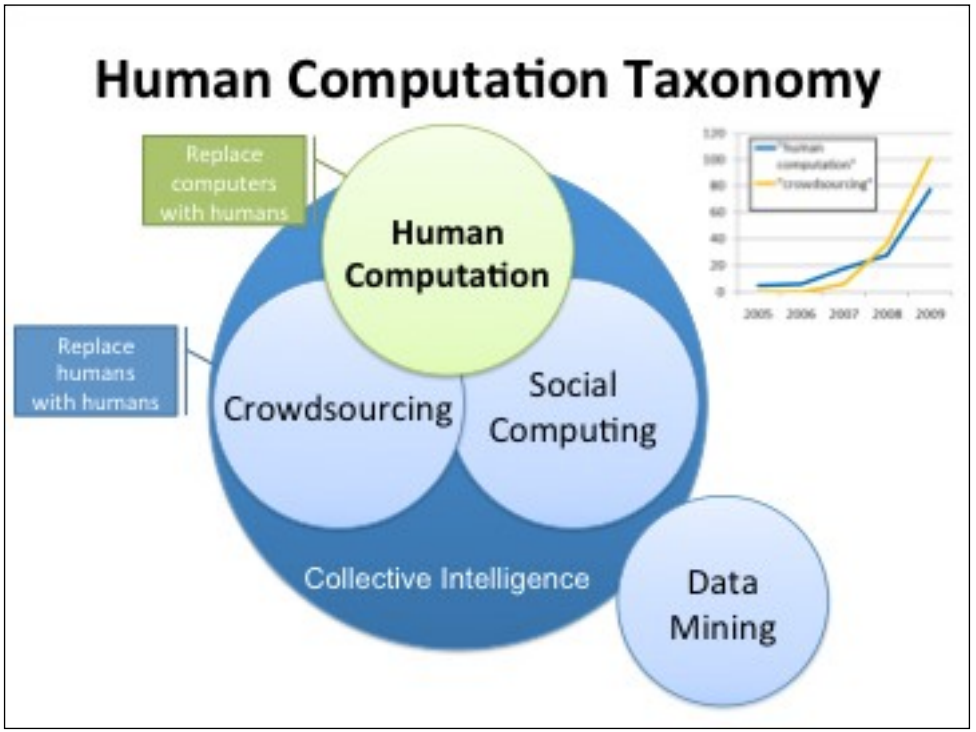

## Some fundamental shifts are occurring in practice

- Highly distributed work groups have been successful by not striving for the collocation ideal
  - Wikipedia,
    - > 500,000 successful articles
    - Each written by 10s - 1000s of editors & large time periods
    - Coordination via the malleable & revertible artifact
    - Coordination thru text linked to the artifact
  - Open source software
    - Highly distributed teams
    - Task decomposition
    - Database driven production, with formalization to reduce the need for direct interpersonal communication
- Maybe the comparison with collocated work is fundamentally misleading. Fundamentally new structures are possible...

# Wisdom of the Crowds (Surowiecki)

- **Tasks:**
  - At predicting the future (prediction markets)
  - At solving tough problems (InnoCentive)
  - At collecting / filtering info (Digg, Delicious, Twitter)
  - At democratizing production (Wikipedia)
  - At doing work (GWAP)
- **Motivations:**
  - Pay (Amazon Mechanical Turk)
  - Fun/reputation (GWAP, StackOverflow)
  - Was doing it anyway (Re-captcha, Fold.it)
  - Altruism (anonymous blog comments)

# Human Computation Taxonomy



# Challenges

- Disparity of benefit between worker and requester
- Motivation must scale
- Balance openness with quality / malicious behavior
- Integrate / aggregate information