

Human-Computer Interaction

CSCW

Professor Bilge Mutlu

Today's Agenda

- » Topic overview: *CSCW*
- » Discussion

What is CSCW?

What is CSCW?

Definition: Computer-supported collaborative work (CSCW) "combines the understanding of the way people work in groups with the enabling technologies of computer networking, and associated hardware, software, services and techniques."¹

What is groupware?

Definition: Groupware includes application software designed to help people working on a common task to attain their goals.²

¹Wilson, 1991, Computer Supported Cooperative Work: An Introduction

²Wikipedia: Groupware

Historial Context: *Groupware* → *Collaborative Ecosystems*

- » Early CSCW → focus on co-located collaboration (meeting rooms, shared displays).
- » 2000s → distributed collaboration (email, wikis, Slack).
- » 2020s → *ecosystems* integrating humans, AI agents, sensors, and workflows (GitHub Copilot as human-AI pair collaboration)

CSCW = the group working process + the technology¹

¹Wilson, 1991, Computer Supported Cooperative Work: An Introduction

What do you mean by group work processes?

1. *Individual human characteristics, e.g., conversation patterns*
2. *Organizational aspects, e.g., structure and culture of the organization*
3. *Group work design issues, e.g., involvement in the work design process*
4. *Group dynamics, e.g., group decision making, collaboration¹*

¹Wilson, 1991, Computer Supported Cooperative Work: An Introduction

What do we mean by CSCW technology?

1. *Communication mechanisms*—enabling people to communicate, e.g., videoconferencing
2. *Shared work space facilities*—enabling people to view and work on the same electronic space, e.g., screen sharing
3. *Shared information facilities*—enabling people to view and work on a shared set of information, e.g., cloud-based document sharing
4. *Group activity support facilities*—augmenting group work processes, e.g., simultaneous document editing¹

All of these are being updated with AI!

¹Wilson, 1991, Computer Supported Cooperative Work: An Introduction

Time/space Groupware Matrix³

	Synchronous	Asynchronous
Collocated	Face-to-face interactions Decision rooms, single display groupware, shared table, wall displays, roomware	Continuous task Team rooms, large public display, shift work groupware, project management
Remote	Remote interactions Video conferencing, instant messaging, chats/MUDs/virtual worlds, shared screens, multi-user editors	Communication + coordination Email, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis

³Johansen, 1988, Groupware: Computer Support for Business Teams

Face-to-face interactions⁴

Right: group decision rooms (e.g., NASA Mission Control Center, Johnson Space Center)

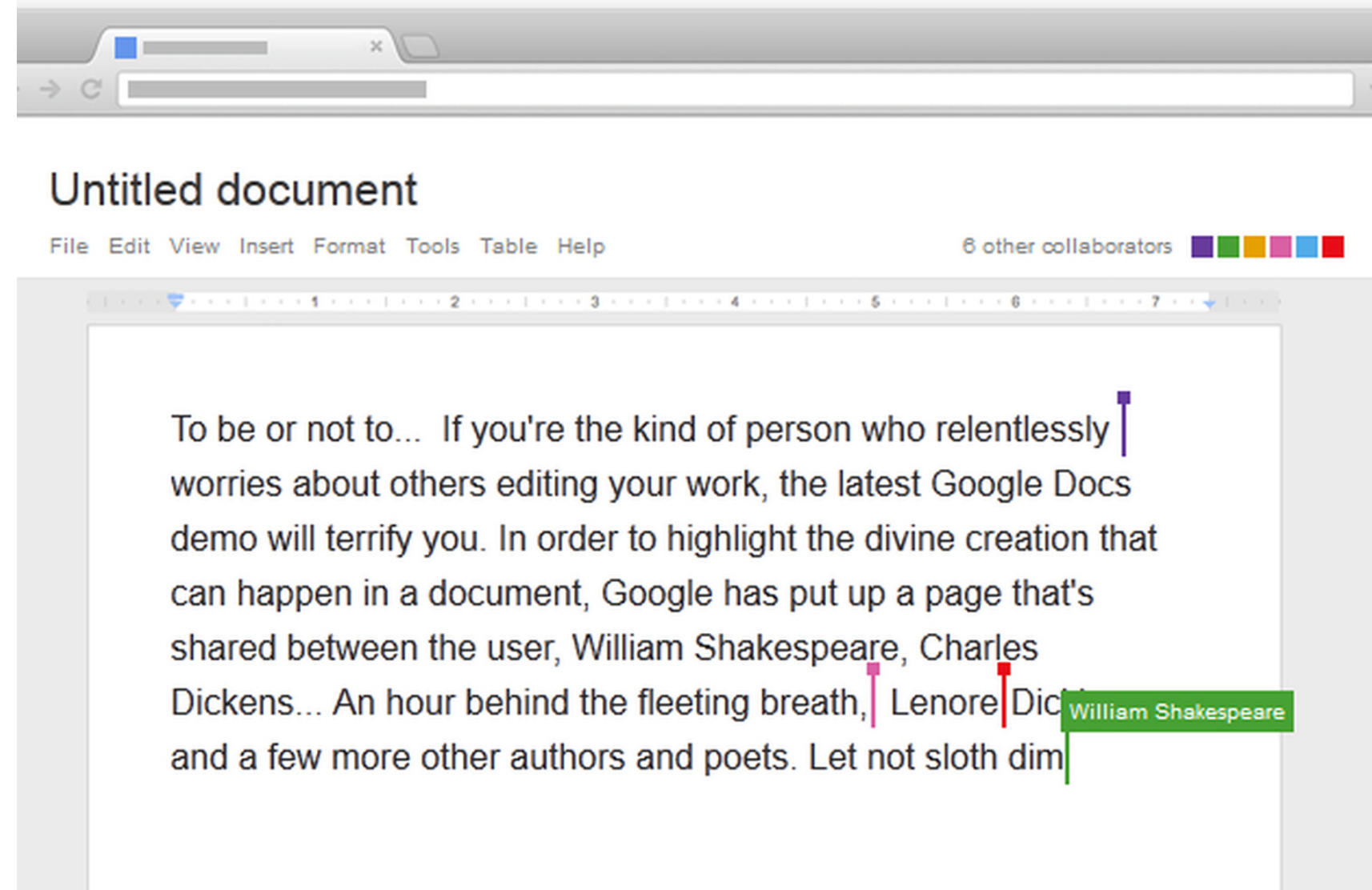


⁴ Image source: [NASA](#)

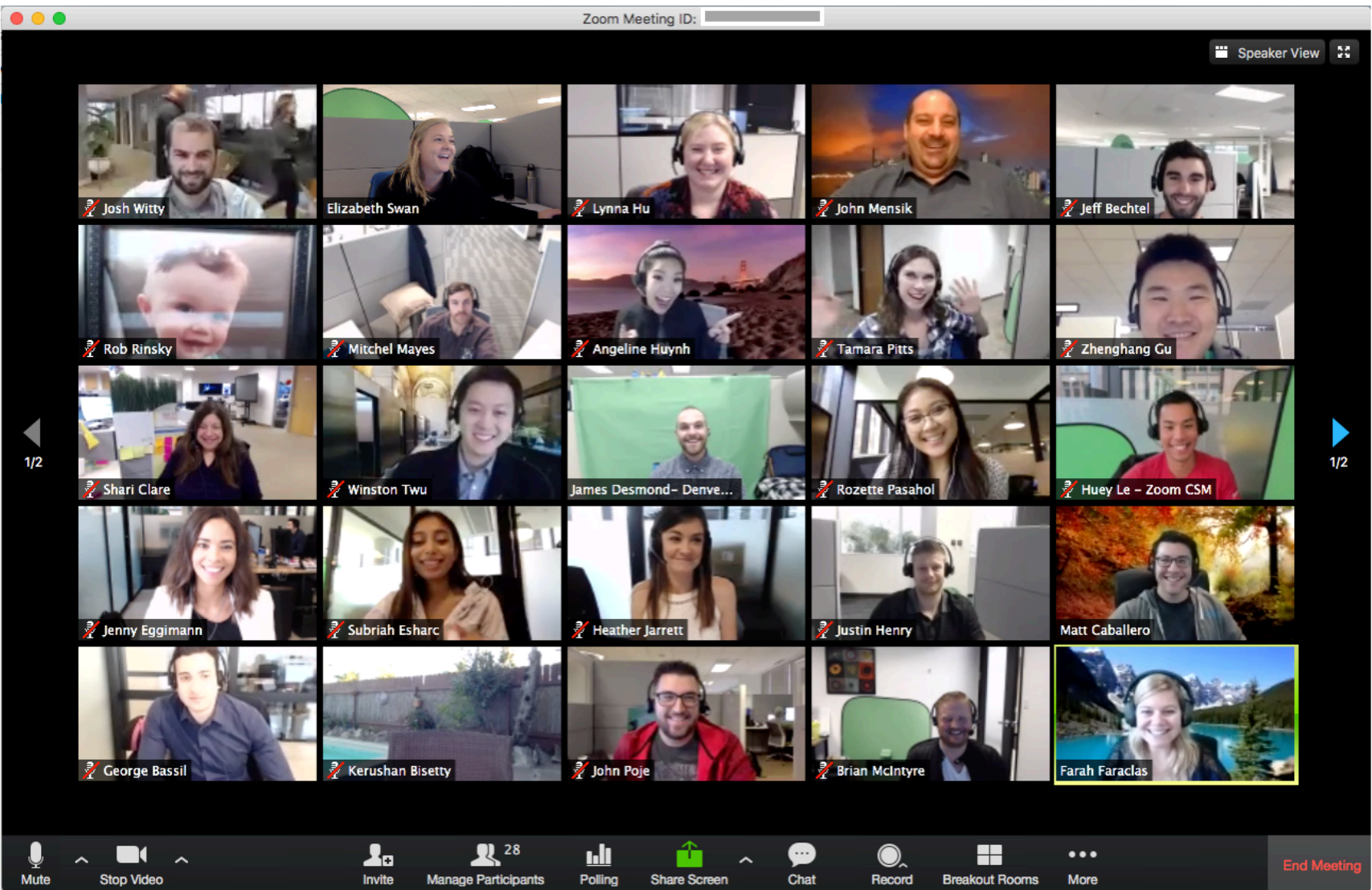
Remote interactions⁵

Right: collaborative authoring in Google Docs

Next slide: different forms of videoconferencing



⁵ Image sources: [Right](#), [Next slide, left](#), [Next slide, right](#)



Continuous task⁶

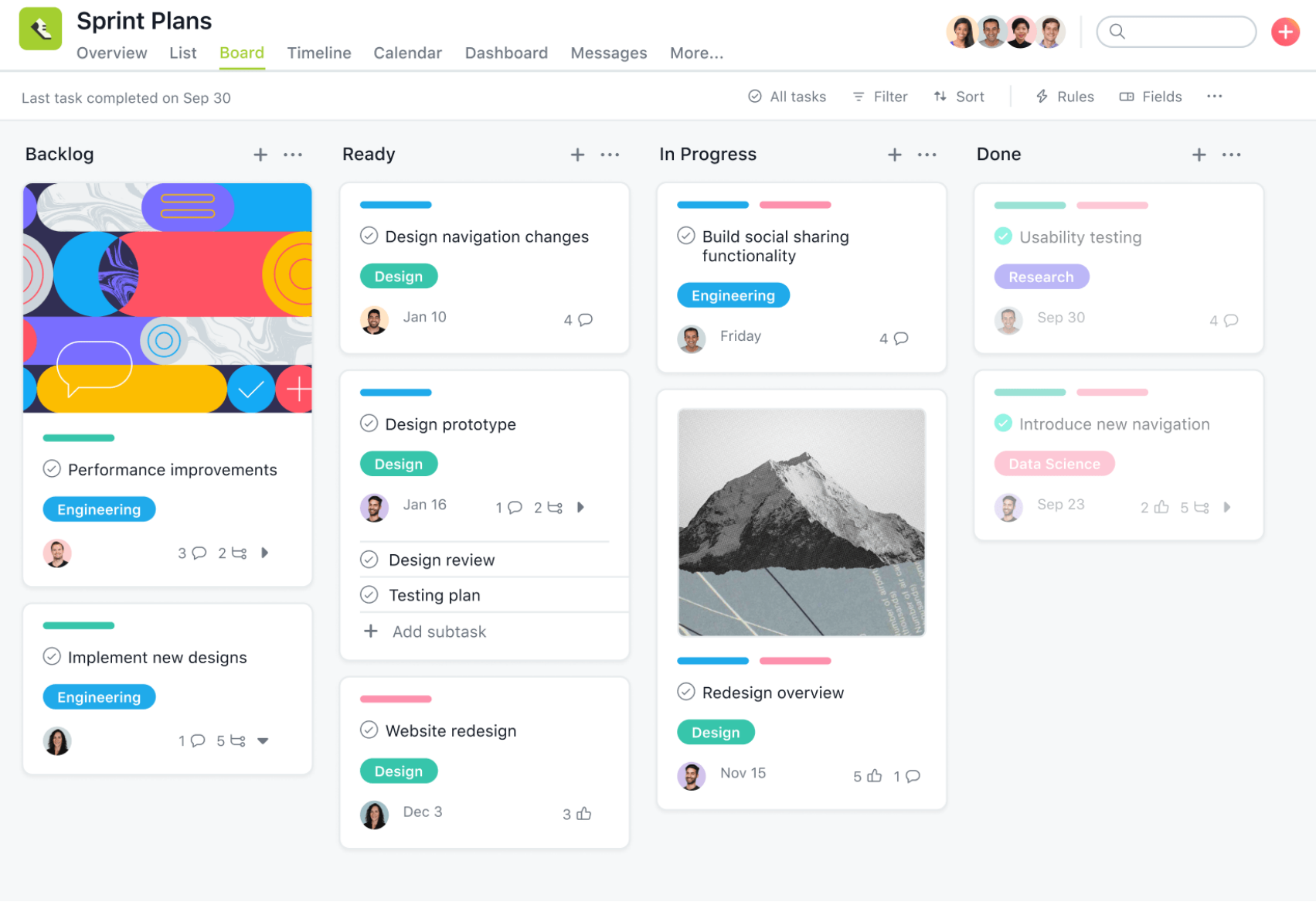
Right: persistent project management displays



⁶Image source

Communication + coordination⁷

Right: project management software tools



⁷Image source

What did we learn from early CSCW?

Grudin, 1984: Eight Challenges¹⁵

- » Disparity of work and benefit
- » Critical mass
- » Disruption of social processes
- » Exception handling
- » Evaluation difficulties

Orlikowski, 1992: Learning from Notes¹⁶

- » Misaligned mental models (“personal tools” vs. collaborative tools)
- » Incongruent organizational incentives
- » Cultural mismatch (competitive vs. cooperative)

¹⁵ Grudin, J. (1994). Groupware and social dynamics: Eight challenges for developers. *Communications of the ACM*, 37(1), 92-105.

¹⁶:Orlikowski, W. J. (1992). Learning from notes: Organizational issues in groupware implementation. *CSCW 1992*.

¹⁶ Andro, 2018, Digital libraries and crowdsourcing

What does CSCW in the era of AI look like?

AI as Collaborator

- » Example technologies:
 - » Copilot / Notion AI for co-authoring
 - » Zoom AI Companion, Google Duet, Slack summaries
- » New coordination problems: opacity, trust calibration, turn-taking, authorship, accountability.
- » Transparency, particularly under information asymmetry, is key to design of AI collaborators.¹⁷
- » Cooperation vs. collaboration

¹⁷ Kittur, A., Nickerson, J. V., Bernstein, M., Gerber, E., Shaw, A., Zimmerman, J., ... & Horton, J. (2013). The future of crowd work. CSCW 2013.

Hybrid Collaboration Models

Interaction Type	Synchronous (real-time)	Asynchronous (over time)
Human–Human Collaboration	People coordinate tasks and ideas in real time using shared tools like Miro, Figma, or Zoom. Success depends on maintaining awareness and conversational flow.	Work unfolds over time through tools like GitHub or shared docs, where visibility and continuity of contributions are key.
Human–AI Cooperation (AI as assistant)	AI offers immediate, on-demand help—such as writing suggestions or code completions—under human direction and control.	AI acts in the background to summarize, organize, or prioritize information while humans are offline, requiring trust and transparency.
Human–AI Collaboration (AI as teammate)	Humans and AI work toward shared goals in real time, co-creating or making joint decisions that require mutual awareness and negotiation.	AI continues contributing between sessions, learning from prior interactions or extending work autonomously, raising questions of attribution and alignment.

What is collaboration at scale, a.k.a., crowdsourcing?

Scalable Collaboration: Crowdsourcing → Hybrid Work

- » **Crowdsourcing** organizes large, distributed groups to contribute ideas, labor, or data toward shared outcomes — an early form of massive computer-supported collaboration.
- » Platforms such as Mechanical Turk, Wikipedia, and Zooniverse demonstrated how work can be divided, coordinated, and recombined through digital infrastructures.
- » Today, this idea extends into hybrid human–AI workflows, where algorithms route, filter, or even perform parts of the crowd’s tasks, redefining the boundaries of “collaboration.”

crowds → platforms → hybrid AI-crowds

Where does crowdsourcing come from?

Milestone 1. 13th century, Hugh of Saint-Cher, O.P., coordinated monks to index scripture.

Milestone 2. Longitude act of 1714 offered prize money to anyone who could determine the longitude of a ship to avoid accidents, followed by several examples of reward-based crowdwork.

Milestone 3. In 1794, Gaspard de Prony devised microtasks of addition and subtraction for 80 unemployed hairdressers to develop logarithmic and trigonometric tables.¹⁶

¹⁶ Andro, 2018, Digital libraries and crowdsourcing

Opportunities & Challenges in Crowd and Hybrid Work^{14 17}

Opportunities

- » Access to scale, expertise, and diversity of perspectives.
- » Flexible and rapid mobilization of distributed contributors.
- » Integration of human insight with algorithmic efficiency.

Challenges

- » Labor precarity: low pay, lack of benefits, opaque management.^{13 14}
- » Quality and accountability: balancing open participation with reliability.
- » Ethics and transparency: AI systems now manage, evaluate, or even replace human labor.

¹⁴ Tan et al. (2021). The ethical debate about the gig economy: A review and critical analysis.

¹⁷ Kittur, A., Nickerson, J. V., Bernstein, M., Gerber, E., Shaw, A., Zimmerman, J., ... & Horton, J. (2013). The future of crowd work. CSCW 2013.

¹³ Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. Qualitative Research Journal, 19(3), 259-270.

What do these all mean for designing AI-enabled CSCW systems?

Organizational Implications of AI-Mediated Work

- » AI systems increasingly coordinate, assign, and evaluate human work, reshaping authority and accountability structures.
- » Orlikowski's insight—that technology is interpreted through organizational culture—remains relevant: how AI is framed (assistant, manager, teammate) shapes how it's used.
- » New “invisible work” emerges around training, verifying, and correcting AI systems—often undervalued and unseen.
- » Algorithmic management blurs boundaries between cooperation and control, requiring transparency and worker agency.

Designing for Cooperative Intelligence

- » Designing for users → designing with intelligent partners
- » Support shared mental models so humans and AI understand goals, roles, and context.
- » Provide *social translucence*: visibility into what the AI knows, intends, and is doing.¹⁸
- » Ensure transparency and feedback loops to enable learning on both sides (human adaptation and AI refinement).
- » Embed accountability and attribution into interfaces: who contributed what, and how decisions were reached (also a tenet of joint action).¹⁹

¹⁸ Erickson, T., & Kellogg, W. A. (2000). *Social translucence: An approach to designing systems that support social processes*. ACM TOCHI, 7(1), 59–83.

¹⁹ Sebanz, N., Bekkering, H., & Knoblich, G. (2006). *Joint action: bodies and minds moving together*. Trends in cognitive sciences, 10(2), 70–76.

Summary

- » From Groupware → Group Work → Hybrid Intelligence
- » Core CSCW lessons (social, organizational, ethical) remain central
- » Future CSCW must integrate sociotechnical + cognitive + algorithmic collaboration design

Discussion Format

- » We'll let AI randomly pick 3–5 names
- » In the selected order, students:
 - » Present their provocation/critical artifact/policy or design recommendation (30 secs)
 - » Lead class discussion (5–8 min)

What's Next?

Wednesday:

- » **Methods** — Read *Textbook Chapter 11*¹² + *Linneberg & Korsgaard*¹³
- » **Project** — Project next steps:
 - » *Draft Method* — Due Oct 17
 - » *Final Method* — Due Oct 31
 - » Note: Design-led/systems-based research should be underway **now**.

¹² Lazar et al. (2017). Chapter 11 — Analyzing Qualitative Data. Research methods in human-computer interaction. Morgan Kaufmann.

¹³ Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. Qualitative Research Journal, 19(3), 259-270.