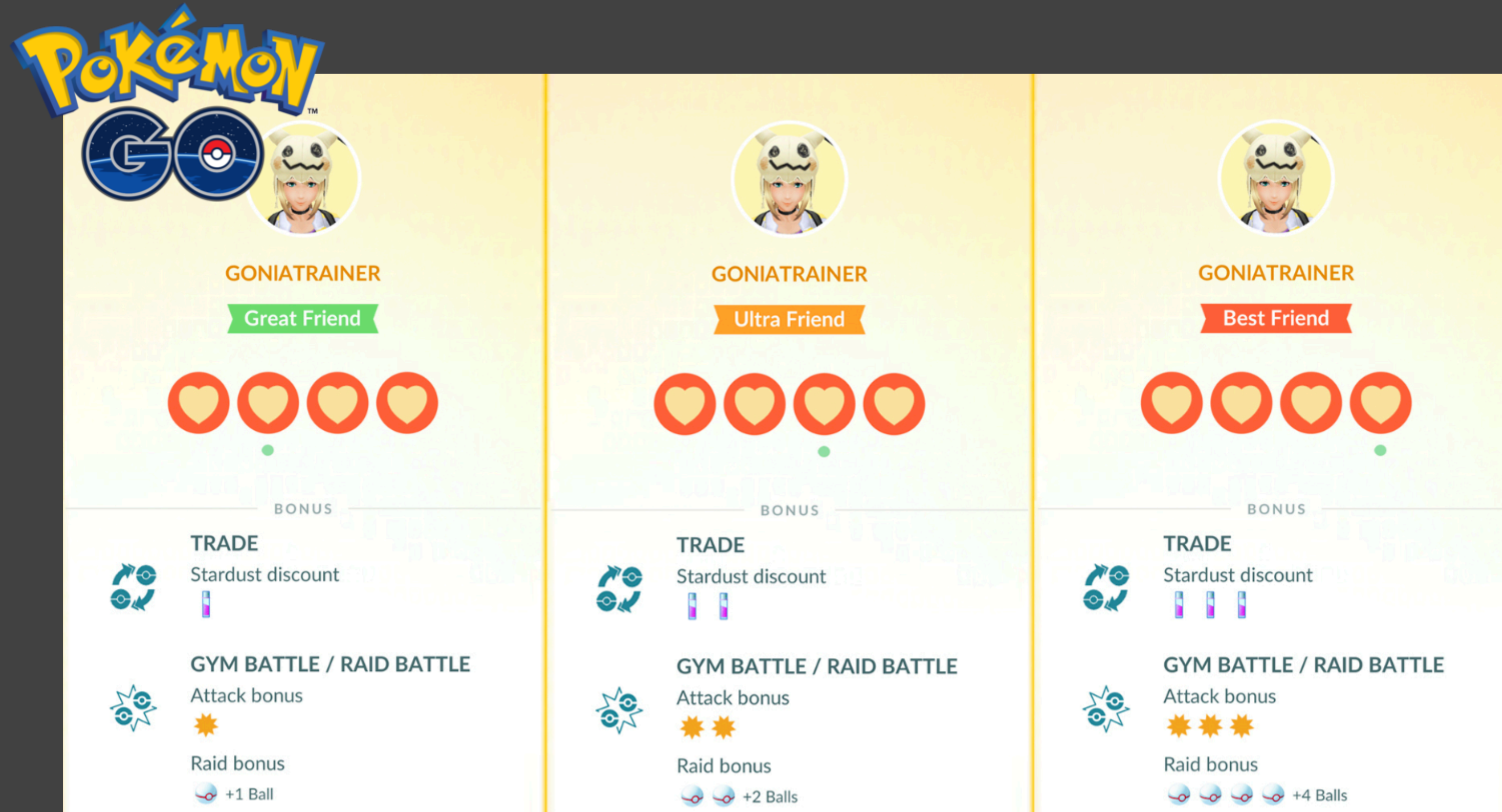


“Strong and Weak Ties” example submitted by Matthew Y.



Attendance



Pokemon Go designs for strong ties by encouraging consistent interaction with your friends in the game. For every day that you send or receive a gift from your friend, you'll grow your friendship level. With higher friendship level milestones, you get in-game rewards and other bonuses.

0.5% extra credit for examples relevant to recent or upcoming lectures. Submit on Ed under the “Lectures” category



Collaboration

CS 278 | Stanford University | Michael Bernstein



Announcements



Assignment 2 is due Tuesday

Project milestone will be due the Wednesday of Week 7

Zone 1: either the front-end or the back-end is functional

Zone 2: no-code components of the project should be complete; code components may still be in progress

Zone 3: launch! no-code components are complete, so take the system live and start recruiting

Last time

Strong ties: a small number of people we know well — design for honest signals, and don't assume all communication happens through the system.

Weak ties: a large number of acquaintances — design to support feelings of connectedness, but remember that many social systems will be dominated in volume by weak ties.

The impacts of social media use on our wellbeing are most negative for those passively consuming content (esp. from weak ties), and for heavy usage among early adolescent girls

Today, a different kind of group: one brought together by shared purpose and goal.



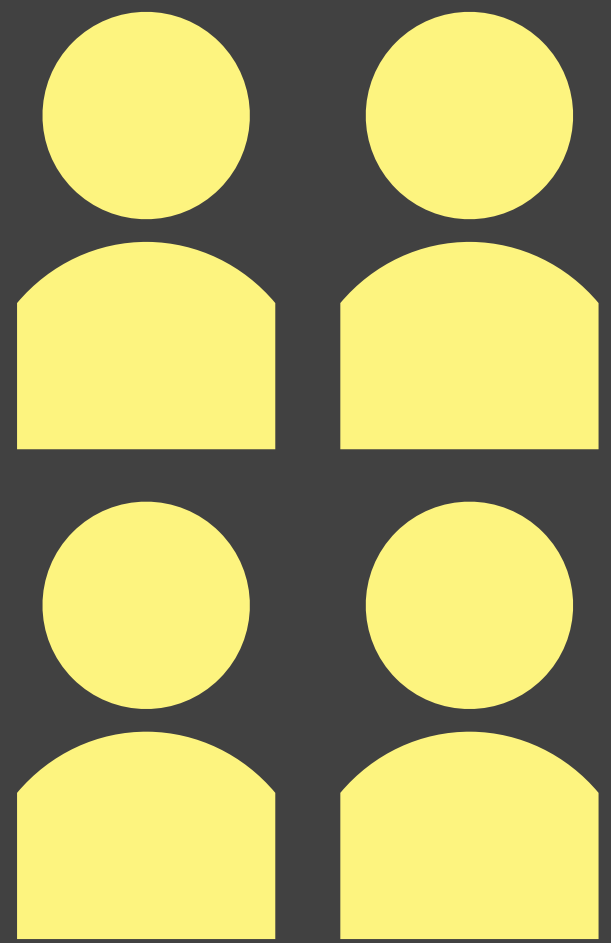
Oh #@&% , It Got
Popular

 Unit 2

We Work

Unit 3

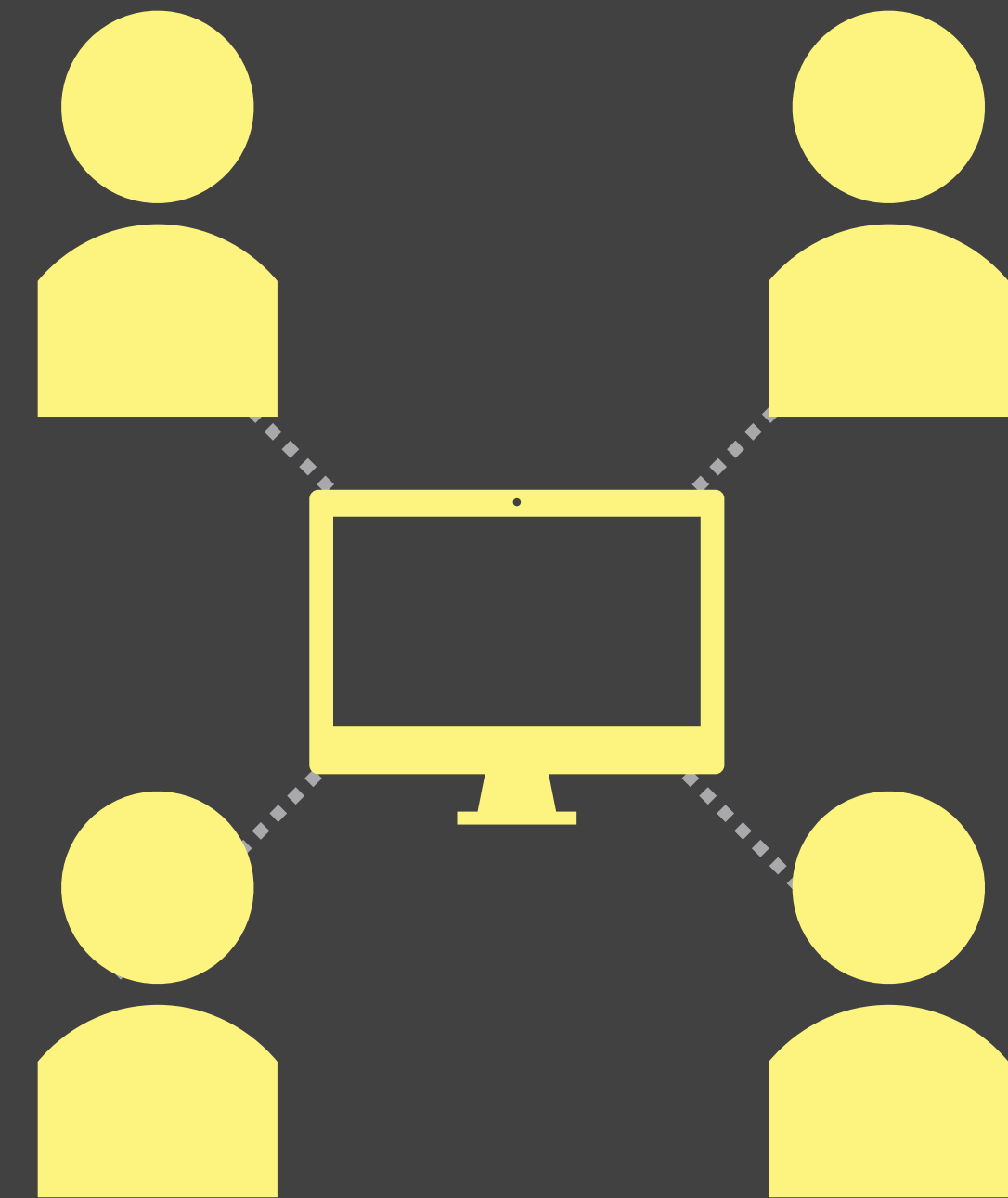
Which team is more effective?



Colocated team
has: a room

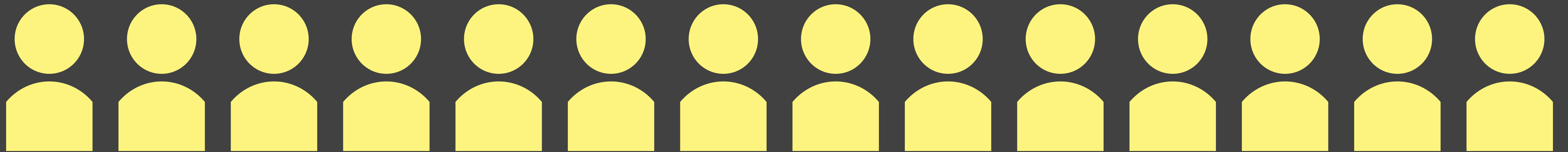
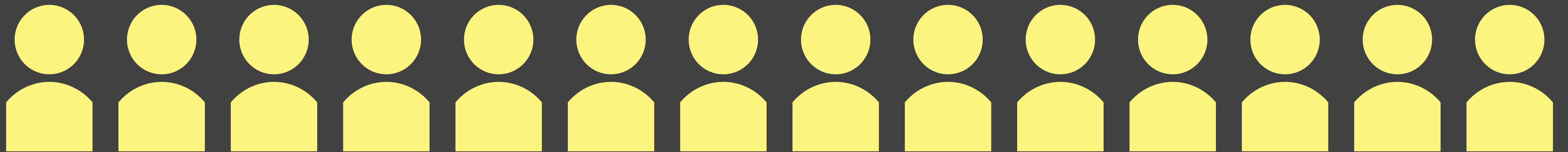
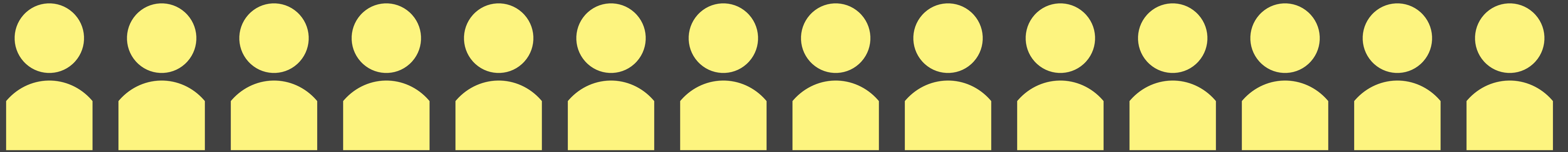
2:1 more effective
[Olson and Olson
2000; Espinosa
2011; Björn 2014;
Hu et al. 2022]

Why? And what
can we do about it?

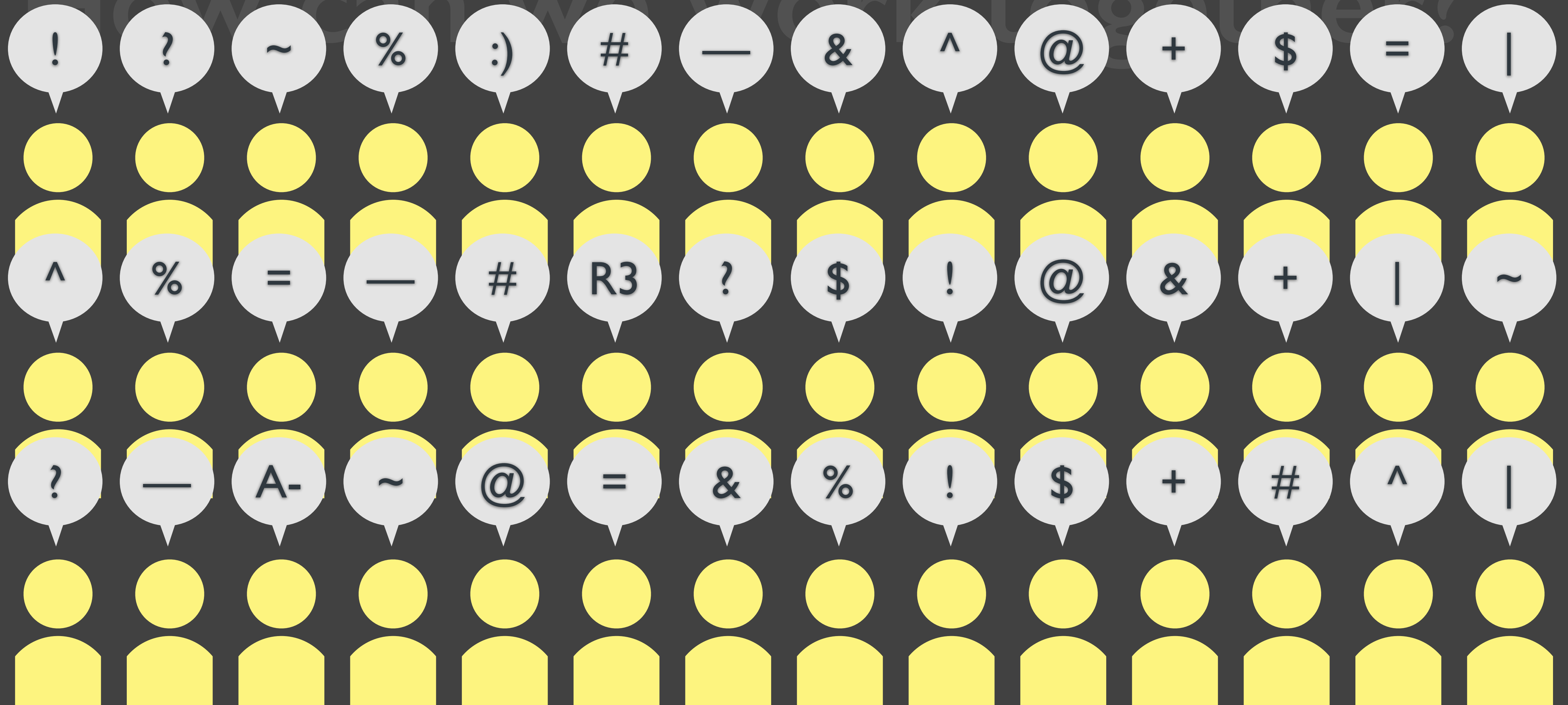


Distributed team
has: Zoom, Slack, Trello,
Dropbox, GitHub, Asana,
Google Docs, Jira

How can we work together?



How can we work together?



Out of Sight, Out of Sync: Understanding
Conflict in Distributed Teams

COORDINATION NEGLECT: HOW LAY
THEORIES OF ORGANIZING
COMPLICATE COORDINATION IN
ORGANIZATIONS

The Mutual Knowledge Problem and Its
Consequences for Dispersed Collaboration

The team scaling fallacy: Underestimating the declining efficiency of larger teams

Who's in Charge Here? How Team Authority Structure Shapes Team Leadership

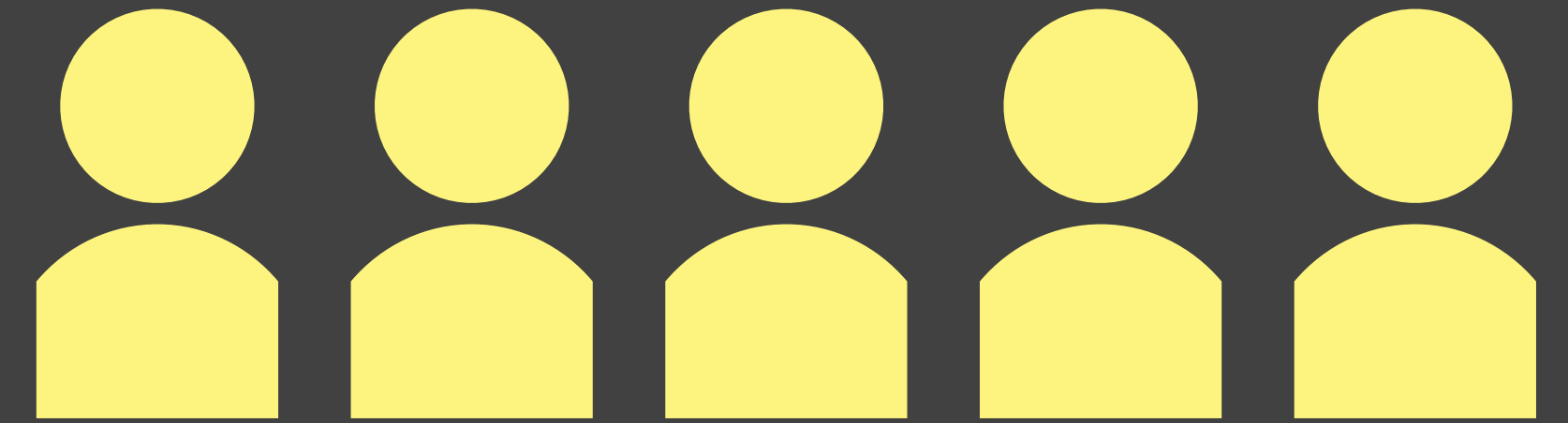
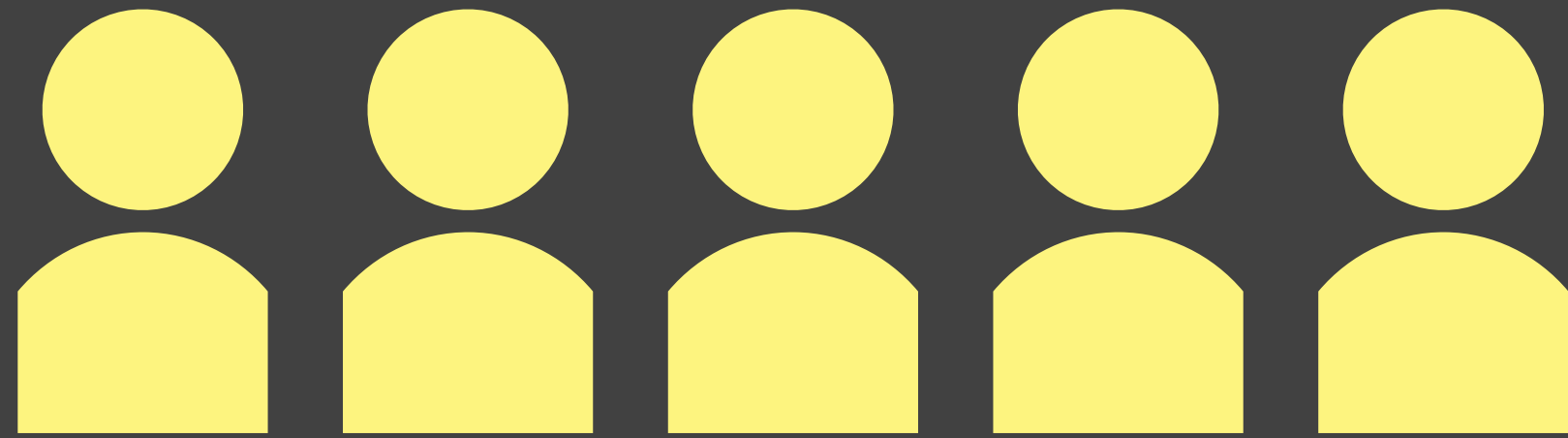
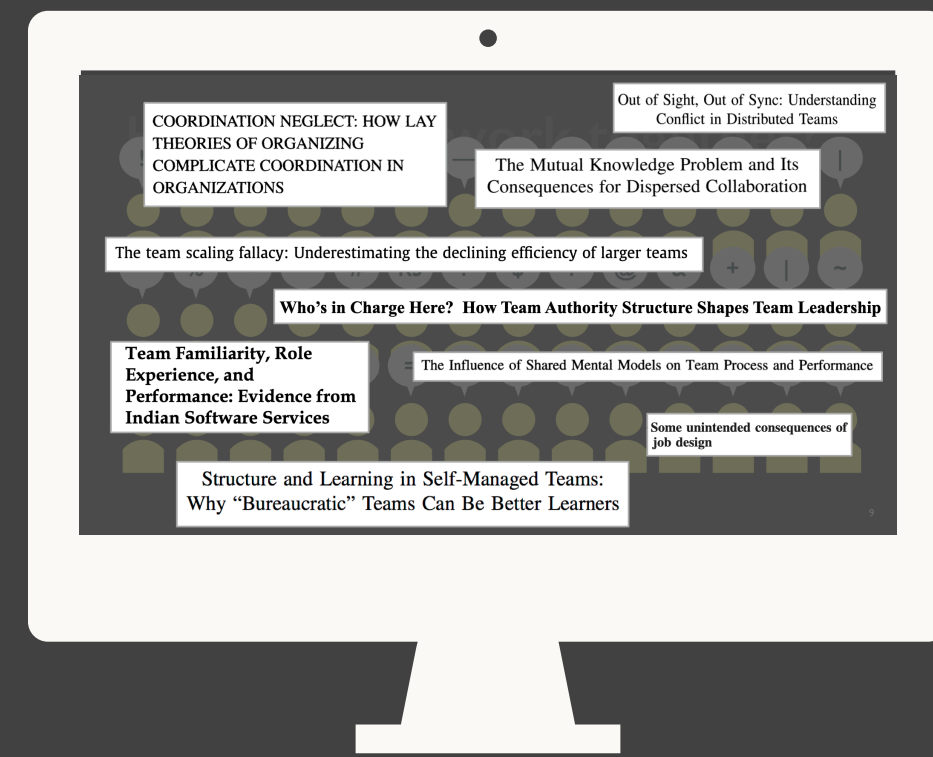
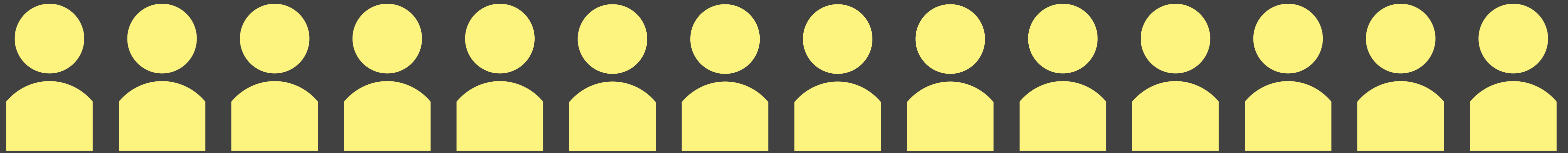
**Team Familiarity, Role
Experience, and
Performance: Evidence from
Indian Software Services**

The Influence of Shared Mental Models on Team Process and Performance

Some unintended consequences of
job design

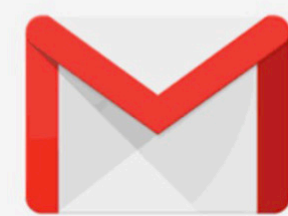
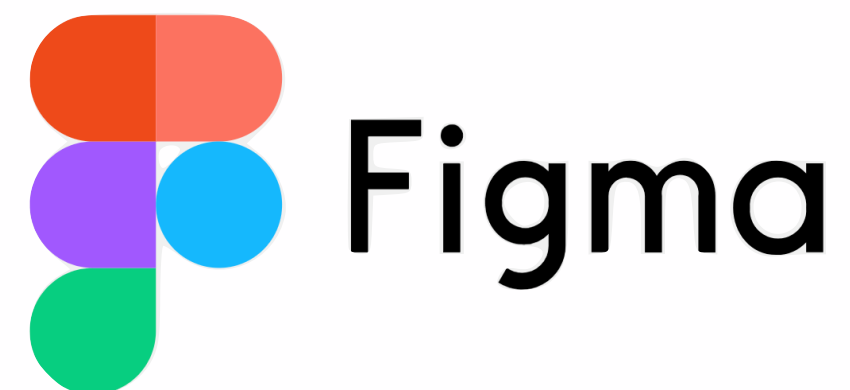
Structure and Learning in Self-Managed Teams:
Why "Bureaucratic" Teams Can Be Better Learners

How might computing augment us in working together?



What tools do we use?

Others?



Gmail



GitHub

What design patterns make them successful?
[2min]



Today

How do we design tools for effective remote collaboration?

Topics

Beyond being there

Social translucence

Grudin's paradox

Remote work

Beyond being there

Goal: being there

Our main goal is to increase fidelity: to try and make the channel have increased richness, allowing for more and more social cues. [Daft and Lengel 1986]

Let's make Zoom and FaceTime have lower delays, higher resolution, and 3D VR or AR scenes

Let's make coding collaboration tools as effective as if we were pair programming

Collaborate online as easily as you do in person



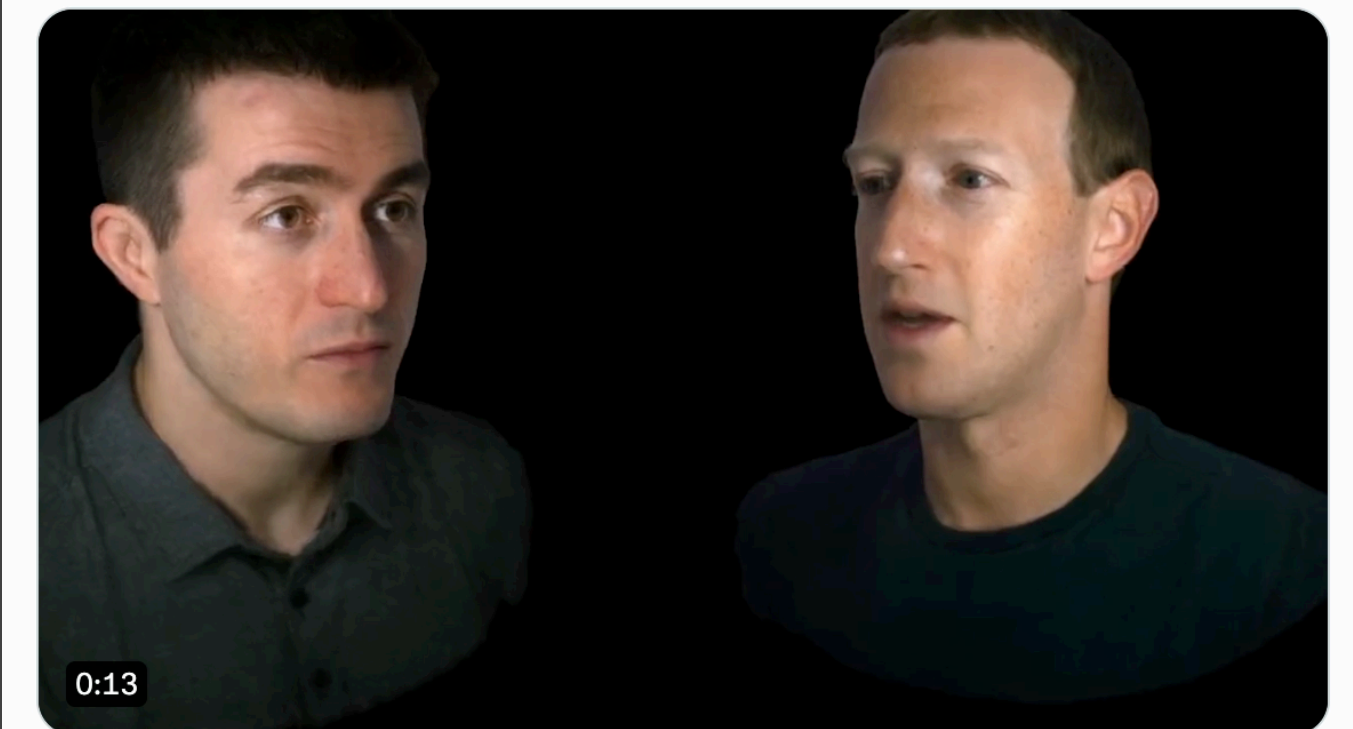
Divam Gupta
@divamgupta

Exciting news! Our team worked to make this a reality - first photorealistic podcast in VR feat. [@lexfridman](#)

This podcast was entirely hosted in VR, with realistic avatars generated through machine learning.

The immersive experience truly transports you, making it feel as if you're right there with the other person.

This is the future of communication.



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Being There

DreamWorks Animation couldn't find a videoconferencing system that made CEO Jeffrey Katzenberg happy—so it built its own.

Google The Keyword

Project Starline: Feel like you're there, together

Beyond being there

[Hollan and Stornetta 1992]

“Being there” is the wrong goal.

We will never fully recreate the face-to-face experience. There are too many subtle cues for us to fully model or recreate them, even with hypothetical future technology.

Network lag, immersion and comfort issues in VR, lack of shared physical context, ...

So, *stop trying.*

Beyond being there

[Hollan and Stornetta 1992]

Instead of tilting at windmills to design experiences that are as good as being there, design for **beyond being there: experiences that could never have been created face-to-face.**

How could remote video bring you closer in ways that face-to-face collaboration never could?

How could online coordination tools help us be more effective planners than we ever could with whiteboards and gantt charts?

Examples

Skype translating between languages in real-time and producing foreign language speech in your own voice

Tools that help teams quickly identify if they should be flat or hierarchical, encouraging or critical, and enforcing equal turn-taking [Zhou, Valentine and Bernstein 2018]

Finding just the right person to answer the hard question you are facing, immediately [McDonald and Ackerman 2000]

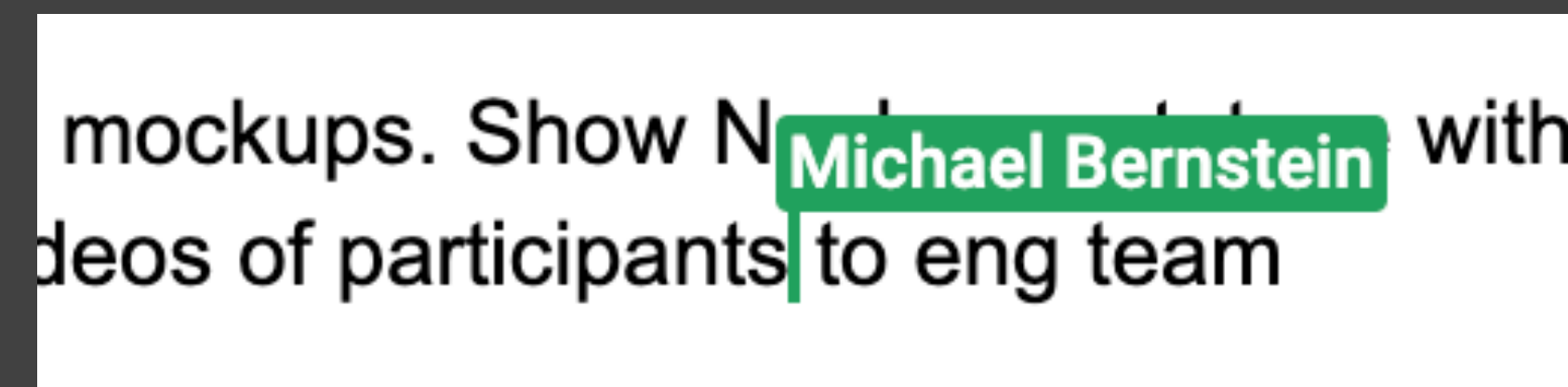
What are some collaborative superpowers you have or could have?

Social translucence

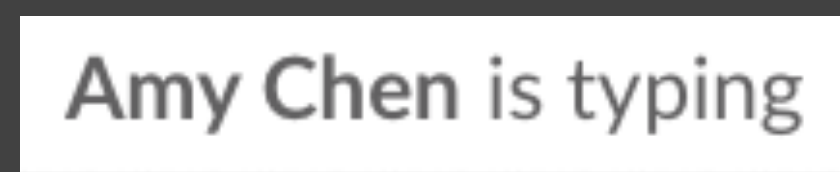
Awareness [Dourish and Bellotti 1992]

Design must allow people to understand each others' state and coordinate accordingly, to coordinate interdependencies.

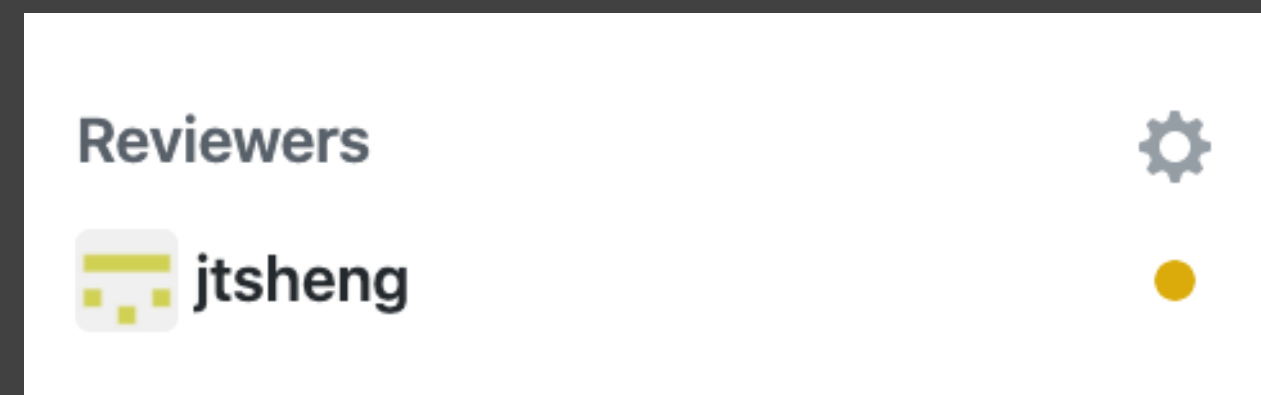
This goal is typically achieved through the design pattern of **awareness**: visualization of others' activities.



Google Docs



Messaging apps



GitHub



Slack



Significant Otter [Liu et al. 2021]

But awareness can go too far

You don't want collaborators to know everything...

Whether you're working at every moment

Draft emails you wrote when you were angry but didn't send

Dumb bugs that you introduced into your code but fixed quickly before you made a git commit

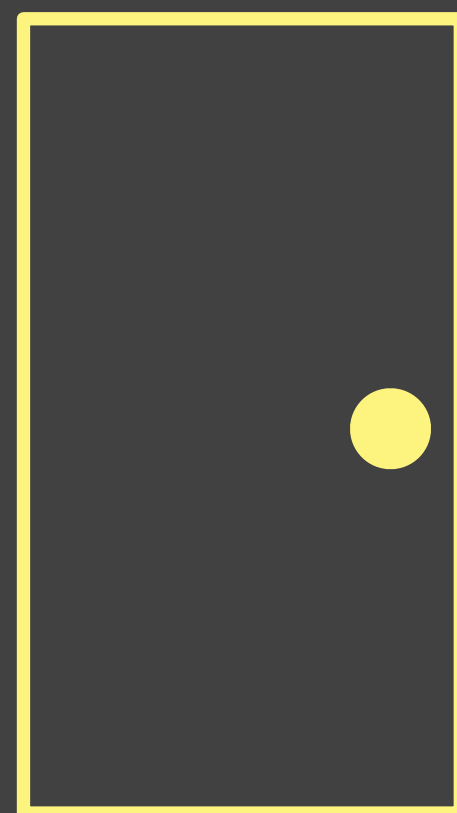
So how do we walk this line?

Social translucence

[Erickson and Kellogg 2000]

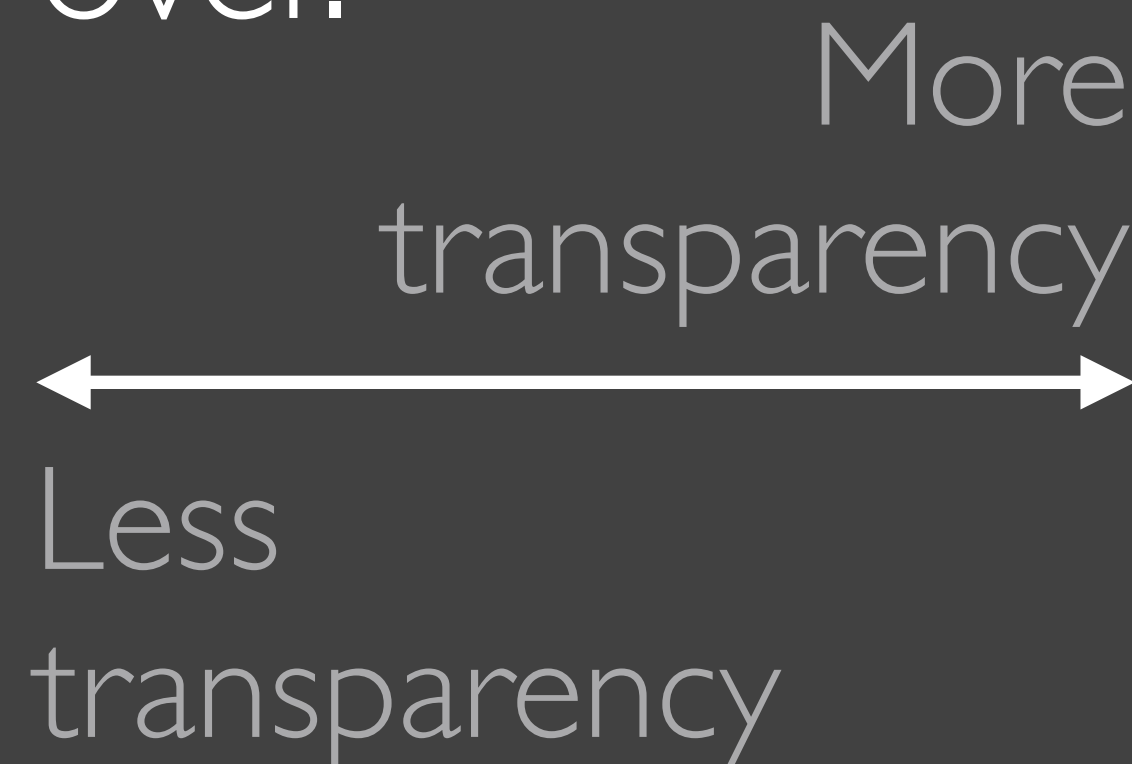
Aim for **socially translucent systems**: give enough information to let natural social cues take over.

Opaque systems:
no information



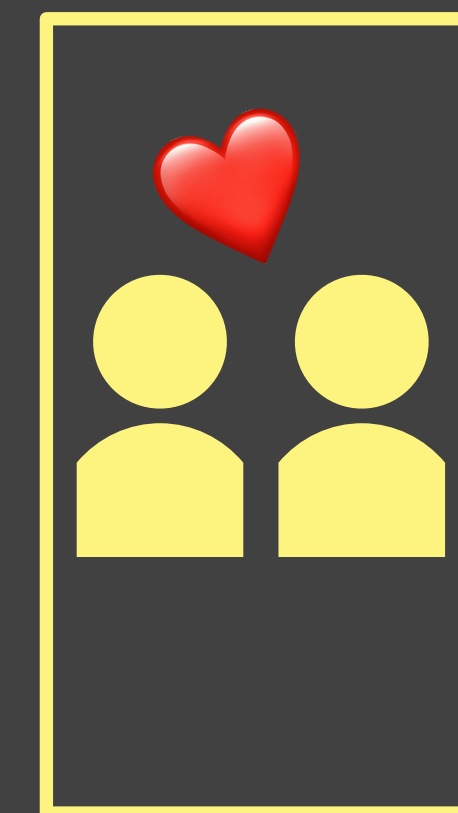
Solid door
to a trafficked
stairwell

Door-in-the-
face situation



Less
transparency

Transparent systems:
total information



Glass door
to a trafficked
stairwell

Everybody feels
awkward

Social translucence

[Erickson and Kellogg 2000]

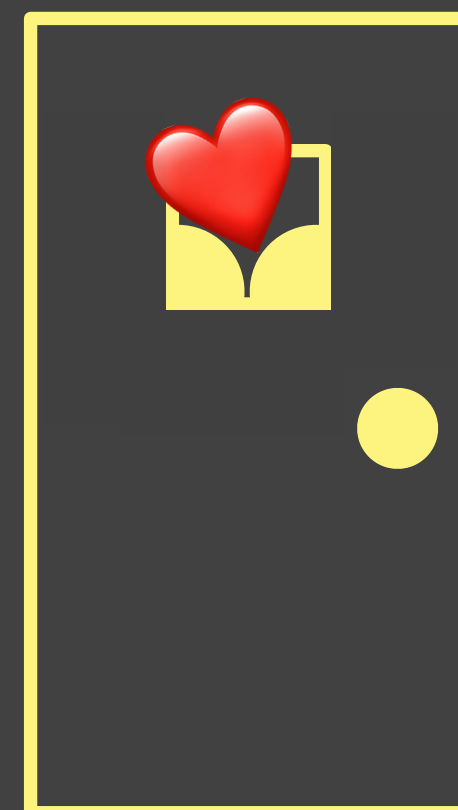
Aim for **socially translucent systems**: give enough information to let natural social cues take over.

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no information

Solid door
to a trafficked
stairwell

Door-in-the-
face situation

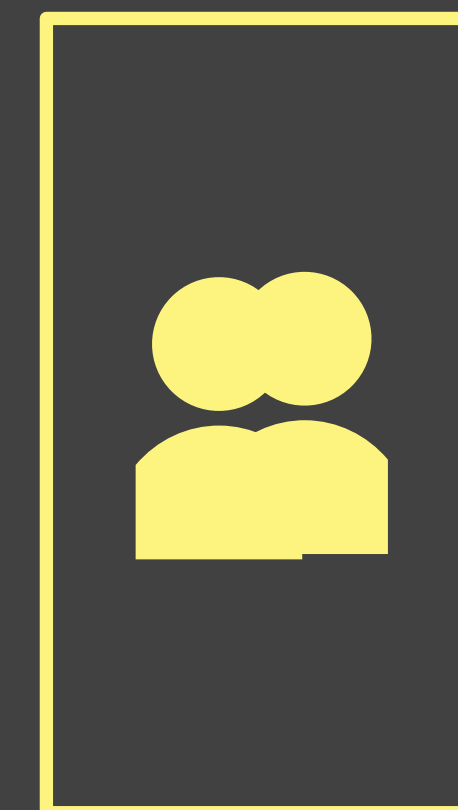
Translucent
systems



Windowed
door

Social cues
prevail

Transparent systems:
total information



Glass door
to a trafficked
stairwell

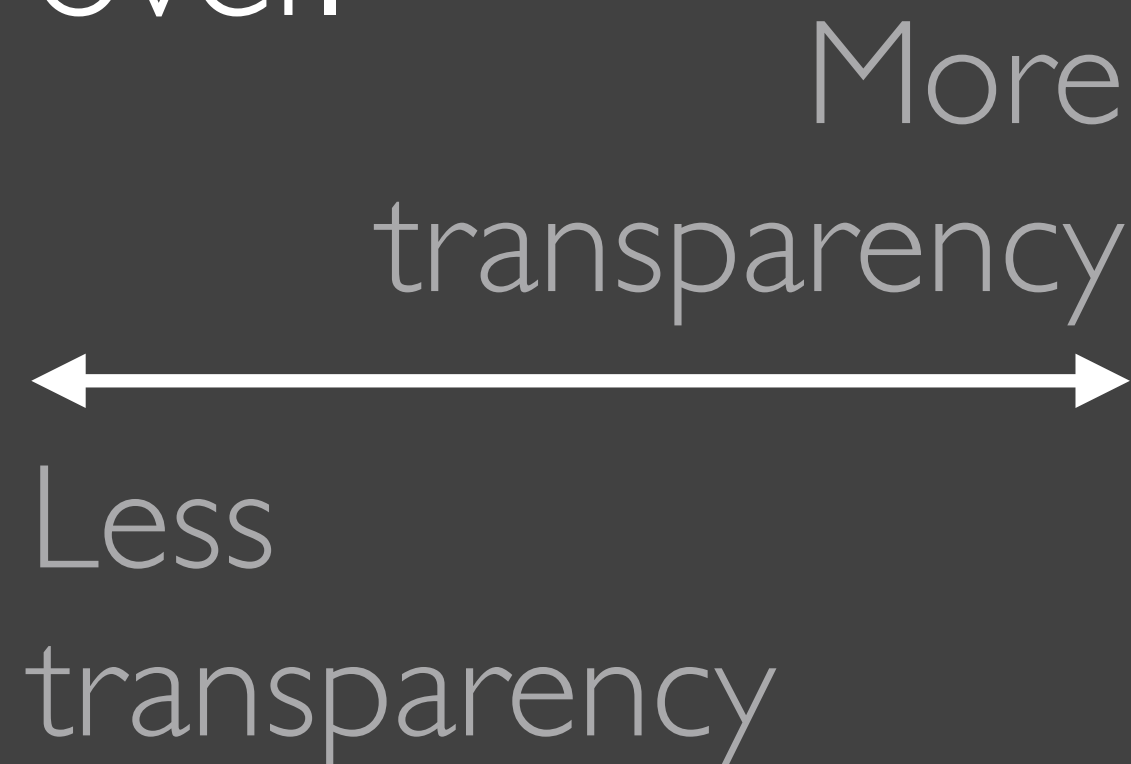
Everybody feels
awkward

Social translucence: example

[Erickson and Kellogg 2000]

Aim for **socially translucent systems**: give enough information to let natural social cues take over.

Opaque systems:
no information
Code isn't pushed yet...



Transparent systems:
total information
Michael Bernstein is editing
`importantfile.py`. He's typing
I am stupid I am stupid I am
stupid I am stupid over and
over into his code editor.

Social translucence: example

[Erickson and Kellogg 2000]

Aim for **socially translucent systems**: give enough information to let natural social cues take over.

Opaque systems:
no information

Code isn't pushed yet...

Translucent
systems

Michael is working
on `importantfile.py`

Transparent systems:
total information

Michael Bernstein is editing
`importantfile.py`. He's typing
`I am stupid I am stupid I am
stupid I am stupid` over and
over into his code editor.

Social translucence

[Erickson and Kellogg 2000]

Two requirements for social translucence:

- 1) **Awareness**: others' activity can be seen — to an extent
- 2) **Accountability**: others know that their activity can be seen

If done correctly, social translucence supports interdependent work while maintaining plausible deniability when necessary.

If there's no plausible deniability in the system, people will abandon it.

Too transparent

The screenshot displays the Google Wave web interface. On the left, there is a 'Navigation' sidebar with links for 'Inbox', 'Active', 'All', 'By Me', 'History', 'Spam', 'Settings', and 'Trash'. Below it is a 'Contacts' sidebar listing several contacts like 'Doctor He's got the cure!', 'Anna-Christina', 'Douglas drinkin' coffee', 'Dan Kettering', 'David Byttow Is typing...', and 'Seth Covitz waving @'. The main area is divided into two panes. The top pane, titled 'Inbox 1 - 11 of 15', shows a list of messages with details like sender, subject, time, and message count. The bottom pane, titled 'How about a BBQ?', shows a conversation window with a rich text editor, a list of participants, and a draft of a message: 'me: i CANT MAKE IT UNTIL LATE!'. The interface includes various icons for actions like 'Archive', 'Mute', 'Read', 'Unread', and 'Folder'.

Google Wave: Imagine if the person receiving your email could see all your drafts as you compose them, like the email thread were a Google Doc

Grudin's paradox

Why do so many collaborative software systems get abandoned?

Dead wikis and documentation at work

Calendars not reflecting actual person or room availability

“Oh, I don’t use that. Just send me a text instead.”

...even though these systems may even provide social translucence and go beyond being there.

Grudin's paradox [Grudin 1994]

The socio-technical system may be benefiting everyone...except the people who are expected to use it.

What is in the product manager's interests may not be in the ordinary users' interests. [Halverson and Ackerman 2003]

Examples:

The manager wants everybody's calendars to be up-to-date...but the programmers don't care, and just want to work on the project.

We want an API to be documented and kept up-to-date, but the people who write and actively use the software don't need the documentation.

Being on Slack is distracting for the people who need to be reached

Grudin's paradox [Grudin 1994]

When a system falls prey to Grudin's paradox, it gets abandoned or circumvented.

How to avoid this? The system needs to provide benefit to all users, not asymmetric benefits.

...And not just perfunctory benefit — enough benefit to justify the work and distraction that using the system might entail.

Hate 'em, then love 'em

Irene Greif, who founded the field — and was the first woman to earn a PhD in CS from MIT — spent much of her career in industry research labs working on collaboration tools.



She notes that with each new generation of collaboration technology, companies are extremely wary: all they can see are the risks and the lawsuits. Even with something as simple as voicemail!

Collaboration benefits are much harder to quantify and put into dollar amounts, to balance against the risk. Only later do companies see the value and buy in.

So where are we going?



Screen images simulated. User experience may vary.

Meta
Horizon
Workrooms:
VR remote
conversations

Using today's
concepts: will
this succeed?
[2min]

So where are we going?



Beam: robot
telepresence
robot

Using today's
concepts: will
this succeed?
[2min]

Michael's take

All the tools that we talked about today take the organizational structures as given: the team, the teams, the hierarchy, and so on.

e.g., Skype already assumes the members of the team are set

My opinion: the important technologies from here on out will help aid the authoring and evolution of these structures more directly.

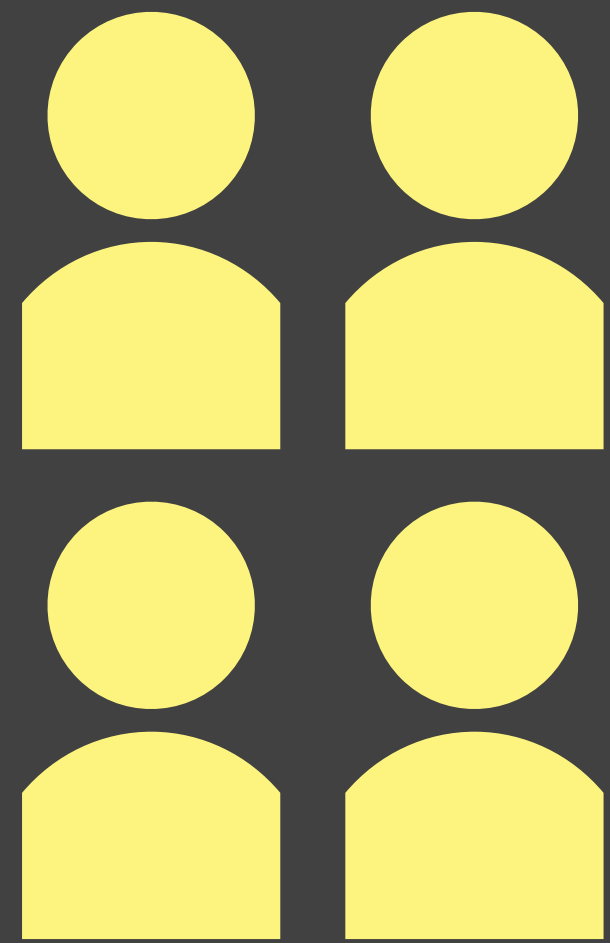
Who can be working with who? And how?

What's the best way for this team to be working together?

Can we recover if we get into conflict and fracture?

Remote work

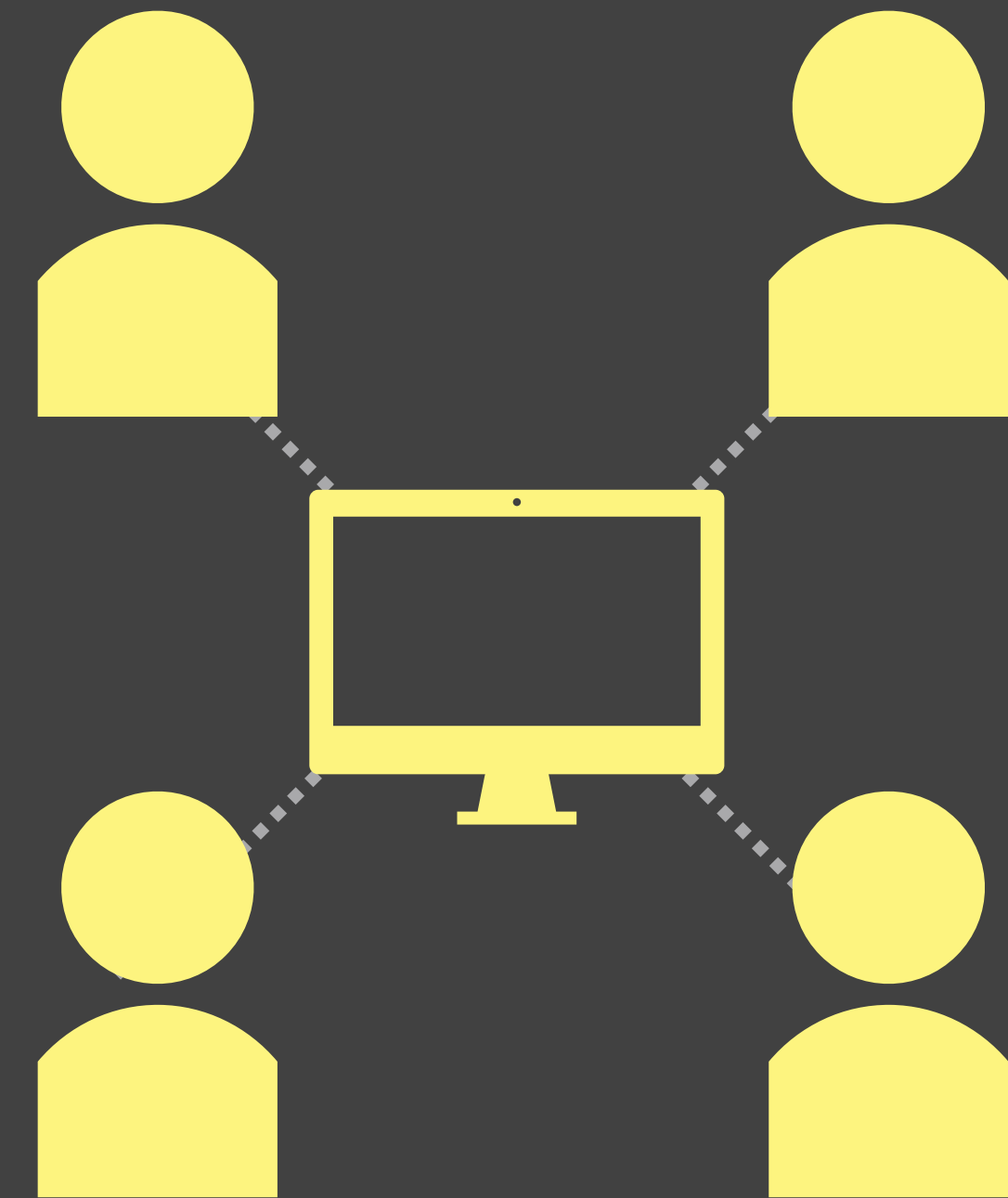
Back to the remote team...



2:1 more effective
[Olson and Olson
2000; Espinosa
2011; Björn 2014;
Hu et al. 2022]

Colocated team
has: a room

Why? Under what
conditions?



Distributed team
has: Zoom, Slack, Trello,
Dropbox, GitHub, Asana,
Google Docs, Jira

Remote & hybrid work

Remote work **does not have a negative effect on individual execution outcomes**

Productivity outcomes go up [Bloom et al. 2015], possibly due to 40% of saved commute time being redirected to work [Aksoy et al. 2023]

Remote work **has a negative effect on creative and social outcomes**

Firm-wide remote work makes collaboration networks more static and siloed [Yang et al. 2021], makes it less likely that teams find solutions to hidden profile tasks [Javalagi et al. 2023], reduces the creativity of ideas generated [Brucks and Levav 2022], and is associated with fewer breakthrough ideas [Lin, Frey, and Wu 2023]

Yes, even today.

Even as improved remote work tools have made collaboration **smoother within teams**, they paradoxically make coordination **worse across teams** [Hu et al. 2022]

Example: what if Stanford forced everyone to use the same Slack/GroupMe/iMessage platform for your projects?

A “Distance Matters” Paradox: Facilitating Intra-Team Collaboration Can Harm Inter-Team Collaboration

XINLAN EMILY HU, The Wharton School, University of Pennsylvania, U.S.A.
REBECCA HINDS, Stanford University, U.S.A.
MELISSA A. VALENTINE, Stanford University, U.S.A.
MICHAEL S. BERNSTEIN, Stanford University, U.S.A.

By identifying the socio-technical conditions required for teams to work effectively remotely, the Distance Matters framework has been influential in CSCW since its introduction in 2000. Advances in collaboration technology and practices have since brought teams increasingly closer to achieving these conditions. This paper presents a ten-month ethnography in a remote organization, where we observed that despite exhibiting excellent remote collaboration, teams paradoxically struggled to collaborate across team boundaries. We extend the Distance Matters framework to account for inter-team collaboration, arguing that challenges analogous to those in the original intra-team framework — common ground, collaboration readiness, collaboration technology readiness, and coupling of work — persist but are actualized differently at the inter-team scale. Finally, we identify a fundamental tension between the intra- and inter-team layers: the collaboration that facilitate inter-team collaboration (e.g., strong centralized IT organizations) can harm practices at the intra-team layer. The addition of the inter-team layer, and conversely the technology and practices that prompt collaboration challenges in the inter-team layer, can harm practices at the intra-team layer. The addition of the inter-team layer to the Distance Matters framework opens new opportunities for CSCW, where balancing the tension between team and organizational collaboration needs will be critical technological, operational, and organizational challenge for remote work in the coming decades.

CCS Concepts: • **Human-centered computing** → **Computer supported cooperative work**.
Additional Key Words and Phrases: distance, teams, workplace, distributed work, remote work, future of work, ethnography, collaboration technology

ACM Reference Format:

Xinlan Emily Hu, Rebecca Hinds, Melissa A. Valentine, and Michael S. Bernstein. 2022. A “Distance Matters” Paradox: Facilitating Intra-Team Collaboration Can Harm Inter-Team Collaboration. *Proc. ACM Hum.-Cent. Comput. Syst.* Article 48 (April 2022), 36 pages. <https://doi.org/10.1145/3512895>

enda [9, 79, 80] in Co

Summary

Group and team collaboration requires interdependence, which leads to a distinct set of design constraints and affordances.

Aiming just to replicate the experience of being there is quixotic; better to aim for beyond being there by looking for affordances unique to the digital realm.

Social translucence is a general principle for designing these systems with awareness and accountability.

If incentives are misaligned, these systems will get abandoned.

References

Aksoy, Cevat Giray, et al. Time savings when working from home. No. w30866. National Bureau of Economic Research, 2023.

Bjørn, Pernille, et al. "Does distance still matter? Revisiting the CSCW fundamentals on distributed collaboration." *ACM Transactions on Computer-Human Interaction (TOCHI)* 21.5 (2014): 1-26.

Bloom, Nicholas, et al. "Does working from home work? Evidence from a Chinese experiment." *The Quarterly journal of economics* 130.1 (2015): 165-218.

Daft, Richard L., and Robert H. Lengel. "Organizational information requirements, media richness and structural design." *Management science* 32.5 (1986): 554-571.

Dourish, Paul, and Victoria Bellotti. "Awareness and coordination in shared workspaces." *Proceedings of the 1992 ACM conference on Computer-supported cooperative work*. 1992.

Erickson, Thomas, and Wendy A. Kellogg. "Social translucence: an approach to designing systems that support social processes." *ACM transactions on computer-human interaction (TOCHI)* 7.1 (2000): 59-83.

Espinosa, J. Alberto, Jonathon N. Cummings, and Cynthia Pickering. "Time separation, coordination, and performance in technical teams." *IEEE Transactions on Engineering Management* 59.1 (2011): 91-103.

Grudin, Jonathan. "Groupware and social dynamics: Eight challenges for developers." *Communications of the ACM* 37.1 (1994): 92-105.

References

Halverson, Christine A., and Mark S. Ackerman. "Yeah, the Rush ain't here yet-Take a break: Creation and use of an artifact as organizational memory." 36th Annual Hawaii International Conference on System Sciences, 2003. Proceedings of the. IEEE, 2003.

Hollan, Jim, and Scott Stornetta. "Beyond being there." Proceedings of the SIGCHI conference on Human factors in computing systems. 1992.

Hu, Xinlan Emily, et al. "A "Distance Matters" Paradox: Facilitating Intra-Team Collaboration Can Harm Inter-Team Collaboration." Proceedings of the ACM on Human-Computer Interaction 6.CSCWI (2022): 1-36.

Javalagi, Anoop A., Alexandra M. Harris-Watson, and Leslie A. DeChurch. "Zooming in and Zoning out: Remote Deliberation Impairs Team Decision Quality." Group & Organization Management (2023): 10596011231169590.

Lin, Yiling, Carl Benedikt Frey, and Lingfei Wu. "Remote collaboration fuses fewer breakthrough ideas." Nature 623.7989 (2023): 987-991.

Liu, Fannie, et al. "Significant otter: Understanding the role of biosignals in communication." Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems. 2021.

McDonald, David W., and Mark S. Ackerman. "Expertise recommender: a flexible recommendation system and architecture." Proceedings of the 2000 ACM conference on Computer supported cooperative work. 2000.

Olson, Gary M., and Judith S. Olson. "Distance matters." Human-computer interaction 15.2-3 (2000): 139-178.

References

Yang, Longqi, et al. "The effects of remote work on collaboration among information workers." *Nature human behaviour* 6.1 (2022): 43-54.

Zhou, Sharon, Melissa Valentine, and Michael S. Bernstein. "In search of the dream team: Temporally constrained multi-armed bandits for identifying effective team structures." *Proceedings of the 2018 CHI conference on human factors in computing systems*. 2018.

Social Computing

CS 278 | Stanford University | Michael Bernstein

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