

# Designing Technologies for Hybrid Collaboration



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# Summary & Learning goals

## Summary:

The students are introduced to relevant factors for recognizing, analysing and designing technology to support hybrid collaborative interaction. This includes understanding how hybridity matters to the tools and processes of collaboration and unpack how hybridity matters when it confers an asymmetry on the coordination that occurs within the interrelated concepts of collaboration.

## Learning goals:

- recognize hybrid collaboration aspects of collaborative technologies
- describe relevant hybrid collaboration aspects of collaborative technologies in oral and visual form.
- analyse and integrate hybrid collaboration aspects in the design of collaborative technologies.

# Recommended readings

- Thomas Neumayr, Banu Saatçi, Sean Rintel, Clemens N. Klokrose & Mirjam Augstein (2021).  
What was Hybrid? A Systematic Review of Hybrid Collaboration and Meetings Research.  
*Manuscript in preparation for submission to the Journal of Computer Supported Cooperative Work (JCSCW)*

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# Definition: Collaboration

## Examples:

- The “highest, synergistic form of working together.”
  - Denning & Yaholkovsky, 2008
- “Collaboration. This is that goes beyond their own individual expertise and vision to complete a task or project. In contrast to a process involving various individuals who may see different aspect of a problem. They engage in a process cooperation, collaboration involves creating a solution or a product that is more than the sum of each participant’s contribution.”
  - Shah. 2010.
- “co-ordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem”
  - Roschelle and Teasley, 1995, p. 70)

There is not one definition – there are many – and terms are used interchangeably

# Definition: Hybrid

## Examples:

- “We define hybrid work as situations where at least three actors are located at fewer geographical sites than the number of actors, and all actors are mutually dependent in their work.”
  - Duckert et al, forthcoming.
- hybrid collaboration refers to “collaborative practices that involve simultaneous co-located and remote collaboration with phases of both synchronous and asynchronous work that spans multiple groupware applications and devices”
  - Neumayr et al, 2018
- hybrid meetings refers to video- or audio-based communication sessions among co-located and remote participants.
  - Saatçi et al, 2019.
- hybrid collaboration and meetings (HCM),
  - Neumayr, et al, 2021.

There is not one definition – there are many – and terms are used interchangeably

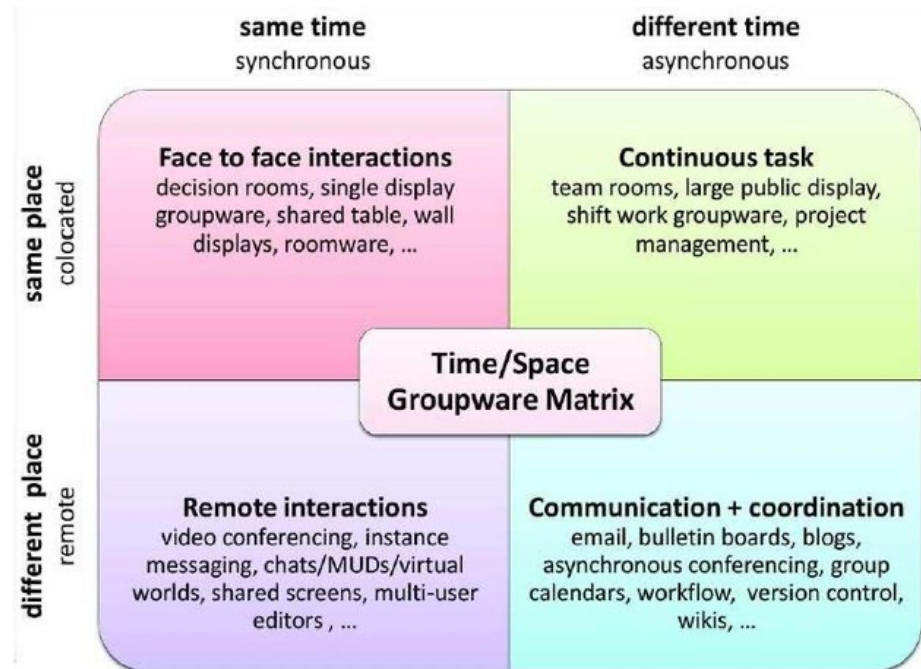
# Definition: Hybrid

- There is not one definition – there are many – and terms are used interchangeably
  - See examples in table
- The particular term ‘hybrid’ was used only rarely in the years up until 2019 (before COVID-19 pandemic) to characterize research described now under this notion.

| Adjectives            | Nouns                   |
|-----------------------|-------------------------|
| hybrid                | collaboration(s)        |
| partially distributed | event(s)                |
| virtual               | meeting(s)              |
| video-based           | team(s)                 |
| video-mediated        | communication(s)        |
| computer-mediated     | collaborative system(s) |

# Definition: Time/space matrix

- Time is a continuum instead of a dichotomy
  - Lee & Paine. 2015.
- ‘Synchronicity’ as well as ‘Asynchronicity’ as distinct continua – from seconds to hours and days between user interactions
  - Neumayr et al, 2021
- Place
  - different place: remote in relation to each other, meaning that only mediated communication is possible between locations
  - Same place: direct in-person communication is possible within the same place
- Tool- & device can become highly complex as personal and shared ecosystems of devices increase in size and complexity





# Definition: Hybrid Collaboration

## **The time-space matrix' dimensions:**

- Hybrid collaboration switches back and forth between all four quadrants of the time-space matrix.
- There are constant transitions between co-located and remote as well as synchronous and asynchronous collaboration.

## **Tool and device usage:**

- Users typically do not rely on a single groupware application or hardware device but simultaneously use different tools and devices during collaboration.

## **Teams split into subgroups:**

- The team size  $S$  is greater than just two collaborators and multiple coupling styles can coexist simultaneously within a single team, effectively dividing the whole team in multiple temporary subgroups with each one having a size of  $1 \leq S_{sub} \leq S$  and an individual coupling style;

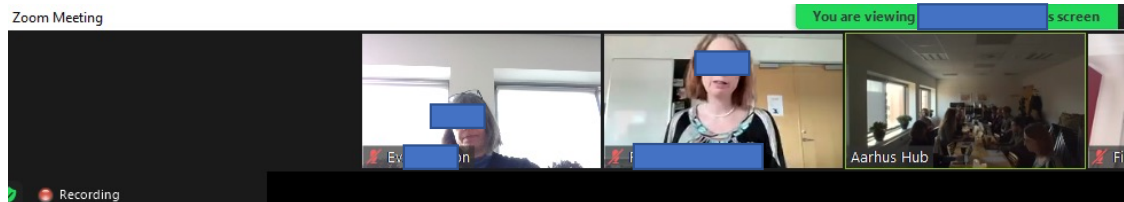
Neumayr et al, 2018

# Definition: Hybrid collaboration vs Hybrid meeting

- **Hybrid collaboration** can include co-authoring, co-programming, co-design, sense-making etc in a hybrid team context
- Hybrid collaboration can last for days, weeks, months or even years
- **Hybrid meetings** typically have activities more similar to traditional meetings, such as information seeking, generation/discussion of ideas, delegation of work, or presentations, etc.
- Hybrid meeting is mostly limited to one occurrence of people coming and working together for usually a few hours at maximum.

Common for both, teams comprised of both co-located local and remote participants

# Examples of Hybrid Collaboration Technologies



Zoom hybrid meeting with individual and co-located participants



Pokemon Go – hybrid collaboration in raids.

# Focal points: Things to consider in designing hybrid technologies

Designing hybrid technologies come with its own unique design challenges.

Examples:

- Enable both fully-remote and hybrid informal collegiality.
- Create coherent experiences over dispersed ecology of devices and software.
- Securing the inclusion of remote participants due to the primary room dominance.

In the next slides examples of focal points are introduced in order to address this.

# Focal points: Things to consider in designing hybrid technologies

- **Hybrid Interaction Mechanics:**
  - Aspects that make interacting in hybrid settings special.
- **Hybrid Meetings:**
  - Hybrid meetings refer to video- or audio-based meetings involving both in-room and remote attendees [165].
- **Hybrid Ecosystems:**
  - hybrid ecosystems are often interwoven with a mix of devices and software both for a single individual (their home and office set-up) and for teams working together.
- **Hybrid teams:**
  - Hybrid teams refer to the distributed work groups mostly living in different time zones.
- **Hybrid patterns of social interaction:**
  - Refer to the social interactions beyond the work-related tasks among workers at a hybrid work setting (e.g coffee machine talk).
- **Hybrid events:**
  - hybrid events may involve hybrid meetings, but are larger, spread out over time, and often cross-organizational (e.g. conferences).
- **Telepresence and Human-Robot Interaction:**
  - Refers to the technologies enabling the (sense of) presence for a remote person, and when enabled through a robot, the remote person is also more active and capable of creating physical presence in a room.

Neumayr et al, 2021

# Focal points: Hybrid Interaction Mechanics

## **Hybrid Interaction Mechanics:**

- Deals with the aspects that make interacting in hybrid settings special.
- These aspects often arise from hybrid collaboration situations because of their mix of synchronous and asynchronous work, because they span multiple groupware applications and devices, and because some people are in the same place and some remote (Neumayr, 2018).
- The spontaneous breakout of subgroups in larger meetings is still not supported well enough in remote and even more in hybrid settings, when subgroups would like to form with several co-located and remote persons

# Focal points: Hybrid Meetings

## Hybrid Meetings:

- Refer to video- or audio-based meetings involving both in-room and remote attendees.
- Differ from fully virtual meetings in that in hybrid meetings there is at least one room where there are co-located participants and remote participants join the meeting via video conferencing.
- Research on hybrid meetings in HCI and CSCW concentrate around four different spheres: workplace, domestic/personal sphere, generational differences and gaze and eye movements.
- The diversity of the hybrid meetings across different spheres underline the fact that “one size fits all” solutions do not apply for hybrid meeting technologies.
- Age, cultural differences, expertise, social structure and group dynamics are some of the many factors, which are found to affect the social presence and inclusion of remote participants.
- Making remote participants be part of the interaction and collaboration among the co-located group and feel included throughout the conversation should be the main objectives of hybrid meetings as well as of the technologies supporting them.

# Focal points: Hybrid Ecosystems

## **Hybrid Ecosystems:**

- Often interwoven with a mix of devices and software both for a single individual and for teams working together.
- Focus on improving different aspects of hybrid communication across diverse domains, but particularly analyze their effects on the group harmony, physical cues and inclusion of remote participants, and bring into light the role of communication infrastructure in shaping the hybrid meeting and collaboration experiences.
- Important questions are how to create coherent experiences over this dispersed ecology of devices and software and how technological support can augment and help overcome typical obstacles (e.g. a lack of awareness, or strongly fluctuating modes of presence).



# Focal points: Hybrid Teams

## **Hybrid teams:**

- Hybrid teams consist of co-located and remote team members collaborating in any domain.
- Hybrid teams refer to the distributed work groups mostly living in different time zones.
- Hybrid teams have different working dynamics compared to fully collocated or virtual teams, since the differences in time, space and culture as well as the asymmetries in interaction due to the video-mediated communication may create social barriers among co-located and remote participants.
- While hybrid teams as a term is used more after the COVID-19 entered our lives, research on distributed, partially distributed, remote or virtual teams have been conducted in HCI and CSCW as well as in other fields to a considerable extent.
- there is a need for differentiating research on hybrid teams from studies on hybrid communication in general because hybrid teams research focuses on more long-term effects of hybrid communication among people, who are constantly collaborating in the same mode.

# Focal points: Hybrid patterns of social interaction

## **Hybrid patterns of social interaction:**

- Interactions beyond the work-related tasks among people at a hybrid work setting (e.g coffee machine talk).
- Focus on different aspects of co-located and remote participation in hybrid settings and how the social interaction between different modes of participation can be improved especially in long-term communication.
- Opportunistic (spontaneous and serendipitous) and informal interactions throughout the work-day play a major role in coordination, productivity, and the well-being of groups.
- Social and group interactions in hybrid collaboration are researched to better understand group cohesion and trust among hybrid team members.
- Focuses on different aspects of co-located and remote participation in hybrid meetings and how the social interaction between different modes of participation can be improved especially in long-term communication.
- Show the opportunities and drawbacks of different modes of participation as well as the mental models of the participants in forming team unity and group identity.
- Enabling opportunistic and informal encounters will be essential to enabling the success of hybrid work.

# Focal points: Hybrid events

## **Hybrid events:**

- May involve hybrid meetings, but are larger, spread out over time, and often cross-organizational (e.g. conferences).
- With the rising interest in hybrid events today, new forms of hybridity will emerge and interesting studies in different areas of research will follow.

# Focal points: Hybrid collaboration

## **Hybrid collaboration:**

- Hybrid collaboration research in the educational domain studies the factors affecting the formation of shared group identity and trust in the real world, whereas hybrid collaboration research in the workspace and in games mainly consists of controlled studies based on prototypes of videoconferencing and tabletop technologies.
- According to some of these papers, hybrid collaboration can be preferred over face-to-face collaboration not necessarily for the purpose of reaching high turnout, but in building trust.

# Focal points: Telepresence and Human-Robot Interaction

## **Telepresence and Human-Robot Interaction:**

- Refers to the technologies enabling the (sense of) presence for a remote person, and when enabled through a robot, the remote person is also more active and capable of creating physical presence in a room.
- With the rise of mixed/virtual/augmented reality technologies and the COVID-19 reality, telepresence technologies and robots will be researched and developed more than ever.
- The scalability of such technology will remain an issue.

Discuss in Class:

In hybrid collaboration, is this statement valid?

“The most profound technologies are those that disappear”

Mark Weiser (1991, p. 94), *The Computer for the 21st Century*.

# Summary

- There is no consensus of terminology in hybrid collaboration.
- Hybrid collaboration has not received significant clear attention in HCI but is likely to change post-COVID-19.
- Of the research that does exist, much includes a hybrid setting without clearly exploring it, and most relies on controlled studies or lab experiments.
- More real-world studies are needed to better understand the particular dynamics of these settings.
- Experiences during the covid-19 pandemic of hybrid work have shown many of the already known problems and solutions of both technical (e.g., a lack of awareness (mechanisms) (Xu, 2017)) and social nature (e.g., in-group/out-group effects (Bos, 2004) or collocation blindness (Bos, 2006)) that go along with this.
- Finding the right use case domains and settings (e.g., group sizes, synchronicity & asynchronicity, and tool & device usage), and to identify a design space from there, is key for future research.

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