

A Peak Into the Future Collaboration: Human-AI Collaboration

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May 2, 2018



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Today I'm going to cover....

- Introduction to Human-Computer Interaction (HCI) and Computer Support Cooperative Work (CSCW)
- Face Value? Exploring the Effects of Embodiment for a Group Facilitation Agent (CHI 2018)

HCI and CSCW Introduction

- explore the
 - social
 - organizational
 - technical issues
- involved in
 - designing
 - developing
 - deploying
 - Evaluating
- computational and communication tools
- to support the activities of groups and organizations



CSCW draws on

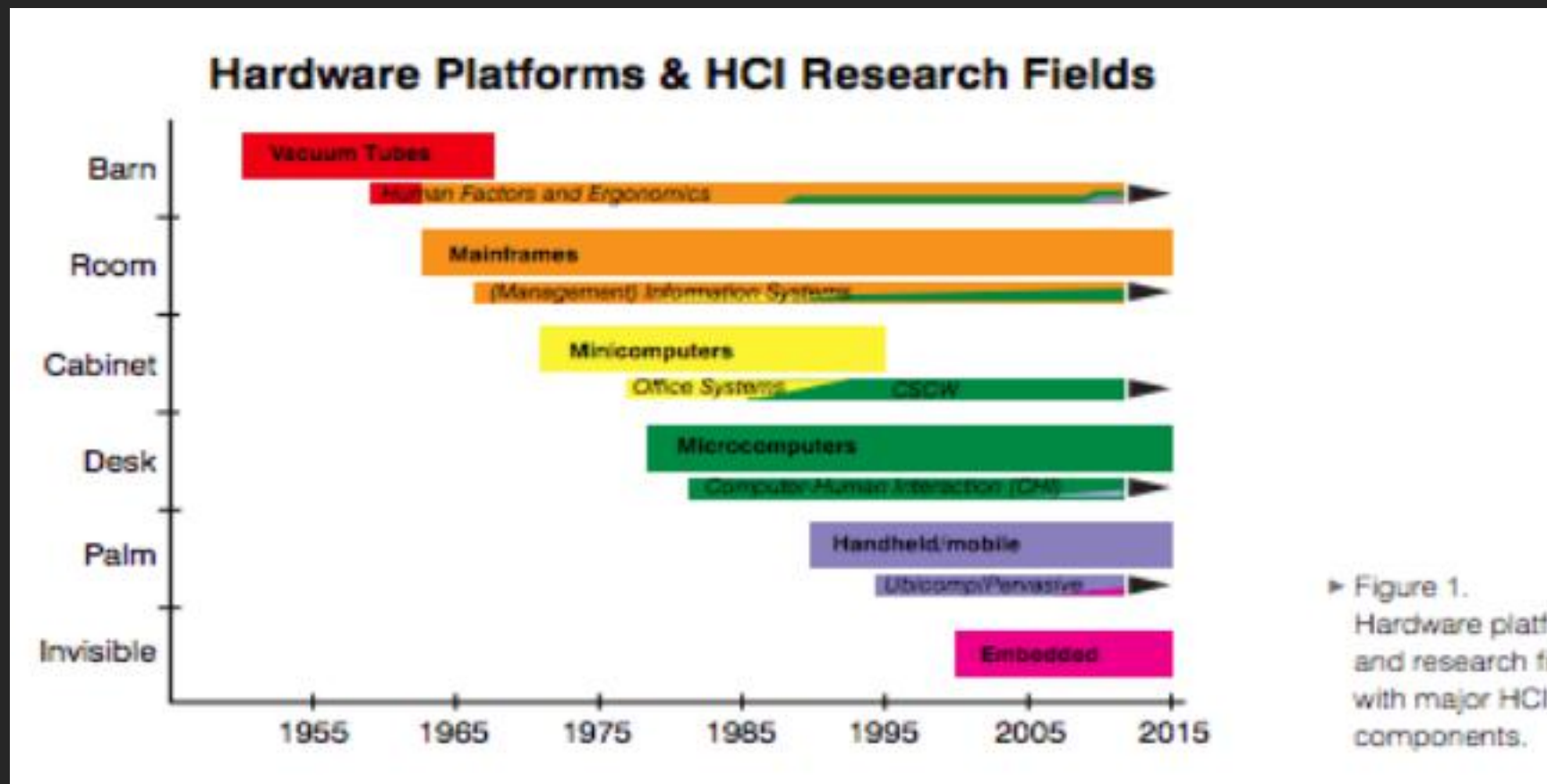
- Behavioral science
 - social psychology
 - organizational science
 - anthropology
 - sociology
- Computer science
 - distributed computing
 - networking
 - user interface, visualization
 - mobile, wireless
- Telecommunications
 - Telephony
 - Video
 - Mobile devices



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HCI and Computer Science

Grudin, 2012, Interactions



► Figure 1. Hardware platform and research field with major HCI components.

HCI early work

- Doug Engelbart, 1968 IFIPS Fall Joint Computer Conference in San Francisco



HCI early work



Cooperative Work situations

		Same	Different
PLACE	Same	Physical Proximity	Walk-in lab, physical BB, phy. library
	Different	Telephone, shared workspace tools	Electronic mail, conferencing tools

Example Areas

- Communication Tools
 - – E-mail
 - – Conferencing – voice, video, text
 - – Blogs
 - – Disaster Response
- Coordination Support
 - – Meeting support
 - – Workflow
 - – Group calendars
 - – Awareness
- Information repositories
 - – Repositories of shared knowledge
 - – Wikis
 - – Capture & replay
- Social computing
 - – Social filtering, recommender systems
 - – Trust of people via the technology
- Integrated systems
 - – Media spaces
 - – Collaborative virtual environments
 - – Collaboratories



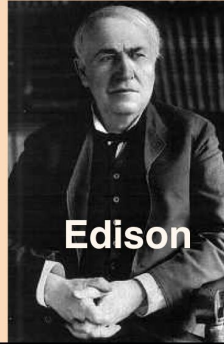
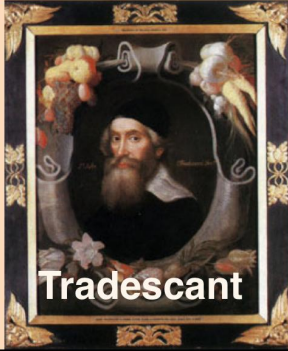
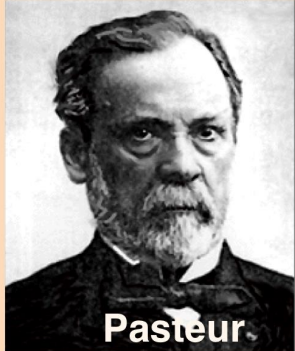
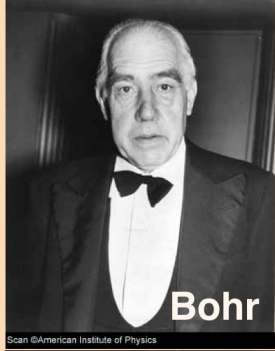
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CSCW Conferences and Journal

- CSCW conference – sponsored by SIGCHI
 - biannual ECSCW conference (odd years)
 - GROUP conference (every other year)
 - CHI conference
-
- CSCW
 - Human-Computer Interaction (HCI)
 - ACM Transactions on Computer Human Interaction (TOCHI)

Pasteur's Quadrant R&D

Focus on Knowledge Creation



Focus on Knowledge Application

HCI Top 10 Ranking (2012 Faculty Hiring)

- Carnegie Mellon
- Georgia Tech
- **UC Irvine**
- U of North Carolina
- U of Washington
- U of Southern California
- U of Michigan
- UC Berkeley
- MIT
- Stanford



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CSCW Top 10 Ranking (2012 Faculty Hiring)

- Carnegie Mellon
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- MIT
- Georgia Tech
- U of Michigan
- Stanford
- UC Berkeley
- Penn State
- Cornell
- U of Washington



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CSCW - Groups

How
productive are
people when
they work on
simple group
tasks?



CSCW - Groups

- The Ringelmann Effect
 - – People become less productive when they work with others
 - – Loss increases as group become larger



CSCW - Groups

- [Kiesler & Cummings, 2002](#)
- [Teasley et al, 2002](#)
- [Beenen et al, 2004](#)

CSCW - Organizations

- Individual
- Group
- Organization
- Industry/Sector
- Society



CSCW - Organizations

- Size (people)
- Size (money, “slack”)
- Geography, space
- Age, Demography
- Goals or strategies
- Structure
- Culture
- Management practices
- Information technology

CSCW - Organizations

- “slack”
- emergence
- routines (tacit knowledge)
- formal vs. informal structure
- parallel, interacting system
- many levels of evaluation
- learning and memory

CSCW - Organizations

	Production	Group Well-Being	Member Support
Inception	Production demand and opportunity	Interaction demand and opportunity	Inclusion demand and opportunity
Problem-Solving	Technical problem-solving	Role network definition	Position and status attainments
Conflict Resolution	Policy resolution	Power and payoff distribution	Contribution and payoff distribution
Execution	Performance	Interaction	Participation

Figure 1. Group functions (after McGrath [6]).

Grudin (2004) on ROI

CSCW - Organizations

- Key issues
 - – Processes – Ackerman & Halverson
 - – Incentives – Orlikowski
 - – Outcomes – Grudin
 - – Organization – hierarchical, matrix, flat, ...



CSCW - Organizations

- [Orlikowski, 1992](#)
- [Ackerman & Halverson, 1998](#)
- [Grudin, 2004](#)

CSCW - Meetings

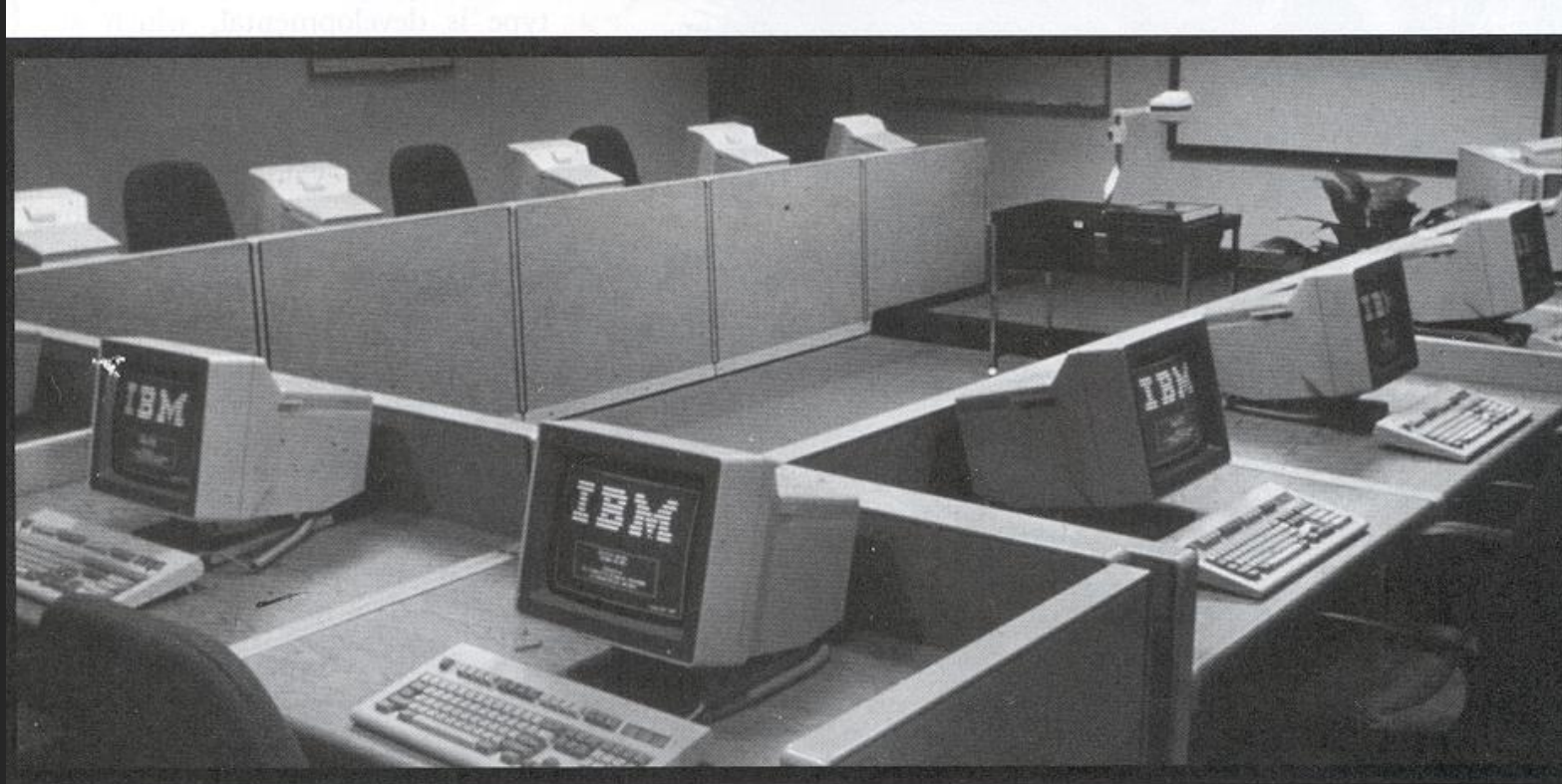


PHOTO 2. The Electronic Meeting Room at IBM Decision Support Center, Boulder, Colorado

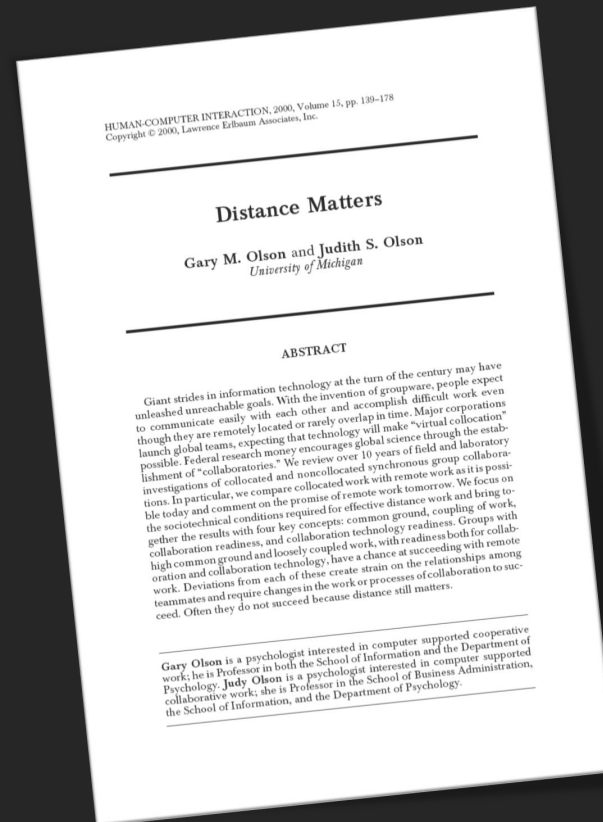
CSCW - Meetings



CSCW - Meetings

- Factors in the Physical Environment
 - Distances among participants (proxemics)
 - Visual contact possible
 - Placement of the facilitator
 - Lighting, walls, noise, etc.
 - Elevation, diff tiers – if a big group
 - Orientation of people & displays
 - Issue of the power position – relation to display,etc.
 - Door location
 - Visibility of each others' work, privacy
 - Details of décor to create social effects
 - Assigning roles to locations takes some care
 - Subtle interactions of technology, place, with power

CSCW – Distance Matters



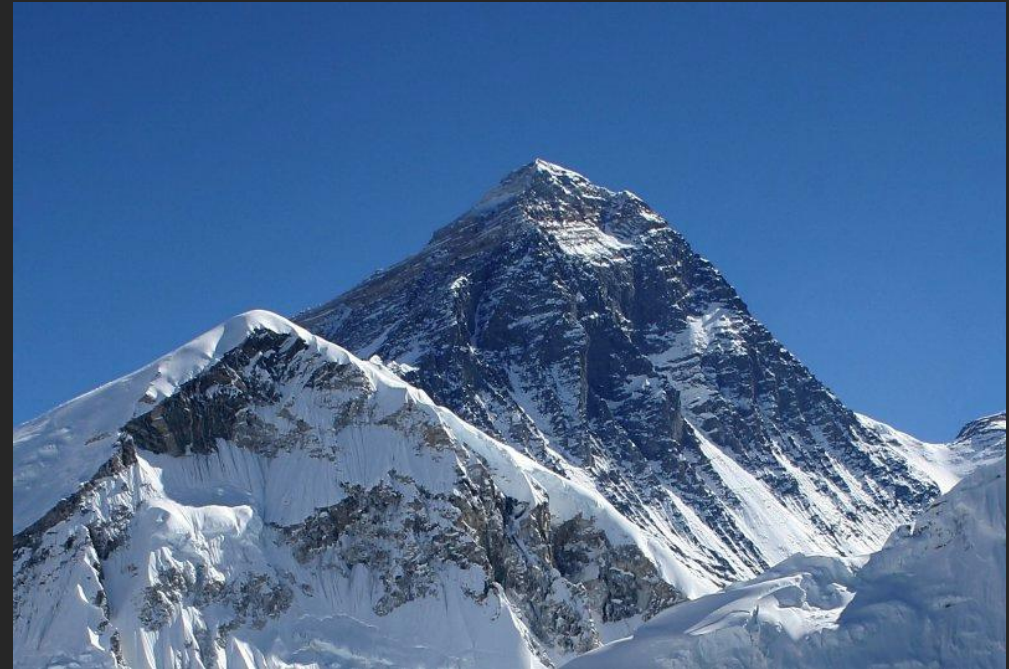
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CSCW – Distance Matters

- Ease of communication -- common ground
- Nature of the work -- How tight the coupling
- Readiness to collaborate
- Technology readiness – personal, infrastructure
- Trust
- Culture
- Time Zones

CSCW - Distance Matters

- More knowledge, experience
 - – Organizations
 - – Individuals
- Better tools
- But still difficult



CSCW - Meetings

- [Moran et al, 1996](#)
- [Olson & Olson, 2000](#)
- [Yankelovich et al, 2006](#)

Face Value? Exploring the Effects of Embodiment for a Group Facilitation Agent

CHI 2018



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Rachel Bellamy²



Thomas Erickson²

1. Northeastern University

2. IBM Research, T.J. Watson Research Center

Participants

- Stefan
- Viktor
- Aliz
- Victoria
- James
- Nathali
- Rosa

Chat

15:37:02 Stefan has joined the chat
 15:39:22 Viktor has joined the chat
 15:40:54 Aliz has joined the chat
 15:40:55 Viktor: Hello Everyone
 15:40:57 Victoria has joined the chat
 15:41:08 James has joined the chat
 15:41:09 Victoria: Hi, nice to see everybody
 15:42:15 Nathali has joined the chat
 15:42:23 Rosa has joined the chat
 15:42:32 Stefan: Great we can start now



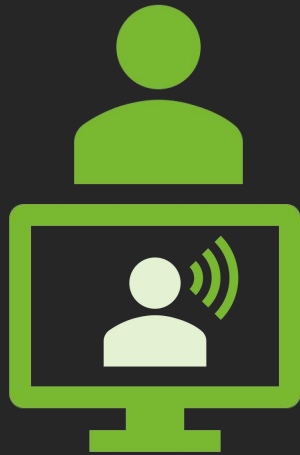
A Conversational Agent as a Group Facilitator





The right embodiment for a
Group Facilitation Agent?

Individual vs. Group Interaction



Conversational Agent Embodiment



Improves many subjective measures such as:

- Social presence
- Motivation
- Entertainment
- Trust

Learning outcomes



No/limited effect on objective measures such as:

- Comprehension and recall
- Memory
- Performance (e.g., in a direction-giving service)

How do different designs of the agent's embodiment (VOICE vs. AVATAR) influence:



RQ1: **Subjective social perception** of the agent (rapport, trustworthiness, intelligence and power) in a group setting?

RQ2: **Objective response** (collaborative behavior and outcome) such as:

- a) The group decision outcome
- b) Participants' interaction together
- c) The group interaction with the agent

Research Method

- Experiment Task: Hiring decision
 - Select the best candidate among 5 Resumes
 - Initial and final voting
- Facilitation agent
- Wizard of Oz



Wizard of Oz protocol

Wizard Interface

Decision Facilitation

Introduction Greeting Answer Greeting

Task Description Task Goal CV Review/Rating Focus on Review

Discuss Criteria Remind Job Des. Remind Criteria:
 Education
 Experiences
 Projects
 Skills

Elimination Confirm Elimination Eliminate One More Elim. Summary

Final Decision Reflect Init. Rating Candid. Pros/Cons

Summary w/ Dec. Summary w/o Dec.

End Session

Social Behavior

Non Verbal

Gaze A Gaze B Gaze Front

Smile Signal to Speak

Listening Confirmativ Listening Confused

Verbal

Confirm Praise Out of Scope

Agree Sorry

Disagree Thank You

Meeting Facilitation

2 Min Reminder 1 Min Reminder Finish? Wait

Push for More Crit

Move on(Conflict) Move on(Next)

Push for Decision 5 Min Reminder

General Meeting Facilitation

Push A Push B

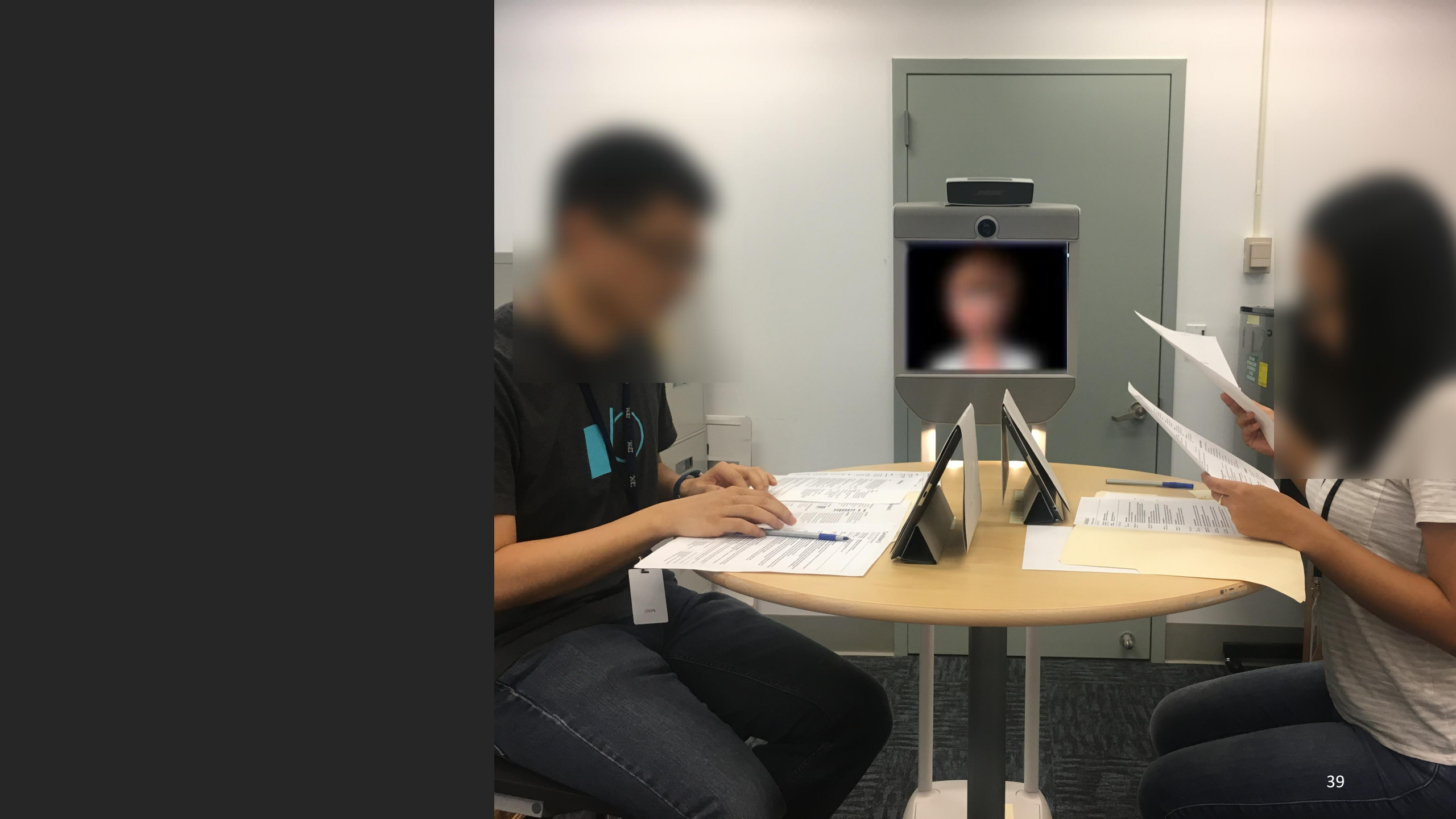
Push for More A Push for More B

Focus on Topic Remind Time

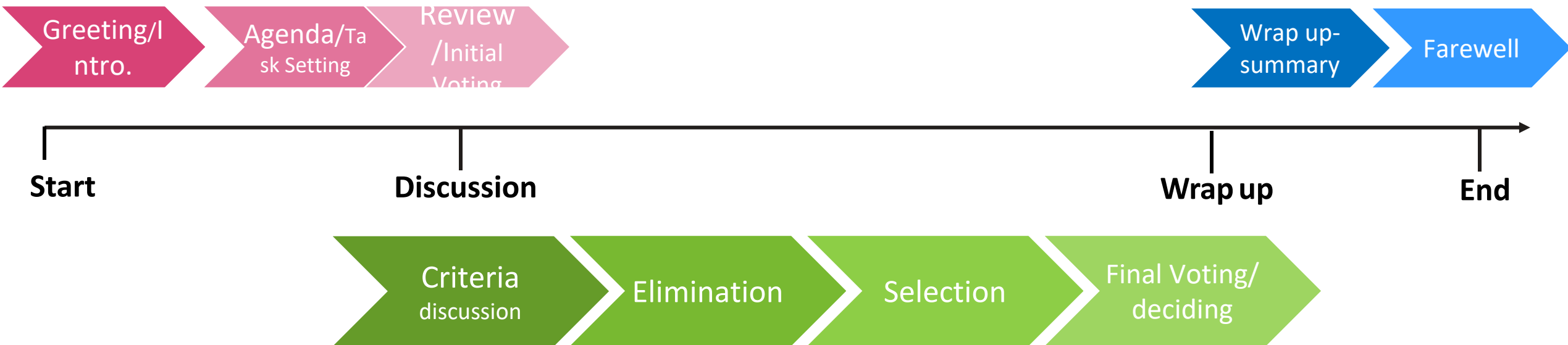
Open Input Send

Participant A Name Participant B Name

Initiate Avatar



Experiment Procedure

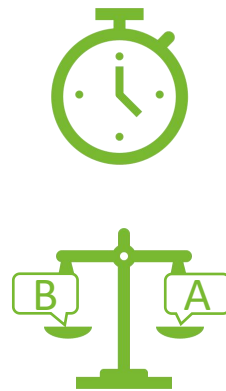


Facilitation Agent Functionalities

Decision-Making
Facilitation



Meeting Facilitation



Social Interaction



Experiment Design

Between-subject study



40 participants (20 user groups)

60% male



Measures

User Perception Towards the Agent:

self-report: rapport, power, anthropomorphism, intelligence, and trust

Objective measures:

Decision outcome, group interaction, and participants interaction with the agent

Interviews

Results

Effects of agent's embodiment on:

RQ1: **Subjective** social perception of the agent
(rapport, trustworthiness, intelligence and power)

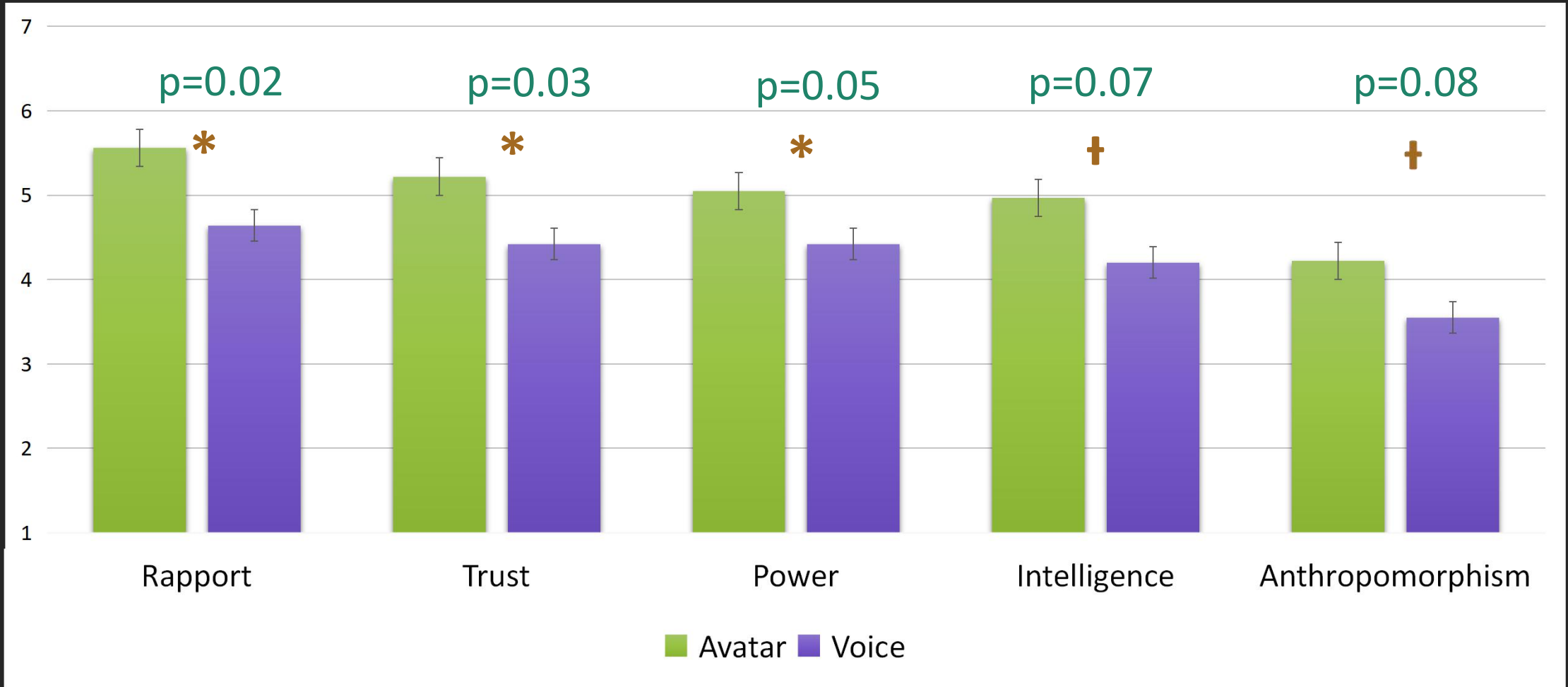
RQ2: **Objective** response

- a) The group decision outcome
- b) Participants' interaction together
- c) The group interaction with the agent
in the group setting?



RQ1: Subjective Perception towards the agent ✓

LMM





Embodiment affects:

Subjective social perception of the agent
in the group setting.



How about the **objective** measures



RQ2-a: Embodiment's impact on the "Decision Outcome"



- Consensus shift
- Individual shift
- Majority choice
- Confidence improve
- Time
- Self-reported decision satisfaction

Δ =Pair rating ICC **after** the session - Pair rating ICC **before** the session

ICC (Individual's rating **after** session , Individual's rating **before** session)



Embodiment affects:

Subjective social perception of the agent
in the group setting.



How about the **objective** measures

Decision outcome



Group behavior



RQ2-b: Embodiment's impact on the "Group Interaction"

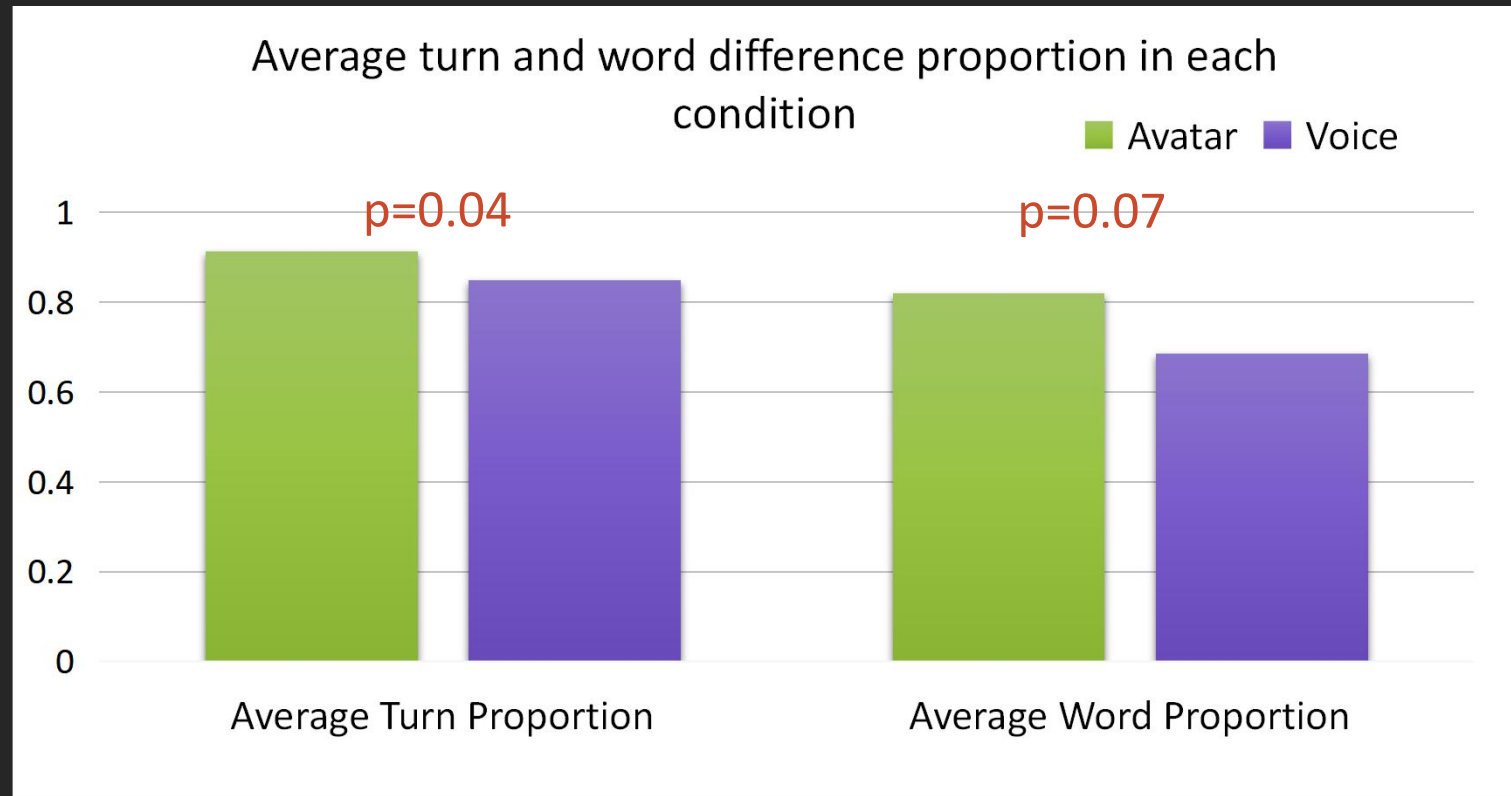
- "I found my partner and I, shared many similarities"
- "I made efforts to respond to my partner's questions and suggestions"



RQ2-b: Embodiment's impact on the "Group Interaction"

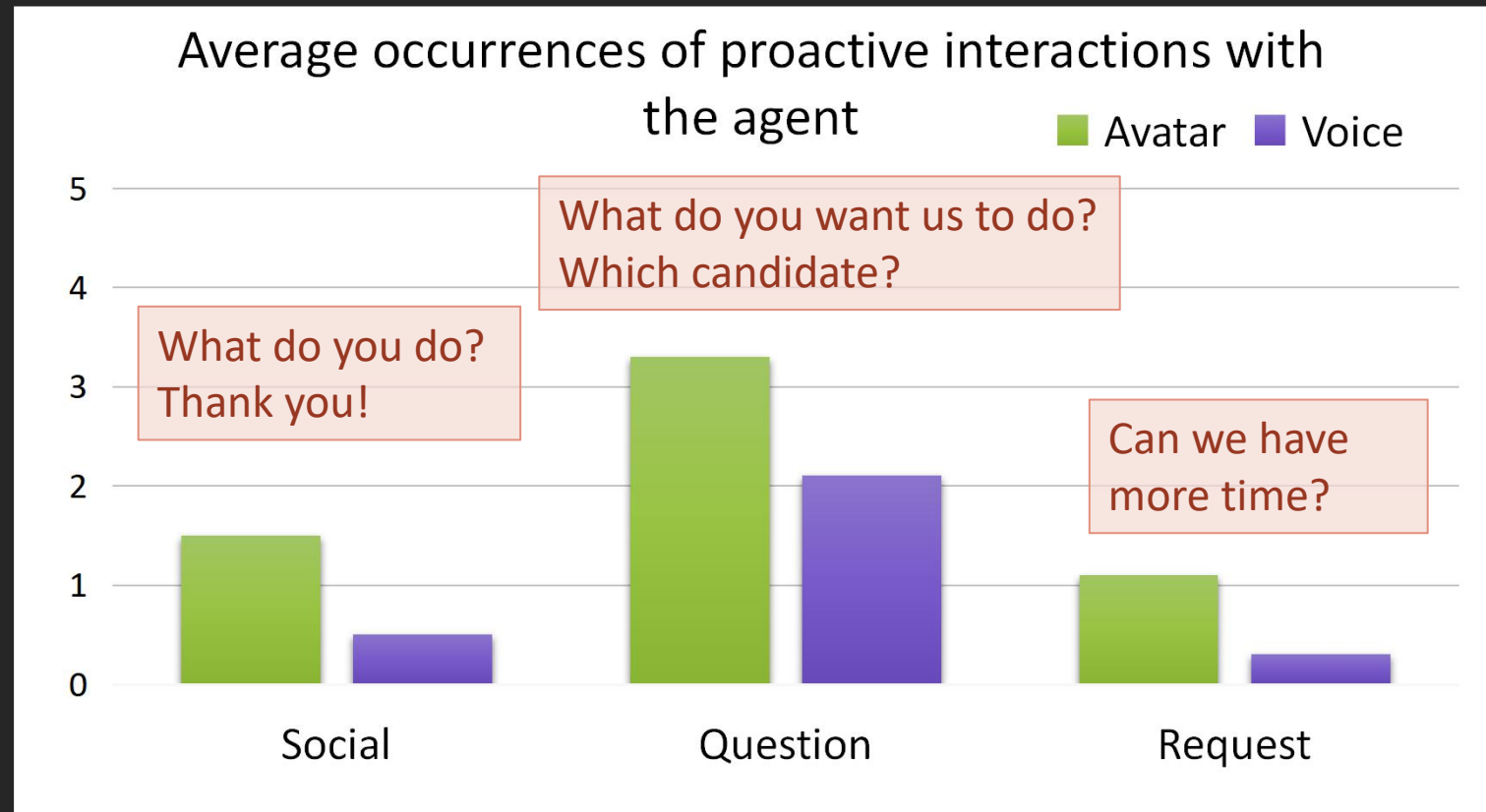


$$\frac{\text{Words and turns of the less talkative participant}}{\text{Words and turns of the more talkative partner}} = \text{Pair contribution}$$



RQ2-c: Embodiment's impact on the "Agent's Interaction" ✓

Pro-active interaction with the embodied agent more than doubled ($p = .06$)



Qualitative Results

What to
expect from
Embodiment?

Locating social intelligence

Exhibiting task capabilities

Qualitative Results

What to
expect from
Embodiment?

Locating social intelligence

Exhibiting task capabilities

Enhancing Presence

Enhancing Presence



“A: ...it’s more like a group discussion I feel like. B: I agree. In a group discussion you hope that it does actually have a face indicating that now she is participating in this conversation rather than just an object on the table... A: otherwise I feel like she just not existing here. We can just like talk, and (she is) in the background.”

Qualitative Results

What to expect from *Embodiment*?

Locating social intelligence

Exhibiting task capabilities

Enhancing Presence

What to expect from a *Facilitation Agent*?

Structure Management

Affective Catalyst

Information Support

Take Away

- Conversational Agents are well perceived as a group facilitator
- Embodiment is important when:
 - The agent's presence is useful,
 - The group needs to trust the agent,
 - The group needs to feel that they are being observed
- Embodiment is not necessary when:
 - The task is very demanding and embodiment may be distracting
 - A visual portrayal may raise expectations higher than what the agent can satisfy



Take Away

- Conversational Agents are well perceived as a group facilitator
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What it means to have impact

- What “counts”
 - Theory gets used
 - Downloads/views
 - Profits
 - Degrees/Education
 - Technologies
 - Lives changed
 -
- Who is impacted?
 - Students
 - Developers
 - Consultants

 - Specific populations
 - The general public

What impact will you make?

- Theories
- Assessment Tools
- Popular technologies that become standards
- Guidelines, templates, patterns, toolkits and standards
- Policies
- New media dissemination
- Action Research
- Teaching and teaching materials
- ...

Thank you

Acknowledgement:

[Shamekhi et al. 2018] at CHI is a group effort in Human Agent Collaboration team at IBM Research

Intro to CSCW materials are from Gary Olson and Judith Olson.

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