



When in Rome: The Role of Culture & Context in Adherence to Robot Recommendations



**Lin Wang
& Pei-Luen (Patrick) Rau**



**Benjamin Robinson
& Pamela Hinds**



Vanessa Evers



Tsinghua University

STANFORD
UNIVERSITY



UNIVERSITY OF AMSTERDAM

Funded by grants from the Specialized Research Fund for the Doctoral Program of Higher Education (SRFDP 20050003017), a NWO-NSFC exchange grant, and NSF #IIS-0121426 and #0624283. 1

Motivation

- To clarify the effects of users' cultural background and cultural context on human–robot team collaboration.
- Research Question
 - How do characteristics of national culture affect how people respond to a collaborative robot in a team setting?



清华大学

Tsinghua University

STANFORD
UNIVERSITY



People's behaviour toward robots vary across cultures

- When a robot was an ingroup member, Chinese as compared with US subjects reported feeling more comfortable and having a strong sense of control (Evers et al, 2008).
- Participants evaluated robots as more likable, trustworthy, and credible, and were more likely to accept the recommendations of a robot that spoke in more culturally normative ways (Rau et al, 2009).



清華大學

Tsinghua University

STANFORD
UNIVERSITY



People's attitude toward robots vary across cultures

- Results from a survey across 7 countries showed that participants from different nations had different attitude toward robots (Bartneck et al, 2005).
- A Chinese robot was perceived as more likely to know famous Hong Kong landmarks than an American robot (Kiesler, 2005).



清华大学

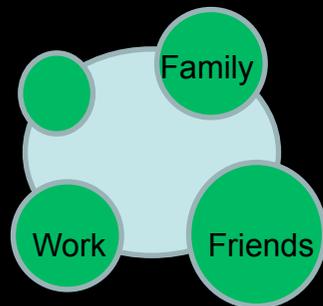
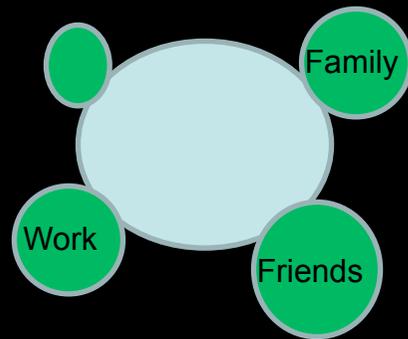
Tsinghua University

STANFORD
UNIVERSITY



Effects of culturally normative behavior

- Independence vs. Interdependence



- Low context cultures

- Direct
- Little ambiguity
- Informed by content

- High context cultures

- Indirect
- Ambiguous (seemingly)
- Informed by context (vocal emotion, gestures, seating arrangements, etc.)



清华大学

Tsinghua University

STANFORD
UNIVERSITY



Hypotheses

H1: Chinese as compared with US participants will see the robot as more of an ingroup member, as more credible, as sharing more common ground, and as more trustworthy when it communicates implicitly vs. explicitly.

H2: Chinese as compared with US participants will change their decisions to align with the robot's advice more when the robot communicates implicitly vs. explicitly and this relationship will be mediated by trust of the robot.



清華大學

Tsinghua University

STANFORD
UNIVERSITY



Effects of national context on HRI: Attitude toward robots

- Cultures are embedded in social and institutional context and these contextual elements have equal footing in predicting behavioral differences across cultures (Kitayama et al, 2006).
- China and the US have different exposure to robots.
- Chinese had less positive attitudes toward the social dimension of robots than Japanese respondents (Bartneck et al, 2005).



清華大學

Tsinghua University

STANFORD
UNIVERSITY



Hypotheses

H3: Chinese as compared with US participants will have more negative attitudes toward robots.

H4: Chinese as compared with US participants will change their decisions to align with the robot's advice less and this relationship will be mediated by their attitude toward robots.



清華大學

Tsinghua University

STANFORD
UNIVERSITY



Method

- 2 x 2 Experiment, 40 teams each, between subjects design



清华大学

Tsinghua University

STANFORD UNIVERSITY



Participants

- 80 Chinese teams (160 participants). Mean age 21.70 (SD=2.88) years old and 53.1% of the participants were male.
- 80 US teams (160 participants). Mean age 21.31 (SD=2.92) years old and 48.7% were male.



清華大學

Tsinghua University

STANFORD
UNIVERSITY



The Task

- Make decisions about a chicken coop, balancing environmental sustainability & profit



Measuring temperature



Measuring weight



Measuring density



清华大学

Tsinghua University

STANFORD UNIVERSITY



Manipulations

Topic	Implicit response	Explicit response
Plot size	A bigger area allows some grass in a chicken's diet, which can make chickens healthier and increase egg production.	I think we should choose 75 square meters because having some grass in a chicken's diet makes chickens healthier and increases egg production
Lighting	Artificial light may be an option since it will help to maintain egg production.	Artificial light will help to maintain egg production, so it is a better choice.



清华大学

Tsinghua University

STANFORD
UNIVERSITY



Procedures

1. fill in a pre-task questionnaire
2. read instructions about the experiment and task
3. enter six personal decisions about the task
4. work with team, together with the robot, to make all six group decisions
5. fill in a post-task questionnaire.
6. One member of each team was also randomly selected for interview



清华大学

Tsinghua University

STANFORD
UNIVERSITY





During the session



清华大学

Tsinghua University

STANFORD
UNIVERSITY





Wizard of Oz



清华大学

Tsinghua University

STANFORD UNIVERSITY



Measures

■ Dependent Measure

- **Decision change** (3- item self-reported, actual)
- **Perceptions of the robot as a team member** (1 item)
- **Credibility of the robot** ($\alpha = .84$, 14-item credibility scales, McCroskey and Young, 1981)
- **Common ground** ($\alpha = .69$, 4-item scale)
- **Trust** ($\alpha = .76$, 4-item scale)
- **Negative attitudes toward robots** ($\alpha = .70$, 6-item NARS scale)

■ Other Measures

- Preferences for high vs. low context ($\alpha = .75$, 6 items, Richardson & Smith, 2007)
- Individual vs. group self-representations (5 items, Brewer & Chen, 2007)



清华大学

Tsinghua University

STANFORD
UNIVERSITY



Results (H1): Chinese as compared with US participants see the robot as more trustworthy when it communicates implicitly vs. explicitly.

- The interaction effect of nationality and communication style predicted trust.
 - Chinese participants increased their trust of the robot when it communicated implicitly.
 - Whereas the US participants decreased their trust of the robots in that condition, $F[1, 307]=5.85, p<.05$



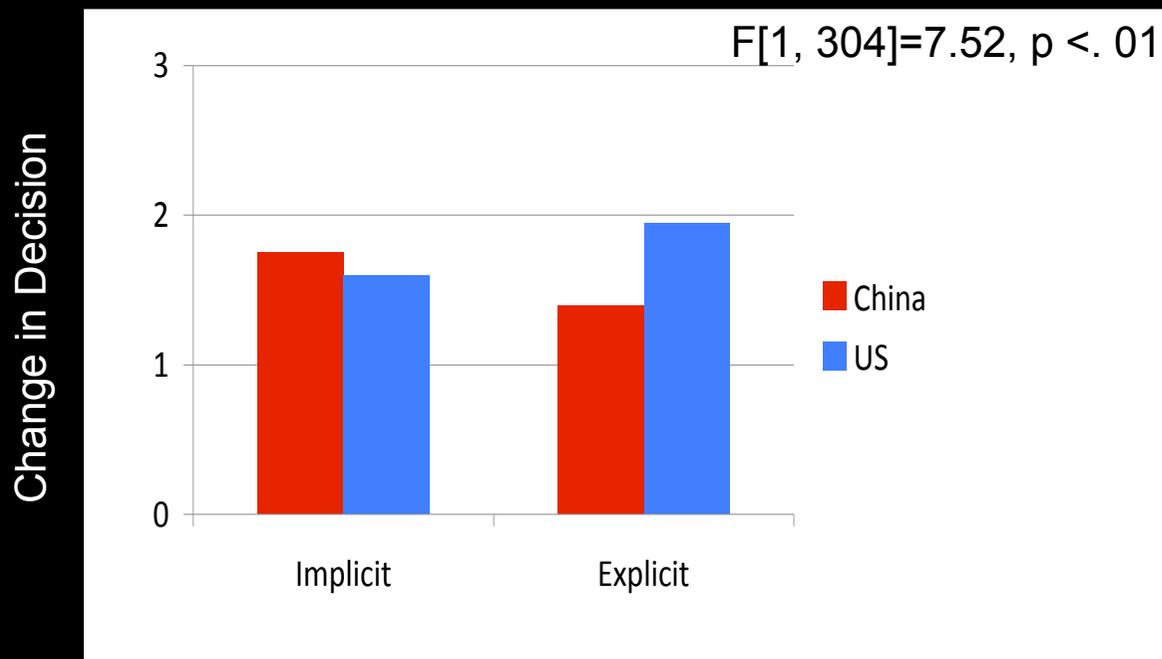
清华大学

Tsinghua University

STANFORD
UNIVERSITY



Results (H2): Chinese change decisions more when the robot communicates implicitly



清华大学

Tsinghua University

STANFORD
UNIVERSITY



Results (H2): Chinese change decisions more when the robot communicates implicitly. This effect is mediated by trust

- Self-reported decision change, $F[1, 304]=7.52, p < .01$
- Actual decision change, $F[1, 307]=6.22, p, .05$
- Regression analysis suggests mediation
- Sobel test confirms that trust mediates the relationship between the interaction term and decision change, $z=2.92, p, .01$.

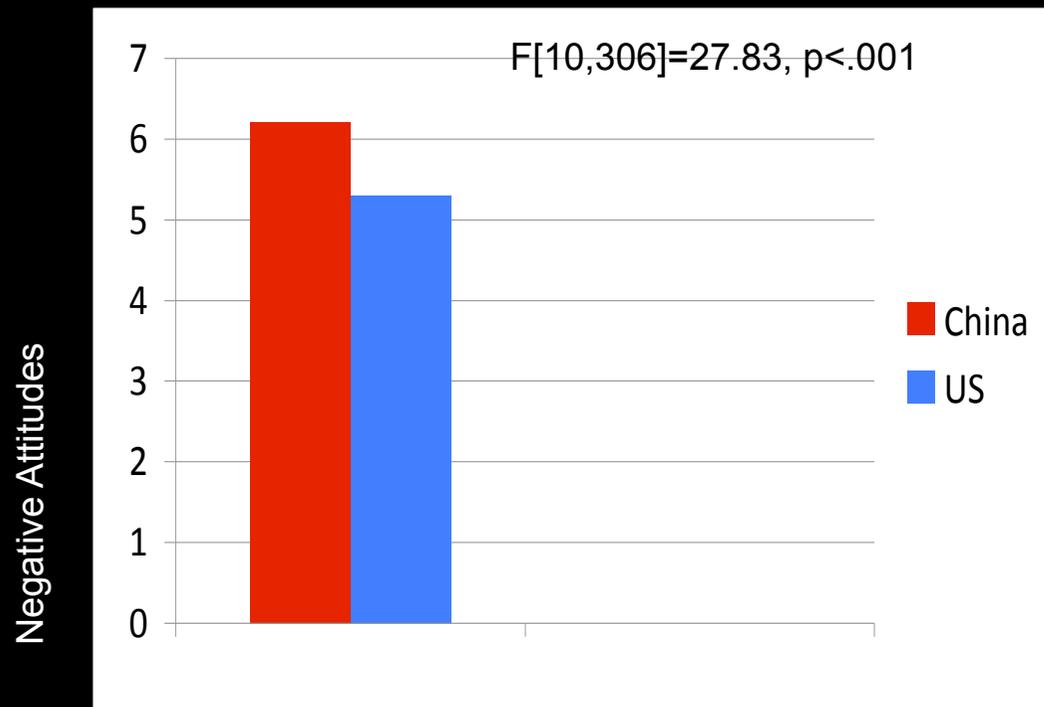


清华大学
Tsinghua University

STANFORD
UNIVERSITY



Results (H3): Chinese as compared with US participants had more negative attitude toward the robot



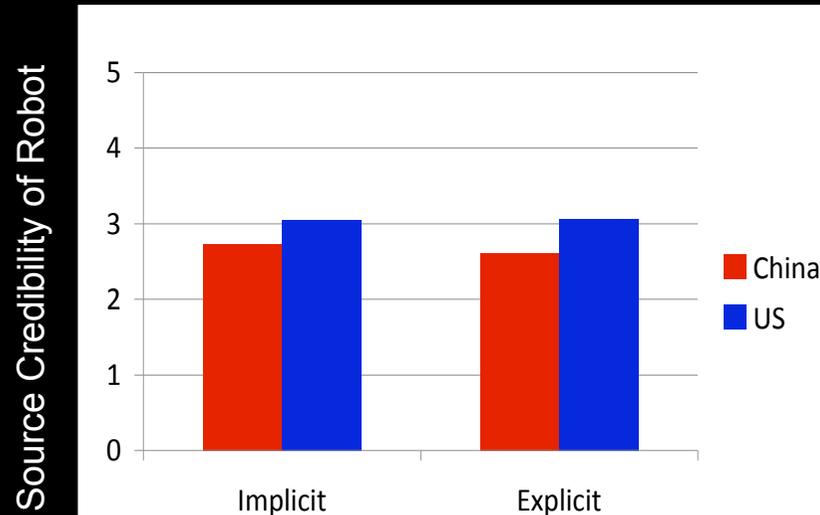
清华大学

Tsinghua University

STANFORD
UNIVERSITY



Results (H4): Chinese will change their decisions less and this relationship will be mediated by their attitude toward the robot



Nationality is highly correlated with negative attitudes toward the robot, with Chinese generally having more negative attitudes and changing their decisions less.

Regression suggests that negative attitude mediates the relationship ($r = .33$, $n = 320$, $p < .01$) between nationality and decision change but it does not pass Sobel test



清华大学

Tsinghua University

STANFORD
UNIVERSITY



Conclusions

- **H1:** Chinese as compared with US participants will see the robot as more of an ingroup member, as more credible, as sharing more common ground, and as more trustworthy when it communicates implicitly vs. explicitly.
 - Mixed support.
- **H2:** Chinese as compared with US participants will change their decisions to align with the robot's advice more when the robot communicates implicitly vs. explicitly and this relationship will be mediated by trust of the robot.
 - Supported.
- **H3:** Chinese as compared with US participants will have more negative attitudes toward robots.
 - Supported.
- **H4:** Chinese as compared with US participants will change their decisions to align with the robot's advice less and this relationship will be mediated by their attitude toward the robot.
 - Not supported.



清华大学

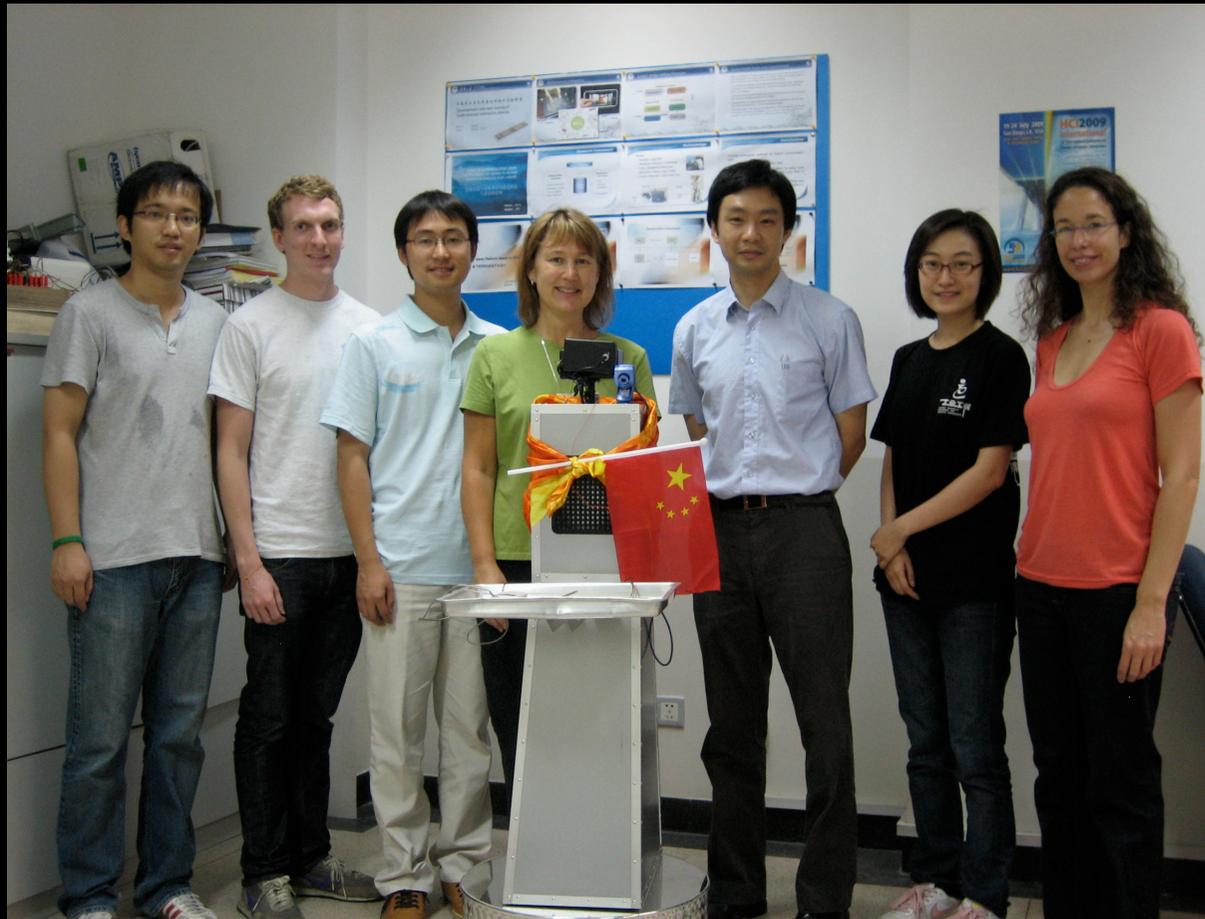
Tsinghua University

STANFORD
UNIVERSITY





Thank you!



清华大学

Tsinghua University

STANFORD
UNIVERSITY

