Intercultural Awareness: Cultural and Relational Effects on Awareness Information Gathering Behavior

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Abstract

Awareness information, information about others' presence and activities that allows us to determine their availability for conversation, plays an important role in workplace communication, as people often gather and act on it in the process of negotiating mutual availability. This paper presents a laboratory experiment examining how gathering awareness information is affected by the cultural backgrounds and mutual familiarity of collaborators. Results suggest that members of cultures considered more relationship-oriented (e.g., China) gathered awareness information less frequently than members of cultures that are more task-oriented (e.g., the United States). We argue that this is because of the different motivations for interaction prioritized by these cultures. We did not find any effect for familiarity, but provide several alternative explanations for this result.

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1   Introduction

Awareness information about others' presence and activities (Gross, Stary, & Totter, 2005) can help people determine the availability of their colleagues before initiating interactions. People can use this information to time their interruptions so as to minimize disruption of others (D. Tang & Birnholtz, 2010). Common examples of gathering awareness information include checking whether someone is online or offline using instant messaging status (Gross et al., 2005; D. Tang & Birnholtz, 2010), or simply poking one's head into someone's office to see if they are there. However, these behaviors can be socially delicate in that, when timed or executed poorly, they can become interruptions themselves, and may therefore cause unnecessary stress or relational strain (Carton & Aiello, 2009; Makin, Rout, & Cooper, 1988). A substantial body of research has explored the design of systems that provide awareness information without causing negative social consequences (for a review, see J. Tang, 2007).

However, there is reason to believe that many of the findings from that research merit reconsideration in today's increasingly globalized working environment. With barriers to communication being eased by technologies, and communication across national borders occurring every day (Diamant, Lim, Echenique, Leshed, & Fussell, 2009; Krishna, Sahay, & Walsham, 2004), research has found that people from different countries may use the same technology quite differently, partly due to different social norms and cultural expectations (Ur & Wang, 2013).

One area in which these differences have significant potential consequences is the use of awareness information in timing interruptions. There is some evidence to suggest that people from Chinese and

American cultures, which have been shown to differ in the extent to which people focus on getting a job done vs. nurturing their relationships with collaborators, differ in their concerns about interruption and initiating interaction (Schuster & Copeland, 2006; Triandis, 1995; Triandis, Bontempo, & Villareal, 1988). We argue that members of these cultures may therefore differ in the extent and frequency of their use of awareness information.

Additionally, people develop different levels of familiarity with their collaborators: some may be more familiar because they have been working or spending some time together; others may be complete strangers with no previous interaction history. Research suggests people interact with strangers and non-strangers differently, in that they are more informal and less polite when they are interacting with a friend than with a stranger (Brown & Levinson, 1987; Wolfson, 1988). These behavioral differences may also be reflected in how people gather awareness information about their collaborators. Since gathering awareness information is socially delicate and can be perceived as invasive and impolite, we argue that people will gather awareness information more frequently from people they know rather than from strangers.

These two factors, cultural background and familiarity, are not only important individually, but also act together. Research suggests Americans and Chinese may differ in the ways they treat strangers and friends/acquaintances, in that Chinese may become less relationship-oriented when they are interacting with strangers than with friends, whereas no study has documented similar tendency for Americans (Tickle-Degnen & Rosenthal, 1990; Yang, 1995). Understanding and acknowledging the potential differences caused by culture, familiarity, and their interaction will not only help researchers develop and evaluate systems in a value-sensitive way, but also shed light on how relational closeness impact people's collaboration.

The present study examines how different cultural values and relational familiarity affect how people gather awareness information in a simulated work environment. We found that American and Chinese users did use the same system, OpenMessenger, differently in terms of frequency of gathering awareness information. Contrary to our expectation, no difference was found along the familiarity dimension.

2   Background

2.1   Awareness information

Awareness information refers to any information about other's presence and activities (Gross et al., 2005). It has an interesting two-sided nature. On one hand, studies have found that sharing and making use of it not only enhance group task performance (Weisband, 2002), but also strengthen members' feeling of group identity (Huijnen, Ijsselsteijn, Markopoulos, & de Ruyter, 2004). Abstract display of this information helps other collaborators to time the initiation of interaction, to get the information they need while minimizing the interruption (Dabbish & Kraut, 2003, 2004). Tang and Birnholtz (D. Tang & Birnholtz, 2010) found sharing such information increases the social attraction between collaborators, partly because users can better explain the unresponsiveness of their partner. Reynolds et al.'s study found simply displaying the awareness information saves time for explicit communication and therefore is crucial for time-sensitive tasks (Reynolds, Birnholtz, & Lee, 2012).

On the other hand, however, there are reasons that restrain people from conducting awareness checks on a need basis, despite of its advantages for task performance. Dabbish and Kraut (Dabbish & Kraut, 2004) found that awareness information is used to time the interruption only when the collaborators are motivated on a team basis. Birnholtz et al. (Birnholtz, Bi, & Fussell, 2012) noted that visibility of those awareness checks has an impact in that when people believe their awareness information gathering behavior can been seen by their collaborator, whose information is being gathered, they conduct such checks significantly less frequently than when they believe people cannot see them; they believed it was because they are concerned about the social appropriateness or possible negative consequences (e.g., annoyingness).

The visibility of awareness checks raises an important point that has emerged in recent discussion of this issue. As Tang (J. Tang, 2007) notes in his review, a key aspect of negotiating mutual availability is having a multi-staged "approach" that allows people to first check on others without necessarily interrupting them, and then gradually allow their interest in interaction to become more salient. Birnholtz et al. (Birnholtz et al., 2012) build on this, noting that there is potential utility in allowing those being checked on to see (and thus potentially respond to) all awareness checks. This, in principle, allows for a more natural negotiation of mutual attention in that all acts of gathering can be seen and responded to (see Birnholtz et al., 2012; Birnholtz, Schultz, Lepage, & Gutwin, 2011, for a much more detailed discussion of these issues).

It is with this premise in mind that we use the OpenMessenger system in this study. We acknowledge that most commercial systems that provide awareness information (e.g., Skype, Google Chat, etc.) do not make all awareness checks visible and do not support a natural negotiation of mutual attention. We believe, however, that doing so could provide substantial benefit, and that the general lessons derived here are more broadly applicable as well.

In the present study, where awareness checks are made visible to both parties, we describe below why people may also be concerned about the social or relational appropriateness of their awareness information gathering. However, to our knowledge, few studies have explored other reasons that account for the difference in such behaviors, and it is the goal of the present study to explore two of them: cultural background and familiarity.

2.2   Cultural background: Task vs. relationship focus

Being a notoriously broad umbrella term, culture or cultural background has raised a great deal of controversy in definition (Hofstede, 1991). While we acknowledge equating it to nations lacks granularity, further examining how it affects members of subgroups (e.g., race and ethnicity) will go beyond the scope of the present study. Since intercultural collaboration nowadays still predominantly refers to and operates on the national level (Bird & Osland, 2006), we decided to adopt the definition of culture as the set of values, norms, and customs shared by individuals from a particular country (Doney, Cannon, & Mullen, 1998; Hofstede, 1991), and we are using the United States and China as the two cultural backgrounds for comparison in our study.

American and Chinese cultures are different along many dimensions, one of which, and the most pertinent one to our study, is the emphasis each culture places on maintaining social relationships with collaborators versus completing the task at hand in the most efficient manner. Triandis (Triandis et al., 1988) found people from individualistic cultures (e.g., United States, Canada) focus more on task efficiency than on relationship development and maintenance, and that when facing conflicts between task completion and interpersonal relationship issues, they tend to choose to complete the task rather than maintain their relationships. In contrast, members of collectivist cultures (e.g., China, Japan) prioritize relationship maintenance more than task efficiency.

Cultural differences in emphasis on task vs. relationship affect multiple aspects of group work. For example, Hamid (Hamid, 1994) found less frequent communication about work and task among Chinese students than their New Zealand counterparts, who are more task-oriented. In the workplace, members of relationship-oriented cultures tend to focus more on nurturing social relations between co-workers than members of task-oriented cultures (Schuster & Copeland, 2006; Shell, 1999; Triandis, 1995; Triandis et al., 1988). Hu and Jasper (Hu & Jasper, 2007) contend that even in a task situation, members of relationship-oriented cultures tend to be more sensitive than members of task-oriented cultures to social cues (e.g., the attitudes of people around them) (Ruble & Nakamura, 1972) and their task performance is more likely to be influenced by them (Krishna et al., 2004).

Taken together, these findings suggest that members of relationship-oriented cultures are more likely to consider the relational effect a certain behavior or conversation may have in workplace, whereas members of task-oriented cultures are more likely to consider the potential benefits of that behavior or conversation for getting the task done quickly and efficiently.

Although we are aware of no study on how task versus relationship orientation directly influences awareness information gathering behavior, it is clear from the literature that when facing a tradeoff between improved task performance and potential damage to a social relationship, members of relationship-oriented cultures are more likely to consider the relational impact of their actions than their counterparts of task-oriented cultures. The case of gathering awareness information provides a useful instantiation of this tradeoff. On the one hand, awareness information can be useful for interruption timing and improving task performance (Dabbish & Kraut, 2003). On the other hand, the visibility of gathering this information can have social cost if it distracts or annoys a collaborator (Birnholtz, Gutwin, & Hawkey, 2007; Clement, 1994; Heath, Luff, & Sellen, 1995).

In the present study, we compare awareness information gathering behaviors of American participants (who tend to be task-oriented) and of Chinese participants (who tend to be relationship-oriented). We hypothesize:

> *H1: American participants will gather awareness information more frequently than Chinese participants.*

2.3   Familiarity

Familiarity within social relationships refers to the degree to which people are close to and comfortable with each other (Little, 1965). People develop different levels of familiarity with others due to frequency of interaction (Whittaker, Frohlich, & Daly-Jones, 1994): close friends, friends, acquaintances, or complete strangers. Those categories are influential factors in verbal as well as nonverbal communication.

In verbal communication, utterances toward a stranger tend to be more polite than those toward a friend (Gupta, Walker, & Romano, 2007). In contrast, Planalp and Benson found that conversation between close friends is characterized by more interruptions, criticism, and disagreement than acquaintances in their interaction (Planalp & Benson, 1992).

In nonverbal communication, Whittaker et al. (Whittaker et al., 1994) also found that people who rated each other as more familiar had less formal communication and produced more interruptions; in their study, "interruption" meant to start an interaction without achieving shared attention. One way to interpret it would be that people who are more familiar with each other do not consider such interruption as it is for complete strangers.

These findings are consistent with politeness theory, which centers on the concept of "face", which refers to the image people have of themselves, and that they believe others have of them, with socially desirable attributes. Acts with the potential to harm this positive image are considered face-threatening acts (FTA) (Brown & Levinson, 1987). Politeness theory suggests that FTAs will be more likely to occur in closer relationships, because people who are more intimate with each other understand that they have more face concern for each other, and thus the behaviors are not seen as impolite or offensive (Culpeper, 1996). Leech (Leech, 1983) even went further to argue in his Banter Principle that being impolite to each other is a way to cultivate intimacy; and the closer the relationship is, the less necessity there is to follow the principles of being polite.

As noted above, the more familiar one is with someone, the less polite he/she is likely to be. In equal relationships (no party is more powerful than the other), FTAs like interruptions and criticism are more likely to frequent friends than strangers. In the context of awareness information gathering behavior, a previous study (Birnholtz et al., 2012) has found that when such gathering is visible to both parties in an interaction, people are less likely to do it than when it is invisible, since it might be seen as invasive or

interruptive and is therefore socially undesirable. Therefore, we argue that gathering awareness information about one's collaborator, in the general sense, may be perceived as invasive and thus a potential FTA. Because FTAs are more likely to happen in people with closer relationship than complete strangers, we hypothesize that people will be more likely to gather awareness information about a friend than about a stranger.

> *H2: Participants will gather awareness information more frequently about their friends than about strangers.*

Studies have also suggested that culture and familiarity level may have an interaction effect. For example, Gupta et al. (Gupta et al., 2007) found that British and Indians have different perceptions of politeness, in that Indians are more informal when talking to friends than British are. However, to our knowledge, there is no study addressing how these two factors interact in the United States and China. Therefore, we turned to literature that separately examines how Americans and Chinese interact with familiar and unfamiliar persons.

For Americans, Tickle-Degnen and Rosenthal (Tickle-Degnen & Rosenthal, 1990) found strangers are more likely to be polite and positive in their conversations than friends, because the importance for positivity decreases as the friendship progresses. In other words, the more people are familiar with each other, the less they need to feel the "friendliness and caring" (p. 286) in each other.

For Chinese, Yang (Yang, 1995) described three social categories of interpersonal relations: *jiaren* (family members), *shuren* (familiar persons, excluding family members), and *shengren* (acquaintances and strangers). The latter two categories differ from each other in terms of interaction principles: familiar persons interact on the basis of a combination of utilitarian and affectional concerns, whereas strangers or acquaintances' major concern is gain and losses, especially when money is involved.

In the case of gathering awareness information, we reason that people may differ along cultural lines in their hesitation to gather information about a friend vs. a stranger. Chinese, who value relationship cultivation, may be less willing to gather information about a stranger prior to cultivating a relationship with them. However, we are aware of no direct evidence supporting this argument, so alternative outcomes are also plausible. Therefore we asked:

> *RQ1: Is there an interaction effect between culture and familiarity on the frequency of awareness checks?*

2.4   Effects of awareness information

Apart from cultural background and familiarity, we also examined the effects of gathering awareness information on perceived task performance, social attraction, and annoyingness.

The perceived task performance of oneself and one's partner bears significance in collaboration. Like actual task performance, perceived performance is also an important indicator of effectiveness (Costa, 2003); moreover, it is strongly and positively correlated with team satisfaction. Salanova (Salanova, Llorens, Cifre, Martínez, & Schaufeli, 2003) found that it not only moderates actual team performance but also builds individual well-being and reduces anxiety level.

Sallnäs (Sallnäs, 2005) found that people perceive themselves doing better when the partner's social presence increases. Since the awareness information provides information about social presence and activities, we hypothesized that:

> *H3a: There will be a positive correlation between awareness checks one conducts and the rating of perceived task performance of their own.*

The same reasoning may also apply for their ratings of perceived performance of their partner:

H3b: There will be a positive correlation between awareness checks one conducts and the rating of perceived task performance of their partner.

Although awareness information checking may be beneficial for task performance, doing it too frequently may be considered invasive or inappropriate to collaborators (Birnholtz et al., 2012). One way to measure these possible effects is to examine social attraction of the gatherer of the information. In this study, social attraction refers to the appreciation one evokes (Damian, Baur, & André, 2013; Simpson & Harris, 1994). Since previous studies have indicated awareness checks may be perceived to be invasive, we argue social attraction should generally be lower to partners who conduct more awareness checks. We thus hypothesized:

H4: There will be a negative relationship between the number of awareness checks conducted by one's partner and one's social attraction to the partner.

Awareness checks, being mutually visible, may affect the perceived annoyingness of oneself to one's partner, and of one's collaborator to oneself. Since awareness information checking is mutually visible in the current study, there is a chance that frequent checks, even without initiation of any conversation, will make oneself appear annoying to collaborators (Birnholtz et al., 2012). As the literatures about familiarity and impression management (Culpeper, 1996; Leech, 1983) suggest, acts may be considered differently depending on the relationship between the interactants. People are usually less polite to friends than to strangers, therefore something that is annoying for strangers may be considered less so when it is carried out toward friends. Therefore we hypothesized:

H5a: There will be a positive relationship between the number of awareness checks one conducts and the extent to which one perceives oneself as annoying to one's partner.

H5b: The correlation between awareness checks conducts and perception of one's own annoyingness will be stronger for stranger pairs than for friend pairs.

We believe the same logic that familiarity influences the outcome of a certain behavior also applies when the participants rate their partner's annoyingness. Therefore we hypothesized:

H6a: There will be a positive relationship between a partner awareness checks and one's rating of the partner's annoyingness.

H6b: The correlation between partner awareness checks and rating of partner annoyingness will be stronger for stranger pairs than for friend pairs.

3   Method

3.1   Participants

Participants consisted of 66 students (30.30% male; 51.52% American, the rest are Chinese) at a large university in the northeastern United States.

In the "friends" condition, the participants signed up for the study and were required to come to the experiment together with a friend, who shared the same cultural background with them. We asked the participants to rate how they feel psychologically close to the friends they brought, using a 7-point Likert scale question with 1 being the least closest and 7 being the most. Participants indicated they were quite close (M = 5.66, S.E. = 0.24).

In the "strangers" condition, the experimenter partnered each participant with a stranger from the same culture, and made sure that they had not met prior to the experiment. To verify this manipulation, the experimenter asked whether they knew each other before coming to the lab and got all negative responses. Each student was paired with someone at the same education level (i.e. undergraduate with undergraduate, graduate with graduate) to ensure equal power status.

Each participant received a financial award of $5 for participation, and an additional award varying from $2 to $5, based on his or her individual task performance, detailed below.

3.2   Equipment and software

We used OpenMessenger (OM), a research prototype CMC tool that supports the mutual visibility of awareness information gathering (Birnholtz et al., 2011). Participants were seated at tables on opposite sides of the room. Each table had a Windows PC and a 20" LCD display. In addition, OM provides a peripherally projected display called the "OMNI Window" (see Figure 1), in which avatars for one's contacts are projected on the wall surrounding the user. In our experiment, this display was projected on the wall just above the LCD display, with the projection about 5 feet wide and about 2 feet in front of the participant. Two avatars were displayed (see Figure 2): the bottom one represented the participant and the top one represented their partner. When one gathered awareness information about his/her partner, in the form of information about their progress on the task, the partner would see the gatherer's avatar moving closer to his/her own from the top to bottom of the OMNI Window.

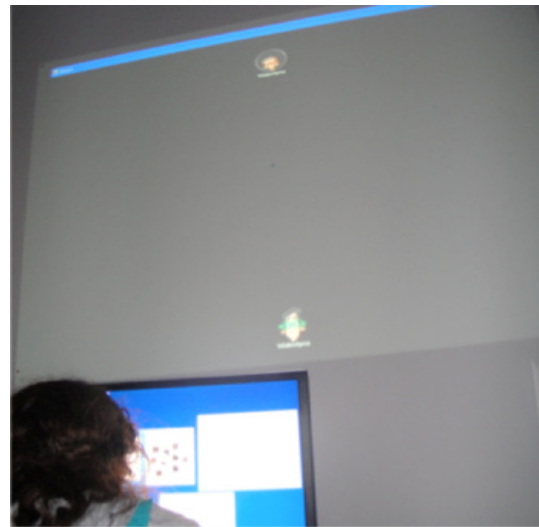Figure 1: OpenMessenger, with the OMNI window projected peripherally on the wall

Figure 2: Setup of the current experiment, with avatars for the participant (bottom) and partner (top) both shown peripherally

3.3   Tasks and materials

The task was designed to replicate a real-world scenario in which a person has both shared and individual tasks with complex interdependencies, and in which incentives for shared and individual tasks are mixed. Participants collaborated on completing five large jigsaw puzzles on the computers, each of which was divided into six smaller sections that were completed one by one. Each person was individually responsible for three sections. Each puzzle section was solved in a "puzzle window" (see Figure 3), which consisted of the puzzle itself and a space for the puzzle pieces. Participants solved the puzzle by dragging the pieces into the puzzle area and snapping them into the grid.
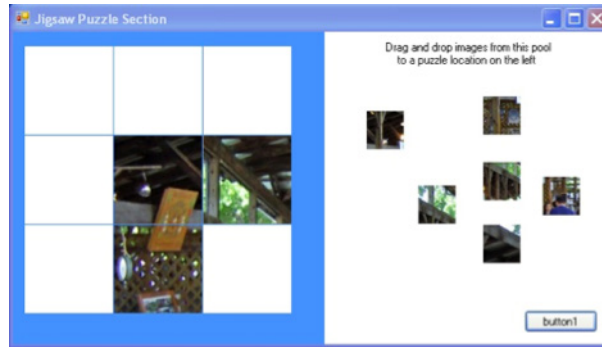
Figure 3: Puzzle interface, with the puzzle section (left) and the pile of pieces (right

To create interdependency in the task, participants were not permitted to move on to their next puzzle section until their partner had finished his/her own current section. Participants who completed a section faster than their partner, however, did have the opportunity to earn additional points – and a potential cash bonus for themselves – by playing "shape games" individually.

Every time the participants finished a puzzle section before their partner, they were offered the opportunity to play a shape game via a dialog box with options of "Yes" and "No". If they chose "Yes", they proceeded to the shape game; if they chose "No", no points would be deducted, but they would not be able to play any shape games until after the next time they finished a puzzle section before their partner did.

In playing the shape games, participants were shown a sequence of ordinary objects for 5 seconds. They then had to identify the displayed sequence from four options after the original images had disappeared (see Figure 4). The shape games were optional. For each shape game successfully completed, the participant got 1 point; but if their partner finished the jigsaw puzzle section while the participant was still playing a shape game, the participant would lose 5 points. Points were used to determine the financial reward received at the end of the experiment. In this way, there was a clear incentive to use awareness information to estimate available time for shape games.
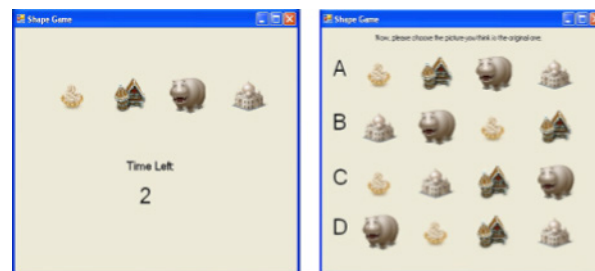

Figure 4: Shape game interfaces, with the initial sequence (left) and the set of choices (right)

To do so, participants could use OM to view the number of puzzle pieces their partner had correctly placed. Effectively, this was an indicator of how far along one's partner was on the puzzle task and how much time the participant had to play shape games. By hovering the mouse cursor over the avatar on top, participants would see the number of puzzle pieces correctly placed by the partner. This information was used to help the participant decide whether they had enough time to play shape games (see Figure 5). Participants in the shape game could gather this awareness information whenever they needed to determine whether he/she should do another shape game or not.
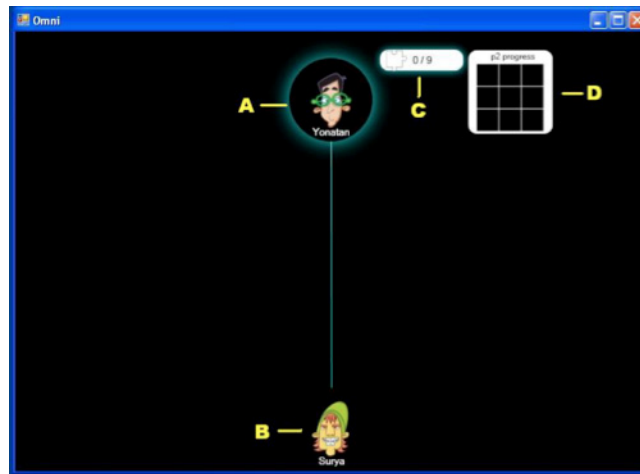
Figure 5: The projected awareness window including: (A) the partner's avatar, (B) the participant's avatar, (C) the number of correctly placed piece puzzles, and (D) the location of correctly placed puzzle pieces

Two paper-based questionnaires were also administered. The pre-experiment questionnaire collected participants' experience in IM usage. The post-experiment questionnaire asked about the participants' workload, impression about the partner, individualism/collectivism, evaluation of self-performance, task/relationship orientation, and demographic information.

3.4 Procedure

After participants arrived at the lab, they completed a consent form and the pre-experiment questionnaire. Participants in the stranger conditions also filled in a simple profile note, which documented their name, gender, and birthplace (city, country). The experimenter then showed their notes to each other to give the participants some basic information about each other's cultural background.

Participants were seated in the two corners of a room, facing different directions and separated by dividers so they could not see each other. They wore noise-cancelling headphones so they did not hear ambient sounds.

In the beginning of the experiment, participants watched a short instructional video in which they were introduced to the puzzle, shape game tasks and the financial incentive. They were told they would earn 1 point for each shape game they played correctly and that a wrong answer would mean a 1-point loss. Most importantly, if their partner finished their puzzle section while they were still playing a shape game, they would lose 5 points. The final total points would be used to determine cash bonuses, with more points meaning a larger cash bonus.

This scoring scheme was structured to motivate participants' awareness information gathering behaviors, because in order to gain more points and avoid losses they would need to get information about their partner's progress on the puzzles. In other words, it was to their advantage to know how far along their partner was on his/her puzzle task, so they could estimate whether or not there is enough time to play shape games to earn points, without being cut off and thereby losing more. They were instructed to use OM to collect such information.

After the instructions but before starting the study, participants completed one simple puzzle section and one shape game, including a practice session to gather awareness information from their partner, to familiarize themselves with the game rules and the OM system.

3.5   Measures

Data gathered during the experiment consisted of surveys and log data from the system, which contained both the puzzle and shape game durations and scores, as well as the awareness checking, from which we extracted the number of awareness checks per puzzle section.

3.5.1   Awareness checks

Counts of awareness checks per puzzle section were extracted from the OM log files. Because the raw number of checks was correlated with the amount of time available to participants for these checks, we first used the logs to determine how much time was available. Participants only had time for shape games, and thus only had reason to perform the awareness checks, if they finished their section of the puzzle before their partner did. This means that only one of the two participants could engage in shape games in a given puzzle section. We determined which partner had time for shape games, and how much time was available, for each section. We then used the total amount of time available to the participant across all puzzles and sections as the denominator to compute our rate of awareness checks. The resulting value was positively skewed so we used a log transformation prior to analysis.

3.5.2   Actual task performance

The shape games were used to rate the actual task performance. Each attempt at a shape game was scored, and total score per puzzle section were extracted from the logs. To correct for the amount of time available for playing shape games, we divided people's total shape game score by the number of the games played.

3.5.3   Perceived game performance

Participants' ratings of perceived task performance on four semantic differential scales (*good/bad, fast/slow, unproductive/productive, efficient/ inefficient)*, for both themselves and their partner, were averaged (Cronbach's α for ratings of oneself = .88; Cronbach's α for ratings of partner = . 87).

3.5.4   Social attraction

We adopted the sub-scale from the Interpersonal Attraction Scale (McCroskey & McCain, 1974) to measure the social attraction of participants. Scores on five questions pertaining to participants' desire to interact socially with their partners (e.g., "I would like to have a friendly chat with him/her") were averaged to create a social attraction measure (Cronbach's α = .87).

3.5.5   Annoyingness

Participants' ratings of the negative effects of their own awareness information checking behavior on their partners on three semantic differential scales (*annoying/calming, unintrusive/intrusive, upsetting/pleasing*), as well as their ratings of partner's behaviors were averaged, respectively (Cronbach's α for ratings of oneself = .72; Cronbach's α for ratings of partner = .66).

3.6   Statistical analyses

All analyses were run using the mixed model procedure in JMP, to take into account the fact that participants were nested in dyads. Note that Mixed Model analyses can result in non-integer degrees of freedom (Littell, Milliken, Stroup, & Wolfinger, 1996).

4   Findings

We present the results in four parts. First we examine how culture and familiarity affect awareness information gathering behavior in terms of awareness check frequency. Then we look at how awareness information checks correlate with the ratings of participants' perceived task performance. Third, we examine how the checks correlate with partner's social attraction. Finally we examine how they influence the participants' ratings of annoyingness of their own and their partners.

4.1   Manipulation check

One key underlying assumption for our design is that awareness information gathering actually does improve task performance. To test this manipulation, we examined the relationship between awareness check frequency and participants' performance and found a positive correlation between awareness check frequency and task performance in the shape games (r (64) = 0.67, $p <$ .0001, n = 66). Thus, our manipulation was successful in that regard.

4.2   Effect of cultural background and familiarity

Our first set of hypotheses examines the main and interaction effects of participants' cultural background and their familiarity with collaborator on the frequency of awareness information gathering behavior.

We ran a mixed model analysis of variance on the natural log of awareness check frequency, since this variable was positively skewed. We used participants' cultural background, familiarity of partners, and the interaction of the two as fixed effects; and pairs as well as individuals as random effects. The results are presented in Table 1.

Dependent variable: Log of Awareness Checks				
Variables	β	S.E.	DFDen	p
Intercept	2.92	0.11	29	***
Individual culture (A)	0.32	0.11	29	**
Familiarity (S)	-0.12	0.11	29	
Individual culture (A) x familiarity (S)	0.04	0.11	29	

Table 1: Effects of culture and familiarity on the log of awareness checks frequency. *Notes*: p-values: ** p <= .01, *** p <= .001, A=American, S=Stranger

H1 predicted that American participants would perform awareness checks more often than Chinese participants. As shown in Table 1, the results showed that there is a main effect of culture (F [1, 29] = 8.50, $p <$ .01). Consistent with H1, this indicates that all the American participants from both friends and stranger conditions (M = 3.24, S.E. = 0.15) conducted awareness checks more frequently than Chinese participants (M = 2.61, S.E. = 0.16) (see Figure 6).
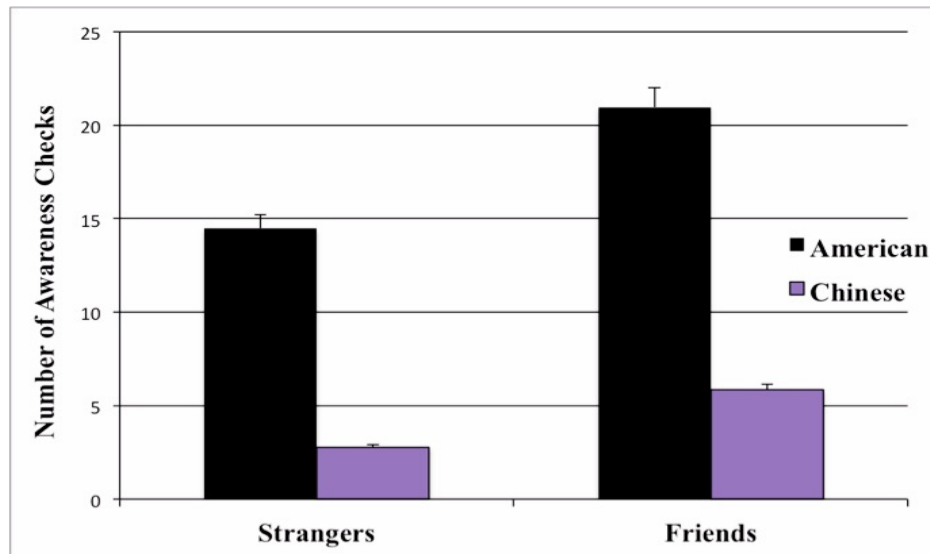
Figure 6: Mean numbers of awareness checks as a function of familiarity and cultural background

H2 predicted that participants would gather awareness information more often from friends than from strangers. However, we did not find a significant effect of the familiarity between partners (F [1, 29] = 1.24, *n.s.*), nor an interaction between culture and familiarity on the number of awareness checks (F [1, 29] = 0.14, *n.s.*). Therefore H2 is not supported.

4.3   Effects of awareness information gathering behavior on perceived task performance

Our second set of hypotheses looks at how the frequency of awareness checks affects the participants' perceptions of their own and the collaborator's task performance.

H3a predicted a positive correlation between the frequency of awareness checks and participants' ratings of their perceived task performance of their own. Consistent with this hypothesis, there was a significant positive correlation between the two (r [64] = 0.35, *p* < .01).

H3b predicted a positive correlation between the frequency of awareness checks one's partner conducted and participant's ratings of the perceived task performance of their partner. We found a significant positive correlation between the two (r [64] = 0.32, *p* < .01), Therefore, both H3a and H3b were supported, meaning increased awareness check frequency is related with better perceived task performance, for both the participants themselves and their partners.

4.4   Effect of awareness information gathering behavior on social attraction

Our next hypothesis explores how the frequency of awareness checks affects the participants' perceptions of their collaborator's social attraction.

Contrary to H4, which predicts a negative correlation, we did not find anything significant between awareness checks and social attraction (r [64] = 0.14, *n.s.*). On the surface, this seems to provide conflicting evidence against previous study (D. Tang & Birnholtz, 2010); we will discuss the reasons in the discussion section.

4.5   Effect of awareness information gathering behavior on annoyingness

The last set of hypotheses examines how the frequency of awareness checks affects the participants' perceptions of their own and the collaborator's annoyingness. We also included familiarity to see whether it interacts with awareness checks frequency and influence such ratings.

H5a proposed that when people conduct more awareness checks, they would think they are more annoying to their partner. This hypothesis was supported (r [62] = 0.28, *p* = .02).

H5b predicted that people would think that awareness checks were more annoying to partners who were strangers as opposed to friends. Consistent with this hypothesis, there was a significant positive correlation between the awareness checks and perceived annoyingness in stranger pairs (r [32] = 0.41, p = .02); but for friend-pairs this correlation was not significant (r [30] = 0.09, $n.s.$). Therefore, H5b was supported.

H6a and H6b examined this relationship on the partner's side. H6a predicted that the frequency of awareness checks received from a partner would correlate positively with the perceived annoyingness of one's partner, but this was not supported (r [64] = 0.10, $n.s.$). H6b predicted that the correlation would be stronger for stranger pairs, but this was not supported, either, as neither correlation is significant (for stranger pairs (r [32] = 0.16, $n.s$; for friend-pairs (r [30] = 0.05, $n.s.$).

5   Discussion

We have presented an experimental examination of how cultural background and familiarity affect awareness checking, and how awareness checking, in turn, influences perceptions of one's own and a partner's task performance, annoyingness, and partner's social attraction. In this section, we will discuss the implications of these findings for theory and design, as well as limitations and future research direction.

5.1   Theoretical implications

As we hypothesized, American participants performed awareness checks more frequently than their Chinese counterparts. This is consistent with the theoretical view that American culture is more task-oriented and less relationship-oriented than Chinese culture.

Proposed in the last century, Hofstede's seminal cultural dimensions (Hofstede, 1991), especially the division of individualism/collectivism, have been suffering increasing criticism in the recent years, largely because many believe equating culture to countries does not adequately consider national heterogeneity (e.g., McSweeney, 2002), and some believe that culture is such a constantly evolving concept that it has already been reshaped by technology use and increased international interaction (Irani, Vertesi, Dourish, Philip, & Grinter, 2010). While it is true that globalization and economic transformation have been influencing some values in Chinese culture, our study shows that Chinese are still, as Hofstede and Triandis predicted, more concerned about relationship maintenance rather than their American counterparts, who are more task-oriented.

This also shed light on the value-sensitive design (VSD) approach, where accounts of human values should be reflected throughout the design process (Borning & Muller, 2012). VSD mainly treats value as a universal concept, but our study, as well as many others, has shown that at least the focus on task completion and relationship development still differ greatly across cultures, and they are playing an important role in how people use communication technology. Using the awareness information system, people from a task-oriented culture like USA (e.g., Canada and the North European countries) tend to gather awareness information more frequently than people from a relationship-oriented culture like China (e.g., Japan and Korea). Such a difference is not due to one party's lack of task commitment or negative social intentions, but more because of the values and norms that are deeply embedded in their particular society. Therefore, when incorporating values in the design process, as Borning and Muller (Borning & Muller, 2012) also suggested, designers should take a pluralistic view of value, admitting culture to be an important variation in it.

Contrary to our expectations, awareness checks did not differ in frequency in stranger and friend pairs. While it is possible that familiarity has no effect on awareness checking behavior, two alternative explanations are also probable here. Firstly, as Culpeper (Culpeper, 1996) puts it, in terms of politeness, familiarity is entangled with intimacy and similarity. A simple dichotomous operationalization of friends vs. strangers might have been omitting not only the nuance in the spectrum of familiarity, but also in the

dimensions of intimacy or similarity. Relating to this first explanation, it is also possible that our manipulation of strangers and friends pairs was not as rigorous as desired. "Friends" may have been acquaintances from class, for example, and "strangers" might expect to encounter one another in the classroom, especially for the Chinese participants, who are a minority group in this university. It would be useful to replicate the study using stranger pairs with no possible prior and anticipated future interaction.

We did find, however, that people thought of themselves as more annoying when they conducted awareness checks frequently toward strangers than toward someone they know. This finding supports the idea that familiarity is an important factor when determining the appropriateness of certain behavior.

One puzzling finding is the lack of correlation between awareness checks and assessments of social attraction, either overall or in the American or Chinese samples separately. There are several possible explanations for this. It could be, for example, that awareness checking actually had no effect on social attraction or that the measurement scale was not sensitive enough to capture any effects that did occur. As awareness checking has influenced social attraction in prior work (Huijnen et al., 2004; D. Tang & Birnholtz, 2010), this merits further study in an intercultural context.

5.2   Implications for design

These findings have several implications for designers of collaboration systems to consider. The overarching theme is that it is important to consider the relational context of action.

The finding that Chinese participants conducted fewer awareness checks than Americans – even when it would have benefited them to do so in terms of task performance – suggests two design possibilities. First, it suggests that evaluating awareness tools only on the extent to which they improve task performance, a common CSCW measure in past studies (Dabbish & Kraut, 2003, 2004), may not be as appropriate or useful in more relationship-focused contexts. Designers might consider ways to measure the perceived effects of such tools on social relationships, and to build features into these tools that allow for gathering information in relationally sensitive ways. One might, for example, allow for different types of virtual approaches (e.g., subtle vs. more obvious) with different contacts, or even provide users from relationship-focused culture with suggestions on when it might be ok to interrupt, or even, in some cases, encourage them to conduct awareness checks on somebody from another culture in order to proceed on the task.

Relating to this, the contrast between the results about annoyingness of participants themselves and their partners is worth mentioning, too. Positive correlations were found between the awareness checks frequency and participants' ratings of their own annoyingness, but not between the checks and their partner's annoyingness. This suggests that people have different standards for themselves and for others in judging the appropriateness of gathering awareness information, and they are not necessarily aware of it. It provides further support for integrating an encouraging mechanism when designing awareness information system, given that increased awareness checks come with better task performance, both actual and perceived, as our results suggest. Such an encouraging mechanism can range from setting the rules explicitly to visually presenting the contacts in a friendly and equal way.

With regard to working with friends and strangers, it is further noteworthy from a design standpoint that, for participants working with strangers, there was a positive relationship between awareness checks and one's own perceived annoyingness. This highlights the tradeoffs involved in building systems that allow for improved task performance, but in which some valuable behaviors have possible negative social consequences. This suggests that, when collaborators are likely to be working with an unfamiliar partner, it may be useful for them, before and during their collaboration, to discuss norms around interruption and possible annoyances, and when these are acceptable.

It may further be useful to consider these tradeoffs in the design of interfaces that are sensitive to whether people are working with known collaborators or strangers. Using histories from prior collaborations, for example, systems might help people by visualizing their behavior against past groups or personal history

(e.g., Leshed, Hancock, Cosley, McLeod, & Gay, 2007) to gauge whether or not they are actually being annoying. This could help those who may be overly concerned with annoying their partner be more productive, in a relationally sensitive way.

5.3   Limitations and future directions

Our study aimed to replicate a real-world situation in which one had to make the choice between enhancing one's productivity and nurturing relationships. As such, we engineered the task in a way that there was a significant performance advantage to regularly performing awareness checks. Although we found that the Americans and Chinese performed the awareness checks differently, we still lack a fine-grained understanding of where this difference originates. Literatures have suggested a few possible but untested answers. For example, Nakane (Nakane, 2007) found Japanese students usually avoid interrupting others as a face-saving strategy; Chinese are quite similar in this respect. In the future, we hope to follow up with interviews that probe the reasons that Americans and Chinese participants do or do not perform awareness checks; this will also further help us in avoiding the trap of oversimplified application of intercultural theories.

A possible confounding factor in our study is that Chinese participants in the stranger pairs, although with no interaction history just as their American counterparts, might still feel closer toward each other psychologically, because the population of Chinese students at our university is much smaller than that of Americans. Being a member of the minority group activates the salience of their cultural identity and makes them feel closer toward each other than two American strangers might have felt in the same setting (Schmitt, Spears, & Branscombe, 2003). In addition, they may have higher expectation for future interaction, which could also have influenced their behaviors (Gibbs, Ellison, & Heino, 2006; Walther, 1994).

Finally, awareness information gathering is just one example of many behaviors in workplace that are, on one hand, beneficial for one's own or the group's overall task performance, but on the other hand, present a potential threat to interpersonal relationships between collaborators. Being aggressive, or being "pushy", for example, may enhance the team effectiveness, but at the same time reduce the social attraction of team members. Future research will be needed to test the generalizability of our findings to these similar kinds of work behaviors.

6   Conclusion

In summary, this study explored how awareness information gathering behavior may be influenced by one's own cultural background and familiarity with one's partner. It suggests that members of relationship-oriented cultures (e.g.: China) conduct awareness checks less frequently than members of task-oriented culture (e.g., the States), probably due to the fact that task-oriented cultures legitimize the task-related behaviors, such as awareness information gathering, more so than relationship-oriented cultures. The study also examined the effects of awareness checking behaviors on people's perceptions of themselves and their partner's task performance and annoyingness, as well as partner's social attraction.

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8   Table of Figures

9   Table of Tables