Real-time Collaborative Editing Behavior in U.S. and Japanese Distributed Teams

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ABSTRACT

While there are tools that allow distributed teams to collaboratively edit in real time, little work examines this practice among real teams doing real work. Even less is known about how teams from different countries make use of real-time collaborative editing tools. The current work highlights results from a qualitative user study of real-world Japanese and U.S. distributed work teams who used LiveDeck, a real-time slide editing and whiteboarding tool. Through the implementation of various novel features used as probes, differences in behavior and attitudes between team members were uncovered. Differences in the use of slide navigation options, anonymity features, and pop-up 'emotes' representing nonverbal gestures are discussed.

Author Keywords

CSCW, collaborative editing, distributed teams, cultural differences, computer-mediated communication

ACM Classification Keywords

H5.3. Group and Organization Interfaces: Computer Supported Collaborative Work

General Terms

Human Factors

INTRODUCTION

Collaborative software that is popular in one country may not always be adopted in another. This may be due to the fact that certain collaborative tools may not fully support aspects of communication emphasized by a particular country (e.g., [27]). Yet, even when technologies are adopted across countries, they are not always adopted for the same reasons (e.g., [23,34]) or in the same ways (e.g., [19]). Little empirical research, however, has examined in depth how distributed teams use real-time collaboration tools for their actual day-to-day work, and fewer studies have examined whether use of these tools differs across countries. That some recent tools intended to support real-time communication and collaboration, such as Google Wave, have been unpopular with consumers [7] seems to

contribute to even more uncertainty over what features users desire from real-time collaboration tools.

Various aspects of communication and culture may contribute to whether a distributed team uses a given tool. For instance, the emphasis on nonverbal communication in some countries might make individuals less likely to adopt technologies that minimize nonverbal cues. Or, individuals from countries where independence and uniqueness is valued may be less likely to use technologies that emphasize group control. Yet the extent to which one's cultural background relates to behaviors and preferences for certain real-time editing features is largely unknown.

Understanding how individuals in different countries use real-time collaboration tools is important for two main reasons. First, understanding which technology features are preferable in different countries may allow designers and developers to understand which features may be adopted globally and which features are important to tailor to specific audiences. Second, understanding how individuals use various features may help us better understand whether cultural differences identified by a large body of empirical research persist in a distributed, collaborative environment.

In this paper, we address the research question: How do Japanese and U.S. distributed work teams use real-time collaborative editing tools? In order to examine the usage of different real-time collaboration features in Japanese and U.S. teams, we conducted an exploratory study of Japanese and U.S. distributed work teams' use of LiveDeck, a system that supports real-time collaborative editing of presentation slides. Using LiveDeck, a nascent prototype, we inserted various features as "cultural probes" [2,5] in order to understand usage patterns in both Japan and the U.S. Results reveal how Japanese and U.S. participants differ in their use of various novel LiveDeck features, including group vs. independent slide navigation, anonymity features, and pop-up 'emotes' that represent select nonverbal behaviors. In addition, results suggest that Japanese and U.S. participants differ in their attitudes and rationale behind their use of various features.

In the following related work section, we review some of the literature that shaped our exploratory processes. We used the previous findings to inform both the probes that we built into LiveDeck and the themes that we explored.

RELATED WORK
Collaborative Content Creation & Editing
When collaborating at a distance, individuals must negotiate the process of coordination and deal with issues such as miscommunication and awareness of group members' behavior. Early tools like ShrEdit [14] allowed users to work on different parts of a document in parallel, and more recent tools like CoWord and CoPowerpoint allow users to work collaboratively within out-of-the-box software platforms [35]. How one navigates through a document or set of slides is important for real-time collaboration and is often examined from an awareness perspective (e.g., [16,17]). Yet, navigation control, or who controls what the group sees, is also important. While many slide-sharing tools typically assign a "leader", where one person navigates through the slides for the group, other systems (e.g., [17]) allow users to move from slide to slide on their own. It is unclear, however, whether these or additional options might be better suited to the work styles of individuals from different backgrounds.

One commonly discussed issue for distributed teams who collaborate online is the lack of nonverbal cues during distributed collaborations. This can be troublesome for teams (see [12] for a review) and may be especially hard on individuals who rely heavily on nonverbal communication for understanding. Proxies for nonverbal communication, such as emoticons, are often present in web conferencing software and may help promote friendship formation [36] or satisfaction with a tool [30]. It is unclear, however, whether these findings hold for distributed work teams as emoticons may be interpreted as unserious. There is also no clear consensus on how representations of other nonverbal behaviors like gestures may be interpreted in a real-time collaborative environment.

Another issue for distributed teams is conflict. Previous research has indicated that distributed teams experience more conflict than collocated teams (e.g., [11]). Issues of conflict may be especially significant for teams that place emphasis on maintaining social harmony. However, certain features of a tool may help to mitigate conflicts, maintain social harmony, and may be more effective for teams from certain countries. For instance, being able to communicate anonymously may make it easier for group members to make contributions during meetings (e.g., [14]) or to provide constructive criticism [37]. Or, anonymity might make individuals less likely to participate since they cannot be as easily held accountable. However, issues such as how easily a message sender can hide her identity or how strongly the message recipient wishes to identify the sender may influence how anonymity features are adopted [28].

In order to better understand how teams in Japan and the U.S. might use real-time collaborative editing tools, we review the differences between these two cultures.

Japanese & American Culture
Across disciplines and within the field of HCI, numerous conceptualizations of culture have been put forth (e.g., [13]; see [25] for a review). One definition conceptualizes culture as concepts, values, and schemata that are developed from experiences and that are specific to certain contexts [33]. While there are many levels of culture including the accepted norms and schemas held by people in a particular job role or team (e.g., [3,18]), the current work focuses on national culture, as defined by geographic location. Though we do not assume that every Japanese or American individual is alike, a vast body of empirically supported literature has identified several differences in how individuals from these two cultures behave and communicate. Different cultural dimensions, however, may become more or less salient depending on the social context or situation [6], suggesting the need for an investigation of the role of culture in novel environments.

One cultural difference between Japanese and American individuals is how they define the self. Japanese individuals typically have a sense of self that is interdependent, or defined by their relationships with others. Interdependent societies emphasize one's membership in a group, as well as the promotion and maintenance of interpersonal harmony (e.g., [22]). In a work setting, consensus is emphasized, and Japanese individuals often exert much effort to gain group consensus during decision-making processes [15]. Alternatively, individuals in the U.S. typically identify with an independent sense of self, which emphasizes being unique from others and promotes the expression of unique ideas and opinions, even at the risk of threatening social harmony (e.g., [22]).

Another difference identified in previous research is the use of nonverbal communication. Japanese individuals tend to rely on (often subtle) nonverbal behaviors, such as eye movements, smiles, and other facial expressions for social feedback [9,15] while Americans tend to rely more on language when communicating [8]. Additionally, Japanese and Americans often differ in their focus on hierarchies. While Americans recognize social hierarchies, individuals in Japan tend to be more cognizant of hierarchies in interpersonal interactions, and place high value on respecting people in leadership roles [31]. In one study, Japanese individuals perceived greater differences in verbal (e.g., length of sentences, volume of speech) and nonverbal (e.g., smiling, using eye contact) behavior based on status/hierarchy than did Americans [20].

Japanese and American individuals may also differ in their strategies for expressing opinions. For instance, one study of the Japanese and U.S. versions of Slashdot, an online news community, found that Japanese users were more likely to post their opinions anonymously than were U.S. users [24]. In fact, researchers have debated the extent to which Japanese individuals are able to express their true feelings in anonymous questionnaires and note that individuals in Japan may be more likely to say one thing but mean another in order to publically present themselves in the right way (see [10] for a review). Yet, these findings may not hold in situations where individuals are acquainted
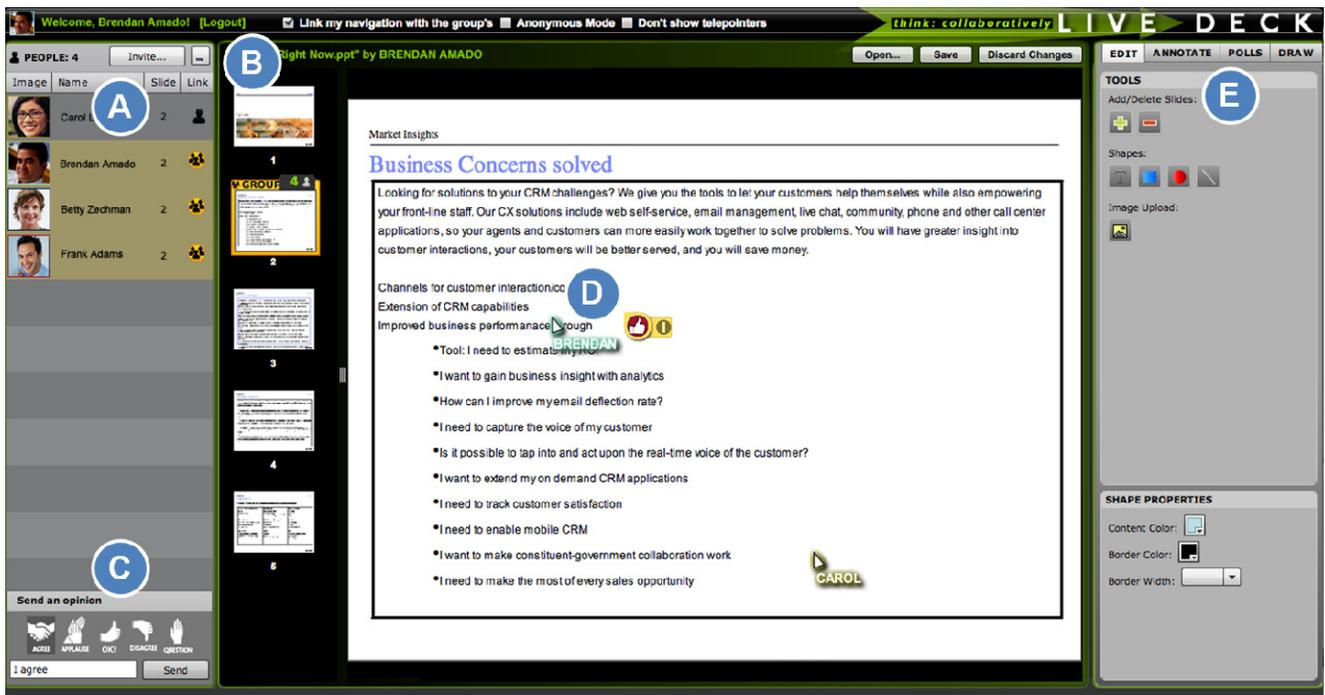
Figure 1. The LiveDeck interface as viewed by the user 'Brendan Amado' (names have been changed to preserve privacy). (A) Meeting participant list. The list shows the slide number participants are on and whether they are in 'group' (highlighted in yellow) or 'independent' navigation mode. (B) Slide thumbnails allow users to navigate slides and show the number of people viewing a slide. Here, all participants are viewing slide 2. (C) 'Emotes' allow users to send a pre-generated or custom message. (D) Slide content showing a telepointer of a user and a minimized 'thumbs up' sticky note. (E) Editing tab. Other tabs allow users to use 'sticky notes', create polls, and draw freehand.

or plan to have non-anonymous interaction in addition to anonymous interaction.

Cultural backgrounds may influence the extent to which equal participation and collaboration within groups is achieved. For instance, in Japan where a hierarchical structure is salient, workers may feel uncomfortable making suggestions in front of their superiors and peers for fear of disrupting social harmony. While this respect likely works for some types of work, it may be problematic in a collaborative exercise where more participation across group members might yield more and varied ideas. Yet, another central aspect of eastern cultures like Japan is that individuals should act for the good of the group [4]. Making suggestions in the form of constructive criticism may ultimately benefit the group yet the concern for respecting and not embarrassing others seems at odds with this goal. Therefore, it is unclear how Japanese individuals may use anonymous features during collaborative work.

In the current work, we are interested in examining how these cultural differences may affect how distributed teams behave and communicate in a real-time collaborative editing environment. While cultural differences have been studied extensively across various disciplines, there has been little empirical work examining how individuals from different cultures use real-time collaborative tools. Furthermore, the majority of work on this topic has looked at how randomly assigned teams complete arbitrary tasks in a laboratory setting. While there are benefits to this type of

methodology, little is known about how real-world distributed teams in different countries use real-time collaborative tools for real work.

LIVEDECK

LiveDeck is a web-based, real-time, synchronous slide editing / whiteboarding tool. It is built using Adobe Flash [1] and supports both Microsoft PowerPoint and Open Document Presentation formats. Users can work on an existing slide deck or create a new one using templates available from within LiveDeck. Users invite others to join them for real-time collaboration by sending them the unique meeting URL LiveDeck creates for each slide deck. Below we describe the main features of LiveDeck, including those used to probe certain topics. Figure 1 provides a screenshot of the complete LiveDeck interface.

Group vs. Independent Navigation

There may be many reasons why users want to navigate a slide deck independently, as opposed to passively viewing what the presenter is showing. In a presentation meeting, users that arrive late may want to view content that they missed. Others may want to skip ahead. In brainstorming or collaborative editing meetings, users might want to form subgroups to work on separate slides. LiveDeck supports all of these scenarios. By default, when users log in, they are in 'independent' navigation mode. They can group their navigation with others by clicking a checkbox at the top left of the LiveDeck interface. In LiveDeck we did not want to have users rely on a moderator who assigns privileges such

Figure 2. An 'applause' emote from 'Carol Li'.

Team	Country	Size	Task Type
Team 1	Japan	12	Brainstorming
Team 2	Japan	4	Reporting project updates
Team 3	Japan	4	Review slides with feedback
Team 4	Japan	4	Project planning, minute taking
Team 5	USA	3	Reporting project updates
Team 6	USA	5	Brainstorming
Team 7	USA	4	Review slides with feedback
Team 8	USA	8	Review slides with feedback

Table 1. Summary of Teams Observed.

as controlling slide navigation. Thus, when any user in 'group' navigation mode moves from one slide to another, all other users that are grouped together move with her. There is only one group and users may not force other users into the group; users must self-select into the group. These navigation options allowed us to probe how one's sense of self (interdependent vs. independent) [22] might influence individuals' preferences for slide navigation options.

Anonymous mode

Based on findings that hierarchy and group harmony are more salient in Japanese culture than in the U.S. [10,31], we implemented an anonymous mode as a probe to determine if anonymity makes a difference in expressing constructive criticism. Users can choose to be in anonymous mode by checking the 'anonymous mode' checkbox at the top of the interface. When a user is in anonymous mode, her telepointer, annotations created, and emotes sent are not associated with her identity.

Emotes

To explore how findings that Japanese individuals focus on nonverbal behavior in face-to-face conversation [9] might be manifested in an online setting, we included a set of five "emotes" or expressions with pre-determined sayings ('Agree', 'Applause', 'OK!', 'Disagree', and 'Question'). A corresponding picture of a gesture accompanied each saying. We confirmed that these gestures held the same meaning in Japan and in the U.S. Users can customize the message by typing in the text box in the emote window. Sending an emote causes a pulsating square to appear around a user's picture (see Figure 2). All emotes except 'Question' disappear after 3 seconds. The 'Question' emote stays active until the user who sent it cancels it.

Annotations

We wanted users to be able to quickly provide comments on aspects of a slide that would persist and could be saved as metadata. For example, a user might want to remark that she does not agree with a particular point in the slide, with the intention of revising it later. We thus allow LiveDeck users to input six types of 'sticky notes': 'Plain', 'Thumbs up', 'Thumbs down', 'Important', 'Question', and 'Bookmark'. There is also an annotations tab, along with a log that lists what annotations have been created on what slide. The log items are hyperlinks, allowing users to easily navigate to the slide containing the annotation. Users can also reply to an annotation, similar to chat.

Polls

To allow users to get quick feedback on an issue and to further explore issues of anonymity, we implemented polls in LiveDeck. From the polls tab, users can create a slide-specific or global poll. A slide-specific poll is shown in the poll tab on that slide whereas global polls are shown regardless of the slide a user is on. Users can specify whether the poll requires a yes/no response or a choice from multiple options. Users receive a pop-up message when a poll gets created, requesting them to participate. The poll creator can see how many people have voted and can end the poll, though all votes are cast anonymously.

METHOD

Participants

Participants ($N=44$) were employees at a large international technology organization who volunteered to use LiveDeck with their teams. 44 individuals across 8 teams participated in a LiveDeck meeting and 31 volunteered to participate in a follow-up interview. 18 were male and 13 were female. Participants had on average 11.5 years of full-time work experience. Participants were fairly familiar with their team members, and reported an average familiarity of 6.9 on a scale of 1 to 9 (1=*not at all familiar*, 9=*extremely familiar)* Teams ranged in job role (e.g., sales, product development), size, and task type (see Table 1 for a summary). The average meeting lasted 67 minutes.

Procedure & Analysis

The researchers contacted team leaders to see if they would be interested in using LiveDeck as part of a user study. Teams were chosen based on the fact that they were distributed, that members all worked in different locations in the same country, and that they had regularly scheduled meetings for collaborative activities. The LiveDeck interface was internationalized, and teams worked on tasks in LiveDeck in their native language. The researchers did not assign tasks; tasks were already on teams' agendas. Team members communicated via telephone while they used LiveDeck and the researchers recorded these calls.

A demo was provided to the teams that agreed to use LiveDeck. This allowed team members to become familiar with the tool. We do not report any data from the demos. The data reported in this paper is from the meeting where LiveDeck was used for real work following the demo. After that meeting, participants were contacted via email to see if they would participate in a 30-minute individual interview.

A semi-structured interview script was developed based upon a thorough literature review on various topics related to collaborative editing and cultural differences between individuals in Japan and the U.S. Although we intended to

explore certain themes identified in the interview script, the semi-structured nature allowed participants to tell us what they thought was relevant, which allowed for the possibility of additional themes to emerge. The interview script was originally crafted in English and later translated to Japanese. Extensive discussion of the interview items occurred between the American and Japanese researchers in order to keep the two interview guides as semantically similar as possible. In addition, a researcher outside the immediate team fluent in both languages reviewed the two interview scripts to ensure that the meaning of the English questions was accurately transferred.

American participants were observed and interviewed by the American members of the research team and Japanese participants were observed and interviewed by the Japanese members. The researchers logged into LiveDeck and observed the meetings and accompanying audio calls as a 'fly on the wall'. Researchers were not co-located with any of the participants during the meetings. Audio recordings and screenshots of the meetings were made during the observations and interviews, which were conducted via telephone. These were recorded with the permission of participants and later transcribed in the language they were conducted. Japanese interviews were then translated into English by the Japanese members of the research team, who are fluent in both English and Japanese. In addition, all actions performed in LiveDeck were captured in a log.

Conducting observations and interviews in the participant's native language reduces the potentially harmful effects of a language barrier, such as second language anxiety [32], in cross-cultural research. In other words, Japanese participants did not have the strain of answering questions in English, which likely allowed them to be more clear and thorough. U.S. and Japanese members of the research team discussed the interview data in English.

English language versions of the interviews were coded using HyperResearch [29], a qualitative analysis software tool, to identify themes related to the use of LiveDeck's various features. We used an iterative process, reading through interviews and field notes several times, applying initial codes, and then reevaluating and changing codes as we delved deeper into the data. Transcripts were tagged with codes related to themes identified from the previous literature and to topics that interviewees brought up themselves. Some codes were more general (e.g., "likes emotes") while others were more specific (e.g., "likes emotes – friendly"; "likes emotes – easy to interrupt"). As patterns began to emerge, the interview script was altered to reflect these discoveries. Additionally, follow-up interviews were conducted with some participants to further explore emergent topics of interest. After the interviews were coded, we focused on the more frequently occurring codes to develop themes related to the use of the probes. Ultimately, we identified three themes related to LiveDeck features that represented our sample.

RESULTS

While numerous interesting aspects emerged from our exploratory research, we will mainly focus on three: *group vs. independent navigation, emotes (proxies for nonverbal behavior),* and *anonymity features.* We note that our study was not a formal evaluation of LiveDeck. Rather, it was an attempt to understand real-time collaborative editing behavior in Japan and the U.S., using LiveDeck as a probe.

Group vs. Independent Navigation

Participants in Japan and the U.S. used the navigation features differently. While U.S. participants primarily used independent navigation, Japanese participants used group navigation about 41% of the time of the entire meeting and independent navigation about 59% of the time (across teams), noting the usefulness of both. On the one hand, using the group navigation option seemed to help Japanese groups stay connected to their leaders:

"Linking with the moderator's page is very important because we have to see the same page as the moderator. Sometimes I need the moderator's command, so the 'link with group' option is important." **(Interviewee 9, Japan)**

On the other hand, some Japanese participants also liked the ability to move freely through the slide deck:

"I think both of these modes will be necessary. Basically, it is usual that everyone watches the same slide at the same time. But sometimes I want to go back to the previous chart, or want to see the following slides. In such cases, it will be convenient to use this function to go to other slides separately." **(Interviewee 17, Japan)**

However, some Japanese participants wished there was less control for each group member over the slide navigation and more control for one person who would be in charge. For example:

"I think it is better if LiveDeck has a function to lock other people's operation. If freely editing slides interrupts the progress of the meeting, it is better if a moderator can prevent the editing of slides." **(Interviewee 1, Japan)**

Alternatively, most U.S. participants (82%) responded well to the fact that there was no one leader in charge of navigating the slides for the group. For example:

"I liked the fact that there was not just one person running the meeting who had to hand off control to everybody else. I thought that made for a much more interactive and lively meeting." **(Interviewee 12, USA)**

Many U.S. participants liked the fact that they could look at different slides but still be a part of the meeting. For instance, one participant noted that she…

"…felt comfortable that if people were on different pages, they could still contribute to that conversation."

And further mentioned:

"It felt like we were in a real meeting and someone would just flip over a piece of paper." **(Interviewee 13, USA)**

In fact, several U.S. participants explained that monitoring the movement of others actually contributed to a greater sense of awareness. Taken together, these observed differences in preferences for group vs. independent navigation may be related to previous work suggesting that individuals in the U.S. tend to value independence while individuals in Japan tend to value interdependence.

Emotes

As previously discussed, a menu of 'emotes' or pop-up features representing various nonverbal expressions and gestures such as "Agree" or "OK!" was implemented. Japanese participants used these emotes overwhelmingly more often than did U.S. participants. While there were 91 instances of emote use across Japanese teams, only 7 instances of emote use occurred in two U.S. teams; the other U.S. teams did not use the emotes at all. Of Japanese participants who used the emotes, 93% rated them favorably. Japanese participants liked the emotes for various reasons. For instance, one participant explained:

"The functions we used were the Applause, OK, and Question buttons. We cannot nod in a telephone conference, so this function is good because we can casually send our opinions." **(Interviewee 6, Japan)**

In addition to replacing nonverbal behavior like nodding which may be typical of face-to-face meetings, Japanese participants felt that the emotes promoted a level of friendliness that is often difficult to achieve over the phone. For instance:

"The pictures of hands [emotes icons] *were very good for me. They were very friendly. So it is easy to send my opinion by using the pop-up message and also I'm happy to receive opinions by pop-up message. So it is not cold. I think it is a good balance."* **(Interviewee 9, Japan)**

Japanese participants also used the emotes as a way of communicating without disrupting the main conversation during the meeting. For instance, one participant explained:

"When it is hard to ask a question, especially in the case of a remote meeting, it is good to ask a question by using the left side button without interrupting the discussion." **(Interviewee 8, Japan)**

Another Japanese participant echoed these sentiments:

"When I say something by telephone, I interrupt the talking. If I want to say 'I think this is good' or make an agreement, and do not have something to say in detail, I do not have to interrupt by using this button. So it is convenient." **(Interviewee 4, Japan)**

Alternatively, U.S. participants did not view the emotes as a way to communicate without disturbing the discussion. About 55% of U.S. participants attributed their lack of emote use to the size of the group, and could see how the emotes might be useful in larger meetings. For instance:

"Sometimes when you have a big meeting with 20, 25, 30 or even 40 people … the head nodding and hearing people say, 'yes this looks fine', that sort of pulse of where the audience is, it's useful to get that. If you only have 5 people on the call, you can just ask. People will talk and give you that. I think it's [the emotes] *useful when it's impractical for each person to speak individually. … I think it's useful for large groups to see what the general mood and temperature is."* **(Interviewee 12, USA)**

While group size may be the moderating factor behind emote use for U.S. teams, it may not be for Japanese teams, since Japanese teams that were similar in size to the U.S. teams did use the emotes. Interestingly, a few U.S. participants saw emotes as beneficial to the extent that they reduce or omit other nonverbal cues that may exist in web meetings. One participant explained:

"The agree/disagree buttons you have, it takes away the verbal inflection of the voice. You can have somebody that agrees with something who is very polite about it, and somebody who agrees with something who is very rude about it. So it kind of gives you the chance to be neutral." **(Interviewee 11, USA)**

For this participant, neutrality could minimize the harmful effects of a team member who is being negative or dominant and bringing down the morale of the team.

About 34% of emotes sent by Japanese participants were accompanied by custom messages such as "Great", "Cheers for good work", and full-sentence questions to accompany the Question emote. One participant explained:

"I wanted to show my activeness with my words. I can provide my meaning to the moderator by using the custom message." **(Interviewee 9, Japan)**

This feedback suggests that using pictorial descriptions of feedback such as "Applause" or "OK!" may not express sufficient meaning in some circumstances, and further clarification is needed. Furthermore, the fact that some Japanese participants inserted their own messages may be an example of an adaptation to overcome certain limitations of the technology. Overall, however, Japanese participants thought that the emotes enhanced their meetings:

"It makes the meeting more alive." **(Interviewee 25, Japan)**

Anonymity Features

In addition to the group vs. independent navigation option and emotes, we included features to allow participants to behave and communicate anonymously in their meetings. The main feature for this was "anonymous mode" which was an opt-in choice that rendered all comments and behavior (e.g., switching slides, telepointer movement on the slide screen) unlinked to one's identity. One reason for including an anonymous mode, as suggested by a fellow researcher in Japan, was to explore whether or not Japanese participants would be able to express unique ideas and opinions more comfortably under the guise of anonymity.

Somewhat surprisingly, Japanese participants did not use anonymous mode in their meetings other than trying it out to see how it worked. Furthermore, a vast majority (90%) of Japanese participants noted that anonymous mode was

not appropriate for meetings where team members are acquainted with one another or for meetings where the team is relatively small. Participants revealed several explanations for these preferences. For instance:

"If I say something by anonymous mode, other people will think 'who is it?' and will not take it seriously. If I write a comment, people cannot understand who wrote it, and they cannot determine how important it is." (Interviewee 8, Japan)

Participants also said that they would not make a comment anonymously, *especially* if it was constructive criticism.

"When we talk about criticism, the meeting does not work if we do not know who says the criticism. An anonymous opinion does not have much meaning." (Interviewee 5, Japan)

While we might have expected that criticism would be easier to say if it could be done without the potential threat to one's standing with one's teammates, it seems that criticisms without knowing the source would be meaningless to the Japanese participants in our study.

This feedback reveals two important aspects of why anonymity does not work in the types of meetings we observed. First, team members might try to guess who made the anonymous comment, which may be distracting to the team and could ultimately disrupt group harmony. Second, this participant's feedback highlights the importance of the context of the message. Knowing who said a comment may influence how to interpret the comment or determine its importance.

Japanese participants, however, did not reject all of the anonymity features. The polling feature, which allows any user to create a poll and send it to the team for an anonymous vote, was used and liked by Japanese participants. An average of 2.2 polls was created per Japanese team. 80% of participants felt that the polls were a convenient way to gather opinions from the group and liked that one's vote was anonymous. For example:

"Hiding results until voting finishes is also good because we do not change our opinions by watching other people's opinions." (Interviewee 2, Japan)

As opposed to anonymous comments that Japanese participants wanted to be able to attribute to a particular individual, the anonymous polls, which were used in order to gather opinions across the group, enabled Japanese participants to express their unique opinions without being influenced by the opinions of others. Furthermore, this feature was popular since it allows individuals to express themselves without obviously standing out from the group, which may disrupt group harmony and threaten one's standing in the group.

U.S. participants did not use anonymous mode, nor did they use the polling features. In order to gather opinions, U.S. participants used the audio channel rather than the polling feature. For instance, one participant in Team 5 asked the group if there was a website they looked at everyday, and each group member took his turn on the audio channel giving his response. Furthermore, U.S. participants were not concerned about their identity being tied to their comments or behavior, nor were they concerned about disrupting group harmony. In addition, U.S. participants felt that these features neither encouraged nor hindered the ability to express their opinions.

Most Japanese participants (85%), however, noted that they could see a use for anonymous mode in certain circumstances. The first is when one is participating in a meeting with a large group (e.g., greater than 20) where individuals do not have much or any previous experience with each other. In this type of meeting, many Japanese participants felt it would be difficult to make a unique or slightly critical comment if it was attached to their identity. One participant noted that the option to use anonymous mode in this type of meeting …

"…would reduce the psychological burden when I say something that is totally different from what we are talking about." (Interviewee 4, Japan)

Another Japanese participant explained why he would use the anonymous mode in a meeting where people do not know much about each other:

"The reason is, I do not want to give a negative impression by saying a negative opinion. In our case, we knew about each other. If participants know about the personality of each person, we will acknowledge negative opinions." (Interviewee 3, Japan)

This participant's comments reveal an interesting distinction about how critiques are received. Making negative remarks in front of people one knows well is considered acceptable because it will not reflect poorly on one's character or 'face'; one's character is already known to the group. Making comments in front of people that one does not know well may lead those others to conclude that the person is divisive and would disrupt social harmony.

Similarly, some Japanese participants said that anonymous mode would be helpful for meetings with customers. For instance:

"When customers are participating, it is good to have anonymous mode to make it easy for customers to say opinions. But I think it is not necessary as an internal tool. … From my experience, customers cannot say opinions by raising their hands. Because I think they especially have difficulties saying counterarguments, it will be useful. … It is difficult for customers to say counterarguments, like negative opinions about our product, with saying their names." (Interviewee 26, Japan)

Another situation where anonymous mode could be helpful is when communicating with one's superior. Several Japanese participants explained that anonymous mode would be useful for expressing opinions where they might be reticent to do so. For instance:

"I think [anonymous mode] *is necessary to say critiques ... in some cases, for example, in the case that it is difficult to say an opinion to your boss."* **(Interviewee 7, Japan)**

Some U.S. participants (45%) could also see some use for anonymous mode, though their examples were based on personality rather than relationships or group context. For example:

"I think where it [anonymous mode] *may work - for people who are quieter and maybe don't like to talk as much - it may give them the opportunity where they could post a comment or pose a question."* **(Interviewee 13, USA)**

While Japanese participants thought of different contexts, U.S. participants mainly thought of a different personality type for which anonymous mode might be useful.

DISCUSSION

By introducing specific features into a real-time collaborative editing environment, we were able to uncover both behavioral and attitudinal insights about how Japanese and American distributed work teams communicate and collaborate. The first feature or probe was the option for group vs. independent navigation in the slide deck. Japanese participants saw a use for both the group and independent navigation while U.S. participants almost always used the independent navigation. Interestingly, both U.S. and Japanese participants noted that feeling a part of the group was important. However, U.S. participants still felt part of the group without actually linking to the group navigation, while Japanese participants tended to attribute feeling connected to the group to joining the group navigation. It seems that while the goal of feeling connected to the group was shared across Japanese and U.S. teams, the way the teams achieved the goal was different. This finding suggests that explicit interface indications of being "in the group", such as our group icon indicating those in the shared navigational state, may be especially useful in cultures that promote an interdependent sense of self.

Yet, the lack of a leader was problematic for some Japanese participants. This may be due to the fact that typical business meetings in Japan are formal, contain a fair amount of structure, and emphasize social roles or hierarchies. Accordingly, several Japanese participants suggested we implement a 'presenter mode' as a third navigation option. This option would appoint a 'leader' who would control the slide navigation, similar to the way many web meeting presentation tools operate. Interestingly, this mode was requested not for traditional slide sharing but for collaborative editing and brainstorming activities, suggesting that an environment with no leader may not be ideal for activities that are traditionally thought of as egalitarian. On the other hand, American culture tends to place more of an emphasis on freedom, such as the freedom to express an idea even if it disrupts social harmony [22]. This may help to explain why U.S. participants tended to use the independent navigation option.

Japanese participants' reasons for using the emotes suggests that ethereal, relatively innocuous messages which represent nonverbal behaviors that might occur in a face-to-face meeting help to create a feeling of friendliness among team members. Furthermore, these emotes served as a way of contributing to the meeting swiftly but without interrupting the main flow of the meeting, reflecting previous findings that Japanese individuals are concerned with maintaining group harmony. And while U.S. participants said small meeting size was the reason they did not use emotes, similarly sized Japanese teams did choose to use emotes. Japanese participants may prefer to use emotes because they remind them of "kawaii", an aspect of Japanese culture that refers to cute things that evoke positive emotions and feelings of social affiliation [26]. Or, they may have felt more comfortable providing their input through emotes than through other channels.

The inclusion of the anonymous features (anonymous mode, anonymous voting in polls) revealed differences among Japanese and U.S. participants in terms of how they might use such tools across various business situations. While Japanese participants felt that anonymous mode was inappropriate for meetings with their familiar teams, they pointed out various instances where anonymous mode might be useful. Alternatively, U.S. participants could not easily see a use for anonymous mode. That anonymous mode, a feature we thought might aid in maintaining harmony, was problematic for teams reflects the inconsistent findings in the literature about the benefits of anonymity in group work [21], and suggests that we may need to reevaluate the link between group harmony and anonymity. In addition, our findings suggest that different types of anonymity features may be more or less successful in actually disguising one's opinion. Though anonymous mode does not connect comments and edits with one's name, participants suggested that it might be possible to discern the identity of the content creator through other cues. Not only would this practice be distracting, it might make others unwilling to use anonymous mode for fear that it would not actually mask one's identity.

The anonymous polls, however, seemed to thoroughly disguise participants' opinions, and Japanese participants liked this feature. There seemed to be a difference with the sort of opinions participants wished to gather via a poll vs. the opinions participants wished to gather through text-based comments or over the telephone. With a poll, the information is collected to gain an understanding of how the group feels at an aggregate level. Individual comments, however, typically come attached with meaning based on the individual's identity, which carries information such as status or personality. That individual comments would lack this contextual information was problematic for participants working with familiar co-workers. Taken with previous research [10,24], our data suggest that the appropriateness of acting anonymously differs across situational contexts. While anonymous behavior may be appropriate in online communities or even with unfamiliar clients, acting

anonymously within one's familiar work team may be awkward or even problematic.

These observed differences across Japanese and U.S. teams suggest that the usability of the system was at some level influenced by cultural distinctions in the interpretations of features. In addition, our findings indicate that knowledge of cultural differences at the aggregate level cannot simply be mapped onto the design of collaborative software to improve usage across cultures. Rather, specific aspects of culture, such as the desire to maintain social harmony or the tendency to communicate through nonverbal behavior, must be explored across different scenarios in order to understand how one's background may influence how one uses collaborative software. Accordingly, our findings suggest that designers of collaborative software should include multiple options for features like slide navigation and anonymity so that users can choose the best option across situations. Furthermore, designers can use insights not only about how but *why* certain features work in order to further expand on these features in the right direction.

Limitations & Future Work

While our work provides new insights into how Japanese and U.S. distributed work teams use real-time collaborative editing tools, there are limitations to our work. First, the number of teams examined was relatively small, and teams were not identified a priori for variables such as task type or team size. While we examined a variety of team sizes and task types, we did not focus on these variables, which have been shown to influence team dynamics and outcomes. Our data revealed that team size and task type might influence Japanese participants' use of LiveDeck. In particular, observing the use of anonymous mode in Japanese teams might be more appropriate for larger teams where participants can more easily hide amongst their fellow teammates or in teams who work with clients. Future work could examine a wider variety of group sizes, including very large teams, to further explore our findings on the use of anonymity, as well as navigation options and emotes. Second, while we examined teams in two different countries, all participants were employed by the same global organization, so findings might be different if individuals from other organizations were included. Finally, since we did not examine teams' use of LiveDeck over time, certain findings may be influenced by the novelty of LiveDeck to users.

Because of these limitations, we are unable to know for sure whether geographic location is at the root of the differences we observed. However, we feel that this in-depth investigation of real teams doing real work can help to inform hypothesis generation for more structured or experimental studies that could potentially isolate the effects of geographic location.

CONCLUSION

In this study, we attempted to gain a deeper understanding of how Japanese and U.S. teams use real-time collaborative editing tools. As real-time collaborative editing software

evolves, it is important to understand what features work for individuals with different cultural backgrounds and in different contexts. By exploring the different features that enhance friendliness, participation, or the ability to express one's opinions, we can continue to unravel the relationship between cultural backgrounds and online collaboration.

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