Leveraging Digital Backchannels to Enhance User Experience in Electronically Mediated Communication

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ABSTRACT
Rendezvous is a conference call solution that leverages Voice over IP, enterprise calendaring, instant messaging, and rich client functionality to enhance the user experience and effectiveness of distributed meetings. We describe the service, and two of its user experience innovations – the conference call proxy and iHelp – which function as digital backchannels. We present results from a preliminary user evaluation, and discuss our notion of digital backchannels with respect to the social translucence framework.

Categories and Subject Descriptors
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1. INTRODUCTION
Computer-mediated communication has become an essential part of work practice in the last decade. People in global organizations or who routinely collaborate with remote colleagues have quickly adapted to the use of email, instant messaging (IM), wikis, and the like, in carrying out their daily work. Audio conferencing, an older technology, still figures prominently in this arsenal of tools, with only the telephone, fax, and email being more common [11].

Despite its frequency of use, audio conferencing suffers from a number of limitations that have been shown to impact the effectiveness of remote meetings [13][14]. Among these are noisy lines or background noise, difficulty hearing the speaker, and not

knowing who is speaking. In this paper, we describe an enhanced audio conferencing solution called Rendezvous, which leverages a corporate Voice over IP (VoIP) network along with other corporate resources such as calendaring, instant messaging, and "rich client" functionality. The goals of Rendezvous include improving the user experience, increasing meeting effectiveness, and lowering the cost of audio conferencing. This paper focuses on two features of Rendezvous that provide a digital backchannel [7][8][14] – a "social proxy" [3][5] for conference calls, and iHelp, a help function that leverages a user's social network.

We begin by reviewing related work. Next we describe the Rendezvous service, its current deployment, and how the conference call proxy and iHelp function as digital backchannels. Finally we present a preliminary user evaluation, and conclude by discussing our expanded notion of digital backchannels with respect to the social translucence framework [4].

2. RELATED WORK
2.1 Backchannels
The concept of a backchannel has two primary references – one from linguistics, where backchannel utterances such as "uh-huh" or "yes, quite" may be used by a listener to indicate that they are listening, or that they agree with what is being said. The other is a political connotation, referring to informal, "unofficial" interaction in the background that can preserve deniability (among other possible benefits) in the public foreground. More recently, researchers have focused on digital backchannels and their role in group interactions – for example one-on-one chats during classroom lectures [2] or the use of chat as a public backchannel in physically-shared spaces such as an academic conference [7].

Cogdill and colleagues [2] analyzed the use of backchannel chat in a MUD where a "mainchannel" conversation was also occurring. The backchannel utterances fell into five categories: process-oriented (analyzing or steering the group process or commenting on the experience of being in the online environment), content-oriented (private responses to mainchannel conversation), participation-enabling (helping users function better in the environment in which the interaction takes place), tangential (taking a thread started in the mainchannel offline), and independent (unrelated to the mainchannel conversation).

Research on backchannels has shown both positive and negative consequences for group interactions, and for backchannel participants and non-participants. Positive consequences include being able to get or give help, ask questions, or provide related

references without disrupting the mainchannel interaction [2][7][8], and helping to "focus and define mainchannel conversation by influencing both process and content." [2][7][8] Negative consequences include distraction (for backchannelers), occasionally rude content, the creation of ingroup/outgroup conflicts, and effects on mainchannel participation (e.g., uneven participation from co-present people, off-topic chat or ill-timed interruptions) [2][7][8][14]. Nevertheless, in professional and work settings research consistently shows a high degree of appropriateness in use of chat and backchannel tools [5][12][14].

It is useful to think of backchannels with respect to Clark and Brennen's [1] notion of common ground; that is, the knowledge that people have in common and know that they have in common. Olson and Olson note that while *visibility* and *audibility* support the establishment and maintenance of common ground in face-to-face interactions, only *audibility* is available to those on conference calls [11]. But as we shall see, the Rendezvous conference call proxy is intended to create visibility and a heightened sense of co-presence.

2.2 Audio Communication and Conferencing

Rendezvous is not the first system to explore ways to enhance audio communication. Moors [9] distinguished between the content of an audio meeting and control information that "conveys information used for speaker identification, feedback, and turn taking." His SmartPhone system let users see who was participating and send feedback to the speaker or to the group through pre-coded text messages. Nelson and colleagues' Quiet Calls system used pre-recorded messages from a mobile phone to help manage aural interactions [10]. More recently, a series of studies by Yankelovich and colleagues documented problems with audio conferencing, and their Meeting Central system explored mechanisms for addressing these problems, including providing information about participants, text and speech based backchannels, enhanced audio quality and the ability to spatially separate voices [6][13][14][15].

While these systems make it clear that the idea of providing 'extra' information about conference participants is not new, there are a variety of different ways of achieving this. For instance, both Meeting Central and Rendezvous are designed as socially translucent systems, with control being mediated socially (e.g., it is technically possible for a listener to interrupt a speaker), rather than being imposed by the "system," as in SmartPhone (although this limitation was subsequently relaxed). A hallmark of Rendezvous' approach is its tight integration with enterprise systems: it gathers its information about meetings and their attendees from its users' calendars, uses caller ID to authenticate them, and is integrated with the corporate directory so that a meeting attendee can see where others fit in the organization chart, browse the projects they're on, and so on.

3. RENDEZVOUS IN USE

The IBM Rendezvous service allows people to talk in small groups using telephones. The service appears to be a VoIP version of audio conferencing; however, instead of calling directly into an audio conference, a Rendezvous user in effect phones his or her corporate calendar, selects a meeting from it, and enters into a multiparty conversation with the people invited to that meeting. As a result, Rendezvous users have a single phone number they can use for all their conference calls, and a single way of

authenticating themselves to the system, rather than having to manage multiple phone numbers and passcodes. Because Rendezvous uses VoIP, it is cost effective for the organization. As noted, Rendezvous makes use of information automatically available about users; it provides other functionality via a visualization (hereafter, the conference call proxy) and a social computing help function, iHelp, that we will describe shortly

In late 2005, we began to deploy the Rendezvous service. Users have been drawn from two primary sources, a cross-section of consultants and executives invited to use the system, and volunteers from a company-wide internal website that provides access to a variety of new technologies. Instructions for how to use Rendezvous and iHelp were sent to users in email, available on the Rendezvous website, and supported by an interactive voice response system. While the deployment began with a few hundred users and has been augmented by early adopters, Rendezvous is beginning a phase of systematic deployments that will make it available to twenty to thirty thousand users over the next year. Thus, while at present our results reflect the experience of volunteer "early adopters," we expect to be able to present a more general set of results in the future, at least for corporate conference callers (a not insignificant usage niche).

4. DIGITAL BACKCHANNELS

Digital backchannels are an interesting blend of the two senses of backchannel mentioned earlier. They allow listeners to provide non-interruptive feedback to the speaker ('raising hands,' asking questions via IM), but at the same time they may take on the more private character of the second more political sense of backchannel (allowing two audience members to chat via IM with one another with no indication to others that it is occurring). Digital backchannels differ from face-to-face backchannels in that they may be more difficult to discover. That is, in a face-to-face situation, those who are co-present understand the physical and sensory characteristics of the various backchannels: they see who is present, and understand that whispering and note-passing is possible. But when communication is digitally mediated, backchannels may not be obvious. That is, even if participants know who else is participating in an interaction, this doesn't guarantee (as it does in the face-to-face world) that there is an accessible backchannel. Through the conference call proxy and iHelp functions, Rendezvous recognizes the importance of backchannels and provides mechanisms to access them.

4.1 The Conference Call Proxy

The idea of a "social proxy," first introduced in work by Erickson and colleagues [5], is to provide a shared, minimalist visual representation people and their activities in an online environment. A social proxy is one method of creating social translucence, defined by Erickson and Kellogg [4] as "providing perceptual cues that lead to awareness and accountability." The conference call proxy (Figure 1) shows a minimalist representation of the people who are on a phone call, placing them around a schematic table. The screen shows people in attendance as well as people who are invited to the meeting but who have not yet arrived. Attendees are shown by name and represented by a small semi-circle, which grows to a full circle and highlights when that person is speaking in the call. Attendees

on mute have their names grayed. The conference call proxy is tied into the corporate directory and instant messaging systems. Clicking on any attendee brings up the corporate directory information, including a picture, at the bottom of the window. Double-clicking initiates a chat session. In addition, the proxy shows information about the meeting from the calendar entry, and the time remaining in the meeting. Finally, the proxy allows the meeting moderator to "lock" the call so that no one else may join it.

Figure 1. The Rendezvous Conference Call Proxy.

Using the proxy in meetings affects behavior in interesting ways. A new arrival, instead of waiting for an opportune time to interrupt and announce her presence or for someone else on the call to say "Who just joined?" may find herself simply greeted by others already on the call. As the meeting starts up, late arrivals can be identified visually, avoiding the need for interrupting the call several times as it gets started (a new arrival's name highlights for a few seconds along with a soft "ding-dong" doorbell chime). If someone leaves before a call has ended, this is also visible to others. When the meeting is over, the proxy continues to function, perhaps showing people who remain behind on the call to continue talking.

4.2 iHelp

Imagine you are at the airport with just your cell phone, calling into a meeting. You call Rendezvous and authenticate yourself, but for some reason Rendezvous cannot find the meeting. In such cases, Rendezvous uses its interactive voice response to offer a feature called iHelp that allows a user to send an automated instant message to a colleague of their choice. Rendezvous sends the colleague an IM that identifies the person requesting help (you), and provides for fixed actions, including 1) pulling you into a telephone meeting already in progress; 2) transferring you to the colleague's telephone; or 3) answering you with a short textual response to the instant message which is then played back (after a text-to-speech conversion) to you.

Rendezvous determines a set of potentially helpful colleagues by looking at your calendar, place in the organization, and your IM buddy list; a user chooses from this set to appeal for help. Thus, iHelp represents the classic form of digital backchannel (one-to-one communication outside a mainchannel), but in a cross-modal way. A colleague already on the conference call you are trying to join need not do anything more than type a response into her IM

client to join you to the call. This minimizes disruption to the colleague being tapped for help, and provides a quick remedy for the most common failure mode – being unable to access an audio conference. iHelp can also be useful in more complex situations.

Rendezvous also helps mobile users by monitoring the meeting chairperson's calendar for changes to the scheduled meeting. If a meeting is rescheduled and a mobile user, unaware, calls into it, Rendezvous will immediately inform the caller that the call has been rescheduled, eliminating the need to wait on hold.

5. PRELIMINARY USER FEEDBACK

In February, 2006, a survey was distributed to 210 people who had been using the Rendezvous service for at least 30 days. Ninety-nine (99) responses were received for a response rate of 47%. The survey covered a variety of issues about the basic functionality of Rendezvous, and the conference call proxy; it did not explicitly ask about iHelp.

The results were surprisingly and overwhelmingly positive: 91.9% of respondents were satisfied overall with the service; 68.7% of respondents said they use the service several times a day; 91.9% were satisfied that the service would add significant business value; and 92.9% were satisfied with the voice quality, a measure closely associated with meeting effectiveness [13][14].

Ninety-three (93) of ninety-eight (98) respondents downloaded and installed the conference call proxy (94.9%). Of those, 85.7% of respondents were satisfied with the usability of the proxy, and 90.1% of respondents said they were satisfied overall with it. Another indication of satisfaction is that of 283 users who had downloaded the proxy, 263 had updated to the current version, which required visiting a web site and doing a manual download.

Several survey respondents provided comments, a few praising the functions of the proxy, but most suggesting additional features, or drawing attention to aspects of the visualization that were not working well. Comments included:

> Didn't the little green [sic] heads used to blink when that person was talking? This can be a very handy feature when you are working with new people and don't know voices yet.

> I would also like an 'always on top' feature to keep [the visualization] around as I go through the charts.

> The visualization is the real Rendezvous productivity aid here. Muting noisy lines, identifying who is talking, or who has left. Makes for a more reliable call. ... let the visualization see all that are there. The more people on the call, the more the need to identify the people there.

There were also, of course, suggestions for enhancements to the service, some of the most interesting of which were:

> [Provide the] ability to drag invitees who 'aren't there' into the meeting in the viz tool.

> Enable a subset of the visualization functions from a cellphone (list upcoming meetings w/click to call in, snapshot of attendee list).

> [Provide the] ability to page request a user to join the call from call-up/ICT/[instant messaging client].

Would like to be able to drag a person from IM Hub to a meeting and send them an [instant] message inviting them to join a meeting real time.

The most common criticism was that Rendezvous would be more useful when more people could use it (the deployment is still limited). Other comments included:

Speaker bubbles are not reliable with multiple people speaking. Bubbles appear when a participant is not talking (line or set noise).

Should be able to add the name of a "Guest" who was not an initial invitee.

This visualization feature should be described as a security benefit for two reasons: You can force the call to positively identify everyone on the call. (There should be a way to disconnect those who will not identify themselves) and you can identify who has left the call.

6. DISCUSSION

The conference call proxy and iHelp extend the notion of digital backchannels. The proxy, by virtue of providing a "visual backchannel" to an aural interaction can be expected to interfere less than a backchannel that shares the audio channel with the mainchannel event, such as that provided by [13][14]. In Cogdill and colleagues' [2] terms, the conference call proxy is a "process-oriented" backchannel; providing a resource for participants to understand what is happening in the interaction and to guide it. Its spatial characteristics (e.g., placing participants around a virtual table) allow for new behaviors to emerge: for example, "going around the table" getting each person's input, or figuring out who it is that is asking me to send them something. Integration with the corporate directory allows participants to access information about others; and of course the easy access to instant messaging provides a classic backchannel to converse with one or more people on the call. iHelp extends the notion of digital backchannel by allowing users with different media capabilities to interact.

As Erickson and Kellogg [4] have argued, social proxies provide a resource for group interactions online that helps to build common ground. This fits with Clark and Brennen's [1] assertion that co-presence and visibility help to establish and maintain common ground. The notion of digital backchannels as mechanisms for creating common ground in the enactment of online interaction is a useful one for design. Coupled with the approach of making systems socially translucent, the first glimpses of the use of Rendezvous' backchannels "in the wild" suggest that they will indeed enhance the user experience of conference calling and improve meeting effectiveness.

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