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Adapting Communication To Create Common Ground in a Virtual World

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Abstract

Although new organizational forms, technologies, and work arrangements allow individuals separated by distance to work together, distributed collaboration has proven challenging. In this study, we explore synchronous, distributed collaboration conducted in a virtual world. This type of collaboration differs from much collaboration in organization, which often occurs asynchronously, between distributed collaborators who rely on technology to communicate and divide and coordinate tasks, yet conduct much work independently. Virtual worlds allow synchronous, distributed collaboration and thus have the potential to support collaborative creation in a more natural manner than more traditional communication technologies and thereby better support innovation. This study is a grounded analysis of data collected primarily through participant observation of the collaborative creation of software by distributed collaborators working in a virtual world. We draw on Kock's (2004; 2005) media naturalness theory to address the broad research question, "What adaptive behaviors support synchronous, distributed collaboration?" and focusing in particular on how distributed groups create common ground in virtual worlds.

Keywords

Virtual world, distributed collaboration, technology mediated communication, common ground

1. Introduction

Although new organizational forms, technologies, and work arrangements allow individuals separated by distance to work together, distributed collaboration has proven challenging (Cramton, 2001; Desanctis & Monge, 1998; Gibson & Gibbs, 2006; Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002). We define collaboration as a special form of interaction involving co-construction and mutual engagement (Lipponen, 2002) by interdependent participants (DeChurch

& Mesmer-Magnus, 2010), involving coordinated actions and intentional joint effort toward a shared goal. In this study, we focus on synchronous, distributed collaboration conducted in a virtual world. This type of collaboration differs from much collaboration, and research on collaboration, that occurs in organizations. Much collaboration in organizations occurs asynchronously, between distributed collaborators who rely on technology to communicate and divide and coordinate tasks, but often do not conduct work jointly, at the same time. Virtual worlds allow synchronous, distributed collaboration and thus have the potential to support collaborative creation in a more natural manner than more traditional communication technologies.

The study is based on a grounded analysis (Corbin & Strauss, 2008; Gioia, Corley, & Hamilton, 2013) of data collected primarily through participant observation of the collaborative creation of software by distributed collaborators working in a virtual world to address the question: "What adaptive behaviors support synchronous, distributed collaboration?"

2. Theoretical Background

To engage in collaborative work, individuals must thus make assumptions about what others know and how they will act on that knowledge (Enfield, 2000). Clark (1996), discussing communication as collaboration, referred to this as *grounding*. Grounding is the collective process by which collaborators achieve a state of mutual belief that they have reached an understanding sufficient to interact in concert (Clark & Brennan, 1991, p. 223). Individuals achieve grounding by drawing on and creating common ground (Clark, 1996; Cramton, 2001; Monk, 2008). Common ground includes the knowledge, beliefs, and assumptions individuals infer they share, either through participation in a common community (e.g., we both work in this organization), shared experience (e.g., we both attending a presentation in the team meeting room today), or personal exchanges (e.g., you tell to me that you enjoyed the presentation). Ambiguous, creative work, often requires the development of new common ground. A lack of common ground is key barrier facing distributed collaborators (Cramton, 2001; Monk, 2008).

Recent research suggests that successful distributed collaboration may require different behaviors than face-to-face collaboration (DeRosa, Hantula, Kock, & D'Arcy, 2004; Faraj, Jarvenpaa, & Majchrzak, 2011; Katz & Te'eni, 2007; Kock, 2004). Distributed collaborators confront complexity and face unique challenges (Berry, 2011). While virtual worlds may allow more natural communication than do traditional communication technologies, realizing their full potential may require collaborators to engage in different behaviors than they would in a face-to-face setting (Maznevski & Chudoba, 2000; Kock, 2004; Kock, 2005). Empirical studies focusing on the drivers of success in distributed collaboration in today's uniquely constructed work arrangements remain limited (Maynard, Mathieu, Rapp, & Gilson, 2012).

3. Research Approach and Methods

This study focuses on a project completed by a subgroup of the larger community. The subgroup hosted weekly, in-world collaborative programming sessions devoted to creating tools for use in a virtual world. This study focuses on the collaborative development of a virtual pointer that allowed users to visually direct others' attention much as one might use a laser pointer.

The group used a variety of collaborative including a web viewer, which allowed collaborative, multi-party use of any web-based program operating in the world, post-it notes, a white board, and a bulletin board for tracking coding issues. Any in-world participant could take control of the tools, allowing the group to work synchronously. Session participants wrote new code by taking turns controlling an in-world instance of Netbeans, an integrated environment for developing with Java. Software development occurred in the virtual world. The virtual pointer was created during 28 sessions held over a six-month period beginning in December 2011 and ending in June 2012. Each meeting had between four and ten participants, with an average of six. One member of the research team attended 23 of the 28 sessions.

Data included notes, digital snapshots and digital video recordings, and texts used by the group for communication in and out of the virtual world. The audio tracks were transcribed, resulting in 479 pages of text. In addition, the researchers collected audio recordings of presentations and conducted 10 interviews with regular participants, lasting from 30 to 60 minutes.

4. Analysis and Results

All transcriptions and notes were imported into NVivo for analysis. We began the analysis by reviewing our research notes and the community communication, grouping text into initial categories and summarizing the case in a description and a timeline of events. Nineteen individuals participated in these meetings at different points in time, but only seven were regular attendees. We prepared a profile of frequent contributors including each collaborator's longevity and involvement in the community, experience with virtual worlds, experience with java programing, and motivation for attending the sessions.

We grouped the text into initial categories through, line-by-line coding using the language of participants and active verbs to code segments of text (Charmaz, 2006). By looking for similarities and differences between the segments of text with our initial labels, we grouped segments into 41 categories conveying what was said and done (Corbin & Strauss, 2008, Gioia et al., 2013). This initial categorization yielded 130 segments of text up to several paragraphs labeled to describe what was being said such as, "Do you see what I see?," "Do you hear what I hear?," "What time is it?," and "Where are you?" This categorization yielded an additional six categories labeled to describe what was done: greeting and socializing, planning and organizing, problem solving, creating, testing and identifying problems, and closing meeting and exiting. This initial analysis drew our attention to the notion of adaptation in communication (Kock, 2004; 2005), which guided subsequent, more focused analysis.

4.1 Themes and Dimensions

Kock (2004; 2005) defines adaptation as a change in communication behavior unique to the virtual setting. The analysis draws on Kock's (2004, p. 333) five key elements of face-to-face communication to identify segments of text that displayed adaptations of communication to the virtual setting. We assessed each segment of text against Kock's (2004) key elements (co-location, synchronicity, the ability to convey and observe facial expressions, the ability to convey and observe body language, and the ability to convey and listen to speech) and focused further analysis on segments that indicated a deficiency in an element and an adaptation to overcome it. We

developed a map of the data structure (Gioia et al., 2013) and gathered the categories into two dimensions: mutually represented context and mutually represented action.

4.2 Preliminary Results: Working Out Loud

Our preliminary analysis suggests that participants adapted their communication by articulating individual in-world and out-world contexts and action. Articulation compensated for the absence of cues typically available in physical settings and facilitated the development of a mutual mental representation of collaborative action. As illustrated below (see Figure 1), articulation of context and action generated a mutual representation, which framed action in the virtual space.

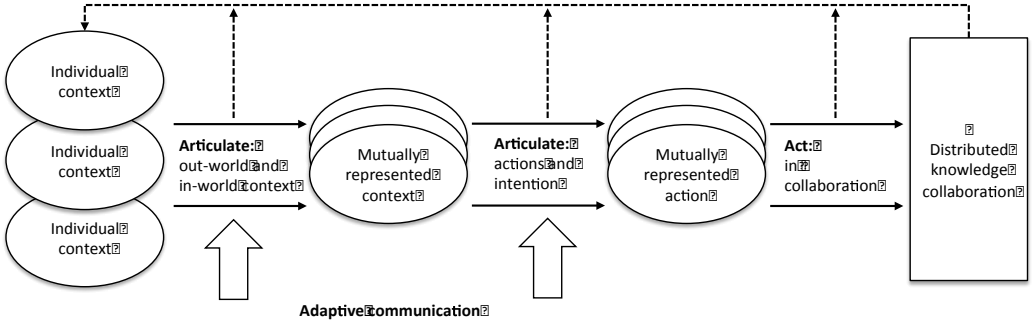

Figure 1: Collaboration in the Virtual World

4.2.1 Creating a mutual representation of context

Articulation allows group members to create an assumed mutual representation of context. We draw on one interaction to illustrate the model. The interaction begins between Jake and Susan as they wait for others to arrive. The meeting space had been used to demonstrate the features of the virtual world platform during a virtual conference earlier in the week, and visitors had left some objects behind and were still visiting the space. Thus, regular participants were confronted with unfamiliar objects and avatars in the virtual world. Susan articulates her experience of the virtual space, "So, I wasn't here last week. What are these thingies that I see in the background?" Jake responds, confirming that he has the same individual experience of the communal space, "Oh yeah, we were using those for testing. Oh yeah, the server never got cleaned up, so who knows what's gonna happen today." Susan and Jake now have a shared representation that the virtual world may not be normal today.

Susan sees what she interprets as a penguin and sees the name Kimberly in the participant list on her screen. Susan assumes that what she believes is a penguin is an avatar representing a person named Kimberly, whom she does not recognize. Thus, Susan seems to assume, despite Jake's warning, that the animal is somewhat normal and that the only unusual part requiring attention is that she, Susan, has not met Kimberly the penguin. However, before deciding how to act or interact with what she initially interprets as a penguin representing Kimberly, Susan asks Jake:

Susan: [Do] You know, who is the penguin?
Jake: She's not a penguin, [it's a] pigeon. I'm not sure what the pigeon is, Kimberly is in other space [and she's not the pigeon].
Susan: Oh, okay. [She's] Not actually here with us.
Jake: No.

Thus, Jake explains that what Susan is seeing is not a penguin but instead is a pigeon. This requires no further attention, as it is accepted in the virtual space that graphics are not identical depictions of reality. Jake moves on. In his representation, Kimberly requires no further attention. The meaning of the name Kimberly in the participant list is clear: She is a visitor somewhere in the world out of earshot. Jake turns his attention to the pigeon, which is still unexplained. Because the pigeon does not represent Kimberly, it is not a "normal" avatar-type pigeon. Based on this information, Susan seems to assume that Kimberly does not require immediate interaction, but Susan continues to seek information as Jake focuses on the pigeon:

Susan: Do you know Kimberly?
Jake: [responding to both questions] A pigeon is a Twitter … no, I don't.
Susan: Oh.
Jake: [thoughtfully] A Twitter pigeon [continuing explanation of Kimberly]. Yeah, there was a big event in Europe. Last week or the week the before. Last week, at the beginning of the week and they built a bunch of spaces and they invited a bunch of people in. So there have been sort of people hopping on and off the server all week.
Susan: Oh, nice. Okay.

This ends the discussion about Kimberly, suggesting that Susan and Jake now have an assumed mutual representation of their private experience of the communal space where they each see the name Kimberly in the participant list. This representation allows them to create a mutual representation of action in the space order to, in this case, take no action and ignore Kimberly. Jake and Susan assume that Kimberly plans to tour the space, does not intend to interact with the group or participate in the meeting, and will not join them. Susan and Jake act accordingly based on their mutual assumptions about Kimberly's thoughts, intentions, and likely actions; they ignore Kimberly. Neither Susan nor Jake send a greeting to Kimberly.

4.2.2 Creating a mutual representation of action

Jake and Susan focus on what they now agree is a virtual pigeon, which does not represent a person, but for which they still have no shared representation or understanding. They interact with the pigeon, articulating and requesting articulation of action. This serves to create an assumed mutual representation of action, which elaborates a specific action sequence within a particular context.

In the interaction described below, Jake and Susan can imagine each other's intentions and actions and the likely consequences of action. As Jake continues to interact with the pigeon, he draws on cultural knowledge, which he assumes Susan shares, and articulates his actions.

Jake: [interacting with the pigeon] Yeah. Pigeon I think is a Twitter pigeon.
Susan: Oh, look at that [referring to words coming out of the pigeon's mouth], are you doing that? [assuming that Jake is seeing what she is seeing]
Jake: Yeah. I just put in a search for San Francisco, which is [why] a Twitter pigeon is spitting out tweets about San Francisco. [discuss how to make the pigeon work]
Jake: Yeah, yeah, it's just whatever you would get if you went to Twitter and searched San Francisco.

Shared knowledge furthered understanding, just as it would in a face-to-face setting. But, additional experimentation and articulation was required in the virtual setting to access this cultural

information and link it to the animated bird. The following interaction further illustrates how the group draws on assumed mutual knowledge, as would be expected in a face-to-face setting. Bill enters and is apparently already familiar with the Twitter pigeon, its meaning, and purpose. Bill articulates his experience of the virtual world and also the meaning he attaches to it, but Nancy has to ask for clarification:

Bill: Oh, this is our Twitter thing here.
Jake: Yeah. [Nancy enters]
Nancy: Oh yeah, very cute.
Jake: It's a tweeting pigeon.
Bill: Tweeting pigeon.
Nancy: Tweeting pigeon. [discussion]
Nancy: Why a pigeon?
Jon: Because it tweets.

Jon draws on assumed shared knowledge (an understanding of Twitter), as he might in a face-to-face setting to explain the connection between the pigeon and Twitter. Following this interaction, the group created an assumed mutually held representation of action within their context. Group members drew on existing mutual knowledge, as would be expected in a face-to-face setting, but also articulated their individual physical contexts, individual experience of the virtual context, and their actions within it. The assumed mutual representation of action within the context allows the group members to predict each other's actions regarding the pigeon based on their assumptions of the mutually held representation. Jake does another search while other participants enter. The group's assumed mutual representation of next action-steps, in context, allows the collaborative action illustrated below.

Nancy: I think we should get started.
Jake: Okay.
Nancy: Should we get rid of tweeting bird?
Jake: Uh, sure.
Nancy: Kill the bird.
Jake: Is there any way to make it stop tweeting?
Nancy: I don't know, I don't' see anything in the control panel that can like turn off.
Jake: Okay.
Nancy: It's easy enough to re-add it if we need it back. I'm just gonna delete it.

The pigeon then proves impossible to delete, and the group collaborates to figure out how to get rid of it. This collaboration would not have been likely if some members still assumed the pigeon was an avatar representing a person. Given the assumption that the pigeon represented a person, Nancy's actions attempting to delete it would have been confusing to the group, and they would have had difficulty collaborating with her. By articulating, group members created a metal representation of collaborative action within the context, which they could assume was shared. Group members could assume that each saw the pigeon and understood that the pigeon did not represent a person, and could predict the steps others might take to get rid of it. Thus, the assumed mutual representation of action within the context enabled group members to mentally predict one another's actions, facilitating successful collaboration to "kill the bird."

5. Conclusion

Our analysis of interactions of among community members developing software for a virtual world suggests that successful distributed collaborators adapted their communication behavior in the virtual setting. We have identified three communication mechanisms that individuals used to overcome challenges to communication in virtual worlds: articulation of virtual, in-world context; articulation of physical, out-world context; and articulation of action. Although articulation of context and action may occur in face-to-face settings (e.g., if a communication repair is needed, or it is not clear why I am taking a particular action), in the virtual world it occurred frequently and in circumstances in which articulation would likely not be required in a face-to-face setting.

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