Organization Science

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A Dialogical Approach to the Creation of New Knowledge in Organizations

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Despite several insightful empirical studies on how new knowledge is created in organizations, there is still no satisfactory answer to the question, how is new knowledge created in organizations? The purpose of this paper is to address this question by focusing on direct social interaction, adopting a dialogical approach. The following argument is advanced. From a dialogical perspective, new knowledge in organizations originates in the individual ability to draw new distinctions concerning a task at hand. New distinctions may be developed because practitioners experience their situations in terms of already constituted distinctions, which lend themselves to further articulation. Further articulation develops when organizational members engage in dialogical exchanges. When productive, dialogue leads to self-distanciation, namely, to individuals taking distance from their customary and unreflective ways of acting as practitioners. Dialogue is productive depending on the extent to which participants engage relationally with one another. When this happens, participants are more likely to actively take responsibility for both the joint tasks in which they are involved and for the relationships they have with others. Self-distanciation leads to new distinctions through three processes of conceptual change (conceptual combination, conceptual expansion, and conceptual reframing), which, when intersubjectively accepted, constitute new knowledge. Several organizational examples, as well as findings from organizational knowledge research, are reinterpreted to illustrate the above points.

Key words: knowledge creation; dialogue; innovation; tacit knowledge; boundary objects; creative cognition; metaphors; analogies; interaction
History: Published online in *Articles in Advance* June 15, 2009.

Knowledge creation in organizations has been a topic of great interest to both scholars and practitioners (Carlile 2002, 2004; Hargadon and Sutton 1997; von Krogh et al. 2000; Nonaka et al. 2006; Ribeiro and Collins 2007). Various aspects of knowledge creation have been empirically studied in diverse contexts (Calhoun and Starbuck 2003; Leonard and Sensiper 1998; Robertson et al. 2003; Obstfeld 2002, 2005). Students of organizational learning, innovation, and the knowledge-based view of the firm have also dealt with knowledge creation to some extent, because there is an inevitable overlap between these topics (Edmondson 2002, Vera and Crossan 2003, Grant 2002, Kogut and Zander 1992, Nahapiet and Ghoshal 1998). Yet, despite the proliferation of empirical studies and the important insights gained, more theoretical work is needed to further expand on the processes through which new organizational knowledge emerges.

Researchers who have adopted a broadly constructivist view of knowledge have focused on the *intraorganizational* processes through which new knowledge is generated, and have highlighted the importance of both social *practices* within which new knowledge is created and social *interaction* through which new knowledge emerges. More specifically, Nonaka and his associates (Nonaka and Takeuchi 1995, Nonaka and Toyama 2005, Nonaka et al. 2001) have proposed the socialization externalization combination internalization (SECI) model of knowledge creation, the core idea of which is that "knowledge is created through the interaction between tacit and explicit knowledge" (Nonaka and Takeuchi 1995, p. 62). Knowledge creation, Nonaka and his associates have further argued, involves the creation of new concepts through dialogue and the management of conversations (Nonaka and Takeuchi 1995, p. 86; von Krogh et al. 2000, Chapter 6). Moreover, they have highlighted the use of figurative language and the combination of concepts to create new ones, in different parts of the knowledge creation process (see also Hargadon and Sutton 1997, 2000). Cook and Brown (1999) have argued that the "generative dance" between knowledge and knowing is a powerful source of organizational novelty. Orlikowski (2002) has described knowing in organizations as an ongoing socially interactive process and an active accomplishment that inherently holds the possibility of novelty. Hargadon and Fanelli (2002) have suggested that new organizational knowledge is generated out of the cyclic interaction between "latent" and "empirical" knowledge. Obstfeld (2005) and Håkanson (2007) have noted that the engine of knowledge creation is "articulation"—a continuous process of making knowledge explicit and relevant to the task at hand. Carlile (2002, 2004) and Bechky (2003a, b) have shown how the creation of new knowledge is

facilitated when knowledge boundaries are crossed. And Tsoukas (2003) has argued that new knowledge comes about when practitioners seek to turn an unreflective practice into a reflective one through reflexive social interaction.

Although the preceding researchers have rightly emphasized the importance of *conversational interaction*, embedded within the "semiotic" space (Kogut and Zander 1996, p. 515) of a social practice, the valuable insights they have offered need further theoretical development. For example, although dialogue has been suggested (or implied) by several organizational knowledge researchers to be an important mechanism through which conceptual change and, thus, new knowledge emerges, it has not been adequately theorized. We do not know enough about *how* dialogue works to generate new organizational knowledge. For example, Nonaka and his associates rightly postulate conceptual change, mainly in the form of analogies and conceptual combination, to be triggered by dialogue, but stop short of explicating this process (see Nonaka and Toyama 2004, p. 115; Nonaka and Takeuchi 1995, p. 64; von Krogh et al. 2000, pp. 84–88). Questions like the following need to be addressed: What is in dialogue that enables new knowledge to emerge in organizations? How does this happen?

To address such questions, a more fine-grained, process-oriented theoretical account is needed that will build on the hitherto available insights of the preceding researchers *and* develop them further. The purpose of this paper is to provide such an account by adopting a *dialogical* approach: it seeks to theorize how face-to-face dialogues make it possible for new organizational knowledge to emerge. Although in conversational interaction more is going on than turn-taking between interlocutors (notably dialogical exchanges are mediated by the use of ostensive definitions, material demonstrations, and artifacts in socially structured situations; see Bechky 2003a, b; Carlile 2002, 2004), the dialogical exchange of utterances per se is an important mechanism through which cognitive change and, thus, new knowledge may come about. In this paper, although the analytical emphasis will be on the pragmatic use of language, it is acknowledged that more than language is involved in new knowledge creation. The argument developed will draw on strands of interpretive and phenomenological philosophy (Dreyfus 1991; Dreyfus and Dreyfus 2005; Taylor 1985a, b, 1995; Polanyi 1962), sociocultural psychology (Markova 2003a, b; Shotter 2005, 2006; Wertsch 1991, 1998), and creative cognition research (Sawyer 1999, 2003, 2007; Smith et al. 1995; Ward et al. 1997), as well as on those organizational scholars who have accorded "dialogue" a central place in their work (Anderson 2005, Anderson et al. 2004, Barrett 1999, Gergen et al. 2004, Heracleous 2006, Isaacs 1999, Oswick et al. 2000, Shotter and Cunliffe 2003).

This paper is structured as follows. In the next section, I discuss the embeddedness of practitioners in discursive practices constituted by distinctions and the possibility of further articulating those distinctions, thus creating new ones, through dialogical exchanges. Following this, in the same section, an argument is presented concerning how further articulation is made possible through dialogue. More specifically, it is shown that, when productive, dialogue leads to self-distanciation. Dialogue becomes productive when the modality of interaction between participants is that of relational engagement. In the subsequent section, it is argued that self-distanciation leads to new distinctions through three processes of conceptual change—namely, conceptual combination, conceptual expansion, and conceptual reframing—that, when intersubjectively accepted, lead to new knowledge. This theoretical account is then illustrated in a separate section, followed by a discussion of how a dialogical perspective can extend current research on organizational knowledge creation. Finally, in the conclusions, suggestions for further research are offered.

Tacit Knowledge, Dialogue, and the Emergence of Novelty

Articulating the Background

According to Bell (1999, pp. lxi–lxiv), the defining feature of knowledge, compared with data and information, is the maximal exercise of human judgment. An individual is knowledgeable by the extent to which she has the capacity to exercise judgment, which is either based on an appreciation of context or is derived from theory, or both (Bell 1999, Tsoukas and Vladimirou 2001). Drawing on Dewey (1934), Bell (1999, p. lxiv) argues that "judgment arises from the self-conscious use of the prefix *re*: the desire to *re*-order, to *re*-arrange, to *re*-design what one knows and thus create new angles of vision or new knowledge for scientific or aesthetic purposes."

The capacity to exercise judgment involves the ability of an individual to draw new distinctions concerning a task at hand ("the self-conscious use of the prefix *re*" in Bell's (1999) definition) (Benner 1994, pp. 139–140). To draw a distinction implies splitting what was hitherto thought of as a unitary phenomenon in parts (Herbst 1993, p. 29; Kittay 1997, p. 376; Reyes and Zarama 1998, p. 23), such as, for example, when an experienced burn nurse distinguishes between "cold" and "ice cold" skin in a burn patient (Benner et al. 1999, p. 33), when a design engineer distinguishes between different ways of attaching subassemblies (Carlile 2002, p. 450), or when, in an immunology lab, scientists distinguish two mechanisms causing a particular autoimmune human disease instead of one, as they had hitherto assumed (Dunbar 1997, p. 487). As several empirical studies have shown (Nonaka and Takeuchi 1995, Benner et al. 1999, Obstfeld 2005), when new distinctions are made and accepted,

new organizational knowledge emerges; and when the new distinctions are developed into new products or processes, or are embodied in new actions, innovation and learning respectively occur (Hargadon and Sutton 1997; Edmondson 2002, p. 128; Tschang 2007).

However, what is less clear in Bell's (1999) definition, and, by contrast, what is shown by ethnographic studies of innovation (Dougherty 2004; Hargadon and Sutton 1997; Carlile 2002, 2004), is that individuals exercise their judgment within a *collective* domain of action—within a "normative territory" (Kogut and Zander 1996, p. 507). Why is this important? Because to enter a social practice—to become, say, a manufacturing manager or a design engineer—is to enter a *discursive* practice, namely, a practice whose identity is constituted through the normative use of language (Hardy et al. 2005, p. 61; Philips et al. 2004, p. 636; Harré and Gillett 1994, pp. 28–29). To be a member of a practice, therefore, is to experience one's situation in terms of *already* constituted distinctions, concerning basic tasks, notions of competence and quality, orientation to time, understandings of reciprocity and authority, etc., expressed through the discourse (i.e., within the "normative boundaries"; see Kogut and Zander 1996, p. 515) that defines the practice (Dreyfus 1991, Chapter 5; MacIntyre 1985, pp. 187–194; Taylor 1985a, pp. 54–55, 1985b, p. 27, 1991, p. 305).

The already-constituted distinctions of a practice make up what Wittgenstein (1979, §94) calls the "inherited background," against which practitioners make sense of their particular tasks (Shotter and Katz 1996, p. 225; Taylor 1993, p. 325, 1995, p. 69). Practitioners are aware of the background, but their awareness is largely "inarticulate" (Taylor 1991, p. 308) and implicit in their activity (Ryle 1963, pp. 40–41). The background provides the frame that renders their explicit representations comprehensible (Dreyfus 1991, pp. 102–104; Taylor 1993, pp. 327–328, 1995, pp. 69–70; Kögler 1996, Chapter 3). To use Polanyi's terminology, practitioners necessarily rely on a subsidiary (tacit) awareness of the background for focally attending to the particular tasks they engage in (Polanyi and Prosch 1975, pp. 37–38; Polanyi 1962, p. 56).

Notice, however, that the background is not something of which an actor is simply unaware, as he might be unaware of certain rare plants found in the Amazon jungle (Taylor 1993, p. 325). His unawareness is different: it is *focal* unawareness. The background is known, albeit in the form of subsidiaries, and, as such, it cannot be separated from the focus and examined independently because its meaning would then be lost (Polanyi 1962, p. 88; Tsoukas 2003, p. 423). However, because the practitioner is subsidiarily aware of the background, she can, in principle, *articulate* it; that is, she can deploy conceptual categories to mark distinctions and relations

among her experiences (Kittay 1997, p. 376). It is precisely her familiarity with the background (in a way that is not the case with the rare Amazon plants) that makes the practitioner capable of articulating the background, although she will never be able to fully articulate it (Polanyi 1962, p. 70; Taylor 1995, pp. 69–70).

What is the benefit of articulating the background? Because, as discussed earlier, practitioners' experiences involve *already* constituted distinctions, the latter admit of *further* elaboration (i.e., further articulation) (Dreyfus 1991, pp. 215–217; Taylor 1985a, p. 63; Spinosa et al. 1997, pp. 24–25). Through further articulation, practitioners obtain a clearer understanding of what they do by becoming aware of the distinctions they have been employing, of the taken-for-granted habits they may be following, and of the associated power-laden structures that underlay their discursive practices (Argyris 1993; Kögler 1996, pp. 98–100). Through further articulation, practitioners are potentially led to "self-distanciation" (Kögler 1996, p. 252), namely, to taking distance from their customary and unreflective ways of acting. Through self-distanciation, practitioners gain critical insight into their practices, which potentially facilitates the making of new distinctions. Below I will examine how this happens.

On Dialogue
How is further articulation possible? How can the background, which, after all, is a condition of intelligibility, be questioned and new distinctions emerge? Further articulation occurs through *dialogical* forms of communication and understanding (Holquist 1997, p. 390). In attempting to understand the other in dialogue, we potentially alter our own understanding (Taylor 2002, p. 294; von Foerster 1991, pp. 72–73; Holquist 2002, p. 28). This happens more fully when dialogical understanding occurs with real others in direct social interaction—the domain Goffman (1997) described as "the interaction order."

A dialogue is a joint activity between at least two speech partners, in which a turn-taking sequence of verbal messages is exchanged between them, aiming to fulfill a collective goal (Walton 1998, pp. 29–30, 2000, pp. 333–334, 2006, p. 2; Barrett 1999, p. 137; Bohm 1996, Chapter 2; Gergen et al. 2004, p. 7; Issacs 1999, pp. 19–20; Luckmann 1990, pp. 52–53). At its most general, dialogue aims at removing some kind of unsettledness (or perplexity) experienced by the parties involved, through their reasoning together by verbal exchanges. The typical pattern in a dialogue is that of turn-taking, in which partners alternate between the roles of speakers and listeners (Van Eemeren and Grootendorst 2004, pp. 62–68; Walton 2006, p. 8).

Dialogue involves, in principle, the possibility of mutual influence, and insofar as this is the case, we can talk of *productive* dialogue (more about this later).

Productive dialogue thrives insofar as participants refuse to become predictable and "finalized" (Bakhtin 1984, p. 59), while striving to assimilate the strangeness of the other (Markova 2003a, p. 104, 2003b, p. 257; Baxter and Montgomery 1996, p. 24). When this happens, each interlocutor potentially makes the other realize the limitations of his focal awareness and stimulates a search for an ever broader focal awareness, thus, each one potentially surprising himself. As Merleau-Ponty (1962, p. 354) aptly noted, my interlocutor "draws from me thoughts which I had no idea I possessed." By contrast, when dialogue is unproductive, individual contributions are fragmented and participants talk in parallel conversations, "never finding a *common language*" (Argyris 2002, p. 7, emphasis added) to deal with the issue at hand (see also Kögler 1996, p. 44; Bechky 2003b, p. 324–325).

To see more precisely how in productive dialogue mutually experienced strangeness fuels the search for an ever broader focal awareness and, thus, for conceptual change, potentially bringing forth new distinctions, consider the following. Suppose that individuals A and B are engaged in a conversation. A offers an utterance a, which is reciprocated by B's utterance b, to which A then responds through utterance a_1 (see the first round of recursion in Figure 1; the conversation continues and that is why more than one round of recursion is shown in Figure 1). Two things are worth noting here.

First, there are three *logical* steps in such an exchange (see the thick lines in Figure 1, first round of recursion). Having made utterance a (first step), A has access to B through her receiving of b (second step), but B cannot know how b fits in with a, unless a third logical step is undertaken by A through utterance a_1 (Markova 1987,

Figure 1 Three-Step Model of Dialogue in Each Conversational Round of Recursion

Source. Adapted from Markova (1987, p. 295).

pp. 294–295). Weick (1979, p. 89) calls such three-step sequences "double interacts." In other words, an actor cannot know the meaning of his utterance until another actor has responded. As Sawyer (2003, p. 43) remarks, "the complete meaning of a turn is dependent on the flow of the subsequent dialogue." An utterance has the potential to mean, but contains no meaning in itself; its potential is realized through another's response (Gergen et al. 2004, p. 12). For example, by responding, "Fine, thank you," I affirm the significance of your question, "How are you?" The latter's meaning as a greeting is realized through my reply to it. Prior to that, it carries a potential, which may be realized in several ways (e.g., a blank stare, an angry face, a medical diagnosis).

Second, a_1 is a *reflexive* utterance: it is made by A while bearing in mind both interactants' previous utterances (a and b) (Linell and Markova 1993, p. 182; Mead 1934, pp. 135–152). This is shown in Figure 1 through the cognitive change a_1^b A has undergone into A_1 as a result of her conversation with B. In other words, a_1 partly signifies that A understands her own earlier utterance a in light of B's response to it (Gergen et al. 2004, pp. 12–13). Thus, self-distanciation occurs through each interlocutor reflexively understanding her own utterances, prompted by the utterances of the other. The double interact implies that the other's response lets an actor be an object for her own perception (Taylor and Van Every 2000, p. 252; Bakhtin 1981, p. 293; Holquist 2002, p. 28; Mead 1934, p. 156; Gergen and Thatchenkery 1996). New distinctions emerge insofar as both interlocutors may take a distance from their previously held views and a new common sensibility emerges.

Making Dialogue Productive

What must be the case for dialogue to become *productive*? The modality of interaction between participants affects how productive dialogue will be. Modality is a tacit property of the dialogical situation, indicating the *relational* aspect of communication (in distinction to the content) (Robichaud et al. 2004, p. 622). More specifically, in making an utterance, A not only states something, but by doing so he tacitly conveys an attitude or orientation to the kind of relationship he has or wants to have with interlocutor B. The modality of interaction constitutes communication *about* communication, and has been variously called "metacommunication" (Bateson 1972, pp. 137, 180; Watzlawick et al. 1967, pp. 51–54), "metaconversation" (Robichaud et al. 2004, p. 621), or "metapragmatics" (Sawyer 2003, pp. 63, 70). All of these terms indicate the same thing: a speaker tacitly indicates what sort of utterance his utterance is to be taken as.

Following the work of several philosophers and communication theorists (Anderson 1997, Baxter and Montgomery 1996, Bohm 1996, Cissna and Anderson 1998, Grice 1989, Habermas 1991), a dialogue is more likely
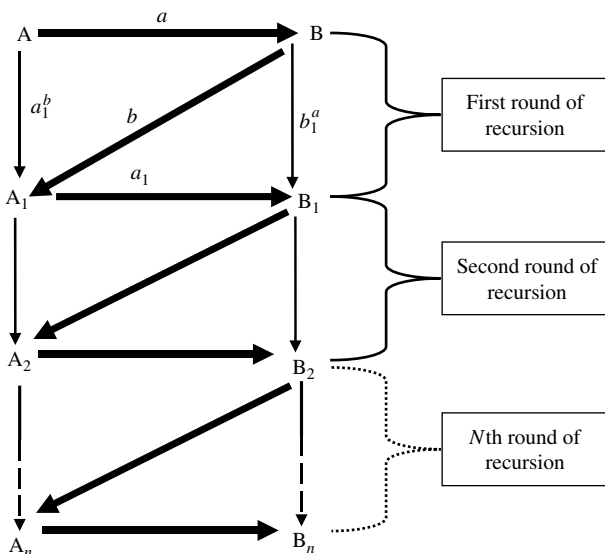
to be productive when the modality of *relational engagement* is adopted by those involved. In relational engagement, individuals take active responsibility for both the joint tasks in which they are involved and for the relationships they have with others (Andersen and Chen 2002, Cross et al. 2002, Gittell 2003). Relational engagement involves interactants acknowledging responsibility for helping to maintain a less than desirable setting of joint action or, more positively, accepting responsibility for improving a setting of joint action. In conditions of relational engagement, individuals are likely to establish high-quality connections; namely, their relationships will tend to have a high emotional carrying capacity, be high in tensility, and have a high degree of generativity (Dutton and Heaphy 2003, p. 266; Gittell 2003, pp. 282–283). As a result, individuals are likely to make themselves more open to one another and develop more fully depth and breadth awareness (Hirschhorn 1997, p. 90; Lee et al. 2003, p. 210).

Argyris (2002) provides a convincing illustration of a productive dialogue. Following his intervention in a business consulting firm, whose professionals had initially displayed defensiveness in the way they discussed their frustrating experiences with a particular client, a group of consultants eventually got engaged in the following dialogue (Argyris 2002, p. 13):

> *Professional* 1: One of the biggest problems I had with the way you [the manager] managed this case was that you seemed to be unable to say no when either the client or your superior made unfair demands. [Gives an example.]
>
> *Professional* 2: I have another example to add. [Describes a second example.] But I'd also like to say that we never really told you how we felt about this. Behind your back we were bad-mouthing you—you know, "he's being such a wimp"—but we never came right out and said it.
>
> *Manager*: It certainly would have been helpful if you had said something. Was there anything I said or did that gave you the idea that you had better not raise this with me?
>
> *Professional* 3: Not really, I think we didn't want to sound like we were whining.
>
> *Manager*: Well, I certainly don't think you sound like you were whining. But two thoughts come to mind. If I understand you correctly, you were complaining, but the complaining about me and my inability to say no was covered up. Second, if we had discussed this, I might have gotten the data I needed to be able to say no.

The reason this dialogue turned out to be productive was that the professionals did not only openly comment on how the manager had handled the particular client but, crucially, acknowledged *their* own part in covering up their complaints in the past (Professional 2). It is the willingness to accept responsibility for their part in helping to maintain the problem by not speaking up that contributed decisively to making this particular dialogue productive. It is the modality of relational engagement that tacitly conveyed an attitude as to the kind of

relationship the professionals and their manager desired to have, which created the appropriate context within which the specific dialogical exchange took place, and, as Argyris (2002) makes clear, a shared new sensibility eventually emerged.

Relational engagement is created by what Möllering (2006, pp. 110–111) calls "suspension," namely, the attitude that enables participants to suspend "irreducible social vulnerability and uncertainty *as if* they were favorably resolved" (Möllering 2006, p. 111) and maintain a state of favorable expectation toward the other (see also Sawyer 2003, p. 101). The productive dialogue reported by Argyris (2002) became possible insofar as professionals bracketed their vulnerability and the uncertainty of the manager's response. This is evident in their utterances. Professionals 1 and 2 begin with a critique of the handling of the client by both the manager and themselves. Their utterances contain the potential to mean, which is realized through the manager's response. The manager could have selected only the part of the professionals' utterances that criticized him in an attempt to defend his actions and shift blame, but he did not. The professionals behaved *as if* the uncertain response of the manager was certain and, by so doing, they helped bring about relational engagement.

By contrast, when the modality of *calculated* engagement is present, individuals confine themselves to minimally cooperative behaviors, or behaviors that aim to maximize individual or sectional gains or protect turf. As a result, dialogues are likely to be unproductive: Those involved either talk past each other or engage in "dehydrated," stylized, or conflict-ridden conversations (Gratton and Ghoshal 2002, p. 210) that fail to spark a new shared understanding. The suspension required for participants to let themselves open to influence is not achieved. The case studies reported by Beech et al. (2002) and Hodgkinson and Wright (2002) are particularly revealing in that regard.

Productive dialogical exchanges are characterized by four properties. The first is *collaborative emergence* (Sawyer 1999, p. 449, 2000, p. 183). Every utterance in a dialogical exchange represents a bifurcation: multiple contingencies are present at each line of dialogue (Sawyer 2003, p. 101). With each turn, participants contribute to the gradual creation of an interactional frame. The latter is analytically irreducible to participants' intentions or actions in individual turns of dialogue, "because in many cases an actor cannot know the meaning of his or her own turn until the other actors have responded" (Sawyer 2003, p. 43). The frame emerges from joint action and changes with every turn. The final outcome of the dialogue, namely, whether it will lead to new distinctions, is an *emergent* effect that cannot be decomposed into its components (Sawyer 1999, p. 448). The second is *constrained novelty*. A dialogue is a process that involves both upward and downward causation. A dialogue proceeds insofar as those

involved make their individual contributions (upward causation). At the same time, there is, at any given moment, an *emergent* interactional frame, tacitly created by the individual contributions, that constrains subsequent individual contributions (downward causation) (Sawyer 1999, pp. 455–456). Constrained novelty gives dialogue both a coherence, which comes from the emergent frame into which later contributions must fit, *and* novelty, which comes from participants' further modifying an ever-changing emergent frame. Third, following from the previous two, is *incremental emergence*. Because a dialogue has the features of collaborative emergence and constrained novelty, at each dialogue turn participants can modify the emergent frame by a small amount (Sawyer 1999, p. 467). And fourth, in a productive dialogue there is always some element of *indexical creativity* (Sawyer 2003, p. 69, 2007, pp. 140–144). An utterance is indexically creative when it helps enact the state of affairs it presupposes. To take an ideal-typical example, when, in an opening scene in improvisational theatre, an actress addresses another actor on stage with the question, "May I help you?" she creatively indexes him as a customer, although he has not yet been identified as a customer. The question helps create the state of affairs it presupposes.

Generating Distinctions

So far, the question, what makes dialogue productive? has been explored, and the argument has been made that when dialogue is productive it leads to self-distanciation, which facilitates the making of new distinctions. The question to be addressed now, in this section, is, how do new distinctions come about as a result of self-distanciation? Drawing on creative cognition research, three processes of *re*conceptualization—that is, conceptual changes to accommodate or bring about changes in practices (Dunbar 1997, p. 485)—will be identified that give rise to new distinctions: conceptual combination, conceptual expansion, and conceptual reframing. Each process is described and illustrated below.

Conceptual Combination

A new concept may be generated by combining two or more existing concepts. As well as for reasons of communication efficiency, conceptual combination occurs primarily because novel combinations create new categories to describe or bring about changes in something familiar (e.g., "Zionist Christians," "affordable luxury," "natural selection") (Wisniewski 1997, p. 54). Typically, combinations take the form of noun–noun or adjective–noun modifications whereby a modifier (noun or adjective) is applied to a head concept (usually a noun). Such combinations range from the mundane (e.g., "blue car," "radio phone") to the creative (e.g., "sweet sorrow," "sound wave," "natural selection," "global village"). The new concept may have *emergent attributes*,

that is, attributes that are different from those of either of the constituent parts (Hampton 1997, p. 87; Sawyer 2007, p. 114). To take a mundane example, when asked to list the properties of the concept *blind lawyer*, a typical response is "courageous." However this attribute is not normally listed as a typical attribute of either blind individuals or lawyers (Glucksberg et al. 1997, p. 346; Hampton 1997, pp. 88–100). The smaller the overlap between the two terms of the combination, the higher the likelihood of emergent attributes (Hampton 1997, p. 90).

Faced with novel combinations, individuals strive to come up with a coherent account as to how to apply a modifier to a head concept (Thagard 1997). According to Wisniewski (1997, pp. 56–57), conceptual combinations can take three forms: *relation linking*, when a relation is postulated between the referents of the modifier and noun (e.g., "disabled toilet," i.e., a toilet for disabled individuals); *property integration*, when one or more properties of the modifier apply to the noun (e.g., "robin snake," i.e., a snake with a red underbelly); or *hybridization*, when the combination refers to a combination of the constituents (e.g., "robin canary," i.e., a bird that is a cross between the two) or a conjunction of the constituents ("author painter," i.e., one who is both an author and a painter).

When individuals fail to come up with a coherent account—that is, when the attributes of the novel conceptual combination cannot be fully accounted by these three types of conceptual combinations—more creative cognitive processes are activated, such as *analogy* and *abduction* (Thagard 1997, pp. 138–140). For example, one will find it difficult to form a coherent interpretation of *web potato* by applying any of the above-mentioned three kinds of combinations. Such a failure may set in motion a more creative thinking process that could take the form of analogical reasoning. A "web potato" may be interpreted analogously to a "couch potato," namely, as someone who spends too much time on the Internet (Thagard 1997, p. 139).

Abduction is another source of creative thinking (i.e., forming explanatory hypotheses to explain how the modifier may apply to the head concept; Thagard 1997, p. 139). For example, faced with a combination such as *socially responsible corporation*, one is led to form hypotheses to explain why, and in what ways, a profit-seeking corporation may not relentlessly pursue profit maximization for the sake of social responsibility. For Thagard (1997, p. 137), analogy and abduction are the two main sources of creativity in science, one of the best examples being the combination *natural selection*, which is based on both analogy (with artificial selection practiced by breeders) and abduction (the postulation that selection could become natural in the process of organisms seeking reproductive advantage).

Nonaka and Takeuchi (1995) provide illustrations of conceptual combinations, which may be illuminatingly

reinterpreted by applying the preceding analysis. Take, for example, the well-known case of the development of Matsushita's Home Bakery, the first fully automated machine for home use (Nonaka and Takeuchi 1995, pp. 100–120). According to the authors, the critical step in the knowledge creation process that led to the development of the new product was the articulation of "twisting stretch" by the software developer, following her apprenticeship with a master baker at a major Japanese hotel and several discussions with a team of engineers who were brought to the hotel to experience the kneading and baking of bread. "Twisting stretch" is a novel conceptual combination to provide an image of the kneading movement required. This combination can be partly accounted by property integration, that is, by a property of the modifier ("twisting") that applies to the head concept ("stretch"). As well as such a mapping, however, further issues remain to be resolved that concern the bringing about of the "twisting stretch" movement. This requires the construction of a model that would abductively hypothesize ways in which the modifier would apply to the head concept. This is what the project team did, and Nonaka and Takeuchi (1995, pp. 104–105) describe the mechanisms engineers developed to bring about a suitable "twisting stretch" kneading movement by the machine's propeller (e.g., special ribs were added so that the dough could be stretched as the propeller turned).

Conceptual Expansion

As well as by combining concepts, another way through which new distinctions may arise is conceptual expansion. The latter involves semantically extending the use of a concept beyond its core use to match a new situation (Murphy 1997, p. 242; Lakoff and Johnson 1999; Tsoukas and Chia 2002, p. 574). Psychological experiments confirm that semantic extension is an inherently creative process, insofar as language users often use concepts in less usual ways when encountering new situations. However, this is not an "anything goes" process. On the contrary, as Murphy (1997, pp. 256–258, pp. 260–261) suggests, on the basis of experimental evidence, there are at least two constrains on semantic extensions. The first is the *relatedness constraint*. Semantic extensions are more likely to be accepted when the new use is not far removed from the core meaning. In other words, for novel extensions to be accepted, they need to be built on already known senses of a concept. Semantic extension is incremental. Second is the *variability constraint*. The new use is more likely to be accepted if it follows a conventional form of semantic extension. The making of analogies is such a form.

The relatedness constraint helps us understand the often incremental character of new distinctions arising in practice. For example, Barrett et al. (1995) noted that the introduction of a total quality management

(TQM) system in a section of the American Navy constituted a new discursive template that included concepts such as "empowerment," "participation," and "continuous improvement." In the course of time, those concepts were further extended to refer not only to strictly TQM-related issues but also to broader issues of organizational culture.

The variability constraint, especially the preference for conventional means of semantic extensions, helps us understand why analogies, especially "near analogies" (that is, analogies whose source and target domains are of the same or similar types; Dunbar 1997, p. 472, pp. 476–467; Gentner et al. 1997), are often used in knowledge creation. New distinctions may arise through analogically mapping a relation (or system of relations) obtaining in the source domain to the target domain and, therefore, drawing inferences about something unknown (target) from something known (source) (Cornelissen 2005, Gentner 1998, Tsoukas 1991). Reasoning through analogies is widely considered an acceptable mechanism for drawing inferences (Gentner et al. 1997).

Dunbar's (1997) detailed study of four molecular biology labs demonstrates the heavy reliance of scientific problem-solving on the effective use of near analogies—in this case, analogies either to the same organism ("within-organism analogies") or to other similar biological organisms ("other-organism analogies") (see Dunbar 1997, p. 472)—in providing explanations and formulating hypotheses. In an immunology lab, for example, a group of scientists reasoned together to decipher the mechanisms through which B-cells cause a particular autoimmune human disease. The scientists' reasoning was shot through with near analogies between the autoimmune human disease and the autoimmune disease in rabbits and hamsters. Through extended conversations, scientists were able to come up with new distinctions, in this case specifying two new mechanisms, instead of a single one they had hitherto assumed, that explained all three diseases (Dunbar 1997, p. 487). New distinctions gradually arose through changes produced largely by near analogies.

Conceptual Reframing

A third way of creating new distinctions is conceptual reframing. Reframing means reclassifying an object, or at least shifting emphasis from one class membership to another, so that a new view of it emerges (Bateson 1972, pp. 186–189; Bartunek 1988; Watzlawick et al. 1974, p. 98). Reframing can be nonmetaphoric or metaphoric.

An example of nonmetaphoric reframing is provided by Hoberg (2006), who reports in some detail a structured "dialogue seminar" that took place between eight software architects at Combitech Systems, a Swedish software company. The purpose of the dialogue seminar was to enable participants to understand more deeply the skills of a software system's architect. Participants

exchanged views on what methods they had been using in writing software in an attempt to articulate what the essential skills of their jobs were. Different views were put forward, some of which, in the course of the dialogue, were subsequently revised. However, the conversation tended to circle around familiar ground, and, as Hoberg (2006, p. 120) makes clear, something was missing. Then, following a particular exchange, a new shared understanding spontaneously emerged.

The group had been discussing the extent to which methods are useful in software writing when Kjell, a respected software engineer of considerable experience, made the point that software architects' experience is irreplaceable in creatively framing problems, and that methods are useful *after* a creative framing has been made. Hoberg (2006, p. 120) quotes from the meeting's minutes as follows: "There is a moment's silence. Somehow there was nothing more to say, that is just the way it is. We were standing on a new platform. The evening's dialogue had created something that made Kjell's answer a message for everyone. Suddenly a new discussion begins, at a different level and with greater concentration and purposefulness, on the software architect and his role in the project." In spontaneously accepting Kjell's description, group members jointly created a new shared sensibility—a new distinction had emerged and been adopted. Kjell's description created an "arresting moment" (Shotter 2006, p. 255) in the interaction order of the group, which reclassified the use of methods in software writing as occurring *after* a particular problem had been creatively framed, not before, as had hitherto been assumed in the meeting.

Another type of reframing is metaphoric reclassification. A metaphoric statement is typically of the form "X is a Y," where X is the metaphor topic and Y the metaphor vehicle (Glucksberg et al. 1997, p. 328; Cornelissen 2005; Tsoukas 1991). For example, "Mary's job is a prison," where "Mary's job" is the topic and "prison" is the vehicle. Metaphors are property attributions that can create new categories through reclassification. For example, in the expression "Mary's job is a prison," the term "prison" has two referents. One is the literal prison (the building used to confine prisoners), and the other is the metaphoric prison, the superordinate attributive category that the literal prison exemplifies (i.e., the category of things or situations that are unpleasant, confining, oppressive, etc). When the vehicle "prison" is used to characterize the topic "Mary's job," it functions as a superordinate attributive category—it provides attributes to the topic. In that sense, metaphoric statements are class membership statements. Mary's job has been classified as belonging to the category "prison," that is, to the superordinate attributive category of unpleasant, confining, oppressive situations that prisons exemplify (Glucksberg et al. 1997, p. 333), and in that sense a new category has been created. Metaphors

do not report an antecedent similarity but *create* a similarity through dislodging a topic from a familiar class membership and inserting it in a new one provided by the vehicle (Kittay 1997, p. 389, 1982).

The preceding analysis helps shed light on the use of metaphors in organizational knowledge creation. Consider, for example, the classic case described by Schön (1979, pp. 257–260), where a group of product-development researchers was trying to find ways of improving the performance of a new paintbrush made with synthetic bristles (for similar examples, see also Hargadon and Sutton 1997, 2000). Following several conversations in the group and a lot of trial and error, a researcher observed that "a paintbrush is a kind of pump." This is a metaphorical reclassification through which properties of the superordinate category "pump" are attributed to the topic "paintbrush." Put differently, the topic is inserted in a new classification provided by the superordinate attributes of the vehicle. This metaphoric statement is a class membership statement. A pump is an instrument that moves liquid from one place to another by pushing or sucking it through a channel. A paintbrush can be described as being like a pump because it *is* a pump, in the sense that it belongs to the superordinate category of tools that push or suck liquid through a channel. This category provides the properties that are attributed to the paintbrush (cf. Glucksberg et al. 1997, pp. 347–348; Schön 1979, p. 260).

By reclassifying "paintbrush," a new category is created, which makes possible the drawing of new distinctions. As Schön (1979, p. 258) describes, now the researchers notice the *space* between the bristles (not just the bristles) and think of them as *channels* through which paint can flow; rather than seeing the paint as adhering to the surface of the bristles, they now see it as *flowing* through the channels formed by the bristles. The metaphor pushed to the foreground certain features of the bristles that had hitherto remained at the background. Schön (1979, p. 260) further remarks that researchers initially had an "unarticulated perception of similarity" derived from experience, being unable to point out "similar with respect to what." In an effort to explicitly account for the similarity, they articulated an account of the similarity perceived by formulating explicit analogies between a pump and a paintbrush, and mapping a set of relations obtaining in the former onto the latter.

Conceptual Change and Dialogue:
A Brief Discussion
In all preceding illustrations of the three types of reconceptualization, the latter occurs through extended productive dialogues in problem-solving teams. For example, although Nonaka and Takeuchi (1995) do not provide the scripts of the relevant dialogues, they do emphasize that none of the novel conceptual combinations they report (i.e., "twisting stretch," "comfortable

functionality") would have been possible unless project team members had talked extensively with one another about how to proceed with the task at hand. The novel conceptual combinations arrived at introduced new distinctions as a result of the perplexity participants experienced. Such perplexity acted as a stimulus to team members to overcome through dialogically assimilating the strange and creating a new sensibility.

Similarly, Dunbar (1997, p.482) emphasized the centrality of dialogue in scientists' group reasoning processes (what he calls "distributed reasoning"), without which scientists would not have been as creative in coming up with near analogies as they were. As he explains, group dialogue is important because it helps circumvent a major problem individuals reasoning alone face: generating *alternative* hypotheses, explanations, and theories. Dialogue "provides new premises and models that an individual may not be able to generate when reasoning alone" (Dunbar 1997, p. 483), and insofar as this is the case, dialogue enriches the inference processes and the concepts individuals use.

In principle, new premises are introduced through self-distanciation—each interlocutor "doubly interacting" with one another and reflexively understanding their own utterances. Moreover, in a productive dialogue, inference processes such as induction and deduction come to be shared to some extent at least, in the sense that the multiple premises used in them are provided by different participants. For example, in one of the labs researching HIV, it was found that 30% of inductions and deductions were shared by more than one individual and 12% were shared by more than two. Inductions of one scientist sometimes formed the basis for a deduction by another (Dunbar 1997, p. 483). Dialogue enriches the inference processes used by the group by generating several premises that become inputs to the group inference processes.

The case of conceptual enrichment that is brought about by dialogue has been demonstrated by Markman et al. (1997). In a series of experiments involving individuals building LEGO spaceship models in different conditions (that is, in one group pairs of individuals had to talk by design, whereas, by contrast, in the other group individuals were asked to build the models solo), Markman et al. (1997, pp. 193–200) showed that the pairs in the first group created more complex categories than those created by the solitary individuals in the second group. Dialogue potentially complexifies individuals' thinking (Sawyer 2007, p. 132).

The centrality of dialogue for bringing about conceptual reframing is born by Hoberg's (2006) and Schön's (1979) illustrations too, although no detailed dialogue scripts have been provided. For example, Kjell's contribution was clearly critical in reframing the issue at hand, but it is impossible to say which aspect of the new shared understanding was due to whom. Kjell's statement, in which he drew the crucial distinction about the use of methods before and after the creative framing of a problem, was made in *response* to a comment that Odd, another seminar participant, had just made, and, at any rate, Kjell's statement was uttered against the background of an already evolving dialogue between the members of the team. The new shared sensibility was *dialogically* created (Wertsch 1991, pp. 28, 86–92). The same applies in the case of Schön's (1979) product development team. The researcher came up with the metaphorical statement "a paintbrush is a kind of pump" after the group unsuccessfully tried several improvements and talked about them. The perplexity they faced helped generate conversations, out of which the metaphor emerged.

An Illustration

Let me summarize the argument so far before proceeding with an illustration. From a dialogical perspective, new organizational knowledge originates in the individual ability to draw new distinctions concerning a task at hand. New distinctions may be developed because practitioners experience their situations in terms of *already* constituted distinctions, which lend themselves to further articulation. Further articulation develops when organizational members engage in productive dialogical exchanges. Dialogue becomes productive when the modality of interaction is that of relational engagement, namely, when participants take active responsibility for both the joint tasks and the relationships in which they are involved. Participants in a productive dialogue make themselves open to influence and, thus, are led to self-distanciation, that is, to taking a distance from their customary and unreflective ways of acting as practitioners. Productive dialogical exchanges are characterized by four properties: collaborative emergence (i.e., the construction of an interactional frame turn by turn), constrained novelty (i.e., contributions maintain coherence with the emergent frame yet change it at the same time), incremental emergence (i.e., at each turn the emergent frame is modified incrementally), and indexical creativity (i.e., participants attempt to index one another in new ways). The properties of productive dialogue indicate participants' efforts to assimilate mutually experienced strangeness. Such assimilation occurs through conceptual combination, conceptual expansion, and/or conceptual reframing. Through these three processes of conceptual change, new distinctions are made, which, when intersubjectively accepted, constitute new knowledge. The latter, over time, fades into accepted knowledge and forms part of the inherited background, thus providing the context for new organizational issues causing unsettledness to emerge, and the dialogical processes to be reactivated (see Figure 2).

Figure 2   A Dialogical Model for Organizational Knowledge Creation in Direct Social Interaction
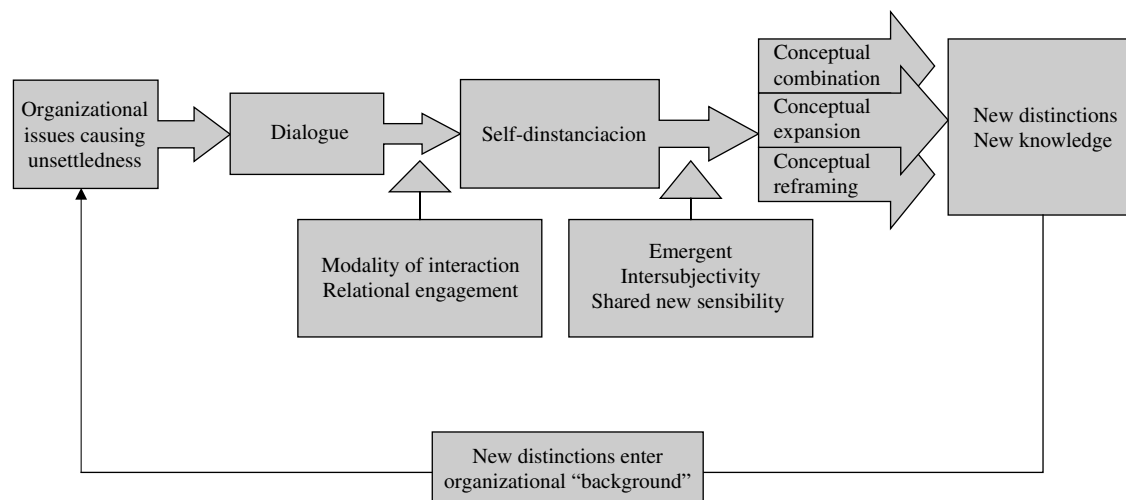
This theoretical framework will be illustrated below with an example drawn from Middleton's (1998, pp. 248–249) field research. More specifically, by examining in some detail a brief sequence of dialogue that took place between a pharmacy assistant (P) and a nurse (N) at the Sister's Office in a multidisciplinary Child Development Centre (CDC), located within a large National Health Service hospital in the United Kingdom, it will be shown how a variation encountered in carrying out routine work may cause local unsettledness, which organizational members tackle by engaging in dialogue and improvising a new solution. The properties of productive dialogue will be demonstrated as well as how the relational engagement of the participants leads them to revise a standard operating procedure (self-distanciation) and modify it in practice, thus generating a new work-related distinction through one of the three processes of conceptual change analyzed earlier.

As Middleton (1998, pp. 248–249) describes, the pharmacy assistant had brought over some prescribed drugs to the CDC, packed in a particular way, and the following conversation took place with the nurse:

1 P: Sally I have split it in two bottles and given two syringes
2 N: yes
3 P: one for school and one for home
4 N: that's great thank you
5 P: and I didn't split the tables because with it being a twice daily dose I presumed they would be taking both doses at home
6 N: yes yes yes I would think so thank you
7 P: OK then [about to leave]
8 N: I'll put them in that cupboard [indicating one in the Room] | Dad might come straight round to you for it because I think he usually does normally | we give the prescriptions and leave it and he is picking it up tomorrow so I'll I'll lock it in that cupboard so if he turns up

9 P: do you want me to take it back to the pharmacy
10 N: he is more likely to come straight to you for it
11 P: alright then as long as long I don't want him somebody want somebody just to pick it up (&)

|

12 N: you didn't want somebody not to explain
13 P: (&) without explaining but if we keep it—it will be
14 N: if you keep it you will make sure you explain it
15 P: yes and if you mention to the doctor that if ever they want to write that you know split it in two its OK

|

16 N: will you be open
Tomorrow it is Good Friday [possible holiday] is the Pharmacy open
17 P: no no
18 N: I'd better ring him and ask him to come up for it this afternoon then alright
19 P: yes you do want [offering the drugs back]
20 N: I will give him a ring now I'm just um when I have finished talking I will ring Dad and ask him to come up this afternoon but I won't be here
21 P: right so collect it from us then (&)

|

22 N: so it is best at Pharmacy
23 P: (&) and we explain that
24 N: alright then thanks
25 P: OK thanks a lot [leaves room with drugs].

Notice that by Turn 6 the basic elements of an interactional frame emerge. The pharmacy assistant explains to the nurse what she did and why, and the nurse acknowledges the account provided. The frame emerges in the give and take of conversation (upward causation). Although each one's incremental contributions may be identified in each turn, the frame is a collective accomplishment because of the double interact: the meaning of every utterance cannot be known until the other actor has responded. When the pharmacy assistant begins describing what she has done (Turn 1), her utterance

has the potential to mean, which is realized in the positive acknowledgement provided by the nurse (Turn 2). The positive acknowledgement encourages the pharmacy assistant to continue with her description (Turn 3), which is further acknowledged by the nurse in even stronger terms (Turns 4 and 6). A collaborative frame gradually emerges that constrains subsequent individual contributions (downward causation).

After the introductory remarks (Turns 1–6), the first substantive moment in the dialogue occurs in Turn 8. There the nurse describes what she will do with the drugs the pharmacy assistant brought her. At the same time, the nurse creatively indexes, albeit mildly, the pharmacy assistant as a likely source of the particular drugs ("Dad might come straight round to you for it . . . "), given the father's past behavior to visit the pharmacy to pick up the drugs (". . . because I think he usually does normally"). Note that the nurse's statement in Turn 8 does not mean anything in particular until it receives a response from the pharmacy assistant. There is no particular reason why the pharmacy assistant *should* have responded as she did in Turn 9. She might have unreflectively said "this is fine" or might have started gossiping on the father's habit.

Instead, the pharmacy assistant replies to the nurse's creative indexing by offering help: "do you want me to take it back to the pharmacy" (Turn 9). This opens up an *alternative* allocation of responsibility for dispensing the drugs: instead of the CDC giving out the drugs, the pharmacy could do this, with the added benefit that the pharmacy people can explain the prescription to the father. Interlocutors agree to do so and go one step further: perhaps a more general principle may be made that accommodates this nonstandard manner of dispensing drugs to patients (Turn 15). In formulating this ad hoc course of action, a new work-related distinction emerges, which might have organizational implications.

Moreover, this is a case of a new distinction incrementally arising from conceptual expansion. The concept of "drug dispensation" had so far been organizationally defined in such a way that sole responsibility for dispensing drugs to patients had rested with the CDC. However, a noncanonical case was encountered here: the particular drugs had been prescribed in an idiosyncratic way (Lines 1 and 5), which needed to be explained to the family concerned, and who better to do this than the pharmacy (Turns 12–14). In addition, the father was in the habit of visiting the pharmacy anyway (Turn 8). The core use of "drug dispensation" was semantically extended to include the pharmacy to accommodate this idiosyncratic case. It was a plausible and incremental extension: the new use was not far removed from the hitherto core meaning. To the extent the new use would be organizationally adopted, it might constitute a new practice.

It is noteworthy that, in this exchange, *both* the nurse and the pharmacy assistant take joint responsibility for how to get the drugs to the family and explain the prescription to them (see Middleton 1998, p. 251). Their relational engagement involves suspension, albeit not a particularly risky one. The nurse's utterances in Turns 8 and 12 indicate a state of favorable expectation toward the pharmacy assistant, which is reciprocated. Their dialogue leads them to self-distanciation insofar as, eventually, they reconsider the relevant standard operating procedure in response to a local "variation" (Feldman and Pentland 2003, p. 102). Dealing in practice with an idiosyncratic case generates unsettledness, which they seek to dialogically process. Engaging relationally with one another, they are open to influence. As a result, their conversation leads them to enact the organizational routine regarding drug dispensation in a different manner (Feldman and Pentland 2003). Through their conversation, new premises are introduced (i.e., the need to explain the prescription to the family, the impending bank holiday which would keep the pharmacy closed), which are fed into the inference processes used (Turns 11–15, 18–23), thus leading the interlocutors to search for a broader focal awareness that would remove the experienced unsettledness.

Admittedly, this is a simple exchange (for similar ones, see Quinn and Dutton 2005, p. 40; Sawyer 2007, pp. 135, 139–140). Moreover, on the face of it, the new distinction concerning the dispensation of drugs does not appear to have significant implications for the functioning of this particular organization. However, it does show *how* new distinctions may arise in dialogue. How organizationally important those new distinctions may turn out to be is another matter. From a dialogical point of view, the organizational significance of particular new distinctions that arise in a situated dialogical interaction (or series of interactions) cannot be assessed except *in retrospect*, namely, after the new distinctions have been woven into other ideas and applications created by others (Sawyer 2007, pp. 144–146; Hargadon and Sutton 1997, p. 731). The history of innovation is replete with such examples (see Sawyer 2007, p. 45; Hargadon 2003).

Discussion

The dialogical theory of knowledge creation outlined here can shed new light and further extend current research on organizational knowledge. Consider, for example, the work of Carlile (2002, 2004), which provides more complex cases of knowledge creation (and the difficulties encountered therein) than the illustration discussed above (see also Bechky 2003a, b). Knowledge creation in organizations, Carlile argues, often occurs *across* functions (or knowledge domains). In such cases, a diverse team of experts, each one possessing domain-specific knowledge (e.g., about design, manufacturing, sales, safety, etc.), is typically formed, aiming at solving a

particular problem. The specialization of team members' knowledge creates *differences* in the type of knowledge team members have, *dependencies* that hold important consequences for the specific tasks their respective functions do, and *novelties* in the form of, typically, new customer needs, translated into new organizational requirements (e.g., a new valve, improved management of vehicle design).

Novelty creates unsettledness, which may be removed through the creation of new knowledge (e.g., how to manufacture the new valve, how to make communication and problem solving more effective across organizational functions). When novelty arises, it can be assessed in terms of its likely adverse consequences for different knowledge domains. Consequences may be adverse because creating knowledge usually involves more than settling differences of opinion and translating different meanings into different knowledge domains. Crucially, it often involves negotiating occupational jurisdictions, protecting career interests, and making trade-offs. Changing current domain-specific knowledge is costly because knowledge takes time and resources to acquire and it is bound up with organizational members' competencies, careers, and, ultimately, identities (Bechky 2003a, Orr 1996). Therefore, knowledge is "at stake" when challenged (Carlile 2002, p. 446, 2004, p. 556). For adverse consequences to be assessed, a body of common knowledge may be developed that can represent differences and the consequences arising out of dependencies (Bechky 2003b, p. 324). Common knowledge often takes the form of a boundary object (i.e., an across-boundaries shareable framework, tool, object, or tangible demonstration) whose representational power influences the extent to which productive dialogue across diverse knowledge domains may be achieved by enabling participants to learn about the adverse consequences arising out of current and novel types of dependencies. Insofar as a boundary object makes it possible for adverse consequences to be openly discussed and negotiated, changes in knowledge across domains and, thus, the emergence of new knowledge, may take place (Bechky 2003b, p. 325; Carlile 2002, p. 445).

Clearly, dialogue is an important mechanism through which new knowledge emerges in the ethnographic settings Bechky (2003a, b) and Carlile (2002, 2004) studied, because dialogue facilitates both across-functions understanding and the negotiation of occupational interests. This is amply shown in, for example, Carlile's (2002) fieldwork concerning the development of a new, more complex valve at XT Products. Mick was the representative from manufacturing engineering to several design review meetings concerning the manufacturing and testing of a new valve. He had been frustrated with the design engineers because "they don't realize that [the new valve], with its high part count and 3,000,000-a-year volume is going to be a completely different beast

to deal with" (Carlile 2002, p. 443). The new valve had four times as many parts compared to previous valves, and it would be produced at a significantly higher volume. The novelty facing the organization—high part count, high volume—had manufacturing implications and needed to be addressed. These new requirements made Mick push for four subassemblies to manufacture and test the valve and try to get design engineers to change the current design of the new valve to accommodate the suggested subassemblies. In the design review meetings, Mick initially used assembly drawings that did not reflect designers' concerns, namely, issues related to specs, tolerances, and locations of critical sealing surfaces, all of which were part of the current design of the new valve. When, however, in a meeting, enabled by the use of a new computer aided design (CAD) tool, Mick used updated assembly drawings that reflected the current design, design engineers could see the design change required by the four subassemblies. Vigorous discussion started about the pros and cons of changing the current design, which uncovered the currently problematic way of attaching parts. Eventually, the head design engineer accepted to redesign the valve with four independently testable subassemblies connected through different means from what had been shown on the current design.

Carlile (2002, p. 450) notes that "Mick had proposed going to subassemblies in meetings before," and asks, "What was different this time?" Carlile's answer is that what made the difference was the use of updated assembly drawings, which enabled participants to have the designs' differences and dependencies, as well as the consequences arising from those dependencies, represented and discussed (e.g., how the current design makes for high scrap rates (Mick's concern) or how going to subassemblies might undermine the new valve's design functionality (design engineers' concern)). In short, *both* parties (manufacturing and design engineers) were able to see and discuss what was "at stake." But why may the representation capacity of an effective boundary object lead to productive dialogue?

Although the technical challenge to construct effective boundary objects (in this case, the updated assembly drawings) should not be underestimated, what is *interactionally* significant is the *relational* modality of engagement that is enabled by an effective boundary object. Mick's use of the updated assembly drawings made it possible for design engineers' concerns to be represented rather than ignored, which stimulated them to engage relationally with him. Similarly, Bechky's (2003b, p. 326) fieldwork in EquipCo shows that the machines were more effective boundary objects than the engineering drawings in facilitating productive dialogue between engineers and assemblers, because "the drawings could not invoke the key differences in work contexts between the groups," whereas machines could.

In both cases, the use of the right boundary object tacitly conveyed an attitude as to the kind of relationship both parties (manufacturing engineers and design engineers in the case of Carlile (2002); design engineers and assemblers in the case of Bechky (2003b)) desired to have, which created the appropriate shared context within which the dialogical exchanges that ensued took place. This is more clearly seen if Mick's use of the updated assembly drawing and the productive dialogue that followed is juxtaposed to earlier, unproductive design review meetings, without the updated drawings (Carlile 2002, p. 443). In the early meetings, dialogue was unproductive because design engineers had adopted the modality of calculative engagement in an effort to protect their turf, because the assembly drawings used in those meetings were not up to date and did not represent design engineers' concerns (see also Bechky 2003a, p. 737). By contrast, the updated assembly drawings used later included their voice (Bakhtin 1984, p. 197); design engineers now felt they had a stake in what was "at stake." Productive dialogue led the team to conceptual reframing: the current connections between parts were reclassified from the "spin-weld" type to the "snap-fit" type, which enabled the current design to change to include the four subassemblies (Carlile 2002, p. 450).

Carlile (2004, p. 557) makes the useful distinction between the "capacity" of the common knowledge (the boundary object) to represent differences and dependencies and the "ability" of the actors involved to *use* the common knowledge. His ethnographic studies have mainly focused on, and significantly enhanced our understanding of, the "capacity" and its consequences for managing knowledge across boundaries. Research informed by the dialogical perspective suggested here can illuminate what is involved in actors' "ability" to use common knowledge, namely, the extent to which they engage relationally with one another and the extent to which they create opportunities for reconceptualization. More light on actors' "ability" to use common knowledge to tackle novelties will be shed by examining closely dialogue scripts. Then, one can see the extent to which participants offer new premises, the kinds of analogies, conceptual combinations, and/or expansions they use (if at all), and their modality of interaction.

Conclusions and Suggestions for Further Research

This paper has attempted to offer a dialogical theory of knowledge creation in organizations that is compatible with what is currently known *and* take it further. Although previous theories of organizational knowledge creation have correctly highlighted the importance of conversational interaction, they left unspecified the process through which it gives rise to new knowledge. In this paper, I have focused on an important aspect of

conversational interaction—dialogical exchanges. I have argued that new knowledge, conceived as the making of new distinctions, emerges through productive dialogue. The later enables participants to take a distance from their customary and unreflective ways of understanding and acting, and reconceptualize a situation at hand through conceptual combination, expansion, and/or reframing.

The dialogical perspective described here can inform further research on organizational knowledge creation in several ways. As noted when discussing Carlile's (2002, 2004) research, the use of boundary objects is important in generating new knowledge across boundaries. Hargadon and Sutton (1997) have similarly underlined the importance of physical products, components, prototypes, sketches, notes, and drawings in creating new knowledge in the context of product design. To put it more generally, conversational interaction in organizations is often mediated by artifacts, whose importance in knowledge creation has been noted by several management and organizational researchers (Bechky 2003a, b; Boland et al. 2007; Schrage 2000; Leonard-Barton 1995; Nonaka and Takeuchi 1995; von Krogh et al. 2000). Of course, as sociocultural psychologists have pointed out (Wertsch 1991, pp. 28–43), language itself is an artifact, and it is on the use of this particular artifact that I have focused in this paper. However, focusing on artifacts in the more narrow sense of the term will help us see what is distinctive of objects and tools in the process of knowledge creation. Organizational members can articulate better what they want by interacting with artifacts, such as prototypes and visual aids, than by enumerating requirements or verbalizing needs (Bechky 2003b, p. 324; Leonard-Barton 1995, pp. 127–133; von Krogh et al. 2000, pp. 89–90; Schrage 2000, p. 166). Future research could focus in more detail on how artifacts and tools, as well as tangible definitions and demonstrations, mediate conversational interaction in organizations; on the characteristics artifacts need to have to bridge specializations, facilitate shared understanding, and thus contribute to knowledge creation; and on the capacity of artifacts to be useful in the knowledge creation process in terms of features such as tactility, manipulability, and transferability.

Moreover, as Bechky's (2003a, b) and Carlile's (2002, 2004) work makes clear, conversational interaction occurs in socially structured situations in which status and power are unevenly distributed. If, as argued here, relational engagement makes dialogue productive, how is relational engagement achieved in hierarchically arranged contexts? How does the uneven distribution of power in organizations affect the dialogues individuals engage in? (Marshall and Rollinson 2004, Yanow 2004). An important finding from Bechky's and Carlile's research is that boundary objects, be they "tangible definitions" (Bechky 2003b, p. 326) or artifacts,

must have the capacity to "invoke the key differences in work contexts between [different] groups" (Bechky 2003b, p. 326). What influences the choice of boundary objects and how they are used? How do members of occupational groups in organizations mobilize boundary objects or draw on their expertise-derived authority to buttress their occupational status and jurisdiction at the expense, perhaps, of creating a shared context of relational engagement with members of other groups? When occupational and/or hierarchical differences subside, and relational engagement prevails, how does this happen? More generally, in what organizational conditions is it more likely for relational engagement to prevail?

As Obstfeld (2005) has shown in his ethnography of a vehicle's core design at NewCar, knowledge articulation involves making knowledge *relevant* to the situation at hand (see also Boden 1994, p. 13; Tsoukas 1996, p. 21). Making knowledge relevant, Obstfeld (2005, p. 30) notes, is a process that selectively draws on past experience to bring it forward to address the situation at hand (Hargadon and Sutton 1997, pp. 735–740). In dialogue, individuals negotiate their understandings, and by doing so they attempt to influence one another. Future research may explore the various modes of argumentation organizational members use in their influence attempts. When, for example, design teams discuss new product designs, how do team members draw each other's attention to weaknesses and opportunities for improvement? What rhetorical means do they make use of, and with what effects? (Sillince 2005).

If Carlile (2002, 2004) and Bechky (2003a, b) have demonstrated the difficulties in creating knowledge within functionally heterogeneous groups, Dunbar (1997) has pointed out the difficulties arising within a homogenous group. His research has shown that conceptual change is far more likely to occur when individuals reasoning together share a common background, yet, at the same time, bring their different experiences and/or expertise to the table. Group heterogeneity increases the number of different analogues that are brought to bear on the problem at hand (Gentner et al. 1997, p. 446). Future research can shed further light on the relationship between group heterogeneity and knowledge creation as well as further explore what kinds of analogies lead to what kinds of outcomes, and at what stages of the dialogical exchanges.

Finally, although the research question explored here focuses on direct conversational interaction, increasingly, knowledge creation takes place in virtual environments. Virtuality changes importantly the conditions of social interaction: time and place are separated, reality becomes abstracted, individuals have more control over how they project themselves, and new forms of relationality emerge (DeSanctis and Monge 1999, Ren et al. 2007). In light of this, what difference does virtuality make to knowledge creation? The dialogical perspective suggested here would need to be further developed to accommodate the mediated environments in which knowledge creation takes place.

Acknowledgments

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