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Title: Interaction Management: The Next (and Necessary) Step Beyond Knowledge Management (revised)

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Summary: Purveyors of knowledge management software have a disconcerting tendency to promote the myth that all problems may be solved by more powerful tools for the exchange of information in the workplace. This fallacy is based on the faulty assumption that knowledge management is about the management of *knowledge* (as if knowledge were a commodity that could be managed), as opposed to the management of *people* whose work depends critically on what they know. The origins of knowledge management are far more firmly rooted in the psychological legacy of organizational communication than they are in the technological legacy of information management systems. However, even organizational communication is an inadequate foundation, since various schools of thought in social theory, particularly the structuration theory of Anthony Giddens, inform us that interaction (in the workplace or in any other social setting) is not strictly limited to communication. Knowledge management thus requires moving beyond simplistic models of information exchange to more challenging problems of leveraging social interaction to the advantage of the enterprise. This paper focuses on the claim of structuration theory that the dimension of communication should be supplemented with additional dimensions of power and sanction. This perspective is then examined in light of a case study of crisis management practices, and the case study provides a basis for addressing implications for technological support.

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INTERACTION MANAGEMENT: THE NEXT (AND NECESSARY) STEP BEYOND KNOWLEDGE MANAGEMENT

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ABSTRACT

Purveyors of knowledge management software have a disconcerting tendency to promote the myth that all problems may be solved by more powerful tools for the exchange of information in the workplace. This fallacy is based on the faulty assumption that knowledge management is about the management of *knowledge* (as if knowledge were a commodity that could be managed), as opposed to the management of *people* whose work depends critically on what they know. The origins of knowledge management are far more firmly rooted in the psychological legacy of organizational communication than they are in the technological legacy of information management systems. However, even organizational communication is an inadequate foundation, since various schools of thought in social theory, particularly the structuration theory of Anthony Giddens, inform us that interaction (in the workplace or in any other social setting) is not strictly limited to communication. Knowledge management thus requires moving beyond simplistic models of information exchange to more challenging problems of leveraging social interaction to the advantage of the enterprise. This paper focuses on the claim of structuration theory that the dimension of communication should be supplemented with additional dimensions of power and sanction. This perspective is then examined in light of a case study of crisis management practices, and the case study provides a basis for addressing implications for technological support.

INTRODUCTION

MOTIVATION

The "knowledge movement" has now been with us for about two decades, at least if we trace its origins to Ikujiro Nonaka's research on "organizational information creation" in the eighties.[1] Has it brought us new insights regarding innovative practices in the workplace, or has it devolved into little more than a business opportunity for software vendors claiming to support the exchange of information? The only answer we can give with conviction is that the injection of "knowledge-based terminology" (knowledge creation, knowledge management, tacit knowledge, etc.) has led to more confusion than enlightenment. Phrases like "knowledge creation" and "knowledge management" entail the faulty assumption that knowledge is a commodity that not only can be produced but also whose production can be managed. However, even the most rigorous attempts at "scientific management" (terminology this time due to Frederick Taylor [34]) recognize that it is *people*, rather than commodities, that are managed. Thus, the more substantive message to be found in the writings of Peter Drucker [13], Ikujiro Nonaka [24], Thomas Davenport, Laurence Prusak [11], and many others who have published under the banner of knowledge management is concerned with the management of people whose work depends

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[1] Nonaka's book on organizational information creation was published only in Japanese but is cited in *The Knowledge-Creating Company* [24]. Fritz Machlup was investigating the economic significance of knowledge in this same time frame. (By way of historical perspective, Friedrich Hayek had published his view of "the price system as … a mechanism for communicating information" [21] in 1945.) Machlup had planned a massive eight-volume work to document his findings [22]. Sadly, he died after only three of these volumes had been published.

significantly on what they know. This paper is an attempt to review critically the concept of knowledge management in terms of two fundamental questions:

1. What does it really mean to manage people whose work depends significantly on what they know?

2. How may technology facilitate this management task?

The first question will lead to abandoning one terminology for another, proposing that "interaction management" is a more suitable descriptor than "knowledge management."

BACKGROUND ON KNOWLEDGE

The confusion engendered by knowledge-based terminology can probably be traced back to the epistemological traditions of Western philosophy, particularly where that tradition draws upon concrete representations, such as the formulae of symbolic logic, which almost *can* be viewed as commodities. While Nonaka has claimed that the Japanese intellectual tradition poses an important departure from Western epistemology [24], that claim is not really substantiated by any survey of that tradition, such as that of Randall Collins [7]. What is really at stake in any review of philosophical foundations is the opposition of objectivity and subjectivity. Both positions have a long history in Western philosophy (dating back at least to Plato and Aristotle); but the Japanese proponents of Kyoto School philosophy (which emerged in the early twentieth century and has been cited by Nonaka [24] as a major inspiration) attempted a synthesis (possibly under the influence of Georg W. F. Hegel) of the objectivity of German metaphysics with the subjectivity of Zen. Nonaka has also claimed that this synthesis is reflected in Japanese management style [24]; but the connection seems unlikely, given a general lack of interest in Kyoto School philosophy in contemporary Japan (possibly because of its association with the Japanese invasion of China in 1937 [7]).

If we wish to leverage the history of philosophy, we would probably do better to turn to the social theorist Karl Mannheim [23], who was writing in Germany at the same time that Kyoto School philosophy was emerging. Mannheim derived from an examination of the history of philosophy an evolutionary trend of how man has wrestled with understanding the nature of knowledge. What is most important about Mannheim's approach is that he presents epistemology as only the first stage in this evolutionary progression, subsequently followed first by psychology and ultimately by sociology. Let us briefly examine what distinguishes each of these points of view.

The earliest Greek philosophers quickly discovered that different people not only had different views of the world but also different foundational assumptions concerning the very *objects* that constituted the world. When Theaetetus informs Socrates that he was told "that true belief with the addition of an account (λóγος) was knowledge" [25], Socrates can easily uncover the uncertainties surrounding what we mean by "belief," "true," and justifiable "account." As Mannheim observed [23]:

> *Epistemology sought to eliminate this uncertainty by taking its point of departure not from a dogmatically taught theory of existence, nor from a world-order which was validated by a higher type of knowledge, but from an analysis of the knowing subject.*

This seed of "the knowing subject" would ultimately flower into the Cartesian motto, so significant that, for a change, it deserves to be set in its proper context [12]:

> *Lastly, considering that the very thoughts we have while awake may also occur while we sleep without any of them being at the that [sic] time true, I resolved to pretend that all the things that had ever entered my mind were no more true than the illusions of my dreams. But*

6

immediately I noticed that while I was trying thus to think everything false, it was necessary that I, who was thinking this, was something. And observing that this truth 'I am thinking, therefore I exist' was so firm and sure that all the most extravagant suppositions of the sceptics were incapable of shaking it, I decided that I could accept it without scruple as the first principle of the philosophy I was seeking.

However, if we are going to talk about a subject as a *person*, as opposed to an embodiment of logical reasoning processes, then we have to depart from the abstractions of epistemology and acknowledge that every individual also has a psychology [23]:

It became evident that much more could be said about the manner in which the structure of the subject influenced his world-view when one made use of animal psychology, child psychology, the psychology of language, the psychology of primitive peoples, and the psychology of intellectual history than when one set about it with a purely speculative analysis of the achievements of a transcendent subject.

Thus, the sense of not only belief but also truth and justification may be derived from the *behavior* of the "knowing subject," rather than relationships between the properties of the subject and the properties of the world in which that subject exists.

Nevertheless, knowledge must involve more than the behavior of the subject, because no individual lives in isolation from all other individuals. Individuals are always members of social groups; and what Mannheim calls "the context of group life" [23] is as important to establishing what constitutes belief, truth, and justification as is the psychology of the individual. The recognition of this context forms the basis for what Mannheim came to call "the sociology of knowledge," thus providing the lens through which knowledge may be seen as a product of interaction and identity a product of participation. Indeed, the very act of participation figures significantly in Mannheim's own characterization of thought [23]:

Strictly speaking it is incorrect to say that the single individual thinks. Rather it is more correct to insist that he participates in thinking further what other men have thought before him.

This "context of group life" thus poses a challenge to the usual premises of knowledge management. The practice of knowledge management tends to concentrate on the exchange of information through different approaches to communication,[2] while the sociology of knowledge assumes that the kind of interaction from which knowledge is derived is not strictly a matter of communication. Indeed, if we are to try to understand interaction, we quickly encounter a rich variety of points of view as to what constitutes its nature. Let us now consider how previous research into the nature of interaction offers alternatives to current thinking about knowledge management.

PREVIOUS RESEARCH ON INTERACTION

A SYSTEM-CENTRIC POSITION

In his 1990 Presidential Address to the American Association for Artificial Intelligence, long before knowledge management was emerging as a new opportunity to invent software solutions, Daniel Bobrow challenged his audience to turn their attention beyond "the principles of construction of … intelligent, but deaf, blind, and paraplegic agents" and to focus instead "on

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[2] The four "modes of knowledge conversion" that constitute Nonaka's SECI model (Socialization, Externalization, Combination, Internalization) [24] all basically reduce to different perspectives on how communication can take place.

systems consisting of active agents with multiple goals, communicating among themselves, and interacting with the world" [3]. The body of his talk then addressed issues involving what he called "three dimensions of interaction: communication, coordination and integration." Bobrow's dimensions provide one useful perspective on why interaction involves more than communication.

Bobrow began by recognizing that there is more to communication than worrying about insuring that the signal bits from a source can be passed through a channel to a destination without being corrupted by noise [3]:

> *For communication to exist between two agents, there must be some common ground of mutual understanding. Where does this come from, and how does it develop? What techniques are used by people and systems to build and extend this base for communication? Communication between a particular pair of agents might not always be easy, or even possible. In such cases, communication can be facilitated by interposing a mediating agent.*

While Bobrow grounded communication in mutual understanding, he approached coordination more as a matter of resource allocation [3]:

> *With multiple agents with multiple active goals, progress requires agents to share resources and work toward some common goals. Various organizational structures, for example, based on markets and business hierarchies have been used in the resource-allocation process. But resources are not the only thing that must be shared. For independent agents to work together, they must be able to predict other's behavior, but not necessarily in great detail. Joint commitments to future action are a useful way of organizing this information.*

Finally, Bobrow viewed integration in terms of not only relationships among systems but also relationships between systems and work practices [3]:

> *Systems do not exist in isolation. Systems must solve problems that have some payoff outside the system itself. For agents that we build to be useful, they must fit in with the current work practices of both people and other computer systems.*

Bobrow's challenge, while laudable, particularly for its time, still focused its attention on the technology of systems, rather than the sociology of the users. Before we can aspire to his goal of building better systems that interact with people, we need to refine our understanding of how people interact with each other. Let us now complement Bobrow's dimensions of interaction with an alternative approach, grounded in the structuration theory of social theorist Anthony Giddens [17].

GIDDENS' DIMENSIONS OF STRUCTURE AS A BASIS FOR INTERACTION

Like Bobrow, Giddens viewed interaction as a three-dimensional "space." He called the three dimensions of his space signification, domination, and legitimation; and he drew the two charts illustrated in Figure 1 to summarize them. Let us discuss the nature of each of these dimensions in a bit more detail.

Signification

Signification may be described most simply as understanding what things mean. The term is generally associated with semiotics [2], where the "things" are usually taken to be symbolic expressions. In the business world "things" tend to be manifested in documents; but their manifestation in talk often plays a critical role when the negotiation of understanding is at stake.
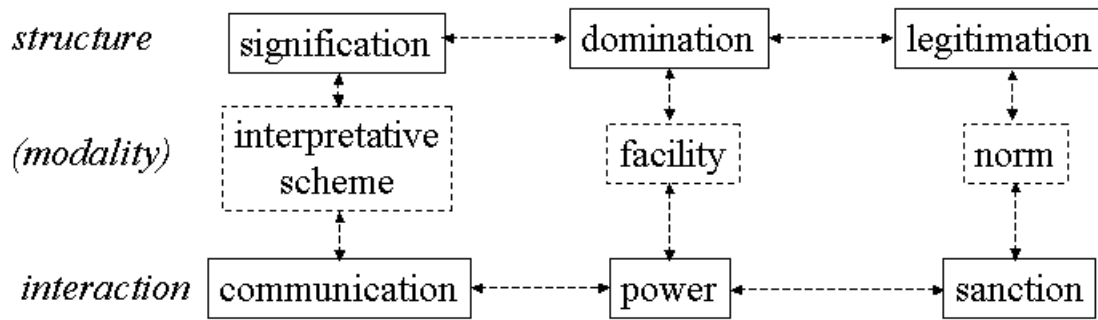
Structure(s)	Theoretical Domain	Institutional Order
Signification	Theory of coding	Symbolic orders/modes of discourse
Domination	Theory of resource authorization	Political institutions
	Theory of resource allocation	Economic institutions
Legitimation	Theory of normative regulation	Legal institutions

Figure 1: Giddens' Dimensions of Interaction (Reproduced from Anthony Giddens, The Constitution of Society: Outline of the Theory of Structuration, *copyright © 1984 Anthony Giddens, University of California Press)*

The problematic issue is that understanding cannot be grounded in the structures of the symbolic expressions themselves. Rather it is based on each individual's scheme for *interpreting* those symbolic expressions; and, as is illustrated in Figure 2, there is never any guarantee that any two individuals will interpret the same symbolic expressions in the same way [23]. Signification is thus not a problem of abstract logic but rather one of the individual and social psychologies of "knowing subjects."

Domination

If signification is about understanding what things mean, then domination is about understanding who has authority; and, if differences in interpretative understanding of what things mean has become a norm in business operations, then managing authority has also become an increasingly problematic issue. Knowledge management has raised our awareness that value resides in the personal knowledge of individuals [11]; but, when those individuals appreciate the value of their own personal knowledge, they have little tolerance for domination. Thus, we see an increasing need for more cooperative approaches to organization, such as communities of practice [35]; but, while communities of practice provide a conducive environment for negotiating those differences in interpretation that lead to problems of signification, they are not always decisive enough to be both rapid and effective. Furthermore, the very notion of a community is one that raises the distinction between "self" and "other" to the level of groups; so, while cooperation *within* a community is rarely a problem, issues of domination involving the relationship of the community to the rest of the organization can still be very difficult.
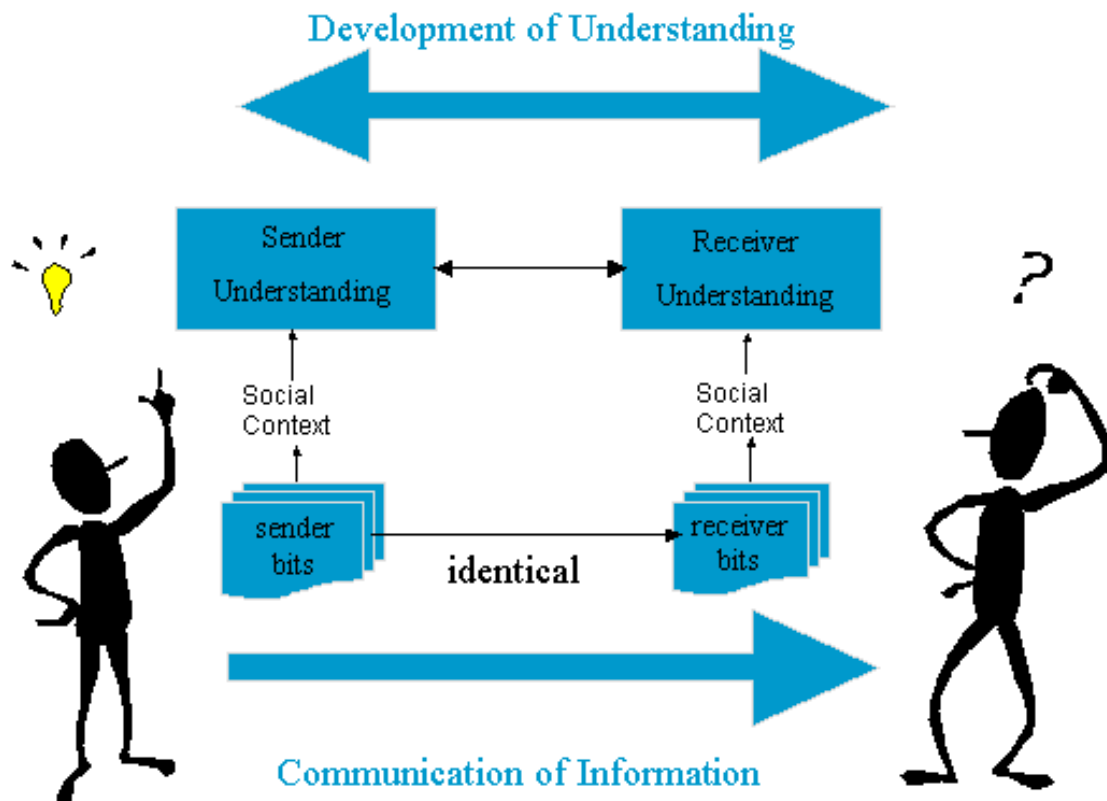
9

Figure 2: The Individuality of Interpretation

Legitimation

Legitimation complements domination's understanding of who has authority with the understanding of what is acceptable. The scope of legitimation is usually both practices and artifacts, and the challenge of legitimation is the regulation of normative behavior without suppressing individual identity. Any practice of legitimation must thus recognize privacy; and, if social capital is to have any valid currency, particularly where trust is concerned [27], any normative behavior must include the encouragement of tolerance. Legitimation establishes what Giddens calls "ontological security" [17], which is basically a sense of knowing what to expect without which the risk of taking any action might become crippling.

OBJECTIVE

The context of this social perspective reveals that any problem of managing people, particularly people whose work depends significantly on what they know, is basically a problem of managing how those people *interact*, hence the argument that the term "interaction management" better suits the needs of today's workplace than does the term "knowledge management." The "knowledge movement" was useful in its efforts to revive our consciousness of the significance of organizational communication, particularly when the business world was in danger of ignoring that significance amidst a flood of results in experimental psychology whose impact was not always evident [29]. However, as knowledge management is gradually assimilated into the workplace, we see that its perspective tends to be limited by simplistic models of information exchange at a time when it is necessary to address the more challenging problems of leveraging social interaction to the advantage of the enterprise. Confronting those problems must be served by recognizing, as Giddens has done, that a work environment is a much richer collection of social interactions, *all* of which fall under the responsibility of effective management. Thus, rather than concentrating on roles that technology can play in the flow of

information, we should direct our attention to the role of technology in Mannheim's richer "context of group life," particularly life in the workplace.

EXPECTED CONTRIBUTION

Invoking Giddens' structuration theory to model the nature of interaction in the workplace is not, in itself, a novel idea. JoAnne Yates and Wanda Orlikowski took a structurational approach in their effort to identify genres of organizational communication [36]. Another approach to organizational communication is that of Marshall Scott Poole, who studied the impact of "organizational climate" on communication. He applied structuration theory to these "climatic" conditions along three dimensions [26]:

1. "structural properties of the organization"

2. "apparatuses that directly produce and reproduce climates"

3. "members' knowledge and skills"

Both of these studies, however, deal only with the signification dimension of Giddens' framework. This paper is based on a case study that illustrates the manifestation and interaction of all three dimensions. It thus constitutes an attempt to honor Giddens' own admonition to avoid dealing with these dimensions in isolation [16]:

> *The communication of meaning in interaction does not take place separately from the operation of relations of power, or outside the context of normative sanctions. All social practices involve these three elements.*

It is important for the reader to recognize, however, that this is not a case study of our own design. Rather, it is based on a close reading of Andrew Grove's documentation of his experiences at Intel in his book *Only the Paranoid Survive: How to Exploit the Crisis Points That Challenge Every Company and Career* [20].

The key theme of this book is that a major problem at Intel was the need to recognize "strategic inflection points." Grove argues that the only way to do this "is through the process of clarification that comes from broad and intensive debate" [20]. In other words the organization, as a whole, will not recognize a strategic inflection point unless it supports sufficiently rich processes of interaction through which that "process of clarification" can take place. This paper hopes to demonstrate that a better understanding of those processes of interaction can lead to a new generation of software that facilitates such interactions and that this software will constitute the basis for a new approach to "interaction management."

STRUCTURE OF THE PAPER

The following (and central) section thus presents the case study that illustrates the three dimensions of Giddens' structuration theory put into practice through Grove's approach to the management of "broad and intensive debate." Giddens' perspective is discussed in terms of the value it adds to the way in which knowledge management might contribute to such situations. This is then followed by a section that examines how new technologies can provide support for this new "interaction management" perspective. Finally, a concluding section summarizes the results, cites specific contributions, addresses possible limitations, and identifies opportunities for future research.

SIGNIFICATION

Signification is clearly important, since clarification comes from members of the organization negotiating differences in understanding what things mean. This is similar to what Bobrow calls "mutual understanding" in his characterization of communication [3]; but there is a broad gulf between a multi-agent artificial intelligence system and the social world of Intel! Unlike any artificial intelligence system, Intel is a vast organization whose members are endowed with a rich palette of shared experiences. Unfortunately, there is rarely any guarantee that any two members of that organization will interpret a shared experience in the same way. This is why "broad and intensive debate" is a recurring *leitmotif* in Grove's text and why he believes in applying it across all the different kinds of experiences that are shared. The significance of the role of debate stems from the fact that, as Figure 2 attempts to illustrate, signification is a highly personal process and that the debate provides the platform for negotiating differing interpretations of shared experiences.

It is also important to observe that Grove does not see *consensus* as the ultimate objective of debate. As we have seen, signification is always going to vary from individual to individual; and Mannheim [23] emphasized repeatedly that, while various approaches to argumentation and rhetoric can often have a profound impact on changing a point of view, neither will ever totally eliminate variation in signification. For Grove signification is actually a *space* of interpretations that may span the entire organization. What is important for any individual is to clarify his or her own sense of where he or she is situated in that space [20]:

> *It is important to realize what the purpose of these debates is and what it isn't. Don't think for a moment that at the end of such debates all participants will arrive at a unanimous point of view. That's naive. However, through the process of presenting their own opinions, the participants will refine their own arguments and facts so that they are in much clearer focus. Gradually all parties can cut through the murkiness that surrounds their arguments, clearly understand the issues and* each other's *point of view. Debates are like the process through which a photographer sharpens the contrast when developing a print. The clearer images that result permit management to make a more informed—and more likely correct—call.*

In this respect Grove's language actually reflects Mannheim's vision of the "unfolding" of knowledge through group interaction [23]:

> *In actuality it is far from correct to assume that an individual of more or less fixed absolute capacities confronts the world and in striving for the truth constructs a world-view out of the data of his experience. Nor can we believe that he then compares his world-view with that of other individuals who have gained theirs in a similarly independent fashion, and in a sort of discussion the true world-view is brought to light and accepted by the others. In contrast to this, it is much more correct to say that knowledge is from the very beginning a co-operative process of group life, in which everyone unfolds his knowledge within the framework of a common fate, a common activity, and the overcoming of common difficulties (in which, however, each has a different share).*

Such language stands in sharp contrast to the knowledge management perspective on signification. Consider, for example, some "mottos" of knowledge management extracted from a recent vision piece from the corporate world [30]:

> *The organization knows what it knows and uses it and knows what it needs to know and learns it.*

> *For any project, for any customer, the project team delivers the knowledge of the overall organization.*
>
> *The organization delivers the right information to the right people, at the right time—with the tools they need to use it!*

This is not a vision of "broad and intensive debate" as part of life in the work environment. It is a vision of *answers* being *delivered* accurately, reliably, and rapidly. Any problems of signification are simply dealt with through how the answers are delivered. Mannheim's vision may thus be seen as a sharp critique of at least this particular vision of knowledge management.

DOMINATION

It generally tends to be assumed that strong leadership is most necessary in times of crisis, but this raises questions as to what role such leadership can play in a setting that encourages the free expression of different interpretations of shared events. Grove's approach is to deal with crisis situations in terms of the relationship between domination and cooperation and to manage this relationship through an infrastructure based on *responsibility*, rather than authority. Thus, for example, contributing to debate over signification is presented very much as a matter of responsibility [20]:

> *Don't justify holding back by saying that you don't know the answers; at times like this, nobody does. Give your most considered opinion and give it clearly and forcefully; your criterion for involvement should be that you're heard and understood. Clearly, all sides cannot prevail in the debate but all opinions have value in shaping the right answer.*

Similarly, acting upon the results of a debate is a responsibility to be shared across the different levels of management, rather than being a buck that stops at a sufficiently high level of authority [20]:

> *The more complex the issues are, the more levels of management should be involved because people from different levels of management bring completely different points of view and expertise to the table, as well as different genetic makeups.*

It goes without saying that this is a perspective that is not even acknowledged, let alone honored, in most visions of knowledge management.

LEGITIMATION

From this point of view, debate is then resolved by supporting and managing community opinion, rather than by authoritarian decision. In other words legitimation of a communitarian sense of what is acceptable is more important than how the organization chart determines who has authority. As Grove observes, such legitimation is no easy matter [20]:

> *This kind of debate is daunting because it takes a lot of time and a lot of intellectual ergs. It also takes a lot of guts; it takes courage to enter into a debate you may lose, in which weaknesses in your knowledge may be exposed and in which you may draw the disapproval of your coworkers for taking an unpopular viewpoint. Nevertheless, this comes with the territory and when it comes to identifying a strategic inflection point, unfortunately, there are no shortcuts.*

Grove also makes it a point to emphasize that community opinion is not the same thing as consensus, reflecting an observation he made in an earlier book, *High Output Management* [19]:

> *An organization does not live by its members agreeing with one another at all times on everything. It lives instead by people committing to support the decisions and the moves of the business.*

Finally, legitimation should involve more than just the members of the organization itself but must also take into account those individuals who, in the course of their own business activities, interact with the organization [20]:

> *The debate should involve people outside the company, customers and partners who not only have different areas of expertise but also have different interests.*

Such an emphasis on opinion challenges the very ontological foundations of knowledge management. As we have seen, those foundations have a clear role for the concept of belief; and epistemology, as a discipline, has devoted considerable attention to dealing with that concept. However, opinion is not the same as belief, which is one reason that Etienne Wenger [35] emphasizes that "shared beliefs … are not what shared practice is about."[3] This is not to say that knowledge management systems are not capable of dealing with opinion (at least when that opinion is documented); but they *do* tend to treat the documentation of opinion like any other form of documentation, which can be a dangerous category error when the contents of documents have a major impact on the activities of an enterprise (which is just about always).

In summary, we see that Grove's own words reflect the same issues concerned with negotiating differences of understanding through interaction that form the basis of Giddens' theoretical model and that, at least as far as Grove's experiences at Intel are concerned, Giddens' dimensions are as interdependent as Giddens claims them to be.

TECHNOLOGY SUPPORT FOR INTERACTION MANAGEMENT

If we are to address questions of how technology can contribute to social interaction, we must begin by recognizing that interaction is not strictly limited to communication, nor should it be viewed through the technical lens of exchanging information. The different perspectives on interaction that we have examined provide vivid examples of how inadequate and confining a "techno-centric box" can be. Furthermore, the three dimensions of Giddens' structuration theory demonstrate in very explicit terms that interaction cannot be limited to communication.

Nevertheless, technology *can* provide means by which we can extricate ourselves from our "techno-centric box." Furthermore, when we try to identify what these means can be, we discover that they can be characterized by once again turning to Giddens' dimensions of interaction. Let us now examine each of the dimensions in terms of how technologies can be harnessed to facilitate it.

SIGNIFICATION

As was illustrated by the experiences at Intel, signification is rarely a simple matter, particularly in mission-critical situations. Nevertheless, it is easy to succumb to the illusion that technology can simplify complex problems of signification. Those susceptible to this illusion would do well to recall what Paul Dickson dubbed "Mencken's Meta-law:" "For every human problem, there is a neat, plain solution—and it is always wrong" [14]. As has already been observed, there is a tendency, encouraged by prodigious advances in search engine technology, to

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[3] As a matter of fact, Wenger observes that what Grove calls "broad and intensive debate" is basically the concept of discourse introduced by Michel Foucault [15], which Wenger [35] describes as "a social, interactive resource for constructing statements about the world and coordinating engagement in practice."

assume that the Internet is always there to provide the right answer, in as simple and compact a manner as possible, to the right person at the right time. However, rather than trying to build the Internet as an all-knowing agent that is always there for us with the right answers, we should think of it as the primary vehicle with which we learn how to deal with our most challenging problems of signification, pursuing John Seely Brown's vision that the Internet can "become an incredibly powerful medium to unleash a culture of learning" [9].

Once we recognize that understanding cannot be achieved through a sufficiently powerful search engine, where can we turn to honor Brown's vision in practice? Davenport believes we should turn to a better understanding of how librarians (or, as he prefers to call them, "information staff") help their clients achieve understanding. Davenport's model is based on the goals and tasks of information staff members [10]; and there are rich opportunities to identify how technology may facilitate those tasks and the achievement of the goals [32].

DOMINATION

The legacy of artificial intelligence has tended to cultivate the assumption that technology is best applied in the service of signification; but it can also serve the management of domination, particularly if, as was observed in the Intel example, such management has more to do with responsibility than with authority. For example work practices may be mediated by conversational agents as a move away from authority figures. The capabilities of such artificial agents have been investigated by Elizabeth Churchill and her colleagues [6]. In addition, various forms of existing collaboration technologies, such as chat rooms and shared work areas, may be invoked to support the self-organization of communities and networks. Churchill and another set of colleagues have investigated how documents may serve as "boundary objects" [33] around which such self-organization may take place through a technology that she calls "anchored conversations," converting the sort of spatial artifact Microsoft Office implemented for comments into a chat space area, thus enabling conversations to be conducted over specific (multiple) locales within the document [5].

Another area of technology that needs to be reviewed in light of the issue of domination is workflow support. Rebecca Grinter's study of the use of workflow systems indicates that, in the general context of work practices, criteria for success are severely limiting [18]:

1. "the developers [of the workflow system] understood and accepted the model of work"

2. the workflow system "provided understandable and useful representations"

3. "the 'right' work was automated"

4. "the corporation was supportive"

One way to interpret the experiences at Intel is that, if the criteria for the success of workflow systems are to be less limiting, those systems need to be *re*conceived towards the negotiation of capabilities and responsibilities. What is required is an accounting of what individuals bring to the entire work environment, touching on mission-critical issues such as the following:

1. Who has skills in which core technologies?

2. Who has the best intuitive understanding of the nature of the product?

3. Who has the best intuitive understanding of the types of markets in which the product may be involved?

There is frequently a tendency to question the second of these items, based on the assumption that any understanding of a product should be based on a formal engineering specification; but, as Scott Noam Cook and Dvora Yanow have observed [8], such an intuitive understanding can be necessary for successful production.

LEGITIMATION

Community opinion played a strong part in the role of legitimation in the Intel example, so opportunities for technology should reside in the support and management of community opinion without disturbing priorities of privacy and tolerance. This can involve a variety of different approaches:

- One consists in providing means for *collecting* opinion with minimal burden on the user community. Such collection may be implicit in user actions, such as tracking the frequency of visiting Web sites. However, in the interest of privacy, the anonymity of users should be respected when it is requested (or, indeed, treated as a default condition).

- Once opinion has been collected, it should be *visualized* in ways that are likely to be meaningful to the community at large. Visualization is rarely a straightforward matter [4]. Indeed, if the user community is sufficiently large and varied, it may be necessary to provide multiple forms of visualization for the benefit of different sectors of the organization.

- In such cases it may also be necessary to invoke means of *filtering* opinion based on community membership, drawing upon techniques such as those of collaborative filtering [1].

However, it is important to bear in mind that any technology concerned with community opinion will only succeed if it is reinforced with appropriate investments in social capital [27]. Members of an organization are not going to use a technology that they do not trust, nor will they use it if they do not trust the *people* who are providing and encouraging use of that technology. The technology will only succeed if its usage is perceived as a behavioral norm. This means that it must be perceived as equally fair to all users; but it must also be perceived as furthering the co-destiny of the entire community.

CONCLUSION

SUMMARY OF RESULTS

We may now return to the questions with which this paper began:

1. *What does it really mean to manage people whose work depends significantly on what they know?* What it really means is that the work these people do depends heavily on both their capacity and opportunities for social interaction. It does *not* mean that such people must "convert" their "tacit knowledge" to "explicit knowledge" and then communicate the resulting explicit knowledge to other work groups. Rather, it means that the work environment must exploit the full range of interactions that constitute the basis of Giddens' structuration theory.

2. *How may technology facilitate this management task?* Technology can deal with more than problems of signification. It can deal with domination by providing channels for interaction that circumvent impediments that tend to be associated with problems of

authority. It can deal with domination by managing the accumulation and distribution of community opinion.

The resulting approach to management is sufficiently different from the connotations of knowledge management that it deserves a name of its own: *interaction management.*

CONTRIBUTION

The primary contribution of this paper is the justification of interaction management as a new and necessary discipline, reinforced by evidence of the significant role that interaction plays at work in a case study.

LIMITATIONS

The primary limitation of dealing with interaction management as a new discipline is essentially the same limitation that continues to trouble knowledge management: a lack of sufficient quantitative evidence of the true value of the discipline. Unfortunately, the more "social" a situation gets, the harder it is to collect such evidence. Thus, for example, in discussing management issues associated with service productivity (an area that has received considerable attention from promoters of knowledge management), James Brian Quinn [28] observed that "standard (ROI or PV) financial evaluations were often inappropriate or useless." Evaluating the impact of interaction management is likely to be even more problematic, given the increase of subjective variables that are involved.

Workplace attitude is also likely to be a major source of limitations. While there tends to be little argument over the limitations of scientific management [34], there remains a lingering desire for a "rule book" that both managers and workers can follow. The tendency to think in terms of such rules is the "dark side" of Giddens' ontological security. However, just as it has already been observed that people are not going to use a technology that they do not trust, they will be equally suspicious of any new approach to management. (After all, when Mao Tze-Tung introduced his "policy of letting a hundred flowers blossom" in his February 27, 1957 speech in Beijing, who would have anticipated the Cultural Revolution of 1966 that would mow down those flowers so brutally and systematically?) This is why a commitment to interaction management is only going to work if it is reinforced with an equally committed investment in social capital [27].

OPPORTUNITIES FOR FUTURE RESEARCH

We have already seen that all three of Giddens' dimensions of interaction may be supported by innovations in information technology. Taken as a whole, we may wish to call those innovations examples of "social computing." This would basically be a vision of software technology that supports the realization of a seamless network of people, devices, and information [31]. However, in light of the limitations discussed above, any implementation of social computing must take into account the integration of social values into document usage. In addition the concept of the seamless network opens the door to a wide spectrum of research opportunities covering the entire grid of interactions that can take place along the different pairings of people, devices, and information.

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