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Summary: . As the technology for communication changes, the role of communication in the conduct of business changes with it. Communication is no longer just a technical matter of separating signal from noise and managing bandwidth but also a social matter in which negotiating differences in understanding among and between communicators is a primary business priority. Addressing this priority requires an understanding of how individuals interact in the course of their decision making activities. Using the work of Anthony Giddens as a point of departure, this paper views interaction in communication as consisting of three dimensions – meaning, authority, and trust. These three dimensions are used to identify new opportunities for advances in decision making technology which help deal with potential breakdowns in social interaction.

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COMMUNICATION AND
UNDERSTANDING FOR
DECISION SUPPORT

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CHANGES IN THE NATURE OF COMMUNICATION

The rise of knowledge management (Davenport and Prusak, 1998) tends to reflect, among other factors, the needs of businesses whose offerings are shifting (or have shifted) from products to services, either entirely or to supplement their product offerings. Knowledge management still benefits product-based businesses; but service-based businesses are more susceptible to the problems that it has been attempting to solve. This particularly concerns the key distinction between service-based and product-based businesses, which is one of social context: While the information involved in a product-based business tends to be generally *objective*, a service-based business involves a highly *subjective* relationship between the service provider and the customer. That relationship can only succeed if it rests upon a foundation of *mutual understanding*. The priority of conducting business is thus shifting from one that presumes the objectivity of the mathematical theory of communication (Shannon and Weaver, 1964) to one that must honor a highly subjective view of understanding what is communicated.

COMMUNICATION, UNDERSTANDING AND DECISION MAKING

Communication and understanding are crucial to decision making because the decision making process is increasingly interactive. Hackathorn and Keen (1981) identify three forms of decision making with respect to the nature of the interaction among the participants. *Independent* decision making occurs when an individual takes the full responsibility for gathering the necessary information and making the decision. Often called the “high noon” style, after the image of Gary Cooper standing alone in his commitment to face his enemy in a gunfight (at high noon), this form of decision making has always been rare and is now nearly extinct. Even so, gathering the necessary information and understanding it are key to the decision making process. *Sequential interdependent* decision making involves a process in which an individual makes a decision on part of the task or problem, then passes it on to another. Through a series of these steps, the separate decisions form the aggregate solution. Here the importance of communication and understanding between the steps is obvious. Finally, Hackathorn and Keen define *pooled interdependent* decision making in which all the participants interact throughout the decision making process. Communication is less structured than in the sequential process, and the resultant understandings are much more valuable. This is the domain of what Michael Schrage (1995) has come to call “the dynamics of creative collaboration;” and it has been reinforced by many technology advances in the area of computer-supported collaborative work (CSCW).

Recent work on DSS has emphasized this freely interactive decision making as prevalent and has led to the development of a strong literature and practice in group decision support systems. Jay Nunamaker and his colleagues (2001) suggest the following categories of interaction in decision making:

- With *collective effort*, people work on their own. Group productivity is simply the sum of individual efforts. Technologies such as shared network directories, word processors, and spreadsheets may be used effectively to support collective efforts.
- With *coordinated effort*, people make individual efforts, but they have critical hand-off points. Productivity depends on the level of individual effort and on the coordination among those efforts. Electronic mail, team databases, and workflow automation may support coordinated efforts.

— With *concerted effort* all members must make their effort in synchrony with other members. The performance of any member directly affects the performance of the other members. There are no individual efforts. Collaborative reasoning tools may be used to enhance the value created by concerted efforts. Examples of collaborative reasoning tools are a key part of CSCW technology and include electronic brainstorming tools, group outlining tools, and idea categorizers. Schrage (1995) provides an excellent introductory review of many of the pioneering tools in this area.

Except for the independent style, which is extremely rare, decision making thus rests on mutual understanding among the interacting parties, even if the interaction is a sequential one.

Charting a path to mutual understanding often rests on a strong awareness of *misunderstanding*: how it arises, how it imposes impediments to success, and, most important of all, how it may be resolved. Dealing with those differences that lie at the heart of misunderstanding usually involves getting beyond the domains of the functionality of DSS and CSCW tools because, at the end of the day, differences in understanding can only be *negotiated*. Negotiation is at its most effective when it draws upon a rich suite of opportunities for interaction, some of which apply directly to the source of the misunderstanding, while others contribute to a contextual social environment of understanding.

Misunderstandings are thus rarely negotiated in a marketplace of abstract ideas and the application of those ideas to formal processes of argumentation.¹ In fact, to draw upon the terminology of Robert Putnam, the marketplace of negotiation is actually based on *social capital*: “features of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives” (Putnam, 1995). In other words differences in understanding are negotiated within a context of behavioral norms established among the parties doing the negotiating and grounded upon a foundation of trust cultivated by all of those parties. Within this context communities and networks organize themselves for the general good of the organization.

THE DIMENSIONS OF INTERACTION

The primary issue at stake, then, is how the negotiation of differences in understanding can best benefit from the resources of documents and other sources of information. We begin by recognizing that *reading* an information source, whether it is an extended report, a message typed into a DSS or computer-mediated collaboration system, or some multimedia document, such as a complex image, involves more than “figuring out what it means,” at least at a level that would be called “semantic” in linguistics. It also involves “reading” the social context in which that document was written. As Anthony Giddens (1984) has demonstrated, one significant part of this context involves organizational *authority* (which Giddens calls “domination”). An equally significant part involves that element of *trust* that contributes to Putnam’s model of social capital (Putnam, 1995), although Giddens (1984) argues for a broader context to which he assigns the name “legitimation.” These two elements, along with *meaning* (which Giddens calls “signification”) may be viewed as three dimensions of a “space” of interaction. Differences in

¹ This insight can be traced back as least as far as Aristotle, who, in Book I of his *Rhetoric* wrote, “The duty of rhetoric is to deal with such matters as we deliberate upon without arts or systems to guide us, in the hearing of persons who cannot take in at a glance a complicated argument, or follow a long chain of reasoning” (Aristotle, 1984).

understanding may involve these dimensions in various combinations, or they may arise when the dimensions get confused. Let us consider how each of these dimensions applies to the effective operation of an organization.

MEANING

When we talk about understanding what things mean in the business world, “things” tend to be manifested in documents; but their manifestation in talk, including the “virtual talk” of computer-mediated communication (Erickson and Herring, 2000), often plays a critical role when the *negotiation* of understanding is at stake. Clarity of meaning has always been a major priority in the conduct of business. However, the volatility of the world in which business is conducted today is such that, no matter how hard we strive for clarity, differences in understanding what things mean constitute the norm, rather than the exception; so the need to negotiate such differences tends to be a part of the activities of every day of just about any successful enterprise. Such negotiation is best realized through conversation, which constitutes the basis for the argument by Richard Rorty (1979) that the certainty of understanding “will be a matter of conversation between persons.”

AUTHORITY

If confronting differences in understanding what things mean has become a norm in business operations, then managing authority (including organizational awareness of who has what authority) has also become an increasingly problematic issue. A primary mantra of knowledge management is that value resides in the personal knowledge of individuals (Davenport and Prusak, 1998); but, the more those individuals appreciate the value of their own personal knowledge, the less tolerance they tend to have for authoritarian domination. Thus, we see more cooperative approaches to organization, such as communities of practice (Wenger, 1998). However, while communities of practice may be valuable for dealing with many general problems of meaning, 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. Therefore, while cooperation *within* a community is rarely a problem, issues of authority involving the relationship of the community to the rest of the organization can still be very difficult.

Authority can also be a key factor in the success or failure of the deployment of DSS. Nunamaker and his colleagues (1996) have analyzed the impact of the presence of an authority figure on the text exchanges that take place in Group Support Systems (GSS). They observe that anonymity can often provide protection for the interference of authoritarian domination; but, when particularly strong authority figures are involved, even anonymity is not necessarily foolproof. Ultimately it is often better to acknowledge the influence of authority and work in the context of that influence, rather than try to work around it.

Are there positive ways to work within that context? To return to the terminology introduced by Putnam (1995), what is at stake in a well-run organization is the pursuit of “shared objectives.” If negotiating what things mean is important for making decisions, then an effective working relationship between an individual and his/her employer depends on an investment in negotiating shared purpose. A corporation should be able to articulate its mission clearly and convincingly, so that the mission statement is recognized as more than a hollow symbolic gesture. Similarly, every individual should be able to articulate his or her own mission statement and should be able to engage in discourse on the relationship of that personal mission to the corporate mission. Such

conversation is best engaged upon a foundation of *shared values*, but this means that every member of an organization must be able to recognize what those values are and how those values are prioritized. Individuals may then come to understand their personal values as a framework for the *capabilities* that they bring to the organization, and the relationships between individual values and shared values provide a similar framework for the *responsibilities* each individual assumes for pursuing the shared objectives of the organization. Conflicts of shared and individual values and priorities should be accepted as inevitable; but, as is the case with understanding what things mean, they should be addressed through negotiation rather than raw authoritarian mandate.

TRUST

The establishment of trust situates the understanding of who has authority within a context of reciprocal obligation (Fukuyama, 1996). Such reciprocity is assumed as a social norm, and the administrative challenge is to regulate normative behavior without suppressing individual identity. This entails both the recognition of privacy and the encouragement of tolerance. The reciprocity of trust establishes what Giddens (1984) calls “ontological security,” which is basically a sense of knowing what to expect, without which the risk of taking any action might become crippling.

In the effective running of an organization, trust is as much a business priority as are meaning and the management of authority. On the one hand, if understanding what things mean is critical to business operations, businesses will require the ontological security that reflects their mutual ability to trust specific interpretations; so all *content* rests upon a foundation of acceptability. At the same time, if interactions based on authority are critical to business operations, *feedback* will be required to assess the acceptability of those interactions; and feedback can only be delivered effectively within a framework that delimits acceptability of *conduct*. An agreed-upon framework of trust is thus the linchpin of organizational behavior, without which the other dimensions of interaction quickly lose their effectiveness.

VIEWS OF INTERACTION AT WORK

These dimensions of interaction provide a new way of looking at the different ways in which interaction figures significantly in activities in the workplace. These changing views of interaction in the workplace are summarized in Figure 1. The grid represents the fact that every unit of interaction has a “source” (labeled “from”) and a “destination” (labeled “to”), generalizing on the traditional view of communication (Bach, 1995). The chart then breaks down the interactive relationships into those between individuals, those between businesses, and those involving an individual and a business. Each cell then contains representative examples of these units of interaction, font-coded to represent whether their primary involvement is with meaning, **authority**, or *trust*. The word “representative” was chosen because this chart was not intended to be exhaustive, only illustrative of the current state of interactivity in the workplace.

NEW OPPORTUNITIES FOR TECHNOLOGY

These changes in how we view the workplace can also serve as a framework for examining opportunities for new technologies. If the forms of interaction mapped out by our dimensions are so significant to making an organization work, then it is worth asking to what extent technology

		to	
		individual	business
from	individual	Cultivation of “social worlds” (beyond work boundaries) Debate of change-making decisions <i>Trusted interpretations of data about businesses</i>	Solicitation for products and services <i>Evaluative feedback</i>
	business	Customization of products and services Communication of change-making decisions <i>Running user trials for purposes of product evaluation and test marketing</i>	Cultivation and assessment of new business models Negotiation of mergers and acquisitions <i>Coordination of outsourcing and alliances</i>

Key

Meaning

Authority

Trust

Figure 1: Changing views of interaction in the workplace

may be able to facilitate such interactions. Let us examine each of the dimensions in terms of the sorts of technologies required to facilitate it.

MEANING

Negotiating meaning is rarely a simple matter, particularly in mission-critical decision making situations. Nevertheless, it is easy to succumb to many of the hyperbolic claims of the DSS community that technology can simplify complex problems concerned with resolving what things mean. The proliferation of the Internet has led to a tendency, encouraged by prodigious advances in search engine technology, to assume that the World Wide Web 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 comprehension, pursuing John Seely Brown’s vision that the Internet can “become an incredibly powerful medium to unleash a culture of learning” (Corcoran, 2000).

Thus, if we wish to look to how technology can alleviate confusion over what things mean, rather than looking at new ways to support DSS technologies, data repositories, and search engines, we should ask how technologies can either provide or support the capabilities of librarians, or, as Thomas Davenport (1997) prefers to call them, “information staff.” In Davenport’s words these capabilities have more to do with “making information meaningful” than with serving as an interface to a massive collection of documents. Davenport has summarized these capabilities as follows:

Pruning: We all know that we have more things to read than we have the time in which to read them. Indeed, the more material made available to us through the connectivity of the Internet, the less time we have to reflect on any of that material. Any service that filters resources down from “what *might* be of value” to “what is *highly likely* to be of value,” if not “what is *necessary*,” will significantly impact the metaphorical distance between us and the understanding we seek.

Providing context: Davenport (1997) summarizes his general approach to context as follows:

Support staff would do well to remember, of course, that much of information's context is difficult to control. The communicator of information only creates one part of the context; the audience also brings its own. For example, the external cultural environment or the social background of the audience affects how any information is interpreted. The job of the information professional is to try to assess that context and tailor the information content accordingly.

Enhancing style: Davenport (1997) invokes some of his strongest language in addressing the significance of this task:

Many current information professionals, for example, resist improving the style of information because they assume style somehow interferes with the facts, or is a waste of time. This is only true if you don't care whether the facts are ever received or used.

One might argue that one can never learn about style from a book; however, Joseph M. Williams (1999) has written a book entitled *Style: Ten Lessons in Clarity and Grace* that appears to be a good step in the right direction (particularly since the book is now in its sixth edition).

Choosing the right medium: As more and more media are available for presentation purposes, it is easy to succumb to the temptation to use everything in sight. Unfortunately, media excess generally implies media saturation, which usually entails loss of attention (i.e. lack of engagement). *Selection* is the operative principle here. Buckminster Fuller used to lace all of his lectures with the admonition to “make more and more with less and less.” One inevitably communicates more with the bare minimum of properly chosen media than can be communicated through an extravaganza of media abundance.

AUTHORITY

The legacy of artificial intelligence has tended to cultivate the assumption that technology is best applied in the service of meaning; but it can also serve the management of authority, particularly when, as was discussed above, such management has more to do with responsibility than with domination. 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 (2000a). 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 (2000b) have investigated how documents may serve as “boundary objects” (Star and Griesemer, 1989) 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.

Another area of technology that needs to be reviewed in light of the issue of authority is work flow support, particularly since work flow often figures in instances of the sequential interdependent model of decision making and, as Rebecca Grinter (2000) has observed, the criteria for the success of work flow support systems are severely limiting. While work flow technology was conceived to facilitate the management of business processes, it now needs to be *reconceived* towards the negotiation of capabilities, responsibilities, and values, as was discussed previously. What is required is an accounting of what individuals bring to decision making situations throughout the entire work environment, touching on mission-critical issues such as the following:

- Who has skills in which core technologies?
- Who has the best intuitive understanding of the nature of the product or service being offered?
- Who has the best intuitive understanding of the types of markets in which the offering may be involved?

There is frequently a tendency to question the second of these items, particularly when the offering is a product, under the assumption that any understanding of a product should be grounded in a formal engineering specification; but, as Scott Noam Cook and Dvora Yanow (1993) have observed, many work places in the “real world” of production often demand such an intuitive understanding on the part of the work force if those workers are to do their jobs most productively.

TRUST

We tend not to think of technology as being particularly well equipped to deal with matters of trust, but it *can* be used to reflect the degree of trust that an organization has in its work force. Toyota demonstrated this by undoing the Ford assembly line concept and overhauling the design of the entire factory floor to provide all workers with a greater share of the responsibility for all production operations (Fukuyama, 1996). The Toyota strategy used technology to provide everyone with increased awareness of what was happening at all stages of production. In other decision making environments what is equally important is an awareness of prevailing opinions, since those opinions will lie at the heart of all negotiation required for successfully concluding a decision that will be supported by all parties involved. Technology can play a strong positive role in providing awareness of such “community opinion” in ways that do not disturb 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, should be treated as a default condition). This can be

achieved through techniques implemented in the GSS technology reviewed by Nunamaker and his colleagues (1996).

— Once opinion has been collected, it should be *visualized* in ways that are likely to be meaningful to the community at large. This will reinforce the conviction that community opinion is a community resource. Visualization is rarely a straightforward matter (Card et al., 1999). 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 (Arnheim, 1996).

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 (Putnam, 1995). 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 an acceptable 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.

CONCLUSIONS

The study and practice of decision support systems have tended to emphasize the data sources, the analytic models, and the interactive processes that enable decision makers to interact with these technology tools and resources; but decision making processes usually involve multiple people interacting with each other over time. This interaction must involve communication of information, plus the development of shared understandings. In this paper we have explored three dimensions of this interaction and considered how technology can support meaning, authority, and trust, as well as the traditional roles of data access, modeling, and human computer interfaces. We thus conclude that there is opportunity for an expanded role for technology in supporting the social aspects of decision making.

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