

REVIEW: A COGNITIVE-AFFECTIVE MODEL OF ORGANIZATIONAL COMMUNICATION FOR DESIGNING IT^{1, 2}

By: Dov Te'eni
Center of Global Knowledge Management
Bar-Ilan University
Ramat-Gan
ISRAEL 529000
teeni@mail.biu.ac.il

Abstract

There are several theories available to describe how managers choose a medium for communication. However, current technology can affect not only **how we communicate** but also **what we communicate**. As a result, the issue for designers of communication support systems has become broader: how should technology be designed to make communication more effective by changing the medium and the attributes of the message itself? The answer to this question requires a shift from current preoccupations with the medium of

communication to a view that assesses the balance between medium and message form. There is also a need to look more closely at the process of communication in order to identify more precisely any potential areas of computer support.

This paper provides the spadework for a new model of organizational communication, and uses it to review existing research, as well as to suggest directions for future research and development. Beginning with the crucial aspects of action, relationship, and choice, an integrated model of how people communicate is developed. This model incorporates three basic factors: (1) inputs to the communication process (task, sender-receiver distance, and values and norms of communication with a particular emphasis on inter-cultural communication); (2) a cognitive-affective process of communication; and (3) the communication impact on action and relationship. The glue that bonds these factors together is a set of communication strategies aimed at reducing the complexity of communication.

The model provides a balance between relationship and action, between cognition and affect, and between message and medium. Such a balance has been lacking in previous work, and we believe it reflects a more realistic picture of communication behavior in organizations. A set of propositions generated from the model sets an agenda for studying the communication process as well as its inputs and outputs. Furthermore, this knowl-

¹Richard Watson was the accepting senior editor for this paper.

²MISQ Review articles survey, conceptualize, and synthesize prior MIS research and set directions for future research. For more details see <http://www.misq.org/misreview/announce.html>
The associated web site for this paper is located at <http://misq.org/misreview/teeni.shtml>

edge of the mechanisms that guide behavior is used to demonstrate the potential for developing design principles for future communication support systems.

Keywords: Organizational communication, communication complexity, cognition, affect, organizational memory, design

ISRL Categories: HA08, AC0401, HA10, AD0518

Introduction

Motivation, Scope and Contribution

Nowadays, managers have at their disposal a wide variety of communication technologies from which to choose. A number of recent studies have reviewed and extended theories of how managers choose a medium for a specific situation.³ Nevertheless, current technology can also affect **what we communicate**, as well as **how we communicate it**. Thus, the question for designers has become broader: how should technology be designed to make communication more effective by changing not only the medium, but also attributes of the message itself?

A short example of organizational communication can illustrate how we choose the medium and message form. Table 1 shows 10 messages recorded on three consecutive days. Three messages are taken from a diary in the production room. The other seven use a variety of other media: e-mail, face-to-face private meeting, typed memo, phone call, and voice mail. The messages


³Webster (1998) provides a comprehensive overview of theories that describe how managers choose a medium for a specific situation. Among these theories are those concerning media richness (Daft and Lengel 1984, 1986) and social presence (Short et al. 1976), theories related to media richness (Rice et al. 1989; Straub 1994; Trevino et al. 1987), further theories such as those relating to physical accessibility of the medium or availability in space and time (Markus 1994a; Reinsch and Beswick 1990; Rice and Aydin 1991), and indeed, more recent suggestions such as a task closure model (Straub and Karahanna 1998) and a combined view of utility and norms (Kraut et al. 1998).

of the first two days center on the production of two paper products, of which one is red and the other blue (product #8123). A problem has occurred and it requires action and communication to solve it. We shall refer to this example throughout the article, but for now, it will suffice to note that people have different communication goals: they may request the next shift to take action on product #8123, coordinate the teamwork, build a relationship with another employee, and motivate workers. People also choose to use different media for different goals. Moreover, people choose different forms of a message (e.g., the level of formality) but also make clever adaptations to given situations and media. For example, using a diary to convey a happy greeting with a smiling face effectively conveys an emotion through a medium that is usually expected to communicate short task-oriented messages. (The typo—product 1823—is intentional to demonstrate later how technology can help reduce errors in communication.)

The model developed below attempts to explain how people choose the message form and the medium according to goals and situations. Following on from this model, if correct, it might then be possible to design a computer-based communication system. For example, the diary, as part of a sophisticated organizational memory, could recognize that Jack is a new worker and supplement the message of the April 3 morning shift with additional context information such as product name (rather than just #8123) and details about the blue dying color. More generally, a model of effective communication could be incorporated into communication technology so as to adapt messages. This could be achieved by automatically recommending to the sender the optimal amount of context information in the message.

A model of user behavior for guiding design needs to satisfy several conditions. It should describe not only the product, but also the process of communication, in order to identify opportunities for computer support. For example, the developers of Colab (one of the more ambitious collaborative support systems) provide an insightful analysis of

Table 1. Messages Illustrating Communication Goals, Media, and Forms of Message[†]

Diary Entries	Ad Hoc Communication
<p>(1) <i>April, 2, evening shift – Smith:</i> Joey spilt tea onto the pulp for product #8123. We had to leave tray #5 open to dry (went by the manual p. 501). We did go on with the blue order and finished it, but take care of product 1823 first thing (you will need Joey or some other painter).</p>	<p>(2) <i>E-mail from Smith to contract manager:</i> Delay in product #8123 to Macy's. Expected to be completed tomorrow a.m. (3) <i>E-mail from contract manager to logistics (threaded to previous e-mail from Smith):</i> postpone delivery for Macy's to Monday. (4) <i>Face-to-Face Smith and contract manager:</i> "...I know what you're thinking about Joey. I want to ask you not to make a big deal out of all this. The guy felt bad and has already volunteered to work overtime. BTW, do you know the dining room is closed; there really is no place to get a snack at night." (5) <i>E-mail from contract manager to Smith:</i> I've never met Joey. Ask him to stop by so I can get to know him.</p>
<p>(6) <i>April, 3, morning shift – Mike:</i> back on schedule. We finished product #8123 left over from yesterday in addition to planned production, but we are lower than expected on blue!</p>	<p>(7) <i>Typed memo from contract manger to all employees:</i> Effective immediately 4/3/2000 Please refrain from bringing in drinks or food into The production rooms. The dining room will be Open 24 hours a day. (8) <i>Phone-call Mike to Joey:</i> "Hi Joey, it's Mike. I just heard there was a delay with the red order. I know you must be very tired, but could you possibly come in for a few hours. I need to set up a team but can't find a painter....Great, thanks Joey. So what time can you come in?"</p>
<p>(9) <i>April, 4</i> Happy Birthday, Jack!</p> 	<p>(10) <i>Voice mail from CEO to all employees:</i> Good morning. I want to remind you about the European visit tomorrow. We all need to be at our best. You must believe me when I say there will be no layoffs as a result of this merger. I have negotiated this issue to the very last detail telling the newcomers that we have always been family and that this is the way we stay!</p>

[†]This example follows scenarios of communication found in Saunders and Jones (1990) and Robinson et al. (2000).

users' communication failures, which they attribute to the designers' need for control over the communication process (Tatar et al. 1991). Second, rather than building on either cognitive or affective aspects of communication, the model should capture both aspects, so as to build a more accurate representation of actual behavior. Past studies have tended to concentrate on one aspect, rather than the other. This is now changing as researchers attempt to bring together relational communication in organizations, action related communication, and communication technology for collaborative work (see, for example, Fulk 1993; Kraut et al. 1998; Poole and Jackson

1993; Sitkin et al. 1992; Webster and Trevino 1995). This paper attempts to go one step further by offering a model of organizational communication that integrates action and relationships through a set of cognitive and affective strategies. A third requirement of a model leading to design implications is that it should explain how a single message is produced if we are to support message production (Rice 1992; Webster and Trevino 1995). Ideally, such support would be an optimal configuration of medium and message attributes.

Our first contribution is a review of the literature leading to the development of the model. In his

seminal book *Organizations in Action*, Thompson sets out to identify "a framework which might link at important points several of the now independent approaches to the understanding of complex organizations" (1967, p. viii). He considers his framework to be a conceptual inventory capable of generating propositions and demonstrated the plausibility of these propositions by using illustrative studies without any systematic evidence. This paper is a step toward a conceptual inventory of computer mediated communication in organizations. It is an attempt both to assemble past research on communication from diverse sources and to propose a new understanding of organizational communication. Not only does it bring together different perspectives from different sources so as to provide a wider reference for future research, but it reveals elements of the communication process which can refine previous findings and help stimulate new work. For example, a statement such as "face-to-face and e-mail rather than a typed letter is used to convey informality" (e.g., Trevino et al. 1987) may not be true in an organization that imposes formal e-mail as its standard means of communication. On the contrary, face-to-face communication may symbolize a very formal event.

The second main contribution offered by this paper is in providing a prolegomenon of a new model that (1) is more balanced in its treatment of action and relationship, of cognition and affect, and of message and medium, and (2) digs deeper to reveal the mechanisms by which people choose to behave. The result is a more complex description of communication behavior that has multiple purposes (e.g., to accomplish a task and maintain a good relationship) and uses a range of cognitive and affective strategies. If indeed it presents a more realistic view of communication behavior, it should be more capable of informing design. The economic value of improved design of communication technology should be clear. Thompson's widely accepted theory assumes that the cost of communication should be minimized, and to this end, organizations are designed to reduce communication when coordination can be achieved without it. The balanced view of action and relationship presented here reinforces the need to minimize the cost of communication, but also includes in it the cost of low commitment to action

due to poor relationships between communicators. Hence, reducing human communication or automating it may damage the organization when it hampers communication intended to build a relationship. Nevertheless, the benefits and costs of organizational communication are evidently very high. The finding that managers spend around 75% of their time communicating has not changed over the past 30 years, from Mintzberg (1973) to Rice and Shook (1990). Improving organizational communication should, therefore, be extremely valuable (see also Carlson and Davis 1998).

The Proposed Model

Organizational communication is seen from a three-fold perspective: action, relationships, and choice. Organizations must focus on action, and communication plays a pivotal role in organizations, and may even be seen as the foundation for most organizational action (O'Reilly and Pondy 1979; Weick 1979). Hence, it must be assumed that organizational communication eventually leads to action, although not all communication can, nor should it be, associated directly with a specific action. In other words, communication is seen as taking action and organizations are seen as collections of communicative acts (Winograd and Flores 1986). This perspective helps to identify the goals of communication insofar as they relate to different types of action while it also helps to define effective versus poor communication.

Second, organizations may be described as entities engaged in social, as well as economic, exchange (Blau 1964). Since they cannot exist without social communication, action-oriented goals are complemented by the relationship-oriented goals of communication.

Third, a communicator will generally choose how to communicate. We use a combination of social and utilitarian values to describe how people choose their communication behavior, including their choice of communication media.⁴

⁴Indeed, rational-choice models for using communication technology, such as media richness theory (Daft and Lengel 1986), have been influential. However, recent

Within the perspective of choice, action, and relationship, we develop a model that has three main factors, each of which includes several elements (shown in Figure 1):

- **Inputs** to the communication process: (1) task attributes, (2) distance between sender and receiver, and (3) values and norms of communication;
- A communication cognitive-affective **process** that describes the choice of (1) one or more communication strategies, (2) the form of the message, and (3) the medium through which it is transmitted; and
- The communication **impact**: (1) the mutual understanding and (2) relationship between the sender and receiver.

Looking back at Table 1, the example demonstrates several communication goals, forms of message, and media. Communication strategies, however, are less obvious. For example, in trying to influence the employees, the CEO takes their perspective in the voice mail about the European takeover. Below we enumerate several other communication strategies and show how they affect the choice of medium and message.

We use extensively the notion of communication complexity to explain the choices of strategies, messages, and media. Communication complexity results from the use of limited resources to ensure successful communication under problematic and uncertain conditions. It grows as the demands of the communication process on mental resources approach their capacity (e.g.,

research has shown that these models alone cannot fully explain empirical findings about the use of communication technology (El-Shinnawy and Markus 1997; Fulk and Boyd 1991; Fulk et al. 1990; Huang et al. 1998; Lee 1994; Ngwenyama and Lee 1997; for comprehensive accounts of evidence on media choice see also Markus 1994a; Straub and Karahanna 1998; Webster 1998; Zack 1993). In this paper, social-influence accounts of media selection are advanced, not so much as an alternative approach to rational-choice models (e.g., Donabedian et al. 1998), but rather as a complement of relationship goals to task goals (e.g., Webster and Trevino 1995).

Rasmussen 1986). The sources of communication complexity can be categorized as cognitive complexity, dynamic complexity, and affective complexity.⁵

Cognitive complexity is a function of

- (1) the intensity of information exchanged (interdependency) between communicators, which increases the probability of misunderstanding (Straus and McGrath 1994),
- (2) the multiplicity of views held by the communicators, which increases the plausibility of understanding the message in a different context than intended (Boland et al. 1994), and
- (3) the incompatibility between representation and use of information, which requires the information communicated to be translated before it can be used, and increases the demands on resources and the probability of error (Barber 1988; Norman 1990).

Dynamic complexity refers to how far the communication process depends on time constraints, unclear, or deficient feedback and changes during the process. Dynamic complexity increases the likelihood of misunderstanding the required action (Diehl and Sterman 1995). For example, when the receiver's behavior is highly unpredictable (e.g., lapses of attention), the communicator needs to adapt the communication process to fit in with the new behavior.

Affective complexity, meanwhile, refers to how far communication is sensitive to attitudes or changes in disposition toward the communication partner or the subject matter. It is typified by relational oriented obstacles such as mistrust and affective disruptions (Salazar 1995).

⁵Cognitive and dynamic complexity are action oriented, corresponding to coordinative, component, and dynamic complexity in defining task complexity (Wood 1986).

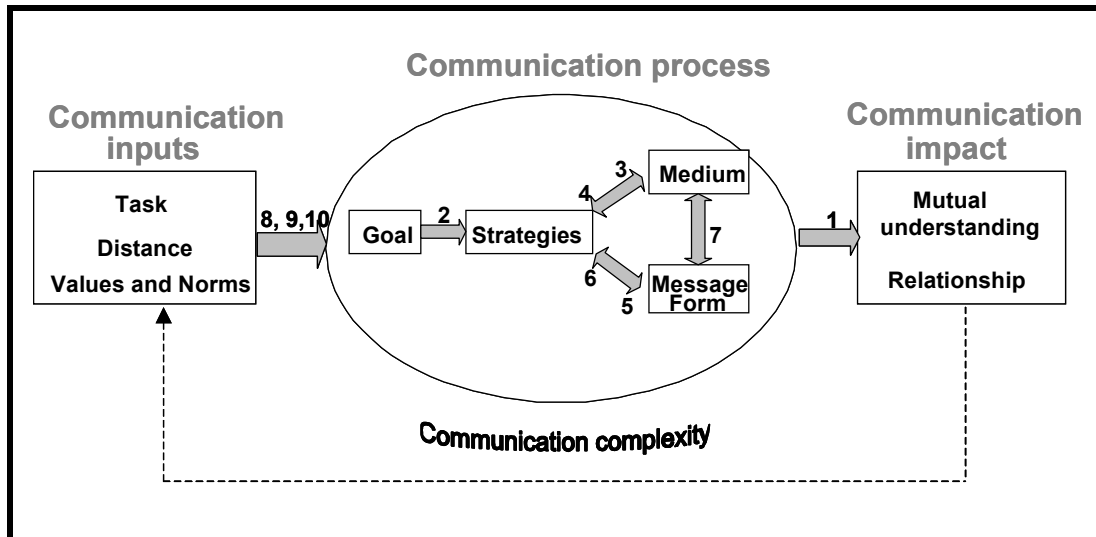


Figure 1. A Cognitive-Affective Model of Organizational Communication

A simple task can demonstrate these sources of communication complexity. Joe asks Rita to help him bring his new boat to harbor through a narrow and long water passage. They decide to row the boat and adjust the boat's course, where necessary, by rowing faster on one side and holding the oar steady on the side to which they wish to turn. They each take a side of the boat and row in parallel, both maintaining eye contact and each deciding on the rowing pace by estimating the leeway between the boat and the bank. Now suppose that Joe cannot see what is happening on Rita's side and vice versa. They need to communicate continuously to inform one another of the leeway on each side in order to work harmoniously. The intensity of the communication is higher because Joe must rely on information from Rita before he can act. Cognitive complexity is, therefore, higher than in the previous scenario. Now let us suppose, further, that it takes a few seconds to see the effect of adjusting the speed of rowing on the change of course. Joe says "Right" but sees no immediate reaction (feedback) and is left uncertain as to whether Rita heard or understood his message. Dynamic complexity is therefore high and Joe may consequently ask Rita to confirm by saying "OK" whenever she gets a message. Finally, let us say that Joe is not sure about how Rita feels toward him today and suspects that she may not mind terribly if the boat gets scratched. So when he

screams "Right" and she answers slowly "OK," he is not sure that he can rely on her intent to follow with appropriate action. This is a state of high affective complexity.

The three factors and their elements are mapped in Figure 1 and described in Table 2. Later, the attributes or classes of the model are defined more precisely. The paper proceeds as a journey from a more abstract discussion of communication goals rooted in philosophy, through to an analysis of cognitive and affective strategies built on behavioral sciences, to the more concrete design implications with regard to information and communication technologies. Figure 1 serves as a map to keep on track. The criterion for choosing the landmarks for the central path concerns how to best uncover the process of communication so that others can forge new paths along similar lines for new conditions. For example, organizational politics, which are left out of the analysis, undoubtedly play a role in shaping communication, but they too could be investigated in the future, using the same rationale developed to analyze the effect of culture. So while the review of the literature attempts to be comprehensive within the boundaries sketched out in Figure 1, the development of the model concentrates on representative elements. The choices of these elements are described in more detail later.

Table 2. Glossary of Elements in the Model

Factor	Element	Description: Classes and Attributes of Elements
Impact	Mutual understanding	The communicative act is judged to be comprehensible and true.
	Relationship	The communicative act is judged to be trustworthy and appropriate.
Process	Communication goals	The sender's intended impact of communication on the receiver: instruct action, manage interdependent action, manage relationships, and influence.
	Communication strategies	Methods of coping with communication complexity to achieve communication goals: contextualization, affectivity, control, perspective taking, and attention focusing.
	Message form	Characteristics of the form of the information communicated: size, distribution, organization, and formality of the message.
	Medium	Characteristics of the physical medium on which the message is transmitted: channel capacity, interactivity, and adaptiveness.
Inputs	Task	Characteristics of the task situation: analyzability, variety, and temporal demands.
	Sender/receiver distance	The relative situations of sender and receiver: cognitive and affective.
	Values and norms	Cultural values are stocks of knowledge that guide behavior of communicators belonging to that culture: independence-interdependence.
Communication complexity	Cognitive complexity	The complexity due to the intensity of information exchange, the multiplicity of views and the incompatibility between representation and use of information.
	Dynamic complexity	The complexity due to time constraints, deficient feedback, and changes during the process.
	Affective complexity	The complexity due to sensitivity to attitudes and changes in dispositions.

Each of the numbered arrows in Figure 1 represents a general proposition developed below. The exposition of the model follows Figure 1 from right to left, beginning with communication impact (proposition 1) in the next section of the paper. The heart of the discussion is presented in the section that explains the elements of the communication process, summarizes the principles of behavior assumed in this model, and proposes effective combinations of goal, strategy, medium, and message attributes (propositions 2 through 7). We then examine how inputs into the communi-

cation process can affect it by determining a person's goal priorities and setting limitations on behavior (propositions 8 through 11). Special attention is devoted in this section to the intercultural effects on the communication process due to the growing importance and recent interest in global communication. The final section looks at the model's implications for research and design. It takes the model's three factors (Figure 1) as a specification of required functionality, adds the notion of organizational memory as a necessary resource, and postulates some general design

guidelines for future communication support systems.

The last introductory note specifies the level of the theory (Klein et al. 1994). In Table 1, messages 1, 2, 3, and 8 are all associated with the task of producing and delivering product #8123 with minimal delay. These four messages may be seen as a higher-level group of individual messages that are all influenced by certain attributes of the common task. The model described below is a mixed-determinants model in the sense that the elements of a message (e.g., its medium) are determined by other elements of the message (its goal) but also by elements of the common task (e.g., the urgency to complete the task with minimal delay). The section on the communication process develops the relationships between elements of a message, assuming that the messages are independent of group effects. The section on inputs to the communication process introduces the effects of inputs such as task attributes on messages, assuming that messages are relatively homogeneous with respect to the inputs.⁶ For example, all messages associated with an urgent task will usually be communicated by phone or e-mail but not by typed memos. The effects of both levels may interact. For example, messages that are not only associated with an urgent task (a group level) but also involve persuasion (a message level) will be communicated by phone rather than by e-mail more frequently than urgent messages not involving persuasion.

Elements of Communication Impact

The Theory of Communicative Action

A definition of communication impact necessarily begins with an explanation of what is actually

⁶We use the terminology offered by Klein et al. (1994). In mixed-determinants models, determinants from a variety of levels may influence the dependent variables. Homogeneity with respect to a construct implies that the group members' values on a given construct are sufficiently similar so that it is meaningful to talk about the group construct.

meant by communication. Of the many definitions of communication, we have sought one which emphasizes goal driven behavior, which is later shown to be the basis for choosing strategies so as to impact action and relationship. Gerald R. Miller claims that, "In the main, communication has its central interest in those behavioral situations in which a source transmits a message to a receiver(s) with conscious intent to affect the latter's behavior" (1976, p.92). By analyzing the message, its communicative impact can be assessed to the extent that the sender's intent (goal) has been understood and accepted once the message has been received. Furthermore, it is only the immediate impact of the communicative act on the receiver's desire to react that is investigated.⁷

The model of organizational communication proposed here is a pragmatic theory of a rational communicator who uses resources to implement communication goals. We build on the theory of communicative action (Habermas 1984), which similarly situates social communication within a top-down hierarchy of goals and resources in the context of social norms and cultural values. However, to be able to move from a theory of communication to the design of systems that support communication, the top-down view must be complemented with a bottom-up view of how limited resources are used to achieve goals.

⁷An in-depth examination of communication makes it necessary to concentrate on the direct impact of communication to keep the discussion manageable. For example, Computer-Supported Cooperative Work literature usually treats the impact of using communication systems on action and relationship. Hollingshead and McGrath (1995) provide several instances of such impacts. Regarding action, communication affects (1) the task product, e.g., time, number and quality of decision solutions, and (2) the users' reactions, e.g., satisfaction and rated effectiveness. Regarding relationship, communication affects (1) the relations between actors, e.g., attraction and feeling of alienation, and (2) the pattern of interaction, e.g., total or non-task amount of participation. This paper examines the impact of the communicative act on the receiver's understanding of the message and on the receiver's relationship with the sender, but does not examine any aspects of organizational impact, such as decision quality. Ideally, the individual and organizational levels of analysis can be integrated (O'Reilly et al. 1987). However, for practical reasons, this paper is limited in scope and assumes that better communication will lead to better decision quality.

These two views explain, respectively, what and how people communicate, and, when examined in the context of a particular situation, they provide the necessary knowledge for design. For example, if we assume that senders exercise more control over interpersonal messages when they feel the receiver's reaction is less predictable, a designer who knows this may build into the system both high and low levels of control (e.g., instant versus delayed feedback). Moreover, the system could be designed to set the default level of control according to the level of uncertainty about the receiver's reaction (e.g., according to how closely the sender and receiver have worked together). But such design decisions rely on knowledge of how people communicate and, therefore, extends the scope of the theory of communicative action. Below we simplify the framework used by Habermas and argue why this framework is appropriate for a model of organizational communication, while we also indicate in general terms what must be adapted.

Habermas (1998) developed his theory of communicative action as an element of a more general theory of society.

[The] concept of communicative action refers to the interaction of at least two subjects capable of speech and action who establish interpersonal relationships. The actors seek to reach an understanding about the action situation and their plans of action in order to coordinate their action by way of agreement (Habermas 1984, p. 86).

Communicative action (a behavior) takes place in relation to three additional factors—culture, society, and person—that together constitute the “lifeworld,” which serves as the context for communication. These four factors are organized in Figure 2, alongside the corresponding products by which action is oriented: resources, values, norms, and goals. In order for goals to be achieved, coordination between communicators is necessary, as is the commitment of communicators to behave in certain ways, which is assumed to be part of establishing relationships.

Habermas further talks about two characteristics underlying communicative action: rationality and complexity. Communicative action is based on the

senders' obligation to provide the reasoning for the validity of their claims, and furthermore, these claims may be rooted in or regulated by the life-world shared by the communicators. The complexity of implementing communicative action grows with the need for coordination and type of action orientation (goals, norms, and values). These two characteristics are shown, respectively, as a top-down and bottom-up arrow in Figure 2. The distinction between goals and resources is common in social (and organizational) analysis, but the difference between norms and values requires explanation. Norms are the orders of interpersonal relationships accepted by society for the purposes of regulating practices and habitual behavior. Norms are expected to be validated not only against standards of rationality but also against standards of relationships. In contrast, engrained in the culture are values of objects of utility that are not usually put to tests of validity.

To adopt communicative action for organizational communication, we evaluate whether the system depicted in Figure 2 is appropriate in the organizational setting. We regard an organization as a social system that can be characterized by resources, goals, norms, and culture. Moreover, we assume that organizations rely on coordinated action and, indeed, act under norms of rationality in the sense that actors of the organization are guided by their goals, norms and culture on how to act in order to produce desired outcomes (Thompson 1967). Communication complexity has already been discussed. In other words, looking at Figure 2, one can substitute “person” with an actor in an organization, replace “society” with organization, and consider “culture” as both organizational and national culture. Finally, in this organizational setting, we take communicative action to be an ideal form of organizational communication. Indeed, several studies of information systems have recently used the theory of communicative action to understand organizational communication (e.g., Ngwenyama and Lee 1997; Ngwenyama and Lyytinen 1997).⁸

⁸Recent studies have used Searle's (1969) theory of speech acts (e.g., Moore 1998; but see criticism by Janson and Woo 1996), Habermas's (1984, 1987) theory of communicative action (e.g., Mingers 1995; Ngwenyama and Lee 1997; but see criticism by Sharrock and Button 1997), and a combination of both Searle and Habermas (e.g., Schoop 1997).

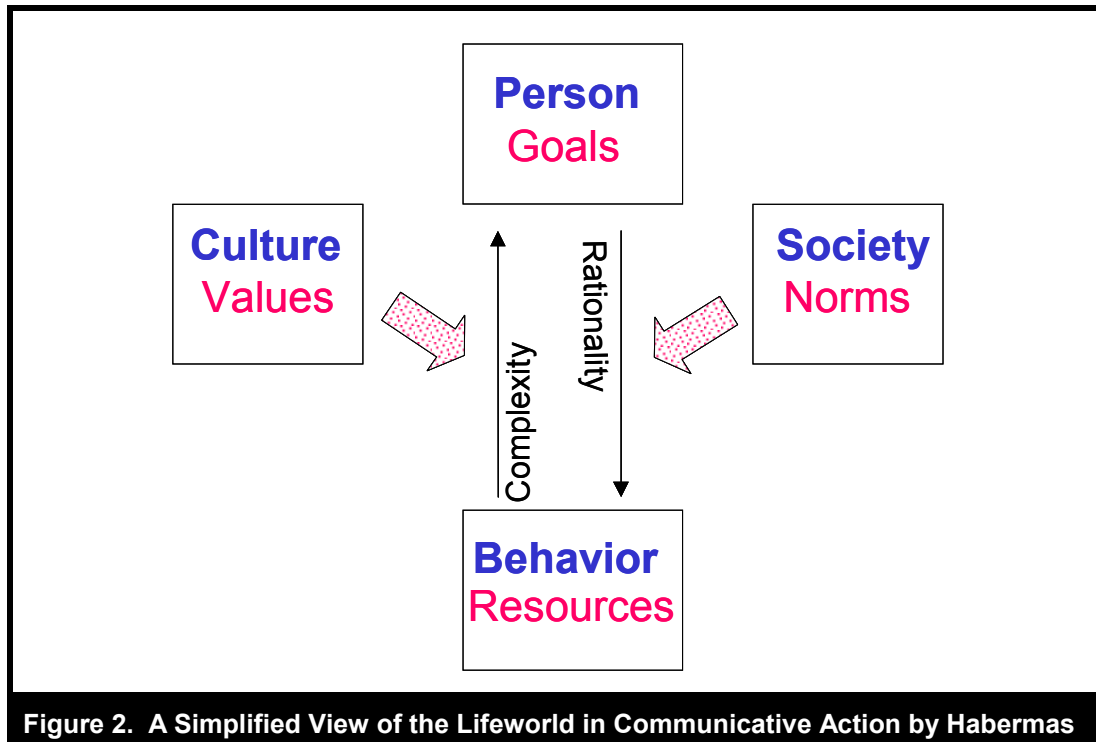


Figure 2. A Simplified View of the Lifeworld in Communicative Action by Habermas

The framework in Figure 2 must, however, be adapted to form the basis for design. First, while the theory of communicative action has little connection with the physical aspects of communication, a model leading to design must address the interaction between the communicator and the media. The levels of context (in Figure 2) are necessary but not sufficient for designing information technology; they must be complemented with lower levels of abstraction that describe the physical functions and form of communication (Rasmussen 1986). Therefore, in our model, behavior will be described in greater detail as communication strategies, medium, and message. Second, Habermas' categories of goals and actions, which he sees as universal, may be inadequate to capture the idiosyncrasies of a specific setting such as an organization (Sharrock and Button 1997). Therefore, we use the principles of communicative action, but do not adopt the detailed classifications. Third, in the theory of communicative action, a situation represents a temporally and spatially defined segment of the

lifeworld that is delimited in relation to goals, but there is little concern with how the situation affects behavior. Therefore, in our model, situation will be characterized more specifically as task and sender-receiver distance to demonstrate how they affect behavior.

Communication Impact Defined as Mutual Understanding and Relationship

The first implication of the theory of communicative action is a definition of communication impact. Habermas (1984, 1987) claims that four conditions are necessary for a communicative act to take place:

- (1) the act must be comprehensible, so that the receiver can understand the sender;
- (2) the act must be true, so that the receiver can share the sender's knowledge;

- (3) intentions must be expressed truthfully, so that the receiver can trust the sender; and
- (4) the act must be appropriate within some normative context so that the receiver can agree with the sender within this value system.

Communication is at once an act of building a mutual understanding between sender and receiver and building a relationship between them. The relationship is necessary for gaining a commitment from the receiver to the sender or the larger group to which they belong. In fact, it is the act of communication more than the informational content that produces this commitment (Huff et al. 1989). Although some may regard the third condition to be somewhat naïve, truthful expressions of intentions are the basis for the commitment necessary in social exchange (Blau 1964).

These four conditions of validity allow us to develop two mirror perspectives: (1) defining mutual understanding and relationship as the impact of successful communication and (2) characterizing impediments to action and to relationships as poor communication. While Habermas combines understanding and relationship, we separate the two, acknowledging that they are interwoven yet assuming that people can distinguish between the two. *Mutual understanding* refers to the first and second conditions (a comprehensible and true message) and is associated with the action-oriented aspect of communication. Mutual understanding includes not only the receiver's understanding of the message, but also the sender's awareness that the recipient of the message has understood it. *Relationship* refers to the third and fourth conditions (trustworthiness and appropriateness) and is associated with the dimension of relationships within the communicative act (Habermas 1984). Successful communication necessitates both aspects, although the marginal impact of a single communicative act on relationship may be smaller than that on mutual understanding and may depend on the precise communication goal. For example, if the sender's goal is to convey the price of a product, then mutual understanding is the desired impact. On the other hand, if the goal is to influence the

receiver to purchase the product, then the communication must not only be comprehensible, but also appropriate.

Relationship and mutual understanding are, of course, closely interrelated. Indeed, work relationships, and more specifically, mutual trust, facilitate a more productive flow of information (Hart and Saunders 1997; Nelson and Coopridge 1996). Moreover, relationships build trust, which can be described as the confidence that the receiver will fulfill obligations and behave in a fair and predictable manner (Anderson and Weitz 1989). Communication is, therefore, more effective when trust and commitment are high (e.g., Dore 1983; Williamson 1975). Explanations perceived to be timely and sufficiently detailed to allow for adequate understanding of the message are more likely to lead to trust (Whitener et al. 1998). In fact, any communication between managers and subordinates that appears to be open builds trust (Gabarro 1978). On the other hand, faulty communication and unsuccessful interaction make it impossible to reduce psychological distances between people (Schein 1996). Thus, mutual understanding and relationship are intimately related.

The four conditions of communication invalidity also allow us to investigate poor communication as an impediment to action and relationship. Such a perspective is useful for two reasons: in practical terms, failures in communication are often easier to measure than successful communication, while conceptually, a focus on communication invalidity can serve to explain behavior that attempts to overcome impediments to action. In line with the action perspective adopted here, poor communication can be defined as an impediment to action, that is to say, any exchange of information that leaves the receiver unable, unwilling, or unsure of how to proceed with the sender's intended impact. Taking a similar approach, De Bono (1976) considers thinking from the point of view of action and defines an effective explanation as one that allows an individual to decide on what to do next.

High levels of communication complexity can lead to communication failures. Cognitive complexity

and dynamic complexity impede mutual understanding by making it difficult to understand and share knowledge, which are the first two conditions of successful communication noted by Habermas (1984). Affective complexity primarily impedes the processes of building trust and setting an appropriate normative context of the communication that is acceptable to both receiver and sender. These are the third and fourth conditions of successful communication. Overcoming high complexity is thus central to successful communication. In theories of human information processing, it is generally agreed that higher complexity results in poorer performance, although extremely low levels of complexity may reduce performance by failing to arouse sufficient attention (Rasmussen 1986; Schroder et al. 1967). We adapt this general observation to the specific domain of communication in proposition 1 and treat it here as an axiom from which other propositions are derived.⁹

Proposition 1: Beyond some minimal value of communication complexity, a reduction in it will result in higher levels of mutual understanding and relationship.

In sum, the impact of a communication is linked to the receiver's intent to react. The theory of communicative action is used (1) to define communication impact as mutual understanding and relationship and (2) to define impediments to action and relationship, and characterize their causes as cognitive complexity, affective complexity, and dynamic complexity. Reductions in communication complexity are expected to improve communication.

⁹The discussion is framed as a set of propositions, the first of which is taken here to be axiomatic and the remaining propositions are part of an expandable set of testable theorems (Blalock 1969). In discussing how to construct verbal theories, Blalock argues that "Axioms are propositions that are assumed to be true. Theorems, on the other hand, are derived by reasoning, or *deduced*, from the axioms" (p. 10). He further suggests two rules for stating theories in verbal form: (1) axioms should be statements that imply direct causal links and (2) theorems should be stated in a testable form.

The Communication Process ■

The discussion of the communication process begins with communication goals (see Figure 1) and proceeds by incorporating three inter-woven elements, as follows:

- the communication strategies for a given communication goal;
- the medium on which the message is transmitted;
- the form in which the information is packed into a message.

Although not necessarily sequential, they will be explained one by one in the sections that follow (Table 3 provides a glossary of all the process elements). Once the first two elements (goals and strategies) have been discussed, we will elaborate on the assumptions behind behavior and choice, and will use these to explain how goals affect the choice of strategies. The same rationale for choice is later used to explain how strategies affect the choice of message and medium, and how inputs affect the process (discussed in the section on inputs to the communication process).

Goals

Habermas (1987) discusses four broad social processes that require communication: reaching understanding, coordinating action, building relationships (socialization), and strategically influencing others. Several empirically derived classifications of organizational communication goals exist (see recent classifications in Carlson and Davis 1998; Kettinger and Grover 1997; Mackay 1988; Orlikowski and Yates 1994; Poole and Hirokawa 1996; Te'eni and Schwartz 2000). They are diverse and more elaborate than Habermas' four processes. This is presumably because they attempt to map the communication goals to a multitude of observable activities within the organization, e.g., processing of information vs. choice making. In the interest of parsimony in theory development, we choose here to build on the theoretical foundations in communicative action, adapting them to the organizational

Table 3. Glossary of Attributes in the Communication Process

Element Attributes	Definition
Goals	
Instructing action	Getting the receiver to act according to the sender's wishes.
Managing inter-dependent action	Coordinating interdependent actors.
Managing relationships	Fostering relationships between people at work.
Influencing	Attempting to influence behavior and attitude to conform to the sender's wishes but realizing the receiver can behave differently.
Strategies	
Contextualization	Provision of explicit context in messages.
Affectivity	Provision of affective components (emotions, moods) in messages.
Control—testing and adjusting	Testing and adjusting communication according to feedback during the process.
Control—planning	Planning the pattern of communication and contingencies ahead of the process.
Perspective taking	Considering the receiver's view and attitude.
Attention focusing	Directing or manipulating the receiver's information processing.
Media	
Interactivity	The medium's potential for immediate feedback from the receiver.
Channel capacity	The medium's potential to transmit a high variety of cues and languages.
Adaptiveness	The medium's potential to adapt a message to a particular receiver.
Message	
Size	Number of semantic units.
Distribution	Number of destinations to which the message is sent.
Organization	The extent to which the message is ordered to support mutual understanding.
Formality	The abstraction of a description toward closure of action according to the rules of communication in the particular organizational setting.

setting.¹⁰ Furthermore, as we define each of the four communication goals, we also relate it to communication complexity.

The simplest instance of reaching understanding is in *instructing action*, which has the goal of getting the receiver to act according to the sender's wishes (Habermas calls this "instrumental action"). One such action is a request for information. Although most of the empirical classifications of organizational communication mentioned above appear to classify information seeking as a distinct class of action, we remain consistent with the theory of communicative action and include a request to provide information as a special case of instructing action. Furthermore, there is no inherent source of complexity in this communication. Indeed, other goals will be seen to be more complex by comparison.

The aim of *managing interdependent action* is to coordinate interdependent actors. In comparison to instructing action, managing interdependent action is higher in terms of cognitive complexity. According to Thompson (1967), interdependent action generates cognitive complexity due to interdependence between actors that can be either serial (one's action depends on the other's action) or reciprocal (one's action both depends on and affects another's action). Furthermore, when the task requires simultaneous interactions between actors, dynamic complexity increases too (Van de Ven et al 1976).

¹⁰While most recent classifications of organizational communication differentiate between communication around current action and communication for some future action, which includes knowledge acquisition (Carlson and Davis 1998; Kettinger and Grover 1997; Poole and Hirokawa 1996; Te'eni and Schwartz 2000), we decided to keep to the theoretical framework of communicative action, in which the situation of social action is defined by temporal and spatial conditions. The distinction between communication about current and future action (e.g., formal procedures for actions) will, therefore, be characterized in the present study by an attribute of the task element called temporality (discussed in the section on inputs to the communication process).

The purpose of *managing relationships* is to foster relationships between people at work (we use the term managing relationships rather than building or maintaining relationships to connote the whole range of actions beyond initiating creating a relationship, e.g., preserving, strengthening, and, if necessary, severing relationships). The communication needed to manage relationships is not action-oriented (Scollon and Scollon 1995; Street and Cappella 1985; Weedman 1991). This goal is, therefore, closely related to affective complexity due to the possible dispositions between sender and receiver. Moreover, the absence of any focus on action often widens the possible meaning of the message, making it more subjective. Indeed, managing relationships is most frequently invoked in situations of changing or deteriorating relationships (Lee and Jablin 1995). Where such communication is irregular, and the interpersonal context of the sender-receiver communication is less established, the uncertainty of the receiver's reactions to the communication is high. This uncertainty also increases dynamic complexity.

Influencing can be either action oriented or relationship oriented. Influencing is about attempting to influence behavior and attitude in order to conform to the sender's wishes but realizing the receiver can behave differently. Influencing is often concerned with resolving conflicts and, thus, it reflects high interdependence between communicators, more so than thinking collectively (Straus and McGrath 1994). Moreover, the need for influencing assumes a multiplicity of views or preferences held by the communicators, which need to be connected. Influencing is, therefore, of high cognitive complexity. Furthermore, influencing assumes that the receiver's behavior cannot be determined in advance and, therefore, that communication should be sensitive to changes in the behavior. Influencing includes attempts to change behavior by bringing about an alteration in attitude. Hence, influencing may depend on the receiver's dispositions toward the sender or the subject matter and is, therefore, usually high in affective complexity.

Table 4 lists the four communication goals and the corresponding sources of communication complexity to which they are most susceptible.

Table 4. Communication Goals and Corresponding Sources of Complexity

Goal	Inherent Source of Complexity
Instructing action (includes requesting information)	
Managing interdependent action	High cognitive complexity due to interdependency and multiplicity of views. High dynamic complexity when interdependent action is done in parallel.
Managing relationships	High affective complexity due to dependency on interpersonal dispositions. High dynamic complexity when reactions are uncertain.
Influencing	High cognitive complexity due to multiple views and high affective complexity due to dependency on interpersonal dispositions.

Communication Strategies

The four classes of communication goals (Table 4) and their inherent sources of communication complexity are used below to explain the choice of communication strategies. *Communication strategies* may be defined as the means by which communication goals can be fulfilled.¹¹ Such strategies are needed to overcome the complexities of the communication process. The six communication strategies discussed below are summarized in Table 3. They have evolved from previous research in communication, human information processing, and organizational behavior, as well as from our own observations. The terms communication strategies, patterns of communication behavior, communication preferences, and communication styles were used interchangeably to search the literature. Most of the strategies outlined have been adapted to fit in with the level of analysis of a message and the cognitive-affective orientation adopted in this paper.

The list of strategies selected here is likely to be incomplete. However, it is at least representative of the three different stages in the communication process: the creation of a message by the sender, the transmission of the message between

sender and receiver, and the receipt of the message by the receiver. Communication is achieved by being more or less active in the following activities: (1) creation—building cognitive and affective components in the message; (2) transmission—controlling the information transmission through planning and through testing; and (3) receipt—considering the receiver's perspective on the issue and affecting the receiver's information processing. These strategies can be seen as the centerpiece of the communication process.

Contextualization

Contextualization may be described as the provision of explicit context in the message. It requires the sender to build an explicit interpretation of the issue as opposed to noting only the desired reaction or core message. Thus, contextualization is central to theories of comprehension and is necessary for improved problem solving performance (Kintsch 1988; Mayer 1985; van Dijk and Kintsch 1983). Context is usually constructed through layers around the core message that explains, among other issues, the following: how an action can be performed; how it can be broken down into sub-actions; how the action answers its motivation; what information may be related to the message; what alternative interpretations are possible. Piaget, for example, discusses understanding as "the 'how' and 'why' of the connections observed and applied in action" (1978, pp. 218). In information systems, the con-

¹¹ The term "communication strategies" is borrowed from the literature on inter-language communication to denote ways in which people tackle and overcome problems in pursuing a communicative goal (Kasper and Kellerman 1997).

notation of contextualization is narrower: it seeks to elucidate the situation in which the message was created, detailing such issues as who is communicating with whom, when, and under what conditions (Schwartz and Te'eni 2000). Message #3 in Table 1 is an instruction to postpone delivery (the core of the message) and message #2 (which is threaded) gives the reason for the instruction (the context). Additional context information about the message creation is the sender (contract manager), receiver (logistics) and date (April 2).

Affectivity

Affectivity may be seen to be the inclusion of affective components in the message that describe emotions and moods, not necessarily pleasant ones (Schwarz 1990). Emotions are more intense, relatively short-lived, and usually prompted by a clear trigger, such as excitement about the prospects of success, an apology, and the pleasure of meeting someone. Moods, such as the state of feeling good, are rather longer term affective states, usually with no salient cause. Schlosberg (1952) has mapped affect according to two dimensions: attention-rejection and pleasantness-unpleasantness. This was later reconfirmed for communication that is both non-verbal (Green and Cliff 1975) and verbal (Osgood 1969). Affectivity can be used to motivate, e.g., to sustain favorable attitudes and dispositions, and to inform, e.g., provide information about the subjective evaluation of a product. Indeed, such a quality is needed to cope with potential communication problems due to affective complexity.

Control by Testing and Control by Planning

Control is largely a matter of overseeing and, if necessary, adjusting the communication process to assure effective communication. For example, Street and Cappella (1985) note the need for maintaining coherence in discourse and managing dominance and control, and Clark and Brennan (1991) emphasize the continuous need to coordinate content and process. Moreover, different levels of control are needed for different types of goals (Jordan 1998). Control can take two basic forms: (1) planning the pattern of communication, and if necessary contingency patterns, ahead of

the process, and (2) testing and adjusting on the basis of feedback during the process (online). Indeed, people are capable of recognizing and adopting spontaneous versus planned communication, depending on whether the interdependence between them is parallel or sequential (Lea 1991).

For planned control, one needs to consider whether the communication process is pre-determined, leaving the locus of control with the sender, or whether it is flexible, leaving open the progression of communication and letting control shift from one partner to another. A particular characteristic of control through planning is the clear designation of who does what in the communication process and a distinction between plan and implementation. In planned control, message redundancy, especially repetition of key ideas, is used to ensure successful communication (Mayer 1985). For example, senders sometimes copy messages to other people with the sole intention of pressuring the receiver to take action (Phillips and Eisenberg 1993). Additionally, the sender may send the same message several times, rephrase messages, and summarize previous communication. Important characteristics of this control behavior are, therefore, redundancy and repeated communication ("I'm sending this message again to your other address," "Attached is a summary of our phone conversation") and multiple recipients (including multiple copies and blind copies).

In seeking to achieve control through testing and adjusting, the sender plays an active part in ensuring that the process works well. Timely feedback is, of course, essential for effective control (Te'eni 1992). For example, the sender repeatedly asks the receiver if the communication was successful and adjusts the message according to the receiver's reaction. Characteristic of this control behavior are online tests of the communication such as "Did you get the message?" and "Do you understand the message?"

Perspective Taking

Perspective taking is concerned with whether the receiver's view and attitude are a target of the communication or whether they are left outside

the scope of communication. This strategy includes both cognitive and affective aspects of the receiver's perspective. Krauss and Fussell (1991b) argue that perspective taking, in which the sender actively considers (imagines) the receiver's point of view, is necessary for the communication to be comprehensible. At a minimum, it requires you to consider what your partner sees and hears of your message (Schober 1993). In a similar but broader sense, Scollon and Scollon (1995) use the term involvement to describe a communication strategy in relational communication. They too stress the sender's involvement in the receiver's world, but include in it the way that world is seen publicly. Perspective taking can best be demonstrated by taking interest in the receivers' viewpoints, inquiring about their affairs and attitudes and supporting them, sharing common beliefs and talking in a personal style (e.g., message #10 in Table 1). It usually includes the sender's expression of attitude that can be characterized by the use of magnifying adverbs and attitudinally loaded words (Egins and Martin 1997).

Attention Focusing

In attention focusing (also known as "flagging" or "contextualization cues"), the sender attempts to direct or even manipulate the receiver's processing of the message. In organizational theory, attention focusing is a well-known strategy used by managers who wish to direct knowledge acquisition (Simons 1991). At the level of communicating a message, attention focusing may involve highlighting parts of the message, switching from small to large letters, shouting after talking softly, etc. (Gumperz 1982). This process involves the use of various techniques to affect information processing, such as switching format (size, uppercase, underline, etc., such as in message #7 in Table 1), switching styles, and creating an unusual composition (e.g., sequence of sentences, repeats, headings). Using some of these techniques in moderation is common, but deliberate, sophisticated and pervasive use of multiple techniques cannot be taken for granted. Moreover, in itself, attention focusing introduces complexity and should be applied with care. For instance, some people take offense in a switch from lower to uppercase to denote urgency.

Principles of Behavior Assumed in the Model

Having defined communication strategies (summarized in Table 3), it is now possible to discuss how the sender chooses to use them. The sender's choice of how to communicate is central to this model: it is used first to explain strategy selection, then to explain medium and message selection, and, finally, it is expanded to explain how communication inputs affect the communication process. Following Beach and Mitchell (1998), the choice of strategies involves two types of tests: (1) a filtering of admissible strategies (e.g., affectivity may be banned, de facto, in formal communication) and (2) a cost-benefit (profitability) analysis in which benefits (e.g., accuracy in message comprehension) are weighed against costs (e.g., time spent). For example, perspective taking requires time and will be selected only if the probability and cost of communication error to the sender for a particular message is high enough to justify the effort.¹² Moreover, the cost-benefit approach is also appropriate to the relationship impact of communication (Blau 1964). Communication complexity, therefore, plays a major role in the choice of strategies because it reflects the plausibility of errors or difficulties in communication, while strategies are the means by which complexity is reduced. Later on, when we talk about the medium, the choice of strategy will be tied to the choice of medium, changing the costs and benefits, or even the feasibility of strategies (e.g., it may be infeasible to control by testing and adjusting an airmail letter). Similarly, certain inputs to the communication process may make strategies infeasible (e.g., a complete lack of knowledge about the receiver may make perspective taking infeasible).

¹²Such two-stage models are common in decision making (Beach and Mitchell 1987, 1998). The mechanism for choosing a strategy includes two aspects, the first of which involves a filtering of acceptable strategies and the second of which implies a cost-effectiveness selection of preferred alternatives. The first stage, by implication, suggests a yes-no definition of feasibility, while the second is a matter of degree, and of weighing costs and benefits. The costs are usually personal costs, such as mental effort, and the benefits are accuracy and salience of decisions (Payne et al. 1993).

Underlying the application of this framework are several principles of behavior that apply generally to information processing but have also, on occasions, been applied to communication. First, people avoid or may attempt to reduce effort and complexity so that they will select the least costly strategy that achieves their goal. Describing the rationale for choosing how to communicate, Kasher (1977, p. 231) describes it as "given a basic desired purpose, the ideal speaker chooses that linguistic action, which he believes, most effectively and at least cost attains that purpose." This principle explains, for example, why people employ communication strategies in the first place.

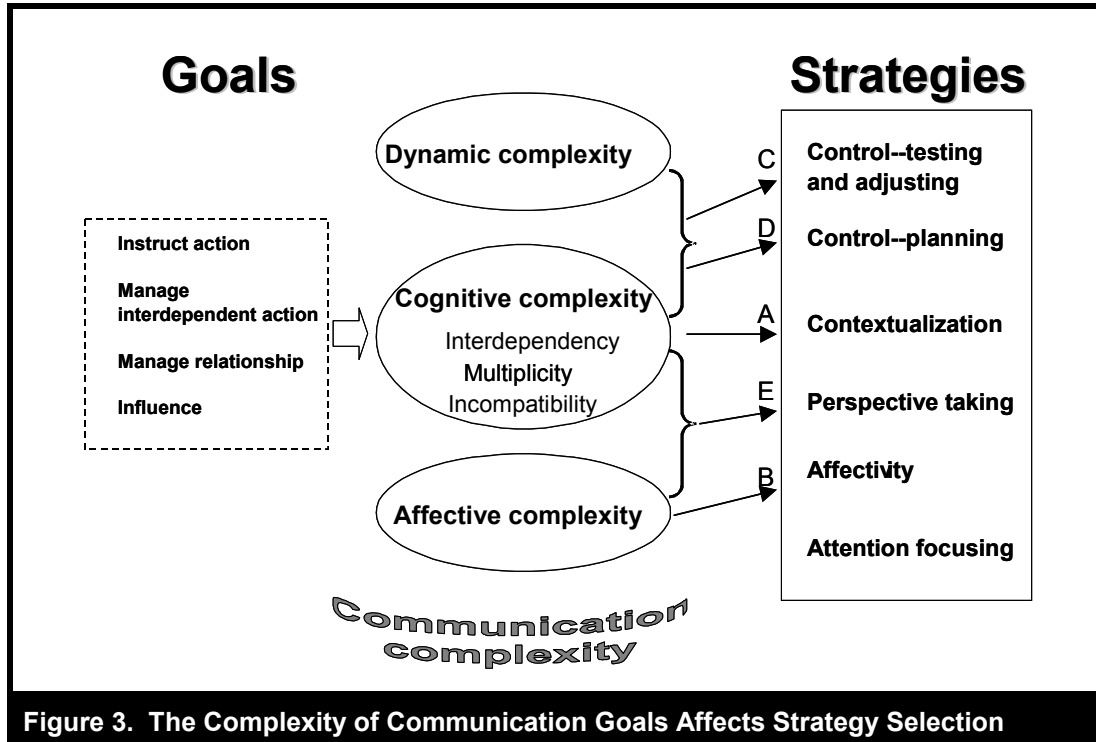
The second principle refers to shifts between strategies. People represent action at multiple levels of abstraction, and at any one moment, one of these levels is their focal level (Rasmussen 1986; Vallacher and Wegner 1987). People tend to remain on higher rather than lower levels of abstraction, but shift their attention to a lower level of abstraction when complexity increases and breakdowns occur. Berger (1998) uses this principle to explain patterns of communication behavior, and we use it here to explain shifts between strategies (control and contextualization), describe the choice of message form, and derive design implications. Moreover, from this principle it follows that whenever people are able to do so, they strive to attain closure on actions at lower levels so that they can proceed with the higher levels. This explains, for example, why people choose less effective but more readily available media (Straub and Karahanna 1998).

Third, people have expectations, often cultural ones, about representations and the way they correspond to goals (in other words the affordance rendered by a representation or technology, e.g., Norman 1990). For example, some people expect to read a message from left to right, and others from right to left. Representations that are incompatible with these expectations require additional effort or increase the probability of error, and are, therefore, rejected in favor of compatible representations (Barber 1988). Fourth, people adapt to

incompatible representations by transforming or restructuring the representation or by employing compensatory strategies, e.g., re-reading the message. This last category may take longer to appear than the first three reactions and will be referred to as secondary behavior which is able to describe adaptations to incompatible medium and message (propositions 4 and 6). These principles of behavior are treated here as assumptions, providing the rationale for developing the propositions below. Therefore, the propositions about the choice of behavior describe how people prioritize goals and choose strategies according to these assumptions. However, the propositions about effective configurations of messages and media are normative in the sense that they state which configurations are more effective in achieving higher impact for certain situations (these are propositions 3 and 5). Accordingly, we will use different formats for the descriptive and normative propositions.

Proposition 2: Certain Strategies Are Selected for Certain Goals

At this stage in the paper, we develop the general proposition that certain strategies are selected for certain goals. This general proposition is composed of five specific propositions, each of which determines what strategy can improve communication by looking at the sources of complexity inherent in the communication goals (the specific propositions are depicted as arrows labeled A through E in Figure 3). Thus, we examine the potential benefits of each strategy in coping with cognitive, affective, and dynamic complexity. This line of thought is depicted in Figure 3 (which explodes the link between goals and strategies shown in Figure 1) and applied below to each of the strategies with the exception of attention focusing. The latter is needed whenever complexity is high in relation to the receiver's attention span and is primarily a function of environmental factors such as information overload (discussed in the section on inputs to the communication process). A comprehensive view of the strategies is then taken and a possible tradeoff between strategies is demonstrated.



Specific Propositions on Choice of Strategies

Contextualization is necessary when a message is liable to be misunderstood (Gumpertz 1982). Such a misunderstanding occurs most frequently when cognitive complexity is high, for example within non-routine situations involving a more complex exchange of views (Daft and Lengel 1984). While reducing cognitive complexity by simplifying the situation may be seen to be highly dangerous, providing information rich with context is more effective (Janis 1989).

Proposition 2A: Contextualization is selected for communication goals characterized by high cognitive complexity.

For example, managing interdependent action, which can be ranked highly in terms of cognitive complexity, is particularly susceptible to misunderstandings. The strategy of building context into the message decreases the probability of misunderstanding and thereby increases the probability of accomplishing the goal of thinking collec-

tively. Indeed, Tyre and von Hippel (1997) showed how the explicit presentation of multiple contexts triggers different, more effective thinking. Influencing, too, leads to high cognitive complexity, as it assumes a difference of opinions or preferences, but also high affective complexity (Petty and Cacioppo 1986).

Affectivity is needed when affective complexity is high. Such a strategy is often associated with building relationships, a process that depends on attitudes and trust (Scollon and Scollon 1995).

Proposition 2B: Affectivity is selected for communication goals characterized by high affective complexity.

Control (either by planning or by testing and adjusting) is required when a given situation is perceived to be complex and when the probability of communication error is high (Srinivasan and Te'eni 1995). Of the two types of control, testing and adjusting is needed when dynamic complexity is high. Predetermining the process is counter-

productive when it is difficult to predict the pattern of communication, such as in first acquaintances. In particular, goals that require a high degree of parallel interdependence, such as influencing and collective thinking, can be less effective when the process is predetermined (Conger 1998). Similarly, communication for monitoring generally relates to unplanned events and, therefore, requires immediate adjusting if the communication is faulty.

Proposition 2C: Control by testing and adjusting is selected for communication goals characterized by high cognitive complexity coupled with high dynamic complexity.

In contrast with monitoring and influencing, setting procedures usually assumes a relatively small amount of dialogue. The mode of communication is often one to many, and the receivers will usually receive the information at a later time, perhaps months after it was issued. Dynamic complexity is usually low.

Proposition 2D: Control by planning is selected for communication goals characterized by high cognitive complexity coupled with low dynamic complexity.

Perspective taking is needed when the receiver's view may distort or reject the intended meaning of the message if its contents are not adapted to fit the receiver's view (Krauss and Fussell 1991b). Perspective taking is applicable in situations where there are inconsistent views and is most probable when a multiplicity of views (high cognitive complexity) is coupled with high affective complexity. This communication strategy is, therefore, of paramount importance in influencing, where all partners feel they are entitled to their views and do not feel an obligation to conform. In such cases, dismissing one's partner's views is counterproductive (Conger 1998).

Proposition 2E: Perspective taking is selected for communication goals characterized by high cognitive complexity coupled with high affective complexity.

A Comprehensive View of Strategies

The general proposition that certain strategies are appropriate for certain goals has been articulated by five specific propositions (2A through 2E) shown in Figure 3. The same rationale can be used to develop additional propositions as we learn more about the communication strategies and goals. Another important direction to examine is the relationship between strategies as communicators will usually employ several strategies. One example is the tension between control and contextualization. Control is needed in order to regulate actions and correct them if necessary, and it requires a high level of abstraction. In contrast, contextualization supports comprehension, and it requires a lower level of abstraction. According to the second principle of behavior (see the earlier section on principles of behavior assumed in the model), people will shift from control to contextualization only when a miscommunication occurs, and will shift back once comprehension is achieved.

Corollary: Contextualization is selected over control when mutual understanding decreases.

Media: Certain Medium Attributes Are More Effective for Certain Strategies

Given a particular set of communication strategies, a particular medium and message form need to be chosen for it to be implemented. The bidirectional links between strategies and medium (propositions 3 and 4), between strategies and message (propositions 5 and 6), and between medium and message (proposition 7), as shown in Figure 4, are discussed below. We begin with a review of past research on attributes of the medium.

Attributes of Medium and Review of Recent Studies

Nowadays, a variety of communication technologies are available, including letters, memos, faxes, telephone, e-mail, voice mail, and, very shortly, video conferencing and the mobile video

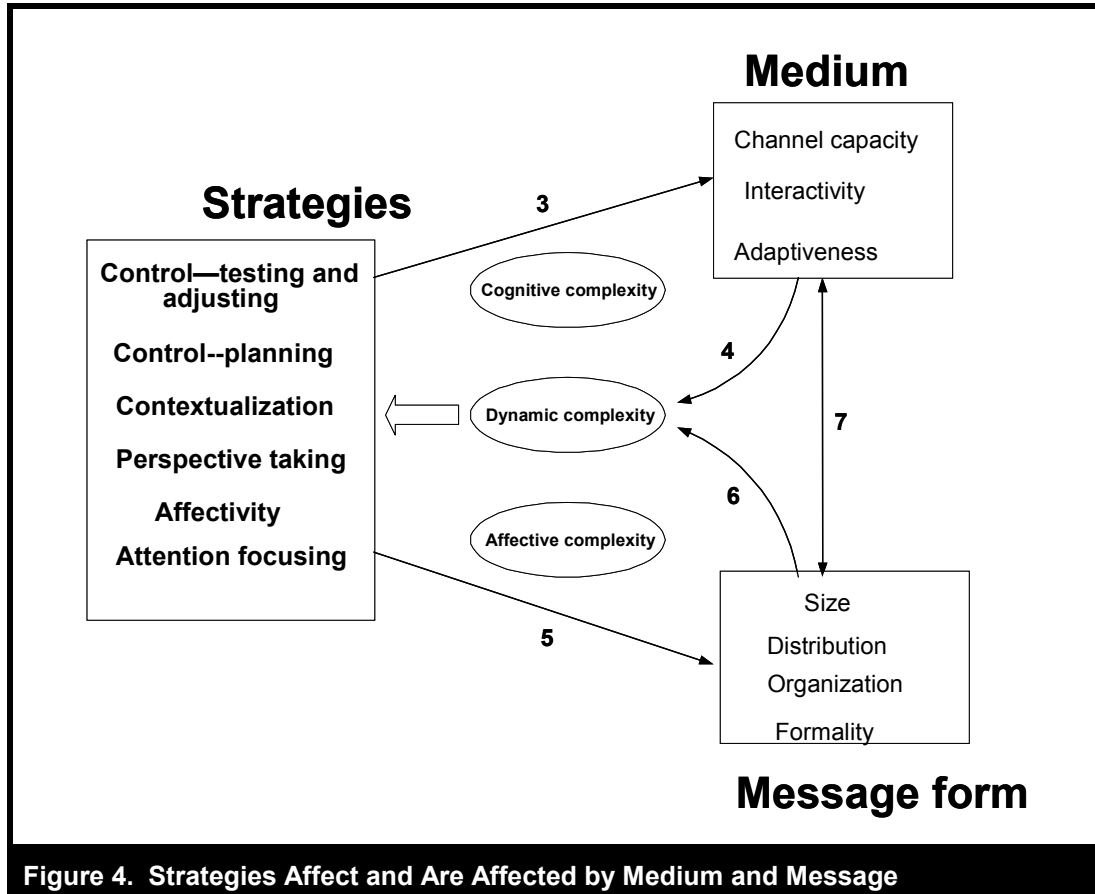


Figure 4. Strategies Affect and Are Affected by Medium and Message

phone. The most common classifications of media build on the following three dimensions of media richness:¹³

- *Interactivity*—the potential for immediate feedback from the receiver. It is manifested by simultaneous, synchronous, and continuous exchange of information (Zack 1993).

- *Channel capacity*—the potential to transmit a high variety of cues and languages (Daft and Lengel 1984).

- *Adaptiveness*—the potential to adapt (personalize) a message to a particular receiver (Daft and Lengel 1984).

¹³Most classifications or ordering of media build on media richness characteristics, which integrate the level of interactivity, number of channels supported, capacity to transmit a high variety of languages, and ability to personalize messages (Daft and Lengel 1984, 1986; Daft et al. 1987). See Sillince (1997) for an expanded list. In order to develop a more suitable basis for designing these attributes, we first examine each attribute separately, and then the interaction between attributes, concentrating on the three attributes most widely addressed (the capacity to transmit language variety can be subsumed under channel capacity, see Dennis and Kinney 1998).

Consider the voice mail of the CEO in the introductory example (Table 1). The CEO, who is trying to reassure the employees chooses a medium that has higher channel capacity than, say, a written memo (voice carries with it subtle signals that are difficult to emulate in writing). A recorded video (audio-visual) message would have an even higher channel capacity. Technologies that allow the sender to insert the name of the employee (from a file of names recorded in the CEO's voice) would increase adaptiveness, but only superficially (much like personalized junk

mail). Furthermore, the recorded message is of low interactivity in comparison with, say, a video conference, where the CEO could present the issue and then take questions about it.

Table 5 shows the results of recent studies relating to the quality of communication with medium attributes. Where possible, the results are organized according to the three attributes. Those studies that did not distinguish between these attributes are grouped under combined attributes as face-to-face (FtF) communication versus computer-mediated communication (CMC) such as e-mail. In the table, impact is divided in two: action-oriented and relationship-oriented. Furthermore, this and other reviews in the paper are intentionally limited to research published in the last 15 years in view of the dramatic changes in communication technology. Exceptions are cited only to emphasize differences or similarities with the communication world of the 1960s and 1970s.

The review demonstrates that the impact of media on both action and relationship is inconclusive. In a period of rapid advances in information and communication technologies, this may be seen to reinforce earlier conclusions regarding the contradictory results of media richness a decade ago (Markus 1994a, Rice 1992). One way to resolve the contradictions with regard to effects of media is to examine further contingencies on goal-related factors, e.g., type of task (D'Ambra et al. 1998) and level of interdependency in task (Straus and McGrath 1994), or upon input factors, e.g., sender-receiver distance (Zmud et al. 1990). Another way is to break away from media richness as an *integrated perception* of the potential reduction in task equivocality (Daft and Lengel 1984), and to investigate separately what each attribute of the medium affords. In this study we take both directions by bypassing media richness (as a construct, not the principles of the theory) to concentrate on the three attributes of media, and by looking closely at the contingent effects of media on communication strategies and inputs.

Contradictory results remain, however, even when examining each attribute separately. In terms of interactivity, interactive brainstorming (versus non-interactive) is both more productive (Valacich et

al. 1994) and less productive (Pinsonneault et al. 1999). Channel capacity too shows an inconsistent impact, not only on mutual understanding, but also on relationship. The review also points at the paucity of behavioral research on the impact of adaptiveness, which contrasts with the technological efforts placed on personalization of communication technologies (discussed in the section on implications and conclusions). In the case of relationship-oriented impact, there seems to be a differential effect between higher and lower channel capacity over time, but even this effect is inconsistent with regard to video versus FtF. One explanation may be that there are primary effects that are immediate and secondary effects (adaptations to initial states) that take longer. In our model, these are propositions 3 and 4, respectively. In general, the observations of mature behavior will include adaptations, while observations of initial communication patterns will not. For example, with time, people find ways of transmitting feelings in e-mail, even though it would not be the medium that would be considered compatible with the strategy of affectivity.

Proposition 3: The Choice of Medium Attributes

The choice of medium according to strategies (proposition 3) is shown in Figure 4 as the arrow pointing to medium. It reflects the earlier discussion of the two types of tests: admissible and profitable. Is the particular medium admissible for the strategy (e.g., control by testing and adjusting is infeasible on messages sent by "snail mail") and is this medium best suited for the strategy (e.g., conveying emotions can be done through e-mail but face-to-face enables you do so more easily and more effectively)?

Interactivity facilitates control through testing and adjustment because of its ability to provide instant feedback (Smith and Vanecek 1990). Moreover, high interactivity implies that the sender controls the pace of the communication, while low interactivity leaves the decision with the receiver, reducing the sender's control. Such dynamic control is a necessary dimension in a person's ability to cope with dynamic complexity (McLaughlin 1984). Interestingly, interactivity is itself a source

Table 5. Recent Studies on Medium Effects

Medium Attribute	Action-Oriented Impact	Relationship-Oriented Impact
Interactivity	Immediate feedback improves understanding (Clark 1992; Dennis and Kinney 1998). Immediate feedback speeds communication, which in turn, improves understanding (Clark and Brennan 1991; Walther 1992). CMC with blocked concurrent input produces less non-redundant communication (Valacich et al. 1993).	Interactivity is important for affect in CMC (Kiesler et al. 1985).
Channel capacity	Multiple cues can improve but also hinder understanding (Dennis and Kinney 1998). Higher channel capacity can speed but also slow down communication (Chapanis 1988; Sproull and Kiesler 1992). Higher capacity reduces explicit control (Kraut et al. 1998). Video conferencing produces more awareness and conversational fluency than voice alone (Tang and Isaacs 1992), particularly in larger groups (Daly-Jones et al. 1998). In comparison to audio-only, video has no effect on mutual understanding (Gale 1990) or some improvement but less than FtF, when it is high quality (Doherty-Sneddon et al. 1997).	Mixed results on whether multiple cues seem less or more friendly (Fulk and Collins-Jarvis in press; Walther 1992, 1995). Low capacity channels reduce social cues (Sproull and Kiesler 1992) but not if communicators sense a social identity with the communicating parties (Lea and Spears 1991; Spears et al. 1990). Video conferencing is effective in promoting social activity (Fish et al. 1993). Video vs. FtF shows no effect on initial trust (Muhlfelder et al. 1999).
Adaptiveness	None found.	Voice-mail seems more personal than e-mail (Adams et al. 1993).
Combined (FtF versus CMC)	FtF produces better mutual understanding than CMC (Straus and McGrath 1994) and only so for preference tasks (Tan et al. 1999). Mixed results: FtF produces more valid and novel arguments than CMC (Kiesler et al. 1985; McGuire et al. 1987) and equally valid arguments (El-Shinnawy and Vinze 1998). CMC causes information suppression (Hollingshead 1996). CMC generates less communication than FtF in hierarchical teams (Hedlund et al. 1998; Hightower and Sayeed 1996). CMC generates more productive brainstorming by reducing production blocking (Gallupe et al. 1994; Valacich et al. 1994) but also less productive brainstorming by increasing distraction and complexity (Pinsonneault et al. 1999). CMC generates more communication in organizations (Schultze and Vandembosch 1998). CMC generates more communication but processed inaccurately (Dennis 1996). CMC generates more biased discussions, especially when information load is high (Hightower and Sayeed 1995). Technology-performance relationship depends more on experience than type of task (Hollingshead et al. 1993).	Compared with CMC, FtF is rated less relationship oriented and less expressive of affect (Hollingshead et al. 1993; Lea and Spears 1991; Walther 1995). Compared with CMC, FtF is rated less relationship oriented but produces more total communication (Hiltz et al. 1986). However, Siegel et al. (1986) found them to be equally task oriented. Use of e-mail decreases communication and amount of greetings (Sarbaugh-Thompson and Feldman 1998). CMC produces less trust than FtF (Rocco 1998) and poorer social life (Markus 1994b) and closer ties within coalitions but more social unrest overall (Romm and Pliskin 1998). CMC over time increased social orientation, trust, and informality (Walther and Burgoon 1992) but slower than FtF (Chidambaram 1996). A synchronous web-base conference produces less relational links than FtF (Warkentin et al. 1997).

of dynamic complexity because of its potentially spontaneous, unpredictable progression of communication and the possibility of interruptions (e.g., "chat" is more interactive and more unpredictable than asynchronous e-mail). Hence, unless used only when needed, interactivity may prove to be a liability.

Proposition 3A: For control by testing and adjusting, high, rather than low, interactivity is more effective.

Although it may be hard to show when high *channel capacity* is counterproductive (Rice 1992; Tan et al. 1999b), it is possible to determine for which strategies it is especially useful. Contextualization deals with high cognitive complexity through the provision of multiple layers of context, multiple views, and, in general, more task-related information than communication without contextualization. It necessarily follows that such communication requires greater channel capacity. Indeed, in this regard, media richness theory predicts that communication aimed at resolving ambiguity and explaining interpretations will require interactive media and high channel capacity media (Daft and Lengel 1984). Furthermore, in a survey of a large petrochemical company, Russ et al. (1990) found that managers select high channel capacity media for equivocal messages and low channel capacity media for less equivocal messages, as did Daft and Lengel (1986; Daft et al. 1987). Taking a different perspective of video versus audio, Whittaker (1995) sees video as providing data about the objects of discussion rather than adding non-verbal cues about the communicators, but nevertheless regards this additional channel capacity as a tool for building a shared context.

Proposition 3B: For contextualization, high, rather than low, channel capacity is more effective.

Similarly, *affectivity* copes with high affective complexity by adding emotions and dispositions into the message. In comparison to cognitive strategies, though, affectivity is relatively sensitive to how the affect is transmitted and received (Wallbott and Scherer 1986). Such communi-

cation often requires a wide variety of signs that can be transmitted only on channels of high capacity (e.g., Carnevale and Isen 1986). The media richness theory asserts that high channel capacity, e.g., face-to-face oral communication, is necessary to enable social cues such as facial expressions, body language, and tone of voice that are absent in written communication or CMC such as e-mail. However, high channel capacity media have only the potential for enriching communication. They cannot ensure a richer communicative act in reality (Ngwenyama and Lee 1997). There is, nevertheless, some evidence that high channel capacity is perceived to be more effective and more appropriate for affective communication, primarily because of the complexity of feelings and importance of non-verbal messages (Sproull and Kiesler 1992; Westmyer et al. 1998). It is interesting to note that the use of audio-visual, in comparison to audio only, has been shown to be effective in terms of informal communication, which often includes social information (Bly et al. 1993; Fish et al. 1993).

Proposition 3C: For affectivity, high, rather than low, channel capacity is more effective.

Adaptiveness is necessary in strategies that attempt to tailor the message to a personal perspective. For example, when compared with e-mail (higher adaptiveness) and face-to-face conversation (highest adaptiveness), a bulletin board is unable to support effectively any form of adaptiveness. In practical terms, it is sometimes hard to separate adaptiveness from channel capacity. In a simple case, when the sender refers in the message to the receiver's view too, then the channel should have the capacity to transmit multiple views. In a more realistic case, perspective taking includes affective as well as cognitive references to the receiver's world. In such cases, the channel must also have the capacity to support the personal touch by tone, pronunciation, and other non-verbal gestures. A useful example is voice-mail, which eliminates the synchronicity of a telephone conversation but includes its channel capacity and adaptiveness. E-mail, in comparison, can be adapted to the receiver but has less channel capacity. Adams et al. (1993) have

compared the two media and found voice-mail to be more personal than e-mail according to most people. Quite possibly, this may be because most people cannot separate adaptiveness from the capacity to transmit a variety of social cues.

Perspective taking usually requires the sender to understand new viewpoints and adapt the message accordingly (Goldberg 1990). It also requires the sender to adapt the message to make it more personal. In contrast, managers conveying to a group the formal structure of authority and code of behavior (e.g., setting procedures and roles) will usually select a written rather than face-to-face mode of communication.

Proposition 3D: For perspective taking, high, rather than low, adaptiveness is more effective.

Proposition 4: Adaptations to Non-compatible Media

Adaptations are necessary when the medium is not compatible with the strategy, i.e., inadmissible, high on cost, or low on benefit (see the earlier section on assumed principles of behavior). This section examines the secondary effect of medium attributes on communication strategies or, in other words, how users adapt to the media (DeSanctis and Poole 1994). This is shown in Figure 4, where incompatible media increase complexity, although, compared with the effect of goals on strategies in Figure 3, the main source of complexity is now the media attributes rather than the communication goals. The first implication of reduced or insufficient channel capacity, as perceived by the sender, is that of higher dynamic complexity as a result of the lack of feedback (O'Connaill et al. 1993). The effect of higher dynamic complexity is a perceived need for higher control to overcome possible disruptions of the communication flow (Rutter and Stephenson 1977). This reaction will be particularly strong if the cost of control remains relatively low, for example, in a system that enables an automatic reminder if there is no reply within a pre-specified time. The choice of the particular type of control strategy to use depends on the interactivity of the medium available. When interactivity is high, control through testing and adjusting will be used to cope with reduced

channel capacity (Doherty-Sneddon et al. 1997). For example, field workers used more explicit control when channel capacity was reduced from video to audio (Kraut et al. 1998). When interactivity is low, however, senders may choose to cope with reduced channel capacity by increasing control through planning, e.g., by explaining procedures in different ways to increase the probability that one of them will be understood.

Proposition 4A: Senders will adapt to low channel capacity coupled with high interactivity by increasing control through testing and adjusting.

Proposition 4B: Senders will adapt to low channel capacity coupled with low interactivity by increasing control through planning.

A second result of reduced channel capacity is higher affective complexity. Limiting the means of conveying emotions becomes threatening to the sender when there is uncertainty about the receiver's response and, at the same time, little ability to control the communication. This scenario may explain Lea and Spears' (1991) notion of increased social cues on e-mail only when there is an established social identity. Moreover, even if social identity has been established, only high interactivity will allow the sender to securely increase affectivity that uses limited cues (e.g., only words) in order to compensate for the lack of customary cues of affectivity (Walther and Burgoon 1992). The findings on this matter are, however, mixed (Sarbaugh-Thompson and Feldman 1998).

Proposition 4C: Senders will adapt to low channel capacity coupled with low interactivity by decreasing affectivity.

Proposition 4D: Senders will adapt to low channel capacity coupled with high interactivity by increasing affectivity.

Comprehensive View of Medium

Table 6 summarizes the specific propositions about how strategy dictates medium attributes and

Table 6. Summary: Certain Strategies Require Certain Media Attributes (Proposition 3) and Certain Media Induce Certain Strategies (Proposition 4)

Specific Proposition	Medium	Strategy
<i>Strategy → Medium</i> <i>Primary</i>	3A High interactivity	Control by testing and adjusting
	3B High channel capacity	Contextualization
	3C High channel capacity	Affectivity
	3D High adaptiveness	Perspective taking
<i>Medium → Strategy</i> <i>Secondary</i>	4A Low channel capacity + high interactivity	Increase control by testing and adjusting
	4B Low channel capacity + low interactivity	Increase control by planning
	4C Low channel capacity + low interactivity	Decrease affectivity
	4D Low channel capacity + high interactivity	Increase affectivity

how media trigger adaptations through the strategies. More complex propositions about combinations of attributes can be developed in the future. The combination of high interactivity and high channel capacity is particularly potent when high dynamic complexity is coupled with high affective or cognitive complexity. For example, contextualization and control through testing and adjusting are needed for understanding complex problems. Interactive hypermedia is a prime example of high interactivity and high channel capacity. (Hypertext is a device that not only organizes but also communicates multiple and related views.) Indeed, in an experiment that required contextualization, interactive hypertext was shown to be more effective than a linear interactive support system (Mao et al. 1996). Another example of high dynamic and cognitive complexity is parallel work such as collective thinking. The channel capacity of video conferencing provides the necessary cues to enable effective feedback and the interactivity makes it possible to react in time (Daly-Jones et al. 1998).

If communication technologies could be seen as being different combinations of interactivity, capacity, and adaptiveness, then some of these

technologies would be incompatible with our expectations; expectations formed by media to which we are accustomed (face-to-face, of course, is the one we literally grew up with). This creates certain problems that have to do with unbalanced adaptation. For example, as has been noted above, people express their emotions through e-mail. Like a letter, e-mail has low channel capacity. However, it has little control through planning. Like face-to-face, it enables instant responses but without non-verbal feedback used for control through testing and adjusting. E-mail is left uncontrolled, which may explain the contradictory results that even when CMC does not reduce social communication, it disturbs relationships (e.g., Markus 1994b; Romm and Pliskin 1998).

Message: Certain Message Attributes Are More Effective for Certain Strategies

Attributes of Message Form

Four attributes of message are defined here and then linked to strategies. Message form is a term

that characterizes the configuration and style of the information communicated. In contrast to the choice of media, the choice of the message form has received little attention in information systems research. Research in communication theory has also neglected it as evident by the call to “devote more energy than they have in the past to a close study of messages themselves” (Stohl and Redding 1987, p. 494). Past characterizations of message and the more recent work in CMC suggest four attributes of a message: size, distribution, degree of organization (structure), and degree of formality. Here, these attributes are redefined when necessary to ensure they do not overlap with attributes of the medium.¹⁴

Message size is a function of the number of semantic units such as words or sentences (Daft and Lengel 1986). *Distribution* is the number of destinations to which the message is sent. Size and distribution are the most popular measures of communication in CMC (Rudy 1996), perhaps because they are relatively easy to retrieve from system logs with little need to code the material manually.

¹⁴Formality is an essential characteristic of communication, but has received only casual attention in empirical research (Stohl and Redding 1987). Influential sources on formality are Downs (1967) and Melcher and Beller (1967). Both sources characterize formality as a function of the organizational setting, namely the capacity in which the sender acts. Stohl and Redding compiled a list of message classification schemes, but again, most of these schemes incorporate other constructs of our model (goals and input factors). However, characterizations of messages that do not clearly distinguish between message and medium would be inappropriate for a model (such as ours) that does. For example, information richness has been defined as “the ability of information to change understanding within a time interval. Communication transactions that can overcome different frames of reference or clarify ambiguous issues to change understanding in a timely manner are considered rich” (Daft and Lengel 1986, p. 560). In contrast, we seek constructs that are evident in the message itself, rather than which remain a judgement of its ability to achieve a goal and, consequently, blur the distinction between medium. Clearly, this issue deserves more attention. For example, from the social influence perspective (Fulk et al. 1990) and symbolic meaning perspectives (Sitkin et al. 1992; Trevino et al. 1987), formality can be conveyed by the choice of media. It may be that a separate construct of formality could be defined in the context of the medium too.

The degree of *message organization* may be defined as the extent to which the message is systematically ordered to support mutual understanding, by explaining how message can be understood (the word “structure” is avoided because it is usually associated with the task or process). For example, the next paragraph (starting with “A highly organized message”) is divided into four ordered dimensions, creating a clear two-level hierarchy in the message that guides the reader from upper to lower level, and proceeds from the first to the fourth item sequentially.

A highly organized message may, therefore, be characterized in terms of several, but not necessarily all, of the following dimensions:

- (1) An obvious set of ordered and clearly distinguished elements that can easily be differentiated and discriminated (Schroder et al. 1967) (e.g., paragraphs with an opening that indicates the theme or sections with subtitles or numbering);
- (2) A clear allocation of tasks between sender and receiver so that the latter can immediately understand the action required (e.g., the sender provides information and the receiver is expected to take action).
- (3) A clear structure of and access to different levels of context to easily grasp and navigate the macrostructure (van Dijk and Kintsch 1983) (e.g., explanations as footnotes, references to documents that provide more details or a more complete rationale, hyper-text style access to more details);
- (4) A familiar or standard format for immediate recognition to avoid searching or learning (Berlyne 1960) (e.g., each of the diary entries in Table 1 begins with date, shift, and author).

The fourth attribute of message is formality, which denotes interactive closure toward some organizationally accepted representation of action (Iedema 1999).¹⁵ One scenario of such closure is the

¹⁵This definition does not preclude formalities dictated by more general norms outside the organization (e.g., language), but for simplicity they are subsumed under “organizationally accepted representation of action.”

progression from stories, through investigation and experimentation, to (probable) facts. These facts are represented as formal, abstract, and accepted (Latour 1990). Formality, therefore, implies an abstraction of a more concrete description. A given issue embedded in a particular context can be more formally represented. This allows it to describe a principle relevant to a more general situation in a way that conforms to the rules of communication in the organizational setting. In the example of Table 1, Smith informally tells the contract manager about how Joey spilt tea in the production room, suggesting that this would not happen had the dining room been open. After some processing (formality usually involves careful effort), the contract manager issues a formal memo that is more abstract and which focusses on the desired action. This is written in a style that signals conformity with the organization. In practical terms, it is easier to measure conformity with formal rules of communication than closure toward conformed action (c.f., Irvine 1979).

Proposition 5: The Choice of Message Attributes

Having described the four attributes of message form, we now turn to the links between message and strategies. Affectivity relies on a sense of sincerity, which may be lost if the receiver sees the same emotions shared with others. High degrees of affectivity may also rely on intimacy, which is clearly incompatible with wide distribution.

Proposition 5A: For affectivity, a small, rather than wide, distribution is more effective.

Message organization becomes profitable when the effectiveness gained in terms of reduced complexity outweighs the usually substantial effort involved. High message organization is, therefore, found only when communication complexity is high and time and effort are affordable. For example, contextualization, which is associated with higher complexity, requires a well-organized message to improve comprehension (Mayer 1985).

In achieving control through planning, the effort invested in planning frequently implies a corresponding effort in organizing the message. Planning will usually result in a highly organized message that enables tasks to be clearly allocated between sender and receiver, a necessary part of the plan. For example, this paper is an unusually complex message but it can demonstrate how message organization is linked to strategies. For example, each proposition is always preceded by an explanation. A set of instructions to the reader could support control through planning by anticipating that some (hurried) readers will read only the propositions, and look for more details or examples only when they are not sure they understand the message. The instructions would inform the readers that when they feel uncertain about a proposition, they should look for the explanation in the paragraphs preceding the proposition.

Proposition 5B: For contextualization, high, rather than low, message organization is more effective.

Proposition 5C: For control by planning, high, rather than low, message organization is more effective.

High affectivity is more likely to benefit from a reduction in formality (Morand 1995). Indeed, formality provides a direct contradiction to spontaneity and personal attention, which are both expected in sincere affectivity and involvement.

Proposition 5D: For affectivity, low, rather than high, formality is more effective.

In general, contextualization requires more specific, concrete information than does control (Te'eni 1992). Contextualization provides details and explains how to take action. Effective contextualization often relies on examples, step-by-step procedures, and even rich scenarios, presented as narratives. These messages are usually represented with low formality. On the other hand, control operates on a higher level of abstraction (discussed in the earlier section on the comprehensive view of strategies) and often relies on simple rules or more general principles of action which are represented with higher formality.

Proposition 5E: For control, high, rather than low, formality is usually more effective.

Proposition 5F: For contextualization, low, rather than high, formality is usually more effective.

Proposition 6: Adaptations to Non-compatible Message Forms

Having looked at how strategies dictate message attributes, we now consider how message attributes affect strategy selection. One direct result of larger messages is higher cognitive complexity due to information overload, which can be reduced by attention focusing.

Proposition 6A: Senders will adapt to a long message by increasing attention focusing.

Poor message organization also increases cognitive complexity. Control through testing and adjusting is a common reaction to a disorganized message, but can be accomplished only when using interactive media. For example, in situations of stress, messages are often disorganized and continuous control with feedback is usually the only way to cope with the complexity.

Proposition 6B: Senders will adapt to low message organization by increasing control through testing and adjusting, provided media interactivity is high.

Comprehensive View of Message

Table 7 summarizes links between strategies and individual attributes of a message. We also examined the interactions among message attributes, but found little evidence of such interactions. It may be reasonable to expect size and formality, which are both higher on cognitive complexity, to increase message organization. Moreover, propositions 5 and 6 refer to individual strategies, but communication involves combinations of strategies too. Indeed, the corollary to proposition 2 predicts that, in shifts between control and contextualization, the latter will replace the former when communication breaks down. Propositions 5E and 5F, therefore, imply a corresponding change from high to low formality. Recall the instructions to readers on how to go from the proposition to its preceding paragraph when they do not understand the proposition. The propo-

sitions, which are more abstract and phrased in the accepted terminology of the model, are of greater formality than their preceding paragraphs, which should be more concrete and possibly include specific examples. One of the implications for design (discussed below) is that these shifts from one level to another should be supported by higher message organization but also with corresponding changes of formality.

Links Between Media and Message Form

Choice mechanisms involving admissibility and profitability can also explain the interactions between medium and message form. For example, e-mail facilitates an increase in message distribution and a commensurate decrease in distribution costs, and this makes distribution more attractive to the user. Indeed, past research has shown that CMC increases the distribution of messages (Palme 1985; Phillips and Eisenberg 1993; Sproull and Kiesler 1992). Similarly, interactivity increases the time-related cost of long messages because of the online nature of the dialog but not necessarily the velocity of messages (Jones et al. 1993). In fact, there is some evidence that this is what happens with the use of CMC (Trevino et al. 1987). Social norms of using certain interactive media, such as small talk at the beginning of a face-to-face meeting or phone conversation, may, however, moderate this effect.

Proposition 7A: When interactivity is high, senders will exchange shorter, rather than longer, messages.

Low channel capacity generates a sense of limited feedback and higher risk of failure in communication that calls for more control (propositions 4A and 4B). Moreover, according to Proposition 5E, higher formality is associated with increased control while low formality introduces a higher chance of failure (e.g., getting angry, losing control, and offending your partner). As a result, low channel capacity may induce higher formality, particularly through more stringent rules of communication (see also O'Connell et al. 1993).

Proposition 7B: When channel capacity is low, senders will exchange messages of higher, rather than lower, formality.

Table 7. Summary: Certain Strategies Require Certain Message Attributes (Proposition 5) and Certain Message Attributes Induce Certain Strategies (Proposition 6)

Specific proposition	Message	Strategy	
<i>Strategy → Message</i> <i>Primary</i>	5A	Small distribution	Affectivity
	5B	Highly organized message	Contextualization
	5C	Highly organized message	Control by planning
	5D	Low formality	Affectivity
	5E	High formality	Control
	5F	Low formality	Contextualization
<i>Message → Strategy</i> <i>Secondary</i>	6A	Long messages	Increase attention focusing
	6B	Low message organization + high interactivity	Increase control by testing and adjusting

Inputs to the Communication Process

Attributes of Task, Sender-Receiver Distance, and Values and Norms

Research into communication shows that the communication process is affected by a host of inputs (e.g., Carlson and Davis 1998; Ehrlich 1987; Fulk et al. 1991; Markus et al. 1992), although exactly how it is affected is not always clear. This section attempts to examine these effects on the communication process elements identified above, namely goals, strategies, media, and messages. As noted earlier, the formulation of the communication context developed in the theory of communicative action (see the lifeworld in Figure 2) must be adapted to the organizational setting so that its effects on behavior can be analyzed. To do so, we have adopted three common classes of inputs to communication: (1) task, (2) sender and receiver characteristics, and (3) values and norms (c.f., McGrath 1984). It is obvious that all three inputs can affect communication. Communication goals are shaped by tasks, as well as by the relative situation between the communicators, be it physical (in space and

time) or psychological and social. In addition, the values and norms of communicators dictate certain communication patterns. In the introductory example (Table 1), there is a physical-time difference between the shift workers communicating through the diary, which makes the message necessary in the first place. The happy birthday greeting is welcomed under an organizational norm of congratulating colleagues on their birthday, but in a more conservative organization, it might be considered as a breach of privacy.

In this section, we first select the attributes of these three inputs (shown in Table 8) and then use them to review recent literature. The review is necessarily restricted to these elements. Furthermore, after the review of each input, several propositions are constructed that link the input to the process elements. Of the many possible propositions, we concentrated on links that could be developed using the admissibility and profitability choice mechanisms and the notion of communication complexity. The propositions thus refer to a yet smaller subset of inputs and process elements (e.g., values but not norms), albeit one that is sufficient to demonstrate the mechanism by which the inputs affect the process.

Table 8. Glossary of Input Attributes

Element Attribute	Definition
<i>Task</i>	
Analyzability	The ability to define procedures needed to complete the task.
Variety	The variation among different instances of the task.
Temporality	The time related demands to complete the task.
<i>Sender-receiver distance</i>	
Cognitive distance	The gap between the sender's and receiver's interpretations before transmitting the message.
Affective distance	The emotional gap between the sender and the receiver before transmitting the message.
<i>Values</i>	
Interdependence	A tendency to think and act as a person independent of others or as a person inter-dependent on others.

Task

In the information processing view of organizations, tasks are usually classified according to two fundamental dimensions: task analyzability and task variety (Daft and Lengel [1986], but see Dennis and Kinney [1998], who consider only the former). *Task analyzability* characterizes the ability to define the procedure (algorithm) needed to complete the task. *Task variety* describes the variation among different instances of the task. A third dimension that has become prominent is task temporality, which includes the time during which the task must be completed as well as how temporal patterns affect the task demands.

The operational definitions of analyzability and variety can be adopted from the media richness theory. Task variety is the frequency of unexpected or novel events encountered in a task instance. Meanwhile, task analyzability belongs to a person's knowledge of the exact procedures for accomplishing the task. Both elements have been measured by questionnaires (Daft and Macintosh 1981), expert judgements (Daft et al. 1987), and coded interviews (Donabedian et al. 1998). Time to complete can be measured by the number of temporal units (e.g., minutes or weeks), and temporal patterns have been linked to stages of a decision task (Saunders and Jones 1990).

Sender-Receiver Distance

Communication is shaped by senders and receivers and is, therefore, likely to be affected by their individual styles of method or information processing. For example, individuals who are able to cope with high cognitive complexity plan more complex communication (Waldron and Applegate 1994) and those who are more independent seek and provide more information (Oetzel 1998). It may be even more important, however, to discern the relative characteristics that create a distance between sender and receiver. While individual characteristics introduce variations in the process that may sometimes be ignored when analyzing of communication, distance must be overcome, one way or another, to enable communication to take place. The term distance usually connotes physical distance and, indeed, numerous studies have looked at the effect of physical distance on communication in general and on computer-mediated communication in particular. Equally important, though, is psychological distance, which may exist regardless of the physical distance.

In order to capitalize on the model developed above, the sources of psychological distance are abstracted from the organizational context and

framed as primarily cognitive or affective. A sender-receiver cognitive distance may be defined as the initial gap between the sender's and receiver's interpretations before transmitting the message (Hutchins 1991). This may result from differences in current information or from different ways of thinking and communicating. Such differences arise from different work functions, different nationalities, different organizational cultures, differences in languages, etc.

A sender-receiver *affective distance*, meanwhile, is the initial emotional gap (negative relationship) between sender and receiver before transmitting the message. It involves feelings and attitudes between two parties. Strangers to each other form an affective distance on instinct or stereotypical impressions, for instance. Communicators with a history of interaction form an affective distance on the basis of the relationship that results from previous communications.

Values and Norms

Values and norms define the outer (or highest) layer of the communication context (Figure 2) and are probably the hardest to relate systematically to the communication process. A complete discussion of the effects of values and norms on communication lies beyond the scope of this paper, but we need to demonstrate their importance and to consider how they affect the process in order to explain the underlying mechanisms of the model. We, therefore, make some simplifications and compromises. A striking example of the effect of norms on communication is described in the Colruyt case study (Janson et al. 1999). Colruyt (a chain of stores) has developed an organizational culture that emphasizes maximum worker participation, so that individual limitations might be overcome. Thinking collectively had been pre-ordained by the CEO, and so workers had to adopt a strategy of controlling communication to ensure that workers understood each other. Perhaps the most vivid example reported concerns a new employee who became embroiled in an emotional exchange of e-mails with her coworkers. A senior manager who witnessed this responded on the e-mail system to all involved

(with copies to other managers) that "one should refrain from flaming—'getting emotional on the system.' He further specified that the correct way of handling issues is to make a personal appointment to discuss the matter" (Janson et al. 1999, p. 191). Thus norms clearly affect goal priorities and dictate appropriate communication strategies and media. However, this example also points at the difficulty of abstracting such effects to links between process elements and general attributes (leading to operational definitions) of values and norms.

The first simplification we make (following the framework adapted from Habermas in Figure 2) is that values are associated with culture, while norms are associated with organizational rules of conduct (formal and informal). Organizational norms of communication and culture have been seen in past research to dictate decisions on message and medium that transcend task attributes (Fulk and Boyd 1991; Fulk et al. 1990), and we extend these decisions to include the change of goal priorities and selection of strategies. We demonstrate these effects with one dimension of culture, independence-interdependence, which is closely related to individualism-collectivism.

Individualism-collectivism is a major dimension for explaining similarities and differences in communication behavior (Gudykunst 1998; Gudykunst and Matsumoto 1996). Furthermore, it is probably the one most used in research on CMC (Rice et al. 1998; Tan et al. 1998a). In broader terms, national culture is a set of unique values that guides the behavior of people belonging to that culture (Triandis 1995). Dimensions of national culture such as individualism-collectivism are likely to be widely applicable, due to the growing interest in international communication and the growing importance of intercultural communication in multinational organizations. We hasten to add, however, that this and other dimensions have been criticized for their weak theoretical basis. In building the theoretical development, therefore, we follow others in combining individualism-collectivism with theories of cultural psychology (e.g.,

Gelfand and Christakopoulou 1999). This explains the use of independence-interdependence.

A fundamental difference between Western (labeled individualistic or independent) and Eastern (labeled collectivistic or interdependent) cultures is the different values these cultures place on being separated from or connected to others. These different values produce two distinct ways of seeing oneself: one independent (characteristic of Western cultures) and the other interdependent (characteristic of Eastern cultures). These ways of seeing oneself reflect the focus of individuality in the respective cultures. Moreover, they produce different goal priorities and different cognitive and affective behaviors (Markus and Kitayama 1991; Trompenaars 1998). We build on this basic difference in individuality in order to analyze how individuals belonging to an individualistic versus a collectivistic culture differ in their communication processes.

In individualistic (independent) cultures, individuals direct their thinking toward their inner world and what makes it different to others. As a result, these individuals are more likely to seek information about themselves than about the group they belong to (Markus and Kitayama 1991). By contrast, in collectivistic (interdependent) cultures, individuals see themselves as part of a social relationship in which one's own thinking and feeling are interdependent with regard to those of others in the group. As a result, these individuals seek information about others in the group as well as themselves (Markus and Kitayama 1991).

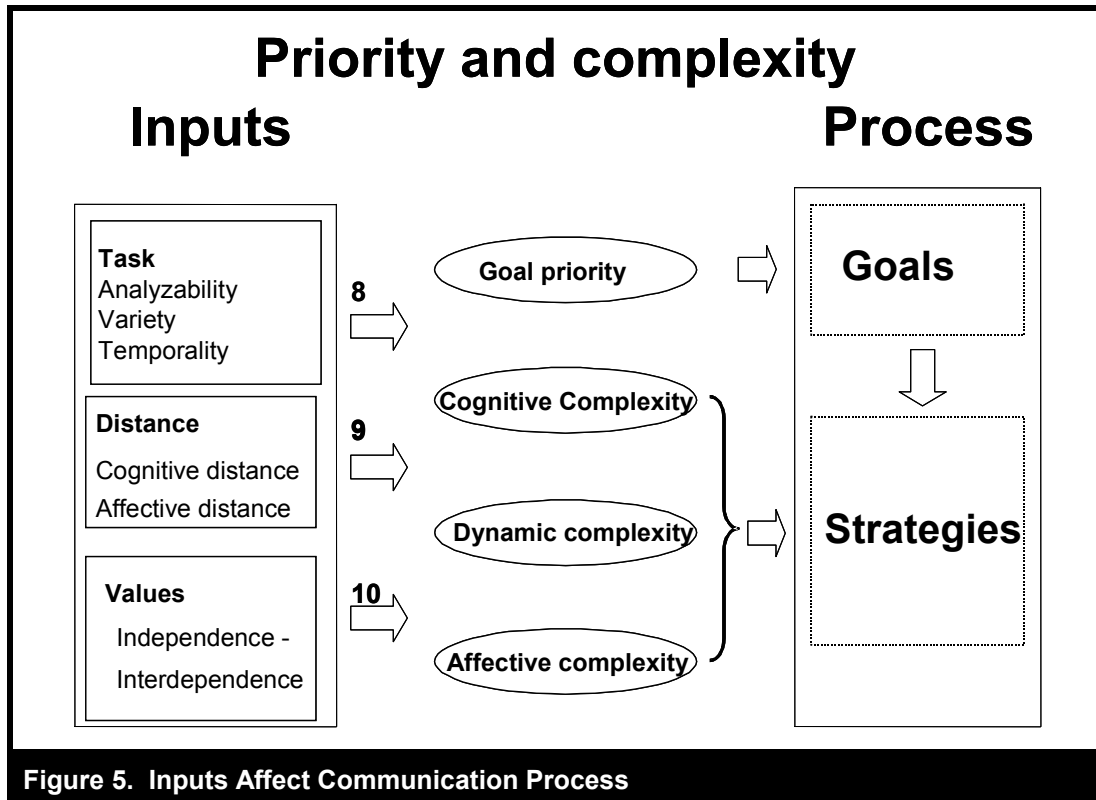
Independence describes cultures in which individual goals are dominant and ties between individuals are weak (except, of course, the immediate family unit). *Interdependence* describes those cultures in which people tend to function as strong groups and maintain such ties for very long periods (Hofstede 1991). Interdependence is closely associated with low-context communication and collectivism with high-context communication (Gudykunst and Ting-Toomey 1988; Hall 1976). In high-context communication, less of the information communicated is in "the coded,

explicit, transmitted part of the message" (Hall 1976, p. 79). Low-context communication, in contrast, is explicit and usually direct, precise, and consistent with one's feelings.

A General Explanation of How Inputs Affect Process

This section provides a general rationale for predicting the effects of inputs on the process, as outlined in Figure 5. Two routes are shown by arrows going from the input box to the process box through two types of explanations: goal priority and complexity (shown in ellipses). The lower route of complexity involves the admissibility and profitability mechanism for choosing communication strategies shown in Figure 3. Like other applications of the cost-effectiveness approach to human-information processing, the cost side of the equation has dominated the explanations of the choice of media (Reinsch and Beswick 1990). For example, workers who experienced difficulties using e-mail for communication used it less than those who communicated flawlessly (Lantz 1998). Nevertheless, inputs may affect both the relative costs (e.g., time and effort) and the benefits (e.g., the probability of communication failures), thereby affecting the communication process. In the upper route of goal priority, inputs affect the process by setting or changing the sender's goal priorities, e.g., making it more important for the person to engage in communication for managing relationships. While the discussion of the communication process (presented earlier) assumes the goals to be given, the discussion of inputs should consider the possibility of changes in the sender's goal priorities. Furthermore, such changes may be reflected in corresponding changes in the relative frequencies in which the goals are adopted.

In reality, the communication process may be affected simultaneously by several inputs. Indeed, a recent study by Kraut et al. (1998) demonstrates the multiple effects of communication inputs in a single case. Their study revealed that the adoption of a new communication medium was influenced by a change in the benefits of media as more col-



leagues began to use CMC but also directly by making CMC an acceptable norm of communication. Furthermore, in addition to the two routes in which inputs affect the process (shown in Figure 5), inputs may also determine the feasibility of certain media, e.g., a physical distance precludes an immediate face-to-face meeting.

Task Attributes Affect the Communication Process

Review

Table 9 provides an outline of recent studies that link task attributes to communication. Task has been a primary interest of group work in general (McGrath 1984) and of computer supported group work in particular (DeSanctis and Gallupe 1987; Zigurs and Buckland 1998). Most of the studies reviewed measure performance according to various combinations of task and communication medium, where performance includes quality of

decision output (or group products) and quality of communication such as accuracy and convergence (Smith and Vanecek 1990). Table 9 is limited to recent studies that clearly link the task to the quality of communication. More general reviews of communication media, task, and group performance can be found in Hwang (1998) and Straus and McGrath (1994).

The review suggests the importance of considering task requirements in terms of interdependencies between workers. The higher the interdependency, the higher the cognitive complexity, and the more intensive the need for managing collective action becomes. Higher interdependency is assumed in judgmental tasks, which usually imply more intensive influencing.

The review also shows an understandable concern with regard to the effect of task on action-related impact but no concern with relationship. This has the danger of misrepresenting the full effect of task attributes, for example, by discounting the effects of analyzability on communi-

Table 9. Recent Studies of Task and Communication Quality

Situational Attributes	Use and Action-Oriented Impact	Relationship-Oriented Impact
Task analyzability	Immediate feedback and multiple cues improve understanding particularly for equivocal tasks (Dennis and Kinney 1998; Straus and McGrath 1994) but also asynchronous communication improves idea exchange in less equivocal tasks (Shirani et al. 1999). CMC improves communication only for low interdependence tasks (meta-analysis by Hwang 1998; Daly 1993; El-Shinnawy and Vinze 1998). Group support systems with FtF outperformed those without, only for highly equivocal tasks (Tan et al. 1999a) and reduced differentials (Tan et al. 1999b). Richer media are preferred overall but not as a function of analyzability (D'Ambra et al. 1998). Video conference chosen for routine tasks (Webster 1998).	None found.
Task variety	Variety requires more information (Daft and Macintosh 1981). Use of inter-organizational e-mail grows with uncertainty (Kettinger and Grover 1997).	None found.
Task temporality	Communication under time pressure is faulty: none found. Use of phone relative to e-mail increase with urgency (Wijayanayake and Higa 1999). Communication patterns change over time vis-a-vis the task (Jones et al. 1994), and these temporal effects interact with the type of medium (Saunders and Miranda 1998) and with communication genre (Orlikowski and Yates 1994). The perceived appropriateness of media grows with experience (King and Xia 1997).	Relational communication is unsuccessful in short time (Walther 1995).

cation problems, which in turn may damage relationship (Berger 1998). The uncertainty reduction theory (Berger and Calabrese 1975), which was developed independently of task variety and analyzability, may provide the link. This theory predicts that the higher uncertainty about actions and attitudes of communicators increases information seeking, which will eventually decrease uncertainty and, consequentially, strengthen relationships (this is revisited below in the discussion of sender-receiver distance). However, to use uncertainty reduction theory for establishing the link between task variety and relationship, the theory will have to incorporate task variety (Berger and Gudykunst 1991).

Propositions

We analyze the effects of task on communication by looking at the effects on goal priority and complexity (Figure 5). The task perspective of organizational communication regards the information communicated as a response to uncertainty. Uncertainty is defined as "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization" (Galbraith 1977, p. 36). Thus the task-related need for information is a function of both the task (variety and analyzability) and the goal (performance aspirations).

The straightforward effect of variety on communication is to increase the priority of requesting

information (which was defined as a special case of "instructing action" goal) because more information is needed to describe higher variation among instances. This is consistent with media richness theory, which claims that high task variety requires larger amounts of information (Daft and Lengel 1986).

Proposition 8A: Higher task variety increases the frequency of requesting information.

The effects on strategies is explained through the profitability test in which complexity is the primary cost and accurate goal achievement is the effectiveness (Beach and Mitchell 1987). Low task analyzability increases the probability of misunderstanding how to proceed with action (Daft and Lengel 1984). This increases the cognitive complexity of the communication because of the ambiguity and multiplicity of meanings, which in turn increases the benefits of contextualization (Boland et al. 1994; Gumperz 1982). This too is in line with media richness theory, which claims that lower task analyzability requires richer information (Daft and Lengel 1986).

Proposition 8B: Lower task analyzability increases the use of contextualization.

Of all temporal attributes, we concentrate on the one most directly associated with the model, namely, the time available to complete the task. The relationship between time-to-complete and communication complexity is curve-linear: communication in either very short or very long time spans is more difficult than in intermediate time spans. Under time pressure, communication will be stressful as cognitive demands exceed cognitive resources and feedback (which further consumes cognitive resources) may be infeasible or unclear due to time constraints and, therefore, dynamic complexity will be high.

On the other hand, when tasks stretch over long periods of time, communication is often out of context and out of control. To the receiver, a message relating to historical events will usually be out of context, making it difficult to comprehend unless effort is made to get back into the problem.

In fact, people are reluctant to invest this setup cost, often avoiding communication or misunderstanding. Further, communication over long periods of time may spiral out of control unless effort is made to manage the communication over time, and individuals remember when to initiate communication, remember to respond, and detect problems in communication where feedback is often irregular and delayed. Saunders and Jones (1990) propose a model of information acquisition in decision tasks in which communication patterns change during the life cycle of the task. For example, communication about the task may be intense at some initial stage, stop for a while, and then resume sporadically, and not be sufficiently salient to regain the communicator's attention. These changes of patterns are difficult to control. Thus, in extremely long time spans, both cognitive complexity and dynamic complexity are high. Typical examples are organizational procedures, which require a careful planning of the message and what mistakes may arise as a result of time changes (similar to temporal distances between communicators discussed below). Furthermore, as control by planning is associated with higher message organization, this would also explain the typically high organization of procedures.

Proposition 8C: A short time-to-complete the task increases the use of control by testing and adjusting.

Proposition 8D: A very long time-to-complete the task increases the use of control by planning.

Future work can develop more complex propositions about the interaction between task analyzability and communication goals. When the goal of communication is to influence or to manage interdependent action for tasks of low analyzability, the result is high cognitive and dynamic complexity (see the earlier section on assumed principles of behavior). Thus the interaction of the two sources of complexity produces higher complexity and, as a result, a higher chance of misunderstanding. This will result in a more intense use of communication strategies to cope with the complexity and thereby place additional demands on medium and message form. For example,

tasks that involve value judgements in collective action will require negotiations and influencing, which in turn will require high channel capacity, interactivity, and often adaptiveness (Straus and McGrath 1994). Higher interdependence will usually lead to a higher need for managing relationships and a higher use of perspective taking and affectivity strategies. These too require high channel capacity. The accumulated demands on the use of strategies will require very rich communication media such as face-to-face. This explains the role of task interdependence in the results of Table 9.

Sender-Receiver Distance Affects the Communication Process

Review

Table 10 reviews recent studies on the effects of sender-receiver distance, classifying the studies into physical and psychological distance. In the organizational setting, psychological distance is also divided into organizational and cultural distance. From the table, it can be seen that, overall, sender-receiver distance is a determining factor in the communication process, but most of the studies (especially those looking at psychological distance originating from intercultural differences) have concentrated on task oriented impact.

One of the more powerful methods of studying sender-receiver effects is to analyze patterns of communication in organizations. Surprisingly, this type of research has declined dramatically since the 1970s (see O'Reilly et al. 1987) and has not revived despite significant changes in power structures within modern organizations.

Propositions

The distance between sender and receiver changes both goal priorities and considerations of compatibility and profitability (Figure 5). The effects of physical distance are, on the one hand, extremely dependent on the advances in technology, and on the other hand, largely dependent on human physiology, which is beyond our model. We, therefore, concentrate on the cognitive and affective distances. From a cognitive perspective,

greater differences or distances between sender-receiver worldviews, values, languages, and other common factors pertinent to information processing will increase cognitive complexity of the communication and lower the plausibility of mutual understanding. A greater cognitive distance may also be associated with higher uncertainty about what the receiver knows and, therefore, higher cognitive complexity (Kraut and Higgins 1984). Indeed, uncertainty reduction theory (Berger and Calabrese 1975; Berger and Gudykunst 1991) predicts that uncertainty about the receiver will induce more information seeking. When communication diverges from mutual understanding, a shared context needs to be created (Goffman 1981; Krauss and Fussell 1991a). In contrast, communication between established work groups can be less explicit without hindering mutual understanding (Bernstein 1964). For example, distances generated by intercultural differences have been shown to depend on the level of intersection between the phenomenal fields of the sender and receiver (Haworth and Savage 1989). Furthermore, different backgrounds with different worldviews and experiences will stimulate a more intense exchange of ideas and perspectives (Cox and Blake 1991; Markus 1990). Hence, a higher priority on goals of seeking information.

Proposition 9A: Greater cognitive distance increases the use of contextualization.

Proposition 9B: Greater cognitive distance increases the frequency of requesting information.

Parallel to the effect of cognitive distance on cognitive complexity, a greater affective distance may increase affective complexity by increasing the sender's anxiety over the receiver's reactions (Stephan and Stephan 1985). Such anxiety will usually result in cognitive biases such as selective information processing. Affective distance may also imply a lack of trust between communicators (recall that subsequent trust following the communication is part of impact). Low trust reduces the likelihood of information exchange (Williamson 1975). This finding demonstrates how common practices may be ineffective and create a "Catch 22" situation: cognitive distance coupled with low trust will reduce the likelihood of information exchange where it is most needed in order to build

Table 10. Recent Studies on the Effects of Sender-Receiver Distance

Sender-Receiver Distance	Use and Task-Oriented Impact	Relationship-Oriented Impact
<p>Sender-receiver physical distance: Space</p> <p>Time</p>	<p>Distance reduces amount of communication but moderated by CMC availability (Sarbaugh-Thompson and Feldman 1998; Sproull and Kiesler 1991). However, distance has no effect (Valacich et al. 1993). Distance is one of three major determinants of media choice (Caldwell et al. 1995).</p> <p>Distance affects media choice (Reinsch and Beswick 1990; Webster and Trevino 1995).</p> <p>CMC is particularly useful to communicate between shift workers (Huff et al. 1989).</p> <p>Temporal unavailability leads to less interactive media to promote task closure (Straub and Karahanna 1998).</p>	<p>Distance reduces non-task related communication (Sarbaugh-Thompson and Feldman 1998).</p> <p>CMC reduces impact of distance on building relationships (reviewed in McKenna and Bargh 2000).</p>
<p>Sender-receiver psychological distance: organizational</p>	<p>Direction of communication affects media choice (Zmud et al. 1990).</p> <p>Richest exchange of information is between supervisor and subordinates (Allen and Griffeth 1997). Rich media was believed to improve comprehension when seeking information from outside the organization (Lee and Heath 1999).</p> <p>Conflicting results on preference for e-mail vs. phone as a function of distance (Wijayanayake and Higa 1999). E-mail is preferred when effective distance is high (Markus 1994b). Less shared information leads to higher rate of relevant information (Hightower and Sayeed 1995; Stasser and Titus 1987).[†]</p>	<p>An awareness of sender-receiver relations is essential for successful relationships (Gabarro 1990). Shared knowledge mediates effect of mutual trust on performance (Nelson and Coopridge 1996).</p>
<p>Sender-receiver psychological distance: intercultural</p>	<p>Incompatible cultural patterns of sharing information lead to less effective communication (Brett and Okumura 1998; Ohbuchi and Takahashi 1994). No support for effect of intercultural distance on frequency of information seeking (reviewed in Berger and Gudykunst 1991).</p>	<p>None found.</p>

[†]Older but unchallenged observation: direction of communication affects amount of information transmitted (O'Reilly and Roberts 1974).

trust. Indeed, mis-communication will be higher when inter-cultural distance is greater, because of different languages, different patterns of using language, different values and beliefs, and different attitudes to communication (Larkey 1996).

Cross-cultural communication, which is characterized by a combination of cognitive and affective distances, is often problematic. Moreover, different reactions to misunderstandings may intensify the impact of those misunderstanding, creating not only dissatisfaction but outright hostility, which impedes communication even further (Pettigrew and Martin 1989). However, there is a need to test empirically the effect of affective distance on the frequency of information seeking (Kellermann and Reynolds 1990).

Proposition 9C: Greater affective distance reduces the frequency of requesting information.

Communication Values and Norms Affect the Communication Process

Review

The review of recent studies on norms and values is organized by organizational and national (usually cross-cultural) studies (Table 11). The studies of organizational effects on CMC have focused on differences in the adoption of the media. We could not find a similar concern with goal priorities and the message form and content, but this may reflect an inadequate search. By comparison, the studies of national characterizations are more varied. On the one hand, there is evidence of diversity in the way different cultures prioritize communication goals and choose media and message. On the other hand, it would seem that CMC can moderate the cultural differences (Suzuki 1997; Tan et al 1998b; Watson et al. 1994; but see Rice et al. 1998). Furthermore, in the cross-cultural studies, researchers have used more structured measures (questionnaires), which may make it easier to generalize across studies.

Propositions

As noted above, to keep the scope manageable, the propositions concern only one dimension of values: interdependence. Recall that compared with independent cultures, individuals in interdependent cultures are more likely to think and feel interdependently with regard to others in a group. Interdependence dictates, therefore, a difference between in-group behavior and out-group behavior that is less pronounced in individualistic cultures (Espinoza and Garaza 1985). Indeed, this difference would qualify certain patterns of communication found with collectivists to in-group behavior where the psychological distance (primarily affective distance) does not exceed some threshold. Interdependence further implies a higher frequency of relationship goals in communication and a higher rate of affectivity (Gudykunst and Ting-Toomey 1988; Trompenaars 1998). Finally, there is also some indication of lower formality in interdependence (Trompenaars 1998).

Proposition 10A: Individuals in interdependent cultures tend to engage in more frequent communication for managing relationships, provided the affective and cognitive distance does not exceed some threshold.

Moreover, individuals will usually exercise more perspective taking and exchange more informal and personal information between group members (Gudykunst et al. 1987). Interestingly, they tend to not disclose information outside the group but only within the group (Triandis 1989). Collectivists not only seek greater involvement, but also are more capable of doing so (Markus and Kitayama 1991). For example, collectivists (Greeks) proved to be better than individualists (Americans) at considering their counterparts' interests in a negotiation task (Gelfand and Christakopoulou 1999). However, the evidence is still inconclusive (Singelis and Brown 1995), and it is not clear whether this prediction should also be qualified by the psychological distance between partners.

Proposition 10B: Individuals in interdependent cultures tend to use more perspective taking.

Table 11. Recent Studies on the Effects of Communication Norms and Values

	Use and Task-Oriented Impact	Relational-Oriented Impact
Organizational norms	Social factors affect attitudes and use of CMC (Fulk 1993; Fulk and Boyd 1991; Fulk et al. 1990; Kraut et al. 1998). Organizational norms have a smaller effect on e-mail than other media (Kiesler 1986).	Coworkers with similar attitudes use CMC to create "ego networks" or relational communication networks (Fulk and Ryu 1990; Rice and Aydin 1991). Hacker's culture leads to a "flight" from relationship with people (Turkle 1984).
National culture	Japanese (collectivists) use explanations and information seeking more frequently than Americans (individualists) (Neuliep and Hazleton 1985). Culture moderates the impact of CMC (Watson et al. 1994). Individualism-collectivism did not moderate on preference and richness assessment of media (Rice et al. 1998). Japanese rate e-mail lower than FTF and fax, although fax was not considered more useful (Straub 1994). CMC moderated the impact of culture on rounds of information in a group decision (Tan et al. 1998b).	Different cultures build relationships and trust in different ways (Doney et al. 1998). Different cultures agree on some bodily expressions of emotions but often disagree on expression intensity and differ in the use of emotional communication strategies such as control (review by Matsumoto et al. 1989). Individualism-collectivism (American-Japanese) moderates the effect of social identification on relational communication (Suzuki 1997). Relation-oriented cultures prefer e-mail over fax (Rowe and Struck 1999).

Table 12 summarizes propositions 8, 9, and 10, which refer to the effect of individual inputs. The combined effects of inputs are beyond our scope, but, clearly, they occur and must be researched. Moreover, combinations such as high time pressure and great psychological distance may produce critical communication complexity that will fail without appropriate support.

Implications and Conclusion ■

Thus far, we have proposed a model of organizational communication, reviewed recent publications from several distinct fields of research, and demonstrated how the model can be used to generate propositions (see Figure 1). Our review suggests that information systems research has

concentrated primarily on communication inputs and impact. The proposed model, on the other hand, opens up the black box of the communication process by seeking to define those choice mechanisms relating to cognitive and affective goal-based strategies, media, and messages. The view presented is one in which action-oriented impact is complemented with relationship-oriented impact. Hence, the paper's main contribution is in organizing diverse research into a coherent framework. This enables us to generate a novel understanding of goals and strategies, message forms and media, and multi-purpose communication. The argument here is that this framework is a more realistic and more informative view of communication. In consequence, this section takes this view one step further by exploring the implications of the model on future research and practice.

Table 12. Summary: Propositions 8, 9, and 10—Task, Sender-Receiver Distance, and Communication Norms Affect the Goal Preference and Strategy Selection

Specific Proposition	Input	Component of Process Affected
<i>Task</i>	8A	Higher task variety
	8B	Lower task analyzability
	8C	Short time to complete task
	8D	Very long time to complete task
<i>Distance</i>	9A	Greater cognitive distance
	9B	Greater cognitive distance
	9C	Greater affective distance
<i>Values</i>	10A	Greater interdependence
	10B	Greater interdependence

Implications for Research

The proposed model brings one closer to theory-based empirical research, which is urgently needed (Steinfeld and Fulk 1990). The primary focus on the communication process, which governs this paper, means that it has been necessary to limit the scope of the model, and the propositions are, therefore, restricted to a subset of potential elements and relationships. The most obvious implication for future research is to enable the generation of hypotheses from the propositions developed above. The operational definitions proposed here, or dealt with in the cited research, suggest that such empirical work is feasible. Indeed, preliminary field work suggests that the elements of the communication process (e.g., attributes of the message) can be measured satisfactorily (Te'eni et al. forthcoming). Two other implications are developed around (1) refining the model and (2) exploring new perspectives.

Refining the Model

The Dynamic Impact of Communication on the Communication Inputs

The broken arrow in Figure 1 signifies a dynamic process, in which the impact of communication

feeds back over time into the situational context to affect the sender-receiver distance. It may also affect the task through growing experience and, over even longer periods of time, the norms and values. The feedback relationship reveals the full complexity of communication when it is treated dynamically, but it should also be noted that it necessarily implies an elevation of our discussion at the level of a message to the level of an individual (the sender). We accept here that communication creates a shared meaning by building a social context (Sproull and Kiesler 1992) and a cognitive context (Kintsch 1988). Indeed, as users gain experience, they will place increasing value on the impact of communication (King and Xia 1997). We can further assume that the knowledge learned from the integration of multiple messages resides in an individual's memory, so that we can briefly sketch future directions of research on these impacts of communication and, in the next section, discuss some practical implications.

Several research directions can be pursued to explore this feedback loop. One is the intermediate effect of mutual understanding and relationship with regard to cognitive complexity (Kraut and Higgins 1984) and affective complexity (Gudykunst and Shapiro 1996; Stephan and Stephan 1985). Perceptions of mutual trust and

mutual understanding grow with communication, provided that the parties of the communication process perceive it to be successful, but this takes time (Walther 1995). A second direction is the interaction of such an impact with the medium. The Internet seems to have reduced perceptions of communication complexity and, consequently, the sender-receiver distance (McKenna and Bargh 2000). Although computer-mediated communication has been shown to increase trust, it is sometimes short lived (Jarvenpaa and Leidner 1999). As we discuss in the next section, information technology can go further to establish and maintain a shared understanding, thereby reducing the cognitive distance. A third direction uses structuration theory to analyze the impact of communication technology on norms (Orlikowski 1992) and the effects over time on genres of communication (Orlikowski and Yates 1994; Yates et al. 1999; but see critic in Banks and Riley 1993).

Refining Elements and Attributes: Goals, Strategies, Message

Our review suggests important areas for further theoretical development. Flores (1998) has already stated that we know more about task related aspects of communication (action) than about commitment in communication (relationship). We should, therefore, begin by refining the goal of managing relationships so as to distinguish, for example, between building, maintaining, severing, and controlling relationships (Rogers and Farace 1975). Similarly, new affective strategies may be articulated such as a strategy of affective control (as opposed to the predominantly cognitive control we have discussed above). Research has shown, for example, that control over social interactions is relaxed in CMC (Siegal et al. 1986).

An important area of research is the interaction between task-related goals and relational goals and between affective and cognitive strategies. For example, Goffman (1981) describes the involvement-independence strategy, in which the goal of maintaining "face" incorporates a tendency to consider one's partner's thoughts and feelings to a greater extent (involvement) or lesser extent (independence). It has been defined as "the

negotiated public image, mutually granted each other" (Scollon and Scollon 1995, p. 35). As such, it may have special relevance to new forms of communication in the World Wide Web (Flores 1998). We should note, however, that this goes beyond our model to include what Habermas has referred to as the dramaturgical model of action, which may have different validity criteria. Another example of an affective-cognitive strategy is that of ambiguity in messages, which serves to promote the goal of influencing (Eisenberg 1984) but may also be effective in maintaining face.

The summary of recent work on the effects of media shows that it is necessary to study the impact of interactivity on relationship and the impact of adaptiveness on both relationship and understanding (see Table 5). Moreover, there is clear need for more empirical research on message form. Meanwhile, in the review of task attributes, there are no studies of task effects on relationship (see Table 9). This is an area of potential research that is of particular significance to virtual organizations, which on the one hand will have to cope with decreasing levels of analyzability and, on the other hand, may depend on CMC to form relationships. Such organizations are likely to experience difficulties in communication unless steps are taken to cope with communication complexity. The situation of overload within organizations, a corollary of task variety, amount of information, and media that promotes distribution, is another research area of growing importance. Rudy (1996) has summarized and discussed future directions for research on overload and, more recently, so have Schultze and Vandenbosch (1998).

More research is also needed on the effects of sender-receiver distance. As has been noted above, the analysis of communication flows between people in organizations has declined dramatically. In light of the potential effects of sender-receiver distance on communication, such analyses would seem to be fundamental to any study of interpersonal communication. It may be true to suggest that the emerging forms of organizations, in particular virtual and multinational firms, will trigger a new interest in this area of communication (Quinn 1992). Similarly, little research into individual styles in CMC has

been found. This absence may be connected with the widespread decrease in research into individual differences in information systems during the 1980s, after a long stream of research (Huber 1983). Nevertheless, cognitive styles that dictate communication determine, by definition, different preferences and capabilities for different communication strategies. This whole area seems an untapped avenue for future research that may, after all, lead to individually tailored systems. The generation of such systems may be especially relevant to the new virtual organization in which the bulk of the communication cannot rely on face-to-face communication.¹⁶

Exploring Other Perspectives: Receiver, Privacy and Others

Several other important issues have been omitted from the model to keep its complexity manageable. Perhaps the most immediate need is to add the receiver's perspective (c.f. Contractor and Eisenberg 1990; Rudy 1996). Communication strategies have been described from the sender's perspective, since they have been formulated as means for achieving goals determined by the sender. Yet the active receiver becomes a sender herself the moment she responds, and following this, the same strategies are employed. Moreover, the same strategies can be applied in a similar fashion to the process of receiving information (this assumes that the sender and receiver share the same communication goals). For example, the receiver can also use the attention-focusing and control strategies to improve understanding. Nevertheless, it is necessary to articulate new communication strategies for receiving information

designed to achieve goals determined by the receiver and it is necessary to examine the same strategy from the receiver's viewpoint, e.g., how does the receiver choose to respond to a request for information.

A related perspective is that of privacy, which is concerned with the right of individuals to determine when, how, and to what extent information is transmitted. Every act of communication discloses something of the communicator and often this is regarded as a risky act (Goffman 1981). The research directions recommended above (particularly relational goals and affective control) will demand a better understanding of privacy. Furthermore, CMC intensifies disclosure by making recorded information accessible, and not always in an obvious way. At a message level, privacy links directly to the medium and through it to organizational memory (a topic discussed below). The sender's perception of the communication's confidentiality depends on media attributes (Sillince 1997). It will be important to investigate how perceptions of confidentiality affect communication behavior, and to link them back to attributes of the media. For example, when do people compromise and choose media of low confidentiality? Can privacy dictate low channel capacity? The privacy perspective will be likely to become a crucial aspect in understanding organizational communication, particularly as the boundaries between the workplace and home (Venkatesh and Vitalari 1992) and between the organization and its suppliers and customers continue to blur. Privacy may be an important factor in generalizing our model across these boundaries.

Once these aspects of receiver and privacy are clarified, it will be possible to analyze more effectively other important issues of communication and to integrate them with the elements we have discussed here. Recent examples include topics such as suites of communication technologies (Ocker et al. 1998), network size (Valacich et al. 1991), message content (Sussman and Sproull 1999), gender (Gefen and Straub 1997), and awareness (McDaniel and Brinck 1997).

¹⁶The ideas of communication complexity are a natural entry point for studying the effect of cognitive styles such as cognitive complexity (see Kelly 1955; Schroder et al. 1967). A review of such a broad area lies beyond the scope of this paper, but one example demonstrates the direction of further research. Mischel's (1973) conception of a self-regulatory system defines individual differences in the degree of control one imposes on information processing. This style is likely to predict the tendency to use the strategy of control. For other directions of research on individual differences in communication, see Greene and Lindsey (1989), O'Keeffe (1988) and Wilson (1989).

Implications for Designing Communication Support Systems

As has been suggested previously, communication in organizations is becoming increasingly complex, more intensive, and supported more frequently by information technology (Huber 1990). Systems that support communication will, in the future, have to deal with large communication networks, mobile communication, intercultural communication, ubiquitous multi-media communication, and continuous states of a heavy information load (or overload). Decomposing the communication process into sub-processes brings closer the possibility of developing more specific design guidelines for such systems. The emphasis here is on what functionality needs to be developed, rather than how to develop it, and specific technologies are presented only to demonstrate feasible directions. We must, however, stress the tentativeness of implications drawn from an untested theory, which is obviously a less desirable foundation for deriving design implications than one that has been tested. Yet it may be beneficial to trigger and guide experimentation with new functionality. Indeed, several influential articles have proposed a framework and derived from it prescriptions for designing and implementing information technologies for groups (DeSanctis and Gallupe 1987) and organizations (Huber 1990). Moreover, we cannot at this state of knowledge solve possible tradeoffs between effects that are addressed by individual propositions. This knowledge may come from observing people communicate with a variety of advanced technologies and consequently revising certain propositions.

The three factors of the proposed model (Figure 1) frame the discussion about functionality. One can conceive of information technology that (1) identifies the inputs (e.g., the initial distances between communicators), (2) supports the formulation of goals and the choice and implementation of communication strategies, medium, and message, and (3) provides the user with feedback on impact. Organizational memory is a key resource in supporting each of these types of functionality. Figure 6 can, therefore, be seen as a general framework for design that takes

off from the systems requirements specified in Figure 1. The discussion of design follows Figure 6.

Organizational Memory

Organizational communication and organizational memory should be tightly interrelated (Anand et al. 1998). Recent research on designing communication systems demonstrates this link: Annotate! is a knowledge dissemination system in which user appraisals of knowledge items affect the system's prioritization of answers to a query (Ginsburg and Kambil 1998), and AIMS is an agent that automatically prioritizes e-mail messages according to personal preferences mapped by organizational categories of messages (Motiwalla 1995). In this section, we wish to capitalize on a deeper understanding of context and of the communication model to flesh out new, perhaps speculative, directions on OM design, particularly the part of OM that is built on communication and learning.

Organizational memory (OM) is taken here to be a repository of the context of action. Cossette (1998) has distinguished between three types of context: situational, cognitive, and emotional. *Situational context* includes information about the communicators, the place of the interaction, and time of the interaction. The earlier discussion of the message and medium attributes suggests that these too are important aspects of the situational context, inasmuch as they affect the meaning of the information transmitted. *Cognitive context* includes the communicators' intentions and hopes of the receiver's ability to understand. *Emotional context* is the feelings which one communicator has toward another and about the issue communicated, and can be part of the affective information communicated (Schwarz 1990). These three types of context address, respectively, the dynamic, cognitive, and affective complexity. They could possibly be built into OM to cope with the three sources of complexity by supporting the relevant communication strategies (for a more technical examination of the roles of the different types of context, see Fairclough 1992; Halliday and Hasan 1989).

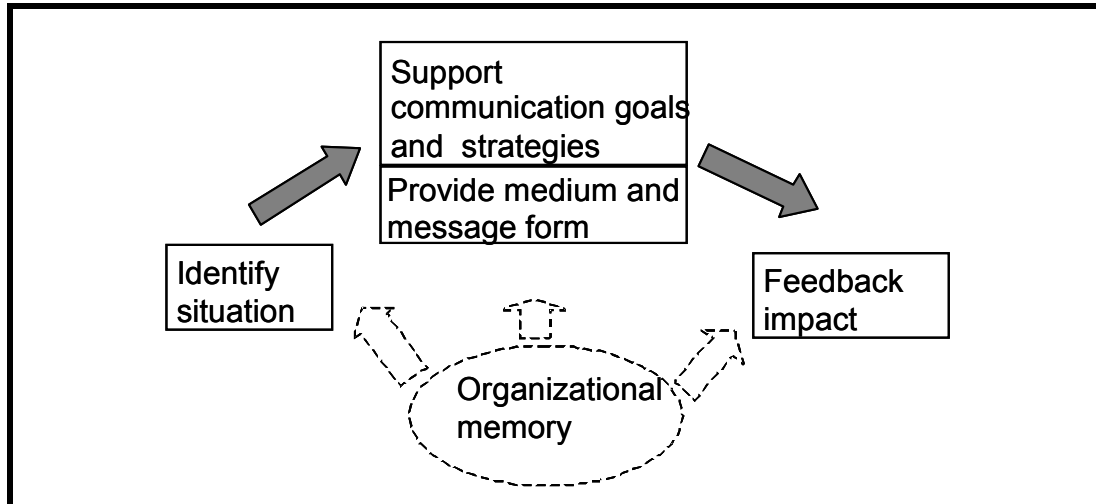


Figure 6. The Functionality of Computer Supported Communication Systems

The diary in Table 1 is not only a medium for dialog but also part of an OM. In other words, OM is not only used to support communication but, in fact, can build from it. An important challenge is to distill the different types of context from the original message, store it in OM, and use it to re-contextualize future communication (Schwartz and Te'eni 2000). Furthermore, following the discussion of formality, the OM would include information that is organized at different levels of formality. Over time, some messages will be gradually abstracted to become increasingly formal. As discussed above, it may be important to be able to trace back from the formal to the original message, when communication breaks down. The OM may, therefore, be constructed through stories (such as the one about Joey spilling tea), facts (such as product #8123 is incomplete), and more formal principles (such as no food in production). (For some initial directions on abstracting texts, see Crampes et al. 1998.)

Inputs

A key role of information technology is to create an awareness of the state of input. Physical distances in space and time are usually easier to display than psychological distances, which are

often less noticeable. The review of sender-receiver distance and the discussion of proposition 9 demonstrated how these distances are born and how they affect the communication process. Technology's role in creating awareness has, in the past, concentrated on the perceptual issues of communication. Clark's contribution theory of discourse (Clark and Brennan 1991) suggests that it is crucial to monitor the receiver's attention and understanding for effective communication, resulting in several attempts to design appropriate support such as *Portholes* (Dourish and Bly 1992), *ClearBoard* (Ishii et al. 1992), and *Peepholes* (Greenberg 1996). Similarly, it should be possible to display semantic distances between sender and receiver, for example those concerning difference in terminology. For instance, *kMail* (Schwartz and Te'eni 2000) uses previous knowledge to show whether or not the same terms are shared by sender and receiver, assuming that a visual display of differences enhances the awareness of their existence.

Organizational memory can play a major role in characterizing the workers involved in the communication and then characterizing the psychological distance between them (Anand et al. 1998). Simple examples are identifying communi-

Table 13. Computerized Support of Communication Strategies

Contextualization	Organizing and retrieving the context information, structuring the context information presented
Control	Provide feedback on the communication process by manipulating the media, displaying receiver's reactions, recording communication, monitoring progress
Attention Focusing	Formatting and structuring the information presented, remote control of information presented
Affectivity	Templates of appropriate affectivity and feedback on current message (e.g., language check)
Perspective taking	Presentation of receiver's views (e.g., cognitive maps or physical objects) to sender at the time of message preparation

cation between different national cultures, between different organizational cultures, or between users with different profiles. In these examples, an organizational memory is needed which is able to characterize the users and match them (e.g., *DIRE*, in French 1994). More complex examples of such a process may involve differences between people who have, in the past, ascribed different meanings to current terms. Furthermore, some errors in communication can be detected (or suspected) on the basis of the immediate or related context stored in the OM. A trivial example is that the mistake in Table 1 about product 1823 (should be 8123) could be corrected automatically from its context.

Communication Strategies and Goals

Our model identifies a list of communication strategies, all of which are candidates for computer support (see Table 13), but also identifies the conditions in which they should be activated in response to communication complexity inherent in the process (proposition 2) and induced by inputs (propositions 8, 9, and 10). Contextualization depends on information retrieval and, as a result, is likely to be the most promising direction for computer support. Nevertheless, this process poses two main problems: providing complete and relevant information and providing it only when needed. The first problem implies knowledge

structures that on the one hand enable effective retrieval and, on the other hand, enable effective presentation to the user as an accessible, multi-layered knowledge structure of context such as hypertext.

The second problem (timing) calls for mechanisms that detect the conditions under which contextualization is needed to avoid information overload. *Spider* (Boland et al. 1994) is designed to present context in a variety of forms so that it can lead more efficiently to better, richer communication. The system displays the different rationales behind an issue in the form of cognitive maps that highlight the similarities and differences in the communicators' perspectives. Thus, messages are richer in context but (more importantly) are displayed in a fashion that is manageable. Mao et al. (1996) show how contextualized access improves problem solving with *Hyper-Finalizer*. The very same idea can be used in person to person communication. Indeed, Kock (1998) looked at how expert systems technologies support contextualization in group-activities.

Control of communication can be enhanced by several techniques. One is to emulate the capacity built into face-to-face communication (which would be more effective than the secondary reaction predicted by propositions 4A and 4B). Effective eye contact, which helps maintain control by

informing the sender what message the receivers are sensing, can be emulated by advanced displays that create and update a picture of the spatial relationships between communicators during the session (Fussel and Benimoff 1995; Muhlbach et al. 1995). However, the quality of media, with respect to channel capacity, interactivity, and adaptiveness, has to be very high (Doherty-Sneddon et al. 1997; see a review of technical requirements by Patrick 1999). Another direction for supporting control (proposition 4A) is to organize simultaneous feedback during message production and manage it throughout the session (Herring 1999). For example, messages that include dynamically created hypertext links to the organizational memory should be shown to the sender before transmission (Schwartz and Te'eni 2000). The management of feedback throughout the session is particularly important when there are several participants and each one may have his or her own space on the screen and when there are several streams of conversation and each stream must be associated with its particular feedback. Herring suggests that two different views should be possible, one linear (reflecting the time dimension), and the other non-linear (reflecting topical progression).

A third direction is to support planned control (proposition 4B). CMC generally provides more control than other media with similar channel capacity because it can store information to allow non-simultaneity (Hesse et al. 1988). Control through planning cannot guarantee perfect implementation of the plan (e.g., directing the reader to look for the explanations in the paragraphs preceding the proposition, but the reader may not search and find the explanations). Nevertheless, interactive technology, unlike a printed message, can be designed to guide the reader when the situation arises.

Information technology supports attention focusing through formatting effects, multi-modal messages that include synchronized voice and motion, and pointing by remote control (e.g., *pcANYWHERE*). Video conferencing, too, has proven an effective technique to focus attention or at least to create an awareness of low attention (Daly-Jones et al. 1998). However, these techniques may not suffice to draw and retain attention as communi-

cation of higher complexity, from more sources, and on multiple media compete over the user's limited resources. One possible direction that may be taken is to develop technologies that provide more integrative solutions, using combinations of message and medium, to grab more attention from the user and allocate it efficiently.

Computer support for perspective taking can be achieved indirectly by presenting the receiver's perspective, thereby triggering the sender to use the strategy of perspective taking. Presenting your communication partner's cognitive map is one possibility (Boland et al. 1994). Designers and scholars often use whiteboards to create drafts of message and invite others to add their perspective by moving, erasing, and adding ideas around the board. *Flatland* is a computer-based whiteboard that groups ideas and presents them in different perspectives (Mynatt et al. 1999).

Computer support for affectivity is likely to be the more difficult to achieve, because much of our affective communication in organizational life is traditionally non-verbal, instinctive, and, often, intentionally non-documented. Using information technology to add social and emotional material to messages is directly tied to how well we manage to incorporate it in organizational memory as emotional context.

Proposition 2 (about the appropriateness of communication strategies shown in Figure 2) is yet to be tested, but if shown to hold true, the proposition can be used in designing systems that automatically recommend the use of communication strategies. If organizational memory is attributed with communicative characteristics that match those described in the model (e.g., *AnswerGarden* in Ackerman 1998), the system can use either stereotypic knowledge or individual knowledge to assess when strategies are more or less effective and recommend them accordingly. Moreover, when communication goals are determined, it may be possible to match strategies to goals. Some early work on *Coordinator* (Winograd and Flores 1986) shows it is possible to assign to each message its purpose but it burdens the sender too much. Advances in technologies that determine the user's communication goals could be used to match appropriate strategies, and

provide feedback to support control (see, for example, Ardissono and Sestero 1996). Indeed, *Collagen* models collaborative discourse on the basis of goals that are either voiced by the user or detected automatically by an intelligent agent (Rich and Sidner 1998).

Message and Medium

Propositions 3, 5, and 7 stipulate effective combinations of strategy, message, and medium, namely, compatible designs of medium and message. If shown to be correct, these combinations could also be incorporated in support systems. In the future, unified interfaces, providing a gateway to alternative media (e.g., computer, fax, phone, videoconference) and alternative forms of messages (templates, hypermedia structures) will probably be commonplace. The most direct implication of the corollary to proposition 2 (about shifts from control to contextualization) and of the discussion on the corresponding shifts in formality is the need to support an easy transition between levels of formality. We have already noted that the OM should preserve the progression of information items from low to high formality (e.g., stories, facts, and abstract principles). In addition, however, the support system should be designed to supply the right level at the right time. Furthermore, such systems should be media sensitive (Trevino et al. 1990). Intelligent systems can recommend effective choices, present default designs or point at poor choices by using the proposed model to identify effective combinations of medium and message for given goals and strategies. For example, Kennedy et al. (1998) use a model-based approach to generate compatible message formats.

Feedback on Impact

Ultimately, feedback on the impact of communication must come from the user's own reaction, but future systems may serve as effective providers of this feedback to the sender. The OM can be designed to include results of successes and failures of communication that are provided to the sender at the appropriate time. Little research has been carried out in this area, but as communication support systems become more common, the importance of informing senders of impact will grow. Some form of feed-forward may be possible,

e.g., a simulation of probable errors due to high cognitive distance. Clearly, there is still much to do in terms of developing ways of identifying and reporting on communication failures (see the discussion in the elements of communication impact section).

Conclusion

Globalization, competition, technological sophistication, and speed have increased the complexity of organizations. If, indeed, organizations thrive on communication, then clearly, communication should enable them to cope with such complexity. The information systems field can, and indeed must, play a role in enabling effective communication, but for this, such a field needs to inform the design of information technology on the basis of a realistic model. The proposed model has sought to draw a balance between relationship and action, cognition and affect, message and medium. As noted in the introduction, we believe that such a balanced view provides a more realistic view of organizational communication and avoids possible pitfalls in prescriptions, e.g., minimize communication by disregarding the need for building relationship. Underlying this approach is the realization that we are facing new forms of communication and new forms of organizations (Fulk and DeSanctis 1995).

It is important to invent new designs that are able to support new forms of communication, but it is essential that this should be done only on the basis of a better understanding of what needs to be accomplished. In this paper, an attempt has been made to achieve such an understanding by abstracting patterns of current behavior, rather than simply by speculating on what can be done with emerging technologies, such as virtual reality. Computer-mediated communication has been described as a different state of communication, which "may change the psychology and sociology of the communication process itself ...[creating] a new linguistic entity with its own vocabulary, syntax and pragmatics" (Rice and Love 1987, p. 86). In order to direct the new communication process, however, it is necessary to understand the way people choose to behave. Only then will it be possible to design support that is more

relevant to actual communication behavior. Furthermore, it is time to reconsider the metaphor of lean-rich media, which climaxes with face-to-face communication. Intelligent communication support systems may be better thought of as providers of optimal levels of interactivity, channel capacity, and adaptiveness in conjunction with recommendations of optimal message form. At the same time, however, it is important to note two caveats. One is the simplified view of organizational communication adopted here in which organizational politics are ignored. Organizational games in which communication is a medium of power may certainly distort the behavior described above (Frost 1987). Secondly, technology not only facilitates communication but also creates new realities that may trigger unproductive communication behavior (Spears et al. 1990; Sproull and Kiesler 1992). We may, for example, learn to rely on machines for relating to other people instead of learning how to relate (McLeod 1999). Thus, the rather optimistic view of technology should be taken with a grain of salt. In fact, under certain conditions it may be more effective to train people how to communicate rather than delegate communication to machines.

Enterprises of the future are likely to rely even more heavily on virtual organization. Trust will be crucial. At the same time, however, they may find it more difficult to develop trust between people who hardly ever meet (Handy 1995). Thus, communication is expected to play a growing role in promoting not only task-oriented goals, but also relationship-oriented ones. In this respect, we believe that, increasingly, organizations will need to design communication support systems based on cognitive and affective models in order to facilitate better operations and working relationships within such virtual organizations.

Acknowledgments

Many good colleagues have constructively criticized this manuscript in the last two years, and I am very grateful to each and every one. In particular, I thank the attendees of several research seminars at Oxford (England), University of Warwick (England), Case Western Reserve University (USA), New York University (USA), and

University of Waterloo (Canada). I also thank Phillip Ein-Dor and my colleagues at the Center of Global Knowledge Management at Bar-Ilan University (Israel) for their valuable comments. I'm indebted to Rick Watson for his insightful guidance and continued encouragement. I would also like to thank Gerard Sharpling, Sharon Te'eni, and Tali for editing the many pages, illustrations and references. The editing of this manuscript has been supported by the Schnitzer Foundation for Research at Bar-Ilan.

References

- Ackerman, M. S. "Augmenting Organizational Memory: A Field Study of Answer Garden," *ACM Transactions on Information Systems* (16:3), 1998, pp. 203-224.
- Adams, D. A., Nelson, R. R., and Todd, P. A. "A Comparative Evaluation of the Impact of Electronic and Voice Mail on Organizational Communication," *Information & Management* (24:1), 1993, pp. 9-21.
- Allen, D. G., and Griffeth, R. W. "Vertical and Lateral Information Processing: The Effects of Gender, Employee Classification Level, and Media Richness on Communication and Work Outcomes," *Human Relations* (50:10), 1997, pp. 1239-1260.
- Anand, V., Manz, C. C., and Glick, W. H. "An Organizational Memory Approach to Information Management," *Academy of Management Review* (23:4), 1998, pp. 796-809.
- Anderson, E., and Weitz, B. "Determinants of Continuity in Conventional Industrial Channel Dyads," *Marketing Science* (8:4), 1989, pp. 310-323.
- Ardissono, L., and Sestero, D. "Using Dynamic User Models in the Recognition of the Plans of the User," *User Modeling and User Adapted Interaction* (5), 1996, pp. 157-190.
- Banks, S. P., and Riley, P. "Structuration Theory as an Ontology for Communication Research," *Communication Yearbook* (16), 1993, pp. 167-196.
- Barber, P. J. *Applied Cognitive Psychology: An Information-Processing Framework*, Methuen, London, 1988.
- Beach, L. R., and Mitchell, T. R. "Image Theory: Principles, Goals, and Plans in Decision

- Making," *Acta Psychologica* (66:3), 1987, pp. 201-220.
- Beach, L. R., and Mitchell, T. R. "The Basics of Image Theory" in *Image Theory: Theoretical and Empirical Foundations*, L. R. Beach (ed.), Lawrence Erlbaum, Mahawa, NJ, 1998, pp. 3-18.
- Beer, M. *Organizational Change and Development*, Goodyear, Santa Monica, CA, 1980.
- Berger C. R. "Message Plans, Communication Failure and Mutual Adaptation During Social Interaction," Chapter 5 in *Progress in Communication Sciences, Volume XIV, Mutual Influence in Interpersonal Communication: Theory and Research in Cognition, Affect and Behavior*, M. T. Palmer and G. A. Barnett (eds.), Ablex Publishing Stamford, CT, 1998, pp. 91-111.
- Berger, C. R., and Calabrese R. "Some Explorations in Initial Interactions and Beyond: Toward a Developmental Theory of Interpersonal Communication," *Human Communication Research* (1:1), 1975, pp. 99-112.
- Berger, C. R., and Gudykunst, W. B. "Uncertainty and Communication," in *Progress in Communication Sciences, Volume 10*, B. Dervin (ed.), Ablex Publishing, Norwood, NJ: 1991, pp. 21-66.
- Berlyne, D. E. *Conflict, Arousal and Curiosity*, McGraw-Hill, New York, 1960.
- Bernstein, B. "Elaborated and Restricted Codes," *American Anthropologist* (66:6), 1964, pp. 55-69.
- Blalock, H. *Theory Construction*, Prentice Hall, Englewood Cliffs, NJ, 1969.
- Blau, P. M. *Exchange and Power in Social Life*, John Wiley, New York, 1964.
- Bly, S., Harrison, S., and Irwin, S. "Media Spaces: Bringing People Together in a Video, Audio and Computing Environment," *Communications of the ACM* (36:1), 1993, pp. 28-47.
- Boland, R., Tenkasi, R., and Te'eni, D. "Designing Information Technology to Support Distributed Cognition," *Organization Science* (5:3), 1994, pp. 456-475.
- Brett, J. M., and Okumura, T. "Inter- and intra-Cultural Negotiation: U.S. and Japanese Negotiators," *Academy of Management Journal* (41:5), 1998, pp. 495-510.
- Caldwell, B. S., Uang, S. T., and Taha, L. H. "Appropriateness of Communication Media Use in Organizations: Situation Requirements and Media Characteristics," *Behaviour and Information Technology* (14:4), 1995, pp. 199-207.
- Carlson, P. J., and Davis, G. B. "An Investigation of Media Selection Among Directors and Managers: From "Self" to "Other" Orientation," *MIS Quarterly* (22:3), 1998, pp. 335-362.
- Carnevale, P. J. D., and Isen, A. M. "The influence of Positive Affect and Visual Access on the Discovery of Integrative Solutions in Bilateral Negotiation," *Organizational Behavior and Human Decision Processes* (37:1), 1986, pp. 1-13.
- Chapanis, A. "Interactive Human Communication," in *Computer Supported Cooperative Work: A Book of Readings*, I. Grief (ed.), Morgan Kaufmann Publishers, San Mateo, CA, 1988, pp. 127-142.
- Chidambaram, L. "Relational Development in Computer-Supported Groups," *MIS Quarterly* (20:2), 1996, pp. 143-163.
- Clark, H. H. *Arenas of Language Use*, The University of Chicago Press, Chicago, IL, 1992.
- Clark, H. H., and Brennan, S. E. "Grounding in Communication," in *Perspectives on Socially Shared Cognition*, L. B. Resnick, J. Lewine, and S. D. Teasley (eds.), American Psychological Association Press, Washington, DC, 1991, pp. 127-149.
- Conger, J. A. "The Necessary Art of Persuasion," *Harvard Business Review* (76:3), 1998, pp. 84-95.
- Contractor, N. S., and Eisenberg, E. M. "Communication Networks and New Media in Organizations," in *Organizations and Communication Technology*, J. Fulk and C. Steinfield (eds.), Sage Publications, London, 1990, pp. 143-172.
- Cossette, P. "The Study of Language in Organizations: A Symbolic Interactionist Stance," *Human Relations* (15:11), 1998, pp. 1355-1377.
- Cox, T. H., and Blake, S. "Managing Cultural Diversity: Implications for Organizational Competitiveness," *Academy of Management Executive* (5), 1991, pp. 45-56.
- Crampes, M., Veuillez, J. P., and Ranwez, S. "Adaptive Narrative Abstraction," in *Proceedings of HyperText '98*, ACM Press, New York, 1998, pp. 97-105.
- Daft, R. L., and Lengel, R. H. "Information Richness: A New Approach to Managerial Behavior

- and Organizational Design" *Research in Organizational Behavior*, 1984, pp. 191-233.
- Daft, R. L., and Lengel, R. H. "Organizational Information Requirements, Media Richness and Structural Design," *Management Science* (32:5), 1986, pp. 554-571.
- Daft, R. L., Lengel, R. H., and Trevino, L. K. "Message Equivocality, Media Selection and Manager Performance: Implications for Information Systems," *MIS Quarterly* (11:3), 1987, pp. 355-366.
- Daft, R. L., and Macintosh N. B. "A Tentative Exploration into the Amount and Equivocality of Information Processing in Organizational Work Units," *Administrative Science Quarterly* (26:2), 1981, pp. 207-224.
- Daly, B. L. "The Influence of Face-to-Face versus Computer-Mediated Communication Channels on Collective Induction," *Accounting, Management and Information Technology* (3:1), 1993, pp. 1-22.
- Daly-Jones, O., Monk, A., and Watts, L. "Some Advantages of Video Conferencing Over High-Quality Audio Conferencing: Fluency and Awareness of Attentional Focus," *International Journal of Human-Computer Studies* (49:1), 1998, pp. 21-58.
- D'Ambra, J., Rice R. E., and O'Connor M. "Computer-Mediated Communication and Media Preference: An Investigation of the Dimensionality of Perceived Task Equivocality and Media Richness," *Behaviour and Information Technology* (17:3), 1998, pp. 164-174.
- De Bono, E. *Practical Thinking*, Pelican Books, Middlesex, England, 1976.
- Dennis, A. R. "Information Exchange and Use in Group Decision Making: You Can Lead a Group to Information, But You Can't Make It Think," *MIS Quarterly* (20:4), 1996, pp. 433-457.
- Dennis, A. R., and Kinney, S. T. "Testing Media Richness Theory in the New Media: The Effects of Cues, Feedback and Task Equivocality," *Information Systems Research* (9:3), 1998, pp. 256-274.
- DeSanctis, G., and Gallupe, R. B. "A Foundation for the Study of Group Decision Support Systems," *Management Science* (33:5), 1987, pp. 589-609.
- DeSanctis, G., and Poole, M. S. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science* (5:2), 1994, pp. 121-147.
- Diehl, E., and Sterman, J. D. "Effects of Feedback Complexity on Dynamic Decision Making," *Organizational Behavior and Human Decision Processes* (62:2), 1995, pp. 198-215.
- Doherty-Sneddon, G., Anderson, A., O'Malley, C., Langton, S., Garrod, S., and Bruce, V. "Face-to-Face and Video-Mediated Communication: A Comparison of Dialogue Structure and Task Performance," *Journal of Experimental Psychology: Applied* (3:2), 1997, pp. 105-125.
- Donabedian, B., McKinnon, S. M., and Bruns, W. J. "Task Characteristics, Managerial Socialization and Media Selection," *Management Communication Quarterly* (11:3), 1998, pp. 372-400.
- Doney, P. M., Cannon, J. P., and Mullen, M. R. "Understanding the Influence of National Culture on the Development of Trust," *Academy of Management Review* (23:3), 1998, pp. 601-620.
- Dore, R. "Goodwill and the Spirit of Market Capitalism," *British Journal of Sociology* (34:4), 1983, pp. 459-482.
- Dourish, P., and Bly, S. "Portholes: Supporting Awareness in a Distributed Work Group," in *Proceedings of ACM CHI'92 Conference on Human Factors in Computing Systems*, P. Bauersfeld, J. Bennett, and G. Lynch (eds.), ACM Press, New York, 1992, pp. 541-547.
- Downs, A. *Inside Bureaucracy*, Little Brown, Boston, 1967.
- Eggs, S., and Martin, J. R. "Genres and Registers of Discourse" in *Discourse as Structure and Process*, T. A. van Dijk (ed.), Sage Publications, London, England, 1997, pp. 231-256.
- Ehrlich, S. F. "Strategies for Encouraging Successful Adoption of Office Communication Systems," *ACM Transactions on Office Information Systems* (5:4), 1987, pp. 340-357.
- Eisenberg, R. M. "Ambiguity as Strategy in Organizational Communication," *Communication Monographs* (51:3), 1984, pp. 227-242.
- El-Shinnawy, M., and Markus, M. L. "The Poverty of Media Richness Theory: Explaining People's Choice of Electronic Mail vs. Voice Mail," *International Journal of Human-Computer Studies* (46:4), 1997, pp. 443-467.
- El-Shinnawy, M., and Vinze, A. S. "Polarization and Persuasive Argumentation: A Study of Decision Making in Group Settings," *MIS Quarterly* (22:2), 1998, pp. 165-198.

- Espinoza, J. A., and Garza, R. T. "Social Group Salience and Inter-Ethnic Cooperation," *Journal of Experimental Social Psychology* (21:4), 1985, pp. 380-392.
- Fairclough, N. *Discourse and Social Change*, Polity Press, Cambridge, MA, 1992.
- Fish, R. S., Kraut, R. E., and Root, R. W. "Video as a Technology for Informal Communication," *Communications of the ACM* (36:1), 1993, pp. 48-61.
- Flores, F. "Information Technology and the Institution of Identity," *Information Technology & People* (11:4), 1998, pp. 351-372.
- French, J. C. "DIRE: An Approach to Improving Informal Scientific Communication," *Information and Decision Technologies* (19), 1994, pp. 527-541.
- Frost, P. J. "Power, Politics, and Influence," in *Handbook of Organizational Communication: An Interdisciplinary Perspective*, F. M. Jablin, L. L. Putnam, K. H. Roberts, and L. W. Porter (eds.), Sage Publications, Newbury, CA., 1987, pp. 503-547.
- Fulk, J. "Social Construction of Communication Technology," *Academy of Management Journal* (36:5), 1993, pp. 921-950.
- Fulk, J., and Boyd, B. "Emerging Theories of Communication in Organizations," *Journal of Management* (17:2), 1991, pp. 407-446.
- Fulk J., and Collins-Jarvis, L. "Wired Meetings: Technological Mediation of Organizational Gatherings," in *New Handbook of Organizational Communication*, F. M. Jablin and L. L. Putnam (eds.), Sage, Newbury Park, CA, 2000, pp. 624-663.
- Fulk, J., and DeSanctis, G. "Electronic Communication and Changing Organizational Forms," *Organization Science* (6:4), 1995, pp. 337-349.
- Fulk, J., and Ryu, D. "Perceiving Electronic Mail Systems: A Partial Test of the Social Information Processing," Paper presented to a meeting of the International Communication Association, Dublin, 1990.
- Fulk, J., Schmitz, J. A., and Schwarz, D. "The Dynamics of Context-Behavior Interactions in Computer-Mediated Communication," in *Contexts of Computer-Mediated Communication*, M. Lea (ed.), Harvester Wheatsheaf, London, 1991, pp. 1-29.
- Fulk, J., Schmitz, J. A., and Steinfield, C. "A Social Influence Model of Technology Use," in *Organizations and Communication Technology*, J. Fulk and C. Steinfield (eds.), Sage Publications, Newbury Park, CA, 1990, pp. 117-140.
- Fussell, S. R., and Benimoff, I. "Social and Cognitive Processes in Interpersonal Communication: Implications for Advanced Telecommunications Technologies," *Human Factors* (37:2), 1995, 228-250.
- Gabarro, J. J. "The Development of Trust Influence and Expectations," in *Inter-Personal Behavior: Communication and Understanding in Relationships*, A. G. Athos and J. J. Gabarro (eds.), Prentice Hall, Englewood Cliffs, NJ, 1978, pp. 290-303.
- Gabarro, J. J. "The Development of Working Relationships," in *Intellectual Teamwork: Social and Technical Bases of Collaborative Work*, J. Galegher, R. E. Kraut, and C. Egido (eds.), Erlbaum, Hillsdale, NJ, 1990, pp. 79-110.
- Galbraith, J. R. *Organization Design*, Addison-Wesley, Reading, MA, 1977.
- Gale, S. "Human Aspects of Interactive Multimedia Communication," *Interacting with Computers* (2), 1990, pp. 175-189.
- Gallupe, R. B., Cooper, W. H., Grise, M., and Bastianutti, L. "Blocking Electronic Brainstorms," *Journal of Applied Psychology* (79:1), 1994, pp. 77-86.
- Gefen, D., and Straub, D. W. "Gender Differences in the Perception and Use of E-mail: An Extension to the Technology Acceptance Model," *MIS Quarterly* (21:4), 1997, pp. 389-400.
- Gelfand, M. J., and Christakopoulou, S. "Culture and Negotiator Cognition: Judgement Accuracy and Negotiation Processes in Individualistic and Collectivistic Cultures," *Organizational Behavior and Human Decision Processes* (79:3), 1999, pp. 248-269.
- Ginsburg, M., and Kambil, A. "Annotate! A Web-based Knowledge Management Support System for Document Collections," Working Paper #IS-98-19, Stern School of Business, New York University, 1998.
- Goffman, E. *Forms of Talk*, University of Pennsylvania Press, Philadelphia, PA, 1981.
- Goldberg, D. T. "The Social Formation of Racist Discourse" in *Anatomy of Racism*, D. T.

- Goldberg (ed.), University of Minnesota, Minneapolis, 1990, pp. 295-318.
- Green, R. S., and Cliff, N. "Multidimensional Comparisons of Structures of Vocally and Facially Expressed Emotions," *Perceptions and Psychophysics* (17:5), 1975, pp. 429-438.
- Greenberg, S. "Peepholes: Low Cost Awareness of One's Community," in *Conference Companion of CHI '96*, ACM Press, New York, 1996, pp. 206-207.
- Greene, J. O., and Lindsey, A. E. "Encoding Processes in the Production of Multiple-Goal Messages," *Human Communication Research* (16:1), 1989, pp. 195-231.
- Gudykunst, W. B. "Individualistic and Collectivistic Perspectives on Communication: An Introduction" *International Journal of Intercultural Relations* (22:2), 1998, pp. 107-134.
- Gudykunst, W. B., and Matsumoto, Y. "Cross-Cultural Variability of Communication in Personal Relationships," in *Communication in Personal Relationships across Cultures*, W. B. Gudykunst, S. Ting-Toomey, and T. Nishida (eds.), Sage Publications, Newbury Park, CA, 1996, pp. 19-55.
- Gudykunst, W. B., and Shapiro, R. B. "Communication in Everyday Interpersonal and Intergroup Encounters" *International Journal of Intercultural Relations* (20:1), 1996, pp. 19-45.
- Gudykunst, W. B., and Ting-Toomey, S. *Culture and Interpersonal Communication*, Sage Publications, Newbury Park, CA, 1988.
- Gudykunst, W., Yoon, Y., and Nishida, T. "The Influence of Individualism-Collectivism on Perceptions of Communication in In-group and Out-group Relationships," *Communication Monographs* (54:3), 1987, pp. 295-306.
- Gumperz, J. J. *Discourse Strategies*, Cambridge University Press, Cambridge, England, 1982.
- Habermas, J. *The Theory of Communicative Action: Reason and Rationalization of Society, Volume 1*, Beacon Press, Boston, 1984.
- Habermas, J. *The Theory of Communicative Action: Lifeworld and Social System, Volume 2*, Beacon Press, Boston, 1987.
- Habermas, J. *On the Pragmatics of Communication* (edited by M. Cooke), The MIT Press, Cambridge, MA, 1998.
- Halliday, M. A. K., and Hasan, R. *Language, Context and Text: Aspects of Language in a Social-Semiotic Perspective*, Oxford University Press, Oxford, England, 1989.
- Hall, E. T. *Beyond Culture*, Doubleday, New York, 1976.
- Handy, C. "Trust and the Virtual Organization," *Harvard Business Review* (73:3), 1995, pp. 40-50.
- Hart, P., and Saunders, C., "Power and Trust: Critical Factors in the Adoption and Use of Electronic Data Interchange," *Organization Science* (8:1), 1997, pp. 23-42.
- Haworth, D. A., and Savage, G.T., "A Channel-Ratio Model of Intercultural Communication: The Trains Won't Sell, Fix Them Please," *Journal of Business Communication* (26:3), 1989, pp. 231-254.
- Hedlund, J., Ilgen, D. R., and Hollenbeck, J. R. "Decision Accuracy in Computer-Mediated versus Face-to-Face Decision-Making Teams," *Organizational Behavior and Human Decision Processes* (76:1), 1998, pp. 30-47.
- Herring, S. "Interactional Coherence in CMC," *Journal of Computer Mediated Communication* (4:4), 1999 (online publication, 26 pages).
- Hesse, B. W., Werner, C. M., and Altman, I. "Temporal Aspects of Computer Mediated Communication," *Computers in Human Behavior* (4:4), 1988, pp. 147-65.
- Hightower, R. T., and Sayeed, L. "The Impact of Computer-Mediated Communication Systems on Biased Group Discussion," *Computers in Human Behavior* (11:1), 1995, pp. 33-44.
- Hightower, R. T., and Sayeed, L. "Effects of Communication Mode and Pre-discussion Information Distribution Characteristics on Information Exchange in Groups," *Information Systems Research* (7:4), 1996, pp. 451-465.
- Hiltz, S. R., Johnson, K., and Turoff, M. "Experiments in Group Decision Making, 1: Communication Process and Outcome in Face-to-Face versus Computerized Conferences," *Human Communication Research* (13:2), 1986, pp. 225-252.
- Hofstede, G. *Cultures and Organizations: Software of the Mind*, McGraw-Hill, New York, 1991.
- Hollingshead, A. B. "Information Suppression and Status Persistence in Group Decision Making: The Effects of Communication Media," *Human Communication Research* (23:2), 1996, pp. 193-219.

- Hollingshead, A. B., and McGrath, J. E. "The Whole Is Less than the Sum of its Parts: A Critical Review of Research on Computer-Assisted Groups," in *Teams Decisions and Team Performance in Organizations*, R. A. Guzzo and E. Salas (eds.), Jossey-Bass, San Francisco, 1995, pp. 46-78.
- Hollingshead, A. B., McGrath, J. E., and O'Connor, K. M. "Group Task Performance and Communication Technology: A Longitudinal Study of Computer Mediated versus Face-to-Face Work Groups," *Small Group Research* (24:3), 1993, pp. 307-333.
- Huang, W., Watson, R. T., and Wei, K. K. "Can a Lean E-mail Medium be Used for Rich Communication? A Psychological Perspective," *European Journal of Information Systems* (7), 1998, pp. 269-274.
- Huber, G. P. "Cognitive Style as a Basis for MIS and DSS Designs: Much Ado About Nothing?," *Management Science* (29:5), 1983, pp. 567-579.
- Huber, G. P. "A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making," *Academy of Management Review* (15:1), 1990, pp. 47-71.
- Huff, C., Sproull, L., and Kiesler, S. "Computer Communication and Organizational Commitment: Tracing the Relationship in a City Government," *Journal of Applied Social Psychology* (19:16), 1989, pp. 1371-1391.
- Hutchins, E. "The Social Organization of Distributed Cognition," Chapter 13 in *Perspective on Socially Shared Cognition*, L. B. Resnick, J. M. Levine, and S. D. Teasley (eds.), American Psychological Association Press, Washington, DC, 1991, 283-307.
- Hwang, M. I. "Did Task Type Matter in the Use of Decision Room GSS? A Critical Review and a Meta-Analysis," *Omega International Journal of Management Science* (20:1), 1998, pp. 1-15.
- Iedema, R. "Formalizing Organizational Meaning," *Discourse and Society* (10:1), 1999, pp. 49-65.
- Irvine, J. "Formality and Informality in Communicative Events," *American Anthropologist* (81:4), 1979, pp. 773-790.
- Ishii, H., Kobayashi, M., and Grudin, J. "Integration of Inter-Personal Space and Shared Workspace: ClearBoard Design and Experiments," *Proceedings of CSCW'92— Computer Supported Collaborative Work*, ACM Press, New York, 1992, pp. 33-42.
- Janis, I. L. *Crucial Decisions*, The Free Press, New York, 1989.
- Janson, M., Brown, A., and Taillieu, T. "Colruyt: An Organization Committed to Communication," *Information Systems Journal* (9), 1999, pp. 175-199.
- Janson, M. A., and Woo, C. C. "A Speech Act Lexicon: An Alternative Use of Speech Act Theory in Information Systems," *Information Systems Journal* (6), 1996, pp. 301-329.
- Jarvenpaa S. L., and Leidner D. E. "Communication and Trust in Global Virtual Teams," *Organization Science* (10:6), 1999, pp. 791-815.
- Jones, J. W., Saunders, C., and McLeod, R. "Media Usage and Velocity in Executive Information Acquisition: A Exploratory Study," *European Journal of Information Systems* (2:4), 1993, pp. 260-272.
- Jones, J. W., Saunders, C., and McLeod, R. "Information Acquisition During Decision-Making Processes: An Exploratory Study of Decision Rules in Media Selection," *IEEE Transactions on Engineering Management* (41:1), 1994, pp. 41-49.
- Jordan, J. M. "Executive Cognitive Control in Communication," *Human Communication Research* (25:1), 1998, pp. 5-38.
- Kasher, A. "Foundations of Philosophical Pragmatics," in *Basic Problems in Methodology and Linguistics*, R. Butts and J. Hintikka (eds.), Reidel, Dordrecht, Netherlands, 1977.
- Kasper, G., and Kellerman, E. (eds.). *Communication Strategies: Psycholinguistic and Sociolinguistic Perspectives*, Addison Wesley Longman, London, 1997.
- Kellermann, K., and Reynolds, R. "When Ignorance is Bliss: The Role of Motivation to Reduce Uncertainty in Uncertainty Reduction Theory," *Human Communication Research* (17:1), 1990, pp. 5-75.
- Kelly, G. *The Psychology of Personal Constructs Volume 1*, Norton and Company, New York, 1955.
- Kennedy, M., Te'eni, D., and Treleavan, J. "Impacts of Decision Task, Data and Display on Strategies for Extracting Information," *International Journal of Human Computer Studies* (48:2), 1998, pp. 159-180.

- Kettinger, W. J., and Grover, V. "The Use of Computer-Mediated Communication in an Inter-Organizational Context," *Decision Sciences* (28:3), 1997, pp. 513-555.
- Kiesler, S. "Think Ahead: The Hidden Message in Computer Network," *Harvard Business Review* (64), 1986, pp. 46-59.
- Kiesler, S., Zubrow, D., Moses, A. M., and Geller, V. "Affect in Computer Mediated Communication: An Experiment in Synchronous Terminal-to-Terminal Discussion," *Human Computer Interaction* (1:1), 1985, pp. 77-104.
- King, R. C., and Xia, W. "Media Appropriateness: Effects of Experience on Communication Media Choice," *Decision Sciences* (28:4), 1997, pp. 877-910.
- Kintsch, W. "The Role of Knowledge in Discourse Comprehension: A Construction-Integration Model," *Psychological Review* (95:2), 1988, pp. 163-182.
- Klien, K. J., Dansereau, F., and Hall, R. J. "Levels Issues in Theory Development, Data Collection, and Analysis," *Academy of Management Review* (19:2), 1994, pp. 195-229.
- Kock, N. *Knowledge Transfer Using Expert Support Systems: A Study on the Role of Analysis and Explanation Facilities in ESS for Group Decision Making*, Unpublished Ph.D. Dissertation, University of Waikato, New Zealand, 1998.
- Krauss, R. M., and Fussell, S. R. "Constructing Shared Communicative Environments," Chapter 9 in *Perspectives on Socially Shared Cognition*, L. B. Resnick, J. M. Levine, and S. D. Teasley (eds.), American Psychological Association Press, Washington, DC, 1991a, pp. 172-200.
- Krauss, R. M., and Fussell, S. R. "Perspective-Taking in Communication: Representations of Others' Knowledge in Reference," *Social Cognition* (9:1), 1991b, pp. 2-24.
- Kraut, R. E., and Higgins, E. T. "Communication and Social Cognition," in *Handbook of Social Cognition*, R. S. Wyer Jr. and T. K. Srull (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1984 pp. 87-127.
- Kraut, R. E., Rice, R. E., Cool, C., and Fish, R. S. "Varieties of Social Influence: The Role of Utility and Norms in the Success of a New Communication Medium," *Organization Science* (9:4), 1998, pp. 437-453.
- Lantz, A. "Heavy Users of Electronic Mail," *International Journal of Human-Computer Interaction* (10:4), 1998, pp. 361-379.
- Larkey, L. K. "Toward a Theory of Communicative Interactions in Culturally Diverse Workgroups," *Academy of Management Review* (21:2), 1996, pp. 463-491.
- Latour, B. "The Force and the Reason of Experiment," in *Experimental Inquiries*, H. E. LeGrand (ed.), Kluwer Academic Publishers, Dordrecht, Netherlands, 1990, pp. 49-80.
- Lea, M. "Rationalist Assumptions in Cross-Media Comparisons of Computer-Mediated Communication," *Behaviour and Information Technology* (10:2), 1991, pp. 153-172.
- Lea, M., and Spears, R. "Computer-Mediated Communication, De-individuation and Group Decision-Making," *International Journal of Man-Machine Studies* (34:2), 1991, pp. 283-301.
- Lee, A. S. "Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation," *MIS Quarterly* (18:2), 1994 pp. 143-158.
- Lee, J., and Heath, R. L. "Managerial Media Selection and Information Evaluation from the Receiver's Perspective in Decision-Making Contexts," *Management Communication Quarterly* (13:1), 1999, pp. 76-99.
- Lee, J., and Jablin, F. M. "Maintenance Communication in Superior-Subordinate Work Relationships," *Human Communication Research* (22:2), 1995, pp. 220-257.
- Mackay, W. E. "Diversity in the Use of Electronic Mail: A Preliminary Inquiry," *ACM Transactions on Information Systems* (6:4), 1988, pp. 380-397.
- Mao, J., Benbasat, I., and Dhaliwal, J. S. "Enhancing Explanations in Knowledge-Based Systems with Hypertext," *Journal of Organizational Computing and Electronic Commerce* (6:3), 1996, pp. 239-268.
- Markus, H. R., and Kitayama S. "Culture and the Self: Implications for Cognition, Emotion and Motivation," *Psychological Review* (98:2), 1991, pp. 224-253.
- Markus, M. L. "Towards a 'Critical Mass' Theory of Interactive Media," in *Organizations and Communication Technology*, J. Fulk and C. W. Steinfield (eds.), Sage Publications, Newbury Park, CA, 1990, pp. 194-218.

- Markus, M. L. "Electronic Mail as the Medium of Managerial Choice," *Organization Science* (5:4), 1994a, pp. 502-527.
- Markus, M. L. "Finding a Happy Medium: Explaining the Negative Effects of Electronic Communication on Social Life at Work," *ACM Transactions on Information Systems* (12:2), 1994b, pp. 119-149.
- Markus, M. L., Bikson, T. K., El-Shinnawy, M., and Soe, L. L. "Fragments of Your Communication: Email, Vmail, and Fax," *Information Society* (8:4), 1992, pp. 207-266.
- Matsumoto, D., Wallbott, H. G., and Scherer, K. R. "Emotions in Intercultural Communication," in *Handbook of International and Intercultural Communication*, M. K. Asotte and W. B. Gudykunst (eds.), Sage Publications, Newbury Park, CA, 1989, pp. 225-246.
- Mayer, R. E. "Structural Analysis of Science Prose: Can We Increase Problem-Solving Performance?" in *Understanding Expository Text: A Theoretical and Practical Handbook for Analyzing Explanatory Text*, B. K. Britton and J. B. Black (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1985, pp. 65-86.
- McDaniel, S. E., and Brinck, T. "Awareness in Collaborative Systems," *SIGCHI Bulletin* (29:4), 1997, pp. 68-71.
- McGrath, J. E. *Groups: Interaction and Performance*, Prentice-Hall, Englewood Cliffs, NJ, 1984.
- McGuire, T. W., Kiesler, S., and Siegel, J. "Group and Computer Mediated Discussion Effects in Risk Decision Making," *Journal of Personality and Social Psychology* (52:5), 1987, pp. 917-930.
- McKenna, K. Y. A., and Bargh, J. A. "Plan 9 from Cyberspace: The Implications of the Internet for Personality and Social Psychology," *Personality and Social Psychology Review* (4:1), 2000, 1, pp. 57-75.
- McLaughlin, M. L. *Conversation: How Talk Is Organized*, Sage Publications, Beverly Hills, CA, 1984.
- McLeod, P. L. *Personal Communication*, Case Western Reserve University, 1999.
- Melcher, A. J., and Beller, R. "Toward a Theory of Organization Communication Consideration in Channel Selection," *Academy of Management Journal* (10), 1967, pp. 39-52.
- Miller, G. R. (ed.). *Explorations in Interpersonal Communication*, Sage Publications, Newbury Park, CA, 1976.
- Mingers, J. C. "Information and Meaning: Foundations for an Intersubjective Account," *Information Systems Journal* (5:4), 1995, pp. 285-306.
- Mintzberg, H. *The Nature of Managerial Work*, Harper and Row, New York, 1973.
- Mischel, W. "Toward a Cognitive Social Learning: Re-conceptualization of Personality," *Psychological Review* (80:4), 1973, pp. 252-283.
- Moore, S. A. "Categorizing Automated Messages," *Decision Support Systems* (22:3), 1998, pp. 213-241.
- Morand, D. A. "The Role of Behavioral Formality and Informality in the Enhancement of Bureaucratic versus Organic Organizations," *Academy of Management Review* (20:4), 1995, pp. 831-872.
- Motiwalla, L. F. "An Intelligent Agent for Prioritizing E-mail Messages," *Information Resources Management Journal* (8:2), 1995, pp. 16-24.
- Muhlbach, L., Bocker, M., and Prussog, A. "Telepresence in Video Communications: A Study on Stereoscopy and Individual Eye Contact," *Human Factors* (37:2), 1995, pp. 290-305.
- Muhlfelder, M., Klein, U., Simon, S., and Luczak, H. "Teams Without Trust? Investigations in the Influence of Video-Mediated Communication on the Origin of Trust Among Cooperating Persons," *Behaviour and Information Technology* (18:5), 1999, pp. 349-360.
- Mynatt, E. D., Igarashi, T., Edwards, W. K., and LaMarca, A. "Flatland: New Dimensions in Office Whiteboards," in *Proceedings of CHI'99*, ACM Press, New York, 1999, pp. 346-353.
- Nelson, K. M., and Coopridge, J. G. "The Contribution of Shared Knowledge to IS Group Performance," *MIS Quarterly* (20:4), 1996, pp. 409-432.
- Neuliep, J. W., and Hazleton, V., Jr. "A Cross-Cultural Comparison of Japanese and American Persuasive Strategy Selection," *International Journal of Intercultural Relations* (9:4), 1985, pp. 389-404.
- Ngwenyama, O. K., and Lee, A. S. "Communication Richness in E-mail: Critical Social

- Theory and the Contextuality of Meaning," *MIS Quarterly* (21:2), 1997 pp. 145-167.
- Ngwenyama, O. K., and Lyytinen K. J. "Groupware Environments as Action Constitutive Resources: A Social Action Framework for Analyzing Groupware Technologies," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* (6:1), 1997, pp. 71-93.
- Norman, D. A. *The Design of Everyday Things*, Doubleday, New York, 1990.
- Ocker, R., Fjermestad, J., Hiltz, S. R., and Johnson, K. "Effects of Four Modes of Group Communication on the Outcomes of Software Requirements Determination," *Journal of Management Information Systems* (15:1), 1998, pp. 99-118.
- O'Connell, B., Whittaker, S., and Wilbur, S. "Conversations Over Videoconferences: An Evaluation of Video-Mediated Interaction," *Human-Computer Interaction* (8:4), 1993, pp. 389-428.
- Oetzel, J. G. "Explaining Individual Communication Processes in Homogeneous and Heterogeneous Groups Through Individualism-Collectivism and Self-Construal," *Human Communication Research* (25:2), 1998, pp. 202-224.
- Ohbuchi, K., and Takahashi, Y. "Cultural Styles of Conflict Management in Japanese and Americans: Passivity, Covertness, and Effectiveness of Strategies," *Journal of Applied Social Psychology* (24:15), 1994, pp. 1345-1366.
- O'Keefe, B. J. "The Logic of Message Design: Individual Differences in Reasoning About Communication," *Communication Monographs* (55:1), 1988, pp. 80-103.
- O'Reilly, C. A., Chatman, J. A., and Anderson, J. C. "Message Flow and Decision Making," in *Handbook of Organizational Communication: An Interdisciplinary Perspective*, F. M. Jablin, L. L. Putnam, K. H. Roberts, and L. W. Porter (eds.), Sage Publications, Newbury, CA, 1987, pp. 600-623.
- O'Reilly, C. A., and Pondy, L. R. "Organizational Communication," in *Organizational Behavior*, S. Kerr (ed.), Grid, Columbus, OH, 1979. pp. 119-150.
- O'Reilly, C. A., and Roberts, K. H. "Information Filtration in Organizations: Three Experiments," *Organizational Behavior and Human Performance* (11:2), 1974, pp. 253-265.
- Orlikowski, W. J. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," *Organization Science* (6:3), 1992, pp. 398-427.
- Orlikowski, W. J., and Yates, J. "Genres Repertoire: Examining the Structuring Communication Practices in Organizations," *Administrative Science Quarterly* (39:4), 1994, pp. 541-574.
- Osgood, C. E. "On Whys and Wherefores of E, P, and A," *Journal of Personality and Social Psychology* (12:3), 1969, pp. 194-199.
- Palme, J. "Survey of Computer-Based Message Systems," in *Proceedings of the Conference on Human-Computer Interaction (INTERACT '84)*, B. Shackel (ed), Elsevier North-Holland, Amsterdam, 1985, pp. 923-928.
- Patrick, A. S. "The Human Factors of Mbone Videoconferences: Recommendations for Improving Sessions and Software," *Journal of Computer Mediated Communication* (4:3), 1999 (online publication).
- Payne, J. W., Bettman, J. R., and Johnson, E. J. *The Adaptive Decision Maker*, Cambridge University Press, Cambridge, England, 1993.
- Pettigrew, T. F., and Martin, J. "Organizational Inclusion of Minority Groups: A Social Psychological Analysis," in *Ethnic Minorities: Social Psychological Perspectives*, J. P. Van Oudenhoven and T. M. Willemssen (eds.), Swets North America, Berwyn, PA, 1989, pp. 169-200.
- Petty, R. E., and Cacioppo, J. T. *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*, Springer-Verlag, New York, 1986.
- Phillips, S. R., and Eisenberg, E. M. "Strategic Uses of Electronic Mail in Organizations," *Electronic Journal of Communication* (3:2), 1993 (online publication).
- Piaget, J. *Success and Understanding*, Harvard University Press, Cambridge, MA, 1978.
- Pinsonneault, A., Barki, H., Gallupe, R. B., and Hoppen, N. "Electronic Brainstorming: The Illusion of Productivity," *Information Systems Research* (10:2), 1999, pp. 110-133.
- Poole, M. S., and Hirokawa, R. Y. "Communication and Group Decision Making," in *Communication and Group Decision Making*, R. Y. Hirokawa and M. S. Poole (eds.), Sage Publication, Thousand Oaks, CA, 1996, pp. 3-18.

- Poole, M. S., and Jackson, M. H. "Communication Theory and Group Support Systems," in *Group Support Systems: New Perspectives*, L. M. Jessup and J. S. Valacich (eds.), Macmillan, New York, 1993, pp. 281-293.
- Quinn, J. B. *Intelligent Enterprise: A Knowledge and Service Based Paradigm for Industry*, The Free Press, New York, 1992.
- Rasmussen, J. *Information Processing and Human-Machine Interaction: An Approach to Cognitive Engineering*, Elsevier, Amsterdam, 1986.
- Reinsch, N. L., and Beswick, R. W. "Voice Mail versus Conventional Channels: A Cost Minimization Analysis of Individuals' Preferences," *Academy of Management Journal* (33:4), 1990, pp. 801-816.
- Rice, R. E. "Task Analyzability, Use of New Media, and Effectiveness: A Multi-Site Exploration of Media Richness," *Organization Science* (3:4), 1992, pp. 475-500.
- Rice, R. E., and Aydin, C. "Attitudes Toward New Organizational Technologies," *Administrative Sciences Quarterly* (36:2), 1991, pp. 219-244.
- Rice, R. E., D'Ambra J., and More, E. "Cross-Cultural Comparison of Organizational Media Evaluation and Choice," *Journal of Communication* (48:3), 1998, pp. 3-26.
- Rice, R. E., Hughes, G., and Love, G. "Usage and Outcomes of Electronic Messaging at a Rand Organization: Situational Constraints, Job Level, and Media Awareness," *Office, Technology and People* (5:2), 1989, pp. 141-161.
- Rice, R. E., and Love, G. "Electronic Emotion: Socioemotional Content in a Computer Mediated Network," *Communication Research* (14:1), 1987, pp. 85-108.
- Rice, R. E., and Shook, D. E. "Relationship of Job Categories and Organizational Levels of the Use of Communication Channels, Including Electronic Mail: A Meta-Analysis and Extension," *Journal of Management Studies* (27:2), 1990, pp. 195-229.
- Rich, C., and Sidner, C. "Collagen: A Collaboration Manager for a Collaborative Interface Agent," *User Modeling and User Adapted Interaction* (8:3/4), Fall 1998, pp. 315-350.
- Robinson, M., Kovalainen, M., and Auramaki, E. "Diary as Dialogue in Papermill Process Control," *Communications of the ACM* (43:1), 2000, pp. 65-70.
- Rocco, E. "Trust Breaks Down in Electronic Context," *Proceedings of CHI'98*, ACM Press, New York, 1998, pp. 496-502.
- Rogers, L. E., and Farace, R. V. "Analysis of Relational Communication in Dyads: New Measurements Procedures," *Human Communication Research* (1), 1975, pp. 222-239.
- Romm, C. T., and Pliskin, N. "Electronic Mail as a Coalition-Building Information Technology," *ACM Transactions on Information Systems* (16:1), 1998, pp. 82-100.
- Rowe, F., and Struck, D. "Cultural Values, Media Richness and Telecommunication Use in an Organization," *Accounting, Management and Information Technologies* (9:3), 1999, pp. 161-192.
- Rudy, I. A. "A Critical Review of Research on Electronic Mail," *European Journal of Information Systems* (4:4), 1996, pp. 198-213.
- Russ, G. S., Daft, R. L., and Lengel, R. H. "Media Selection and Managerial Characteristics in Organizational Communication," *Management Communication Quarterly* (4:2), 1990, pp. 151-175.
- Rutter, D. R., and Stephenson, G. M. "The Role of Visual Communication in Synchronising Conversation," *European Journal of Social Psychology* (7), 1977, pp. 29-37.
- Salazar, A. J. "Understanding the Synergistic Effects of Communication in Small Groups," *Small Group Research* (26:2), 1995, pp. 169-199.
- Sarbaugh-Thompson, M., and Feldman, M. S. "Electronic Mail and Organizational Communication: Does Saying 'Hi' Really Matter?" *Organization Science* (9:6), 1998, pp. 685-698.
- Saunders, C., and Jones, J. "Temporal Sequences in Information Acquisition for Decision Making: A Focus on Source and Medium," *Academy of Management Review* (15:1), 1990, pp. 29-46.
- Saunders, C., and Miranda, S. "Information Acquisition in Group Decision Making," *Information & Management* (34:1), 1998, pp. 55-74.
- Schein, E. H. "Three Cultures of Management: The Key to Organizational Learning," *Sloan Management Review* (38:1), Fall 1996, pp. 9-20.
- Schlosberg, H. "The Description of Facial Expressions in Terms of Two Dimensions," *Journal of Experimental Psychology* (44), 1952, pp. 229-237.

- Schober, M. F. "Spatial Perspective-Taking in Conversation," *Cognition* (47:1), 1993, pp. 1-24.
- Schoop, M. "Habermas and Searle in Hospital: A Description Language for Cooperative Documentation Systems in Healthcare," in *Communication Modeling: The Language/ Action Perspective*, F. Dignum, and J. Dietz (eds.), Eindhoven University, Eindhoven, Netherlands, 1997, pp. 117-132.
- Schroder, H. M., Driver, M. J., and Streufert, S. *Human Information Processing*, Holt, Rinehart and Winston, New York, 1967.
- Schultze, U., and Vandenbosch, B. "Information Overload in a Groupware Environment: Now You See It, Now You Don't," *Journal of Organizational Computing and Electronic Commerce* (8:2), 1998, pp. 127-148.
- Schwartz, D., and Te'eni, D. "Tying Knowledge to Action with kMail," *IEEE Intelligent Systems* (15:3), 2000, pp. 33-39.
- Schwarz, N. "Feeling as Information: Informational and Motivational Functions of Affective States," in *Handbook of Motivation and Cognition: Foundation of Social Behaviour, Volume 2*, R. M. Sorrentino (ed.), Guilford Press, New York, 1990, pp. 527-561.
- Scollon, R., and Scollon, S. W. *Intercultural Communication: A Discourse Approach*, Blackwell, Oxford, England, 1995.
- Searle, J. R. *Speech Acts: An Essay in the Philosophy of Language*, Cambridge University Press, Cambridge, England, 1969.
- Sharrock, W., and Button, G. "On the Relevance of Habermas' Theory of Communicative Action for CSCW," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* (6:4), 1997, pp. 369-389.
- Shirani, A., Tafti, M. H. A., and Affisco, J. F. "Task and Technology Fit: A Comparison of Two Technologies for Synchronous and Asynchronous Group Communication," *Information & Management* (23:3), 1999, pp. 139-150.
- Short, J., Williams, E., and Christie, B. *The Social Psychology of Telecommunications*, Wiley, London, 1976.
- Siegel, J., Dubrovsky, V., Kiesler, S., and McGuire, T. W. "Group Processes in Computer-Mediated Communication," *Organizational Behavior and Human Decision Processes* (37:2), 1986, pp. 157-187.
- Sillince, J. A. A. "A Media-Attributes and Design-Choices Theory of the Information Technology-Organizations Relation," *Journal of Organizational Computing and Electronic Commerce* (7:4), 1997, pp. 279-303.
- Simons, R. "Strategic Orientation and Top Management Attention to Control Systems," *Strategic Management Journal* (12:1), 1991, pp. 49-62.
- Singelis, T., and Brown, W. "Culture, Self, and Collectivist Communication: Linking Culture to Individual Behavior," *Human Communication Research* (21:3), 1995, pp. 354-389.
- Sitkin, S. B., Sutcliffe, K. M., and Barrios-Cholin, J. R. "A Dual Capacity Model of Communication Media Choice in Organizations," *Human Communication Research* (18:4), 1992, pp. 563-598.
- Smith, J., and Vanecek, M. "Dispersed-Group Decision Making Using Non-simultaneous Conferencing: A Report of Research," *Journal of Management Information Systems* (7:2), 1990, pp. 71-92.
- Spears, R., Lea, M., and Lee, S. "De-individuation and Group Polarization in Computer Mediated Communication," *British Journal of Social Psychology* (29:2), 1990, pp. 121-134.
- Sproull, L., and Kiesler, S. "Connections: New Ways of Working in the Networked Organization," MIT Press, Cambridge, MA, 1992.
- Srinivasan, A., and Te'eni, D. "Modeling as Constrained Problem Solving: An Empirical Study of the Data Modeling Process," *Management Science* (41:3), 1995, pp. 419-434.
- Stasser, G., and Titus, W. "Effects of Information Load and Percentage of Shared Information on the Dissemination of Unshared Information During Group Discussion," *Journal of Personality and Social Psychology* (53:1), 1987, pp. 81-93.
- Steinfeld, C. W., and Fulk, J. "The Theory Imperative," in *Organizations and Communication Technology*, J. Fulk and C. Steinfeld (eds.), Sage Publications, London, 1990, pp. 13-25.
- Stephan, W. G., and Stephan, C. W. "Intergroup Anxiety," *Journal of Social Issues* (41:2), 1985, pp. 157-166.
- Stohl, C., and Redding, W. C. "Messages and Message Exchange Processes," in *Handbook of Organizational Communication: An Interdisciplinary Perspective*, F. M. Jablin, L. L.

- Putnam, K. H. Roberts, and L. W. Porter (eds.), Sage Publications, Newbury, CA., 1987, pp. 451-502.
- Straub, D. "The Effect of Culture on IT Diffusion: E-mail and Fax in Japan and the U.S," *Information Systems Research* (4:3), 1994, pp. 23-47.
- Straub, D., and Karahanna, E. "Knowledge Worker Communications and Recipient Availability: Toward a Task Closure Explanation of Media Choice," *Organization Science* (9:2), 1998, pp. 160-175.
- Straus, S. G., and McGrath, J. E. "Does the Medium Matter? The Interaction of Task Type and Technology on Group Performance and Member Reactions," *Journal of Applied Psychology* (79:1), 1994, pp. 87-97.
- Street, R. L., and Capella, J. H. (eds.). *Sequence and Pattern in Communication Behaviour*, Edward Arnold, London, 1985
- Sussman, S. W., and Sproull, L. "Straight Talk: Delivering Bad News Through Electronic Communication," *Information Systems Research* (10:2), 1999, pp. 150-166.
- Suzuki, S. "Cultural Transmission in International Organizations: Impact of Interpersonal Communication Patterns in Intergroup Context," *Human Communication Research* (24:1), 1997, pp. 147-180.
- Tan, B. C. Y., Wei, K. K., Sia, C., and Raman, K. S. "A Partial Test of the Task-Medium Fit Proposition in a Group Support System Environment," *ACM Transactions on Computer-Human Interaction* (6:1), 1999a, pp. 47-66.
- Tan, B. C. Y., Wei, K. K., and Watson, R. T. "The Equalizing Impact of a Group Support System on Status Differentials," *ACM Transactions on Information Systems* (17:1), 1999b, pp. 77-100.
- Tan, B. C. Y., Wei, K. K., Watson, R. T., Clapper, D. L., and McLean, E. R. "Computer-Mediated Communication and Majority Influence: Assessing the Impact in an Individualistic and a Collectivistic Culture," *Management Science* (44:9), 1998a, pp. 1263-1278.
- Tan, B. C. Y., Wei, K. K., Watson, R. T., and Walczuch, R. M. "Reducing Status Effects with Computer-Mediated Communication: Evidence from Two Distinct National Cultures," *Journal of Management Information Systems* (15:1), 1998b, pp. 119-141.
- Tang, J. C., and Isaacs, E. A. "Why Do Users Like Video? Studies of Multimedia-Supported Collaboration," *Computer Supported Cooperative Work* (1), 1992, pp. 163-193.
- Tatar, D. G., Foster, G., and Bobrow, D. G. "Design for Conversation: Lessons from Cognoter," *International Journal of Man-Machine Studies* (34:2), 1991, pp. 185-209.
- Te'eni, D. "Analysis and Design of Process Feedback in Information Systems: Old and New Wine in New Bottles," *Accounting, Management and Information Technology* (2:1), 1992, pp. 1-18.
- Te'eni, D., Sagie, A., Zaidman, N., Schwartz, D., and Hamburger, Y. "Organizational Communication: A Model and Field Study," *IEEE Transactions on Professional Communications* (44:1), March 2001.
- Te'eni, D., and Schwartz, D. G. "Contextualization in Computer-Mediated Communication," *Information Systems Review* (1), 2000, pp. 59-75.
- Thompson, J. D. *Organizations in Action: Social Science Bases of Administrative Theory*, McGraw-Hill, New York, 1967.
- Trevino, L. K., Daft, R. L., and Lengel, R. H. "Understanding Media Choices: A Symbolic Interactionist Perspective," in *Organizations and Communication Technology*, J. Fulk and C. W. Steinfield (eds.), Sage Publications, Newbury Park, CA, 1990, pp. 71-94.
- Trevino, L. K., Lengel, R. H., and Daft, R. L. "Media Symbolism, Media Richness, and Media Choice in Organizations: A Symbolic Interactionist Perspective," *Communication Research* (14:5), 1987, pp. 553-574.
- Triandis, H. C. *Individualism and Collectivism*, Westview, Boulder, CO, 1995.
- Triandis, H. C. "Cross-Cultural Studies of Individualism and Collectivism," in *Nebraska Symposium on Motivation*, J. J. German (ed.), University of Nebraska Press, Lincoln, NE, 1989, pp. 41-133.
- Trompenaars F. *Riding the Waves of Culture: Understanding Cultural Diversity in Global Business*, McGraw Hill, New York, 1998.
- Turkle, S. *The Second Self*, Simon and Schuster, New York, 1984.
- Tyre, M.J ., and von Hippel, E. "The Situated Nature of Adaptive Learning in Organizations," *Organization Science* (8:1), 1997, pp. 71-83.

- Valacich, J. S., Dennis, A., and Connolly, T. "Idea Generation in Computer-Based Groups: A New Ending to an Old Story," *Organizational Behavior and Human Decision Processes* (57:3), 1994, pp. 448-467.
- Valacich, J. S., Dennis, A., and Nunamaker, J. F., Jr. "Electronic Meeting Support: The GroupSystems Concept," *International Journal of Man-Machine Studies* (34:2), 1991, pp. 261-282.
- Valacich, J. S., Paranka, D., George, J. F., and Nunamaker, J. F. "Communication Concurrency and the New Media: A New Dimension for Media Richness," *Communication Research* (20:2), 1993, pp. 249-276.
- Vallacher, R. R., and Wegner D. M. "What Do People Think They're Doing? Action Identification and Human Behavior," *Psychological Review* (94:1), 1987, pp. 3-15.
- Van de Ven, A. H., Delbecq, A., and Koenig, R. "Determinants of Coordination Modes Within Organizations," *American Sociological Review* (41:3), 1976, pp. 322-338.
- Van Dijk, T. A., and Kintsch, W. *Strategies of Discourse Comprehension*, Academic Press, New York, 1983.
- Venkatesh, A., and Vitalari, N. P. "An Emerging Distributed Work Arrangement: An Investigation of Computer-Based Supplemental Work at Home," *Management Science* (38:12), 1992, pp. 1687-1706.
- Waldron, V. R., and Applegate, J. L. "Interpersonal Construct Differentiation and Conversational Planning: An Examination of the Two Accounts for the Production of Competent Verbal Disagreement Tactics," *Human Communication Research* (21), 1994, pp. 3-35.
- Wallbott, H. G., and Scherer, K. R. "Cues and Channels in Emotion Recognition," *Journal of Personality and Social Psychology* (51:4), 1986, pp. 690-699.
- Walther, J. B. "Interpersonal Effects in Computer-Mediated Interaction: A Relational Perspective," *Communication Research* (19:1), 1992, pp. 52-90.
- Walther, J. B. "Relational Aspects of Computer-Mediated Communication: Experimental Observations Over Time," *Organization Science* (6:2), 1995, pp. 186-203.
- Walther, J. B., and Burgoon, J. K. "Relational Communication in Computer Mediated Interaction," *Human Communication Research* (19:1), 1992, pp. 50-88.
- Warkentin, M. E., Sayeed L., and Hightower, R. T. "Virtual Teams versus Face-to-Face Teams: An Exploratory Study of a Web-Based Conference System," *Decision Sciences* (28:4), 1997, pp. 975-996.
- Watson, R. T., Ho, T. H., and Raman, K. S. "Culture: A Fourth Dimension of Group Support Systems," *Communications of the ACM* (37:10), 1994, pp. 44-55.
- Webster, J. "Desktop Videoconferencing: Experiences of Complete Users, Wary Users, and Non-users," *MIS Quarterly* (22:3), 1998, pp. 257-286.
- Webster, J., and Trevino, L. K. "Rational and Social Theories as Complementary Explanations of Communication Media Choices: Two Policy-Capturing Studies," *Academy of Management Journal* (38:6), 1995, pp. 1544-1572.
- Weedman, J. "Task and No-Task Functions of a Computer Conference Used in Professional Education: A Measure of Flexibility," *International Journal of Man-Machine Studies* (34:2), 1991, pp. 303-318.
- Weick, K. E. *The Social Psychology of Organizing*, Addison Wesley, Reading, MA, 1979.
- Westmyer, S. A., DiCoccio, R. L., and Rubin, R. B. "Appropriateness and Effectiveness of Communication Channels in Competent Interpersonal Communication," *Journal of Communication* (48:3), 1998, pp. 27-48.
- Whitener, E., Brout, S. E., Korgaurd, M. A., and Werner, J. M. "Managers as Initiators of Trust: An Exchange Relationship Framework for Understanding Managerial Trustworthy Behavior," *Academy of Management Review* (23:3), 1998, pp. 330-349.
- Whittaker, S. "Rethinking Video as a Technology for Interpersonal Communications," *International Journal of Human-Computer Studies* (42:5), 1995, pp. 501-529.
- Wijayanayake, J., and Higa, K. "Communication Media Choice by Workers in Distributed Environment," *Information & Management* (36:6), 1999, pp. 329-338.
- Williamson, O. E. *Markets and Hierarchies*, The Free Press, New York, 1975.

- Wilson, S. R. *Coordinating Compliance and Face Goals Within Persuasive Messages*, Unpublished Doctoral Dissertation, Purdue University, 1989.
- Winograd, T., and Flores, F. *Understanding Computers and Cognition: A New Foundation for Design*, Addison Wesley, Reading, MA, 1986.
- Wood, R. E. "Task Complexity: Definition of the Construct," *Organizational Behavior and Human Decision Processes* (37:1), 1986, pp. 60-82.
- Yates, J., Orlikowski, W. J., and Okamura, K. "Explicit and Implicit Structuring of Genres in Electronic Communication: Reinforcement and Change of Social Interaction," *Organization Science* (10:1), 1999, pp. 83-103.
- Zack, M. H. "Interactivity and Communication Mode Choice in Ongoing Management Groups," *Information Systems Research* (4:3), 1993, pp. 207-239.
- Zigurs, I., and Buckland, B. K. "A Theory of Task/Technology Fit and Group Support Systems Effectiveness," *MIS Quarterly* (22:3), 1998, pp. 313-334.

Zmud, R. W., Lind, M. R., and Young, F. W. "An Attribute Space for Organizational Communication Channels," *Information Systems Research* (1:4), 1990, pp. 440-457.

About the Author

Dov Te'eni is on the faculty at Bar-Ilan University, Israel, where he serves as director of the University's e-learning center and as the founding director of the interdisciplinary center for Global Knowledge Management. Dov studies several related areas of information systems in the organizational context: human-computer interaction, computer support for decision making and systems design. In addition, he is interested in information systems for non-profit organizations. His research usually combines model building, laboratory and field experiments and the development of prototype systems such as Spider and kMail. He is currently working on the design of adaptive Web Articles and the use of information technology for supporting communication within multinationals corporations.