



ELSEVIER

Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Information and Organization 15 (2005) 247–266

INFORMATION
AND
ORGANIZATION

www.elsevier.com/locate/infoandorg

Delays and interruptions: A self-perpetuating paradox of communication technology use

Julie Rennecker^{*}, Lindsey Godwin¹

*Weatherhead School of Management, Case Western Reserve University, 10900 Euclid
Avenue, Cleveland, OH 44106, USA*

Received 16 January 2004; accepted 4 February 2005

Abstract

In contemporary knowledge work organizations, work is often accomplished through communication. Consequently, communication disruptions often translate into work disruptions. In this paper, we identify two types of communication disruptions with implications for the relative organization of work: *delays* and *interruptions*. Communication delays contribute to work *disorganization* when a worker is unable to move forward with a task due to insufficient information, while interruptions derail the flow of activities directed toward the accomplishment of a task. Communication technologies are often designed with the intention of improving work organization by reducing communication delays (first-order effect), but the use of these technologies may, in practice, inadvertently contribute to an increase in work interruptions (second-order effect). We illustrate these first and second-order impacts of communication media use in a descriptive model. Then, using this model as our point of departure, we draw on prior research on personal control, relationships, and organizational culture to offer testable propositions regarding likely worker responses (third-order effect) to either communication delays or interruptions with further implications for the organization of work. Our

^{*} Corresponding author. Tel.: +1 216 368 6385; fax: +1 216 368 4776.

E-mail addresses: jar27@po.cwru.edu (J. Rennecker), lng2@po.cwru.edu (L. Godwin).

¹ Tel.: +1 216 368 5266; fax: +1 216 368 4776.

argument suggests that communication technology use may not result in either more or less organized work overall but, rather, may simply shift the locus of control over the flow of work. © 2005 Elsevier Ltd. All rights reserved.

Keywords: Computer-mediated communication; Instant messaging; Paradox; Organization; Disorganization; Communication delays; Interruptions; Personal control

1. Introduction

The development and implementation of information and communication technologies has significantly influenced the structuring of work, a critical determinant of organizational efficiency and effectiveness. For instance, applications such as enterprise resource planning systems offer efficiency gains through the standardization of repetitive information transactions across entire enterprises (Paivarinta & Salminen, 2001), while communication technologies enable more flexible work configurations and information sharing (Majchrzak, Rice, Malhotra, King, & Ba, 2000). Although technologies do often produce intended benefits, or first order effects (Sproull & Kiesler, 1991), studies-to-date have also shown that technologies-in-use (Orlikowski, 1996, 2000) typically have unanticipated, and often paradoxical, consequences (Markus, 1996; Orlikowski, 1992; Robey & Boudreau, 1999), or second-order effects (Sproull & Kiesler, 1991). Communication technologies in particular, which now offer the possibility of near-instantaneous access to co-workers through cellular telephony and instant messaging, pose the paradoxical consequence of simultaneously decreasing work delays (increased organization, a first-order effect) and increasing work interruptions (increased disorganization, a second-order effect).

The elimination of work delays has been an objective of organizational designers and industrial engineers since the Taylorization of the workplace in the early 1900s, but the impact of delays on knowledge worker performance has received little research attention. In contrast to work delays, work interruptions, defined as “a synchronous interaction which is not initiated by the recipient, is unscheduled, and results in the recipient discontinuing their current activity”² (O’Conaill & Frohlich, 1995), have been the focus of extensive investigation. For instance, experimental and observation studies have investigated the impact of interruption timing (Cutrell, Czerwinski, & Horvitz, 2001), duration (Lahlou, Kirsh, Rebotier, Reeves, & Remy, 2002; O’Conaill & Frohlich, 1995), relevance to initial task (Gillie & Broadbent, 1989) and complexity (Gillie & Broadbent, 1989) on worker performance. To the degree that delays and interruptions have each been investigated, however, studies to date have typically depicted social actors as passive recipients of uncontrollable, external influences rather than as active managers of their respective environments.

² Jett and George (2003), differentiate four types of interruptions described in the literature based on the content of the interruption and its implications for the interrupted worker – intrusions, breaks, distractions, and discrepancies. We think these are important distinctions for developing finer-grained theory about interruptions but are less important for the argument developed in this paper.

In this paper, we have interpreted “organization” and “disorganization” quite literally and from the perspective of the individual worker trying to accomplish his or her assigned tasks. We first illustrate how the use of communication technologies can simultaneously decrease work delays and increase work interruptions, and vice versa. Then we argue that whether the use of communication technologies is perceived to contribute to greater work organization or disorganization depends largely on one’s perspective as a communication initiator or responder and whether an interaction takes place synchronously or asynchronously. We use simple models of synchronous and asynchronous communication, respectively, to illustrate this argument, showing how the mode of communication influences the distribution of work delays and work interruptions between information seekers and information providers, and, thus, the locus of control over the flow of one’s work. Then asserting an agentic view of workplace communicators (Lea, O’Shea, & Fung, 1995), we draw on psychological studies of personal control needs to propose possible individual-level responses to both communication delays and interruptions. Paradoxically, strategies intended to increase control (perceived organization) over one’s own work by decreasing either work delays or interruptions, are likely to result in increased interruptions or delays, respectively, or a loss of control and perceived disorganization, for others. Finally, we introduce two variables, relationships and organizational culture, likely to moderate workers’ control-motivated communication strategies. We conclude by discussing implications for both management and research.

2. Background: delays & interruptions

Communication delays impede work by blocking access to a needed resource. For example, a worker needing information, additional materials, or approval to expend resources will communicate that need via an organizationally appropriate medium (i.e., letter, email, telephone call, meeting, or instant message) to an organizationally particular co-worker, boss, subordinate, customer, or supplier. The response from the information provider may be immediate or deferred depending upon the medium used and the responder’s availability. Depending upon the nature and urgency of the task, a communication delay can be quite consequential for both the individual and the organization. While the costs of delays in new product delivery or manufacturing interruptions are often calculated to the minute, research to date has largely overlooked the performance implications of communication delays.

Two streams of research do, however, provide suggestive findings: human–computer interaction (HCI) studies of the link between human performance and system response time and psychological studies of the performance implications of task switching. In an experimental study of the relationship between the length of system response time (SRT), the time required by a computer to process a command in an interactive human–computer task, and individual performance, Schaefer (1990) found that short, predictable delays in SRT corresponded with high performance, measured in terms of speed and accuracy, and low participant stress. In

contrast, SRTs longer than 6 s, regardless of whether the time interval was constant or variable, corresponded with a higher error rate, a slower resumption of the task when prompted by the computer to continue, and a higher level of reported stress. She concluded that delays greater than 6 s exceed average human temporal sensitivities, making the delay seem unpredictable even when the time interval was constant, creating a condition of “temporal uncertainty” known to induce stress in humans (Monat, Averill, & Lazarus, 1972). Applying these findings to human-to-human interaction, the study suggests that disruption of a worker’s task flow by unpredictable communication delays may correspond with performance erosions and stress.

In real world contexts, workers communicating asynchronously, i.e., via email, voice mail, or document postings in a Web repository, may not know exactly how long they will have to wait for a response, but the occurrence of some delay is at least predictable. While it may be possible for an information seeker to continue working on the task at hand, he or she may also switch to another task if unable to proceed without the needed information. Studies examining the time cost implications of task familiarity and complexity in task switching (Rubinstein, Meyer, & Evans, 2001) showed, however, that when switching between tasks, people exhibited a delay before engaging effectively in the new task, even if the worker had been previously engaged in the task. Lost time was greater when moving from a familiar to an unfamiliar task and from a simple to a more complex one (Rubinstein et al., 2001), but each task switch corresponded to time lost. So while task switching makes good use of the time spent waiting for a response, the research indicates that each fragmentation of a task adds to the total time required to complete it.

An *interruption*, as defined by O’Conaill and Frohlich (1995) is “a synchronous interaction which is not initiated by the recipient, is unscheduled, and results in the recipient discontinuing their current activity”.² Whether and when interruptions constitute *disruptions* – i.e., disrupt workflow or compromise productivity – represents a central question of interruption research (Gillie & Broadbent, 1989; O’Conaill & Frohlich, 1995). Researchers have linked interruptions to both negative and positive impacts on “task performance” (Gillie & Broadbent, 1989; Jett & George, 2003; O’Conaill & Frohlich, 1995; Perlow, 1999, 1997), measured in terms of both efficiency and effectiveness. In a quasi field experiment, Perlow (1999, 1997) found that by implementing a “quiet time” – an agreement among coworkers to *not* interrupt one another during designated hours – software developers completed their assignments on time while shaving hours off the typical work day. In a very different setting, Rudolph (2002, 2003) found that interruptions experienced by medical students and physicians participating in simulated learning exercises corresponded negatively with task effectiveness, measured as treatment errors and simulated patient outcomes. In addition, she found that the number and rate of interruptions corresponded with the magnitude of the negative effect.

In contrast, both an experimental study (Lahlou et al., 2002) and an observation field study (O’Conaill & Frohlich, 1995) showed that the *length of the interruption*

and the interrupted worker's *mastery of the interrupted task* influenced whether an interruption positively, negatively, or negligibly impacted the recipient. In fact, in one experimental study, Lahlou et al. (2002) found that once a subject was trained in the task being performed, short interruptions actually facilitated, rather than hindered, performance. In a synthesis of the literature, Jett and George (2003) also note the repeated finding that, counter to conventional wisdom, interruptions sometimes facilitate workers' speed and accuracy, especially on monotonous, well-learned tasks.

Other interruption characteristics, including *relevance to the original task*, *information processing demands*, and *timing*, have also been shown to moderate the strength and direction of the interruption-performance relationship. In experimental studies (Gillie & Broadbent, 1989; Speier, Valacish, & Vessey, 1999, 2003) interruptions unrelated to the initial task or that required complex information processing corresponded with statistically significant erosions in task performance. In addition to the content of the interruption, Cutrell et al. (2001) found that the *timing* of the interruption also influenced its impact on worker performance. Interruptions occurring earlier in the completion of a task were more disruptive than those occurring toward the end of the task.

For the most part, research-to-date focuses on the characteristics of individual interruptions – varying the timing or frequency of a particular interruption type or varying the content of an interruption delivered at a consistent point in a work process. While studies have shown that particular interruption types arriving at particular points in the completion of a task facilitate performance, taking all the research into consideration suggests that the random arrival of multiple interruptions from diverse sources typical of the contemporary work day would contribute to declines in work performance as well as organization. Consequently, work and communication practices that decrease the number of interruptions would be expected to improve individual work organization and performance.

3. The trade-off of delays and interruptions

Many knowledge work activities in contemporary organizations are sufficiently complex to require collaboration, and communication is the lifeblood of collaborative work. As the variety of communication media proliferate, each new technology emerges with the promise to advance productivity by eliminating the inconveniences and inefficiencies of its predecessors (Standage, 1998). Central to the “narrative of progress” (Standage, 1998; Yates, 1989) that accompanies the introduction of new communication technologies is the claim of improved efficiency, often through the minimization of communication delays. From the telegraph to the telephone, from busy signals and unanswered rings to voice mail and electronic mail, and most recently from message repositories to the instant access afforded by cellular telephony and instant messaging, each new technology advance has been accompanied by the claim of increasing communication speed and decreasing delays, with “delay” being

defined primarily from the perspective of an information seeker or conversation initiator.

Seen from the perspective of an information provider or message recipient, however, each “advance” might also be seen as a setback from the perspective of managing one’s own work. In reality, information seekers do not always choose the fastest communication medium (Markus, 1994; Sussman & Sproul, 1999) and message recipients do not always experience incoming messages as an interruption (Gillie & Broadbent, 1989; Jett & George, 2003; Markus, 1996). Depicting the extreme positions of each party in the communication process is useful, nonetheless, for acknowledging that the benefits (decreased communication delays) and inconveniences (increased interruptions) of communicating via a particular medium are not equally distributed among information seekers and information providers. Furthermore, the distribution of delays and interruptions changes depending upon whether the communication takes place in a synchronous or asynchronous mode.

To illustrate this point, we use the simplest example of a single information seeker and a single information provider, each working on different independent assignments, interacting only with one another as shown in Figs. 1 and 2. We use the two communication modes, synchronous and asynchronous, to illustrate these dynamics rather than any particular technology because many communication media can be used to communicate in both modes.³

In Fig. 1, worker A (Mr. A) carrying out task A encounters a need for information and sends a query to a coworker, worker B (Ms. B), via a synchronous channel. For Ms. B, the query represents an interruption, diverting her attention to task A while the interaction allows Mr. A to remain focused on his primary task. After fulfilling the request, Mr. A continues working on task A and Ms. B presumably returns to task B. Mr. A has experienced a minimal delay during which he remained focused on his primary task while Ms. B has switched tasks twice during that same period of time. In this scenario, assuming the time spent on task A did not facilitate Ms. B’s own work, she is at a disadvantage in terms of personal productivity because of time lost both responding to Mr. A and switching from task B to A and back again to task B.

Alternatively, Fig. 2 shows how the balance of benefits, and degree of personal control over the flow of one’s work, shifts when an information seeker opts to communicate asynchronously. Again, Mr. A, working on task A, recognizes a need for additional information. This time, however, his query, sent via an asynchronous channel, goes into a repository (i.e., email, voice mail, Web posting) to await

³ For instance, email, touted largely as an asynchronous medium because messages travel from the sender to an electronic repository where they await retrieval by the appropriate recipient, can also be used near-synchronously by setting up the email application to provide audio or video alerts when new messages arrive and responding immediately. This process would be a few seconds slower than the same interaction executed in instant messaging and would differ aesthetically from an instant message exchange, but for most practical purposes would be experienced as a “real-time” conversation. Similarly, instant messaging can be used asynchronously if the recipient is away from his or her computer or defers responding to a received message.

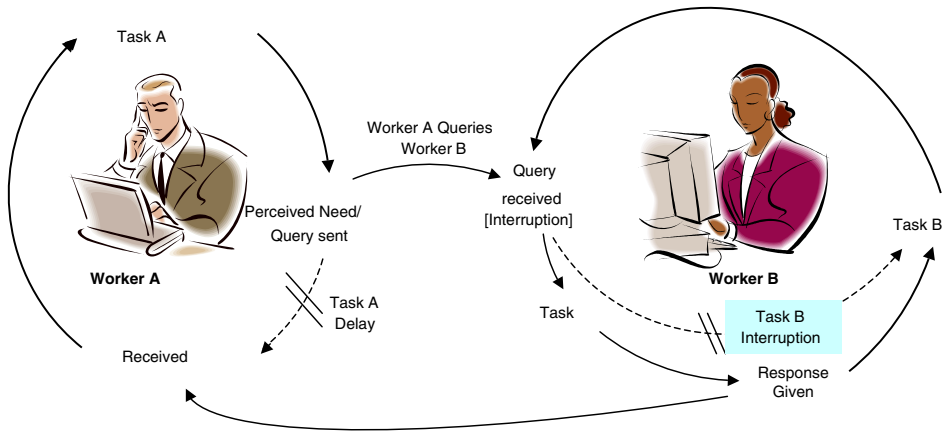


Fig. 1. Work delays and interruptions experienced by information seekers and information providers communicating synchronously.

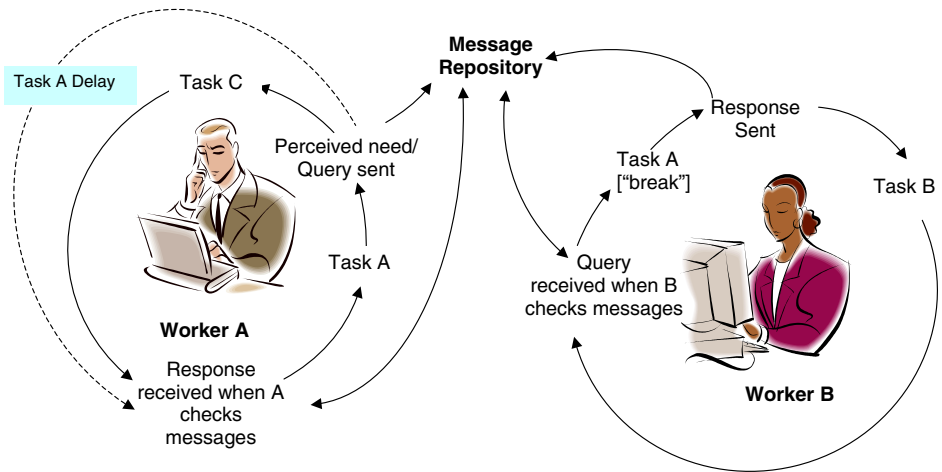


Fig. 2. Work delays experienced by information seekers and information providers communicating asynchronously.

a response from Ms. B. Mr. A, unable to proceed without this information, switches to task C. Ms. B, working on task B, continues her work until it is complete or she perceives a need for a break. She then checks her message repositories at a time of her choosing and responds to Mr. A's query as she deems appropriate with respect to the other messages in the repository. In this case, Mr. A experiences an extended delay requiring a task switch and loss of time while Ms. B works without interruption.

A comparison of the two figures shows that the synchronous mode offers the information seeker more control over communication delays but introduces more

Table 1

Comparison of work organization in synchronous and asynchronous communication modes

Work/communication impact	Synchronous	Asynchronous
Expected delay in information acquisition	Seconds to minutes	Hours to days
Locus of control of interruption	Information seeker(s)	Information providers
Continuity of task work	Information seeker(s)	Information providers

interruptions for the information provider, while the asynchronous mode allows the information provider to control the timing of work interruptions but increases the delay for the information seeker.⁴

In fact, because the information provider in Fig. 2 is able to choose when to access a message repository, asynchronous messages do not satisfy O’Conaill and Frohlich’s (1995) definition of an “interruption”. These differences in senders’ and receivers’ control over their respective workflows in each of the two modes are summarized in Table 1.

While the relationship of delay and interruption control to communication mode (i.e., synchronous and asynchronous) is relatively stable, workers’ choice of whether to use a communication medium synchronously or asynchronously is continually in flux. For instance, the owner of a cellular telephone may set the device to vibrate while in a meeting and may alternately accept and defer calls, using the same medium synchronously and asynchronously. In the following section, we consider how differences in personal needs for control might influence this choice, resulting in strategies for managing communication delays and interruptions, or “third-order effects”.

4. Third-order effects

In this section, we build on the work of several previous scholars (Kling, 1996; Markus, 1983, 1994; Orlikowski, 1992, 2000; Woolgar, 2002) to argue that technology users are not passive recipients of the consequences of technology use but, rather, that they actively assess and respond to these consequences, both preemptively and responsively, creating yet another layer of consequence. The terms “first-order” and “second-order” effects (Sproull & Kiesler, 1991) are typically used to indicate the direct instrumental (first-order) and unintended (second-order) consequences, respectively, of a technology’s use within a particular social context. We are suggesting use of the term “third-order effects” to differentiate between those unintended consequences that stem from the use of the technology, such as lost information, severing of informal communication links, or increased communicative volume, typically called “second-order effects”, and those that represent technology users’

⁴ The length of delays and the intrusiveness of interruptions will vary among media within a particular mode, such as the delay in receiving a response to an email, voice mail, or web posting, but the sequencing of delays and interruptions with respect to the technology users’ work is representative of each mode as a whole.

creative responses to the first and second-order effects to achieve both instrumental and symbolic ends. Because communication technology users have choice in how they use the communicative media available to them, and, as we have shown in the previous section, these choices have implications for their respective degrees of control over the organization of their work, we draw on psychological studies of personal control needs to consider how the need for control might contribute to the emergence of third-order effects.

4.1. *The human need for control*

As illustrated in Figs. 1 and 2, the choice of a communication mode has differential implications for message senders' and receivers' degree of personal control over their respective work environments. Psychologists have been interested in the human need for control and human responses to changes in personal control for several decades, though we are not aware of any studies investigating personal control with respect to mediated communication practices. In this section, we theorize about how the need for personal control over one's work might influence communication technology use.

For many years, conventional wisdom held that all humans act to increase their respective levels of personal control and that higher levels of personal control were consistently preferred. Studies eventually showed, however, that people differ in their need for control (Burger, 1985), or "control motivation". People with a high need for personal control tend to experience losses of control as a challenge and to take action to minimize the impact of the loss and to regain control (Burger, 1985; Gebhardt & Brosschot, 2002).

Applying this relationship to the simple communication scenarios sketched in Figs. 1 and 2, we would expect people with a high need for control to *initiate* more communication in the *synchronous* mode and to *respond* to others' requests *asynchronously* whenever possible, trying to control their own work flow by minimizing both delays and interruptions.

Not everyone, however, has a high need for control (Burger, 1985; Evans, Shapiro, & Lewis, 1993; Folkman, 1984). After several years and an extensive research tradition reinforcing the belief that people preferred to exercise control and experienced less stress when in control of their environments, new studies determined that individuals differed significantly in their desire for personal control (Burger, 1985) and that increases in personal control are not always perceived positively or associated with decreased stress or better coping behaviors (Burger, 1989; Evans et al., 1993; Folkman, 1984; Gebhardt & Brosschot, 2002).

Viewing the same simple communication scenarios pictured in Figs. 1 and 2 populated by workers with *low control motivation*, we might imagine that workers would *initiate* communication using *asynchronous* media and would *respond* to others' requests via the same medium in which the request was received. If all the communicators in an organization, both initiators and responders, had low control motivation, the personal control literature would lead us to expect the majority of communication to be asynchronous.

If we imagine a more common scenario, however, in which the population of workers consists of people ranging from high to low control motivation, we might expect a hybrid of the two previous scenarios. The more highly control-motivated workers would be expected to initiate the majority of their information queries via synchronous modes while avoiding being the recipient of synchronous contacts, decreasing both their communication delays and work interruptions. In contrast, the low control-motivated workers would be expected to initiate queries via asynchronous media while remaining receptive to synchronous queries, *increasing* their experience of both communication delays and work interruptions. If these patterns hold, the net result will be that highly control-motivated workers will use the communication tools available to them in ways that improve the organization of their work, augmenting their own productivity, while low control-motivated workers experience greater disorganization and, consequently, lower productivity.

Proposition 1. *All else being equal, high control-motivated knowledge workers will initiate communication synchronously and respond asynchronously more than their low control-motivated coworkers.*

Proposition 2. *All else being equal, low control-motivated knowledge workers will initiate communication asynchronously and will be synchronously available more than their high control-motivated coworkers.*

It is also possible to imagine the emergence of a “have your cake and eat it, too” mentality in a knowledge work organization predominated by high achievers with high control motivation. Such a scenario would involve workers attempting to initiate most communication synchronously, to decrease delays, while simultaneously trying to avoid receiving synchronous communication to decrease interruptions. For instance, one tactic described in an empirical study of instant messaging (IM) use (Cameron & Webster, 2003) to increase the likelihood of making synchronous connections involves the use of the “buddy list”⁵ feature of instant messaging to monitor others’ availability. The instant a needed coworker logs onto the computer system, the presence of his or her identifier in the buddy list signals availability for contact by telephone, instant messaging (IM), or even a face-to-face visit co-located colleague. This practice corresponds, however, with an increase in work interruptions, or decreased personal control, from the perspective of information providers. In response, knowing that their coworkers use the instant messaging feature in this way, workers may employ a variety of counter-tactics to decrease their visibility, such as not logging onto the system, posting an “away” or “busy” indicator for prolonged periods of time, or making one’s self “invisible”, an option that allows one to be logged onto the system and to access others but to have his or her own identifier

⁵ The “buddy list” feature is available to everyone using the same instant messaging application on the same network and consists of a hyperlink list of everyone currently logged onto the computer network. In some cases, it is possible to log onto the network and the IM application separately, but in other cases, only managers of a particular level are allowed the privilege of controlling their visibility on the list.

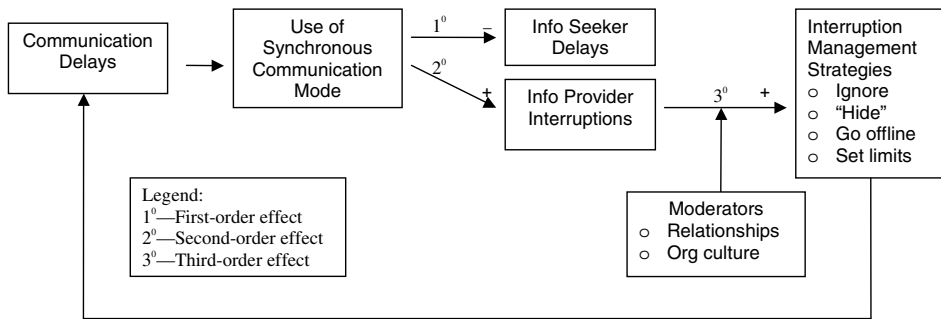


Fig. 3. A vicious circle of “hide and seek” communication among high control-motivated workers.

be unlisted. Additional tactics for minimizing the receipt of synchronous communication could include closing an office door, not answering the telephone, or working away from one’s desk. These tactics for minimizing interruptions, however, have the paradoxical consequence of increasing communication delays for information seekers, who are then motivated to increase their use of synchronous communication channels, potentially creating a sort of “vicious circle” of chasing and hiding from one’s coworkers. This reinforcing process is summarized in Proposition 3 and illustrated in Fig. 3.

Proposition 3. *High control-motivated workers will employ strategies to improve their synchronous access to others and to decrease others’ synchronous access to themselves.*

5. Moderating factors

Workers are not, however, isolated, autonomous agents. They work in relationship with others (Hackman, 1992) and within the larger cultural context of an organization (Schein, 1985) and occupation (Van Maanen & Barley, 1984). In this section, we consider how the communication technology use strategies proposed in the previous section might be moderated by a worker’s relationships with coworkers and the culture within which the interaction takes place.

5.1. Relationships

The social psychological literature indicates that in addition to personal proclivities, individual action is also informed by a person’s relationships with others (Hackman, 1992). More specifically, studies of communicative activity indicate that an information seeker’s *status* (Weisband, Schneider, & Connolly, 1993), and an information provider’s *sense of affinity* toward (Cialdini & Goldstein, 2004) and *expectations of reciprocity* from (Deckop, Cirka, & Andersson, 2003) an information seeker will each influence when and how the information provider responds to a

query. Within an organizational context an individual may receive messages and information requests from superiors, peers, and subordinates, as well as external contacts such as vendors, consultants, and even friends and family (Brodt, Emery, & DeSanctis, 2004). Based on the research to date, we would expect an information provider to employ differing communication technology use strategies depending upon his or her relationship with the information seeker.

The first dimension expected to significantly impact a worker's communication strategy is the *status* of the other party to the communication relative to him or herself. The modern bureaucratic organization is characterized by both formally assigned and emergent status differences among workers, a topic of organizational study since Max Weber (Coser, 1977) with significant implications for social interaction. Research has shown that high status individuals receive more attention and have more influence on group members than low-status individuals (Berger, Cohen, & Zelditch, 1972). The introduction of various communication technologies has raised questions about whether status also influences computer mediated communication or whether the absence of visible status cues in technology-mediated communication mutes these effects. While some have suggested that computer-mediated groups experience more egalitarian participation (Dubrovsky, Kiesler, & Sethna, 1991), other studies have countered this argument, showing that pre-existing status differences not only persist in computer mediated communication (Spears & Lea, 1994; Weisband, Schneider, & Connolly, 1995), but can even be reinforced (Postmes, Spears, & Lea, 1998). These studies, however, have focused on the communication dynamics among people using technology-mediated channels rather than on how status might affect channel choice or tactics for using a particular channel.

Typically, people defer control to persons of higher status (Goffman, 1959). In terms of communication practices, this would translate into *initiating* communication *asynchronously* with a higher status person and *responding* in whatever medium a request is received or whatever medium the higher status person requests. In practice then, when in the position of lower status relative to one's communicative partner, a high control-motivated worker will defer control to the person of higher status, mirroring the communicative practices of low control-motivated workers. The anticipated implications of status differences for the communicative strategies of knowledge workers are summarized in Proposition 4.

Proposition 4. *Status differences between communication contacts will moderate control-motivated communicative practices. All else being equal, when in a higher status position relative to one's communicative partner, a worker's communicative initiation and responding practices will be consistent with his or her control-motivation preferences. When in a lower relative status position, however, a worker will initiate communication with and respond to his or her communicative partner in the mode preferred by the partner.*

In addition to status differences, *affinity* among coworkers also varies and is likely to influence communication practices. Co-workers may characterize their relationship in such diverse terms as "friends", "adversaries", or "professional

associates”. While there has been little research exploring the particular impact of friendship and affinity on computer-mediated communication practices, there has been research suggesting that friendship impacts workplace helping behaviors (Cialdini & Goldstein, 2004). Consistent with this research, we reason workers will tend to both seek help from (Blau, 1955; Nadler, 1991; Shapiro, 1983; Wills, 1991) and provide help to (Schlenker & Britt, 2001) people with whom they have close relationships rather than people they do not know or whom they dislike. Consequently, while the personal control research suggests that a high control-motivated worker is likely to develop strategies to minimize both delays and interruptions, relationship studies suggest that workers will be more responsive when receiving a query from a friend. For instance, when a request from a friend arrives at the same time as one from an unknown co-worker (of equal or lesser status), we would expect the recipient to reply more rapidly and comprehensively to the friend, regardless of the media used.

Proposition 5. *A sense of affinity toward a communication contact will moderate the control motivation of high-control individuals. When affinity is present, all else being equal, a high control-motivated worker will be synchronously accessible to another’s request.*

Finally, we anticipate that expectations and norms around *reciprocity* will also moderate workers’ control-motivated actions, influencing how an individual both approaches and responds to coworkers. Gouldner (1960) presented a theory of reciprocity arguing that individuals are somewhat selfishly motivated toward reciprocity (i.e., responding to a request for information from a co-worker) based on the belief that he or she will receive a benefit from that action in the future (i.e., having his or her request fulfilled at a future time). Blau’s (1964) empirically based “social exchange theory” similarly states that exchange within relationships is based on trust and the belief that an act of goodwill will be reciprocated in the future. In the communication scenarios proposed earlier then, a worker may make him or herself accessible to others’ requests via synchronous communication channels with the expectation that others will be similarly available when the worker needs information. On the other hand, if an expectation of reciprocity is absent, as might be the case when receiving a query from a journalist, for instance, or from a coworker with a reputation of being self-serving, the reciprocity or exchange theories of social interaction suggest that a worker’s control-motivation would prevail.

Proposition 6. *An expectation of reciprocity will moderate the control motivation of high control-motivated individuals. When an expectation of reciprocity is absent, all else being equal, a high control-motivated worker will seek to maximize personal control by initiating communication synchronously and responding to others’ requests asynchronously. When an expectation of reciprocity is present, all else being equal, a worker will be synchronously accessible to another’s request.*

The previous paragraph and proposition consider expectations of reciprocity at the individual and dyadic level, based on previous and anticipated future experiences

with particular individuals. Norms around social exchange, however, can also operate at the organizational level as an integral aspect of an organization's culture, to which we now turn.

5.2. Culture

The individual control and relational dynamics we have described occur within a cultural context. Drawing on Schein (1985), we define "culture" as "the learned product of group experience" (p. 7) that results in "basic assumptions and beliefs" (p. 6) shared by the members of a group that "operate unconsciously and that define, in a basic 'taken for granted' fashion, an organization's view of itself and its environment" (p. 6). Prior research has shown that workers' use of any particular information or communication technology is more strongly influenced by the organizational culture than by the technology design or managers' intentions in implementing the technology (Fulk, Schmitz, & Schwarz, 1992; Markus, 1983; Orlikowski, 1992, 2000).

Extending the findings of these previous studies to the use of communication technologies in particular, we anticipate that workers' choice of a communication medium or mode will be influenced by the cultural norms regarding "appropriate" communicative action. The normative practices in the organization might be thought of as "environmental affordances", or behaviors that are supported and possible within the particular context (Evans et al., 1993). Though a worker may have a naturally high level of control motivation, the organizational culture may not support or enable the individualistic behaviors typical of such a person. For instance, an organizational culture that rewards "high visibility" or that implicitly and explicitly expresses expectations of "anyone, anytime, anywhere accessibility" may instill in the members the belief that turning off instant messaging or one's cellular telephone are unacceptable practices, reinforcing the communicative practices consistent with low control-motivated workers. On the other hand, an organization that rewards individual productivity above all else is likely to encourage communicative practices consistent with those of high control-motivated individuals. These possible moderating effects of organizational culture on control-motivated communicative practices are summarized in Proposition 7.

Proposition 7. *Organizational culture will moderate control-motivated communicative practices.*

- (a) When the organizational expectations are consistent with those of a low control-motivated worker (i.e., a primarily responsive mode without restrictions on accessibility), the majority of workers will use the available communicative tools consistent with these expectations, regardless of the worker's personal proclivities.
- (b) When the organizational culture emphasizes individual productivity and organizational leaders model access control behaviors, workers will exhibit greater use of access-restricting strategies appropriate to their status in the organization.

- (c) When the organizational culture calls for both individual productivity and “teamwork”, workers’ communicative practices will be consistent with their respective natural control-motivated proclivities.

In summary, while research predicts that both the nature of coworker relationships and organizational culture will moderate the effect of individuals’ control motivation on their use of communicative media, these influences do not moderate or mitigate the paradoxical organization–disorganization consequences of communicative media use. These factors only influence whether and when workers will opt for greater delays or interruptions for themselves and for those with whom they communicate.

6. Discussion

In this period of work globalization, the use of communicative technologies to link together the far flung members of an enterprise is becoming an increasingly important and integral aspect of the contemporary work world. At the same time that these technologies enable forms of work organization previously considered impossible or impractical, their use adds new complexity to workers’ daily lives. For the most part, such paradoxical consequences have come to be treated as unsurprising, yet also unforeseeable, outcomes of information and communication technology use. Robey (1997) and Robey and Boudreau (1999) first proposed the notion of a “logic of opposition” as one approach to anticipating, or at least more rapidly identifying post hoc, paradoxical consequences of technological change. We have employed this logic in our own reasoning – e.g., if communicative technologies are expected to increase work *organization* by minimizing communication delays, then use of the same technologies could also be expected to increase work *disorganization* – but have presented an argument suggesting that sufficient research exists to allow us to *anticipate* at least some of these patterns rather than simply documenting them ex post.

For instance, in the specific case of communicative technologies explored here, we analyzed a simplistic example of the communicative *process* in each mode (synchronous and asynchronous) enabled by commonly available interpersonal communication tools. This analysis showed how the interaction practices enabled by each communicative mode resulted in differential distributions of delays and interruptions between information seekers and information providers, simultaneously contributing to work organization (decreased delays, intended first-order effect) and disorganization (increased interruptions, paradoxical second-order effect), depending upon one’s role in an interaction. Existing research on work delays and interruptions was then tapped to theorize further implications of communicative technology use.

Our argument also goes a step beyond the intended and unintended consequences of communicative technologies being used as designed to consider how knowledgeable, sentient, purposeful social actors might further shape the use and, thus, consequences, of communicative technology use, contributing to the organization–disorganization dynamics already at play. By looking at the communication process through psychological and social lenses, we were able to identify a

catalyst (i.e., personal control needs) for and potential moderators (i.e., relationships and culture) of motivated individual action.

In addition, the recombination, synthesis, and application of existing theory to make predictions about technology use (Kraut, 2004) offers a rich source for catalyzing new research that can inform the source literature as well as social studies of technology use. Decades of research have produced numerous theories of human action, both in isolation and in concert with others and in response to a variety of contextual stimuli. As contemporary work lives and relationships become increasingly mediated by interpretively flexible technologies, there is a need both to understand human action in mediated contexts and to test the efficacy of existing theory to contribute to that understanding.

Finally, we demonstrated a cross-level approach to theorizing the use of communicative technologies and the implications of the theorized use. We identified the issue of “personal control” at the individual level as potentially consequential for how a worker would manage his or her use of communicative technologies. We then considered the individual worker with differing needs for personal control being influenced by both interpersonal level and organizational level phenomenon. This argument suggests that while technology use (or disuse or misuse) occurs at the individual level, an individual’s actions with respect to technology are best understood as the product of *concurrent* intra-personal, relational, and contextual dynamics.

7. Conclusions and limitations

Information and communication technology (ICT) advocates tend to emphasize how the use of ICT tools facilitates organizational efficiency and effectiveness. Numerous studies have shown, however, that ICT use often also has unanticipated – and potentially paradoxical – consequences for individuals and organizations (Markus, 1996; Sproull & Kiesler, 1991; Watts Sussman & Sproull, 1999), called “second-order” effects (Sproull & Kiesler, 1991). In this paper, we have contrasted synchronous and asynchronous communication modes, to show how the use of communicative technologies, in particular, can both facilitate and detract from work organization at the individual level depending upon one’s role in the interaction. Specifically, the intended first-order effect of decreasing communication delays on the part of an information seeker often translates into a work interruption (second-order effect) on the part of an information provider. We have drawn on and synthesized prior research on human responses to delays and interruptions, the individual need for control, and the influence of both relationships and organizational culture on individual action to propose possible “third-order effects”, workers’ motivated uses of communication technologies to manage delays and interruptions, with implications for both work organization and individual performance. The model we have developed recognizes the resourcefulness of social actors (Giddens, 1984; Orlikowski, Yates, Okamura, & Fujimoto, 1995) to use and interpret communicative technologies differently than intended in order to balance their obligation to collaborators with

their own need for control over their respective work while maintaining their status as a “member in good standing” within the organization.

We have shown how one’s role in the use of a technology (initiator versus responder) could result in contradictory assessments of how the use of the technology affects work organization or performance. Our argument suggests that future studies of the consequences of communication technology use should allow for the differentiation between initiators and responders in technology-mediated exchanges to obtain a more complete picture of a technology’s implications for individuals, teams, and organizations.

Assessments of information and communication technology “consequences” is a complex matter requiring attention beyond the focal users and the intended effects. While our argument includes the influences of coworker relationships and organizational culture, we have also, for the sake of clarity, ignored or overlooked numerous details of the work context. By identifying more generic processes, we intend to offer a lens that could be applied across contexts to bring paradoxical dynamics into focus amidst the locally particular detail. We anticipate that field studies designed to investigate the propositions put forth here will fill a number of voids in our own argument and further expand our collective understanding of the potentially complex implications of communicative technology use for work organization.

For instance, we have developed propositions based on simplistic scenarios of interaction between a single information seeker and a single information provider. In today’s communicatively intense work environments, however, workers often receive numerous and near-simultaneous messages in a variety of media. From the recipient’s perspective, both the messages and the senders may be inter-related, and these relationships would, no doubt, also enter the worker’s calculus of how and when to respond to whom. These and other factors entering into this calculus, and the implications of this calculus for the worker’s sense of organization or disorganization, would be interesting products of future field research.

It was our intention to make sufficiently provocative predictions to catalyze new studies of communication technology. Regardless of the reader’s response to our argument, we hope we have at least succeeded in this aim and look forward to learning more from others’ studies.

Acknowledgement

The authors thank Jonathan Grudin for helpful conversations during the conceptual development of the ideas expressed in this paper and the two anonymous reviewers for their feedback on an earlier draft of the manuscript.

References

- Berger, J., Cohen, B. P., & Zelditch, M. Jr., (1972). Status characteristics and social interaction. *American Sociological Review*, 37, 241–255.

- Blau, P. M. (1955). *The dynamics of bureaucracy: A study of interpersonal relations in two government agencies*. Chicago: University of Chicago Press.
- Blau, P. M. (1964). *Exchange and power in social life*. New York: John Wiley and Sons Inc..
- Brodth, S. E., Emery, J. D., & DeSanctis, G. (2004). The role of relationship load in E-communication overload: managing multiple roles and identities. Paper presented at the annual academy of management meeting, New Orleans.
- Burger, J. M. (1985). Desire for control and achievement-related behaviors. *Journal of Personality and Social Psychology*, 48(6), 1520–1533.
- Burger, J. M. (1989). Negative reactions to increases in perceived personal control. *Journal of Personality and Social Psychology*, 56(2), 246–256.
- Cameron, A. F., & Webster, J. (2003). Instant messaging systems in corporate environments. Paper presented at the ASAC, Halifax, Nova Scotia.
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591–621.
- Coser, L. A. (1977). *Masters of sociological thought: Ideas in historical and social context* (2nd ed.). New York: Harcourt Brace Jovanovich.
- Cutrell, E., Czerwinski, M., & Horvitz, E. (2001). Notification, disruption, and memory: effects of messaging interruptions on memory and performance. Paper presented at the human-computer interaction-interact '01, Tokyo.
- Deckop, J., Cirka, C., & Andersson, L. (2003). Doing unto others: The reciprocity of helping behavior in organizations. *Journal of Business Ethics*, 47, 101–113.
- Dubrovsky, V. J., Kiesler, S., & Sethna, B. N. (1991). The equalization phenomenon: Status effects in computer-mediated and face-to-face decision making groups. *Human-Computer Interaction*, 6, 119–146.
- Evans, G. W., Shapiro, D. H., & Lewis, M. A. (1993). Specifying dysfunctional mismatches between different control dimensions. *British Journal of Psychology*, 84, 255–273.
- Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality and Social Psychology*, 46(4), 839–852.
- Fulk, J., Schmitz, J., & Schwarz, D. (1992). The dynamics of context-behaviour interactions in computer-mediated communication. In M. Lea (Ed.), *Contexts of computer-mediated communication* (pp. 7–29). New York and London: Harvester Wheatsheaf.
- Gebhardt, W. A., & Brosschot, J. F. (2002). Desirability of control: Psychometric properties and relationships with locus of control, personality, coping, and mental and somatic complaints in three Dutch samples. *European Journal of Personality*, 16, 423–438.
- Giddens, A. (1984). *The constitution of society*. Berkeley, CA: University of California Press.
- Gillie, T., & Broadbent, D. (1989). What makes interruptions disruptive. A study of length, similarity, and complexity. *Psychological Research*, 50, 243–250.
- Goffman, E. (1959). *The presentation of self in everyday life*. Anchor Books, Garden City, NY: Doubleday & Company.
- Gouldner, A. W. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review*, 25(2), 161–178.
- Hackman, J. R. (1992). Group influences on individuals in organizations (2nd ed.). In Dunnette, M. D., & Hough, L. M. (Eds.), *Handbook of industrial and organizational psychology* (Vol. 3) (pp. 199–255). Palo Alto: Consulting Psychologists' Press.
- Jett, Q. R., & George, J. (2003). Work interrupted: A closer look at the role of interruptions in organizational life. *Academy of Management Review*, 28(3), 494–507.
- Kling, R., (Ed.). (1996). *Computerization and controversy: Value conflicts and social choices* (2nd ed.). San Diego: Academic Press.
- Kraut, R. (2004). How can social psychology theory inform CSCW research? Panel presentation at the tenth conference on computer-supported cooperative work, Chicago.
- Lahlou, S., Kirsh, D., Rebotier, T., Reeves, C., & Remy, M. (2002). Experimental study of the effect of interruption on office work. Unpublished manuscript (24 October, 2002). Available from <http://adrenaline.ucsd.edu/edf/Experiment1.htm>.

- Lea, M., O'Shea, T., & Fung, P. (1995). Constructing the networked organization: Content and context in the development of electronic communications. *Organization Science*, 6(4), 462–478.
- Majchrzak, A., Rice, R. E., Malhotra, A., King, N., & Ba, S. (2000). Technology adaptation: The case of a computer-supported interorganizational virtual team. *MIS Quarterly*, 24(4), 569–599.
- Markus, M. L. (1983). Power, politics, and MIS implementation. *Communications of the ACM*, 26(6), 430–444.
- Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science*, 5(4), 502–527.
- Markus, M. L. (1996). Finding a happy medium: Explaining the negative effects of electronic communication on social life at work. In R. Kling & K. L. Kraemer (Eds.), *Computerization and controversy* (pp. 490–524). San Diego: Academic Press.
- Monat, A., Averill, J. R., & Lazarus, R. S. (1972). Anticipatory stress and coping reactions under various conditions of uncertainty. *Journal of Personality and Social Psychology*, 24, 237–253.
- Nadler, A. (1991). Help-seeking behavior: Psychological costs and instrumental benefits. In M. S. Clark (Ed.), *Prosocial behavior: Review of personality and social psychology* (pp. 290–311). New York: Academic Press.
- O'Connell, B., & Frohlich, D. (1995). Timespace in the workplace: Dealing with interruptions. Paper presented at the CHI proceedings, short papers. Available from http://www.acm.org/sigchi/chi95/proceedings/shortppr/boc_bdy.htm.
- Orlikowski, W., Yates, J., Okamura, K., & Fujimoto, M. (1995). Shaping electronic communication: The metastructuring of technology in the context of use. *Organization Science*, 6(4), 423–444.
- Orlikowski, W. J. (1992). Learning from notes: Organizational issues in groupware implementation. Paper presented at the computer-supported conference on cooperative work, Toronto.
- Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. *Information Systems Research*, 7(1), 63–91.
- Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*, 11(4), 404–428.
- Paivarinta, T., & Salminen, A. (2001). Deliberate and emergent changes on a way toward electronic document management. In M. Khosrowpour (Ed.), *Pitfalls and triumphs of information technology management* (pp. 320–333). Hershey, PA, USA: Idea Group Pub..
- Perlow, L. (1999). The time famine: Toward a sociology of work time. *Administrative Science Quarterly*, 44(1), 57–81.
- Perlow, L. A. (1997). *Finding time: How corporations, individuals, and families can benefit from new work practices*. Ithaca, NY: ILR Press.
- Postmes, T., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-effects of computer-mediated communication. *Communication Research*, 25, 689–715.
- Robey, D. (1997). The paradoxes of transformation. In C. Sauer, Yetten, Philip and Associates (Eds.), *Steps to the Future* (pp. 209–229). San Francisco: Jossey-Bass.
- Robey, D., & Boudreau, M. (1999). Accounting for the contradictory organizational consequences of information technology: Theoretical directions and methodological implications. *Information Systems Research*, 10(2), 167–185.
- Rubinstein, J. S., Meyer, D. E., & Evans, J. E. (2001). Executive Control of Cognitive Processes in Task Switching. *Journal of Experimental Psychology: Human Perception and Performance*, 27(4), 763–797.
- Rudolph, J. (2002). Disaster dynamics: Understanding the role of quantity in organizational collapse. *Administrative Science Quarterly*, 47, 1–30.
- Rudolph, J. (2003). Into the big muddy and out again: Error persistence and crisis management in the operating room. Unpublished doctoral dissertation, Boston College, Chestnut Hill, MA.
- Schaefer, F. (1990). The effect of system response times on temporal predicability of work flow in human-computer interaction. *Human Performance*, 3(3), 173–186.
- Schein, E. (1985). *Organizational culture and leadership* (1st ed.). San Francisco: Jossey-Bass.
- Schlenker, B. R., & Britt, T. W. (2001). Strategically controlling information to help friends: Effects of empathy and friendship strength on beneficial impression management. *Journal of Experimental Social Psychology*, 37, 357–372.

- Shapiro, E. G. (1983). Embarrassment and help-seeking. In B. M. DePaulo A. Nadler & J. D. Fisher (Eds.), *New directions in helping: Help seeking* (pp. 143–163). New York: Academic Press.
- Spears, R., & Lea, M. (1994). Panacea or panopticon. The hidden power in computer-mediated communication. *Communication Research*, 21(4), 427–459.
- Speier, C., Valacish, J. S., & Vessey, I. (1999). The influence of task interruption on individual decision-making: An information overload perspective. *Decision Sciences*, 30(2), 337–360.
- Speier, C., Vessey, I., & Valacish, J. S. (2003). The effects of interruptions, task complexity, and information presentation on computer-supported decision-making performance. *Decision Sciences*, 34(4), 771.
- Sproull, L., & Kiesler, S. (1991). *Connections: New ways of working in the networked organization*. Cambridge, MA: MIT Press.
- Standage, T. (1998). *The Victorian internet: The remarkable story of the telegraph and the nineteenth century's on-line pioneers*. New York: Walker and Company.
- Sussman, S. W., & Sproul, L. (1999). Straight talk: Delivering bad news through electronic communication. *Information Systems Research*, 10(2), 150–166.
- Van Maanen, J., & Barley, S. R. (1984). Occupational communities: Culture and control in organizations. In Staw, B. M., & Cummings, L. (Eds.). *Research in organizational behavior* (Vol. 6) (pp. 287–365). Greenwich, Connecticut: JAI Press.
- Watts Sussman, S., & Sproull, L. (1999). Straight talk: Delivering bad news through electronic communication. *Information Systems Research*, 10(2), 150–166.
- Weisband, S., Schneider, S., & Connolly, T. (1993). Participation equality and influence: Cues and status in computer-supported cooperative work groups. Paper presented at the third european conference on computer-supported cooperative work, Milan, Italy.
- Weisband, S. P., Schneider, S. K., & Connolly, T. (1995). Computer-mediated communication and social information: Status salience and status awareness. *Academy of Management Journal*, 38, 1124–1151.
- Wills, T. A. (1991). Social support and interpersonal relationships. In M. S. Clark (Ed.), *Prosocial behavior: Review of personality and social psychology* (pp. 265–289). Newbury Park, CA: Sage Publications.
- Woolgar, S., (Ed.). (2002). *Virtual society? Technology, cyberbole, reality*. Oxford and New York: Oxford University Press.
- Yates, J. (1989). *Control through communication: The rise of system in American management*. Baltimore: Johns Hopkins University Press.