Psychology

The Need for Psychology in Research on Computer-Supported Cooperative Work

THOMAS A. FINHOLT
STEPHANIE D. TEASLEY
University of Michigan

The Internet explosion and broad interest in collaborative technology have driven increased interest in the field of computer-supported cooperative work (CSCW). Historically, behavioral research on CSCW applications has reflected a strong influence from ethnomethodology. This article argues that the CSCW community should adopt a stronger orientation to other social science disciplines, particularly psychology. Greater attention to the psychological literature provides three benefits. First, psychologists offer well-validated principles about human behavior in group and organizational contexts that are relevant to CSCW research. Second, psychologists offer reliable and proven measures of human behavior that, if adopted by CSCW researchers, can provide a uniform basis for comparison across studies. Finally, psychologists offer data collection and analysis methods that identify salient and generalizable features of human behavior, which may lead to the development of universal principles of CSCW design.

Keywords: computer-supported cooperative work, distributed cognition, computer-mediated groups, psychology, ethnomethodology

Through most of the brief history of computing, behavioral scientists have focused on individuals' interactions with computers. Recently, however, the explosion in Internet use and corresponding interest in collaborative computer tools have underlined the importance of understanding how groups and organizations use information technology. Exploring the impact of computing at the group or organizational level requires a fundamentally different orientation than when examining individual human-computer interaction. Fortunately, researchers began thinking about the theoretical implications of group- and organizational-level computing well before the advent of practical collaborative applications. For example, behavioral studies of computer-supported cooperative work (CSCW) represent work with a specific interest in group- and organizational-level computer systems.

The roots of the CSCW field come from computer science and anthropology. This odd mix reflects, in large part, the prominent role of the Xerox Palo Alto Research Center (PARC) in early CSCW work. At PARC in the late 1970s and early 1980s, computer scientists pioneered many of the innovations in workplace computing, such as local area networks, graphical user interfaces, electronic mail servers, and laser printing, that are now routine

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elements of office information infrastructure. A parallel effort by anthropologists at PARC, starting in the mid-1980s, attempted to better understand the relationship between work practice and technology design in order to produce easier-to-use technology (e.g., photocopiers that could detect recurring mistakes by operators and then help correct these mistakes). The computer science and anthropological agendas came together in the late 1980s through attempts to build computer-supported meeting rooms such as CoLab.

The experience with CoLab (Stefik et al., 1987) established an early pattern for CSCW research. The system itself evolved through trial and error by the system designers. The CoLab developers brought a naive understanding of group process to the design task (e.g., based on their own experiences in design meetings) and then produced a system according to these intuitions, modified by tests of the emerging system. Once CoLab became operational, anthropologists attempted to understand the consequences of CoLab use through observations of user sessions. A key methodology aiding the effort of observing CoLab-supported meetings was video analysis (Jordan & Henderson, 1995). That is, in addition to programming CoLab itself to make recordings of user activity, the CoLab room was also instrumented with video cameras to capture user behavior on tape for later examination.

The CoLab study models several key features that, over time, have come to define near-ubiquitous elements of behavioral investigations of CSCW systems (e.g., Abel, 1990; Ackerman, 1994; Bly, Harrison, & Irwin, 1993; Dourish & Bly, 1992; Fish, Kraut, Root, & Rice, 1993; Isaacs, Tang, & Morris, 1996; Tang, Isaacs, & Rua, 1994). First, the design process, as was the case with CoLab, is often driven by the empirical experience of the system designers, who then confound this bias by testing resulting systems on themselves. Second, observation of systems use is often thickly descriptive, with a corresponding emphasis on local or particularistic behavior. Third, data collection and analysis methods, such as the video techniques used in observing CoLab users, provide a rich stream of information about user behavior, but these methods do not parsimoniously identify which behaviors are significant. Finally, as with CoLab, many CSCW studies examine single systems, yet do so in an idiosyncratic fashion that complicates aggregation of data across cases.

As indicated above, the typical style of CSCW behavioral research poses a number of difficulties in understanding how groups and organizations interact with computer technology and in offering prescriptions for more effective design of group- and organizational-level systems. In this review, we address the weaknesses of the existing CSCW literature by proposing the inclusion of lessons learned from psychology. We feel greater attention to the psychological literature will produce a number of key benefits. First, psychologists, particularly cognitive, social, and organizational psychologists, have developed a large body of well-validated principles about human behavior in group and organizational contexts. Rather than rediscovering these principles, or worse, proceeding based on subjective experience, we think CSCW researchers should routinely build on findings from psychological research in their own work. Second, psychologists have developed a large number of reliable and proven measures of human behavior that may help explain adoption and use of CSCW systems. Regularly including these standard cognitive, social, and organizational measures will provide a uniform basis for comparison across CSCW studies (for a treatment of this problem of knowledge accumulation in CSCW research, see Olson, Card, Landauer, & Olson, 1993). Finally, psychologists employ data collection and analysis methods that emphasize parsimony and identification of generalizable features of human behavior. That is, most CSCW research achieves a high degree of external validity within the context of a given study. However, these ethnographic accounts often provide a deep and narrow understanding of behavior in a specific setting at the expense of describing behavior in broader, related settings.

THE SOCIAL SCIENCES AND CSCW TODAY

At the 1994 Conference on Computer-Supported Cooperative Work, Shapiro (1994) made a strong call for a broader integration of the social sciences to better understand group- and organizational-level computer systems. Shapiro contrasted his proposal with the dominant use of ethnomethodology in CSCW research (e.g., Heath & Luff, 1991; Pycock & Bowers, 1996; Rouncefield, Hughes, Rodden, & Viller, 1994). As Shapiro noted, ethnomethodology implies a commitment to a worldview in which theories and other abstractions are rejected. Therefore, ethnographic accounts of behavior are driven not by explanation but "by the stringent discipline of observation and description" (Shapiro, 1994, p. 418). Heavy reliance on ethnomethodology is problematic because this approach cannot generate general principles for understanding CSCW systems and their use.

Shapiro's suggested solution involved a hybrid strategy that would recognize the core beliefs of separate disciplines without taking on the intractable task of resolving conflicting theoretical foundations. Despite Shapiro's effort, CSCW behavioral research continues to reflect a narrow focus on ethnomethodology, with some notable exceptions. For example, examination of the 162 papers that appeared between 1990 and 1996 in the *Proceedings of the Conference on Computer Supported Cooperative Work* shows that each conference had a small number of papers with a psychological orientation (e.g., Hymes & Olson, 1992; Kraut, Miller, & Siegel, 1996; Losada, Sanchez, & Noble, 1990; Parise, Kiesler, Sproull, & Waters, 1996; Toth, 1994). Overall, however, the *Proceedings* indicates only a modest attention to psychological questions, and this attention is diminishing. For instance, 77 out of 695 citations referenced the psychological literature in the 1990 *Proceedings*. By 1996, despite a 34% increase in the total number of citations, the number of references to the psychological literature decreased by 39% to 46 out of 933 citations. By contrast, citations to the CSCW literature grew from 70 in 1990 to 233 in 1996, an increase of 330%.

The remainder of this article reviews recent literature in cognitive, social, and organizational psychology that we feel offers the basis for a legitimate hybrid approach to CSCW research. In the next section, we summarize developments in cognitive psychology such as the emergence of distributed cognition, which we feel has particular relevance for CSCW researchers. Then, we summarize developments in social and organizational psychology, with a specific emphasis on findings from experimental studies of computer-mediated groups. The last section offers suggestions for how to integrate perspectives from cognitive, social, and organizational psychology to inform understanding of core problems in the CSCW literature such as understanding and overcoming constraints on performance in geographically distributed work groups.

COGNITIVE PSYCHOLOGY

The ties between the fields of cognitive psychology and computer science suggest that cognitive psychology should have a visible presence in CSCW research. Indeed, cognitive psychology has provided important insights to the related field of human-computer interaction (HCI). For example, basic psychological principles of human perception (e.g., Fitts' law), attention (e.g., eye movement), and motor coordination (e.g., hand lateralization) have been used to characterize individual user behavior and to inform the cognitive ergonomics of user interface design (e.g., Accot & Zhai, 1997; Balakrishnan & MacKenzie, 1997; Hinckly, Pausch, Proffitt, Patten, & Kassell, 1997). In addition, some HCI studies explore higher level cognitive phenomena, such as issues of cognitive load for the design of systems (e.g., Rader, Brand, & Lewis, 1997; Terwilliger & Polson, 1997). A recent review article by

Carroll (1997) describes the seminal role and the continuing importance of cognitive psychology in HCI. By contrast, apart from lessons about user interface design learned from the HCI community, cognitive psychology is underrepresented in CSCW behavioral research.

Two factors explain the lack of interest in cognitive phenomena in the CSCW literature. First, the rise of CSCW as a distinct field coincided with the "evangelical heyday of the cognitive paradigm" (Carroll, 1997, p. 74). All cognition was considered an intraindividual event, strictly viewed as information processing with an emphasis on encoding, storage, and retrieval of symbolic representations (e.g., the Model Human Processor in Card, Moran, & Newell, 1983). However, the primary concern of CSCW research is the workplace, a complex social environment in which individuals interact to jointly produce physical and cognitive products (Engeström & Middleton, 1996). For most CSCW researchers then, an individualistic and mechanistic model of human cognition is not relevant to the problem of understanding behavior in work groups. Cognitive psychology's reliance on laboratory studies was a second problem for CSCW researchers. In a book influential among leaders of the CSCW community, Lave (1988) proposed that typical tasks used in cognitive research (e.g., the Tower of Hanoi problem) did not represent thinking as it occurred in the everyday world. In addition, normative models of performance specified by cognitive researchers did not capture the kinds of innovative problem solving displayed by those whom Lave termed "just plain folks." Today, experimental studies are rare in the CSCW literature. For example, in the *Proceedings of the 1996 Conference on CSCW*, only 3 of 45 papers used experimental methods.

Distributed Cognition

The CSCW community needs an approach to cognition that recognizes the importance of culture, context, and social interaction. These issues are now being addressed within an emerging cognitive paradigm called "distributed cognition" (Hutchins, 1995; also termed "socially shared cognition" by Resnick, Levine, & Teasley, 1991; or "situativity theory" by Greeno & Moore, 1993). Distributed cognition differs from the traditional approach to cognition by recognizing that social factors influence the content of people's cognition and the processes by which cognitive activities proceed. Specifically, researchers have begun to consider how individual cognitive processes may be reflected at the group level (e.g., Hastie & Pennington, 1991, Hinsz, Tindale, & Vollrath, 1997; Hutchins, 1991). For example, Hutchins (1990) used ethnographic observation to explain the relationship between individual cognitive properties (e.g., memory limitations), tool use, and patterns of information flow among the bridge crew of an aircraft carrier during a navigational crisis. This analysis joined ethnography with psychological theory to show that cognitive properties of groups include structures internal to individuals and structures external to individuals.

In general, studies of distributed cognition show that people inventively exploit features of the social and physical world as resources for accomplishing a task and thereby reduce their reliance on mental symbolic manipulations (Hutchins, 1995; Pea, 1993). External representations, features in the environment, social interactions, and tools and artifacts all play crucial roles in mediating cognitive activity and, in fact, can be seen to embody some of the cognition in them. For example, tools such as scientific instruments embody accepted ways of thinking and thereby shape the cognitive activity associated with their use (Latour, 1987). The advantage of theories such as distributed cognition is that researchers coming from a cognitive point of view can recognize the social and contextual aspects of a particular setting, whereas those inclined to see only the social aspects can now see important cognitive structures and processes. Therefore, the research conducted within this new framework necessitates a unit of analysis larger than the individual—a level of analysis that is already comfortable to CSCW researchers.

Summary

This section summarized research on distributed cognition and pointed to a number of key concepts and methodological considerations that guide this work. Distributed cognition assumes that a broad understanding of cognitive activity requires analyses of cognition in a wide range of activities and contexts. The methodology for studying distributed cognition includes measures to capture how talk, gesture, and eye gaze are used to establish common ground, measures of tool and artifact use during task-related activities, and measures of the specific context in which the task occurs. In generating generalizable features of human cognition, the questions addressed include: What information gets distributed? What are the constraints that govern the dynamics of information distribution? What reconfiguration of activity, people, and tools might lead to improved performance on a given task? And finally, even within this new cognitive paradigm, it is still important to consider the aspects of individual cognition that matter when an individual is part of a group, such as confirmation bias, attribution processes, social comparison, and knowledge accessibility (e.g., Hutchins, 1991; Levine, Resnick, & Higgins, 1993).

SOCIAL AND ORGANIZATIONAL PSYCHOLOGY

Just as the CSCW community has largely ignored developments in cognitive psychology, developments in social and organizational psychology have also been neglected. The source of this neglect is rooted in methodological differences. Specifically, an analysis of 18 years of group research published in leading social psychology journals shows that 76% of all studies were laboratory experiments (Moreland, Hogg, & Hains, 1994). Yet, to reject this work simply on the basis of methodology excludes an important body of results. The section that follows describes the general progress of social and organizational psychological research in an area relevant to CSCW—group performance—during the last 15 years. The section concludes with a review of research on performance in computer-mediated groups that is particularly relevant for understanding group-and organizational-level computing.

Group Performance Research: 1990 to the Present

For CSCW research, the literature on group performance informs at two levels. First, since the users of CSCW systems are individuals in groups and in organizations, understanding factors that influence group performance can improve the ability to build systems that encourage high performance. Second, since the design and construction of complex computer systems often involve individuals working in groups, findings from small-group research speak pragmatically to how the development of CSCW applications could be better organized. Levine and Moreland (1990) offer an excellent review of research on group performance in the 1980s. The work cited below augments their review by spanning research done over the last 7 years.

Research on group performance has produced many key insights for understanding groups engaged in collaborative tasks. For example, it is important to understand why many groups perform less well than would be predicted by the individual performance of group members. One source of reduced performance by groups is the observed tendency for individuals to expend less effort when working together than when working alone, often termed "social loafing." Social loafing is a robust phenomenon that generalizes across tasks and across different types of workers (Karau & Williams, 1993), and is associated with evaluation apprehension and fear of disapproval (Green, 1991). Results suggest that loafing can be diminished by increasing the identifiability and uniqueness of members' contributions to a task (e.g., George, 1992), the ease with which contributions are evaluated (e.g., White, Kjelgaard & Harkins, 1995), members' accountability for their work (e.g., Kerr & Stanfel, 1993; Shepperd, 1993), and task meaningfulness (e.g., Sanna, 1992; Williams & Karau, 1991). Performance also varies with the clarity of group goals. For example, specific and difficult goals increase group performance (e.g., O'Leary-Kelly, Martocchio, & Frink, 1994; Weldon & Weingart, 1993). Results suggest that the effect of goal difficulty on group performance is mediated by group effort (Weingart, 1992) and by the degree of communication in groups stimulated by the pursuit of difficult goals (e.g., Lee, 1989; Locke & Latham, 1990).

Decision making is another area in which group performance can vary. For example, the quality of group decisions often determines the quality of group work. One factor hypothesized to undermine the quality of group decision making is the tendency for individuals in groups to engage in extreme concurrence seeking, often termed groupthink. Groupthink is a well-documented phenomenon that occurs in diverse decision-making contexts (Janis, 1982) and is associated with high group cohesiveness, directive leadership, and high levels of external threat. Recently, critics have attacked the groupthink model, suggesting that groupthink characteristics do not necessarily lead to negative decision outcomes (e.g., Aldag & Fuller, 1993), and characteristics that result in groupthink during one decision-making situation do not extend to other situations (e.g., Moorhead, Ference, & Neck, 1991; Neck & Moorhead, 1995). Another factor hypothesized to reduce decision quality is the failure to exchange unshared information (e.g., Stasser, Taylor, & Hanna, 1989; Vinokur, Burnstein, Sechrest, & Wortman, 1985). Brainstorming, or the suggestion of ideas free of criticism from other group members, is one strategy commonly employed to improve the exchange of unshared information. However, results differ on the effectiveness of brainstorming. Diehl and Stroebe (1987, 1991) found that brainstorming was not effective because nominal groups produced more high-quality ideas than actual groups. By contrast, when measured along other dimensions, such as supporting organizational memory for participants, brainstorming was effective (e.g., Sutton & Hargadon, 1996).

Research on Computer-Mediated Groups

Research on computer-mediated groups has focused on issues of performance and decision making. For example, Hollingshead and McGrath (1995) found over 50 studies done in the last 20 years that examined task performance in computer-mediated groups. These studies showed that performance varied according to task type (computer-mediated groups were better at generating ideas, whereas face-to-face groups were better at tasks that involved problem solving or achieving consensus on group preferences; Straus & McGrath, 1994), that participation in computer-mediated groups was more equal (e.g., Kiesler & Sproull, 1992; Straus, 1996), that richer media improved performance for equivocal tasks (Kraut, Galegher, Fish, & Chalfonte, 1992), and that effects seemingly associated with technology stem from level of experience with the technology and the structuring of tasks imposed by the technology (e.g., Austin, Liker, & McLeod, 1993; Hollingshead, McGrath, & O'Connor, 1993). Finally, electronic performance monitoring at the group level reduces social loafing compared to individual monitoring and also reduces stress associated with monitoring (e.g., Aiello & Kolb, 1995; Aiello & Svec, 1993).

In terms of decision making, McLeod (1992) reviewed experience with group decision support systems and found that decision quality increased, participation was more equal, and groups stayed more focused on tasks. Negative effects included longer time to reach a decision, less overall consensus, and less satisfaction with the decision process and outcome. In terms of group process during decision making, computer-mediated groups outperform face-to-face groups in brainstorming tasks due to reduced production blocking (e.g., Gallupe, Cooper, Grise, & Bastianutti, 1994; Valicich, Dennis, & Connolly, 1994), physically dispersed participants outperform physically proximate participants when using the same decision support system while brainstorming (e.g., Valicich, George, Nunamaker, & Vogel, 1994), numerically larger groups produce more ideas than smaller groups (e.g., Valicich, Wheeler, Mennecke, & Wachter, 1995), and anonymity amplifies the positive effect of transformational leadership relative to transactional leadership in computer-mediated groups (e.g., Sosik, Avolio, & Kahai, 1997). Finally, recent studies with decision-making tasks have found that higher status members dominate in both face-to-face and computer-mediated groups (e.g., Weisband, Schneider, & Connolly, 1995), that members trust human partners more than human-like partners generated on a computer screen (e.g., Kiesler, Sproull, & Waters, 1996; Sproull, Subramani, Kiesler, & Walker, 1996), and that members of computer-mediated groups are less likely to exchange unshared information than members of face-to-face groups (e.g., Hollingshead, 1996).

Summary

This section summarized a number of well-validated principles of human behavior in groups from the social and organizational psychological literature. Specifically, in terms of group performance, this literature suggests that groups are vulnerable to reduced performance when social loafing occurs, when goals are unclear, when extreme concurrence seeking produces groupthink, and when group members fail to exchange unshared information. Research on computer-mediated groups builds on general social and organizational psychological findings by examining the impact on group behavior of computer-mediated communication. Specifically, computer-mediated groups perform poorly on consensus- formation tasks, experience less social loafing with increased electronic performance monitoring, produce more ideas when brainstorming than face-to-face groups, exchange less unshared information than face-to-face groups, and have more equal participation rates than face-to-face groups. The studies described in this section, particularly the studies of computer-mediated groups, summarized a number of standard measures of group process and performance. For example, the research on electronic brainstorming used the number of ideas produced as a common metric for assessing group output. Similarly, several of the studies used "hidden profile" tasks; that is, problem-solving tasks in which the information required to reach a successful solution was not uniformly distributed among group members. Use of hidden profile tasks provides a precise way to measure how well groups exchange unshared information. Finally, many of the studies focused on universal process variables, such as time required to reach a group decision, equality of participation in group activities, and satisfaction with group membership. As a last point, the studies in this section illustrated the degree to which orientation to generalizable features of human behavior in groups (e.g., the tendency to reduce effort when contributions are difficult to identify) provided coherence across studies. For example, taking the observation of social loafing as a starting point, researchers worked to produce studies that examined conditions that produce social loafing as well as factors that reduce social loafing. Similarly, taking salient influences on group process in face-to-face settings, such as status, researchers conducted studies to see how these factors affected the process of computer-mediated groups.

DISTRIBUTED KNOWLEDGE WORK: A TARGET FOR INTEGRATION

A recurring aspiration for builders of CSCW systems is the development of applications that successfully support collaborative task performance among geographically distributed workers. For example, recent attention has focused on the use of the Internet to construct "collaboratories" or virtual laboratories that exist across computer networks (Finholt & Olson, 1997). The collaboratory idea represents the culmination of several evolving technologies, including wide-area computer networks, desktop computers, the World Wide Web, and graphical user interfaces. Possessing the technology to implement a collaboratory, however, is not the same thing as having the knowledge to make collaboratories serve the same social and psychological function as physical laboratories. That is, in addition to being structures to house scientific activity, laboratories are also social organizations that define schools of thought (e.g., the association between Skinner, the rise of behaviorism, and Skinner's lab at Harvard) and social networks (e.g., the generation of scientists trained by Thomson at Cambridge's Cavendish Laboratory). The impact of divorcing cognitively complex group activity from a physical setting, as in moving scientific research from laboratories to collaboratories, is unknown and represents a key open question with significant consequences (e.g., Gore, 1996; Zare, 1997). We think psychology is uniquely poised to address this question, and others, raised by the transformation of group- and organizational-level work through the introduction of CSCW technology.

The idea of distributed cognition provides a fruitful starting point for understanding the coordination of joint intellectual activity and, by extension, the changes in joint intellectual activity that might occur as a result of using CSCW applications. For instance, Hutchins (1995) observed that the physical setting in which work occurs provides critical cues for successful coordination of collaborative tasks. That is, collaborators have a tacit dependence on physical proximity (e.g., ways of manipulating and referencing artifacts) as a result of long experience collaborating with colocated others. Changing the circumstances of collaboration, as through collaboratories or other network-based collaboration technology, introduces new challenges due to loss of shared physical setting. Psychologically, this challenge can be expressed as decreased common ground (Clark & Brennan, 1991) or reduced mutual understanding. Among colocated collaborators, for example, common ground is enhanced through shared visual access to the work space. Therefore, workers do not need to explicitly communicate about information that can be inferred from watching the actions of others, studying the physical arrangement of objects, and reading nonverbal cues. By contrast, distant collaborators interacting via computer-mediated groups often have few cues about what collaborators are doing, or whether collaborators are even active. As a result, there is a heavier burden on participants in computer-mediated groups to explicitly communicate information that would normally be unspoken.

The preceding illustration shows the advantages of using theory to guide inquiry about the impact of collaborative computer applications on group work. That is, the idea of distributed cognition focuses attention on the ways that physical context mediates cognitive activity, or the tendency for humans to infer intentions and actions from the configuration of people and objects in a shared space. Understanding the importance of information about the configuration of people and objects, in turn, underlines how the absence of this information complicates the performance of tasks in virtual, distributed settings (i.e., loss of common ground). As a result, a potentially undifferentiated list of features that might make distributed, computer-supported work as seamless as colocated work is reduced to a small number of salient factors. Armed with awareness of these factors, researchers can systematically search for a general understanding of how to approximate, in CSCW applications, the characteristics of proximity and shared workspace that facilitate group and organizational effectiveness. A particular strength of building research from a shared set of variables is that comparisons across studies become much easier. For example, in the social and organizational psychological literature cited earlier, it was possible to extract generalizations (e.g., computer-mediated groups reach decisions slower than face-to-face groups) precisely because key variables were examined in common by many different researchers. By contrast, ethnomethodological approaches to understanding social phenomena, while offering potentially rich descriptions of specific settings and behaviors, cannot reveal general features of behavior or offer a basis for systematic accumulation of knowledge.

CONCLUSION

In this article, we set out to redress an imbalance toward ethnomethodology in the behavioral research on computer-supported cooperative work. Our specific recommendation is that CSCW researchers, and others interested in emerging computer-supported collaborative technologies, should seek insight from a broad array of social science disciplines. Although we have advocated closer attention to the psychological literature, we acknowledge that there may be an equally great need for the CSCW community to read widely in other fields, such as economics or sociology. We have identified three benefits of adopting a more psychological orientation to CSCW research. First, psychologists offer a large body of well-validated principles about human behavior in group and organizational contexts. In particular, new cognitive theories that take explicit account of social context, such as distributed cognition, are ready-made to address core CSCW research questions that involve group work using technology. Second, psychologists have a large number of reliable and proven measures of human behavior. These standardized metrics allow researchers to make sense of data collected from diverse settings and respondents. For example, in the earlier summary of social psychological investigations of computer-mediated groups, researchers were able to build toward general conclusions because they used similar measures of performance (e.g., number of ideas generated for brainstorming groups). Finally, the psychological practice of doing theory-driven research helps identify salient behavioral variables that form the basis for comparison across studies. For instance, much of the current understanding of computer-mediated groups comes from efforts to determine which characteristics of traditional groups are also present in computer-mediated settings (e.g., the influence of high-status group members).

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Thomas A. Finholt is the director of the Collaboratory for Research on Electronic Work and an assistant research scientist in the School of Information at the University of Michigan. He received a B.A. from Swarthmore College in 1983 and a Ph.D. in social and decision science from Carnegie Mellon University in 1993. His past affiliations include the Xerox Corporation's Palo Alto Research Center and Stanford University. His research focuses on the organizational impact of information technology, including the use of virtual laboratories, or collaboratories, to facilitate scientific work among distant researchers. He is currently a co–principal investigator on two funded projects to design and evaluate collaboratories in space physics and radiology, and he has conducted field studies on the impact of information technology within Fortune 500 corporations. He has published in the organizational and psychological literature, including Psychological Science, American Psychologist, *and* Organization Science.

Stephanie D. Teasley is an assistant research scientist in the School of Information at the University of Michigan. She received a B.A. from Kalamazoo College in 1981 and a Ph.D. in psychology from the University of Pittsburgh in 1992. Her past affiliations include the Learning Research and Development Center at the University of Pittsburgh, the Institute for Research on Learning in Palo Alto, and the Institute for Child Development at the University of Minnesota. Her research focuses on the cognitive benefits of small-group collaborations, and how groupware technology can support the key aspects of these collaborations. She has conducted this work in schools, Fortune 500 corporations, and the international human virology community. She has published in the psychological literature, including Developmental Psychology, and the computer science literature, including the Proceedings of the Conference on Computer-Supported Cooperative Work, *and was the coeditor of* Perspectives on Socially Shared Cognition.