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Face-to-Face and Computer-Mediated Communication: What Does Theory Tell Us and What Have We Learned so Far?

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Abstract

Information and communication technologies (ICT) have not had the predicted effect of substantially altering work and work-based travel patterns. Some researchers argue that one of the reasons may be the inability of ICT to effectively replicate characteristics of face-to-face communication. To examine the differences between computer-mediated and face-to-face communication, this article explores theories of face-to-face communication and synthesizes lessons from studies of virtual and face-to-face teams and groups. Findings on the comparative production outcomes and performance of virtual versus face-to-face teams are mixed, suggesting that it is not clear whether face-to-face communication is necessarily superior to computer-mediated communication for many collaborative processes. Planning can gain from a better understanding of the advantages and limitations of computer-mediated communication so that it may more effectively implement virtual strategies.

Keywords

telecommuting, telework, teleconferencing, communication in planning, virtual teams, virtual planning

Introduction

Some researchers, government agencies, and influential leaders have predicted that as digital and information technologies advance, computer-mediated communication will increasingly replace business-related travel (Mokhtarian, Salomon, and Sangho 2005). However, recent research suggests that many projected growth estimates of telecommuting have been overinflated (Mokhtarian and Salomon 1997; Mokhtarian, Salomon, and Sangho 2005; Salomon 1998). Telecommuting, defined as the relocation of work or meeting from a traditional office to a setting at or near home (Mokhtarian, Salomon, and Sangho 2005) may be growing more slowly than in previous years or may have reached an equilibrium (Mokhtarian, Salomon, and Sangho 2005; Niles 2001; Pratt 2002). At the same time, business travel in general is increasing, which suggests that telecommunication use is not substantially replacing travel for work-related meetings (Faulconbridge and Beaverstock 2008).

Current information and communication technologies (ICT) make it possible for individuals and organizations to complete many business transactions electronically, thereby eliminating the need for the physical co-location of the actors involved, in theory. Yet, in practice, firms and people still cluster, so location remains pivotal for social and economic interaction, and cities assume spatial patterns based on the proximity of residences, industries, government services, and transportation hubs (Storper and Venables 2004). The world's forty largest mega-regions, economic units resulting from the merger of metropolitan regions, account for 66 percent of the global economic activity while only occupying a small portion of the earth's habitable area (Florida, Gulden, and Mellander 2008).

One theory for why location and distance still matter is that economies rely on face-to-face interaction (Faulconbridge and Beaverstock 2008; Giuliano 1998; Mokhtarian 1996; Storper and Venables 2004). Clustering may persist due to the need for individuals and organizations to conduct many transactions and to collaborate in the physical presence of one another, as face-to-face contact with its richness of cues better enables communication and trust. Some argue that the need for people to collaborate in a face-to-face fashion is so strong that the Internet and other communication technologies will not substantially influence the geography of our economies or the urban form of our cities (Learner and Storper 2001; Olson and Olson 2000). They maintain that the communication efficiencies of face-to-face contact exceed those of computer-mediated communication by so much that the need for physical proximity in most businesses and organizations will remain pivotal.

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Yet, computer-mediated communication has some efficiencies over face-to-face communication; for example, it can equalize hierarchies among communicants by reducing status (McQuail 2000). It can also increase opportunities for participation since the more vocal have fewer means to dominate the setting than they do in face-to-face encounters (Martins, Gilson, and Maynard 2004; Walther 1992). These may represent important steps toward the idealized dialogue in democratic decision making as envisioned by social theorist Jürgen Habermas (1984) and used among planning researchers interested in the ways that power and social position affects communication, knowledge formation, and decision making (Hillier 1998; Willson 2000; Innes and Booher 2003; Verma and Shin 2005; Schweitzer et al. 2008).

Computer-mediated communication can better connect an expanding and differentiated global society by giving organizations the opportunity to harness the talents of the most skilled, regardless of their locations and through buffering the transaction costs of travel and time barriers (Martins, Gilson, and Maynard 2004; Piccoli and Ives 2003). Communication technologies have the ability to expand workers' and organizations' options by allowing (1) flexibility in the way we travel for work and meetings and (2) more opportunities for participation and interaction, regardless of location. The question remains: why has business travel increased, and why have telecommuting and teleconferencing not become more prevalent, given that ICT permits more flexibility in the way people work and meet?

This article reviews theories associated with face-to-face contact and examines studies conducted on virtual and face-to-face teams in the fields of psychology, management, human resources, internet technology, and communication. It seeks to discover where inefficiencies occur in computer-mediated communication and to determine where face-to-face communication triumphs. Although the collection of empirical evidence evaluating the differences in face-to-face and computer-mediated communication is difficult, many studies have been conducted comparing the production outcomes of face-to-face and virtual or computer-mediated teams, thereby illuminating some efficiency gaps.

My review examines the extant research from disparate fields investigating communication phenomena to uncover potential lessons and research topics not heretofore considered in urban planning research. Understanding how we communicate through technology has two major implications for planning as (1) the profession adopts new technologies for planning activities and (2) research attempts to understand the effect that digital communications may have on travel demand, economic activity, and cities. This review covers the research with an eye to both purposes, but planning may more readily benefit in applying the knowledge to the second topic as groups formed in business contexts tend to be more ad hoc, with participants assigned to more straightforward and well-defined roles, than groups in planning contexts. Business and planning groups also differ in terms of tasks, incentives, and rewards. Lessons learned from observing the results of business teams specifically identify barriers to telecommuting and telework—key issues for both economic development and travel behavior. Lessons learned can also shed light on virtual communication issues in general.

This article first summarizes the nature of face-to-face contact, as it relates to business and organizational activities. Second, it reviews theories of face-to-face contact developed in the field of communication and presents empirical evidence from studies conducted on virtual and face-to-face teams. The last section discusses the relevance of these findings for planning while defining a research agenda for the future.

Cities and Face-to-Face Contact

Writers such as Thomas Friedman (2005) have posited that globalization will even out geography and eliminate comparative spatial advantages—that instead of concentrated pockets of activity and wealth, production of all types will spread out evenly throughout the globe. Globalization has mobilized labor, trade barriers have lowered, and all while fluid communications and low transport costs allow demands to be met locally. While intuitively it would make sense that globalization has an evening-out effect for industrial location and organization—boundaries become seamless as interactions and networks become more globally intertwined—recent forces of globalization have reinforced industrial agglomerative tendencies. New York and London remain steady financial agglomerations while the Silicon Valley keeps its comparative advantage in high-tech manufacturing.

These phenomena of reinforced agglomerations and continued regional specialization, as a result of globalization, seem counterintuitive in the current age of broadband communication. Communication around the world is becoming more instantaneous and less costly, rendering informational transactions more and more fluid. Transportation costs are simultaneously shrinking seemingly making location even more inconsequential. So why, in this era of shrinking transportation costs and fluid global communication, are many industries still so tied to specific locations?

Early economic agglomeration theories hinge on the returns to scale engendered by geographical proximity. Marshall ([1890] 1927) reasoned that firms cluster due to localized concentrations of specialized labor, the local benefits of non-traded inputs, and the external economies of scale resulting from backward and forward linkages. In addition, production and firms benefit from propinquity due to the efficient flow of ideas and information arising from large markets (Fujita and Thisse 1996). Underlying modern agglomeration theories are the conflicting forces, centripetal and centrifugal, that spur geographical concentration and dispersion (Krugman 1998). Centripetal forces, forces that promote geographical concentration, include market-size effects, richness in labor markets, transportation costs, and external economies; centrifugal forces, forces that disperse, include immobile factors such as resources, land rents, and external diseconomies. Both the linkage effects and the accessibility of immobile factors are contingent upon transportation costs (Krugman 1998).

Nonetheless, some parts of a production chain—such as information or services—would seem to be relatively easy and cheap to transport through digital technologies. Yet, agglomerations that deal in these immaterial products still persist and remain vertically dense so that proximity of the agents involved remains an important aspect of the system (Storper and Venables 2004). The question becomes why, given the low costs of digital technologies, the centripetal forces have not been strong enough to cause greater diffusion of agglomerations among contemporary industries.

One answer may be nonmarket-based externalities in the market. Nonmarket-based externalities are created through information spillovers or the free provision of information regarding innovations and efficiency economic actors gain from being close to each other. These spillover effects enhance the centripetal force of agglomerations (Fujita and Thisse 1996). If firms each have different information, the positive externalities generated from information sharing grow as the quantity of firms increases. As distance increases, the quality of information decays (Fujita and Thisse 1996). Knowledge spillovers deal in tacit knowledge, the communication of which, as will be discussed below, is more efficiently transmitted through face-to-face contact.

Network links established by repeated transactions create in a sense a ''group'' or ''club,'' which entail costs to enter, and once paid, become sunk costs. The information spillovers that occur in these networked clubs rests on social interaction and contact that enable members to stay abreast of trends (Scott 2004, 2006; Storper and Venables 2004). Therefore, learning, interpersonal relationship building, and collaboration are important factors in agglomeration.

Agglomerations occur in locations with high levels of accessibility and diversity that attract many workers. These settings attract workers because of the bounty of jobs available, large social networks that can facilitate job growth and longevity, infrastructure benefits, and the higher access to amenities that metropolitan regions can offer (Scott 2006; Storper and Manville 2006). Labor pools and networks are strengthened through relationship building, screening, and network building—all of which are facilitated through face-to-face contact.

Larger or more specialized metropolitan areas can pull better quantities of ''highly qualified labor'' who are increasingly engaged in ''project-oriented'' work (Grabher 2004; Scott 2006). As projects fluctuate within a firm or between firms, teams will be disbanded and recreated rendering organizational flexibility, trust and reputation imperative, and information paramount to keeping in touch with an industry's changes (Scott 2006). Trust and reputation are facilitated through face-to-face contact.

The key forces behind urbanization and concentration—backward and forward linkages, concentrated labor pools, and innovation—derive from the imperative for physical proximity that is at least in part caused by the need for face-to-face contact. Storper and Venables (2004) argue that when the backward and forward linkages are localized, it has less to do with the high costs of physical transport and more to do with the information behind the physical transaction costs. These transaction costs are reduced through deal making, collaboration, and relationship building based on trust and evaluation.

Collaboration is itself a function of multiple, critical aspects of communication: conflict resolution, effective negotiation, knowledge formation, and risk reduction all rely on effective communication and shared meanings among participants to engage in collaboration (Hoch 2007; Sager 2006). Face-to-face contact can improve group cohesion and prevent individual opportunism by reducing risk (Seabright 2004; Axelrod 1984). Under the ''prisoner's dilemma,'' for example, individuals can gain from cooperation but they can also reap higher payoffs by defecting from the collaboration and allowing others to do the work. To overcome prisoner's dilemma, human evolution has favored face-to-face interaction as it allows us to identify the faces of others and that works to support relationship longevity, reciprocity, and accountability even in large groups of people and among strangers (Seabright 2004; Axelrod 1984).

Face-to-face communication thus plays two supporting roles in urban theory. Proximity and face-to-face interaction can and has lowered the economic costs associated with transactions and industry innovation and economic geographers argue that it continues to do so even as virtual technologies enable instantaneous communication across space. Pivotal to these processes is the social networking and collaboration established through face-to-face contact and research from communication, evolutionary biology, psychology, and anthropology suggests that face-to-face communication provides the social signals necessary for individuals to engage in crucial economic and social exchange, like collaborative work. Face-to-face communication is therefore expected to be the superior method of communication for conflict resolution, negotiation, developing relationships, and resolving situations of uncertainty (Dennis and Valacich 1999; Purvanova and Bono 2009; Seabright 2004; Walther 1992).

However, it is possible that people have not learned to supply or enhance digital technologies in ways that ''change the game'' of economic and social production in cities. New innovations are possible and the next generations of workers may adapt communication styles to enable more substitution between face-to-face and digital communication technologies. Whether that type of adaption is even possible, and what effects it may for planning and cities, depends on the differences inherent between face-to-face and computer-mediated communication.

Face-to-Face and Computer-Mediated Communication

Thompson (1995) defines three types of interactions: (1) face-to-face, (2) mediated, and (3) mediated quasi-interaction. Mediated interaction takes place through a technical medium and results in fewer conversational cues. Quasi-interaction encompasses relationships formed through mass communication. For planning purposes, the most relevant issues concern the

similarities and differences between face-to-face and mediated interaction.

Humans have evolved as a simultaneously social, competitive, and cooperative group. Over the course of time, survival as a group has depended on how well we communicate our own thoughts and understand the thoughts of others. Psychologists and cognitive scientists refer to this as the ability to "mind read"—that is, to interpret what others are thinking based on the observation of their actions and words (Singer 2006). According to the Theory of Mind developed by Baron-Cohen, at an early age, children develop the wherewithal to analyze human behavior through their understandings of desires and beliefs as a result of genetic programming (Baron-Cohen 1995). Eye contact modulates our social cognitive processes during contact with another face, moderating social control and information (Senju and Johnson 2009).

When humans analyze the words being spoken, we attempt to imagine and interpret the communicator's intention behind them and therefore the nonverbal and paraverbal (tone, pitch, and inflection) components in a conversation are as important as the verbal. Participants in a conversation may pay more heed to the nonverbal aspects of communication (Baron-Cohen 1995; Reardon 1987). Paraverbal and nonverbal cues control conversation flow, turn-taking and mind reading (Warkentin, Sayeed, and Hightower 1997). Lack of these cue controls for conversation flow can result in unregulated and disordered conversation, which can lead to confusion and incoherence (Cornelius and Boos 2003).

Acts of communication transmit both information about tasks and interpersonal messages. This information may be "codifiable" or "noncodifiable." Codifiable information can be systemized through symbols and can therefore be easily and cheaply transmitted through communication technology (Storper and Venables 2004). Routinized tasks that involve the communication of codifiable information such as orders can readily be done through electronic devices such as e-mail and fax and may even be performed more efficiently without visual stimulus (McGrath 1984). However, when information cannot be easily codified, the marginal costs of transmittal increases with distance as verbal cues dissipate (Audretsch 1998; Fujita and Thisse 1996).

A good portion of the information we communicate is not strictly based on the symbol system that constructs language. These types of messages can be defined as knowledge-based messages or "tacit knowledge." Tacit knowledge refers to information that is difficult to articulate either verbally or through written language. It often deals with "know-how," which is frequently based on intuition and subjective insight and is accompanied by a high degree of uncertainty. The conveyance of tacit knowledge relies heavily on interpretation, contact, and body language and is difficult to codify. Often messages conveying feelings and attitudes rely only in small part on the *actual* words spoken and more than 90 percent on the way the words are delivered and the facial expressions used in delivery—that is to say, the nonverbal portion of the communication (Mehrabian 1981).

Nonverbal communication also entails nonverbal codes. Nonverbal codes are analogic, transmit simultaneous messages, have universal meaning, elicit automatic responses and at times occur spontaneously (Littlejohn and Foss 2005). These codes can be categorized via bodily activity, voice, touch, space, time, and the use of objects (Littlejohn and Foss 2005). Digital signals result in discrete interpretations (yes/no), whereas analogic signals such as facial expressions can be understood on a spectrum of meaning (satisfied–unsatisfied). Nonverbal codes also contain universal meaning through commonly understood facial expressions such as threat or joy. These types of codes can also be transmitted simultaneously by such vehicles as the pitch of voice and body language.

Important components of such nonverbal communication include space, time, physical aspects of the environment, and eye contact. Edward Hall in *The Silent Language* (1959) emphasizes the importance of culture and space in understanding communication. Different cultures assume different levels of comfort regarding proximity to another and different tones, pitches, and degrees of assertiveness when communicating. These add to the nuances of conversation and at times override the spoken word. Hall argues that we embed our feelings in our silent language, which can pose problems in understanding cross-cultural communication. How one shifts his or her physical position, proximity to others, and time intervals during conversation reveals different meanings and varies across cultures.

In a similar vein, Altman (1975) defines the four attributes in the human behavior/environment relationship that convey meaning and sentiments: privacy, personal space, territoriality, and crowding. Privacy regulates how accessible and open we make ourselves to others. Territorial behavior and personal space are mechanisms we use to control levels of privacy as the closer we are to others, touch, smell, and heat become heightened enriching the communication (Altman 1975). We regulate privacy through fluctuating degrees of contact where isolation and crowding are the extreme and undesirable versions of these states (Altman 1975). Verbal, paraverbal, nonverbal, territorial behavior, and use of personal space operate in different combinations during our regulation of social interactions resulting in patterns that signify comfort, meaning, or misunderstanding and discomfort (Darley and Gilbert 1985; Burgoon, Stern, and Dillman 1995).

Theory suggests that one reason digital technology does not readily substitute for face-to-face communication is because computer-mediated communication negotiates our contact with social reality through a technical medium that relays secondhand or third-party events and information that humans cannot directly observe (McQuail 2000). Some research and theory argue that computer-mediated communication stifles many of the conversational clues that are present during face-to-face communication, rendering the mode less effective (Hightower et al. 1997; Warkentin, Sayeed, and Hightower 1997). There are several theories that share this basic idea, although they all come to somewhat different conclusions about where the deficits in communication via technologies may occur.

Media Richness Theory (MRT)

MRT, developed by Daft and Lengel (1984), places different media along a spectrum where one end represents "rich" media and the opposing end represents "lean" media. Richness depends on the degree of emotional, normative, or attitudinal cues present (Daft and Lengel 1984; Van der Kleij et al. 2009). According to MRT, face-to-face contact is the richest of the communication media because of the simultaneity of cues it projects (Daft and Lengel 1984; Montoya et al. 2009; Van der Kleij et al. 2009; Warkentin, Sayeed, and Hightower 1997). It is followed in richness by video communication, then telephone and lowest on the spectrum is electronic communication such as e-mail and computer documents.

Critics argue that MRT does not sufficiently explain why face-to-face communication is superior to other forms of communication for certain tasks or behaviors (Van der Kleij et al. 2009; George and Robb 2008; Van Deursen and Pieterson 2006). They maintain that the success of performing a task such as decision making or negotiation does not necessarily depend on the medium selected and rich communication is not necessarily dependent on a rich medium (Van der Kleij et al. 2009). Preferences, skills, and attitudes play an important role in technology adaptation and as these variables change so does the way in which we efficiently use technologies (Arnfalk and Kogg 2003).

Some evidence demonstrates that through continued use of ICT, computer-mediated communication or lean media can become richer and can reach the effectiveness of face-to-face communication (Chidambaram 1996; Hollingshead, McGrath, and O'Connor 1993; Wakefield, Leidner, and Garrison 2008; Walther 1992; Wheeler, Valacich, and Alavi 1995). Perceptions of technology also may change over time, adding to the richness of the technology (DeRosa et al. 2004). Effective use of computer-mediated communication also may not simply depend on whether the technology is available but how organizations and culture adapt to technological change (Montoya et al. 2009). These ideas underpin some later extensions and adaptations of MRT, like Media Synchronicity Theory.

Media Synchronicity Theory

The Media Synchronicity Theory (Dennis and Valacich 1999) is an adaptation of MRT that accounts for the benefits of modern technology, which can create efficiencies compared with face-to-face communication. During face-to-face communication, only one person can talk at a time, while some technologies allow for multiple people to communicate simultaneously. During face-to-face communication, dominant speakers win speaking time while computer-mediated communication can allow all members of the conversation to have an equal opportunity of speaking (Van der Kleij et al. 2009). Modern technology may have benefits that enable virtual teams to be as effective as face-to-face teams especially if a set of appropriate media are used for the task and key moderators such as time are flexible (Van der Kleij et al. 2009; Baltes et al. 2002; Caballer, Grace, and Peiró 2005).

Some media, such as e-mail and the Internet, are better equipped to disseminate information—called "conveyance." Other media, such as video conferencing or Telepresence, are better at engendering mutual understanding, which is called "convergence" (Dennis and Valacich 1999; Veinott et al. 1999; Kraut, Fussell, and Siegel 2003; Fussell, Kraut, and Siegel 2000; Kraut, Gergle, and Fussell 2002). Convergence media more accurately simulate face-to-face contact, particularly Telepresence technology—the richest of the visual media in terms of presence and gaze tracking. Both conveyance and convergence are equally important in completing tasks. Media that are better equipped to facilitate one type of process may not necessarily be as well equipped to facilitate the other and, therefore, the use of various media types may be optimal (Dennis and Valacich 1999). During a face-to-face meeting, for example, certain informational tasks could be presented through e-mail or chat media, while exploratory tasks could be performed through video conferencing.

Social Dynamic Media Theories

Social Dynamic Media Theories examine the use of ICT technologies within the context of cultural and organizational settings, arguing that communication behaviors depend on social and organizational systems and their environment (DeRosa et al. 2004; Montoya et al. 2009). The implication here is that barriers to efficient ICT use may have to do with improper training or lack of clearly defined goals resulting from the culture of organizations and social habits. Barriers to ICT use may also have to do with a reluctance to implement computer-mediated communication strategies for organizations that operate under traditional supervisorial techniques (Gani and Toelman 2006; Niles 2001).

In Social Information Processing Theory (SIP), one particular social dynamic media theory, Walther (1992) argues that computer-mediated teams can reach levels of interpersonal interaction that are similar to face-to-face groups, given sufficient time (Walther 1992). According to SIP, those involved in communication use the cues available in developing relationships, and if certain nonverbal cues are unavailable, communicators "adapt their language, style and other cues to such purposes" (Walther, Loh, and Granka 2005). A common example would be emoticons placed throughout text-based communications. Walther, Loh, and Granka (2005) find that communicators can reach the same levels of affective communication (emotional and interpersonal) whether computer mediated or face to face.

Because virtual teams may be more task-oriented than socially oriented, they may process less social and emotional information because information flow is more difficult due to time lags, which stunt the formation of relational links (Chidambaram 1996). Although virtual teams may be affected by reduced social information, knowledge sharing, and weaker interpersonal ties, these disadvantages may dissipate over time as teams increasingly work with one another (Hill et al. 2009; Walther, Anderson, and Park 1994). Occasional or introductory

face-to-face meetings may interject familiarity among team members that helps to overcome some of the social disadvantages of virtualness (Hill et al. 2009).

Virtual groups may also define how useful technology is along with how and when it is appropriate to use for interactions. In Adaptive Structuration Theory (AST), Poole and DeSanctis (1990) hold that group perceptions regarding the technology's usefulness influences whether they use it or not. Perceptions of how easy a technology is to use may influence perceptions of its usefulness (Davis 1989; Lu and Peeta 2009; Norman 1988). Advanced information technologies under AST are examined within the context of social structures and their interaction processes (DeSanctis and Poole 1994). Effective training and adaptation strategies can improve coherence and mutual understanding in computer-mediated groups that use synchronous media such as chat or text-based communication (Cornelius and Boos 2003). Task performance may be more related to experience with the technology than the type of task where the newness of the medium is more influential than the newness of the team (Hollingshead, McGrath, and O'Connor 1993).

According to the Media Naturalness Perspective (Kock 2002), many of the problems associated with computer-mediated communication may have to do with a lag in people's ability to adapt to the technology, since evolution has accustomed humans to face-to face communication. Thus, the use of many communication technologies may feel unnatural. The more unnatural a communication medium feels, the more cognitive effort people have to exert, the more ambiguity arises, and the more people undergo suppressed physiological anxiety (Kock 2002). However, humans are adaptable and although some communication media may feel more unnatural than others, humans ultimately posses the ability to adapt to these forms of communication. The key issue is the time necessary for adaptation. DeRosa et al. (2004) note that ''geographic distance and technological complexity are secondary to processes of adaptation, as humans remain the most complex and flexible part of the communication system'' (p. 219). The Media Naturalness Perspective ultimately argues that virtual teams can reach the same levels of trust, communication effectiveness, interpersonal connection, and performance as face-to-face teams given enough time.

In sum, most theories acknowledge the difficulties that humans face with computer-mediated communication. Nonetheless, all but the earliest theories argue that given enough time to adapt to the technology and the team, virtual communication can reach parity with face-to-face communication. The empirical research on trust and reciprocity provides some insights into whether these theories may be correct and how virtual adaptation can be enhanced through different variables such as leadership and communicative context.

Trust and Reciprocity in Virtual Teams

Member identification or a sense of belonging is associated with group productivity, as it reduces uncertainty resulting from the need for compliance, motivation, and satisfaction (Fiol and O'Connor 2005). Organizational identification is associated with affiliation and work-based social support; it can build a sense of communion and belonging or connectedness with an organization and may be more easily built in face-to-face situations (Wiesenfeld, Raghuram, and Garud 2001). In virtual teams, organizational identification is an influential factor in employee behavior, as it may balance the loss of characteristics provided by traditional settings and aid in cooperation, coordination, motivation, and longevity of effort (Wiesenfeld, Raghuram, and Garud 2001).

The process through which members of an organization learn behaviors, norms, and the information particular to that organization is called socialization and it is an important contributor to collaboration and team performance (Oshri, Kotlarsky, and Willcocks 2007). Socialization is particularly important to virtual teams, their effectiveness, and their employee retentions as new technologies are introduced, and as norms may need to be continually reacquired throughout the life of the team (Oshri, Kotlarsky, and Willcocks 2007). Introductory face-to-face meetings as well as continued face-to-face meetings throughout a virtual team's life span can aid in the development of socialization, yet these types of meetings do not suffice on their own and socialization efforts through videoconferencing, management intervention, and ongoing renewal and reinvention of collaboration are vital to supporting a virtual team (Oshri, Kotlarsky, and Willcocks 2007).

The development of trust among members of a team is an important contributor to virtual team effectiveness and member identification, as trust builds social capital and encourages knowledge sharing, positive collaboration, and coordination (Hill et al. 2009; Kanawattanachai and Yoo 2002; Rico et al. 2009; Rosen, Furst, and Blackburn 2007; Zornoza, Orengo, and Penarroja 2009). A dearth of trust is a barrier to knowledge sharing and is an added cost for virtual teams, as members cannot visually see reactions and may therefore be cautious about appearing incompetent in seeking information (Newell, David, and Chand 2007; Rosen, Furst, and Blackburn 2007; Wilson, Straus, and McEvily 2006). Virtual team performance is contingent on the development and maintenance of trust throughout the project's life (Kanawattanachai and Yoo 2002).

Trust also stems from an individual's perceptions of others' competence, reliability, integrity, and willingness to authentically help beyond the desire for personal gain (Jarvenpaa, Knoll, and Leidner 1998; Kanawattanachai and Yoo 2002). Trust about the competency and reliability of other members as well as trust built from emotional ties is more difficult to develop in virtual teams than face-to-face teams (Zornoza, Orengo, and Penarroja 2009). When perceptions about obligations and their fulfillment are incongruent among team members, trust declines (Piccoli and Ives 2003). Although face-to-face teams may originally begin with higher levels of trust, trust in virtual teams can develop over time and match that of face-to-face teams, though it may take longer (Wilson, Straus, and McEvily 2006).

Trust builds and develops within teams and can be characterized as social or task-oriented. Task-oriented trust refers to

the level of trust among team members concerning the ability to complete tasks while social trust deals with relationship bonds (Jarvenpaa and Leidner 1999; Rico et al. 2009). For virtual teams, task-oriented communication is more important in building trust than social-oriented communication at the beginning of a project, and as the project continues, predictable communication and increasing task interdependence are vital for maintaining trust (Hart and McLeod 2003; Rico et al. 2009).

Positive perceptions of others can strengthen task-oriented communication and, therefore, good specialists should be chosen for teams (Rico et al. 2009). Task interdependence can be strengthened through training and shifting tasks (Rico et al. 2009). In competitive environments, organizational practices that promote collaboration and organizational accomplishments are important (Hill et al. 2009). To mitigate trust decline arising from incongruent expectations among team members, team leaders can ensure that all members contribute (Piccoli and Ives 2003).

Recent studies suggest that there is not a significant relationship between a group trust climate in virtual teams and their performance (Benoit and Kelsey 2003; Zornoza, Orengo, and Penarroja 2009). However, a group trust climate may increase satisfaction and cohesion on the team itself (Zornoza, Orengo, and Penarroja 2009).

Conflict

Distance and differences among members of virtual teams can also lead to miscommunication and conflict. Conflict can have detrimental effects on performance, satisfaction, and commitment and virtual teams may be more vulnerable to conflict than face-to-face teams due to weaker interpersonal ties, inadequate information sharing, and contextual differences (Hinds and Bailey 2003; Hinds and Mortensen 2005; Mortensen and Hinds 2001). Conflict can go unidentified for longer periods of time in virtual groups than in face-to-face teams, which can result in delayed projects (Armstrong and Cole 2002). When virtual members work with on-site members, conflict can be exacerbated as those who are not on-site might feel they are being left out of important decision-making processes or are not being fully included in meetings (Armstrong and Cole 2002).

More specifically, conflict can be categorized into two types: interpersonal and task type (Hinds and Mortensen 2005). Interpersonal conflict refers to differences in personalities and perceived personal contradictions inciting anger and distrust. Task conflict arises from differences in perceptions on what work needs to be done and how. Some evidence shows that virtual teams experience more task conflict than face-to-face teams (Hinds and Mortensen 2005; Mortensen and Hinds 2001). This can lead to interpersonal conflict, of which virtual teams may experience higher levels than face-to-face teams. However, over time, relationships between team members can strengthen (Mortensen and Hinds 2001).

It is not conclusive that either type of conflict, interpersonal or task type, affects performance levels of virtual teams more so than collocated teams (Hinds and Mortensen 2005). The degree of ''virtualness'' of communication among teams does not necessarily engender more conflict; in fact, technology-mediated communication has the potential to reduce team conflict through positive adaptation (Wakefield, Leidner, and Garrison 2008). However, though this need not be the case, interpersonal conflict or members' lack of personal understandings of each other through culture and norms remains a challenge to virtual teams (Wakefield, Leidner, and Garrison 2008). Spontaneous communication, or informal, unplanned communication, moderates both types of conflicts for both types of groups (Hinds and Mortensen 2005). Spontaneous communication can be encouraged in virtual groups through instant messaging or e-mailing.

Leadership

Team leaders serve a useful role in mitigating conflict, engendering trust, and ensuring success in a virtual team (Armstrong and Cole 2002; Furst et al. 2004; Wakefield, Leidner, and Garrison 2008). Management of virtual teams is challenging as they are susceptible to role uncertainty and conflict (Bell and Kozlowski 2002). Virtual teams may require different types of leadership styles than those needed for face-to-face teams as virtual team leaders may have a more limited amount of resources at their disposal (Kayworth, Leidner, and Mora-Tavarez 2002).

Research suggests that leaders equipped with a larger set of roles than a traditional leader—for example, as a monitor, facilitator, mentor, and coordinator—and who have the ability to assume these roles simultaneously, can better manage virtual teams (Kayworth, Leidner, and Mora-Tavarez 2002; Wakefield, Leidner, and Garrison 2008). Effective leaders of virtual teams have been shown to posses the ability to mentor and empathize with other members while maintaining authority in a flexible manner (Kayworth, Leidner, and Mora-Tavarez 2002). While these same attributes may be useful in terms of leadership of collocated teams, the difference between leaders in virtual teams as opposed to face-to-face teams may lie in the aptitude of the leader to project these attributes in an electronic forum (Kayworth, Leidner, and Mora-Tavarez 2002).

To harness the collective expertise of a team, leaders play a crucial role. They should promote a vision and clearly define what they expect each member to contribute (Purvanova and Bono 2009; Rosen, Furst, and Blackburn 2007). Transformational leadership that incorporates devotion, loyalty, inspirational motivation, intellectual stimulation, and personalized attention has stronger positive effects on computer-mediated communication teams, in turn engendering higher levels of performance (Purvanova and Bono 2009). Transformational leadership has a more potent influence on outputs of virtual teams compared with face-to-face teams as its harnesses a hybridization of roles (Purvanova and Bono 2009).

Team leaders should address problems of cultural differences directly and lead with a highly structured, organized, and focused agenda (Armstrong and Cole 2002). Consistent, organized, and prompt communication that is goal-oriented is also

effective leadership on virtual teams (Kayworth, Leidner, and Mora-Tavarez 2002).

Conclusions for Planning

Currently, face-to-face communication is a superior method of communication for many business and organizational-related activities. Distance matters and it will most likely always matter. Research is not currently in a state where we can assess whether face-to-face communication will be driven back or reduced by the convenience of computer-mediated communication. Yet, computer-mediated communication is still expected to play a larger role than it currently does in business, learning, and collaborative environments and in the way we travel for and structure work. Given the rate at which technology changes and younger workers' acculturation within a culture of computer-mediated communication through texting and other means, the consequences of digital technologies on urban and regional form may be still forthcoming and much greater than has manifested so far.

If planners endeavor to use computer-mediated communication both as a means for interacting about plans and as a means to influence the overall amount of travel, planners need a more comprehensive understanding of the human barriers to its use such as organizational culture, individual/social culture, training methods, design, perceptions, context, structure of teams, leadership, time and age, to name a few, is necessary. It is also important that planners and others understand the advantages and limitations of computer-mediated communication. Current technological constraints will likely improve as long as there is a market for them and it behooves research and practice to be ready to harness new technologies for gains both in the practice of planning and in the way people demand mobility.

Multiple lessons can be drawn from the preliminary research on virtual teams:

- Virtual collaboration may lead to more focused and comprehensive decisions.
- Face-to-face interaction is associated with higher levels of satisfaction.
- Perceptions, skills, and attitudes toward technologies affect their richness of communication but these perceptions may change over time.
- A set of media may be more effective than use of only one medium.
- Visual identification is important and video devices should be used strategically.
- Virtual collaboration is more susceptible to issues of trust but trust can be generated over time through careful measures.
- Leaders are key to ensuring effective virtual communication and collaboration. They should be chosen on the basis of their potential for transformational leadership.
- Time may be the most important variable in ensuring quality during virtual communication. Digital technology does not appear to absolve any actor in collaborative process from the work, energy, and time it takes to build relationships that work over the long term.

A better understanding of how face-to-face and computer-mediated communication currently operate can help planners to understand how the goals of collaborative and communicative planning, which are dominating paradigms within the planning field, can be met in an increasingly globalizing society, and one in which different generations of stakeholders may interact differently with technology. As little research as there is on technology, communication, and planning, planning agencies are readily adopting new media platforms and technology for communicating with multiple planning audiences, through outlets such as Twitter, Facebook, and webinars as well as more prosaic online methods such as Web pages and blogs. Many planning agencies are striving for a virtual "presence" with very little research to back them up on what this presence conveys, how effectively it conveys it, or what it enables among different actors within planning processes.

Communicative and collaborative planning theories have emerged to work within society's changing social networks and distribution of knowledge. They also seek to acknowledge how power and influence shape the ways in which we communicate and construct knowledge. However, we know little about how those theories of communication apply—or do not—to planning communication via digital technologies. The research field is open for significant contributions in this area.

The implications for how trust and power form or dissolve among heterogeneous planning publics via digital communication also offer a potential area for new research. Planning is ultimately entrenched in a complex system of social relations revolving around a socially constructed knowledge of shared actions and feelings whose medium is discourse through language (Healey 1997; Sager 1994). We form and transform both culture and structures through collaborative and reciprocal communication that is moderated by trust (Healey 1997). In this context, planning can be seen as a method of communication whose aims are to organize knowledge in such a way that it can form the foundation for collective decision making (Sager 1994).

Conflict within digital communication and group dynamics may be another potential pitfall of interactive, digital communication between planners and those they attempt to engage. Policy-driven planning reflects the tensions surrounding shared, public space and effective policy which is efficient, accounts for all stakeholders and shares ownership among them (Healey 1997). Inevitably, these processes are susceptible to conflict rendering future collective preferences uncertain. Poor communication, fact and data hiding, suspicions, hostility, and exploitation can lead to unproductive interactions (Sager 1994), and the preliminary research from virtual teams suggest that digital technologies can worsen or ameliorate these types of communication failures.

Effective and equitable policy-driven planning, as well as inclusionary argumentation, are supported by collaborative consensus building through the incorporation of a host of

stakeholders, avoidance of positional bargaining as defined in *Getting to Yes* (Fisher and Ury 1983), accessible information, and a dialogue in which all participants have the opportunity to participate (Innes 2004; Sager 1994). As contradictory as it sounds, digital technologies may push communication toward more positive outcomes regarding conflict for the same reasons it can heighten conflict: by increasing the number and potential diversity of voices heard and changing the traditional power dynamics within groups. Much depends on the type of communication being undertaken and on the medium chosen.

Just so, Habermas's conceptualization of communicative action centers on the notion that debate, dialogue, and interaction allow us to validate claims, identify priorities, and reach consensual decisions. Power distorts communication, but awareness of these distortions can lead to transformation via emancipation (Littlejohn and Foss 2005). More equitable decision-making processes can be attained through the collective interpretation of empowered participants. To achieve empowerment, traditional power structures must be transcended and structures of knowledge reorganized. When traditional power structures are not present, power inequalities can be resolved and all stakeholders have equal opportunities to participate and present arguments (Sager 1994). This line of theory reinforces the findings about the significance of leadership in virtual teams work not in a hierarchical or chain-of-command sense but for the effectiveness of leadership that facilitates interaction, fosters engagement, and disseminates information.

New technologies have the ability to bring together multiple publics while making the integration of newcomers comfortable through the provision of a shared set of values or information and ideas that help groups form identities (McQuail 2000). New media can bolster social cohesion by bringing together a differentiated and large-scale modern society through interactive communication and access to unlimited information that is not readily available via channels of mass media or the "immediate physical environment" (McQuail 2000). Computer-mediated communication can in theory allow all individuals to express views and participate in fluid dynamic platforms of feedback and negotiation while giving all participants access to highly differentiated information, positions, and opinions.

However, if culture tempers how, when, and why technology is used in communication, differences by social group remain relevant to the discussion. Planners must also consider how accessible communication technologies are to different populations. The widely touted "Digital Divide" may be much less discussed in mainstream media now that it was a decade ago, but differences most likely remain among resource-poor groups who may be most affected by planning activities and new projects. Simply having the materials of digital communication, such as the computer, may not mediate a skills-deficit individual in knowing how to use it.

How and why individuals use digital technologies to interact and collaborate, and how this form of communication differs in efficiency from face-to-face communication, is not yet well-understood, as there exist lacunae and contradictions in the body of evidence presented here. There are multiple and significant new directions for planners interested in communicative action and research on new technologies promises a big payoff for planning practice so that it may more effectively use emerging technologies to enhance city life (i.e., through telecommuting/teleconferencing) or to enhance knowledge formed and shared in planning.

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