Information and Communication Technology Use in Organizations

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Researchers first began to seriously study technology use in organizations in the late 1950s and early 1960s. Since that time, two dominant streams of research have emerged. The first has focused on the relationship between technology use and an organization's formal and informal structure. The second has focused on how use of a newly implemented information and communication technology shapes the way people communicate with one another within and across organizations. Over the years, the directions of both streams have flowed back and forth like a pendulum.

Technology and Organizational Structure

The pendulum of research on technology use and organizational structure has swung between the opposing philosophical poles of technological determinism and social constructivism. Technological determinism is the belief that the introduction of certain types of technologies (typically manufacturing or operational systems) directly causes certain kinds of outcomes, such as the centralization of an organization's decision making or the widening of its span of control. Early examples include Thompson and Bates's (1957) essays on the role of technology in the mechanization of work, Woodward's (1958) research into manufacturing and production organizations, and Perrow's (1967) examination of the administrative structure of U.S. hospitals.

By the 1980s, scholars who studied the relationship between technological and organizational change largely eschewed notions of technological determinism in favor of the philosophical stance of social constructivism. Social constructivism holds that both the meanings of and outcomes involving technology are shaped or mediated by the social contexts and interactions into which the new technology is implemented. For example, Johnson and Rice's

(1987) study of the implementation of stand-alone word processing revealed that managers' initial agendas about, and the extent to which supervisors pro-actively shaped the uses and reinvention of, the systems lead to significantly different structuring and outcomes of word processing.

Since the early 2000s, the pendulum seems to oscillate somewhere in the middle. A new stream of research, somewhat similar to the earlier position of socio-technical systems analysis (Hirschheim, 1986), focuses on the *materiality* of technologies. This approach argues that although organizational users can exercise considerable discretion in choosing how the technology will affect their work, the artifact's functional properties do place some constraints on and offer particular opportunities for social action (Leonardi, 2009; Orlikowski, 2007).

Technology and Communication

During this same time period, research on the relationship between information and communication technology use and communication occurring within and across organizations also followed pendulum-like swings. From the 1960s to the mid-1980s, numerous studies suggested technologically deterministic views about the relationship between technology use and effective communication. These studies suggested that certain types of information and communicative needs required particular kinds of media if they were to be effective (Daft & Lengel, 1986; Short, Williams, & Christie, 1976). By the late 1980s and early 1990s the pendulum swung toward the constructivist pole as studies showed how choices about what technologies to use for which communication activities were often the products of social negotiations and influence, and subject to socially defined rubrics (DeSanctis & Poole, 1994; Fulk, Schmitz, & Steinfield, 1987; Rice, 1999). Since the early 2000s, the pendulum characterizing the movement of this research stream has also been oscillating around a middle

position. During the last decade, many researchers have shown that different communication technologies provide different capabilities for communication, and that the value of these capabilities as they relate to communication effectiveness is a social construct (Leonardi, 2007; Rice & Gattiker, 2001).

Merging the Two Theoretical Visions

As these two research programs have begun to find a balance between the extreme perspectives that have forged their histories, they have also come to take on many similarities. For example, one similarity is that both programs largely focus on the influences, implementation, use, and outcomes associated with information and communication technology (ICT). *Information and communication(s) technologies* most generally refers to the devices, applications, media, associated hardware and software that receive and distribute, process and store, retrieve and analyze, digital information, between people and machines (as information) or among people (as communication). In the organizational context, ICT refers to a broad range of computer-based digital systems from transaction and information processing to wired and wireless communication media, connected through internal intranet or external Internet and wireless networks.

It no longer makes sense to treat these two research programs (on structure and on communication) separately. Additionally, organizational researchers have begun to rely on meta-theoretical stances, such as Structuration Theory (Giddens, 1984), Critical Realism (Archer, 1995), Actor-Network Theory (Latour, 2005), and theories of the Communicative Constitution of Organizing (Ashcraft, Kuhn, & Cooren, 2009). Such approaches underscore how organizing is a process that is produced and sustained through people's routine communication with each other. Thus, separating studies of ICTs' effects on organizing from their role in facilitating

organizational communication seems unproductive. In other words, the communicative events that occur through organizational ICT use are also the building blocks of an organization's formal and informal structure (Rice & Gattiker, 2001).

Given these insights, our review of studies on ICT use in organizations over the last decade addresses three questions about ICTs and organizations: (1) What are the influences on ICT adoption, use, and outcomes? (2) Through what contexts and processes do ICTs occasion change, at various levels of analysis? (3) What outcomes are associated with ICT adoption and use? We then ask: (4) How do the three social science disciplines of Communication, Information Systems, and Management compare in their treatment of these questions?

We begin by summarizing the method by which we identified the major themes and general phases represented in our sample of articles. The subsequent section synthesizes empirical findings from these disciplines to show how they have answered the first three questions. The following section examines the fourth question, by describing differences and similarities among the three disciplines in themes, theories, and method. The final section considers the intersection of these three fields to ask what researchers in general, and communication scholars in particular, might begin to explore about ICT use in organizations.

Analysis and Framework for Understanding ICT Use in Organizations

We chose major journals in the three disciplines that have the greatest research attention to ICTs: Communication Studies, Information Systems, and Management. [1] We searched the online reference databases and publishers' sites for the years 2000 through August 2011, using broad search terms (*organiz** and *tech**). From an initial 444 articles, we selected those that had (1) a focus on organizations and communication, and (2) a focus on ICT use (thus not including financial investment strategies in technology, manufacturing, e-commerce, information systems

security issues, or references to technology firms in general), but (3) were neither specifically methodological nor pedagogical, or (4) were not focused specifically on systems design and evaluation issues, or (5) were not industry-level studies where organizations were merely represented as variables. This process narrowed the set to 202 relevant articles: 38 from Communication, 101 from Information Systems, and 63 from Management. Next, we iteratively read, discussed, and grouped the titles, abstracts, and articles based on their empirical findings, theoretical directions, and research approaches. That is, we did not apply a pre-existing typology of research topics.

Thirteen general themes emerged from this process. *Influences* range from intentions and attitudes to emotions, norms and power. *Technology* encompasses the various forms of ICT. *Levels* include *individual* (employee, role), *group* (team, network), *organization*, and *societal* (community, organizational environment). *Structure* concerns issues of boundary, space and time. *Process* covers design, implementation, adoption, and changes. *Interaction* emphasizes communicative processes, such as collaboration, discourse, and social relations. *Problems* vary from resistance to disruptions. *Knowledge* represents topics such as expertise and learning. *Outcomes* incorporate adoption, use, and adaptation of ICT and associated changes. *Research* is the method used (quantitative, qualitative) or type of article (review, theory). Table 1 lists the most frequent words from article titles that reflect each of these themes. Each article included one or more themes; for example, six articles had only one theme, 32 articles had six themes, and two articles had 11 themes.

INSERT TABLE 1 ABOUT HERE

We then iteratively discussed how these 13 themes might relate to each other. We did so within a general framework consisting of the influences on ICT use, the contexts and processes in

which people use them, and the outcomes with which they are associated. Figure 1 portrays these three phases, how we felt the themes were positioned within and across them, and the percentage representation of themes overall and by the three disciplines (C=Communication, I=Information Systems, and M=Management). The arrangement of each theme's box in the Figure implies, based on the vertical dotted lines, how they overlap in phases. For example, analyses of social interaction occurred primarily within the contexts/processes phase, while issues involving levels occurred in all three phases. This initial framework also suggests that the level, structure and process themes may moderate or mediate relationships among the three phases. For example, the relationship between the kind of technology and knowledge sharing may vary based on the level of communication. Thus, the framework represents a general model of causal relationships among the themes across the phases within the analyzed articles.

INSERT FIGURE 1 ABOUT HERE

Research on Influences, Processes, and Outcomes across Disciplines

This section explores answers to our three main research questions. First, we discuss what factors influence the adoption, use and subsequent outcomes associated with the introduction of new ICTs in organizations. Our analysis highlights various phenomena that shape people's reactions to a new technology. We then turn our focus toward an explanation of the contexts in, and processes through, which ICTs occasion organizational change. These processes may vary depending upon the level at which social action takes place. The third section highlights types of outcomes associated with the adoption and use of ICTs within organizations.

Influences: What Factors Shape ICT Adoption, Use, and Outcomes?

Conceptualization of and influences on adoption. A major research tradition of ICT is *adoption*, particularly exploring the evolution of the technology acceptance model (TAM;

Venkatesh, Davis, & Morris, 2007). This model incorporates four influences (performance expectancy, effort expectancy, social influence, and facilitating conditions) on behavioral intentions, which then affect technology use. Moreover, these relationships are moderated by gender, age, experience, and voluntariness of use and have demonstrated strong validity, reliability, and predictive power.

Another central theoretical approach to influences on ICT adoption is examining it as a *socially-situated process*. That is, the adoption and use of organizational ICTs are not solely individual decisions, nor determined necessarily by objective or even perceived characteristics. Influences may come from individual (e.g., innovativeness and self-efficacy), social (e.g., influence), and institutional (e.g., top management commitment) contexts (Lewis, Agarwal, & Sambamurthy, 2003), via central or peripheral cognitive processing routes (Bhattacherjee & Sanford, 2006).

Intra-organizational norms and agendas. Social influence and norms may come from a variety of sources, may be supportive or resistant, and may have both intended and unintended consequences. In the case of one organization's IT planning, three influences played a major role: the company's business process re-engineering, the consultant, and the organization's business environment. These three converged in the development of new rules and norms about crucial aspects and relevant stakeholders that limited the consideration of alternatives because of detrimental results (Tillquist, 2002). Opinion seekers may have greater influence on one's attitudes about an ICT than opinion leaders because of the implied status conferral (Vishwanath, 2006). Moreover, the influence of number of opinion seekers on attitudes may be moderated by the degree of cohesiveness of the group – indicating internalization of attitudes rather than compliance with the group norm. One department's positive rationales for adoption of an ICT (or technology

concept) may be rejected by other departments within the same organization, what Leonardi (2011a) calls *innovation blindness*. But both this rejection and the diffusion of technology across organizational boundaries may reflect an over-time, reciprocal influence process. Ongoing usage is also likely to alter one's beliefs and attitudes and affect the nature of subsequent use (Bhattacherjee & Premkumar, 2004).

Johnson and Rice (1987) analyzed how initial *agenda-setting* (framing of the problem and potential solutions) in an organizations' adoption process influenced the failure or successful integration of stand-alone word processing. Messages about a potential ICT, which are particularly influential during early stages of adoption, can re*frame* salient attributes of a technology, thereby helping to constrain and organize the innovation's meaning. Vishwanath's (2009) experiment revealed how social influence frames affected how important particular attributes and expectations about an ICT were, which in turn affected adoption decisions. Positive framing, then, can generate unrealistic expectations and lead to rejection or later disadoption. The strongest effect occurred when the frame presented negative social information about the innovation. Similar to agenda-setting and framing, influences may also consist of *metaphors* about the hazards or success of technologies (such as silver bullets, or the inherent uniqueness of every innovation and its context) (Ramiller, 2001; see also Hiemstra, 1983).

Emotions. The influence of emotions on adoption, use and outcomes are under-analyzed. TAM could be extended to include emotional and psychological aspects of use and users (such as temporal dissociation, focused immersion, heightened enjoyment, control, curiosity, playfulness and innovativeness) as factors that affect perceived ease of use and usefulness (Ahuja & Thatcher, 2005), thus increasing the likelihood of adopting an ICT. de Guinea and Markus (2009) believe that emotion, consensus, and automatic behavior may be more important than traditional concepts

in explaining ongoing use. Other influential emotions include challenge, achievement, loss and deterrence (Beaudray & Pinsonneault, 2010), or cognitive absorption (consisting of temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity) (Agarwal & Karahanna, 2000).

Power. Power affects communication, meaning, and decisions about the use of new ICTs (Avgerou & McGrath, 2007), whether at the governmental, organizational, managerial, vendor, IT culture, or user level. Jasperson, Carte, Saunders, Butler, Croes, and Zeng's review (2002; see especially Table 6) concluded that analyses that focus on technology, or focus on power, and the interactions between these two lenses, differentially emphasize the development, deployment, management, use and impact of organizational ICTs. Ball and Wilson's (2000) analysis of interpretive repertoires revealed that both individual and institutional discourses about a computer-based performance monitoring system engaged power in different but interlinked ways.

Organizational culture. An organization's *culture* is both a direct and moderating influence on ICT adoption and implementation (Harrington & Guimaraes, 2005). The term *culture* generally refers to "specific norms, values, assumptions, and social structures that shape members' beliefs and behaviors within these organizations" (Gallivan & Srite, 2005, p. 299). One cultural characteristic specifically related to new ICTs (and much studied) is *absorptive capacity*, the "organization's ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (p. 39).

Understanding cultural influences is especially salient with increased corporate mergers, globalization, and standardization of business practices. Organizational culture research needs to be integrated into ICT research, which Gallivan and Srite (2005) attempt to do through social identity theory. This theory argues that individuals have both personal identities and social

identities. Indeed, they may have membership in multiple social identities, including organizational and national cultures. These identities are associated with categorization, identification with certain groups, and social comparison (of in-groups and out-groups) processes. Each of these identities can influence attitudes toward and ways of adopting and using ICTs (e.g., relevant regulations, mediated trust, support for reinvention, gender roles). For example, cultures with high respect for authority are likely to adopt an ICT more readily, but with less reinvention (Al-Shohaib et al., 2010). Leidner and Kayworth (2006) integrate IT and cross-cultural research to develop a *theory of IT-culture conflict* at organizational and national levels. This theory highlights the importance of fit between value orientations of the potential users, and values embedded in the IT. Developing a match between organizational and national culture and IT values reduces conflict and thus increases adoption and use of new technology.

Institutional forces. Organizations may also be influenced by *other organizations*, especially if the focal organizations perceive themselves as leaders, scan the environment, and emulate other leaders (Teo, Wei, & Benbasat, 2003; Zorn, Flanagin, & Shoham, 2011). Organizations may also learn about an ICT concept through consultants, the press and industry discourse, other firms, industrial infrastructure, etc. (Wang, 2009).

Materiality. The physical and digital properties of ICTs may also influence the way people adopt and use them. *Materiality* refers to the arrangement of an artifact's physical and/or digital materials into particular forms that endure across differences in place. Use of the adjective *material* is chosen to remind readers that there are some aspects of the technology that are intrinsic to it and not part of the social context in which the technology was used.

Orlikowski, (2000, p. 406), for example, wrote that software for groupware embodies "particular symbol and material properties," such as features contained in a program's menus.

Leonardi (2007, p. 816) documented use of a help-desk queuing software by IT technicians and argued that its "material features" made possible activities such as assigning jobs or documenting what one did to solve a particular use problem. Thus, the materiality of an ICT, by virtue of providing capabilities to do some things and by making others difficult, can shape the way that people decide to adopt and use it (Jonsson, Holmström, & Lyytinen, 2009; Wagner, Newell, & Piccoli, 2010).

In turn, other scholars argue that the materiality of a technology is so thoroughly shaped by social processes, and is always interpreted and used in the context of social interaction, that it makes most sense to describe people's organizational activities with a new ICT as *sociomaterial* (Orlikowski, 2007). Within this emerging perspective, scholars have set forth two arguments for how to study the relationship between the social and the material. The first suggests that researchers should refrain from treating activities of technology development and use as "special cases" of the organizing process and instead should examine what the material characteristics of a technology do once they have become "constitutively entangled" in organizational life. Thus, Orlikowski and Scott (2008) urge researchers to move away from studying development, implementation, and initial use and instead study technologies already incorporated in people's routine practices. The second argument takes a different approach, by insisting that such activities mark a time when an existing sociomaterial fabric is disturbed, offering researchers an opportunity to "see" more clearly how the social and the material become constitutively entangled (Leonardi & Barley, 2008, 2010). This claim means that, in addition to studying social processes, researchers should attend to what a technology lets developers, implementers, and users do, what it does not let them do, and how people work around these constraints (Rice & Cooper, 2010; Rice & Schneider, 2006).

Processes: How do ICTs Occasion Change at Different Levels of Analysis?

Technology and organization researchers have explored ICT adoption, implementation, and use in a variety of contexts and processes. As indicated in Figure 1, we identify nine major processes of organizational ICTs: four primary levels of analysis (individual, group, organizational, and societal), organizational structure (Leonardi & Bailey, 2008), process (Sykes, Venkaetsh, & Gosain, 2009), problems (Flanagin, 2000; Rice & Cooper, 2010; Rice & Schneider, 2006), social interaction (Sherif & Menon, 2004), and knowledge (Vaast & Walsham, 2005).

Individual level. Individuals' decisions to use ICTs are shaped by many personal factors, such as competence at using the technology's features (Vaast, 2007), familiarity with professional and organizational communication genres (Rains & Young, 2006), impression management goals (Leonardi, Treem, & Jackson, 2010), need for productivity (Fulk et al., 2004), and internal motivation (Woiceshyn, 2000).

Most research implicitly assumes that individuals use only one ICT when communicating with others, but Stephens (2007) and her colleagues show that people use *ICTs in sequence* when they are preparing for meetings, performing daily tasks, or following up to persuade (Stephens et al., 2008). When people need to follow up on initial communication episodes, the overall groupings of ICTs represent two underlying attributes: degree of connection with others and extent of synchronicity. These ICT sequences can expand cues and channels and provide error-reducing redundancy for equivocal and uncertain tasks.

Researchers also focus on *emotions* surrounding the use of a new ICT. McGrath (2006) for example, found that strong emotional reactions to a new technology often led to innovations in use. Indeed, people's emotions may be stronger predictors of continued ICT use in organizations than most rational-oriented models of planned behavior and reasoned action would propose (Ortiz de

Guinea & Markus, 2009). Rennecker and Godwin (2005) showed that ICTs that disrupted and interrupted people's work often resulted in delays, which caused users to become frustrated with and often abandon their new tools. Ragu-Nathan, Tarafdar, Ragu-Nathan and Tu (2008) introduced the concept of *technostress* – stress experienced by end users of technologies in organizations, which was associated with decreased job satisfaction and organizational commitment. Beaudry and Pinsonneault (2010) found that users choose different coping strategies when adjusting to a newly implemented technology, based on whether they feel they have control over their situation or not.

Individual *perceptions and motivations* obviously affect ICT adoption and use. One's perception of perceived switching costs (time, effort, and uncertainty associated with changing to a new ICT), generated from their own experimentation with the ICT, also helps explain continued use or rejection (Kim & Kankanhalli, 2009). Gender may influence what an individual focuses on when they perceive or assess a new ICT. For example, men's technology decisions were more strongly influenced by their perceptions of its usefulness (Venkatesh & Morris, 2003), while women were more strongly influenced by perceptions of ease of use and subjective norms circulating in an organization. Research in the 1990s focused heavily on the extent to which *social influence* from one's peers influenced adoption (e.g., Fulk et al., 1990; Kraut, Rice, Cool, & Fish, 1998; Rice & Aydin, 1991). Although social influence remains important, in the last decade scholars have begun to explore the impact of organizational environment on an individual's perceptions of a new ICT's usefulness. Jeyaraj and Sabherwal (2008) noted that when individuals developed perceptions of an ICT's usefulness by matching their perceptions of the technology's capabilities to the needs of the organization, writ large, they were more likely to adopt the innovation fully than when they let themselves be influenced by the opinions of their coworkers. Similarly, Leonardi (2009) showed that individuals spent a good deal of time alone with the newly

implemented ICT, testing its features and matching emerging perceptions of utility to information about the ICT provided by the organization. Alignment between their perceptions and the information explained continued system use or abandonment.

Group level. Newly implemented ICTs may bring individuals into contact with other employees who do not normally interact with one another, such as organizational units that obtain and provide different kinds of information (Aydin & Rice, 1992). Virtual teams are common contexts for *new interactions* of this type (Jones, Ravid, & Rafaeli, 2004; Kirkman, Rosen, Tesluk, & Gibson, 2004; Maznevski & Chudoba, 2000; Timmerman & Scott, 2006). So are co-located, cross-functional or multi-divisional teams (Butler, 2001; Black, Carlile, & Repenning, 2004). Studies by Bechky (2003), Boland, Lyytinen and Yoo (2007), and Carlile (2004) concluded that the design and use of new ICTs were occasions in which new groups were formed from members of different occupational communities. The groups relied on the visual representations of or produced by the technologies to help them learn to speak a common language. Other studies have shown that new technologies can reduce task conflict, although team leaders may also mitigate task conflict by performing coordinator activities (Wakefield, Leidner, & Garrison, 2008).

These potential and actual group interactions, however, can also generate *obstacles to adoption* and use. In these new interaction contexts, group members often build shared meaning and translate knowledge across boundaries. Membership in multiple organizational social groups created tensions for potential adopters of data conferencing technology in a large distributed organization (Mark & Poltrock, 2004). To function effectively, all team members must adopt the ICT and use it in similar ways. Some members may face resistance from other professional, occupational, and social worlds to which they belong (Aydin & Rice, 1992). Moreover, problems of coordinating cultural differences can proliferate when new technologies bring groups of

scientists together (Walsh & Maloney, 2007). In one study, when scientists and engineers came together to collaborate on the design of a new rocket thruster, the team initially experienced significant misalignments among the organizational environment, group, and technology structures (Majchrzak et al., 2000). To resolve these misalignments and effectively share information and knowledge, the team had to modify team structure, the organizational environment, and the technology itself.

Other studies have focused on the role that particular *members play in shaping a group's use of an ICT* over time. Edmondson, Bohmer and Pisano (2001) noted that successful implementers of a new technology underwent a qualitatively different team learning process than those who were unsuccessful. Successful implementers were team leaders who used enrollment to motivate the team, designed preparatory practice sessions and early trials to create psychological safety and encourage new behaviors, and promoted shared meaning and process improvement through reflective practices. A team's existing informal communication network can moderate the effects that technologies have on information sharing and knowledge transfer. Generally, people in a group use a new ICT to share knowledge with each other when they perceive that it enhances their professional reputations, when they have experience to share, and when they are structurally embedded in a network. Surprisingly, though, contributions often occur without expectations of reciprocal knowledge sharing from others (Heinz & Rice, 2009; Jian & Jeffres, 2006; Wasko & Faraj, 2005).

In a series of studies, Yuan and colleagues (Yuan et al., 2005; Yuan, Fulk, Monge, & Contractor, 2010) showed that perceived *team member behavior and technology-specific competence* were positively related to an individual's use of intranets for knowledge-sharing. These findings supported a socialized model of motivation to participate in organizational

information sharing through the use of collective repositories. This model suggested that management could boost levels of intranet usage through group level social influence and technology-specific training. In addition, although the relationship between directory development ("who knows what" in the group) and expertise exchange was mediated by communication tie strength and moderated by shared task interdependence, team-level variables were also significantly related to individual-level outcomes.

Organizational level. *Organizational learning* and *knowledge management* have received considerable treatment in the literature, include how ICTs may enhance both (Alavi & Leidner, 2001). Organizational variables can affect the rate and extent of organizational learning after the implementation of a new ICT (García-Morales, Matías-Reche, & Verdú-Jover, 2011). For example, prior organizational learning moderates the effects of newly implemented ICTs on organizational effectiveness (Harwood, 2011). Studies by Kane and Alavi (2007) and Nan (2011) found that ICT-based learning mechanisms enable capabilities that have a distinct effect on the exploration (finding out new knowledge) and exploitation (applying known knowledge) dynamics in the organization. Further, this effect is dependent on organizational and environmental conditions as well as on the interaction effects between technological mechanisms when used in combination with one another. The use of an ICT platform can produce online profiles of new and experimental work practices and help diffuse them within a user community (Kang, 2006).

A second related major theme at the organizational level is *organizational decision-making*. Decision-making is typically defined as the organization's ability to leverage past learning to make rational and, sometimes, optimal decisions. Harrington and Guimaraes (2005) found that an organization's *absorptive capacity* – its ability to absorb and make sense of new information given past areas of expertise – influenced the use of ICTs to improve organizational decision

making. Zorn, Flanagin, and Shoham (2011) noted that non-profit organizations that adopted and used technologies tended to be self-perceived industry leaders or ones that scanned the environment and emulated other leaders. They also tended to be spurred by institutional forces if they were characterized by self-perceived leadership and appropriate organizational resources. Such institutional forces influenced the kinds of decisions that organizations made based on use of ICTs.

Societal level. At the societal level, some research has addressed the relationship between *popular discourse about ICTs* circulating in history or popular culture and strategies organizational actors take to control work with new tools. For example, non-governmental organizations often appropriate technology discourse that is popular in society (Ganesh, 2003). However, because of limited conceptualizations of what technology is and can do, such organizations often define their rural constituents as a passive market. Leonardi (2008) suggested that managers often draw on technologically deterministic discourse circulated in Western societies to promote certain organizational changes. Further, they blame other organizational changes on stereotypical notions of technological progress and remove themselves from being seen as agents of change. Wang (2009, 2010) showed that the popularity of an ICT innovation in tech culture and in popular press responds to the broad climate of business. Firms whose names were associated with ICT fashions in the press did not have higher performance, but they had better reputations and higher executive compensations. Companies who invested in ICTs that were currently in fashion also had higher reputations and executive pay than those who did not, but they had lower performance in the short term and improved performance in the long term. Thus, following fashion can legitimate organizations and their leaders, regardless of performance improvement in the short term.

Organizations may have *identities with inertial tendencies* because they are well known in society at large and reinforced by outsiders and the press (Munir & Phillips, 2005). For example, Tripsas (2009) found that in firms of this type, capitalizing on identity-challenging technologies is difficult for two reasons. First, identity serves as a filter, such that organizational members notice and interpret external stimuli in a manner consistent with the existing identity (similar to framing and agenda-setting). Second, because identity becomes intertwined with routines, procedures, and beliefs of both organizational and external constituents, explicit efforts to shift it to accommodate to the identity-challenging technology are difficult.

Outcomes: What Consequences Result from ICT Adoption and Use?

Research considers a wide variety of outcomes (i.e., consequences, implications, effects) associated with ICT adoption and use. From the more proximate to the more distal, or the more individual to the more organizational, we group them into eight outcomes: adoption/acceptance/adaptation, organizational assimilation, conflict, knowledge management, structure, organizational environment, and performance.

Adoption, acceptance, and adaptation. The primary outcomes of influences and processes, are adoption and use of the ICT. The *adoption* process includes more than just adoption or rejection (Rice, 2009; Rogers, 2003). Research also studies rejection, discontinuance, acceptance and adaptation/reinvention. Indeed, Barki, Titah and Boffo (2007) conceptualize information system user-related activity as including adoption, acceptance, and adaptation.

Acceptance includes concepts such as user satisfaction, responses, attitudes, and beliefs, and how use is integrated with or routinized into other work processes. Acceptance does not necessarily follow from initial adoption or system use. One direction of research on end-user satisfaction is to expand its theoretical explanations. Au, Ngai and Cheng (2008) apply expectation,

needs, and equity theories to argue that the ratio of inputs to needs (equitable needs fulfillment) varies across individuals; thus, the technical aspects of a new ICT alone cannot explain end user satisfaction. However, research would benefit from integrating the user satisfaction (beliefs and attitudes about using the system) with ICT acceptance (beliefs and attitudes about the system) (Wixom & Todd, 2005). Managerial frames (e.g., benefits, threats, and adjustments) may interact with organizational capabilities (technological opportunism and sophistication) to affect the use of technologies, such as business-to-business electronic markets (Mishra & Agarwal, 2010). Indeed, assimilation of technologies into organizational practice, as opposed to simple use, is necessary for integration and sharing of fragmented organizational knowledge (Purvis, Sambamurthy, & Zmud, 2001). Institutional forces play both a constraining and facilitating role in such assimilation (see also Rice & Gattiker, 2001).

Adaptation or reinvention is the process whereby users, groups and organizations modify, reinvent, appropriate, or adapt particular features or uses of a new ICT (Johnson & Rice, 1987). This is a subtle, complex, and over-time process, which may be heavily constrained by pre-existing social and organizational norms, managerial agendas, individual needs and abilities, work networks, training, and technology features. Feedback about use of technologies includes such responses as maintaining current practices, supplementing channels, expanding or learning new uses, or discontinuing use (Waldeck, Seibold, & Flanagin, 2004). The research model developed by Jasperson, Carter and Zmud (2005) explicitly proposed factors influencing *continued acceptance and adaptation*, including organizational interventions (internal and external experts, managerial support, incentives), individual learning interventions (e.g., training, experimentation with features, peers), and individual cognitions (e.g., innovation attributes, expectancies,

behavioral control, media characteristics, social influences), and differences (demographics, cognitive style, use voluntariness, organizational position).

Software and knowledge reuse are two appropriate arenas for studying ICT adaptation. For example, Sherif and Menon (2004) show, through four case studies of software reuse, that actors at various organizational levels change strategy, process and culture to enable innovative applications of the software. Further, these changes become new routines that increase an organization's absorptive capacity, thereby improving its ability to implement future innovations. Unfortunately, discrepant or misaligned events may stimulate unexpected and dysfunctional adaptations (Rice & Cooper, 2010). Leonardi's (2007) study revealed that such events led technicians to appropriate certain features of an ICT service management tool, which resulted in generating new information and knowledge management potentials, fostering different advice networks, and changing the organization's social structure.

Organizational assimilation. A few studies assess the extent to which ICTs may affect an individual's *organizational assimilation* (or socialization), that is, the extent to which newcomers learn about and adjust to the culture, values and norms of an organization. In Waldeck, Seibold and Flanagin's (2004) study, advanced technologies were second in importance only to face-to-face communication in aiding new employees' socialization. Use of workplace technologies can also shape organizational members' construals and enactments of time (such as pace, urgency, or future perspective) as elements of organizational culture (Ballard & Seibold, 2004).

Conflict. Several studies analyze how new technologies contribute to *conflict* or may be used to manage it. These conflicts may arise from the acceptance and adaptation processes of ICTs or the unexpected and undesirable problems that occur in technology use. Conflict is especially likely to arise if an ICT disrupts existing organizational structures and work processes. In the

context of software reuse, managerial interventions, such as coordination mechanisms and organizational learning practices, may reduce conflict (Sherif, Zmud, & Browne, 2006). Virtual teams may also generate conflicts due to geographical, cultural, professional, and temporal differences and dispersion (Majchrzak, et al., 2000; Wakefield, Leidner, & Garrison, 2008). Hence, virtual team leaders must use ICTs to occupy various roles for different kinds of conflict.

Knowledge management. ICTs may affect or *restructure organizational knowledge management* by changing encoding, storage, retrieval, coordination and reuse processes (Heinz & Rice, 2009). These changes in turn can improve knowledge sharing and use, improving team performance (Choi, Lee, & Yoo, 2010). Nonetheless, there is considerable doubt about the effectiveness of knowledge management systems, partially because of the crucial role of *tacit knowledge* (experiential understanding not easily transferable) that is difficult to manage through technologies. More generally, Ruey-Lin, Tsai and Ching-Fang (2006) showed that interactions among the technical, social, and innovative contexts in a semiconductor-fabrication equipment company explained problems in knowledge transfer, coordination and reuse. Closely related, communicative structures such as advice networks may be reshaped as users appropriate an ICT in response to discrepant events. In Leonardi's (2007) study of technicians in a large IT organization, appropriations generated new and different types of information. This new information became the basis for seeking and finding advice in different ways and through different organizational network members.

Structure. ICTs may provide the occasion for *changes in organizational structure*, at different levels, and in either content (e.g., discourse) or relationships (communicative or transactional) (Rice & Gattiker, 2001). Organizational-level studies have explored the validity of a number of popular hypotheses about technology's effects on organization form and function. For

example, new technologies do not always bring about the demise of hierarchy or the fixtures of authority that had historically dominated organizations (Schwarz, 2002). Hierarchy may be reshaped or reinforced, depending on management's implementation approach and non-management's responses. Although ICTs may facilitate organizational downsizing, technologies do not deterministically cause it. Adverse environmental conditions can trigger downsizing, and the role that technologies play in organizational downsizing can vary according to the change strategy (Pinsonneault & Kraemer, 2002).

Organizational environment. Two societal-level structural outcomes include the organization's *market environment*, and its *public communication space*. In the market context, ICTs can influence managerial decisions to engage in new structural relationships with other organizations (e.g., a CEO considering entering the fiber-optics product market) and levels of organizational factors (e.g., orientation toward emerging or existing technology) (Eggers & Kaplan, 2009). In the public online Usenet groups, levels of interaction and information overload shape both the content and relational structure of message and response complexity and participation duration (Jones, Ravid, & Rafaeli, 2004). Straub and Watson's review (2001) focuses on the network-enabled relationships of businesses with consumers, identifying four primary research issues: strategy, organizational design, metrics and managing IS.

Performance. Finally, a primary espoused organizational motivation for implementing ICTs is to improve *performance*, whether at the individual, group, organizational or societal level. At the individual level, IT "road warriors" suffer from family-work conflicts, overload, lack of reward fairness, and job autonomy. These factors can lead to exhaustion and turnover, which negatively affect performance (Ahuja, Chudoba, Kacmar, McKnight, & George, 2007). Thus, technology management strategies must consider these sources of stress for this type of worker. At

the group level, ICT managers may coordinate activities among their employees to improve user performance, but organizational climate (especially, attitudes about the ICT organizational function) significantly moderates that relationship (Li, Jiang, & Klein, 2003). At the organizational level, a different kind of ICT-related performance is web-based search success. In this case, web sites that provide a sense of context (i.e., cues about the organization of and one's location in the information space) reduce the use of search and help features, which in turn improves retrieval performance (Webster & Ahuja, 2006).

Disciplinary Differences in the Study of ICTs in Organizations

This section explores differences in the ways that the fields of Communication, Information Systems, and Management address the three research questions explored in the 2000-2011 period. We begin by examining different ways they approached influences, contexts and processes, and outcomes. Next, we compare the theoretical approaches they use to conceptualize organizational action within each of these phases. Finally, we highlight similarities and differences in the research focus these disciplines make in their research on ICT use in organizations.

Themes

The percentages in Figure 1 indicate the most frequent themes overall and the frequency that each discipline examines them. Overall, Technology, Process, and Levels themes occurred in more than half of the articles, followed by Research, Interaction, Outcomes, Influences, and Problems.

Influences. Researchers in the field of Information Systems focus the most on the factors that influence ICT adoption, use, and outcomes in organizational settings, while those in Management appear to be the least interested in this question. Additionally, scholars in

Communication and Information Systems spend the most time documenting and describing the ICT artifacts and systems that they study, while Management researchers focus on these features in fewer than one half of their articles (for a similar account see Orlikowski & Scott, 2008).

Contexts and processes. Information Systems researchers place most of their focus on the individual-level of analysis, while scholars in Management place the vast majority of their attention on the organizational level. Communication researchers focus mostly on the organizational level of analysis, but also have the highest percentage of articles that center on the group and societal levels.

Questions of structure and process are treated nearly equally across disciplines. However, research in Management tends to combine both structure and process more than the other two disciplines do. For example, many studies discuss how processes enacted by organizational members produce or constitute the organizational structures in which they work (Doolin, 2003; Leonardi, 2011b; Orlikowski, 2007). It is surprising that organizational communication researchers have done less integration of structure and process, insofar as Communication studies dominate the percentage of articles that focus on people's interactions about new ICTs (with much lower percentages in Information Systems and Management). This finding may be partly due to the long tradition of constitutive models of communication within the field, which hold that communication constitutes organizational structures, and the focus on relationships, network analysis, and interactions.

Outcomes. Information Systems researchers have spent more time considering the outcomes associated with ICT use in organizations than have the other two disciplines. However, in the cases in which interaction is considered an outcome, Communication researchers often

specify how ICTs affect organizational relationships. Management researchers have turned their attention to outcomes, especially change in organizational knowledge.

Theories

As articles in each discipline use the same set of theories across the three phases, the following subsections identify the theories that appear in at least two articles in any of three phases. Overall, the most frequent theories that Communication emphasizes are social interaction (social influence, social network theory, and social constructivism), and diffusion processes and attributes (diffusion of innovations, structuration and adaptive structuration, and media richness).

By far the most frequent IS theory was TAM/UTAUT, followed by the related theories of reasoned action, social cognitive theory, and theory of planned behavior, as well as expectation disconfirmation theory and information processing theory. The use of these theories indicates a strong emphasis on individual adoption and use of ICTs, as was noted under the individual level section. Some focus on groups and organizations was indicated by the use of activity, practice, and social network theories. Theories were also concerned with ICT and organizational characteristics, such as materiality, task-technology fit, and absorptive capacity. Finally, organization-level theories included institutional theory, social shaping of technology, and structuration theory.

In Management articles, structuration is the most frequently applied theory, followed by institutional theory. All other theories occurring more than once in Management focus on the firm (knowledge-based theory of the firm, transaction cost economics), innovation processes (organizational learning, exploration/exploitation), emergent processes (collective action), and meta-theoretical approaches (critical realist perspective, actor network theory). As noted, organizational level and process are the only two themes where there were proportionally more Management articles.

Interestingly, the majority of the most frequently used theories in each discipline are unique to that discipline. The only common theoretical concerns across the disciplines – i.e., theories appearing in at least two articles in at least two disciplines – included structuration theory, institutional theory, diffusion of innovations theory, and social network theory (including actor network theory).

Methods

Table 2 summarizes the extent to which articles in each of the disciplines employed qualitative, quantitative, or mixed method analyses, or were theory or review articles. Overall, qualitative and quantitative analysis methods were used about equally. Still, clear differences exist by discipline. Management articles used qualitative methods much more frequently, while Communication articles used them the least. Communication and Information Systems differed in their use of qualitative, but were equally likely to use quantitative methods. In general, Information Systems researchers are the most explicit in discussing research methods and approaches for studying the relationship between technologies and organization. Only Communication articles used mixed methods in any notable amount.

A number of studies, however, are adopting new approaches. For example, in response to calls for methodological diversity (e.g., Orlikowski & Barley, 2001), studies of technologies and organizations are employing narrative analysis (e.g., Doolin, 2003; Pentland & Feldman, 2007), interpretive analysis (e.g., Jian, 2007; Mutch, 2010), longitudinal designs (e.g., Boudreau & Robey, 2005; Leonardi, 2011b), and comparative case-based designs (e.g., Boczkowski, 2004; Edmondson et al., 2001). Some of them are using agent-based simulation models (e.g., Black, Carlile, & Repenning, 2004; Nan, 2011) and network analysis (e.g., Leonardi, 2007; Sykes, Venkatesh, & Gosain, 2009; Yuan et al., 2010) to develop and test theories about ICTs in organizational settings.

INSERT TABLE 2 ABOUT HERE

Information Systems and Management articles were equally likely to be about theory or to provide reviews, but in both cases twice as much as were Communication articles. However, review articles on ICTs in organizations appear infrequently in all three disciplines in this time period. Banker and Kauffman's (2004) review of the information systems literature resembles this chapter's focus on managerial problems, organizational levels, group communication, knowledge management, and ICT acceptance and diffusion.

Directions for Future Research at Disciplinary Intersections

This final section considers how organizational communication researchers might use ideas and concepts within the field to advance their own ICT research and to illuminate puzzles faced in other disciplines.

Emerging ICTs

Most articles published by Communication researchers in the last decade have continued the general trend of examining influences, processes, uses and outcomes of organizational ICTs, ones that enable members to communicate and share information and meaning with one another. Consequently, organizational communication researchers are drawn to technologies that represent the "C" rather than ones that represent the "I" aspect in "ICTs." Studies of communication media, such as email, teleconferencing, instant messaging, intranets, the internet, and mobile devices are common. This focus is certainly an appropriate interest given that communication messages and processes underlie the intellectual history of the field. However, students of ICT use in organizations would do well to consider the role that *new knowledge management systems* (Heinz & Rice, 2009) and *social media* tools, like social networking sites, blogs, wikis, and micro-blogs

(Treem & Leonardi, 2012), play in organizational members' communication patterns and practices. We suggest that scholars study these types of ICTs for two reasons.

First, organizations are widely adopting *knowledge management and social media tools* (see for discussion Treem & Leonardi, 2012). Indeed, one Information Systems review highlights the shift away from hierarchical and centralized information control to examining under-explored practices and arrangements (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007). One new context in particular is the rise of mass collaboration, or technology-enabled large group problem-solving, social networking, crowdsourcing and prosumers, decentralized control over digital content, and public relations/activist campaigns by non-organizational members – all of which challenge and extend the nature of organizations. The popular press is filled with descriptions of dramatic and revolutionary changes that such technologies will bring to the workplace. Organizational communication researchers should level a steady critique at such utopian and often technologically deterministic views through the use of rigorous conceptual and empirical analyses of how organizational practices shape, enmesh, and affect these new ICTs. *Nomadic information environments* are facilitated by *cloud computing* where data and even applications are accessed and shared through distributed servers outside a person's or an organization's building or ownership. These environments enable physically and socially mobile computing and communication services among intra- and inter-organizational users – ones that require both service and infrastructure development. They involve and raise issues of social and technological interdependencies and the crucial phases of design, use, adoption, and outcomes of ICTs that form a rich interdisciplinary area of research and practice (Lyytinen & Yoo, 2002).

Second, many of these new knowledge management and social media technologies *allow users to draw on the technology's materiality in ways that enact affordances useful in achieving*

group, organizational and public communication and which were previously impossible or at least difficult to achieve. For example, unlike dyadic telephone calls or email messages, communication that occurs in knowledge management and social media tools can be public and visible by (many) third parties who may not be involved in the initial communication. If someone posts a question to a coworker on a social networking site or ICT discussion forum, other organizational members who were not directly involved are aware that the two people are communication partners and can learn about their interactions, as well as contribute to them.

Content and Relations

This increased visibility of other people's communication could have important implications for interaction in the workplace. It might affect important processes such as knowledge sharing, discourse and framing, impression management, the development of expertise directories, organizational learning, socialization processes, the formation of subgroups, and ICT adaptation. For these reasons, we suggest that organizational communication researchers attend with care to new ICTs that are entering the workplace by distinguishing what capabilities they provide that may reinforce, constrain, and restructure organizational communication, in both its content (including discourse about it) and its relationships (including network structures) (Rice & Gattiker, 2001). If organizational communication researchers take seriously the notion that communication is constitutive of organizing (Putnam & Nicotera, 2010), new ICTs in the workplace should become an important research area.

Adding research about how new technologies might alter the dynamics of organizing would make it easier for communication scholars to focus on ICTs that are more "I" than they are "C" without losing sight of important communicative phenomena. For example, Aydin and Rice's (1992) over-time analysis showed how a new health information system required new kinds and

formats of information that fostered increased understanding of some other units' work. Boland et al. (2007) described how engineers, contractors and architects using new 3-D simulation technologies shifted patterns of information sharing and innovation across professions. Carlile (2004) analyzed how different engineering occupations changed their communication and decision making patterns after they began using complex computational fluid dynamic tools to create design specifications. None of these studies focused on communication that occurred through a newly implemented organizational ICT. Instead, they examined how the ICT created information that was not previously available to its users and how this information spilled-over into communication patterns that occurred around the ICT in ways that changed the organization of work (Leonardi, 2011b). Rice and Gattiker (2001; and Rice, 1987) also emphasized that ICTs can be both the channel as well as the content of organizational innovation.

Such an approach could also make room for organizational communication scholars who do not consider themselves students of technological change *per se* to engage in meaningful discussions of technologies and organizations. By removing the requirement to study only communication occurring *through* ICTs and adding the option to study communication occurring *around* ICTs, scholars who are interested in popular organizational communication topics (such as socialization, power, resistance, information processing, decision-making, discourse, culture, knowledge sharing, networks, self-presentation, etc.) would be emboldened to incorporate an understanding of technologies into the explanation of their phenomena of interest. Research of this type could add to the perspectives on sociomateriality that are emerging in Information Systems and Management (Leonardi & Barley, 2008; Orlikowski & Scott, 2008).

Knowledge Management and Sharing

A final type of question that organizational communication researchers have yet to analyze substantially concerns organizational knowledge and knowing. As this review demonstrates, the topic of knowledge is of interest to all three disciplines. But organizational communication scholars who focus on ICTs have not devoted extensive empirical analysis or theoretical development to the ways that knowledge is produced, maintained, and changed through the use of technologies. Given recent interest in this topic, especially as a capability that is enacted in the practice of and interaction about one's work (e.g., Heinz & Rice, 2009; Kuhn, this volume; Kuhn & Jackson, 2008), communication researchers have much to offer this line of work.

Conclusion

Research on ICTs and organizations in the first decade of the 21st century is broad, diverse, and inter-related within and across disciplines. This review sets forth 13 main themes in this research: influence, interaction, knowledge, level of analysis (individual, group, organization, societal), problems, process, research, structure, technology, and outcomes. These themes and their relationships within and across phases address answers to central questions about three phases of influences, contexts and processes, and outcomes. The review also notes similarities and differences in themes and research emphases across the disciplines of Communication, Information Systems, and Management. Finally, we suggest some areas particularly appropriate for organizational communication researchers to consider as they continue to unravel the complex and important relationships among influences, contexts and processes, and outcomes of information and communication technologies in organizations.

Endnotes

1. By discipline, the included journals were: Communication *(Communication Monographs; Communication Research; Human Communication Research; Journal of Applied Communication Research; Journal of Communication; Journal of Computer-Mediated Communication;* and *Management Communication Quarterly),* Information Systems *(Information and Organization; Information Systems Research; Journal of the Association for Information Systems;* and *MIS Quarterly)* and Management *(Academy of Management Journal; Academy of Management Review; Administrative Science Quarterly; Management Science; Organization; Organization Science;* and *Organization Studies)*. Please see *http://www.comm.ucsb.edu/faculty/rrice/c71RiceLeonardi2013ArticlesTheories.pdf* for the full list of analyzed articles, and a list of the theories appearing in those articles by discipline and phase.

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Table 1
Research Themes in Article Titles and Most Frequent Words Associated with Each Theme

Influence: attitude; belief *; culture *; emotion; frame; gender; habit; influence **; intention *; norm; power *; support
Interaction: collaboration *; communication **; connectivity; control *; coordination *; discourse; face; feedback; interaction *; relation; shared; social **; talking *
Knowledge: cognitive; expertise; knowledge **; learning **; memory *; transactive; understanding *
Level – individual: customer; employee, individual *; member; peer; professional; role **; self; user **
Level – group: distributed *; group **; network **; team;
Level – organization: business; corporation; firm *; management *; organization **; workplace
Level – social: commons; community; environment; global; human; public; sector; world
Problems: challenge; conflict *; disruptive; problem, resistance
Process: acquiring; action *; activity; adopt **; agency; change **; choice; construction; contribute; design; dynamic *; evolution; formation; implementation *; innovation **; managing *; organizing *; practice **; process *; task *; work **
Research: analysis *; approach; building; capturing; case *; commentary; concept *; determinant; dimension; empirical *; exploration *; extension; field; investigation; issue; longitudinal; model **; narrative; perspective **; predictor; research **; review; study **; test; theory **
Structure: boundary **; form; level; space; structure *; time **; virtual *
Technology: application; computer **; database; digital *; electronic; email; groupware; ICT **; information **; interactive; internet **; machines; media *; mediated; mobile; nomadic; online *; software; system **; technical; technology **
Outcomes: acceptance **; adaptation; assimilation; behavior; capability; effect *; impact *; outcome; overload; perceived; performance *; reuse; satisfaction; usage

Note: no asterisk = 2 to 4 occurrences; * = between and 10; ** = more than 10.

Table 2
Number and Percentage of Type of Research within Discipline, and Overall

Research type	Comm	IS	Management	Total
Qualitative	7 (19%)	30 (30%)	35 (56%)	72 (36%)
Quantitative	15 (40)	39 (38)	10 (16)	64 (32)
Mixed Method	10 (27)	4 (4)	1 (1)	15 (7)
Theory	4 (11)	22 (22)	13 (21)	40 (20)
Review	1 (3)	6 (6)	4 (6)	11 (5)

N = 202

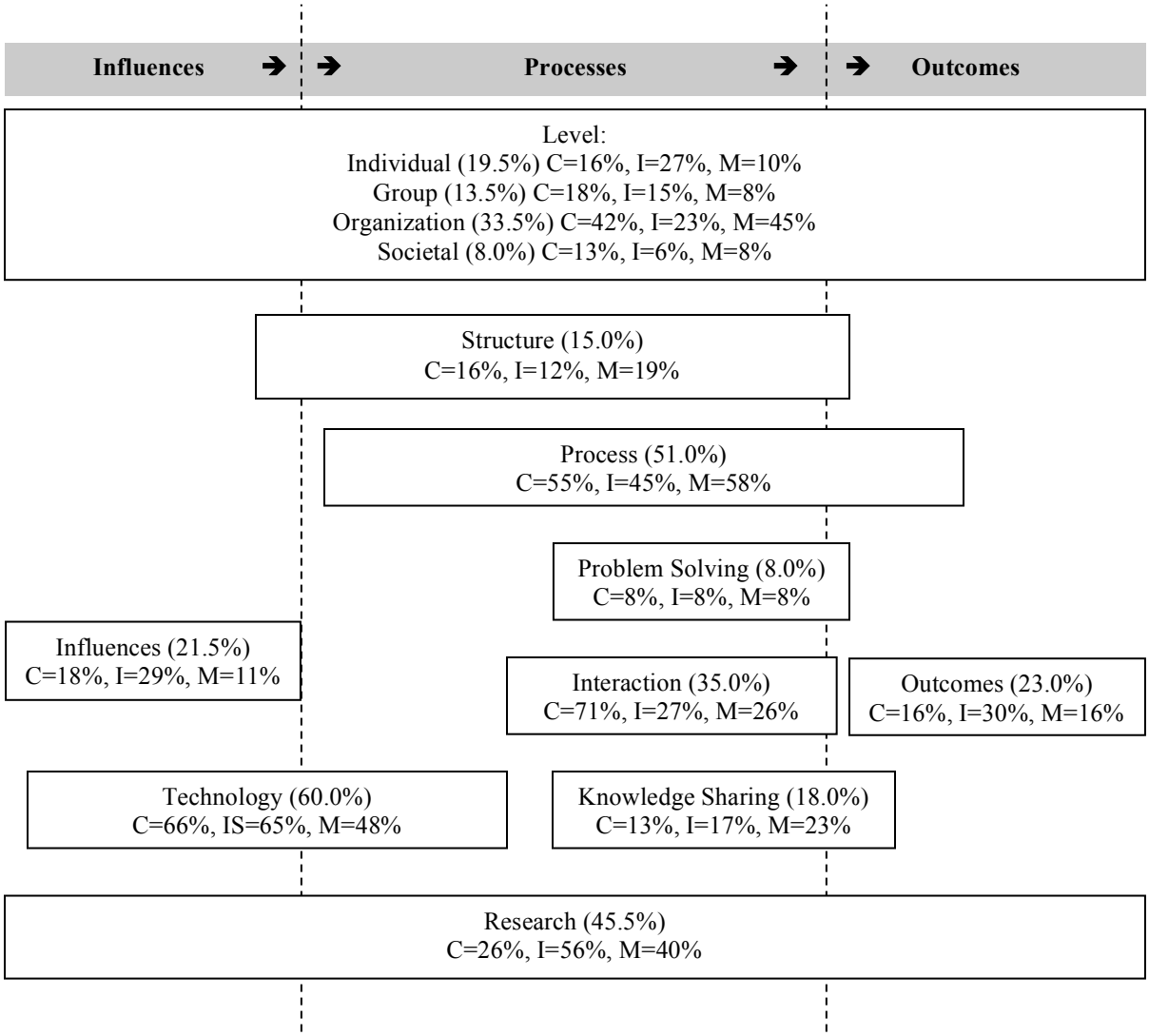

Figure 1. General framework representing relationships among themes and phases represented in articles on organizations and ICTs.

Note: The location of each theme portrays the relationships among the themes, indicating how the various themes might array along the general causal framework. Note that some themes overlap across phases. Percentages are of each theme occurring in all article titles (in parentheses), and in discipline-specific article titles (C=Communication, I=Information Systems, M=Management).