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Yide Shen
Robinson College of Business

Mike Gallivan
Robinson College of Business

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Yide Shen
CIS Department
Robinson College of Business
Georgia State University
Atlanta, GA, USA 30302
yshen@cis.gsu.edu

Mike Gallivan
CIS Department
Robinson College of Business
Georgia State University
Atlanta, GA, USA 30302
mgallivan@cis.gsu.edu

ABSTRACT

Originally regarded as a tool for social communication among teenagers, Instant Messaging (IM) technology has taken practitioners and researchers by surprise with its rapid proliferation in the workplace. While gaining valuable insights from existing IM literature, we identify the gap whereby researchers have neglected to pay attention to the processes that may shape users' perceptions of and behavior with regard to this technology. In this paper, we advocate the use of technological frames (Orlikowski and Gash 1994) as an analytical lens to understand IM adoption, usage, and consequences. We believe that empirical studies applying this theoretical perspective will not only shed light on our understanding of IM technology, but more importantly, they can advance our knowledge of other new communication technologies in organizations.

Keywords (Required)

Instant Messaging, IM, technological frames, social perspective, social definition theories.

INTRODUCTION

Modern organizations are supported by various communication tools, from telephone, fax, email, and videoconferencing, to more recently tools such as Skype and Instant Messaging (IM). According to AOL's Third Annual Instant Messenger Trends Survey (2005), 70% of Internet users use IM, while 26% of employed IM users use IM at work. IBM's Lotus *Sametime*, a leading enterprise IM system, is reported to have more than 15 million users (Topolski 2006) worldwide. This figure is limited to firms where IM technology is officially implemented by the IT department, and doesn't include users who deploy their own IM clients (typically as downloadable client software that is freely available from America Online, Microsoft and Yahoo) without the support of their IT department. Especially in industries where communication must move quickly (e.g., financial-services industry), employees rely on instant messaging more heavily than on email (Millard 2006).

Beyond its rapid proliferation in the workplace, other phenomena associated with IM have drawn interest from IS researchers as well. For example, unlike other technologies currently used in organizations, IM is adopted as a "bottom up" technology, which means that most workplace IM use starts with individual users deploying their own IM clients (Osterman Research 2004), rather than being initiated by their managers or IT departments. This raises the question of whether "bottom up" adoption technology will result in better usage experiences, faster diffusion, and more favorable outcomes of usage. It also suggest the possibility that patterns of adoption for other, future technologies will follow the "bottom up" paradigm, instead of the traditional, "top down" approach of the past several decades.

As an emerging communication technology employed by more and more users in both their social and work lives, there has been some empirical work in examining IM adoption, usage and consequences. However, as noted by several researchers (Cameron and Webster 2005; Handel and Herbsleb 2002), few studies have examined IM use in the workplace. Moreover, with the exception of several recent studies (Cameron and Webster 2005; Nardi, Whittaker and Bradner 2000; Rennecker and Godwin 2003), most IM studies lack a strong theoretical base. Further, our review of IM literature indicates that the studies that are theoretically grounded usually offer an "individual-level rational choice explanation" (Markus 1994) regarding IM usage patterns, but have not investigated the social processes shaping usage behavior. Despite their valuable contributions to the literature, some contradictory findings from these studies cannot be explained by the theories they have employed.

In this paper, we review recent studies of IM, identify the gaps whereby researchers have neglected to pay attention to social processes that shape users' perceptions of and behavior with regard to this new technology, and we propose using technological frames (Orlikowski and Gash 1994) as an analytical lens to understand IM adoption, usage, and consequences.

LITERATURE REVIEW OF INSTANT MESSAGING

A review of existing literature indicates three research themes regarding IM: 1) why is IM used? 2) how is IM used? and 3) what are the consequences of IM use? In this section, we organize our literature review about IM according to these themes, as well as by the theories that have been used to investigate each theme.

Why is IM Used?

Expanded TAM Models

Some researchers employ expanded TAM models to study the adoption of IM technology (Heales, McCoy and Xu 2005; Li, Chau and Lou 2005). Heales et al. (2005) emphasized cultural differences that affect adoption. They proposed that language interface technology, infrastructure, and culture will affect the adoption of IM technology. Li and colleagues (2005) focused on individual's use of IM in sustaining interpersonal relationships by including two social psychology concepts in their research model: *attachment motivation* (an individual's desire for social interaction and sense of communion with others) and *relationship commitment* (an individual's tendency to continue with an established relationship). They predicted that both concepts would be positively associated with perceived usefulness and perceived enjoyment of IM. In their study of 273 undergraduate students who had used IM for at least six months, Li et al. only found support for these constructs (*attachment motivation* and *relationship commitment*) as antecedents to perceived enjoyment of IM, but not for perceived usefulness. One possible explanation for the failure to explain IM's perceived usefulness is that the consequences of using IM do not match the goals of building and maintaining social relationships If so, the perceived usefulness of IM for these purposes may be questionable (Li et al. 2005).

Media Richness Theory

Media richness theory (Daft and Lengel 1984, 1986; Daft, Lengel and Trevino 1987) is another often cited theory for explaining the choice of IM as a communication tool. This theory ranks different media on a continuum with "rich" media on one end and "lean" media on the other end, according to the information capacity of various media. Rich media are those that can provide opportunity for timely feedback, are able to convey multiple cues, support the tailoring of messages to personal circumstances, and facilitate language variety (Huber and Daft 1987). In general, oral media (e.g., face-to-face and telephone) are regarded as richer than written media (e.g., interoffice mail), and synchronous media (e.g., telephone) are regarded as richer than asynchronous media (e.g., interoffice mail) (Straub 1994). Media richness theory considers two antecedents to media choice: a task's information processing requirements and the capacities of the various media options. Communication tasks high in *equivocality* (also called ambiguity) require using rich media; in contrast, tasks low in equivocality can be effectively supported by lean media. Thus, the appropriateness of a given medium for a specific communication task (i.e., whether a medium matches the task) needs to be considered taken into account when choosing the given medium, in order to achieve effective outcomes.

Segerstad and Ljungstrand (2002) suggested that IM is a combination of face-to-face and email communication, thus falling somewhere between these two on the media richness scale. Cameron and Webster's (2005) empirical research suggested that IM was considered rich on only one dimension of media richness: instant feedback – but not for the other dimensions of communication richness. In their case study of 19 users, only one felt that IM was a good medium for conveying meaning and emotion, and only three users stated that IM could be used effectively to communicate ambiguous ideas and concepts.

Symbolic Interactionist Perspective

Media richness theory has been modified and elaborated in various ways (Markus 1994) in response to critiques for neglecting to consider situational and social factors that influence media selection. One resulting theory is known as the "symbolic interactionist perspective", which included two additional reasons for selecting media: situational constraints and symbolic considerations (Trevino, Lengel and Daft 1987). Situational constraints are factors related to time and space constraints, while symbolic considerations address the desire to convey symbolic cues, such as legitimacy, formality, informality, urgency, or caring. Empirical research by Pauleen and Yoong (2001) suggests that IM is used to indicate informal tone, to support informal conversations in virtual teams, to get a person's attention in order to receive a quick response, and to symbolize efficiency; Conversely, while IM is a less appropriate medium to convey formality, official communication, or to support emotional messages (Cameron and Webster 2005).

Critical Mass Theory

While the technological characteristics of a medium may contribute to its appropriateness, critical mass theory notes that social behavior is also an important factor to be considered (Allen 1988; Markus 1987, 1990). Critical mass theory addresses the question: what are the conditions under which reciprocal behavior gets started and becomes self-sustaining? According to critical mass theory, communication media "cannot be used successfully by one person acting alone" (Soe and Markus 1993, p.213), but requires multiple users behaving interdependently. Critical mass theory accounts for *reciprocal interdependence* in individuals' decisions to adopt a medium. *Reciprocal interdependence* means that not only are later adopters influenced by early adopters, but more importantly, early adopters are influenced by their expectations regarding later adopters or else by the skepticism that later adoption will not occur (Markus 1987). Once some early adopters start to use a medium, two results may occur. If early adopters are reinforced by reciprocal behavior by others, their perceived of using the medium will increase and the perceived costs will decline. This will attract additional users, creating an increased rate of adoption, and a virtuous cycle of increasing adoption. However, if the early adopters' use of a new technology fails to trigger reciprocal behavior from their communication partners, then even the early adopters may discontinue using the new technology. As a result, the perceived benefits for the remaining users will decrease and the perceived costs will increase, stimulating further abandonment of the technology. Finally, use of the medium will be extinguished.

Applying critical mass theory to interactive media, such as telephone, voice messaging, and electronic mail, Markus (1987) proposed conditions under which *universal access* (the ability to reach all members in a community through a given medium) is more or less likely to occur. For example, universal access is more likely to occur when interactive media require low skill levels and little effort to use, when the start-up costs and operational cost to the user are low, and when the level of resources and interests in a community is high[1].

As mentioned earlier, once "critical mass" is reached (defined as a certain number or percentage of users), use of a communication medium should spread rapidly throughout the community (Markus 1990). For example, email achieved such a critical mass both in organizations and among consumers during the mid-to-late 1990s. While media richness theory conceptualizes the features of the technology itself (e.g., its support for rich communication) as a cause of user behavior, critical mass theory provides an alternative perspective: it conceptualizes communication richness as an outcome of social behavior, rather than a feature inherent to the technology (Markus 1994). In Cameron and Webster's (2005) study of IM use in the workplace, the lack of critical mass was mentioned as one reason for low IM use by most informants (seven out of eight) in a company where less than 0.8% of employees used IM. In contrast, in another firm where IM was a required tool for all employees, no informant out of seven employees interviewed mentioned critical mass as a reason for using (or not using) IM. Similarly, in their survey of 273 undergraduate students, Li et al. (2005) found that perceived critical mass is positively associated with adopters' perceived usefulness and enjoyment of IM, and also positively associated with their behavioral intention to use IM.

This concludes our discussion of prior research that has studied why IM is used. Of the three themes that we investigate in our paper (why is IM used? How is IM used? What are the consequences of IM use?), this theme is the most theoretically-oriented one. Researchers have documented many reasons for IM use through theoretical perspectives including expanded TAM models, media richness theory, symbolic interactionism, and critical mass. The next section summarizes prior research on how IM is used.

How is IM Used?

Another set of IM studies examined how IM is used. Two studies suggested that IM conversations tend to be brief and cover a single topic (Mahowald and Levitt 2000; Nardi et al. 2000). They also found that IM best supports a rapid exchange of questions and answers, and brief interactions to help schedule a conversations in another medium. Nardi et al. (2000) conducted an ethnographic study of IM in the workplace and described aspects of communication which are not part of current media theorizing. They labeled these unexpected uses of IM as *outeraction*, by which they mean a set of communicative processes that occur prior to information exchange in another medium (e.g., telephone). During this communication stage, IM is used to negotiate other's availability to start an conversation and find ways to "establish connection by inhabiting and maintaining a shared communication zone" (Nardi et al. 2000, p.8).

Other characteristics of IM conversation include prevalent media switching (Connell, Mendelsohn, Robins and Canny 2001; Hansen and Damm 2002; Nardi et al. 2000) and multi-tasking (Cameron and Webster 2005; Isaacs, Kamm, Schiano, Walendowski and Whittaker 2002a; Isaacs, Walendowski, Whittaker, Schiano and Kamm 2002b). Isaacs et al. (2002b) summarized two main reasons for media switching. First, people tend to switch to other media when the conversation

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[1] A detailed discussion of critical mass theory is beyond the scope of this paper. Interested readers can refer to Markus (1987) for a comprehensive review and discussion.

becomes too complex and IM is perceived as inadequate (Connell et al. 2001). Second, users switch to another medium (e.g., telephone) after initiating the IM conversation just to schedule a follow-up interaction in the richer medium (Milewski and Smith 2000). Cameron and Webster (2005) observed that IM is likely to be used concurrent with other communication media or the IM conversation itself is performed simultaneously with other work tasks.

However, other researchers reported contrary results. Isaacs et al. (2002b) analyzed thousands of workplace IM conversations logged in a prototype IM system (Hubbub) and found that the primary use of workplace IM was for complex work discussions. In addition, they found that users rarely switched from IM to another medium when the conversation became too complex. They provided three possible explanations for these discrepancies between their findings and those of prior studies. First, prior research mainly explored social IM use, which is likely to be different from workplace IM use. Second, although more conversations were for complex work discussions, more people used IM for coordination purpose (i.e., to schedule interaction in another medium), which involved simple, single-purpose conversations. That is, more users coordinated tasks than discussed complex work through IM, even though the latter group (who did use IM for complex work discussion) generated more lines of conversation in the message logs. Third, people tend to focus on salient, novel behavior (e.g., bypassing rounds of email to quickly resolve issues) in self-report studies, while taking for granted the ordinary uses (e.g., performing work via IM). As a result, prior research that used self-report measures may underestimate the use of IM for complex work discussion.

As described above, although there are some consistent findings across studies regarding how IM is used, there are also some conflicting results. This indicates opportunities for future research, which will be discussed later in the section titled "Alternative Theory Bases for Future Research on IM Usage," below.

What Are the Consequences of IM Use?

Relatively little research has been conducted to investigate the consequences of IM use. In studying workplace IM use, Cameron and Webster (2005) found that IM use protects and maintains employees' sense of privacy, since IM is a "quiet technology" and no talking is involved. That is, for a person who uses IM to hold a conversation, her behavior cannot be observed by others in the vicinity; of course, this IM user could save the text of the conversation and then forward it to other people – thus compromising the privacy of her communication partner. Another finding is that, although IM may be seen as a useful tool to get quick answers from the message initiator's point of view, from the message recipient's point of view, IM's disruptive nature may be seen as unfair.

Rennecker and Godwin (2003) proposed a theoretical model for studying unintended consequences of IM use for worker productivity. Their main argument is that while IM communication may accelerate *particular* tasks and decision processes, workers' *overall* productivity is likely to be impeded due to increased communication workloads, increased frequency of interruptions, and engaging in polychromic communication (i.e., multiple concurrent conversations). In developing their model, Rennecker and Godwin assumed an individual level of analysis and acknowledged that the propositions in their study were not expected to hold true in other contexts, such as for a team working collaboratively on a group project.

Summary of IM Literature

In summary, existing IM literature has mainly focused on the questions of why and how IM is used, while placing relatively less emphasis on the consequences of IM use. In terms of theory bases, the theories most often used in IM research are expanded TAM models (Heales et al. 2005; Li et al. 2005), media richness theory (Cameron and Webster 2005; Segerstad and Ljungstrand 2002), critical mass (Cameron and Webster 2005; Li et al. 2005), symbolic interactionism (Cameron and Webster 2005; Pauleen and Yoong 2001), and the notion of polychromic communication (Cameron and Webster 2005; Rennecker and Godwin 2003). Other than critical mass theory and symbolic interactionism, other theories were used in an attempt to explain the antecedents and consequences of IM use through what Markus (1994) characterized as individual-level rational analysis. Although there are some consistent findings across studies regarding the antecedents of IM adoption, use, and consequences, there are also some conflicting findings (Isaacs et al. 2002b).

Researchers have begun to recognize the importance of social influences on IM use (Cameron and Webster 2005; Isaacs et al. 2002b), which indicates another perspective through which future IM research can be conducted. The next section describes alternative theory bases that can be applied to study IM adoption, usage and consequences.

ALTERNATIVE THEORY BASES FOR FUTURE RESEARCH ON IM USAGE

The need for theoretical perspectives other than those based on "individual-level rational analysis" to study the adoption and use of new media in organizations has been recognized by other scholars. For example, in a study of managers' use of email – a new communication medium in organizations at the time that Markus (1994, p. 523) conducted her study, she stated:

> When traditional media are concerned, there is a broad social consensus crossing many social groups and organizations about what these media are good for and how they are most appropriately used. …But when new technologies enter the picture, the old consensus may dissolve, at least in those (currently somewhat isolated) parts of society where exposure to the new media is greatest. … It behooves members of the research community to look at the new technologies with theoretical perspectives that are not so thoroughly imbued as information richness theory with the values of the past.

A different theoretical tradition that can provide additional insights for IM usage behavior (or more generally, any technology used in organizations), is a class of theories that Markus (1994) labels *social definition* theories. Social definition theories emphasize the social determinants of behavior for members within social units. The explanatory power of social definition theories results from two aspects that distinguish them from individual-level rational choice theories. First, social definition theories concern the *process* by which specific patterns of behavior "come to be established in the first place and how they are maintained over time" (Markus 1994, p. 508). Specifically, such theories suggest that the adoption, use and consequences of a given technology within organizations can be shaped by social processes such as sponsorship of a behavior by key members of a social unit, socialization of new members into the unit, and social control of deviant behavior. Thus, technology use patterns are likely to vary significantly across social units – even for the same technology. Second, social definition theories concern individual differences in terms of their "conformity with institutionalized norms." That is, different technology usage patterns across individuals within a social unit reflect the extent to which they "behave appropriately" (Markus 1994) in their social context. While the rules of behavior are highly complex and may take some time for individuals to learn, research focusing on these rules and the processes by which group members learn them are likely to provide more insightful explanations of users' behavior.

It is worth noticing that social definition theories are different from other conventional theories that simply add constructs such as "social norms" or "subjective norms" to models such as TAM or TRA. The major difference is the level of analysis. Theories such as TAM and TRA are individual-level theories that explain individuals' behavior based on their own attitudes, as well as their perceptions of other people's expectations for how they should behavior. In contrast, social definition theories are concerned with the group level of analysis (e.g., groups, organizations and societies), and they focus on the processes that shape such collective behaviors (Markus, M.L, personal communication, April 19, 2006).

Applying social definition theories to IM usage patterns will result in different explanations: the social processes surrounding technology use will be treated as more powerful influences than the features of the technology itself. That is, research applying social definitions theories will emphasize the collective instead of the individual character of media use, and the social construction of media characteristics, rather than the individual's perception of them. Conflicting results from prior research may be explained by the different social contexts, the different groups being studied, and their distinct norms of behavior. In the next section, the concept of technological frames, which applies social perspectives to understand people's interpretation of technology in organizations, will be introduced.

Technological Frames

Orlikowski and Gash (1994) articulated a socio-cognitive[2] concept of technological frames that offers a useful analytic perspective for anticipating and explaining people's interpretation of and action toward technologies in organizations. They define technological frame as the "subset of members' organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations" (p. 178). These technological frames are interpretations that members of a social group have about technological artifacts. Orlikowski and Gash emphasized that technological frames include not only the knowledge about a technology's material nature and role, but also people's understanding of the technology's applications and its consequences in a given setting. They further defined the notion of *incongruence* in technological frames as "important differences in expectations, assumptions, or knowledge about some key aspects of the technology" (p. 180). Examples of incongruence in technological frames that can occur among different individuals or groups include different expectations of the role of technology in supporting the organization's business processes and how

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[2] Although they drew on social cognitive research, Orlikowski and Gash were more concerned with the social impacts of technological frames than with the structural features of how cognitions are organized. For more details, please see Davidson and Pai (2004).

employees use the technology. Incongruent technological frames held by different groups are expected to trigger difficulties and conflicts surrounding technology development, implementation and use.

By studying the adoption of a groupware system (*Lotus Notes*) in a management consulting firm, Orlikowski and Gash (1994) identified three frame domains that characterized various organizational stakeholders' understanding and use of the technology: *the nature of technology* (people's understanding of a technology's capabilities and functionality), their understanding of *technology strategy* (people's view of their organization's motivation for adopting the technology), and their *technology in use* (people's understanding of how the technology will be used and its consequences). Orlikowski and Gash found incongruence between the frames held by users and the firm's IT staff, although members of the two groups behaved in ways that were consistent with their particular technological frames. The incongruent technological frames between users and IT staff members led to undesirable outcomes such as initial skepticism and frustration in using *Lotus Notes* on the part of users.

The concept of technological frames has been employed and extended in eight other field studies since Orlikowski and Gash first introduced it to the IS field in 1994, in terms of theoretical development, methodological enhancement, and contributions to practice[3] (Davidson and Pai 2004). The appeal of the technological frames concept lies in its ability to provide an analytic lens through which researchers can examine what interpretations people have for a given technology, how these interpretations occur, whether they change over time, and if so, what internal and external triggers contribute to change. Answers to these questions are more likely to take into account the different social contexts of technology usage and their influences, which provide more explanatory power to various phenomena related to the technology. The next section discusses how IM research can benefit from employing the notion of technological frames.

## Applying the Concept of Technological Frames to understand IM usage

IM systems were first widely used for social purposes, especially by teenagers and young adults. Thus, many users view IM as a tool for personal (social) communication – or even a toy – that is best left outside the workplace (Primeaux and Flint 2004). However, more and more people have begun to use IM in the workplace, which raises the possibility of different users having incongruent perceptions regarding IM and its role in the workplace. Interestingly, unlike other technologies currently used in organizations, IM emerged as a "bottom up" technology, which means that most workplace IM use is not initiated by managers or by the IT department; instead, it often starts with individual users deploying their own IM clients (Osterman Research 2004). These phenomena pose interesting research questions for IM researchers. Below, we list some questions for future research. For example, how do people's perception of IM change from a "teens' toy" to a professional communication tool? Do triggers such as contextual changes (e.g., shifts in business strategy) and sponsorship of a behavior (e.g., an influential manager or employee who legitimates and promotes use of IM) contribute to people's perceptual changes? Do the perceptions of innovators and early adopters (Rogers 1995) and their behaviors contribute to these changes, and if so, how? How do users' frames associated with IM shape their usage pattern? (e.g., are there differences in frames of IM between users who use IM for complex discussions and users who use IM only to schedule a conversation in another, richer medium?) These questions are unlikely to receive satisfactory answers from "individual-level rational choice explanations" (Markus 1994) provided by theories such as media richness and TAM. The concept of technological frames, on the other hand, will provide a powerful and complementary theoretical perspective to help researchers answer these questions.

Figure 1 presents a model representing the above insights in five stages: (1) when using IM within the workplace, the context influences employees' understanding of IM (their technological frames); (2) in turn, employees' technological frames will influence their IM usage patterns; (3) the different geometric shapes in the figure represent different technological frames toward IM; (e.g., a square represents one interpretation of IM, which could be held by one person or be shared by several people; the circle and triangles represent different interpretations of the IM, etc.); (4) change triggers may alter the importance of various frames, possibly leading to *convergence* (i.e., greater similarity between employees' technological frames) over time or the emergence of totally new frames; (5) over time, some incongruence among employees' frames will disappear, while other differences will persist. Some emergent (newer) frames may also persist over time.

Technological frames can also be studied at the group or organizational levels of analysis to understand how these frames develop and change at these levels, although, to our knowledge, no studies have done so (Davidson and Pai 2004). For IM research, the group and organizational levels of analyses can help answer questions such as: how do team members' shared frames with regard to IM develop and change when they work collaboratively on a team project, using IM as a communication tool? When inconsistencies exist between team members' frames, do they lead to problems and/or decreased

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[3] See Davidson and Pai 2004 for a detailed review and discussion.

performance, or do they actually have beneficial effects? Does such incongruence dissipate over time so that group members' interpretations of the technology converge, or do these differences persist?
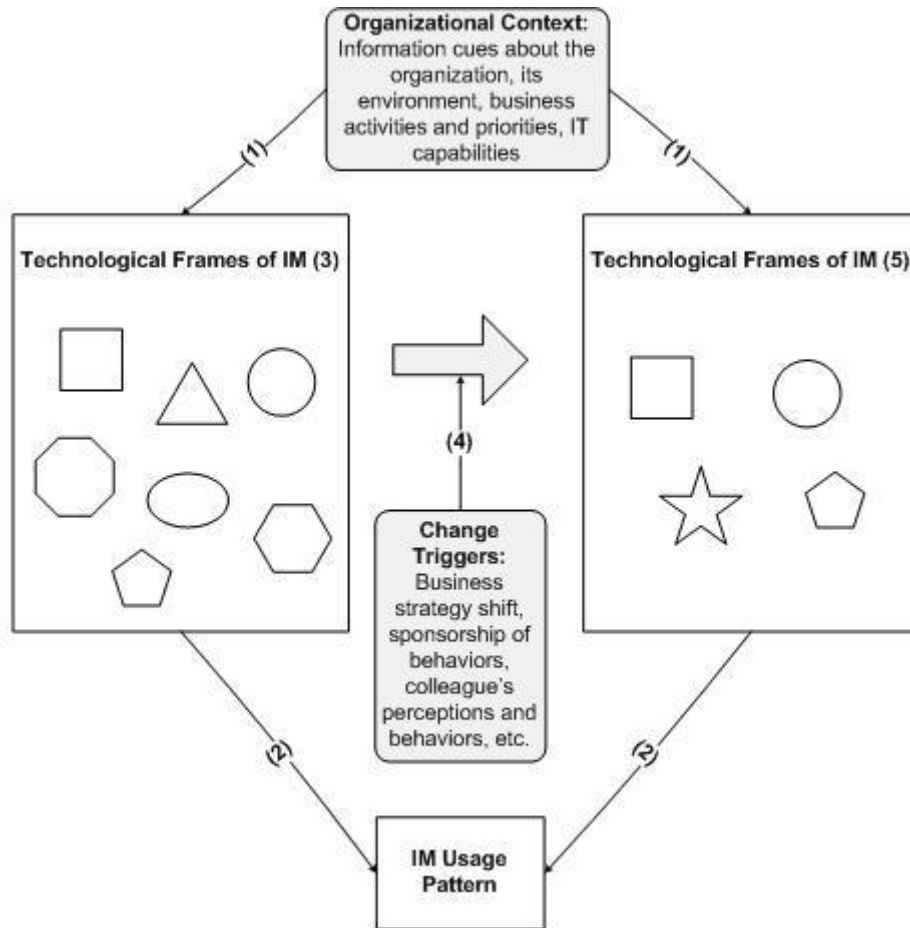
(1) Organizational context influences people's understanding of IM (technological frames of IM).
(2) People's technological frames of IM influence their IM usage patterns.
(3) High levels of incongruence among employees' technological frames exist early in IM adoption.
(4) Change triggers may shift the importance of various frames, possibly leading to convergence of employees' technological frames over time.
(5) Over time, some incongruence in technological frames dissipates (facilitating convergence), while other forms of incongruence persist. New technological frames may also emerge.

Figure 1. Applying Technological Frames Concept to understand IM usage (adapted from Davidson (2002) and Orlikowski and Gash (1991))

In summary, in the early stage of IM adoption in organizations, it is beneficial for researchers to draw on the technological frames concept to study how users' frames and any frame shifts influence adoption of IM as a standard workplace tool. It is also helpful to study how certain user frames are associated with different types of IM usage (i.e., single- or multi-tasking), as well as downstream variables such as group performance and cohesion.

CONCLUSION

We have emphasized the importance of IM as new communication technology in organizations, reviewed prior research on IM and various theory bases they have used, and discussed the contributions and limitations of these theoretical perspectives. In the spirit of Markus's (1994) call for developing theoretical lenses with more explanatory power to study new communication media in organizations, we identified the advantages of social definition theories and the notion of technological frames

for studying IM in the early stages of introduction into the workplace. IM research applying this line of thought can help to shed light on our understanding of IM adoption, usage and consequences, but more importantly, it may advance our knowledge of other, future communication technologies in organizations. We recognize that other theories not discussed in this paper may also contribute to this body of research.

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