

Email as Source and Symbol of Stress

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This research was supported by funding from the Ford Foundation to study "Work, Technology, and the Everyday Lives of Women and Men" (#990-0867), the National Science Foundation under an SGER grant to study, "Technology and the Social Construction of Availability" (NSF Number: 0328662), and the Stanford/GM Collaborative Research Laboratory.

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Abstract

The increasing volume of email and other technologically enabled communications are widely regarded as a growing source of stress in people's lives. Yet, research also suggests that new media afford people additional flexibility and control by enabling them to communicate from anywhere at anytime. Using a combination of quantitative and qualitative data, this paper builds theory that unravels this apparent contradiction. As the literature would predict, we found that the more time people spent handling email, the greater their sense of being overloaded, and the more email they processed, the greater their perceived ability to cope. Contrary to assumptions of prior studies, we found no evidence that time spent working mediates email-related overload. Instead, email's material properties entwine with social norms and interpretations in a way that led informants to single out email as a cultural symbol of the overload they experience in their lives. Moreover, by serving as a symbol email may distract people from recognizing other sources of overload in their work lives. Our theory deepens our understanding of the impact of communication technologies on people's lives and helps to untangle those technologies' seemingly contradictory influences.

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Concern about the increasing pace and volume of work and the implications of both for the stress that people face in their lives has been mounting for decades (Schor 1993, Jacobs and Gerson 1998). Scholars have identified numerous reasons for the growing tyranny of work, including the rise of dual career families (Nippert-Eng 1996, Moen 2003, Jacobs and Gerson 2004), the need for many Americans to hold multiple jobs to make ends meet (Schor 1993), the compression of more activities into a given unit of time (Robinson and Godbey 1997) and, most importantly for the purposes of this paper, the advent of communication technologies (Sproull 2000, Kaufman-Scarborough 2006, Golden and Geisler 2007).

Although email, cell phones, and other communications technologies ostensibly offer greater flexibility and control over work (Hill, Hawkins, Ferris, and Weitzman 2001, Valcour and Hunter 2005), they are also frequently portrayed as sources of overload (e.g. Richtel 2003, Alvarez 2005, Stross 2008, Chesley 2005, Boswell and Olson-Buchanan 2007). Commentators claim that email creates extra work, in part, because its asynchrony allows people to send and receive work related messages at anytime. Similarly, the ubiquitous access afforded by mobile wireless devices allows work to invade times and places that were previously safe from the workplace's intrusion (Murray and Rostis 2007, Middleton and Cukier 2006). Tellingly, those who offer advice on how to reduce communication overload typically advise people to regain control by deploying a technology's material features, such as email filters or the mute button on a cell phone (Jarvenpaa and Lang 2005, Dabbish and Kraut 2006).

Although it makes little sense to dispute that the ubiquity and features of communication technologies can lead to patterns of use that produce feelings of overload, the relationship between stress and the use of those technologies is likely to be more complex. Prior research on technology shows that social processes are usually as important as, if not more important than, a technology's material properties for shaping its use and consequences (eg. Barley 1986, Fulk, Steinfield, and Schmitz 1987, Rice and Aydin 1991, Orlikowski 1992, 2000). With few exceptions (Dabbish, Kraut, Fussel, Kiesler 2005, Renaud, Ramsey, and Hair 2006, Mazmanian, Orlikowski, and Yates 2006), however, the role of the social in

shaping people's experience of their use of communication technologies in their lives has received scant attention. Even less well understood are how norms and interpretations might entwine with the material properties of these technologies to shape when and why people experience them as sources of stress. Sociomaterial accounts of a technology's use – accounts that weave together rather than segregate social, symbolic and material realities – would advance our understanding of why people use and experience technologies as they do (Orlikowski, 2007; Leonardi and Barley, 2008).

Based on a study of the communicative activities of members of a high technology firm, this paper examines people's emotional experience of the communication technologies they use. Specifically, we ask if, and if so, how, email and other communications technologies contribute to the stress people experience. In answering this question we provide a more theoretically nuanced understanding of the relationship between communication technologies and stress by showing that one cannot understand how media induce stress without considering how properties of technologies become entangled with social norms, interpretations, and flow of daily work. We begin by reviewing previous research on communication technologies and the experience of stress and overload. We focus primarily on email because it is the communication technology that has been most clearly associated with stress. Using a mixed methods research approach, we find that because of email's features and the norms and meanings associated with its use, our informants blamed email for the stress they experienced regardless of the amount of time they worked and the fact that their involvement in other communication activities exacerbated their workload and the stress they felt. In short, email had become a symbol as well as source of overload.

Prior Research on Communication Technologies and Stress

Scholars have proposed two paths by which the use of communication technologies generates feelings of being overloaded and overwhelmed. One school of thought, primarily situated in the work-life literature, holds that email, pagers, cell phones, and mobile devices occasion stress because they make it easier for work communications to spill into times and places formerly reserved for family and self (Murray and Rostis 2007). For example, Chesley (2005) and Chesley, Moen and Shore (2003) found that

respondents who reported more frequent use of cell phones, pagers and computer mediated communications reported more negative “work-to-family spillover.” Based on self report data, Duxbury and colleagues (Duxbury, Towers, Higgins and Thomas 2006, Towers, Duxbury, Higgins and Thomas 2006) found that the more people relied on communication technologies, the more they worked from home and locations other than their office. Furthermore, the more they used these technologies, the more likely they were to report feeling burned out. These studies rest on variants of the argument that email and other communications technologies produce stress by enabling work to spill into other domains of life, thereby extending work hours and making it more difficult to disengage from work and fulfill family obligations (Major, Klein and Ehrhart 2002, Boswell and Olson-Buchanan 2007).

A second school of thought, primarily focused on “email overload” argues that email and other communication technologies create feelings of stress primarily because they increase the total amount of work that people must handle and, hence, the time they spend working. Research has revealed four ways that email creates additional work. First, because email is easier to send than written letters and memos, people report that with email they handle more communications and spend more time sorting and filing messages (Dawley and Anthony 2003, Balter 2000, Bellotti, Ducheneaut, Howard, Smith, and Grinter 2005). In the past, administrative aides assumed responsibility for filing and storing most documents. Email pushed these tasks onto everyone regardless of their managerial or professional status.

Second, email creates additional work by making it relatively costless for people to make requests that divert attention away from the task at hand (Manger, Wicklund, and Eikeland 2003, Belotti et al. 2005, Thomas, King, Baroni, Cook, Keitelman, Miller, and Wardle 2006). Dabbish et al. (2005:696) estimated that a third of all messages contain “request(s) for action” that “cause people to shift gears and to add new tasks to their current stack.”

Third, email interrupts concentration. Jackson, Dawson and Wilson (1999, 2001b, 2003) documented the incremental time required to resume work following an email session. In the organization that they studied, employees had set their email to signal the arrival of new messages every five minutes. In addition to the time these employees spent reading and managing messages, they required, on average,

64 seconds to resume work. Jackson et al. (2001a: 55) note that this rate of checking email caused 96 interruptions in an eight hour day and, hence, roughly an hour and a half of recovery time per day.

Gonzalez and Mark (2004, 2005) suggested that the situation is potentially worse than Jackson et al. estimated. Gonzalez and Mark shadowed a total of 36 employees in two organizations over a period of several days using time logs in which they recorded the minute-by-minute sequence of activities in which their informants engaged. Based on these data, the researchers discovered that although people might resume work shortly after an interruption, they often did not return directly to the same task. It took informants, on average, 25 minutes to return to the original task during which they engaged in an average of 2.3 other activities (Mark, Gonzalez and Harris 2005). Thus, email creates distractions that considerably extend the time it takes to complete a given task.

Finally, the use of email to perform tasks for which the programs were not designed requires additional time to compensate for the programs' inadequacies (Bellotti, Ducheneaut, Howard and Smith 2003, Renaud et al. 2006). Researchers have found that people use email not only to communicate, but also to coordinate: for example, keeping track of tasks, distributing documents, managing contact lists, and organizing information (Whittaker and Sidner 1996, Bellotti et al. 2003, 2005). Consider how much time people spend reconciling responses when using email to schedule meetings between multiple parties or when locating documents from email archives. When assigned to geographically distributed teams (Herbsleb and Mockus 2003, Herbsleb, Mockus, Finholt and Grinter 2000, Hinds and Bailey 2003) and to multiple teams (O'Leary, Woolley, and Mortensen 2008, Mortensen, Woolley, and O'Leary 2007) people are even more likely to use email to coordinate.

The common denominator that cuts across the two foregoing bodies of research is that email and other communication technologies induce stress by extending the time that people work, but the reasons offered by these literatures differ. According to studies situated in the work-life literature, the use of communication media extends time by allowing people to continue working after leaving the workplace. According to technology studies, communication technologies increase the total amount of work that people confront. Yet these two streams of research arrive at the same conclusion: The more people depend on and

use email and other electronic media, the longer they work, and the longer they work, the more likely they are to feel overloaded and overwhelmed.

The foregoing research suffers from three shortcomings. The first is methodological. With one exception (Thomee, Eklof, Nilsson and Hagberg 2007), no study of email overload directly measures stress. Instead, researchers document the amount of time that processing email requires and then infer stress by appealing to a large body of research which establishes that working long hours is a correlate of stress (eg. Cooper and Marshall 1976, Sparks, Cooper, Fried, and Shirom 1997, Moen and Yu 2000). Thomee et al. (2007), who directly assessed email's contribution to stress, found no relationship between time spent doing email and stress, although they did find a correlation between time spent doing email and depression among women, but not men.

Although students of work and family have measured stress, their measures of technology use are ambiguous or confounded. Duxbury et al. (2006) and Towers et al. (2006) assessed the link between technology use and stress by asking their respondents to indicate the degree to which each of several technologies caused stress and affected the work-life balance. Hence, their measures of stress were not conceptually independent of technology use. Chesley (Chesley et al. 2003, Chesley 2005) employed well-established indicators of stress, but combined doing email with other uses of the internet to create a measure of computer use. To the degree that her respondents used email for work and the internet for recreation, Chesley's finding of no association between computer use and overload may have resulted from these activities canceling each other out. Because of these methodological problems, the existing literature on communication media and stress provides weak grounds for strong inference.

Second, most studies of communications media and stress have not grappled with the possibility that people use electronic media to gain control over their work and reduce overload. A number of scholars have suggested that email might actually reduce stress by allowing people to avoid meetings, telephone tag, and face-to-face interactions that waste time (Berhel 1997, El-Shinnawy and Markus 1998, Renaud et al. 2006). Phillips and Reddie (2007) argue that email might reduce stress by providing a sanctioned way of procrastinating. Even studies that report a link between stress and email contain findings that suggest that

the opposite may hold under certain circumstances. For example, Chesley et al. (2003: 221) found positive associations between the use of electronic media and work-life balance for women.

Conflicting evidence on the deleterious consequences of electronic communication has also been a recurrent theme in recent research on Blackberries and other mobile email devices. For example, the professionals that Mazmanian et al. (2006) encountered in their study of a private equity firm claimed that Blackberries enhanced their sense of being up-to-date, in touch, and in control of work. Yet, their “experience of almost constant connectivity increase[d] their electronic dependence, and generate[d] compulsive routines of chronic checking, escalation of commitment, reduced time for reflection and increased stress in the longer term” (Mazmanian et al 2006:9). Jarvenpaa and Lang (2005), Middleton and Cukier (2006) and Murray and Rostis (2007) report comparable results in their studies of Blackberry users. Gergen (2002) and Green (2002) show a similar paradox among heavy cell phone users.

A third shortcoming of most research on communication technologies and stress is inadequate attention to social and cultural dynamics. Researchers usually attribute stress and overload to such material properties as email's asynchrony, the cell phone's mobility, time spent communicating, and the volume of messages sent and received. Although studies occasionally allude to the influence of norms and interpretations, with a few exceptions the thesis is rarely developed (Mazmanian et al 2006). For example, in attempting to reconcile why some people reported that email and Blackberries increase stress and others claimed they reduced stress, Duxbury et al. (2006:320) speculate, “it is not the technology per se that contributes to or alleviates stress but how the technology is used” that matters. When Dabbish et al. (2005) found, contrary to their expectations, that individual differences explained little variation in the likelihood that people would respond to email they suggested that response patterns might reflect social norms. Finally, Dabbish and Kraut (2006) noted that how people interpret the volume of email they receive may be more important for explaining email overload than is the actual quantity of messages. In other words, the notion that social dynamics might at least partially account for why and when people find electronic media stressful has usually been proposed as an afterthought.

The tendency for research on communication technologies to blame stress on the material features of the technologies stands in sharp contrast with current research on how technologies shape other aspects of work (Barley 1986, Fulk et al. 1987, Orlikowski 1992, Poole and DeSanctis 1990, Fulk 1993, Markus 1994). Studies of technology and organizing have shown that social influence (Fulk 1993, Rice and Aydin 1991), the transference of interpretations from one domain to another (Barley 1988, Orlikowski and Gash, 1994), situated improvisations (Orlikowski, 1996), and the negotiation and renegotiation of roles (Zuboff 1988, Barley 1990) typically shape a technology's effects. Orlikowski (2007, Orlikowski and Scott 2008) and Barley (Leonardi and Barley 2008) have recently argued that contemporary research on technology and work has become so oriented to social and interpretive dynamics that the role of technology's constraints and affordances has faded from view. To regain balance, both researchers argue for a more integrated or *sociomaterial* approach.¹ As Orlikowski (2007: 1437) put it:

[The sociomaterial] view asserts that materiality is integral to organizing, positing that the social and the material are *constitutively entangled* in everyday life. A position of constitutive entanglement does not privilege either humans or technology...Instead, the social and the material are inextricably related – there is no social that is not also material, and no material that is not also social.

Orlikowski (2007) illustrated a sociomaterial view by drawing on Mazmanian et al.'s (2006) research on Blackberry users. She attributed the Blackberry users' ubiquitous and often obsessive email checking to the interweaving of the device's material capabilities (particularly its mobility and software configurations that continually push email to the user) with the social norms, interpretations and individual proclivities that led users to carry the devices everywhere, to keep them constantly activated, and to respond to email immediately regardless of place or time.

¹ Socio-technical system theorists, writing in the 1950s and 1960s, were the first to argue that technological change implicated both social and material phenomena (Trist and Bamforth 1951, Emery and Marek 1962, Rice 1963). However, sociotechnical systems theorists quickly came to focus almost entirely on social interventions, in particular the use of autonomous work groups (Pasmore 1988). Although one could use "sociotechnical" as a synonym for our use of "sociomaterial," we prefer the latter term because it has fewer historical connotations.

Sociomaterial analysis urges researchers to pay attention to the concurrency and interweaving of three sets of pressures: the technology's material attributes that constrain or afford particular behaviors, the social norms and cultural interpretations that shape how people use a technology, and what we call "quasi-material" parameters. By quasi-material we mean those aspects of a context that are separate from a technology's features and that may ultimately be social, but which users do not see as social and which they treat as objective constraints. Quasi-material parameters include the volume of messages the people receive, the times at which messages typically arrive, and the distribution of correspondents across time zones. Consider a team distributed between North America and India. When North Americans are awake Indians are asleep. Most messages from India arrive in the U.S. in the middle of the night. North Americans treat the timing of the Indians' messages as hard reality, even though in theory a firm could mandate that one group must work at night to force temporal entrainment. In other words, the effects of time zones are experienced as a natural or material fact over which workers have no control even though time zones are partially the product of social conventions that could be contravened.

This study examines whether and how communication technologies evoked feelings of stress among users from a sociomaterial vantage point. We use qualitative data to document how members of an organization interpreted their experience of new media and we triangulate those interpretations against quantitative data to highlight the social, material and quasi-material aspects of the phenomenon. The quantitative data also offer us a direct measure of stress and allow us to point to sources of stress that were not emphasized in the informants' accounts because they were not figural in their work culture.

We discovered that our informants blamed communications related stress exclusively on the volume of email they handled and the extra time that email added to their workday. We also found that processing email bolstered their sense of being able to cope with their work. Yet, our quantitative data show that other media also contributed to feelings of overload and that media-related stress appeared to be independent of workload. Unpacking the sociomaterial reality of email allowed us to make sense of these contradictions and to build theory about the relationship between communication technology and peoples experience of stress in daily life.

Methods

Site and Sample

We collected the data for this study between October 2001 and March 2002 as part of a larger program of research on how people use communication devices to construct their availability to others and manage their work-lives. Seventy-nine employees of a company known internationally for its workstations and servers participated. We drew participants from three departments chosen because they represented different tasks and occupations.

The first group consisted of top level escalation engineers (39 individuals) responsible for resolving customer problems with hardware and software whose solutions had evaded first, second, and third level support staff. The problems were of the type that could bring a customer's business to a grinding halt. Members of the escalation group were available to customers 24 hours a day, 7 days a week. Technical writers (13 individuals), who penned documentation for the company's equipment and software, were the second group. As has become increasingly true for technology companies, the writers distributed much of the material they authored via websites. Marketing personnel (27 individuals) responsible for developing markets for the company's products were the third group. Much of the marketing group's effort involved planning and developing the company's web presence and designing online interfaces for existing and potential customers. Our sample included both employees (71%) and managers (29%).

Members of all three groups were concurrently involved in a number of project teams that cut across functional areas and imposed their own demands and deadlines. To fulfill expectations members of all groups often brought work home. Although each group's tasks differed, all were knowledge workers and were regularly called to innovate or unravel novel problems. The complexity of each type of work created interdependencies that required constant coordination and communication.

The average respondent worked 9.4 hours each day, two-thirds of which (6.4 hours) were spent communicating. Respondents spent 34% of their communication time in a combination of meetings and encounters. Email accounted for another 31%. Phone calls and teleconferences accounted for 16% and

14%, respectively. Email use was ubiquitous. Escalation engineers used email to communicate with each other and with customers to diagnose and solve technical problems. Technical writers used email to talk with the technical specialists whose knowledge they translated into documentation and specifications. The marketers used email to coordinate strategy, interact with customers and develop marketing materials. Managers also coordinated and monitored their groups' activities primarily through email.

The individuals we studied had worked for the company, on average, six years. The average age was 40. Forty-nine percent were women. Sixty-four percent were married. Nearly a third had at least one child who was 18 years old or younger. Because the company actively promoted telecommuting, a third of the respondents worked from home one or more days a week. Everyone had access to email, land phones, and voicemail, and all had computers at home. All used the same email client that offered a number of options for managing email, including the ability to define filters and to decide whether the recipient would be notified of new messages as they arrived. Eighty-six percent carried cell phones, 68 percent used a laptop, and 39 percent (all of whom were escalation engineers) carried a pager.²

Data Sources

Because our goal was to examine the relationship between stress and the use of communication technologies from a vantage point that differs from previous research and because we sought to deepen our understanding of the mechanisms that might underlie the relationship, we collected both quantitative and qualitative data (see Edmondson and McMannus (2007) on methods for building intermediate theory). Combining both types of data is valuable because it not only allows one to confirm common findings across methods (Jick 1979), but just as importantly, to identify dynamics obscured by one data source or the other (Bernard, Killworth, Kronenfeld and Sailor 1985). We collected our quantitative data through communication logs and surveys and qualitative data through interviews.³

² Our study occurred just as mobile email devices were emerging. Only one respondent had a Blackberry and only 22% had ever used IM. Videoconferencing technology was available, but respondents almost never used it.

³ In keeping with the conventions of sociology we refer to the people we studied as respondents when speaking about our quantitative data and as informants when discussing data collect through interviews.

Communication Logs and Surveys. We gave respondents a log book in which we requested that they record all communication activities that occurred during the course of two work days. Additionally, we asked respondents to log all work related communications that occurred in the morning before they came to work, in the evening after they left work, and on one weekend day. Half of the respondents logged communications for a consecutive Thursday, Friday, and Saturday and the other half logged communications for a consecutive Sunday, Monday, and Tuesday.

Before logging began, we assembled the members of each group in their workplace to instruct them on procedures for completing their logs. As part of the training, we had them log communications that had occurred on the day of training to surface questions that might occur while completing their logs. We instructed respondents to log events at the time they took place or shortly thereafter, stressing the importance of being exhaustive and accurate. During the training, respondents completed a brief questionnaire that asked demographic questions as well as questions about which communication devices they used. The questionnaire also included items that assessed the level of stress respondents were experiencing and their capacity to cope with the demands of work.

Respondents logged the full gamut of communication events: face-to-face encounters including meetings, email sessions (defined as any time a respondent looked at or sent an email), voicemail sessions (defined as any time a respondent listened to or recorded a voicemail message), calls made or received on land and cell phones, teleconferences, videoconferences, pages, and instant messages.⁴ Respondents recorded the time at which each event began, the time at which it ended, the location where the event occurred, whether the event was planned or spontaneous, and the number of other people involved. For email and voicemail sessions, respondents logged the number of messages they received, the number to which they responded or forwarded, and the number they initiated. At the end of each day, respondents recorded whether the day was atypical in any way that affected their communications. Almost no respondents acknowledged an atypical day. For each workday, respondents recorded the times they

⁴ Readers interested in obtaining a copy of the communication log should contact the authors.

arrived at and left the workplace.⁵ After logging for three days, respondents sent their logs directly to the researchers using a pre-paid envelope to ensure confidentiality of their data.

Interviews: After receiving completed logs, we interviewed 40 respondents in depth. We selected informants to ensure that we captured the perspectives of all occupational groups, men and women, managers and non-managers, people with and without children, and people who worked from home as well as those who worked in traditional offices. We designed an interview protocol of open ended questions to gain a deeper understanding of how informants made sense of the media they used, how they thought about communicating, and how work-related communications fit into and affected their lives on and off the job. Prior to interviewing each informant, we reviewed his or her communication log. With this data in front of us and before asking the questions on the protocol, we asked informants to explain patterns in their logs and to clarify ambiguous entries.

The interview protocol did not include explicit questions about stress or overload because we did not want to bias informants' descriptions of their experiences with technologies. Thus, when informants talked about stress or made connections between their use of a technology and stress, they did so in the context of responses to broad questions about boundaries between work and home or general queries about technology use. For example, questions like "tell me about how you think about using email" often triggered emotional responses that included talk of overload.

Interviews were conducted via telephone and were tape recorded with the informants' consent. No informant refused to grant permission to record. We asked each informant the same questions in the same order. We transcribed the tapes and entered the transcriptions into Atlas.ti, a software package designed for qualitative analysis of text and other documents.

⁵ For most people, the workplace was an assigned office in a building owned by the company. But even people who worked from home had designated spaces where they worked and could easily determine when they started and when they ended their workday, even if they had never left home.

Measures

Dependent Variables. Because previous research implies that email exacerbates stress by increasing the amount of time that people work, we explored three dependent variables: time worked, overload, and coping. We measured the number of hours worked, by summing two values. The first was the length of the respondent's workdays defined as the number of hours that elapsed between the time the respondent reported starting and ending work on each of the two workdays logged. The second was the number of hours that the respondent communicated about work outside the boundaries of the workday, which we measured as the sum of the duration of all work related communications that occurred (1) in the morning before the respondent reported starting work, (2) in the evening after the respondent reported ending work, and (3) on the weekend day that the respondent logged. Note that our measure is likely to be conservative because we do not have measures of how many hours respondents spent before work, after work or on the weekends doing work-related tasks that did not involve communication.

Stress researchers have long conceptualized stress as multidimensional. General overload and perceived sense of mastery/coping are two of the most important concepts that stress researchers routinely assess. General overload is usually defined as the perception of being emotionally overwhelmed by life's events and demands. Coping/mastery typically refers to having the psychological resources and strategies to withstand or overcome stressors (Lazarus and Folkman 1984). Researchers have developed a number of scales to assess both concepts. We measured overload using the emotional exhaustion subscale of Maslach and Jackson's (1981) well-validated burnout inventory. We measured coping with items from the coping/mastery scale employed by the *1992 National Study of the Changing Workforce* (Families and Work Institute 1992). Because overload is a measure of stress and coping is a measure of being able to handle stress, the two should be negatively correlated. Together, the two scales allowed us to capture the contradictory experiences of doing email, namely that doing email could simultaneously exacerbate overload while making people feel as if they were coping more effectively.

The first column of Table 1 displays the items that comprised both scales. These items appeared on the questionnaire, which instructed the respondents to indicate how frequently they had experienced

"each of the following feelings over the last three months" using a 5-point Likert scale whose values ranged from "never" to "sometimes" to "very often." To insure that the two scales were coherent and distinct, we submitted the items from both scales to principle factor analysis using a varimax rotation. Columns two and three of Table 1 contain the loadings of the items on the two factors that emerged from the analysis. Overload items loaded strongly on the first factor, while coping items loaded on the second, indicating that the two concepts were empirically distinct. Equally important, items that load positively on one factor also load negatively on the other: people who were better able to cope reported less overloaded and vice versa. Factor scores based on the factor analysis served as measures of both overload and coping.

Independent Variables. Because the respondents indicated which medium they used for each communication event and the time at which the event began and ended, we could construct for each medium two indicators of its use: (1) the number of events that occurred via that medium during the two workdays that the respondents logged and (2) the total time that respondents spent using that medium during those days. All number and time variables were calculated for communication events that occurred during the confines of the respondent's workday because we were interested in how communication during the workday affected the total time that people reported working, the degree to which they experienced overload, and the extent to which they felt they could cope.

We also reasoned that different types of face-to-face events would make different demands on people's time and might, therefore, contribute differentially to the experience of stress. Accordingly, we divided face-to-face events into two types based on whether or not the respondent reported that the event had been planned. Doing so enabled us to distinguish between events that had different cultural meanings. *Meetings* were planned and *encounters* were unplanned, face-to-face events. For each, we calculated the number of events in which the respondent had participated and the time that he or she spent participating.

The number of *emails handled* was simply the sum of the number of messages that a respondent reported receiving and sending during the course of the workday; the latter included not only messages initiated but also responses to emails received. *Time spent handling email* was the total number of hours consumed by reading and writing email during the workday. The *number of phone calls handled* was the

sums of calls made and received on land and cell phones during the course of the workday.⁶ *Time on phone* recorded the total number of hours that respondents reported talking on phones during the workday.

Although employees used phones to participate in teleconferences, we asked respondents to distinguish between teleconferences and other types of phone calls when logging their activities. Teleconferences are equivalent to meetings except that the respondent participated by phone. We coded as teleconferences those events that the respondents labeled as teleconferences as well as any cell phone or land phone call, which the respondent recorded as involving more than one other participant. The *number of teleconferences* was the sum of all events coded as a teleconference in which the respondent participated during the workday. *Time spent teleconferencing* recorded the total number of hours that these teleconferences consumed.

Demographic Variables. Researchers have long known that managers use telephones more frequently than non-managerial employees and that they also have a preference for face-to-face communications (Mintzberg 1975, Kotter 1982). Some studies have also found that managers report more stress than employees who have no managerial responsibilities, but others have found the reverse or no effect (Maslach, Schaufeli and Leiter 2001). We indicate being a *manager* with a dichotomous variable.

Prior research has shown that gender, occupation, marital status, and having children influence how long people work, the stress that they report, and how they experience and handle stress (Bogg and Cooper 1994, Cooper, Dewe and O'Driscoll 2001, Jacobs and Gerson 2004, Cooper et al. 2001, Maslach, Schaufeli and Leiter 2001). Accordingly, we constructed a number of variables that captured these demographic effects. Contrary to our expectations none of these demographic variables, including gender and occupation, were significantly related to time spent working, overload, or coping after controlling for

⁶ We initially distinguished between land and cell phones because people used cell phones in more settings than they used land phones and because some respondents used cell phones and land phones for different purposes and audiences. We combine them for the present analysis because we found that distinguishing between land and cell phones made no difference in the analysis.

media use among our respondents. Thus, we do not describe these analyses or report results using these variables here.⁷

Table 2 reports the means, standard deviations and correlations for all variables. The correlation matrix indicates no problems with multicollinearity outside of the correlations that one would expect by definition: correlations between the number of communication events for each medium and the time spent using that medium.

Data Analysis

Quantitative Data. We used hierarchical, ordinary least squares regressions to assess whether being a manager, the number of communication events employing various media, and the time spent using various media influenced the length of respondents' workdays. Because the number of events using a medium and the time spent using that medium are highly correlated we conducted separate regressions for each measure of medium use. We performed similar analyses for overload and for coping except that in these regressions we included the length of the respondents' workdays as an independent variable.

Qualitative Data. We analyzed our interview data in multiple phases, following an inductive process that involved teleporting back and forth between the qualitative data, the quantitative data, and emerging categories and relationships (Strauss and Corbin 1990). The standard approach to analyzing textual data is to read and code the entire corpus of text numerous times (Lofland and Lofland 1984). Initial readings serve primarily to familiarize the researchers with the substance of the data and to suggest potential themes. During subsequent readings, analysts develop increasingly refined coding categories. Typically, these categories are nested to form hierarchically structured mappings of substantive domains. We describe below each phase of data analysis, acknowledging that the analytic processes that characterize each phase are rarely confined to that phase. Nevertheless, explicating the broad phases of the analysis can speak to the rigor of the method and the integrity of the inferences drawn.

⁷ Readers who are interested in seeing regressions that include these variables should contact the authors.

Phase 1: The authors and an additional research assistant read through all transcripts to develop a general sense of the data and each created his or her own list of preliminary codes. Then, we met to compare analyses to determine which codes to use during the second phase of analysis. The initial codes mapped the general topics in our protocol. For example, we had one code that flagged passages for each communication medium that the respondents logged and codes for general topics such as “home life,” “accessibility,” and “children.” At this point, we had no code for stress or overload.

Phase 2: During the second phase of the analysis, we developed second and third level codes that captured the various ways informants used and talked about email, cell phones, land phones, teleconferences, face-to-face interactions, pagers, instant messaging, and voicemail. Second level codes flagged whether passages referred to norms, emotions, evaluations, practices, or reasons for using for each technology. Third-level codes captured distinctions within these categories. For example, one set of third-level codes identified the various norms that informants invoked to explain how people used each medium in their organization. A second set of third-level codes inventoried the emotions informants associated with using each medium. A third family of third-level codes pointed to informants’ positive and negative evaluations of the medium’s utility. The fourth set of third-level codes referred to communication practices or how informants used the media in their lives. Practices tended to be specific behavioral tactics or strategies. A fifth set of third-level codes highlighted reasons for using or not using one medium rather than another. For email and phones, we further distinguished between reasons for using the medium outside the workday, specifically in the morning, in the evening, and on weekends. Table 3 illustrates this level of coding for one medium, email.

Concurrent with developing these codes we also began exploratory analyses of the quantitative data to surface patterns among the larger sample of respondents. These early analyses were invaluable in helping to eliminate several lines of inquiry and to focus our subsequent qualitative analysis on explicating patterns and relationships that appeared to be robust. For example, we initially suspected that we would detect occupational differences in patterns of technology use. However, the quantitative analyses revealed no differences. We, therefore, combed the interview data in search of occupational differences only to find

that they too revealed no consistent differences in how members of three occupational groups thought about, experienced or used the media we examined. The second phase of coding, therefore, led us to abandon this line of inquiry in subsequent analyses.

Phase 3: During the third phase of qualitative analysis, the authors applied the second and third level codes to the entire corpus of interview data. Each of the authors initially coded the same subset of transcripts using the codes developed in the second phase. We then met to compare our codings, to discuss discrepancies, and to refine our understanding of when a code should be applied. Each author then coded a second common subset of transcripts to assure ourselves that we were applying codes consistently. Having assured ourselves that disagreements were now minor, the authors separately coded a third of the remaining transcripts.

Phase 4: In the final phase of qualitative analysis, we identified patterns and relationships in the interview data and triangulated those against the quantitative data from the survey and logs. For each second-level code, we wrote analytic memos that summarized patterns. For example, we developed a memo that summarized “norms about email use” which included counts of the number of informants who referred to a particular norm, such as responsiveness. Another analytic memo summarized all mentions of email practices, such as the practice of “answering email on arrival.” All analytic memos included illustrative quotes and, importantly, noted exceptions to identified patterns, which led to additional analyses to understand the reasons for the exceptions.

We triangulated the patterns and tentative theories that emerged from these analyses with the quantitative data, which enabled us to explore further, affirm, and sometimes refute our understandings. Similarly, when our quantitative analysis pointed to relationships between variables, we turned to our interview data to deepen our understanding of these relationships. For example, our quantitative analysis pointed to a relationship between amount of time people spent doing email and their sense of overload. Our interview data enabled us to probe informants’ subjective experiences of email, including the emotions and social norms they associated with using the medium. Together, these two forms of data enabled us to

assemble an account that combined social and material factors to explain how people experienced the technologies they used.

Email and Stress

Our informants used a variety of communication technologies and many told stories about how phones, pagers and other devices blurred the line between office and home or disrupted their leisure. Yet they complained only about email. For instance, an escalation manager we interviewed told us that his cell phone, PDA, and pager, which he carried in pouches on what he called his “nerd belt,” had allowed him to participate in a conference call while touring Universal Studios with his family:

With my cell phone, two-way pager, and Palm Pilot, I can work anywhere. I've worked escalations in Disney World. In fact I can remember exactly where I was because it made such an impression on me. I think it was the Popeye thing. It was actually in Universal Studios. So the kids are going down the whatever and I'm on the phone with an engineer talking to him about a problem with a storage array. Then we did a conference call with some people from the field service organization and came up with an action plan.

Later in the interview he told us that he often stopped his car to “work escalations on the side of the road” with his cell phone. Rather than view such interruptions as problems, he took pride in his accessibility, noting that being constantly available by phone and pager was part of his job and that he appreciated the flexibility that mobile devices provided. Email, however, was another story. He was bothered by the volume of email that he received. “E-mail is a fire hose,” he told us, “You have got so many requests coming at you from so many directions that it can be overwhelming. Even at the best of times it is hard to manage.”

This manager’s complaints about email, like those of most other informants, mirrored the literature’s explanation for why email contributes to overload. Informants worried about how to handle the sheer volume of email they received and the extra work that it created. For example, they told us that email created extra work because it often contained requests that led them to turn their attention to tasks that they had not planned on performing:

What [really] throws me off is -- we have a manager that sends us stuff through e-mail and says -- okay you all need to work on this right now. And that happens pretty often. It

raises my blood pressure. It changes my focus. It stresses me out. But you've got to do what you've got to do. (*System Administrator in Escalation Group*)

Informants also insisted that email led them to work longer hours. For instance, an escalation engineer admitted that she came to the office early and ate lunch at her desk to stay on top of the flow of messages:

The numbers of e-mails that come in on any given day is between 150 and 200. So you have to find a way to just deal with the sheer volume. I tend to sit at my desk over lunch, if there's no other opportunity. There tends to be three main times when I deal with e-mail -- early in the morning, lunchtime, and before I go home, typically between 5:00 and 6:00.

The majority of informants told us that they worked from home in the morning, in the evening and on the weekend primarily to clear their inboxes so that they would not be overwhelmed by email when they arrived at work. The communication logs indicated that nearly 60% of our respondents handled work-related email from home at some point during the three days that they recorded their communications. Most informants who did not do their email from home told us that they had stopped doing so because the practice had led to conflict with their spouse, significant other, or children. Rather than jeopardize their relationship with loved ones, they accepted a ban on doing work-related email at home.

Although some informants recalled that they brought work home before they had email, they felt that email made the boundary between office and home more permeable. As a marketing manager put it:

Years ago, when we didn't have all this technology, you could take a briefcase and work at home. But it was harder. Now there's a complete blurring of the lines. It could be nighttime, could be whenever, you have access to your files, you have access to your e-mail. You can work from anywhere. So the general theme for me over time has been a theme of the work hours increasing.

Our informants' willingness to blame email for overload stood in sharp contrast to how they understood and experienced other communications activities. The closest informants came to evaluating other media negatively was to say that meetings and teleconferences were often a "waste of time." Some told us that they actually liked teleconferences because during a teleconference they could "multitask:" They

could process their email while on the phone. One technical writer was so enthusiastic about teleconferencing that she saw it as one of the benefits of her job:

We have such a huge volume of e-mail that it's unbelievable. So much work comes through e-mail. Lots of times I'll be on teleconferences where they're talking about things that are not relevant to me, but I know that they will get to something that's relevant to me. So I just start doing e-mail while I'm on the phone. If I was in the [conference room], I wouldn't be able to do that. But because I'm on the phone, they can't see me doing email, so I'm able to get work done. And that is just awesome! It's one of the things I love the most about my job.

It was not uncommon for our informants to teleconference from their office into meetings that were being held in the same building.

The data from our survey and communication logs support the informants' interpretations of email and stress, but complicate their belief that email was the primary culprit. The regression results in first and second columns of Table 4 ask whether various communication activities and being a manager affected the total amount of time that respondents reported working on the weekdays they logged. The regression in the first column uses variables that measure the number of communications in which respondents engaged using each medium. The regression in the second column uses variables that indicate the time that respondents spent with each medium. As our informants contended in the interviews, the first regression shows that the number of emails handled did extend the time our respondents reported working. But in contrast to our interviewees' accounts, email was not the only problematic medium. The results show that making phone calls and participating in teleconferences also extended the hours they worked.

Similarly, the data in third and fourth columns of Table 4 support and at the same time complicate our informant's stories about overload. The regression in the third column asks whether overload was influenced by the number of hours that respondents worked, being a manager and the volume of communication using each medium. The fourth column presents the relationship between overload and the time spent using each medium. The results corroborate our informants' claim that the time they spent doing email was positively associated with feeling overloaded. In contrast to what interviewees believed, however, the regressions suggest that overload was independent of the hours that respondents worked.

Furthermore, although no informants mentioned time spent in meetings as a source of stress, the regressions indicate it was.

In sum, our informant's accounts in the interviews and our analysis of respondents' communication logs and survey responses concur that the more email they handled the longer they worked, and the more time they spent doing email the more overloaded they felt. However, the regressions contradict our informants' and the literatures' assumption that the relationship between email and stress is mediated by the amount of time spent working. Instead, our analysis suggests that email is related to stress regardless of how much time people work. Furthermore, even though our informants did not attribute stress to other communication technologies, the quantitative data show that teleconferences and phone calls were associated with working longer hours and that time spent in meetings exacerbated overload.

To understand why email was the only medium that our informants blamed for the stress they experienced requires delving into how email's material properties interacted with the specific anxieties that email evoked, the norms that governed its use, and the temporal distribution of communicative acts over the course of a day. Our data show that it was the entangling of these factors that led informants to experience and interpret email as stressful independent of how much time they worked.

The Anxiety of Email

Forty-five percent of our interviewees explicitly associated the volume of email they received with a loss of control, which they articulated in terms of two anxieties: the fear of falling behind in one's work and the fear of missing important information. Both anxieties were tied to the technology's asynchrony, which enabled people to send messages at any time without disturbing the recipient and allowed messages to accumulate in the recipient's inbox until processed. Informants spoke of the fear of falling behind using an imagery of a mountain of messages that piled up unanswered, making them feel overloaded and out of control. An escalation manager likened the experience to being at the mercy of a runaway assembly line:

Sometimes I get an e-mail from somebody that says, "What are you doing answering e-mail on the weekend?" It's one of my methods of stress management. I could work a normal 40-hour work week and then I'd be stressed out on the weekend and in the

evenings. It's less stressful for me to put in the hours because I don't have a backlog building up. The stacking up bothers me a lot. I start feeling bad when the mountain is building. You know, it's like *I Love Lucy*, where she's got the chocolates coming at her on the conveyor belt. I start stuffing the chocolates in my shirt and in my mouth. It's like, "Oh no, this is not good."

A program manager for a distributed team explained how her peace of mind hinged on the state of her inbox, "I like to keep my in-box really low, because in the past I've had the problem where it's been so out of control that you can never get control back." A web technologist expressed similar sentiments, "I'm very, very organized with my e-mail. I have my little folders, and if my in-box gets over 100, I start being really frustrated. I feel like I can't prioritize." In short, many informants associated a clean inbox with being in control.

Informants also worried that in the mass of unopened email lay crucial information which, if missed, would affect their ability to stay on top of their work and threaten their aura of competence. An escalation engineer explained that this was particularly true in this company because "that's how [the company] conveys all their updates. So if you miss an email, you might miss something important." A project manager who received between 150 and 200 emails a day concurred:

I feel like I need to deal with each day's e-mail or otherwise you are just guaranteed to lose or overlook something. If I don't have access to my email, like if I'm ever off campus [out of the office], that's when I feel sort of not in control, like I'm missing something. It's like something could be happening with my project that I'm not aware of.

The fear of missing something important prevented the majority of our informants (75%) from using filters and other features designed to screen and reduce the volume of email.

My e-mail is usually way out of control. One of the guys I work with is just so organized and has like 50 e-mails in his mailbox. And I've usually got about 2,000. He says, "Let me show you how to do filters." So he set one up for me and I said -- that's really cool, and then he walked away. And then one of the contractors that I worked with on the customer reference database, kept saying, "You're not responding to my e-mails." I said, "I'm not getting e-mails. She said, "I'm sending you stuff." I finally realized the filter he set up was for anything that would come from this woman and it was all getting filed and I wasn't seeing it. I haven't used filters since. (*Marketing editor*)

Similarly, people told us they were reluctant to “unsubscribe” from large listserves or remove themselves from distribution lists for fear of missing an important item of information. A technical writer explained: “You can subscribe and unsubscribe from some of these groups, it’s just that you feel you may miss something that you would like to know”.

Like other informants, a vice president feared that not reading every email would compromise her reputation. She shared with us what she feared others might say about her:

In business it's important to be up to date, and so when you're in a meeting, if you haven't seen what was due or you haven't seen this or that, you're “unorganized,” “not up to date.” Being surprised is not a good thing. So you want to look on top of it and be on top of it, because if you're not, “you're trying to fake it.”

In short, informants felt compelled to keep up with their email regardless of whether it meant that they worked longer hours or took work home. Doing email eased informants’ anxieties and allowed them to feel as if they were in control. The regressions in the fifth and sixth columns of Table 4 corroborate this claim and are consistent with the paradox of doing email found in the emerging literature on mobile devices. The regression in the fifth column shows that the number of emails people processed was related to their sense of coping. The data also suggest that managers apparently had more difficulty coping than did respondents without managerial duties, a finding that is reconfirmed by the regression in the sixth column, which uses measures of time on technologies as the independent variables. In light of the forgoing discussion, it would seem that handling more messages bolstered the respondents’ sense of coping because processing email reduced the size of their inbox and allayed the anxiety of allowing email to go unanswered. Interestingly, the more time people spent doing email the more overloaded they felt, but the more messages they handed the more they felt they could cope. Of course, any experience of relief was, at best, fleeting, because new email would soon arrive.

Norms about Email

Whereas fears of falling behind and missing information motivated informants to handle all messages to feel in control, social norms pressured them to do so quickly. Although, in theory,

email's asynchrony should have granted recipients the leeway to respond at a time that was convenient for them, our informants described strong cultural expectations about not keeping senders waiting. What constituted an acceptable wait, however, varied. Some informants told us that they expected responses within hours. Others claimed the outside limit was a day. Still others felt timing was contingent on subject matter or the sender's prior responsiveness.

Nevertheless, all informants felt obligated to be responsive and expected the same of their co-workers, however they might define it:

I'm very good about responding to e-mail. I rarely let things sit without a response for more than a day. I'll respond saying either I've done it or that I'll look into it or whatever. Even if I have not completed an action, I'll let them know that I'm working it. So because of my personal thing, I expect people to respond to me within a day or so when I send them e-mail. (*Marketing manager*)

Those who answered their email quickly enhanced their reputation by doing so. As a senior manager explained, colleagues who were responsive were seen as "really sensitive" and "really caring."

Some informants understood that their own behavior was responsible for creating and perpetuating the norm of responsiveness. As one escalation engineer explained to us:

I think different people have slightly different expectations of when you read e-mails. I think it is based on your previous levels of response. I typically respond within reasonable time scales and, therefore, people have that expectation of me. But the flipside to that is that I expect people also to respond to my e-mail within reasonable time scales.

Informants who adhered to the norm became indignant when a co-worker responded more slowly than they thought reasonable:

It really drives me crazy when you send an e-mail to somebody and they don't respond. Even just, "I'm working on it. I got your e-mail, I'm working on it." I at least try to do that! So I get kind of miffed when I don't hear back. I'm always pleasantly surprised if I hear back from somebody within an hour or two. I'm really appreciative. Generally, I expect to hear something back in a day. (*Writer and editor for the marketing group*)

To insure their co-workers responded to messages in a timely manner and to shame those who didn't, informants resorted to a number of practices designed to enforce responsiveness. The first practice was to label emails as "urgent." But, informants told us that when the strategy was overused, co-workers learned to ignore it. The second practice was to follow an email with a phone call to signal to the recipient how important the message was:

If I need to get in touch with someone, I might leave an e-mail and then I'll call. If they're not in the office, I'm going to leave a voice mail as well and just say: "Hey, I left you an e-mail." Or "hey, read your e-mail." There are some things that would be much too lengthy to talk about over the phone, but I'll use that [phone call] to accentuate an important e-mail I might have sent. (*Escalation engineer*)

The third tactic for enforcing the norm of responsiveness entailed copying co-workers or bosses to create a measure of accountability or to shame unresponsive co-workers into changing their ways:

So one thing that I have to do with certain people is to put another peer on the e-mail, and then I'll get a response. I try not to do a lot of one-upping, you know, like put their manager on an email-- I don't like doing that. I'll do that a half a dozen times a year. But I will put peer managers on e-mails to elicit a response. (*Web manager, marketing group*)

A second widely shared norm that shaped how our informants experienced email was rooted in the medium's asynchrony. People were allowed, even expected, to send messages at any time of the day or night, particularly if they worked with teams distributed across time zones. This norm about when one could send email contrasted sharply with informants' expectation that they should not call co-workers late at night or in the morning unless a crisis made it impossible to avoid:

People don't make a habit of calling me at home. It tends to be more e-mail. So if I'm working, it tends to be e-mail. Because it's asynchronous, right? You don't have to bother other people at home, for example. (*Marketer*)

Even though senders felt free to send email anytime and were absolved of guilt about interrupting their coworkers at night, it did nothing to absolve receivers from the obligation to respond.

Flow of Daily Communication Events

Informants faced a conundrum in their attempts to keep their email under control. Most told us that they tried to handle email as it arrived to maintain a sense of being responsive and on top of their work.

I like to respond to (email) right away. It's easier to send them out because I have so many e-mails coming in. It's easier for me to just keep things up, than to come in and have 20 that I have to answer. I'd rather check it every couple of hours, you know, respond to two or three, and be done with it. Then I know I'm up to date. (*Technical writer*)

Our survey data support the informants' claim that they answered email as it arrived: Only 12% of respondents said they tried to handle email in batches. Containing anxiety about email and meeting expectations about responsiveness were particularly difficult, however, when the flow of other activities created quasi-material pressures that precluded answering messages as they arrived. Most of our informants worked on distributed teams with members in Asia, Europe, and the opposite coast. Our informants were often asleep when team members in other time zones were sending messages during their own workday. Consequently, many informants started their mornings facing a loaded inbox:

The first thing I do when I get into work is to check my e-mail, because there's such a huge flow of e-mail. There's a lot of teams and vendors we work with. There's just so much communication flying around. I always need to check my e-mail and make sure that there's no problem that happened overnight, especially because some of our vendors are in Europe and Asia and things might happen during their day and then I won't find out until my morning. I need to see if there are any crises that I need to take care of. E-mail often shapes the early part of my morning. (*Technical writer*)

Working across time zones was not the only way in which the natural flow of daily activities prevented employees from answering email as it arrived. An escalation manager explained:

Often e-mail overload gets to me. You get to the end of a day and you have to spend six out of ten hours in meetings and the rest of it on conference calls, and you haven't been able to deal with the e-mails, and you got more than normal that day, and they're all just piling up, and you feel like they *all* need you to do something. That's the point where I end up either working extra hours or come in on the weekend to get on top of it. Because you just know that if you have to come in on Monday to that level of e-mail, it's not going to be a good week. So yeah, there are times where I get stressed by it. If e-mail starts building

to a level where it's at saturation point, then there's the chance that an e-mail will get missed and you won't do what you need to do.

Unlike other informants, this manager seemed to recognize why she found email so stressful: It built up unanswered when she was occupied by other activities. This buildup, coupled with expectations for immediate response, meant that she frequently approached the end of her day with the anxiety that her work was out of control and that her obligations remained unmet.

This manager's insight into how email fit into the flow of a day is supported by the patterns displayed in Figure 1, which plots the frequency of email sessions and the frequency of the combination of phone calls, meetings, and teleconferences by hours of the day. The figure shows that respondents experienced two peaks of email activity: at 9 am and between 3pm and 4 pm. The morning peak, which was partially the result of working across time zones, occurred just as other communication activities reached a crescendo. Email use subsequently fell and did not reach its second peak until the late afternoon when people could return to their inboxes after other communications had begun to subside. Because respondents felt pressure to answer all email and felt out of control when they did not, successfully handling the volume of messages that accumulated over the course of the day contributed to their sense of coping with the demands of their work even as the time they spent doing so contributed to their sense of overload.

If other communication activities led respondents to push email to the end of the day and if respondents experienced this accumulation of email as particularly stressful, then one might expect respondents who participated heavily in other communication activities to be especially susceptible to email induced stress. Said differently, time doing email should be significantly associated with overload primarily for those respondents whose days were consumed with other activities. To explore this possibility, we calculated the proportion of the day that each respondent spent in the combination of meetings, encounters, teleconferences and phone calls. We split the sample at the median to create two groups: high and low users of other media. For each group separately, we regressed time spent doing email on overload. Although on average members of the two groups handled the same volume of email (163 vs. 173

messages, $t=-0.35$, $p=.72$), time spent doing email was significantly associated with overload *only* for respondents who participated heavily in other communication activities.⁸

Understanding email's position in the flow of daily communications helps us untangle the contradiction between our interviewees' contention that email was their primary source of overload and our quantitative data that indicate that meetings and teleconferences were just as troublesome. When informants spent significant portions of their days in other communication activities, email built up and became figural just as their workday was about to draw to a close. They also knew that the backlog would grow by the next morning because of messages from other time zones. Facing a backlog at the end of the day, anxieties about falling behind and missing important information coupled with the norm for immediate response led informants to conclude that they were overloaded and that additional work would be required to regain control.

In short, rather than attending to how much time teleconferences and meetings consumed or the added demands of working across time zones, interviewees focused on their inbox as the salient source of overload and the target of their complaints. In this way, email became symbolic of the cumulative demands that stretched work beyond what informants could reasonably manage in the course of a day.

Discussion

Sociomaterial distinctions between email and other technologies help explain why email became a symbol of overload and other communication activities escaped blame. Email's material features, specifically those that stored messages in people's inboxes until he or she handled them, enabled responses to be temporally decoupled from messages sent, which meant that people could send email at any time of the day or night without disturbing their recipients. These material properties of email combined with the quasi-material temporal rhythms of the respondents' work to ensure that time away from continuous processing resulted in a build-up. Respondents who worked across time zones woke up to accumulated mail from coworkers whose day had already begun. Respondents who spent a significant portion of the day

⁸ Readers interested in seeing these regressions should contact the authors.

on the phone and who attended meetings and teleconferences returned at the end of the day to swollen inboxes. Thus, the inbox served as a continuous and tangible reminder of how overloaded one was.

Backlogs of email made salient social norms about responsiveness and anxieties about losing control. Informants feared that if they did not handle their mounting email they would fall behind or miss important information for which they would be held accountable. Expectations that obligated them to answer email quickly further exacerbated these anxieties. Because of these norms and anxieties, informants did not feel they could ignore backlogs of email. Consequently, to maintain a sense of control, they either extended their workday or did email at home in the evening, in the morning, and on weekends.

Informants' experiences of meetings and teleconferences were vastly different. Because meetings and teleconferences were synchronous media, they left no material reminder of unaccomplished work. Informants spoke about norms requiring attendance at meetings and teleconferences, but once a meeting or teleconference was over, both the opportunity and obligation to attend disappeared. Although people might need to make an effort to learn what they had missed, informants held that only a small portion of any particular meeting or teleconference was relevant to them. This was why they preferred teleconferences over meetings. Because their telephones were equipped with muting switches, informants could put their phones on mute and catch up on email while listening for cues that signaled that time had come for them to participate in the portion of the teleconference that pertained to them. In other words, teleconferences were welcomed because they offered an opportunity to regain control over an inbox. The organization's norms reinforced multitasking. Not only was the practice widespread, but there was no sanction against attending meetings remotely even when they occurred in the same building. The only proscription was not to be caught off-guard when directly asked a question or when the meeting moved to a topic on which one had an obligation to speak.⁹

⁹ Although informants justified such multitasking by its perceived ability to help them cope with the flood of email, in reality doing email while teleconferencing may not have been as effective as they thought. Research indicates that although multitasking is becoming more prevalent (Reinsch, Turner and Tinsley 2008) it may actually impair performance. In recent series of eight laboratory experiments, Ophir, Nass and Wagner (2009) showed that heavy multi-taskers were more easily distracted, had more trouble storing, organizing and remembering information, and had

Because phones were synchronous, like meetings, they too required co-presence for communication to occur. Social norms entwined with the phone's synchrony to make it unlikely that informants would view phone calls as a source of overload. Although, in theory, informants could have made phone calls at any time of the day, they described strong norms about when such calls were appropriate. In particular, calling coworkers at home late at night or in the morning was taboo, except in the case of a perceived crisis.

In short, one cannot account for why email was singled out as a symbol of stress without considering the unique entanglement of material, social, and quasi-material factors surrounding its use. Absent email's asynchrony, there would have been no buildup of messages for informants to confront. Absent social norms about responsiveness and anxieties about falling behind or missing an important message, respondents could have ignored backlogs, especially at the end of the day. Absent the flow of work across time zones and the distribution of communication activities during the course of a day, people could have responded more easily to email messages as they arrived, thereby ameliorating pile-ups at the beginning and end of the day.

Like any study, ours has limitations. First, because we collected our data in 2001 and 2002 before "Blackberries" and other mobile email devices had widely diffused, the mix of media in use today is likely to be different. It is important to remember, however, that smart-phones are typically used to handle not only phone calls but email anytime, anywhere. We suspect, therefore, that our findings are, at worst, conservative. We would expect mobile email to exacerbate both the sense of being overloaded and the sense of being in greater control because email can be processed even more continuously with these devices. Furthermore, mobile email should, if anything, amplify norms for quick response because senders would have reason to expect that recipients always have access to email. This seems to be precisely what emerging studies on the use of mobile devices show (Jarvenpaa and Lang 2005, Mazmanian et al. 2006; Middleton and Cukier 2006).

more difficulty filtering out irrelevant information. Ironically, they also had more difficulty switching between tasks effectively.

Second, because our study did not entail observation of individuals' daily work, we cannot speak to the topics that people discussed when communicating nor can we address the interplay between communication activities and the amount and nature of other types of work. It is possible that the overload that people reported was partly contingent on the other tasks they were performing. More importantly, because we did not observe or ask about unfinished tasks, it is also possible that the distribution of unfinished work on the days we collected data may have affected both the number of communications in which respondents engaged as well as the overload that they felt. No informant, however, mentioned such work during our interviews even though some must have had unfinished work. This raises the intriguing possibility that in some settings email may operate as a symbol of *all* unfinished work.

Third, our data come from employees of one engineering organization. Samples drawn from other settings might reveal that email's relationship to stress would vary across contexts with different preferences for technology, different norms and different flows of work. Our results might have been different had we studied a sales organization in a single geographical location with a "phone culture." In such a setting, voicemail might have acquired some of the symbolic attributes that email had in this organization.

Finally, we have no way of estimating how accurately our respondents logged their communications. It seems unlikely that respondents would have recorded events that didn't happen. It is possible, however, that they may have omitted communication events that occurred or inaccurately estimated their duration. Given the relative frequency of the various types of communications and the physical demands of logging, we suspect that email sessions or phone calls would constitute the bulk of omitted events. Together, these two considerations imply that errors in logging would have biased our results in a conservative direction, because there is no reason to believe that people who processed relatively few email messages would have been more likely to omit their occurrence. On the contrary, it would seem more reasonable for people who received the most messages to have failed to record some of their email sessions. If this were true, in the absence of omissions, the relationship between email and reported overload should have been even stronger.

Implications

Our story complicates standard conceptions of why email and other communications media create feelings of overload. Explanations in both the work-life and technology literatures blame the technologies' material features. The work life literature tends to attribute overload to features that enable people to send and receive work-related email anywhere at anytime, which allows work to spill into other domains of life. Technology studies usually attribute overload to the volume of messages that people receive and to the extra time it takes to handle them, the tasks associated with them, and the interruptions they create. These are important sources of stress and our study confirms that the volume of email did increase the length of the respondents' workday. Moreover, the more time respondents spent handling email, the more they felt overloaded. In contrast to earlier research, however, the extra time people spent working, either inside or outside the office, did not appear to mediate the relationship between email and the experience of overload. Instead, email appeared to be related to stress, regardless of how many hours respondents worked. As we have shown, to explain why people would experience email as stressful regardless of the amount of work it entails requires taking into account the simultaneous influence of social norms and interpretations, the temporality of work flow, and the patterns of use enabled by the material features of the medium.

Furthermore, our discovery that email functioned as a symbol is important both theoretically and practically. With few exceptions (Barley and Knight 1992, Meyerson 1994) researchers have not examined the symbolic aspects of either stress or email. Recognizing email's symbolism illuminates why workers attended so closely to email's consequences while overlooking how social norms, the structure of their work, other technologies, and the flow of their work also contributed to their sense of being overloaded and losing control. As a symbol, email became the interpretive scapegoat for the workers' perception that they were expected to do more than they could reasonably accomplish in a day. It provided them with a culturally sanctioned rhetoric of complaint as well as a tangible ritual for regaining control: To cope with overload, trim your inbox. Although students of technology have long pointed to the importance of interpretations for understanding a technology's uses and effects (eg. Orlikowski 1992), the possibility that technologies can be transformed into powerful cultural symbols, and that as symbols these technologies have broader implications has not been investigated.

The symbolic nature of email may well extend beyond the site we studied. Anecdotal evidence for this can be found in the popular press, where email is often singled out as the culprit that has destroyed the quality of life. For example, writing for information industry professionals, Adam (2002:89) proclaims that “managers have reported that email causes them more stress than either conflict with the boss or dealing with customer complaints.” On April 22, 2005, news media across Britain and North America rushed to report on a study that claimed email was more distracting than smoking pot (Anonymous 2005a, Anonymous 2005b, Orłowski 2005).

Admitting that email serves as a symbol of general overload implies that attempting to ameliorate overload by redesigning email's material features or by changing how people use those features is unlikely to reduce the stress associated with email. Consider the recommendation that users process email in batches to reduce the frequency of interruptions. Our informants were technologically sophisticated: they worked for one of the most prominent computer companies in the world and many had technical expertise in the design of software. Yet, few used filters and almost none chose to answer their email in batches. We suspect that our informants did not filter or batch because such tactics were of little use for relieving the stress they felt. Overload was not a matter of the number of messages they received, it was the joint product of the time they spent handling messages, the anxieties they felt, the norms of responsiveness they accepted and reproduced, and a daily pattern of communication activities that they could not control. To be truly successful, any attempt to redress email overload would have to address this sociomaterial entanglement head on.

Moreover, the increased pressure on people's home lives due to email's capacity to blur boundaries and accumulate may be experienced more intensely by some groups of people. People who have primary responsibility for dependents or other obligations outside of work that would prevent them from dealing with their inbox in the morning and evening will likely suffer additional anxiety from the accumulation of messages. Whether or not people with ongoing responsibilities outside of work suffer additional overload from their mounting inboxes or are penalized at work for not being continually accessible and responsive is a topic for future research.

The sense of being overwhelmed and overloaded is also likely to become more common and severe as organizations place employees on multiple teams and make greater use of distributed work in their efforts to globalize (Hinds and Kiesler 2002, O'Leary et al. 2008). Distributed teams increase the need for employees to participate in phone calls and teleconferences and to exchange emails across time zones. Our data show that email, teleconferences and phone calls added hours to the workday. Furthermore, our analysis indicates that teleconferences and working across time zones created a backlog of messages at the beginning and end of the day which contributed to people's sense of being overloaded. To the degree that email masquerades as a simple material cause while functioning as a symbol of overload, employees and organizations are unlikely to recognize and address the larger problem: New patterns of work that crowd days and create unrealistic expectations about response time. To the degree that email's symbolic force diverts attention from the stress created by the demands being placed on a downsized and globalized workforce, it serves as a red herring.

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Table 1
 Factor Analysis of Overload and Coping Items

Scales and Items	Factor 1	Factor 2
<i>Overload</i>		
Felt emotionally drained from your work	0.70878	-0.33125
Felt used up at the end of the workday	0.76844	-0.29197
Tired when you get up in the morning and have to face another day on the job	0.71556	-0.16867
Felt burned out or stressed from your work	0.75864	-0.41161
Frustrated by your job	0.75191	-0.18573
<i>Coping</i>		
Felt confident about your ability to handle your personal problems	-0.11606	0.58418
Found that you could not cope with all the things you had to do. (<i>reverse scored</i>)	-0.29776	0.62184
Felt difficulties were piling up so high that you could not overcome them. (<i>reverse scored</i>)	-0.3119	0.75761
Variance Explained	2.94	1.73

Table 2
Means, Standard Deviations and Correlations among All Variables

Variable	N	Mean/%	Std	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Total Hours Worked	74	19.9	3.32	1.00													
2 Overload	72	.06	.87	.15	1.00												
3 Coping	72	-.02	.84	.08	-.16	1.00											
4 # of encounters	74	7.08	6.53	-.02	.21	.20	1.00										
5 # of meetings	74	2.31	2.21	.24**	.20	.00	.17	1.00									
6 # emails handled	74	185	151	.18	.19	.29***	.39	-.12	1.00								
7 # Iphone calls	74	9.39	6.44	.36***	.10	.10	.16	.15	.09	1.00							
8 # teleconferences	74	1.66	2.03	.35***	.16	-.06	-.03	.19	-.05	.29**	1.00						
9 Time doing encounters	74	1.36	1.28	.12	.14	.16	.45***	.23**	.23**	-.11	.01	1.00					
10 Time doing meetings	74	2.41	2.69	.23**	.26**	.08	.11	.86***	-.10	.07	.14	.29***	1.00				
11 Time doing email	74	4.0	2.63	.28***	.37***	-.06	.09	-.14	.44***	.31***	.15	.04	-.13	1.00			
12 Time on phone	75	1.90	1.71	.42***	.17	.00	-.22	.11	.00	.52***	.35***	-.19	.07	.38***	1.00		
13 Time in Teleconferences	74	1.65	2.29	.48***	.16	-.07	-.11	.26**	-.06	.16	.88***	.05	.28**	.14	.43***	1.00	
14 Manager	75	.29		.16	.28**	-.32***	.12	.29***	.08	.22**	.15	.20	.32***	.21	.21	.18	1.00

** p<=.05; ***p<=.01

Note: Total hours worked and all number and time variables are calculated over the two work days logged.

Table 3
Examples of Codes Applied to Passages about Email in Interview Transcripts

Technology	2 nd Level Code	3 rd Level Code	Example
Email	Norm	People should be responsive	I can get a response in an hour, I think that's fair...I won't resend something unless it's been over a day. The other thing is, it depends on the content of the e-mail or whatever I need. If it's something that's not urgent, then what do I care whether it's a day or two days or one hour? But if the server goes down and I send them an e-mail or I call them and I get a voice message and I don't hear back from them for half an hour, then I'll get more stressed. Because that, to me, is something important. (<i>Marketing, Website manager</i>)
Email	Norm	OK to email at night	It's pretty rare [to get work related calls at home]. People don't make a habit of calling me at home. It tends to be more e-mail. Because it's asynchronous, right? You don't have to bother other people at home. (<i>Marketing, Business planner</i>)
Email	Emotion	Guilt for not responding	There have been times that we were ready to go out and I get an e-mail and it's like someone from Europe with a problem... I feel somewhat guilty if I don't respond. (<i>Escalation engineer</i>)
Email	Emotion	Fear of falling behind	Often e-mail overload gets to me. You get to the end of a day and you have to spend six out of ten hours in meetings and the rest of it on conference calls and you haven't been able to deal with the e-mails and you got more than normal that day and they're all just piling up and you feel like they all need you to do something. That's the point where I end up either working extra hours or come in on the weekend to get on top of it. Because you just know that if you have to come in on Monday to that level of e-mail, it's not going to be a good week. (<i>Escalation Manager 2</i>)
Email	Emotion	Fear of missing something	If e-mail starts building to a level where it's just at saturation point, then there's the chance that an e-mail will get missed or you just won't do what you need to do. (<i>Escalation Manager 2</i>)

Email	Evaluation negative	More work, overload	Years ago we didn't use e-mail. It added a step in my day is what it did. I mean it definitely puts me in touch with other resources and makes it easier to have various conversations. But it's an added item. And so this is a negative. (<i>Workstation technologist</i>)
Email	Evaluation positive	Keeps us in contact	So I mean [checking email is] like the top number one priority. That's the way you stay connected, you know, not only with the team in the bay area, but also with the various people in Europe and Japan, in particular. (<i>International web manager</i>)
Email	Practice	Answer on arrival	When you're sitting there working on something and you hear that little ring, it's hard not to go over and see what it is. I don't know how many times I check it in a day, probably, I don't know. It seems to be all day. (<i>Technical writer</i>)
Email	Practice	Keep inbox clean	I try to keep my in-box as clean as possible, although recently I haven't been able to drop it below 200. I normally would like to keep my e-mail in-box below 100. I try to keep the ones that I'm working on the in-box and just look at the new ones coming in. (<i>Program manager</i>)
Email	Practice	Respond to boss and staff immediately	If it's from my boss, I'll always read that. If it's from my co-workers, I'll read that. And then it kind of goes down from there. (<i>Escalation engineer</i>)
Email	Reason for using email versus other media	Creates a record	Email is good because it's a written record of technical things, especially in computers. It might be a list of commands or a certain way to do things. That translates well to e-mail, which doesn't translate well over the phone. It's a lot easier for them to maybe take a screen shot or cut and paste some text into a mail message. So that's certainly a case where I would use e-mail over the phone. (<i>Escalation engineer</i>)
Email	Reason for doing email on weekend	Handle backlog of work	I'm usually on [email on Sunday] three or four hours continuously and that's sort of to sort of clean the plate out. (<i>Web Manager</i>)
Email	Reasons for doing email in the evening	Others is later time zone	[I sometimes log into email after dinner] because it's uninterrupted. So it's e-mailing out. And sometimes Asia will respond back and they sort of seem to like that, so I'm sort of encouraged to continue it because they're so many hours out of sync. They start coming alive 5:00 or 6:00 at night, so if I'm on responding to them, it's pretty helpful. (<i>Web manager</i>)

Table 4
Effects of communication media on time worked, overload and coping

Variables	Hours Worked		Overload		Coping	
	Column 1 Number	Column 2 Time	Column 3 Number	Column 4 Time	Column 5 Number	Column 6 Time
Intercept	16.83***	16.69***	0.31	- 0.42	- 0.592	- 0.666
Time worked	--	--	0.01	- 0.02	0.001	0.028
Manager	0.07	-0.32	0.39	0.19	- 0.738***	- 0.836***
# of meetings	0.32		0.05		0.042	
# of encounters	- 0.10		0.02		0.012	
# emails handled	0.01**		0.00		0.002**	
# phone calls	0.14**		- 0.01		0.018	
# teleconferences	0.39***		0.05		- 0.024	
Time doing meetings		0.16		0.09**		0.056
Time doing encounters		0.29		0.02		0.141
Time doing email		0.22		0.13***		- 0.016
Time on phone		0.46		- 0.01		0.087
Time in Teleconferences		0.46***		0.02		- 0.061
N	74	74	72	72	71	71
R ²	.28***	.34***	.15	.25**	.25***	.23**

** p<=.05; *** p<=.01