"You've *Got E-Mail!*" … Shall I *Deal With It Now?* Electronic Mail From the Recipient's Perspective

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This article considers the nature of e-mail from the recipient's perspective—what the seemingly free and easy communication really costs the recipient. Information gathered by electronic monitoring software is shown to be at odds with the results of an online survey of e-mail users' perceptions of their e-mail experience—users drastically underestimate the disruptive effects of e-mail. The conclusion is that the constant monitoring of e-mail actually reduces productivity and that there is a need for increased power, control, and awareness on the part of the e-mail recipient to ensure that e-mail remains a tool rather than a tyrant. It is necesssary to alert the user of the true cost of e-mail alerts.

1. INTRODUCTION

The incredible growth in the use of e-mail has ushered in a new type of communication that is completely unlike the traditional synchronous and asynchronous forms of communication. E-mail has transformed both business and personal communication. Where people previously had to rely on a slow and sometimes unreliable postal service or expensive transatlantic phone calls, an e-mail now crosses the world in near real time. E-mail use has been mushrooming (Paul, 2003; Raskino, 2003). Workers conduct much of their business, even with colleagues in close proximity, by e-mail, because it is perceived to be less time-consuming, more reliable, and efficient than phoning or meeting face to face (Berghel, 1997).

The name *e-mail*, however, is a misnomer. What started out as an asynchronous electronic memo-sending facility has grown in functionality to a piece of software

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that, in addition to sending electronic messages, also acts as a to-do list; supports task management; serves to remind the user of important tasks, meetings, and deadlines; incorporates a calendar to support diary keeping; archives messages; sustains lengthy and extended conversations between two or more participants; and acts as an address book (Bellotti, Ducheaneat, Howard, Smith, & Grinter, 2005). Although e-mail clients generally provide various forms of support for task management, in this article we concentrate mainly on e-mail use that occurs in conjunction with other applications. Use of these other applications may be interrupted by e-mail activities, as may work-based activities that are not necessarily computer related.

An overview of e-mail research over 30 years (Ducheaneat & Watts, 2005) concludes that the results produced thus far have not been unified because of this multifaceted nature of e-mail. In their article, the authors presented three distinct facets of e-mail: *e-mail as a file cabinet*, *e-mail in the production line*, and *e-mail as a communication genre*. The focus of most research appears to concentrate on e-mail from the sender's perspective. Rudy (1996) argued that because e-mail must perforce involve at least two parties—the sender and the recipient—it is essential also to consider the recipient's perspective of e-mail.

For the purposes of this article, we ignore extra functionality and concentrate on e-mail's original function—as an electronic communication facilitator. E-mail is a relatively new communication medium, compared to more traditional media. Originally it was considered to be merely another kind of asynchronous communication medium, subject to the same rules and norms as other asynchronous media. E-mail, in fact, is turning out not to fit neatly into established categories or to behave according to well-established asynchronous communication rules. There is some evidence that it encourages people to communicate more (Bälter, 1998), that its use is increasing at a hitherto unheard of rate (Paul, 2003; Raskino, 2003), that it is a somewhat difficult tool to use effectively (Jackson, Dawson, & Wilson, 2003), and that it is business critical (Vile & Collins, 2004). Despite increasingly usable user interfaces, the way in which one manages one's time and attention in relation to e-mail-related tasks is still vulnerable to mismanagement. Bertacco and Deponte (2005) referred to e-mail as a *speed-facilitating device*—a device that reduces communication delay, which makes it completely unlike other asynchronous communication media.

All communication takes place between an initiator and a recipient. Such communication may be multimodal—using several parallel channels. An example is a face-to-face conversation where only 10% of the communication takes place via the spoken word and the rest is communicated by means of nonverbal cues (Wertheim, 2005). Other types of communication use fewer channels; a letter uses only text, and this requires more effort because the text must be crafted carefully to communicate the message clearly and unambiguously due to the relatively impoverished nature of the medium. One would surmise that users would choose to use richer communication media when possible, but El-Shinnawy and Markus (1998) found that users often preferred to use e-mail rather than voice mail. It might be argued that the impoverishment of the medium is offset by the facility for revision not offered by voice mail. However, this facility is increasingly available to the "sender" of a voice-mail message when telephone carriers increasingly enable message editing (e.g., "Press # at any time to erase and rerecord your voice message").

This is an interesting finding—e-mail is obviously impoverished as compared to many other media, and yet senders seem to prefer it. There may be many explanations for this. We could start by considering the expectations of the worker in the 21st century as compared to the worker 100 years ago. Communication in the early 20th century would have been conducted either in person or by mail. Hence expectations of responses to mailings were in terms of days and weeks. With the use of e-mail and the Internet, business communication has been quickened immeasurably—an answer can be obtained from an entire group of people by the firing off of an e-mail message and the receipt of responses within a matter of minutes. Bellotti et al. (2005) found that the workers they studied managed an average of 65 concurrent active tasks. They quoted Sproull and Kiesler (1991), who attributed this kind of overload to the increased possibility and ease of making demands and requests of others. They also quoted Mackay (1998), who argued that the lowered cost of delegating tasks to others increases the volume of e-mail. Manger, Wicklund, and Eikeland (2003) argued that e-mail creates the impression that people can be reached quickly and easily, which is probably what makes it such an attractive option because it contrasts with the time-consuming nature of many other traditional communication media.

Another clue to the reported preference for e-mail comes from Markus (1994), who argued that e-mail recipients tend to answer messages as they arrive, which makes e-mail almost as quick as phoning compared with other asynchronous media. Furthermore, e-mail, unlike a phone call, maintains a durable record of the request having been made, which the sender may use if challenged by her supervisor. Hence the use of e-mail costs the sender less than other media, because he is able quickly and easily to pass the responsibility to the recipient and move on to another task.

There is a notion of *cost* associated with communicating, and the cost is usually unevenly carried by the participants—especially for asynchronous communication. Cost is traditionally, very coarsely, made up of time and money, Sometimes the cost is only in terms of time, but if some facilitating tool is used, such as a telephone, there will also be an associated monetary cost. Usually the initiator of the message has to carry most of the cost associated with "sending" the message to the recipient. An example of this is the dispatching of a telegram, which is quite expensive for the initiator but costs the recipient nothing. In some cases, however, the recipient pays more for the message than the initiator. In the e-mail context, a prime example of the recipient carrying the cost is in the case of spam, where the sender, at minimal cost to herself, broadcasts e-mails to multiple recipients who then have to deal with the nuisance this constitutes. Another example of this is the use of collect telephone calls, where the recipient carries the cost of the communication.

This example demonstrates an important factor of communication—*social influence*. The phone call recipient can be induced to pay for communication if the initiator exerts some kind of influence over him. Something of the same nature operates when a task is delegated to a recipient by e-mail. If the sender has authority over the recipient, there will be pressure for the recipient to respond speedily to the message and to respond or carry out the task as requested without delay. If the sender does not exert influence over the recipient, however, it may be more difficult to expect a speedy response, in which case the sender needs to "manage" the request and issue reminders if a response is not forthcoming (Bellotti et al., 2005). In spite of

this, senders will use e-mail as a tool to manage multiple activities and increased demands on their time. In this article, we explore the effect of this sender behavior on e-mail recipients.

We explore the recipient's cost of attending to and responding to e-mail, which makes it possible for organizations to load employees with ever more responsibilities. In section 2 we examine the characteristics of communication in general and e-mail in particular and identify the factors that make up the full cost of the incoming e-mail message. In section 3 we present the results of low-level usage monitoring activities, and in section 4 we present initial findings from a global Web-based e-mail survey. We discuss our findings in section 5 and conclude in section 6.

2. EXAMINING E-MAIL COMMUNICATION

E-mail has traditionally been categorized as asynchronous communication medium, but the way that e-mail has evolved does not really fit in with the norms of asynchronous communication. Table 1 outlines some of the differences between e-mail and two other traditional ways of communicating. It is interesting to note that e-mail is unlike either traditional synchronous and asynchronous communication, which is why we have called it *e-synchronous* communication.

Authors talk about communication slavery (Berghel, 1997), tyranny of e-mail (Eichhorn, 2003), and e-mail addiction (America Online, 2005). America Online's survey of more than 4,000 people found that 25% can't go without e-mail for more than 3 days, 41% check e-mail first thing in the morning, 60% check e-mail on vacation, 47% check personal e-mail at work, and 77% have more than one account. There are a couple of potential explanations for the apparently addictive, overwhelming, and invasive nature of e-mail:

1.   E-mail usage continues to be emergent because people haven't yet learned the rules and Internet (and e-mail) users are increasing exponentially. The rules for management of printed mail or faxes are well established, and one seldom hears anyone talking about slavery to this kind of mail.

2.   E-mail is a multifaceted mechanism, used not only for communication but also for task management (Bellotti, Ducheneaut, Howard, & Smith, 2003; Gwizdka, 2004), appointment keeping, storage of names and addresses, and conversation thread management (Venolia & Neustaedter, 2003). This could be why it is so difficult to manage properly.

Table 1:   Communication Characteristics

Characteristic	Synchronous ← Face to Face	E-Synchronous E-mail	→ Asynchronous Letter
Same time and place	Yes	No	No
Delivery	Immediate	Minutes	Days
Confirmation of receipt	Yes	Possible but unreliable	Possible for extra cost
Persistence of message	No (unless explicitly recorded)	Yes	Yes
Privacy of message	Possible	Never	Mostly
Support for conversation	Yes	Possible	No

2.1. The Cost of E-Synchronous Communication

In the last 2 decades e-mail has caught up with the telephone as an everyday mode of communication, both in business and personal life. It has become an essential tool to support our need for increasingly efficient ways of communicating. However, this tool, perhaps uniquely in the software arena, appears to have the potential to tyrannize, overload, and enslave its users. Some researchers have carried out studies where they observed users' e-mail behavior over time. Jackson, Dawson, and Wilson (2001) found that it took employees in his study an average of 1 min 44 sec to respond to e-mails—with 70% of users reacting within 6 sec by activating the e-mail application. The workers usually took an average of 64 sec to return to their work. This is an interesting trend: One seldom finds employees monitoring their pigeonhole or personal mailbox with such assiduity, so e-mail must have some special qualities that encourage this level of monitoring and speed of response. One explanation could be the pervasiveness of e-mail, as opposed to snail mail, which is delivered at set times during the day. Another reason could be that employees experience a satisfying feeling of productivity from dealing with e-mails, whether or not this activity is directly related to work tasks.

When a person initiates *synchronous* communication, he or she expects to be able to establish a communication session with the intended recipient and embarks on this endeavor in the knowledge that responses to his or her messages will be received in seconds. When a person initiates *asynchronous* communication, on the other hand, he or she is well aware that no response can realistically be expected in real time. The initiator may choose to fax rather than post a letter to speed up the response time, but there is still no real expectation of an immediate response—unless a prior communication has created an expectation of the communication in the recipient's mind, in which case a faster response can be expected.

However, the convenience and almost instant delivery of e-mail messages has created a similar response expectation or pressure in the minds of communicators. It is a common experience to meet someone in the corridor, a matter of minutes after this person has sent you an e-mail, and to be asked whether you have received the e-mail. This question is somewhat disingenuous, because the question often actually being posed is, "Why have you not yet responded to my e-mail?" Even though some users may genuinely be concerned about nondelivery, the majority are using the question to prompt a speedy response. It appears that a response time much closer to that of synchronous communication is expected, even though the cost to the initiator is lower than that of any other types of asynchronous or synchronous communication. Another kind of communication that creates the same expectations is the short messaging service (SMS) provided by mobile phone networks. The initiator of an e-mail or an SMS is well aware that the recipient cannot be watching e-mail constantly, or monitoring their mobile phone while in meetings, or indeed at any time, yet there is often an unreasonable expectation that the response will be almost immediate.

There is some evidence that this expectation of a speedy response, although perhaps beneficial in the efficient running of organizations, is being paid for by the employees in various ways. Gillespie, Walsh, Winefields, Dua, and Stough (2001), reporting on a study of occupational stress in universities, identified perceived

expectations of immediate responses to e-mails as one of the sources of stress. Demiridjian (2005) reported on the "pandemic" associated with e-mail. Demiridjian discussed the problem in an academic environment where students increasingly expect professors to be available on a 24-hr a day basis, fire off e-mails instead of consulting online documentation, and academics neglect their research to respond to student e-mails within the expected time span.

A consequence of this speedy reaction to messages must be a reduction in productivity: Most people leave their e-mail client running and often configure the client to notify them when new e-mails arrive, hence every new e-mail constitutes an interruption. If e-mail users configure the e-mail client to check for e-mail every 5 min, this potentially restricts uninterrupted time to a maximum of 5 min (Jackson et al., 2003) because there seems to be a need to respond quickly if an e-mail does arrive. Other, non-e-mail-generated interruptions will reduce this maximum even further. It is a strange anomaly that people want to be interrupted even though they know that the interruptions will probably tend to make them feel overloaded.

Recipients' perception of an e-mail message is affected by prior experience of the sender, and by what they think of the sender (Matheson & Zanna, 1989). Thus one will respond with a greater degree of alacrity to an e-mail from someone in a position of authority than to a message from an acquaintance. Lee (1994) argued that the process of reading an e-mail is not a mere passive scanning process but rather an active process that activates social constructions to evaluate the message. Table 2 outlines the differences between e-mail and traditional ways of communicating for senders and recipients.

From the research published in this area it seems that the e-mail phenomenon is something of a puzzle—everyone is aware of its potential for enhancing and facilitating communication, but the evidence for its dark side is emerging as e-mail becomes more widespread. In particular e-mail users seem oblivious of the personal cost of using e-mail. We carried out research into people's e-mail usage to answer two questions:

Table 2:   Differences in Sender and Recipient Experiences

	Synchronous ← Face to Face		E-Synchronous E-mail		→ Asynchronous Letter	
	Sender	Recipient	Sender	Recipient	Sender	Recipient
Cost	Equal	Equal	Low	High (monitoring e-mail delivery)	High	Low
Expectation of response/ Pressure to respond	Sec	Sec	Min/Hr	Min[a]	Days/Weeks	
Cognitive engagement[b]	Equal	Equal	Higher	Lower	Higher	Lower
Behavioral engagement[c]	Equal	Equal	Lower	Higher	Higher	Lower

[a]Jackson, Dawson, and Wilson (2001). [b]Cognitive engagement has been defined by Tuckman (1999) in terms of the degree of mental effort that a person expends upon a task. Cognitive engagement often is interwoven with behavioral forms of engagement. [c]Csikszentmihalyi (1996) merged cognitive and behavioral engagement in his concept of "flow"—that state where the individual has judged both his or her own perceived ability to complete a task with a judgment about the difficulty of the task.

1. To what extent did e-mail use intersperse and interfere with other computer-related activity?
2. How did e-mail users perceive their e-mail experience, and how aware were they of their behavior?

The first question was studied by undertaking some low-level usage tracking of user behavior over 3 months. It is difficult to find users willing to be tracked in this way, and thus only eight users were tracked. The data from six are reported, as the tracking software did not fully record the events of the remaining two users. The results are presented in section 3. The second question was studied by using a Web questionnaire to elicit responses from e-mail users to determine their perceptions of their own e-mail behavior. The results of this online survey are presented in section 4. Section 5 discusses our findings and draws conclusions.

3. STUDY 1: LOW-LEVEL USAGE TRACKING

There are two basic ways of monitoring user behavior—by direct observation or automatically. The Hawthorne effect (Roethlisberger & Dickson, 1939) suggests that users behave differently if they are aware they are being observed. However, the validity of Hawthorne's findings has been questioned by researchers using statistical techniques (Franke & Kaul, 1978). These researchers attribute the altered behavior to the fact that productive and disciplined managerial workers replaced insubordinate and mediocre workers—and that the improved performance could not be attributed to mere observation awareness. One undeniable disadvantage of direct observation is the time-consuming nature of the observation activity and the difficulty of correctly recording user activity. Automatic monitoring can be done at two levels—software application level and system level. Application-level monitoring is preferable, but it requires the researcher to have access to application code to insert monitoring code. This is seldom possible for everyday e-mailing software.

Hence we resorted to automatic end-user monitoring, which has its own set of problems but which at least made the observation practical. Automatic monitoring has two major problems (Renaud & Gray, 2004): First, it produces a great deal of data that have to be sifted and aggregated to facilitate analysis. The second, related problem is that automatic monitoring, as we applied it, delivered many low-level user interface events, many of which could not be attributed to the user but which reflected underlying system activity. Thus we can draw limited conclusions from analysis of these data, and we can only surmise what the user's intentions or motivations were during the monitoring; there is no way to gain a comprehensive understanding of the reasons behind the observed behavior.

3.1. Method

A study was undertaken to determine the effects of interruptions on end-user behavior (Renaud & Gray, 2004). The GRUMPS Research Project at the University of Glasgow supports exploratory studies of user interaction by collecting low-level usage data and delivering these data to investigators (Atkinson et al., n.d.). Data are typi-

cally captured to reflect the user's actions involving the keyboard, mouse, and other input devices. Raw usage data are organized into sequences of usage sessions. This mechanism was used to track eight different users over 3 months. Unfortunately we were able to utilize the monitoring data of only six individuals, as the other data were unusable due to various technological problems on their computers.

All users were working in an academic environment. Some were academics, some researchers, and some support staff. All collections were done with the full permission of the participants, and all entered data were obfuscated so that no personal details were recorded. The participants were able to opt out at any time, but all elected to continue with the monitoring to the end of the experiment.

The original findings of the research (Renaud & Gray, 2004) were aimed at understanding user behavior after interruptions. For the purposes of this article a new analysis was carried out, which concentrated on e-mail usage compared with activity in any other application. In this study the following usage behaviors were tracked for each user: (a) the time spent interacting with non-e-mail applications between e-mail usage (non-e-mail sessions), and (b) the time spent interacting with e-mail applications (e-mail sessions). Cessation periods where no activity was logged for more than 10 min were ignored, because they often represented overnight periods and long interruptions and contribute nothing to the study of e-mail usage.

3.2. Results

Overall the six users were logged for just over 320 hr of sessions. E-mail usage accounted for 23.7% of this, around 76 hr. As Table 3 shows, all participants used e-mail extensively to carry out their work (the lowest percentage was 11.4%), and this intensive usage of e-mail is predictable because e-mail usage has become so pervasive (Adam, 2002). More of a surprise, users switched often from other applications to their e-mail application. Table 3 also gives the mean time respondents spent on non-e-mail sessions before switching to e-mail sessions and the mean time spent on e-mail sessions before switching back. The average non-e-mail session was just over 2½ min, whereas the average e-mail session was 47 sec. From this it is possible to estimate that, on average, respondents switched between applications 36 times per session hour (although in practice this would occur over a longer period of real time because of cessations).
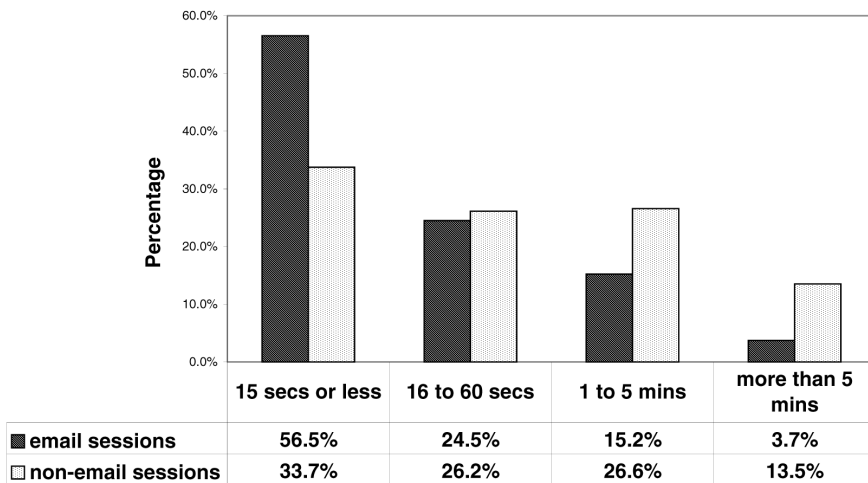
The distribution of time spend on each e-mail session was heavily skewed. Figure 1 shows that over 56.5% of e-mail sessions lasted less than 15 sec, whereas only 3.7% lasted more than 5 min. It seems that in the majority of sessions users were simply checking their e-mail without acting on it. However this continual checking has the effect of reducing the amount of contiguous time users spent on their non-e-mail sessions Perhaps surprisingly, non-e-mail sessions were also skewed, with 33.7% lasting less than 15 sec and 59.9% lasting less than 1 min. Only 13.5% of non-e-mail sessions lasted longer than 5 min.

Overall there was no relationship between length of time between e-mail sessions and the length on an e-mail session (Pearson's correlation coefficient = 0.062). Hence users did not take longer using e-mail after a longer delay. However, Table 3 shows that whereas there were similar patterns of activity for five of the six partici-

<div align="center">Table 3:   E-Mail and Non-E-Mail Sessions</div>

User	E-Mail Sessions as % of Total Time	Mean Time for Non-E-Mail Sessions (Min)	Mean Time for E-Mail Sessions (Min)	Switching Activity (No. of Switches per Session Hr)	% of Non-E-Mail Sessions Over 5 Min	% of E-Mail Sessions Over 5 Min
User 1	33.9	2.04	1.04	40	11.9	5.9
User 2	30.1	1.75	0.75	48	9.2	2.8
User 3	22.0	5.04	1.43	19	23.8	7.6
User 4	20.4	2.34	0.60	41	13.6	2.5
User 5	11.4	2.34	0.30	43	12.3	0.8
User 6	32.6	2.20	1.07	37	14.9	5.9
Overall	23.7	2.53	0.79	36	13.5	3.7

	15 secs or less	16 to 60 secs	1 to 5 mins	more than 5 mins
email sessions	56.5%	24.5%	15.2%	3.7%
non-email sessions	33.7%	26.2%	26.6%	13.5%

FIGURE 1   Time distribution of e-mail and non-e-mail sessions.

pants, one person (User 3) was somewhat different. For example, Users 3 and 4 both used e-mail for around 20% of the time they were tracked. However, User 3 switched far less often (19 times compared with 41). This was because User 3 spent more time on *both* e-mail and other applications: 23.8% of this user's non-e-mail sessions and 7.6% of e-mail sessions were longer than 5 min. Both these percentages are around twice the average. It would seem that this user was unusual in engaging in a more batch-orientated approach compared with the others, who seemed to be trying to parallel process.

In this study the frequent checking of e-mail clearly had consequences for other applications throughout the working day. Speier, Valacich, and Vessey (1999) found that when workers were engaged in complex tasks, interruptions inhibited performance. This monitoring took place in an academic environment so the interruptions are extremely likely to be detrimental to their ability to focus for long periods on other tasks. These effects have been reported by other researchers (Jackson et al., 2003), but users' assessment of the impact of e-mail is not clear: Are they

aware of their e-mail usage? Are they aware of the time they spend e-mailing and monitoring their e-mail application?

It was recognized that without a self-assessment questionnaire it is impossible to answer these questions. In light of this, a second study was planned. This second study examined the self-reported behaviors of a group of e-mail users. A second, independent sample was recruited for the survey, as it is extremely time-consuming and expensive to track the low-level usage behaviors of individual users, and we wished to supplement and expand the data pool in an expedient manner.

4. STUDY 2: GLOBAL WEB-BASED SURVEY OF E-MAIL USAGE

A worldwide Web-based survey of the ways in which individuals think about their e-mail usage was conducted. The survey elicited "self-report" e-mail-related behaviors, which are reported here. In addition, individual differences were explored with respect to the way(s) in which e-mail interruptions are subjectively viewed. These findings are reported elsewhere (Hair, Renaud, & Ramsay, in press). The survey asked about the various activities for which e-mail is used, frequency of usage, control of e-mail, the interweaving of work and personal e-mail communications, and recipient perception.

4.1. Method

The electronic survey was launched in December 2004. Fifty academics completed the online questionnaire, which was hosted electronically at the University of Glasgow. The survey was subsequently revised and launched in spring 2005. The survey was widened to include not only U.K. academics but individuals from all professions and backgrounds around the world. The survey was advertized by word of mouth and was also posted onto Chi-web, a global forum for discussions of issues pertaining to human–computer interaction. There were 177 individuals who took part, at which point the survey was closed and the prize of a £20 Amazon gift voucher was awarded to a randomly selected participant.

4.2. Sample Characteristics

Table 4 shows that 56.5% of the sample comprised those in academic, information technology, or creative occupations. This was partly a result of the methods used to recruit the sample but also related to a conscious desire to investigate people in these occupations. One of the major recipient costs of e-mail found in Study 1 was the potential to disrupt work. As stated earlier, this is extremely detrimental in an academic environment that requires long periods of reflection and concentration. It could be argued that this applies equally to creative occupations, such as those held by software developers, architects, Web designers, and consultants, all of whom figured in the sample. If anybody should feel the tyranny of e-mail, it should be those in creative/academic occupations. Although the sample was clearly not representative of the general population, it was broadly representative of e-mail users in academic and

Table 4:   Occupation of Participants in the Survey

| Occupation	Frequency	%
Academic	25	15.1
Information technology/creative	75	45.2
Administration/noncreative	24	14.5
Management	13	7.8
Not in work	29	17.5
Total	166	100.0
Missing	11	
Total	177	

creative occupations. Furthermore, participants were recruited mostly by e-mail, which suggests a propensity for e-mail usage.

There were significantly more women (61.5%) than men (34.5%) in the sample (chi-square goodness-of-fit test), $\chi^2(1, N = 170) = 13.55$, $p < .01$. As Figure 2 shows, however, there was no relationship between occupation and gender as might have been expected, $\chi^2(4, N = 166) = 3.91$, $p < .42$. In particular, 61.4% of women were in academic/creative occupations compared with 58.3% of men.

Figure 3 shows that the age distribution of the sample. There was an acceptable distribution of participants over the respective age groups. There was a relationship between age and occupation, but that was mostly caused by the large number of young people in the "not in work" category. Once these were excluded, there was no significant association between occupations and age, $\chi^2(6, N = 133) = 10.00$, $p = .12$.

4.2. Results

Reported e-mail usage.   Reported e-mail usage among respondents was very high, which is perhaps not surprising given the nature of the sample. Ninety-six percent of respondents send work-related e-mails on a daily basis, and 76% send per-
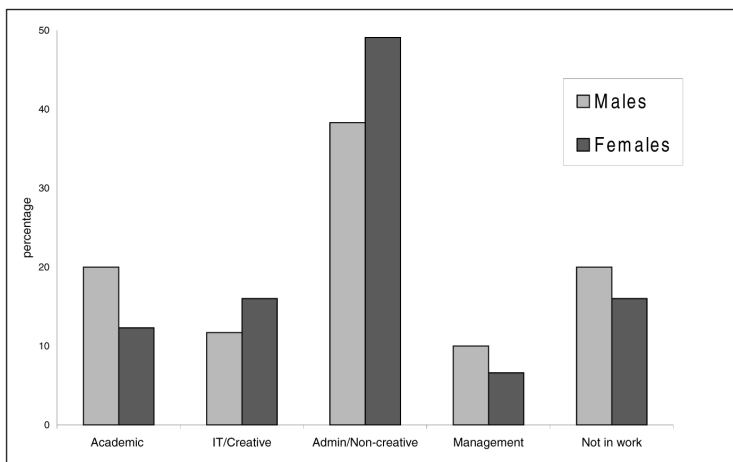
FIGURE 2   Ratio of men to women by occupation in the Web survey.
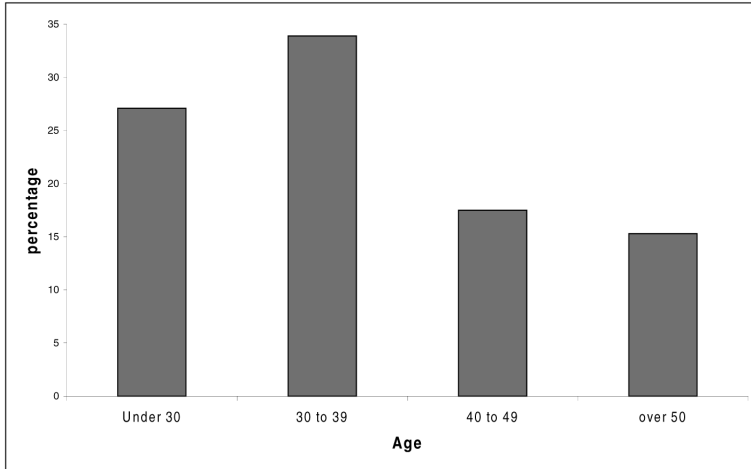
FIGURE 3   Age distribution of sample.

sonal e-mails on a daily basis. Perhaps more surprising, 53% of respondents send work-related e-mails abroad on a daily basis, and 41% send personal e-mails abroad on a daily basis. These figures highlight the truly global nature of e-mail.

E-mail clearly has the potential to be disruptive. The majority, 84%, kept e-mail running in the background at work; indeed, 55% also kept e-mail running in the background at home. Almost half (49%) of respondents always used alerts to notify e-mail arrival, and a further 15% did so sometimes. Only 19% did not use alerts at all.

Table 5 shows the reported frequency of checking e-mails, irrespective of alerts: 34.3% reported that they checked every 15 min or less, and 49.3% reported that they checked e-mails more than once an hour. The median reported time between checks was 60 min. This is at odds with the data reported in Table 3, which show that the median for people we monitored was closer to 5 min rather than every 60 min. It is difficult to directly compare the two studies as the second study used an ordinal scale to measure frequency. However, if one just considers those in the second study who report checking e-mail every hour or more and uses a nonparametric test, then the differences between the two samples are significant (Kolmogorov-Smirnov $Z = 2.055$, $n = 96$, $p < .01$). Hence, despite the small sample

Table 5:   **Reported Frequency of Checking E-Mail, Irrespective of Alerts**

Frequency of Checking	No.	%
Every min	12	8.6
Every 15 min	36	25.7
Every 30 min	21	15.0
Every 60 min	21	15.0
Every few hrs	31	22.1
Once a day	13	9.3
Once a week	6	4.3
Total	140	

size in the first survey, the massive disparity in frequency shows that the perceived usage is not the same as the actual usage.

Perceptions of the recipient cost of e-mail. Respondents were asked to rate the ability of various events to disrupt their work on a 5-point scale where 1 = *not able to disrupt* and 5 = *easy to disrupt*. Table 6 gives the mean scores and the standard deviations.

The three synchronous communications all scored highly, whereas the three asynchronous communications scored much lower. Indeed the asynchronous means of communication all scored lower than general background conversation. A repeated measures analysis of variance was carried out to test whether the mean score for e-mail disruption was significantly different to the three synchronous communications, telephone call, face-to-face conversation, and unannounced visit. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(5, N = 159) = 75.496, p < .01$. Hence degrees of freedom were corrected using Greenhouse–Geisser estimates of sphericity ($\varepsilon = 0.756$). There was a significant within-subjects effect of communication medium on disruptive effect, $F(2.27, 358.18) = 102.97, p < .01$. Contrasts revealed that the disruptive effect of e-mail was significantly lower than any of the other three mediums, $F(1, 158) = 176.69$ for telephone call; $F(1, 158) = 141.85$ for conversation; and $F(1, 158) = 130.82$ for unannounced visit ($ps < .01$). It is clear that respondents do not perceive the disruptive potential of e-mail as anything like as high as traditional synchronous communication mediums.

Part of the explanation of the benign view of the disruptive potential of e-mail may stem from the perceptions of control over e-mail that respondents expressed. They were asked to rate a number of aspects on a 5-point scale where 1 = *never in control* and 5 = *always in control*. A paired *t* test on the differences between individual's responses showed that they felt significantly more in control of e-mails than in their general accessibility to others (e-mail $M = 3.99, SD = 0.92$, general accessibility mean 3.56, $SD = 0.90$), $t(155) = 5.94, p < .01$.

This general feeling of control was reinforced when respondents were asked to rate their agreement to a number of statements on a 5-point scale where 1 = *completely disagree* and 5 = *completely agree*. Respondents generally disagreed that e-mail was a source of stress ($M = 2.40, SD = 1.13$). Respondents felt somewhat greater

Table 6: Disruptive Effects of Different Communication Events

Event	Disruptive Potential (M score)	SD
Telephone call	4.28	0.94
Face-to-face conversation	4.26	0.99
Unannounced visit	4.21	1.00
General background conversation	3.12	1.16
E-mail	3.06	0.99
Instant messaging	3.03	1.31
Short messaging service text	2.79	1.25

Note. N = 159.

pressure to deal with e-mails ($M = 3.08$, $SD = 1.10$). However there was overall agreement that e-mail made their lives easier ($M = 4.10$, $SD = 0.97$).

There was also some evidence that recipients felt some pressure from e-mail. First, respondents did feel the need to deal with e-mail as quickly as possible. They agreed with the statement that they liked to deal with e-mail as soon as possible ($M = 4.00$, $SD = 0.96$) and disagreed that they let e-mails build up before acting on them ($M = 2.22$, $SD = 1.04$).

Second, 45% of respondents sometimes choose to close their e-mail client and those that closed their client agreed significantly less with the statement that e-mail made their lives easier ($M = 3.94$, $SD = 0.97$) compared with those that did not close their client ($M = 4.35$, $SD = 0.86$), $t(139) = 2.61$, $p = .01$.

Third, there was a significant difference between the response time e-mail senders expect of the e-mails they send compared to the response time they felt is expected of the e-mails they receive. Respondents were asked to rate their agreement with a number of pairs of statements on a 5-point scale where 1 = *completely agree* and 5 = *completely disagree*. The results are shown in Table 7. A paired t test between the expectations of the roles of sender and recipient showed that although there was no significant difference in expectations of responses in the medium-term response behavior (replies within days or a week), there was a significant difference in the short-term behavior (immediate replies). Individuals as senders expected a less prompt response than they felt was expected as recipients, $t(155) = 3.48$, $p < .01$.

Finally, there was also some evidence that respondents recognized the relative costs of e-mail for sender and recipient outlined earlier. When asked whether they preferred to send or receive e-mails, 26% preferred sending and only 3% preferred receiving (the rest had no preference). Also, more people felt that they received more e-mails than they sent. Fifty-two percent of respondents said they received more, and only 12% sent more (the rest felt they received and sent the same amount). A hypothesis test on the two proportions showed that the difference was significant ($z = 7.66$, $n = 156$, $p < .01$).

Gender differences. There is some evidence to suggest that women see e-mail as more of a problem than men. As pointed out earlier, approximately 85% of both men and women were in creative jobs. There were clear differences, however, between the genders in their perception of e-mail, with women in creative jobs seeing e-mail as a more intrusive medium.

Table 7:   Sender and Recipient Expectations of E-Mails

Expectations	Agreement (M score)	SD
People expect instant replies to e-mails.	3.26*	1.09
I expect instant replies to my e-mails.	2.95*	1.07
People expect a reply within a few days.	3.56	1.21
I expect a reply within a few days.	3.71	1.04
People expect a reply within a week.	3.14	1.46
I expect a reply within a week.	3.26	1.41

*Differences between statements are significant . $p < .01$.

Women in creative jobs tended to check e-mails significantly more often than men in similar occupations (women: $M = 4.78$, s = 1.53; men: $M = 4.14$, s = 1.51), $t(113) = 2.165$, $p = .033$). They also significantly felt more pressure to deal with e-mails than men (women: $M = 3.27$, s = 1.15; men: $M = 2.83$, s = 1.05), $t(122) = 2.144$, $p = .034$. Finally, women tended to see e-mail as more disruptive to their work, although in this case the difference was almost but not quite significant (women: $M = 3.23$, s = 1.01; men: $M = 2.88$, s = 1.04), $t(124) = 1.901$, $p = .06$. These differences may be related to level of seniority as, even within comparable occupations, it is still the case that women are more often in relatively less senior positions ("The Conundrum," 2005; Equal Opportunities Commission, 2005).

Confusion of work with the personal.   Despite the gender effects just mentioned, there is obviously a conflict between the high impact of e-mail on respondents' work practices and their generally benign acceptance of it. One possible reason for the apparent contrast may be because e-mail is used for both work-related and personal reasons.

A large proportion of respondents used e-mail for both personal and work use, often at the same time. Seventy percent of respondents sent both personal and work-related e-mails on a daily basis while at work. These people tend to check their e-mails significantly more often ($M = 4.65$, s = 1.62, compared with $M = 3.79$, s = 1.66, for those who do not), $t(138) = 2.87$, $p < .01$. They also report less trouble resuming work after an e-mail alert ($M = 3.76$, s = 1.13, compared with $M = 3.37$, s = 1.27, for those who do not), $t(157) = 1.96$, $p = .05$.

Fifty-three percent kept e-mail running in the background both at work and at home. A chi-square test on the relationship between background e-mail use at home and the use of e-mail at work for personal reasons found that the relationship was significant, $\chi^2(2, N = 165) = 13.46$, $p < .01$. Sixty-four percent of those who sent both personal and work-related e-mails on a daily basis kept background e-mail at home compared to 35% for those that did not.

5. DISCUSSION

The findings of these two studies can be discussed in three broad topic areas: the recipient costs of e-mail, the problem of activity switching, and the preference for sending rather than receiving e-mail.

5.1. Recipient Costs of E-mail

There is no doubt that e-mail has tremendous benefits in the workplace; this article—a collaboration between three individuals across two sites—would have been much slower and harder to produce without the benefit of e-mail. However, despite the benefits it is also clear that e-mail does not come without some costs, and these costs are disproportionately loaded onto the recipient. It is evident from this research that the vast majority of individuals in this study use e-mail daily. Contin-

uous activity switching between e-mail (a communications medium) and other (non-communications-based) work-based applications is prevalent. This echoes Bellotti et al.'s (2005) observation that significant evidence is available of switching between applications. Yet the central conundrum from our studies is the clear fact that the disruptive effect of e-mail is not recognized by recipients. E-mail checking behavior and the perception of that same behavior are clearly at variance. As stated in the previous section, although individuals believe they check e-mail approximately every 60 min, usage tracking reveals it is closer to every 5 min. It is clear that e-mail users—at least in terms of self-reporting—feel in control of their e-mail. However, research indicates that humans have an unrealistic expectation of the extent to which they are personally able to control life events (Langer, 1982; Langer & Roth, 1975), thus potentially explaining the discrepancy between the self-reported checking behavior and reality. It is interesting that our respondents also ranked e-mail as being relatively low in terms of its power to interrupt. This relatively low ranking of e-mail may also stem from the fact that users perceive themselves as checking e-mail far less frequently than they really do, or even that they do not take into account responses to e-mail alerts.

5.2. Is Activity Switching a Problem?

Before we explore how this illusion of control can be unmasked, it is pertinent to consider whether it is worth doing: Are there perhaps benefits to the continuous activity switching? First, one explanation of potential benefit lies in the domain of displacement activity (Freud, 1901/1960, 1904/1953; Tinbergen, 1951). In Freud's psychoanalytic philosophy, this form of switching activity might represent an unconscious displacement behavior. Freud's original conception of a "displacement activity" was grounded in the notion that an individual unconsciously moves their mental and physical energies away from a primary, potentially challenging (or threatening) object to a less challenging one. This idea sits well with anecdotal evidence to the same effect; it is clear that e-mail is often used as a diversion from primary, ongoing (usually electronically based) tasks, on the premise that e-mail is, after all, work related and therefore a largely blame-free activity. While engaging in this potentially displacement-driven activity, the e-mail user may benefit from the reprieve granted from the primary task. That reprieve may grant the individual the objectivity required to shed illumination on the primary task and thus ultimately help move it forward.

On the other hand Robbins et al. (1996) illustrated that "distractor tasks," which had key, generic components in common with the original task, crucially had a deleterious effect on overall task performance. Specifically, Robbins et al. witnessed that although activities that were dependent on sound did not suffer from this effect, those activities that had significant commonality between the central executive and visual input did. This leads one to conclude that the closer a given interruption is in certain and specific structure, content, and style to the original activity, the worse the potential end effect. Given this premise, it might feasibly be hypothesized that if one is primarily engaged in a creative endeavor (as were most of the participants in our study), then the closer the incoming interruption in form, con-

tent, and style, the worse the potential outcome for the e-mail recipient. The lesson here would be that if you spot e-mails that are—at face value at leas—conceptually related to the task at hand, then do not open them. But might not the temptation be too great? Certainly, it would be revealing to map or correlate the content and style of incoming e-mails against the interruption effect; this might be the subject of a future study. Even if an incoming e-mail is pertinent to the task at hand, to the extent that it might modify it, the user ideally should be able to choose to select when and how such communications are attended to.

Perhaps more important, as Dabbish, Kraut, Fussell, and Kiesler (2005) recognized, "e-mail usage reflects attentional differences due both to personal propensities and to work demands and relationships" (p. 691). They saw that individual differences "accounted for 26% of the variance in the perceived importance of a message"(p. 696) and "for 15% of the variance in the probability of response to a message" (p. 697). In other words, personality and individual differences play a significant role in e-mail-related behaviors. In recognition of this, we address individual differences in the form of locus of control of reinforcement and self-esteem elsewhere (Hair et al., in press).

A more materialist perspective of e-mail might argue that it is beneficial in increasing the efficient running of organizations by increasing workers' productivity. Bellotti et al. (2005), for example, found that the workers they studied managed an average of 65 concurrent active tasks due to the increased speed and ease afforded by e-mail. It is clear from our findings that synchronous communications are perceived as having a more negative impact than asynchronous ones. This endorses Rubenstein, Meyer, and Evans's (2001) demonstration that humans' ability to "multitask" does have quite clear limits. It is more probable that the constant interruptions from e-mail may in fact result in a reduction in productivity. Edwards (2001) referred to the "reset time"—the time it takes the user to successfully resume the original task. But is the task-resumption cost the real issue? The question must also be asked, Do we work in anticipation of being interrupted, that is, is the cost an anticipatory one? Speier et al. (1999) witnessed the "speeding up" of task execution after interruption, a possible benefit of it happening, yet even though a task is executed more quickly postinterruption, it does not necessarily mean that it is followed through in the most appropriate way. Perhaps of more concern is the creativity issue. Intellectually creative people, such as those who responded to our survey, tend to be "task motivated" (Lykken, 1998) and continually refresh their working memory (Rypma & D'Esposito, 1999) by rearticulating the issue at hand, the context, and the potential solutions identified. As mentioned previously, the central executive plays a key role in the management of working memory.

5.3. Why Is Sending E-mail Better Than Receiving?

Our research has also illustrated that individuals prefer to send e-mail over receiving it. Unfortunately, however, most people report that they receive more e-mail than they send. Future investigations might usefully consider Guéguen and Jacob's (2002) finding that the status (high or low) of the "solicitor" (i.e., the sender of a computer-mediated communication) influences the likelihood of a response.

Guéguen and Jacob looked specifically at participation in Web surveys; however, this effect may well be generalizable to other forms of mediated communication, such as e-mail. Sending e-mail may be preferable to receiving for reasons cited by Venolia, Dabbish, Cadiz, and Gupta (2001) and Bellotti et al. (2003). Incoming e-mail is subject to, using their term, *triage*, meaning there is a requirement placed on the head of the recipient to make a decision as to how to deal with the e-mail.

Despite our finding that people did not consider e-mail to be a source of stress, it is nevertheless recognized as stress inducing among varying sets of employees (Demiridjian, 2005; Gillespie et al., 2001). Our findings of gender differences in attitudes to e-mail suggests that this decision making may be a source of stress more particularly among workers in junior positions, that e-mail stress is related to perceived control over your work environment.

6. CONCLUSIONS

We illustrated (Table 2) that although the cost to the user sending an e-mail in terms of both time and money is negligible, for the recipient the cost of monitoring e-mail messages continuously to respond according to sender expectations is high. It is this mismatch that makes e-mail a tyrant. Khong (2001) enumerated the objections to e-mail from users and administrators. As far as users go, he argued that they object because of the cost of downloading e-mails if they pay for their connection and also due to the time taken to sift through their e-mails. From this discussion, it seems that the problem with spam is its nuisance value and not that it causes users to be stressed, because spam is easily dealt with by using the Delete key. It seems that the recipient's perception of expectation of a quick response by the sender places demands on the recipient that are more costly than anticipated.

A number of researchers (Bellotti et al., 2005; Ducheneaut & Watts, 2005) have proposed user interface design solutions and strategies to improve e-mail usage, but the real solution lies in redressing the equilibrium between sender and recipient and, in particular, in increasing the power, control, and awareness of the e-mail recipient.

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