

Everyday Communication Patterns of Heavy and Light Email Users

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Abstract

Detailed 7-day, 24-hour-a-day communication diaries completed by leaders of a mid-western community were used to compare the communications of 23 heavy (35 or more messages a week) and 22 light (7 or fewer messages a week) email users. Email use supplemented communication beyond the level of the other media, especially for work communication. Heavy email users communicated more frequently to more people, although they neither spent more time communicating (except for work communication) nor communicated with more unique others than light email users. Heavy email use altered overall communication style across both work and non-work content (smaller percentages for several other media across several variables), and a slight displacement of phone contacts was noted in the “personal” and “other business” communication of heavy email users. Results suggest that email finds a niche in everyday communication but also support perceptions of e-stress associated with heavy email use.

Authors' note

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Email is speedier than postal mail, more convenient than telephone tag, and more efficient than other means of group coordination (see Sproull and Kiesler, 1991), and it is largely because of these advantages that email is becoming a fixture of everyday life, with almost half (42 percent) of Americans now reading email daily (UCLA CCP, 2000).

Despite all this, references to this “killer application” (Choney, 2000), to a people “decidedly short on time” (Weil and Rosen, 1997), and to “e-stress” (Pitney Bowes Inc., 2002) abound, hinting at a dark side to this relatively recent technology. Is email a blessing or a curse?

This study attempts to clarify the impact of email on communication and everyday life through 7-day, 24-hour-a-day examination of communication behavior. Communication diaries were kept for one week by a group of community leaders. Results are compared for those for whom email use was a significant feature of daily life (35 or more emails a week) and those for whom it was not (7 or fewer emails a week). Although previous investigations give insight into email use, this study crosses both communication contexts (work, home, and community) and contents (work, personal, and non-work-related business) and provides a unique opportunity for looking at the impact of email technology on everyday communication.

Impact of email use on communication

Are heavy email users, whether due to personal choice or circumstance, simply heavier communicators than others – or is heavy reliance on email associated with decreased use of other communication media? Although previous research generally suggests that heavy email use has been associated with a higher overall communication rate (for example, Rice and Shook, 1988), the precise relationship between email use and employment of other communication media remains an enigma.

Some studies have found heavy email use to be associated with heavy use of all communication media. For example, Kraut and Attewell (1997) found that bank employees who used any one communication medium heavily also tended to use others heavily and that relationships among individual media were positive though weak. Similarly Bikson and Eveland’s (1990) computer-using volunteer task force had a greater number of communications of all types (except unscheduled meetings) than their non-electronic task force. Based on studies of a university research group and distance learners, Haythornthwaite and Wellman (1998) and Haythornthwaite (2000, 2001) found communication pairs to add communication media as they communicated more heavily, starting with unscheduled face-to-face, adding on scheduled face-to-face, and then adding on email (see also chapters by Quan-Haase and Wellman, and Chen, Boase, and Wellman). Communicators with closer work or social ties communicated more often and used more media to communicate.

However, other studies have suggested that, instead of increasing all forms of communication, email displaces the use of other media. In Finholt, Sproull, and Kiesler's (1990) laboratory study, groups using more computer-mediated communication used other media (face-to-face, phone, and memo) less. Nyce and Groppa's (1983) bank employees claimed email replaced the phone and, to a lesser extent, memos, Rice and Case's (1983) managers stated that it reduced phone calls more than paper communication, and Rice and Shook's (1988) aerospace employees reported use of email to slightly decrease initiation of paper, letters, and phone calls.

The results at home parallel the inconsistency of those in the workplace. For example, 83 percent of those surveyed by Katz and Aspden (1997) stated that time spent with friends and family face-to-face and by phone had not changed since they began using the Internet (which would include email) while 6 percent claimed that such time had increased and 6 percent claimed that such time had decreased. However, 48 percent of Dimmick, Kline, and Stafford's (2000) sample of Columbus residents claimed that they used the phone less since adopting email, while 49 percent noted little to no change, and 3 percent claimed to use the phone more.

So what can one conclude? Certainly, it seems that email use is associated with a higher rate of communication in general. However, the precise impact of email on the frequency with which other communication media are employed may vary with communication content and context as well as the strength of the relationships among the communicators (see Haythornthwaite, 2001, 2002). Moreover, most of this evidence is based upon self-reports a long time after the reported events (and sometimes even estimates of relationships between behaviors such as current email use and past telephone use), and these may simply be inaccurate (see Bernard, Kilworth, and Sailer, 1981; Bernard, Kilworth, Kronenfeld, and Sailer, 1984). This study not only includes all communication contexts and contents but also avoids recall issues by capturing use as it occurs by using communication diaries.

Patterns of media use

A similar issue in communication media use relates to the proportionate use of the various media: that is, communication patterns.¹

1 We exclude from this review the multitude of investigations that have studied solely "media perceptions" and/or "media choice," with no consideration of actual communication media use, to avoid confusion of attitudes and intentions with communication behavior.

How often are the various communication media used and where does email sit in the communication patterns of everyday users?

Both Zack's (1994) 18-member newspaper editorial staff and Haythornthwaite and Wellman's (1998) university research group used mainly email and face-to-face meetings to communicate. The editorial staff also used occasional telephone conversations and rare memos. The university research group also used occasional phone, fax, and videoconferencing contacts. Wijayanayake and Higa (1999) found that members of distributed work groups used email and telephone for about 96 percent of their job-related communications, and fax, audioconferencing and videoconferencing for the remaining 4 percent of their communications (face-to-face and paper communications were not mentioned).

However, once again, other studies show a different profile. Dobos's (1992) key informants from for-profit organizations reported media use to include 44.3 percent face-to-face communications, 17.4 percent written memos, and 38.3 percent communication technologies. Of the latter 45.6 percent were audioconferencing, 40.2 percent fax, 3.7 percent phone, and a mere 5.4 percent email. Zeffane and Cheek's (1995) telecommunications employees also reported more frequent use of verbal communication rather than written or computer-based communications, with computers being the least used medium (no percentages given).

Although these results vary greatly in the proportion of communications via different media, particularly email (with content and context variation in the communications and self-report data once again likely factors for the variation), they are consistent in that all but one indicate face-to-face communication to be most frequent. This study seeks to expand upon these results, again through examination of actual communications across contexts and contents.

Email use in life context

Although face-to-face communications have been seen to be the predominant mode of communication, we also see in several studies a high use of email, a trend that is increasing with the spread of Internet access. As email use becomes more common, a consideration of importance in the conceptualization and study of this mode of communication is whether communicators are more appropriately characterized as intrinsically email users versus non-users – or simply as

those who have encountered and adopted a lifestyle that includes email versus those who have not (as yet). Therefore, we consider what it is that leads individuals to use email.

Research has shown computer training, age, ethnicity, income, and "technophobia" to be related to use of technological devices (Rosen and Weil, 1995) and education and income to be associated with the decision to use (or not to use) the Internet (GVU, 1998; Miller and Clemente, 1997). Predictors of actual email use have been limited to skill (Trevino, Webster, and Stein, 2000) and experience (see studies in this volume), favoring the second hypothesis – that heavy email use is more a situational than personal issue.

On an organizational level, we find that the decision to use (or not to use) email has been shown to be influenced by group, organizational, social, and transnational structures (Contractor and Eisenberg, 1990; Poole and DeSanctis, 1990; Rice, 1994). Factors affecting use have included use by relevant co-workers (Steinfeld, 1986; Schmitz, 1987), attitudes of supervisors toward email (Trevino et al., 2000), use by supervisors (Schmitz and Fulk, 1991), attitudes of co-workers toward the usefulness of email (Schmitz and Fulk, 1991; Trevino et al., 2000), managerial encouragement of email use (Markus, 1994; Shin, Higa, Sheng, and Ide, 1999; Wijayanayake and Higa, 1999), and classroom norms (Haythornthwaite, 2000). Additionally, email use has been found to be related to job type, whether secretarial, analyst, or director (Sullivan, 1995) or director versus manager (Carlson and Davis, 1998; Rice and Shook, 1990). Communication tasks and group use have been found to account for significant portions of the variance in number of emails sent (tasks explained 18 percent of the variance, and group use 10 percent; Soe and Markus, 1993).

While these results correspond well with the social network analyst's view of "structured social relationships" as "a more powerful source of sociological explanation than personal attributes of system members" (Wellman, 1988, p. 31), we find that we cannot ignore individual variables in our efforts to unravel the factors in email use (or non-use). Such elements are needed to explain Eveland and Bikson's (1987) findings that department, program, and professional group membership did not significantly predict messaging behavior and that there were individual differences not explained by whether others in the individual's communication network used email. They postulated that use by such individuals might be explained by media style preferences. Fulk and Boyd (1991) concurred with this notion,

stating that organizational culture, policies, and resource constraints as well as rational and social influence factors and individual media style need to be considered in media choice.

The important point to draw from all this is that although individuals may come to a given communication situation with some definite preferences, they are also embedded in a local context in which they may find themselves swept up in prevailing usage norms and situational media availability to such an extent that their own media preferences come to represent only a small, but noticeable, influence on their actual media use. Not so strangely, this notion of the individual being swept up into email use by their social network is in keeping with expectations and results based on diffusion of innovations research (Rogers, 1995; see also Haythornthwaite and Wellman in the introduction to this volume).

Although the phenomenon of heavy versus light email use is in itself worthy of comparison, it also appears that we may consider a group of light email users as a rather fair representation of heavy email users if they had not become involved in their current, heavily email using social networks. Our approach, then, is, first, to explore whether the two groups (heavy and light email users) are comparable to the heavy and light email users of former investigations and, second, to compare the communication patterns of our heavy and light email users. The latter comparison is achieved through addressing the following specific questions:

- 1 How does heavy email use affect frequency of use of other media? Do heavy and light email users differ in frequency of communication, time spent in communication, and number of communication partners across: (a) all communications, (b) all non-email communications, (c) individual communication media (face-to-face, phone)?
- 2 How does heavy email use affect proportionate use of other media? Considering only non-email communications, do heavy and light email users differ in the percentage of communications they conduct, percentage of time spent communicating, and/or percentage of communication partners communicated with (a) face-to-face, (b) by phone, etc.?
- 3 How does heavy email use affect communication style? Considering all communications, do heavy and light email users differ in the percentage of communications they conduct, percentage of time spent communicating, and/or percentage of communication

- partners communicated with (a) via email, (b) face-to-face, (c) by phone, etc.?
- 4 Does frequency of use (see 1), proportionate use (see 2), and/or communication style (see 3) of heavy and light email users differ for (a) work, (b) "business" other than work, and (c) personal communications?

Participants, Data Collection, and Analysis

Participants

Study participants were recruited from a mailing list of 424 community leaders obtained from a county chamber of commerce in a small midwestern American city in spring 1997.² This population was selected to increase similarity of participants in educational and income levels, two factors on which Internet users differ from others (see GVU, 1998; Clemente, 1998). To increase homogeneity regarding length of email usage, all university personnel (who would have had earlier access to email and the Internet) were excluded a priori from the study. The remaining names were randomly ordered, and contacted by telephone. In this initial call, participants were asked to estimate separately the number of email messages they sent and received on an average weekday and sent and received on an average weekend day. They were also asked if they would be willing to participate in a more detailed data collection effort. The total number of reported emails per week ranged from 0 to 2,130 messages. Phone calls continued until 30 heavy email users (over 100 reported per week) and 30 light email users (under 10 reported per week) agreed to participate in the study. A total of 117 subjects completed this initial phone survey, yielding 60 study recruits.

Though recruits were offered both a cash stipend and a personalized communication report in exchange for study participation, participants reported the latter as the greater incentive, increasing our confidence in the accuracy of their communication diaries. Participants were guaranteed confidentiality and signed informed

2 An earlier investigation of these data is reported in Kanfer (2000). Though the earlier report considered some social issues not addressed in this study, it did not provide the comprehensive comparison of media use and examination of interrelationships among media attempted here.

consent forms in accordance with the university's Institutional Review Board.

Of the 60 study recruits, 5 dropped out before data collection was completed. Following data collection, the data were reviewed to compare diary reported email use to that reported during the initial phone contact. Because of inconsistencies in these two reports, heavy and light email use was redefined and only study participants whose phone and diary reports matched in terms of "heavy" versus "light" classification were retained for the current study.

The resulting group of heavy email users consists of 23 community leaders who used email 35 or more times per week and 22 light email users who used email 7 or fewer times a week. The "heavy" email users reported an average of 7.61 years of email use before this study; of the "light" email users, 15 had never used email (and did not use it during the study week), and 7 reported using email for an average of 2.0 years before this study.

Data collection

Data were collected in three parts: (1) a weeklong communication diary, (2) a follow-up social network survey about the participants' communication partners, and (3) a face-to-face interview to collect demographic and other information.

Diaries were used to obtain a record of all communications (Conrath, Higgins, and McClean 1983). Study participants were asked to record "all communications involving the transmission of information beyond a simple greeting" with the sole exception of broadcast communications such as presentations, lectures, and concerts. Email broadcasts were included in the diaries, but are excluded from the current analyses because comparable data are not available for other media.³

For each communication, study participants recorded the approximate length of the communication; whether the content of the communication was primarily "business," "personal," or "other business"; and the communication medium used (face-to-face, phone, phone

3 Broadcast communications were defined as "any information transmitted to a group of people, at least one of whom you do not know, without intention of initiating a two-way conversation."

message, fax, paper, and email).⁴ "Work" content was defined as "all communication which relates to your job in any manner." "Other business" was defined as all communications relating to the conduct of business which is not connected to your job (such as communication with cashiers, waiters, bank tellers, doctors, and so forth as well as communication with family members regarding this personal business). "Personal" content included "all non-work, non-business communication."

Communications recorded in the diaries included those inside and outside the work environment as well as both weekday and weekend communications, 24 hours a day for one full week. Participants recorded as many as possible of the names of people involved in all one-to-one communications, all group real-time communications, and delayed group communications in which they were the sender of the communication. When they did not know a name, they were asked to use descriptive words that would help them remember the person involved. If they were the recipient of a delayed group communication, they were to record only the sender's name.

Study participants were given the choice of recording communication data in a paper diary or in a hand-held personal digital assistant (PalmPilot™ by US Robotics). Thirty of the participants used the PalmPilot to enter data for at least part of the week, and one participant, who had a physical impairment, used a cassette recorder to enter data. The remaining 24 participants recorded all their communication data in a paper diary.

Following the week of recording details of each communication, participants were given a self-administered survey about each of their communication partners or *alters*. For each alter, they recorded the type(s) of relationship(s) they had with that alter, when they had first become acquainted, and the relative location of their home to that of the alter (same town, same state, and so on). A final phase of data collection included a face-to-face interview in which demographic and other data on the participants were recorded. In addition, each participant completed a personality assessment (EASI-11, Buss, and Plomin, 1975) that included five questions for each of three components of temperament: activity, sociability, and impulsivity.

4 Participants also recorded online real-time communications. However, these are excluded here because they comprised only about 0.1 percent of the recorded, non-broadcast communications.

Analyses

T-tests⁵ were used to compare heavy email users to light email users across all communications, all non-email communications, and for each of six media (face-to-face, phone, phone message, fax, paper, and email) for five measures: (1) number of communications; (2) time spent communicating; (3) number of named and unnamed communication alters (including duplicates, that is, alters were counted each time the participant communicated with them); (4) number of named communication alters, including duplicates; and (5) number of unique, named alters (each alter counted once and only once).

Next, percentages were calculated for communication media use as measured by each of the five variables for each of the six communication media across (1) all non-email communications (to examine the impact of heavy email use upon proportionate use of other communication media) and then (2) all communications (to examine the impact of heavy email use upon overall communication style). T-tests comparisons were also run on these percentages.

Finally, these analyses were re-run for each of the three content areas separately: work, other business, and personal communications.

Results

Participant characteristics and overall communication behavior

Were our study participants and their communication behavior comparable to those of previous investigations? Several preliminary analyses were run to make this determination.

Whereas previous studies found 39 percent of bank employees' (Kraut and Attewell, 1997) and about 75 percent of managers' (Mintzberg, 1973; Rice and Shook, 1990) workdays spent on communication, our participants averaged 21.2 hours on work-related communication (53 percent of an 8-hour workday). Given that 60 percent

5 Initially, correlations were calculated among the six media for the five media use variables. Based on low correlations in both this study and Kraut and Attewell's earlier (1997) study (as well as the sometimes negative relationships in our own study and some other studies), we decided that a series of t-test analyses, reflective of the relative independence of the six types of media use, would best serve the purposes of this study.

of these participants were managers, this figure seems in line with communication patterns found in previous studies. Moreover, our participants were comparable to those of other studies in that they reported more communications face-to-face than for any other media (see patterns of media use) and our heavy email users communicated more frequently than our light email users (see impact of email use).

As noted earlier, previous investigations also suggest that heavy and light email users differ in job variables and may, based on studies of technology and Internet use, differ in age and education (see email use in life context). In this study, heavy email users did tend to work in different places ($X^2(3) = 21.899, p < 0.05$) as well as to have different sorts of positions ($X^2(2) = 14.422, p < 0.05$) than light email users. Heavy email users worked more often than light email users in education and information related industries (65 percent versus 9 percent, $X^2(1) = 15.069, p < 0.01$) and less often in government and law offices (4 percent versus 41 percent, $X^2(1) = 8.696, p < 0.01$) or in small business (13 percent versus 46 percent, $X^2(1) = 5.750, p < 0.05$). There was no difference in proportions working in the banking industry. Heavy email users were more often in information technician and research positions (35 percent versus 0 percent, $X^2(1) = 9.307, p < 0.01$) and less often in public service positions (4 percent versus 41 percent, $X^2(1) = 8.696, p < 0.01$). There was no difference in the proportions in management positions.

As might be expected, heavy email users tended to be younger (means of 41 versus 52, $t(43) = 4.252, p < 0.01$) and more educated (65 percent versus 27 percent having a masters degree, $X^2(1) = 6.505, p < 0.05$) than light email users. The two groups did not differ in gender or marital status. Only one of the three personality variables (impulsivity) even approached significance, with heavy email users scoring a mean of 13.4 on a scale of 5 to 25 (based on 5 items scored from 1 [defined as "a little"] to 5 [defined as "a lot"]) compared to 11.4 for light email users ($t(43) = -1.833, p < 0.10$).

In summary, these results confirm an equivalence between our study participants and their communication behaviors and that of previous investigations.

Email use

All but one comparison of email use between heavy and light email users showed significant differences between the groups. Heavy users

had greater numbers and percentages of communications, time spent communicating, and alters than light email users (all comparisons significant at $p < 0.05$) for all communication types except the total number of "other business" alters (which yielded $p < 0.10$).⁶

Media use for all communications

Heavy email users differed from light email users not only in email use but also in having significantly higher numbers of communications and numbers of alters (both total and named; see table 9.1).⁷ Daily communications averaged 400 versus 275 for heavy versus light email users ($t(43) = -2.843$, $p < 0.05$). These communications involved an average of 692 total alters for heavy email users versus 411 for light users ($t(43) = -3.637$, $p < 0.05$) and 493 versus 341 named alters ($t(43) = -2.827$, $p < 0.05$) for heavy versus light email users.

Heavy email use had little impact on the proportionate use of other communication media (percentages excluding email), with the only difference between heavy and light email users that approached significance being a slightly greater percentage of phone communications for light email users than for heavy email users (24 percent versus 19 percent, $t(43) = 1.745$, $p < 0.10$). However, heavy email use had several effects on overall communication style (percentages including email). Light email users had significantly greater percentages of face-to-face (64 percent versus 52 percent, $t(43) = 2.994$, $p < 0.05$) and phone (24 percent versus 14 percent, $t = (43) 3.769$, $p < 0.05$) communications as well as a greater percentage of fax communications at near significance (0.0128 percent versus 0.0069 percent, $t(43) = 1.809$, $p < 0.10$). Light email users also had significantly greater percentages of total alters with whom they communicated via these three means of communication than did heavy email users (73 percent versus 55 percent

6 Sample size in all cases for both these and the following analyses was 45 except for those analyses involving percentages of "other business" communications. In these cases three study participants were dropped from the analyses because percentages could not be calculated since they had reported no "other business" communications for the study week.

7 Numbers in tables do not always sum precisely due to rounding as well as because of a small number of communications for which no mode was recorded. Additionally, the percentages of unique alters for the individual media total greater than 100 percent because alters could and often were contacted via more than one medium.

Table 9.1 Communication media usage by heavy versus light email users across all communications

Email use	No. of communications		Communication time		No. of alters		No. of named alters		No. of unique alters	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
<i>Mean</i>										
All media	275 (141)	400 (152) ^a	3,183 (947)	3,504 (928)	411 (165)	692 (331) ^a	341 (162)	493 (197) ^a	160 (61)	179 (67)
Non-email media	275 (141)	303 (137)	3,182 (947)	3,286 (938)	410 (164)	484 (209)	340 (161)	374 (172)	160 (60)	142 (67)
Face-to-face	177 (104)	214 (115)	2,722 (819)	2,879 (805)	292 (112)	362 (165)	240 (122)	282 (157)	88 (31)	81 (50)
Phone	64 (40)	53 (27)	352 (313)	291 (172)	65 (42)	55 (29)	65 (42)	54 (28)	45 (28)	34 (16)
Phone message	15 (19)	18 (17)	22 (29)	29 (29)	16 (19)	19 (19)	15 (19)	18 (17)	11 (12)	11 (9)
Fax	4 (4)	3 (3)	10 (11)	13 (21)	4 (4)	3 (3)	4 (4)	3 (3)	3 (4)	2 (2)
Paper (excl. fax)	13 (13)	13 (14)	58 (54)	67 (117)	31 (70)	43 (82)	14 (15)	15 (16)	12 (11)	11 (10)
Email	0 (1)	96 (47) ^a	1 (2)	218 (138) ^a	0 (1)	208 (219) ^a	0 (1)	119 (71) ^a	0 (1)	37 (12) ^a
<i>Mean %: all communications</i>										
All media	100	100	100	100	100	100	100	100	100	100
Face-to-face	64 (13)	52 (13) ^a	86 (8)	82 (07)	73 (12)	55 (17) ^a	70 (12)	56 (14) ^a	69 (12)	59 (13) ^a
Phone	24 (12)	14 (06) ^a	11 (07)	08 (03)	16 (08)	09 (05) ^a	20 (10)	12 (05) ^a	33 (13)	27 (09) ^b
Phone message	05 (04)	04 (03)	01 (01)	01 (01)	04 (04)	03 (03)	04 (04)	04 (03)	08 (07)	09 (07)
Fax	01 (01)	01 (01) ^b	00 (01)	00 (00)	01 (01)	00 (01) ^a	01 (01)	01 (01)	02 (03)	02 (02)
Paper (excl. fax)	05 (04)	03 (03)	02 (02)	02 (03)	06 (10)	05 (06)	04 (03)	03 (03)	08 (07)	08 (07)
Email	00 (00)	25 (11) ^a	00 (00)	07 (04) ^a	00 (00)	27 (17) ^a	00 (00)	25 (12) ^a	00 (00)	31 (12) ^a
<i>Mean %: non-email communications</i>										
Non-email media	100	100	100	100	100	100	100	100	100	100
Face-to-face	64 (13)	69 (13)	86 (8)	88 (06)	73 (12)	75 (13)	70 (12)	74 (13)	69 (12)	70 (11)
Phone	24 (12)	19 (08) ^b	11 (07)	09 (03)	16 (08)	13 (08)	20 (10)	16 (07)	33 (13)	32 (12)
Phone message	05 (04)	06 (04)	01 (01)	01 (01)	04 (04)	04 (04)	04 (04)	05 (04)	08 (07)	11 (09)
Fax	01 (01)	01 (01)	00 (00)	00 (01)	01 (01)	01 (01)	01 (01)	01 (01)	02 (03)	02 (02)
Paper (excl. fax)	05 (04)	04 (03)	02 (03)	02 (03)	06 (10)	07 (09)	04 (03)	04 (03)	08 (07)	10 (08)

Standard deviations are in parentheses. ^a $p < 0.05$, two-tailed; ^b $p < 0.10$, two-tailed.

for face-to-face, 16 percent versus 9 percent for phone, and 0.0094 percent versus 0.0044 percent for fax, $t(43) = 4.015, 3.501, \text{ and } 2.136$, respectively, $p < 0.05$). Finally, light email users had greater percentages of named alters and unique, named alters with whom they communicated face-to-face (70 percent versus 56 percent for named and 69 percent versus 59 percent for unique alters, $t(43) = 3.654 \text{ and } 2.659$, respectively, $p < 0.05$) and by phone (20 percent versus 12 percent for named and 33 percent versus 27 percent for unique, $t(43) = 3.599, p < 0.05, \text{ and } 2.024, p < 0.10$, respectively) but not by fax. Heavy email users, as expected, had greater percentages of email communications, time spent communicating, and alters (all three measures of alters).

Media use for "work" communications

Comparing the means for work communications showed much the same pattern as had the comparisons for "all" communications. However, in addition to having significantly more work communications, total alters, and named alters, heavy email users spent somewhat more time in work communications than light email users (table 9.2). Daily work communications averaged 234 versus 150 for heavy versus light email users ($t(43) = -2.645, p < 0.05$). These communications involved an average of 435 versus 219 total alters, and 281 versus 180 named alters for heavy versus light email users ($t(43) = -3.294 \text{ and } t(43) = -2.643$, respectively, $p < 0.05$). Heavy email users spent 1,437 minutes in these communications compared to 1,100 minutes for light email users ($t(43) = -1.768, p < 0.10$).

Though heavy email use had no impact on the proportionate use of other media for work-related communications (percentages excluding email), the results for communication style (percentages including email) were very similar to those across all communication contents. Light email users had greater percentages of face-to-face (57 percent versus 43 percent, $t(43) = 2.901, p < 0.05$), phone (27 percent versus 15 percent, $t(43) = 3.292, p < 0.05$), and fax communications (0.0195 percent versus 0.0098 percent, $t(43) = 1.754, p < 0.10$) as well as greater percentages of total number of alters with whom they communicated via these means (66 percent versus 48 percent for face-to-face, 18 percent versus 10 percent for phone, and 0.0150 percent versus 0.0064 percent for fax, $t(43) = 3.349, 2.756, \text{ and } 1.997$, respectively, $p < 0.05$ in the first two cases and $p < 0.10$ in the third) than did

Table 9.2 Communication media usage by heavy versus light email users across “work” communications

Email use	No. of communications		Communication time		No. of alters		No. of named alters		No. of unique alters	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
<i>Mean</i>										
All media	150 (104)	234 (109) ^a	1,100 (690)	1,437 (587) ^b	219 (137)	435 (283) ^a	180 (120)	281 (135) ^a	96 (57)	118 (61)
Non-email media	150 (104)	167 (98)	1,100 (690)	1,276 (550)	218 (137)	285 (174)	180 (120)	195 (107)	96 (56)	89 (59)
Face-to-face	84 (66)	101 (63)	809 (557)	992 (421)	133 (78)	186 (127)	112 (79)	125 (73)	44 (27)	43 (39)
Phone	41 (37)	38 (29)	210 (248)	186 (157)	42 (37)	39 (30)	42 (37)	38 (29)	31 (25)	25 (17)
Phone message	10 (13)	13 (15)	15 (18)	22 (26)	11 (13)	14 (16)	11 (13)	14 (15)	8 (9)	9 (9)
Fax	3 (4)	2 (3)	9 (11)	12 (21)	3 (4)	3 (3)	3 (4)	2 (3)	3 (4)	2 (2)
Paper (excl. fax)	11 (12)	11 (14)	51 (51)	61 (112)	28 (70)	41 (83)	11 (13)	13 (16)	9 (9)	9 (9)
Email	0 (1)	67 (40) ^a	0 (1)	161 (153) ^a	0 (1)	151 (198) ^a	0 (1)	86 (71) ^a	0 (1)	28 (15) ^a
<i>Mean %: all communications</i>										
All media	100	100	100	100	100	100	100	100	100	100
Face-to-face	57 (16)	43 (17) ^a	74 (15)	70 (14)	66 (16)	48 (20) ^a	64 (15)	46 (18) ^a	61 (15)	51 (16) ^a
Phone	27 (15)	15 (07) ^a	17 (12)	12 (07) ^b	18 (11)	10 (07) ^a	22 (13)	13 (7) ^a	36 (15)	30 (13)
Phone message	06 (06)	05 (04)	01 (02)	01 (01)	05 (05)	04 (04)	06 (5)	04 (4)	10 (09)	11 (10)
Fax	02 (02)	01 (01) ^b	01 (02)	01 (02)	02 (02)	01 (01) ^b	02 (2)	01 (1)	03 (04)	02 (02)
Paper (excl. fax)	07 (07)	04 (04)	06 (07)	05 (10)	09 (14)	07 (10)	06 (5)	04 (4)	12 (11)	12 (10)
Email	00 (00)	31 (16) ^a	00 (00)	11 (09) ^a	00 (00)	30 (19) ^a	00 (0)	31 (18) ^a	00 (00)	39 (17) ^a
<i>Mean %: non-email communications</i>										
Non-email media	100	100	100	100	100	100	100	100	100	100
Face-to-face	58 (16)	61 (17)	74 (15)	79 (13)	66 (16)	68 (19)	64 (15)	65 (17)	61 (15)	62 (14)
Phone	27 (15)	23 (12)	17 (12)	13 (07)	18 (11)	15 (12)	22 (13)	20 (11)	36 (15)	37 (16)
Phone message	06 (06)	08 (06)	01 (02)	02 (02)	05 (05)	05 (05)	05 (05)	07 (05)	10 (09)	14 (11)
Fax	02 (02)	02 (02)	01 (02)	01 (02)	02 (02)	01 (01)	02 (02)	01 (02)	03 (04)	03 (03)
Paper (excl. fax)	07 (07)	06 (07)	06 (07)	05 (11)	09 (13)	11 (14)	06 (05)	06 (05)	12 (11)	14 (12)

Standard deviations are in parentheses. ^a $p < 0.05$, two-tailed; ^b $p < 0.10$, two-tailed.

heavy email users. Light email users also had significantly greater percentages of named alters with whom they communicated face-to-face (64 percent versus 46 percent) and by phone (22 percent versus 13 percent) ($t(43) = 3.681$ and 3.039 , respectively, $p < 0.05$), but not by fax. Heavy email users had greater percentages of email communications, time spent communicating via email, and email alters (all three measures of alters).

Unlike the analyses across all communication contents, light email users only had a significantly greater percentage of unique alters with whom they communicated face-to-face about work (61 percent versus 51 percent, $t(43) = 2.237$, $p < 0.05$). Moreover, the difference in percentage of time spent in work-related communication on the phone by light versus heavy email users (17 versus 12 percent, respectively) approached significance ($t(43) = 1.864$, $p < 0.10$). None of the comparisons of percentages across content had yielded significant results for the amount of time spent communicating.

Media use for "other business" communications

Results for comparisons of means for "other business" communications were somewhat different from those for the all-content and work content analyses (table 9.3). Although heavy email users still differed from light email users in email use for all five variables, the comparisons for all media combined were not significant as they had been for the two previous sets of analyses. Moreover, the difference in unique phone alters between light and heavy email users (7 versus 4, respectively) approached significance for this analysis ($t(43) = 1.815$, $p < 0.10$). This is the only raw number analysis for any of the content areas for which the comparison of heavy and light email users on any medium other than email attained even near-significant results.

The impact of heavy email use on phone use for "other business" communication was even more salient when impact on proportionate use (percentages excluding email) was considered: that is, light email users had greater percentages of phone communications (27 percent versus 18 percent, $t(40) = 2.026$, $p < 0.10$), total phone alters (20 percent versus 12 percent, $t(40) = 1.768$, $p < 0.10$), and named phone alters (24 percent versus 16 percent, $t = 1.756$, $p < 0.10$) than did heavy email users. This finding contrasts with the absence of any impact of heavy email use on the proportionate use of other media for work communications.

Table 9.3 Communication media usage by heavy versus light email users across “other business” communications

Email use	No. of communications		Communication time		No. of alters		No. of named alters		No. of unique alters	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
<i>Mean</i>										
All media	31 (24)	36 (36)	350 (368)	324 (386)	45 (34)	76 (108)	36 (28)	43 (42)	27 (19)	27 (21)
Non-email media	30 (24)	28 (30)	350 (368)	308 (378)	44 (33)	44 (46)	36 (28)	33 (36)	26 (19)	21 (18)
Face-to-face	19 (19)	20 (24)	296 (330)	271 (350)	33 (29)	37 (41)	25 (23)	26 (30)	17 (14)	15 (14)
Phone	8 (9)	5 (6)	47 (74)	27 (43)	8 (9)	5 (6)	8 (9)	5 (6)	7 (7)	4 (3) ^b
Phone message	2 (4)	2 (3)	2 (4)	3 (4)	2 (3)	2 (3)	2 (4)	2 (3)	1 (3)	1 (2)
Fax	0 (1)	0 (0)	0 (2)	1 (2)	0 (1)	0 (0)	0 (1)	0 (0)	0 (0)	0 (0)
Paper (excl. fax)	1 (2)	1 (1)	4 (11)	4 (7)	1 (3)	1 (1)	1 (2)	1 (1)	1 (2)	1 (1)
Email	0 (1)	8 (10) ^a	0 (1)	16 (21) ^a	0 (1)	31 (76) ^b	0 (1)	10 (13) ^a	0 (0)	5 (6) ^a
<i>Mean %: all communications</i>										
All media	100		100		100		100		100	
Face-to-face	63 (21)	59 (23)	80 (20)	78 (21)	71 (23)	62 (27)	67 (22)	61 (24)	70 (20)	62 (22)
Phone	27 (14)	14 (11) ^a	17 (17)	11 (14)	20 (13)	09 (09) ^a	24 (14)	12 (11) ^a	27 (15)	16 (15) ^a
Phone message	06 (10)	05 (05)	02 (04)	02 (02)	05 (10)	03 (04)	06 (10)	04 (05)	07 (11)	06 (07)
Fax	00 (01)	01 (01)	00 (01)	00 (02)	00 (01)	00 (00)	00 (01)	00 (01)	01 (02)	01 (01)
Paper (excl. fax)	02 (04)	03 (04)	01 (03)	01 (02)	02 (04)	02 (03)	02 (03)	02 (04)	03 (06)	04 (05)
Email	00 (01)	19 (20) ^a	00 (00)	08 (11) ^a	00 (01)	24 (28) ^a	00 (01)	20 (22)	00 (01)	21 (22) ^a
<i>Mean %: non-email communications</i>										
Non-email media	100		100		100		100		100	
Face-to-face	63 (22)	72 (19)	80 (20)	83 (20)	72 (23)	80 (18)	67 (22)	74 (19)	70 (20)	74 (19)
Phone	27 (14)	18 (15) ^b	17 (17)	13 (19)	20 (13)	12 (14) ^b	24 (14)	16 (15) ^b	28 (15)	20 (19)
Phone message	06 (10)	06 (07)	02 (04)	02 (03)	05 (10)	04 (06)	06 (10)	05 (06)	07 (11)	07 (08)
Fax	00 (01)	01 (02)	00 (01)	00 (02)	00 (01)	00 (01)	00 (01)	00 (01)	01 (02)	01 (02)
Paper (excl. fax)	02 (04)	04 (06)	01 (03)	02 (03)	02 (04)	02 (03)	02 (03)	03 (05)	03 (06)	05 (08)

Standard deviations are in parentheses. ^a $p < 0.05$, two-tailed; ^b $p < 0.10$, two-tailed.

Comparing communication style (percentages including all media), "other business" patterns were again different from those across contents and for work content, the only significant differences (other than email use) being total phone communications and phone alters (and not for face-to-face and fax). Light email users had significantly more phone communications and alters (on all three alter measures) than did heavy email users. More specifically, 27 percent of light email users used the phone compared to 14 percent of heavy email users ($t(40) = 3.360, p < 0.05$), and light email users compared to heavy email users contacted 20 versus 9 percent of their total alters, 24 versus 12 percent of their named alters, and 27 percent versus 16 percent of their unique alters via phone ($t(40) = 3.198, 3.069, \text{ and } 2.388; p < 0.05$).

Media use for "personal" communications

Comparisons of heavy and light email users' mean media use for personal communications showed a difference only in the number of communications (other than the comparisons of email use which, of course, yielded significant differences). Heavy email users (table 9.4) had 128 personal communications compared to 93 for light email users ($t(43) = -1.725, p < 0.10$).

In comparing proportionate media use of heavy and light email users for "personal" communications (percentages excluding email), the only differences that approached significance were the greater percentage of face-to-face and lower percentage of phone communications for heavy versus light email users. Heavy email users communicated face-to-face 84 percent of the time as compared to 79 percent of the time for light email users ($t(43) = -1.779, p < 0.10$). Light email users, on the other hand, communicated via phone 17 percent of the time, compared to 12 percent of the time for heavy email users ($t(43) = 1.800, p < 0.10$).

Comparing communication style (percentages including all media), "personal" content communications resemble those across contents and for work content, but with some reversal of significant results for face-to-face and phone communications and no significant differences for fax. Light email users had a significantly greater percentage of phone communications (17 versus 10 percent, $t(43) = 2.792, p < 0.05$), total face-to-face (86 versus 76 percent) and total phone (11 versus 7 percent) alters ($t(43) = 2.093 \text{ and } 2.067, p < 0.05$), named phone alters (14 versus 8 percent, $t(43) = 2.656, p < 0.05$), and a nearly significantly

Table 9.4 Communication media usage by heavy versus light email users across “personal” communications

Email use	No. of communications		Communication time		No. of alters		No. of named alters		No. of unique alters	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
<i>Mean</i>										
All media	93 (52)	128 (81) ^b	1,718 (834)	1,723 (615)	146 (75)	179 (126)	123 (70)	167 (127)	49 (29)	49 (28)
Non-email media	93 (52)	107 (74)	1,717 (834)	1,682 (608)	146 (75)	154 (117)	122 (70)	145 (119)	49 (29)	43 (24)
Face-to-face	74 (43)	93 (73)	1,611 (781)	1,598 (598)	126 (68)	138 (115)	102 (61)	130 (117)	37 (22)	33 (20)
Phone	15 (11)	10 (6)	95 (118)	77 (82)	15 (12)	11 (7)	15 (12)	11 (7)	9 (6)	7 (5)
Phone message	3 (5)	3 (4)	5 (8)	4 (6)	3 (5)	4 (6)	3 (5)	3 (4)	2 (3)	2 (2)
Fax	0 (1)	0 (0)	0 (2)	0 (1)	0 (1)	0 (0)	0 (1)	0 (0)	0 (0)	0 (0)
Paper (excl. fax)	1 (2)	1 (1)	4 (9)	2 (3)	2 (4)	1 (1)	2 (4)	1 (1)	2 (3)	1 (1)
Email	0 (0)	21 (37) ^a	0 (1)	41 (64) ^a	0 (0)	25 (39) ^a	0 (0)	22 (38) ^a	0 (0)	6 (6) ^a
<i>Mean %: all communications</i>										
All media	100		100		100		100		100	
Face-to-face	79 (12)	73 (19)	94 (06)	93 (06)	86 (09)	76 (19) ^a	82 (11)	77 (19)	85 (10)	79 (12) ^b
Phone	17 (11)	09 (06) ^a	06 (06)	05 (05)	11 (08)	07 (05) ^a	14 (09)	08 (05) ^a	22 (13)	17 (09)
Phone message	03 (03)	02 (04)	00 (00)	00 (00)	02 (02)	02 (04)	02 (03)	02 (03)	04 (05)	04 (04)
Fax	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (01)	00 (01)
Paper (excl. fax)	01 (02)	01 (01)	00 (00)	00 (00)	01 (02)	00 (01)	01 (02)	00 (01)	03 (05)	02 (03)
Email	00 (00)	14 (18) ^a	00 (00)	02 (04) ^a	00 (00)	14 (18) ^a	00 (00)	12 (18) ^a	00 (01)	14 (13) ^a
<i>Mean %: non-email communications</i>										
Non-email media	100		100		100		100		100	
Face-to-face	79 (12)	84 (09) ^b	94 (06)	95 (05)	86 (09)	87 (08)	82 (11)	87 (08)	85 (10)	87 (08)
Phone	17 (11)	12 (08) ^b	06 (06)	05 (05)	11 (08)	09 (07)	14 (09)	10 (07)	22 (13)	20 (10)
Phone message	03 (03)	03 (04)	00 (00)	00 (00)	02 (02)	03 (05)	02 (03)	02 (03)	04 (05)	05 (04)
Fax	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (00)	00 (01)	00 (01)
Paper (excl. fax)	01 (02)	01 (01)	00 (01)	00 (00)	01 (02)	01 (01)	01 (02)	01 (01)	03 (05)	02 (04)

Standard deviations are in parentheses. ^a $p < 0.05$, two-tailed; ^b $p < 0.10$, two-tailed.

greater percentage of unique, named face-to-face alters (85 percent versus 79 percent, $t(43) = 2.047$, $p < 0.10$) than did heavy email users.

Discussion

The results concur with those of previous investigations in several ways: participants spent about half their workday in work-related communication, communications were most often face-to-face, and heavy email users communicated more frequently than did light email users. This study *adds* to our understanding of the impact of heavy email use on communication by delineating differences in actual media use of heavy and light email users across communication content, context, and media for five communication variables.

One of the most interesting findings of the raw number analyses is the lack of significant differences between heavy and light email users for all analyses where non-email media were combined. This similarity of the two group profiles (minus email) suggests that one impact of heavy email use is simply to supplement communication via other media.

A second point of interest for these analyses is the greater density of communication for heavy email users. In the analysis of all communications, heavy email users communicated more often and to more people (both total and named only, counting duplicates, but not unique) than did light email users, but they did not spend more time communicating. Not only were all of these differences primarily driven by differences in work communication but the separate analysis for work communication indicated that, even though they spent more time on work communication, the heavy email users' schedule of work communication was still denser than that of the light email users: that is, 10 communications and 18 alters versus 8 communications and 12 alters per communication hour. These findings confirm many email users' perceptions of communication overload, particularly for work communication.

To further explore these data we looked at percentages of media use by participants. This had the effect of removing some of the tremendous variation among study participants – a variation that may have contributed in some cases to lack of statistical significance despite large differences in the raw numbers.

For the first set of percentage analyses we excluded email, thus leveling the number of communications across heavy and light

email users, to determine the impact of email on proportionate use of other media. Based on these data, heavy email users had a slightly lower percentage of phone communication than light email users. However, unlike the preceding differences between the two groups, this result was driven more by "other business" and "personal" than by "work" communications. There might be some justification, perhaps, in portraying this as a slight but noticeable trend toward displacement or substitution of phone by email communication, and certainly this is worth examining further through additional research.

Another point of interest for this analysis is that heavy email users had a greater percentage of face-to-face personal communications than light email users, a difference that may or may not relate to job type: for example, heavy email users may have jobs involving both heavy email use and a greater percentage of unscheduled face-to-face communications among non-email communications. In any event, this finding points to a need to examine media use by relationship as well as content to differentiate where personal encounters are occurring (e.g., co-workers, neighbors, co-participants in social organizations, etc.).

The second set of percentage analyses concerned overall communication style and included all communication media. Based on these, heavy email users showed smaller percentages of communications across several of the five communication variables for face-to-face, phone, and fax communication than light email users, and this appeared to be driven mostly by work communications. For "personal" communications, heavy email users had smaller percentages of only face-to-face and phone communications, but, again, this was true across several variables; for "other business" communications, heavy email users had smaller percentages of only phone communications, but this held for all variables except time spent communicating.

Clearly, then, heavy use of email (which comprised 25 percent of our heavy email user's communications) did have an impact on communication style that transcended the boundaries of work communication. Although these heavy and light email users engaged in different types of jobs, presumably with different communication demands, the differences in non-work communications suggest a generalization of communication style to other contexts – a style that included more email and relied less on other media. However, in none of these cases can we say that email displaced or substituted for phone, face-to-face, and fax communication. Rather, where email communication was included in an analysis, it added communications over and beyond those carried by other modes.

This second percentage analysis also revealed a smaller percentage of face-to-face alters for heavy (versus light) email users for personal communications – seeming to suggest that the heavy email user is losing touch with humanity. Only 76 percent (versus 86 percent) of personal communication alters were communicated with face-to-face while 14 percent (versus 0 percent) were communicated with via email for heavy versus light email users. However, it is important to note that the first percentage analysis proclaims precisely the opposite relation between heavy email use and face-to-face personal communication and that only that analysis relates to displacement or substitution whereas this second percentage analysis only considers overall communication style.

This study has shed light on some perplexing questions: how does heavy email use impact use of other communication media? How does it affect communication style? How can users of this new, efficient technology be so overwhelmed? However, in answering these questions others remain unanswered. Additional research is needed to sort out effects due to the types of settings, participants, and measures, and the relationships between participants and their communication partners. Will these results apply equally to university researchers, bank managers, long distance learners, and so forth? Will the results of this investigation apply equally across work, family, and social relationships; co-worker/fellow student versus supervisor/instructor relations; and nameable versus unnameable others? Finally, how are different measures of communication (for example, perceived versus actual use and sent versus received messages) related, and how do these interact with perceptions of stress and communication overload?

In summary, this investigation was initiated to clarify the impact of heavy email use upon communication – to consider whether email is a blessing or curse. We find it to be a bit of both. It enables participants to communicate more, in less time, but it is also likely to increase stress levels, particularly for work communication. Moreover, we find that heavy email use, perhaps begun through work obligations, can lead to a more general communication style that relies more on email and less on other media, extends beyond work to include personal communications and business outside of work, and possibly includes some substitution of email for phone for non-work communication. While this research has clarified some of the findings of previous studies, our results suggest that further exploration of variations in settings, participants, relationships, and communication measures is needed.

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