

Overload is Overloaded: Email in the Age of Gmail

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ABSTRACT

The term email overload has two definitions: receiving a large volume of incoming email, and having emails of different status types (to do, to read, etc). Whittaker and Sidner proposed the latter definition in 1996, noticing that email inboxes were far more complex than simply containing incoming messages. Sixteen years after Whittaker and Sidner, we replicate and extend their work with a qualitative analysis of Google's Gmail. We find that email overload, both in terms of volume and of status, is still a problem today. Our contributions are 1) updating the state of email overload, 2) extending our understanding of overload in the context of Gmail and 3) comparing personal with work email accounts: while work email tends to be status overloaded, personal email is also type overloaded. These comparisons between work and personal email suggest new avenues for email research.

Author Keywords

Email overload, organization, management strategies, work and personal email, qualitative study

ACM Classification Keywords

H.5.3. Groups and Organization Interfaces

INTRODUCTION

The seminal Whittaker and Sidner 1996 paper coined the term “email overload” to describe the problem of cluttered email inboxes [20]. Email clients were originally designed around the metaphor of traditional postal mail where the inbox would contain only unread incoming messages. Whittaker and Sidner found that email inboxes contained many other things than unattended messages such as outstanding tasks or reference emails for future use [20]. In this paper, we will specifically refer to this as email *status* overload (to do, to read, undetermined status, outstanding communica-

tion). The 1996 paper fueled over a decade of research in our community [1-3, 6, 8-10, 15, 17, 19] and spurred the development of new tools for managing this overload. In 2006, ten years later, Fisher *et al.* revisited the 1996 study and concluded that inboxes were still overloaded [9]. Now, sixteen years later, we extend this body of work with an analysis of Google's Gmail. As of June 2012, Gmail has more than 425 million active users [13], and has many of the tools that Whittaker and Sidner advocated for such as threaded conversations, and action markers [20]. Have these tools helped users feel less overloaded?

Overload in the context of email can also refer to the volume of incoming email [6, 10]. We expect that information overload is an increasing problem as people are more connected to email through the pervasiveness of smart phones and tablets [5], the ever-increasing availability of Internet connectivity [5], and the wider spread of social networking [4]. With increased connectivity, access to email is different than it was six, and sixteen years ago. For example, in 2011, one in three tablet owners checked email from their mobile device almost daily [5]. The recent growth of communication over social networking sites is not cannibalizing email usage [16]. Despite the potential for an uncontrollable situation, our participants were able to cope since they felt rather organized in their email. Here, we update coping strategies found in 1996 and 2006 with a study of strategies used today in Gmail.

Email overload has taken on new forms. Prior research had mainly focused on email usage at work, which is an environment that tends to be driven by efficiency and a need to accomplish tasks [2]. However, email is present in all facets of daily life. In their personal lives, email users communicate with friends and family, manage bills, and juggle between groups and activities. We find that work email tends to be overloaded in email *status* (to read, to do) while personal email also tends to be overloaded in email *type* (bills, personal mail, promotional mail). Personal email is complex since users receive a variety of email *types* corresponding to the multiple facets of daily life. We must understand people's experiences in these different contexts, work and personal, to design for them appropriately. These findings suggest new avenues for email research.

We begin by placing our study in the context of prior email research in our community. Next, we compare quantitative

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measures of email metrics between 1996, 2006, and today. Then, we explore new email organizational strategies in Gmail, followed by a study of email overload today. We conclude with a discussion on design implications.

The contributions for our work include:

- Replicating prior work on email overload and organization strategies.
- Extending our understanding of email organization from the perspective of different email habitats.
- Extending the definition of email overload.

RELATED WORK

Email has been the focus of much research in communication technologies and personal information management. We present a summary of related work in the area of email overload and email organizational strategies. This past work has mainly been carried out in the context of professional email accounts. We turn to research in personal archiving for defining ‘organization’ and what it means to feel organized. Finally, we articulate our work through the lens of email as a habitat, which posits that email management depends on the usage context.

Email overload

The term email overload is itself overloaded. Whittaker and Sidner first coined the term in 1996 [20]. For them, email overload related to an inbox that contained messages of different *status* such as to dos, to reads, undetermined status, and ongoing correspondence [20]. They found that the inbox, which was originally designed as an asynchronous communication tool, became a Swiss-Army knife of information management: it was a task manager, scheduler, and personal archive [2, 9, 20]. This work spun out further research in email management tools, such as threaded conversations [17] or task support [1]. Yet updated statistics from 2006 indicated that email was still overloaded ten years later [9]. A second definition of email overload is synonymous with information overload: the idea of receiving large quantities of emails [6, 10]. It is the sheer volume that creates difficulties in attending to email and results in behaviors that make email feel overwhelming [6, 10].

Users can be categorized based on their email management strategies [9, 12, 20]. Whittaker and Sidner classified users from the perspective of 1) whether they filed emails into folders and 2) how often they filed [20]. Users can be categorized as frequent filers, spring cleaners who infrequently file, and no filers [20]. Users can have multiple strategies that they combine over time [9]. Fisher *et al.* added the number of folders as another dimension: some people have many folders with intricate nesting structures and others have few folders with many messages per folder [9]. Fisher *et al.* suggest for future work to ask users how they feel about their email organization, to possibly categorize users along these sensibilities [9].

In this work, we revisit email overload by replicating the Whittaker and Sidner study, and add on to the results found

by Fisher *et al.* From our qualitative interviews with participants, we found that email overload could also be more than status and volume.

Personal archive and feeling organized

In past work, email overload was expressed as a problem to be fixed. We suggest that overload is only a problem when users express negative sentiments about their ability to cope with overload. In order to complement quantitative results about overload, as suggested in Fisher *et al.*, we asked users about their perceptions of organization in email.

Similarly to the way in which Kaye *et al.* describe the construction of meaning through the organization of personal archives in office spaces [11], we can think of the management of email as a way in which users construct meaning about their information. In this sense, *being organized* is subjective to the individual. While an office might have objective standards of organization, the best organization is the one that works for whoever inhabits the place.

Since organization is subjective, we started this work without supposing that one strategy of managing overload was better, or more desirable, than the other. For example, we did not suppose that reducing the number of emails was an ultimate goal for everyone. Instead, we qualified these strategies based on self-perceptions from our participants. In this work, we asked participants about their sense of overload and attempted to uncover pain points.

Email as a habitat

Today, email is an omnipresent habitat in multiple facets of our lives [8]. Past research on email organization has focused on employee email in large companies [6, 8, 9, 20]. However, email is also widely used in personal contexts such as to communicate with friends and to plan activities [16, 18]. Past research has looked at the effect of email usage on social capital and community engagement [18], but not on feelings of organization in a personal context.

The notion of email as a habitat has been primarily articulated in a work context, though it describes an aspect of email that goes beyond work [8]. Ducheneaut and Bellotti posit that most communication in corporate organizations happens through email, which consequently leads employees to spend much of their time in their email [8]. If email is a habitat, then it must be designed with the perspective that people spend time living and create meaning in their email rather than simply accomplishing tasks [7]. The type of meaning that derives from the activities performed in a work email account may be notably different from those undertaken in a personal email account.

The implication from this is that the context of the habitat might influence the experience: work is a different environment from personal. Since prior research has mainly focused on work email accounts of employees at large software companies, we believe that a richer understanding of email overload and feelings of organization must include an analysis of personal email accounts.

GMAIL CLIENT

Gmail was first launched in 2004, and made available to the general public in 2007; to date Gmail has a vast user base of 425 million active users [13]. Google supports companies with their email infrastructure by offering them the same Gmail interface for their work accounts. Some prior work in our research community has looked at organizational tools and email refinding strategies as they relate to Gmail [15, 19]. Yet there has not been a comprehensive study on how Gmail users organize their email. Gmail is different from the tools reported in previous studies, and especially has noteworthy differences with the NotesMail client used by Whittaker and Sidner in 1996 [20], and with Outlook used by Fisher *et al.* in 2006 [9]. It is difficult to describe the exact differences between these clients at the time these studies were conducted since the clients have been continuously iterated on over time.

Gmail provides four tools for filing emails: Labels, which allows users to tag emails (an email can have multiple labels); Archive, which removes emails from the inbox; Move, which assigns a label and archives at once; and Filters which are automatic rules the user needs to specify. Emails can be archived without labels, and be found through search. Filters can perform many actions, such as skipping the inbox, or applying a label but keeping the message in the inbox. Labels contrast with folders used in NotesMail and Outlook [3]. In NotesMail and Outlook users can file emails into folders, and an email can only be contained in one folder. In Gmail, multiple labels can be applied to an email. Applying a label does not automatically file the message out of the inbox; archiving removes the email, labeled or not, from the inbox.

Gmail provides other tools for dealing with overload such as Stars, which users can manually assign to a message; the Important marker, which algorithmically determines the importance of a message without requiring user input; and the ability to mark a message as Unread. Similar features are also in Outlook such as flags.

In addition, Gmail is often praised for its search functionality. Previous research found that search was highly liked as a way to find email. Users often favored these types of opportunistic finding tools over preparatory tools such as labeling or filing [19]. Another opportunistic refinding strategy is through scrolling. Gmail only shows 50 messages on the first page of the inbox, other items are in the next pages, while Outlook allows for infinite scrolling.

There are other features in Gmail that can also help with overload, such as split inbox views where a user can choose what category of messages should appear at the top of the inbox. For example, with Priority Inbox users can see messages that are marked as important in the top-most box of their inbox. In addition, users may add plugins to their inbox through Google labs and third-party apps.

METHOD

Our mixed methods approach is a replication of Whittaker and Sidner's 1996 study [20]. Our primary contribution is a qualitative understanding of email overload today. We also obtained screenshots of each email account to derive quantitative values for each participant in order to compare results across the 1996 and 2006 findings.

Recruitment

To recruit users for our study, we emailed a pre-screening survey to a database of potential study participants. We screened for Gmail users who used the Gmail web client from a desktop multiple times a week. This assured that they were intimately familiar with accessing their email through the web interface. Our participants did anecdotally mention accessing Gmail from other devices (such as smartphones and tablets), though our interview didn't focus on this usage. Those who matched our recruitment criteria were scheduled for a 75-minute session.

The pre-screening survey was self-reported and contained demographics questions, email usage habits, and the size of the inbox. We recruited for participants who used Gmail for both their work and their personal email accounts. We specifically screened for users who did not link the accounts. Linking accounts means that emails merge into one inbox. This measure ensured that we could control for differences between these contexts. We also screened for users who had their account for more than 3 months, and who used the Gmail web client from a desktop multiple times a week.

In particular, we were hoping to recruit through stratified sampling according to three organizational categories: frequent filer, spring cleaner, no filer [20]. However, we reached saturation of the participant recruitment pool before reaching an even distribution across organizational strategies. Nonetheless, the pre-screening survey asked for the size of the inbox as a proxy for organizational strategies. We expected it would be difficult for users to self-categorize. Those with similar behavior to frequent filers would have few emails in their inbox, while those similar to no filers would have many in their inbox.

Participants

We recruited 19 participants. Of the 19 participants, 16 were interviewed in person and 3 were interviewed remotely through telephone and screen sharing. In all the sessions, audio was recorded and the screen was captured. Video of the participants was captured from the in-person interviews.

All participants were located in the United States. Those interviewed in person were located in Mountain View, CA and San Francisco, CA. The age demographics of our participants are: 3 between 18 and 24 years old, 6 between 24 and 30, 6 between 31 and 40, 1 between 41 and 50, 2 between 51 and 60, and one preferred not to say). We obtained a balanced gender representation (9 female, 10 male). Our participants' professional activities were quite

	1996 work email	2006 work email	2012 work email	2012 personal email
N	18	600	17	19
Email client	NotesMail	Outlook	Gmail	Gmail
Archive messages	858	28,660 (15,797)	3,089 (1,232)	4,073 (1,534)
Total messages	2,482	N/A	6,092 (3,703)	18,421 (7,035)
Inbox size	1,624	1,150 (512)	3,003 (1,483)	15,030 (3,500)
Unread in inbox	N/A	153 (7)	696 (3)	4,846 (421)
Inbox as % of total mailbox	53%	8% (2%)	52% (58%)	52% (68%)
# folders /labels	47	133 (77)	27 (9)	22 (11)
% of failed folders/labels	35%	16% (14%)	50% (47%)	44% (42%)

Table 1: Averages given with median in ()'s for 2006 and 2012. (note: for one participant we could not get the exact number of emails in her inbox, however we know that she had 6,134 emails in her 'all mail' label and she does not archive).

diverse including a chef, hair and make-up artist, law student, non-for-profit administrator, real estate agent, photographer, executive assistant, product manager, tour operator, optometric assistant, entrepreneur, and others.

Data collection and analysis

We conducted semi-structured interviews that were composed of three parts. First, we asked what organization meant to them. Then, we asked them to give us a tour of their work and personal email. The questions for both email tours were the same: how frequently they used the different Gmail features, which messages were most important to them, and wrap-up questions about their feeling about the number of emails in their inbox, and their feelings about their number of labels. Some questions were asked as a 5 point Likert scale (such as: "how organized do you feel in this account on a range from 1 to 5 where 5 is most organized?"). Each interview closely followed our pre-defined interview script. The interviews were transcribed, and then organized thematically by interview question. The first author conducted the analysis.

During the study, we also captured screenshots of each inbox. This allowed us to capture rich quantitative informa-

tion for each participant. During the interview section about work email, the participants who had company email clients used the company version of Gmail. It is the same interface as the consumer Gmail with some cosmetic company customization such as a logo.

The resulting data is comparable to the data obtained in the 1996 and 2006 studies since we could capture the number of emails in the inbox, the number of emails in the account, the inbox as a percentage of total mailbox, the number of labels, and the percentage of failed labels, which were labels with fewer than 3 conversations [20]. Since this study was self-reported we could not get an accurate measure of the number of messages received daily. These quantitative results are summarized in table 1 and they are compared to the prior studies. There were two participants who did not have any activity in their work email so we removed them from the work email analysis but included them in the personal email analysis. Based upon close reading of the results from the 1996 and 2006 studies, we interpret "total messages" to mean all emails in the inbox and archive combined, while "archive messages" is the number of messages filed away in the archive. Some of the differences found between these studies could be a result of comparing email behavior across three different email clients.

RESULTS

Comparative results

In this section we compare the quantitative results we collected from the inbox to determine email usage behaviors and how they've changed over time. First we recapitulate the findings from Whittaker and Sidner 1996 [20] and Fisher *et al.* 2006 [9]. Then we complement these findings with the results from our study by looking at the evolution of the size of the inbox, the percentage of the inbox to total mail, number of labels, and number of unread messages.

Summary of previous results

In 2006, Fisher *et al.* replicated Whittaker and Sidner's quantitative measures of email behavior from 1996. The results are summarized in Table 1. Fisher *et al.* found that the number of emails in the inbox stayed the same [9]. They also found similar organizational strategies as in 1996: frequent filers, spring cleaners and no filers [9]. This suggested that issues around email overload highlighted by Whittaker and Sidner persisted 10 years later.

The main difference between 1996 and 2006 was the size of the archive. The archive had grown by a factor of 10, which was correlated with an increase in the number of folders [9]. The rate of failed folders, meaning folders that had fewer than 3 items in them [20], decreased. Fisher *et al.* speculated that these results could have been due company culture, such as the need to manage folders that would automatically delete emails after a certain period of time. The age of the archive did not correlate with a larger archive, so it was not because the users had the account for longer that they had a larger archive. The reason there were fewer failed folders could be due to users learning to better

manage folders over time. The fact that spam became a much larger issue in 2006 may have also contributed to some of the differences in email management.

By collecting quantitative data from user's inboxes, we can contrast email behavior between 1996, 2006 and 2012. We augment our analysis with results from personal inboxes since previous research has mainly focused on work email accounts. We observe differences in volume and in organizational strategies between personal and work email.

Inbox size

The average number of emails kept in our participants' work inbox is 3,003 (median of 1,483). This is more than twice the number of inbox emails compared to Whittaker and Sidner 1996 [20] and Fisher *et al.* 2006 [9]. This means that users are still keeping a large number of emails in their work inbox. In fact, this number might be increasing.

The number of emails in our participants' personal email inbox is even larger with an average of 15,030 emails in the inbox. This number is five times greater than their work email inboxes, nine times greater than what Whittaker and Sidner 1996 [20] found and thirteen times greater than what Fisher *et al.* 2006 [9] found. This suggests that accumulating emails in the inbox might be happening at an even larger scale in personal email compared to work email accounts. Many emails in an inbox can be an issue in a work context such as hindering productivity [6, 10]. This poses the question of what impact large inboxes might have in a personal context.

Percentage of inbox size to total mail

In 2006, Fisher *et al.* had found a stark difference in the size of the archive compared to Whittaker and Sinder [9]. Only 8% of emails stayed in the inbox compared to 53% in 1996. Fisher *et al.* suggested that the increased archive size was due to users' stronger propensity to keep emails, since the number of incoming emails had stayed the same. Our results are similar to the 1996 results. We find that the number of emails that stay in the inbox correspond to about half of total messages in the mailbox (average of 53%) for work email accounts.

Despite the fact that personal inboxes contain five times the number of emails as work, the proportion of the inbox to the total number of emails in the account stays around 50% on average. This is similar to the proportion of work emails kept in the inbox. These findings indicate that our participants archive less than the participants in Fisher *et al.* [9].

Number of labels

We compare the number of labels in Gmail with the number of folders in NotesMail and Outlook. Labels and folders are slightly different: multiple labels can be applied to an email (vs. emails can only be contained in one folder) and applying a label does not automatically archive the message (vs. placing an email in a folder automatically archives it). Yet, the end result with both folders and labels is to file messages away from the inbox. This similar resulting behavior

allows us to compare labels in Gmail with folders in NotesMail and Outlook.

We saw previously that the archive represents a smaller fraction of emails in Gmail than in the previous studies. Going along these lines, we find that the number of labels has decreased compared to the number of folders in both previous studies. In addition, the percentage of failed labels has increased. This could suggest that filing is not as effective today as it used to be. Perhaps users find that placing emails in labels has overhead, similar to folders [19]. This could also be attributed to differences between Gmail and the other clients. For example, search in Gmail might be a sufficient method to find emails [19].

In terms of the number of labels, personal email and work email are quite similar. Since this number is much smaller than the 1996 and 2006 studies, the same conclusion about work email can also be made about personal email: filing emails in labels/folders is done less [19].

Number of unread messages.

The average number of unread messages in work email (696) has increased since the 2006 where the average was 153 unread emails. Whittaker and Sidner did not report unread count. We find that at least half of the participants have a small number of unread emails in their work email. The results found in Fisher *et al.* match our findings, with a median of unread emails of 7 and a much higher mean. Our findings support their conclusion that less than half of our participants manage to stay caught up with their work email, which is not the case for their personal email. We find that personal email has a much higher unread count (4,846 average and 421 median) than work email. This indicates that there are more unattended messages in personal email accounts than in work email.

Summary of quantitative results.

The observed differences between this study and prior research could be due to the different email clients. For example, Gmail puts more emphasis on search as a method to find email while Outlook users might be more encouraged to rely on folders [19]. These differences could also be due to changing norms, where archiving might be less of a prominent behavior today.

Today's inbox shows indication of having a large number of emails, fewer messages are archived, and labels are not as extensively used in Gmail as folders were in previous studies. We also find that the volume of messages is much greater in personal accounts than work accounts, and the number of unread messages is much greater in personal email as well.

The nature of email overload today

We find large differences in email volume between the Gmail users in our studies and the NotesMail and Outlook users in previous studies. Both work and personal inboxes contain large volumes of email on average, with personal email being more than work email. Overload still exists,

and the condition of overload is different between work email and personal email.

Information overload

We were not able to obtain the number of incoming emails to our participants' inboxes, as the study was self-reported. However, in asking the participants how many emails they tend to receive daily it did not appear that it was orders of magnitude larger than in previous studies.

One indication we had about information overload was the mentioning of large volumes of unwanted emails. Our participants often called these messages 'spam' as described by the following comment:

"I don't know what you would call it, it's not like spam emails because it's stuff I signed up for but things I don't really need" P17

These types of 'spam' messages, such as advertisements, may accumulate more in personal accounts than work accounts. This is a different type of spam than what Fisher *et al.* reported in 2006. Back then, spam emails were messages sent to random or targeted email accounts in large volume. Today Gmail has security systems in place to control unwarranted emails. However emails that users sign up for such as discounts, store receipts, or for other reasons, are more difficult to filter through traditional spam detection mechanisms. This may be one reason we observed difference in the inbox size between personal and work: there might be a larger amount of noise in personal email.

Status overload

Email is still overloaded in terms of having to-do items, to reads, on-going communication [20]. These are messages of undetermined status that are waiting to be attended to [20]. For example, the following participant describes his strategy for dealing with emails in the inbox. He describes it similar to previous findings in having the inbox as a to-do manager:

"These are all emails from today as you can see from the timed ones and things that I still have yet to address from when I was out of the country. So I'd like to probably tomorrow just catch up on those last remaining ones and address the remaining ones from today" P10 about his work email

Personal email might be less status overloaded than work email because messages might require less fine-grained status types. One of our participants mentions how he did not use his personal inbox as a task manager but rather as a repository of incoming communication:

"I don't need to follow up with emails in my personal life usually. Usually the people that I'm communicating with I'll see or text or do something else with so I don't need to like monitor the follow-up." P17

Aside from using the inbox as a to-do manager, Gmail provides some features to help handle messages of different status. Stars are flags provided by Gmail, they may be customized to different colors and shapes to indicate different

states of the email. Labels can also help with filing emails, and thus could also be used as a way to indicate the state of different groups of emails. One participant describes his usage of the star functionality as a way to manage different email statuses:

"I'll star certain responses or things that I need to go back and visit just because there's so many things coming back and forth but I usually only star stuff if I know I'm going to be getting a lot of emails back in a certain amount of time" P3

Managing status overload retroactively is a challenge. It is an on-going activity that must be applied consistently. Newly gained knowledge about a better email management strategy is described as being difficult to implement:

"Because I don't keep it organized so it's just kind of like, I feel like I need to start fresh and like clear out old ones and then I would like it better. I also like really started and started filtering things in my work email but by then I already had my personal email for three years or so, now that I know what I do in work I would apply it here but I need to start fresh." P17

By studying personal email usage besides work email, we uncover another type of email overload: type overload.

Type overload

It is especially salient in personal email accounts that emails in the inbox can also be overloaded by type such as bills, medical information, clubs, newsletters, personal emails, and others. Work email is about managing different types of tasks [1], whereas personal email might be more about managing multiple facets of daily life. Participants commented on the fact that they lead complex lives and their personal email reflects this:

"I wear a lot of hats so it's not necessarily one part. I'm a DJ also so, I, there's a lot of that email that goes through here. Also personal email. I was part of a few burning man camps and there's still a lot of burning man email that's still coming through here. I also helped produce parties, that's coming here as well. And there's a couple of small business startups and that's coming here as well." P12 personal email.

Because the messages received are of heterogeneous type, finding a proper organization strategy might be challenging. One participant notes this difference in complexity between work and personal email:

"the complexity isn't there, it's strictly work email." P14 on comparing personal email to work email

We see that Whittaker and Sidner's notion of email overload still exists today and that it has evolved. In addition to information overload and status overload, we find that inboxes could be overloaded by message type. There is possibly some overlap between type and status, more work needs to be done to disentangle them. For example advertisements may most often correspond to a to-read status, though one with a coupon could be a to-do. Next we look at how overload affected our participants' sense of organization in their email accounts.

Sense of organization

We did not suppose that one strategy of managing overload was better than the other. Instead, we asked our participants about their own subjective sense of organization and we qualified these strategies based on self-perceptions. We find that participants feel rather organized in their email accounts with an overall average rating of 3.4 on a 5-point scale. They report feeling more organized in their work email with an average rating of 3.65 (median was 4) out of 5, where 1 was least organized and 5 was most organized, than in their personal account (mean 3.16, median 3).

What made our participants feel organized

In order to deal with the large number of emails in their inbox, some of our participants commented on their usage of the search functionality as their main way to find emails:

“If there was no search I would be lost and frustrated.” P2

“If I need to search for something I can easily find it, that’s my favorite thing about Gmail is the search.” P17

“Again search is really what saves my ass. If it wasn’t so good it’d be really hard to manage all of it.” P12

This echoes the findings in [19] where the authors found that users were more effective at finding email through search. Having easy access to finding what they were looking for contributed to their feeling of organization in Gmail.

We saw earlier that labels and maintaining a small inbox is a way for some of our participants to manage their tasks. As such, labels might not be the fastest way to find emails [19] but might help contribute to feeling organized by acting as a to-do list manager. One of our participants also uses labels for another reason: having a visible structure for her emails. She never archives emails, they all stay in her inbox, yet they are all labeled:

“It works pretty well and um I’m always shocked when people use Gmail and they have like no labels, like I know you can search and find them but doesn’t it just feel better when you sort of have things mentally filed away somewhere?” P18 about her work email.

Whittaker *et al.* found that filing was a reaction to receiving many messages in order to aid in finding those messages later [19]. From our participants, we find that filing can also be a reaction to *type overload*. In personal email, participants actively manage their label structure because their personal life is complex. The following participant describes a need to manage information overload and type overload in the personal email account more so than in their work account:

“I have more email that comes to [personal email] so I have more folders that are made. But the work email I don’t need to make as many folders because it’s all really about the same thing.” P9.

In addition, the time spent in an email habitat and the perceived importance of messages received might also con-

		Sense of organization	Lower than average (1 and 2)	Average (3)	Higher than average (4 and 5)
Work email	N		2	3	12
	Average unread email as % of total inbox		39.28%	3.35%	17.19%
Personal email	N		5	6	7
	Average unread email as % of total inbox		33.52%	37.46%	5.73%

Table 2: Comparison of average unread emails as percentage of total inbox

tribute to achieving a better sense of organization. We observed these effects more in work email. First of all, the amount of time devoted to continuously monitoring email has been shown to help with people’s sense of organization [6]. Many of our participants reported spending more time at work and consequently have more time to attend to grooming their work email:

“Probably my work email [is more organized]. Because I’m constantly looking at it. I’m constantly paying attention.” P1

“I feel like I have more hours in the day, like devoted to work-ing so it’s more important to be organized there.” P17

Second, the perceived importance of the types of emails that are received might also contribute to the sense of organization. Work emails tends to feel more important, so our participants feel more pressure to organize it and to manage the size of the inbox:

“[work email] is more important than the personal. The personal is more secondary, those would be articles that I would read.” P15

Work environments might place more pressure on maintaining a coherent organization while the nature of emails arriving in personal accounts might require active management of email. We find that our participants feel rather organized in both email habitats, but their organizational needs are different.

What made our participants feel disorganized

We find that the participants who feel the least organized in their work email have a high percentage of unread emails (see Table 2). This suggests a possible connection between feeling unorganized and having many unread emails. Some of our participants offered their sentiments about their unread count when asked about how they felt about the number of emails in their inbox. They describe feeling of being overwhelmed by these unread messages:

“It’s kind of alarming, I have 5200 [unread]” P14

	Small inboxers	Medium inboxers	Large inboxers		Small inboxers	Medium inboxers	Large inboxers
N	5	2	10	N	3	4	12
Average # of emails in inbox	28	562	4,979	Average # of emails in inbox	10	679	24,346
Average inbox as % of total mail	13.35%	76.88%	66.49%	Average inbox as % of total mail	0.67%	55.22%	70.88%
	Work email				Personal email		

Table 3. Comparison of small, medium and large inboxers between work and personal email (One of the participants for whom we did not have work email data was a small personal inboxer and two of the small inboxers in work email were large inboxers (more than 1001 emails) in their personal accounts).

“Unread [makes me feel] anxious” P8

In fact, P14 talked about how she sometimes misses emails such as one from her supervisor. This suggests that the number of unread messages in the inbox might be a better metric for evaluating problems with information overload rather than filing emails out of the inbox. We see a higher unread count in personal email than in work email. This could mean that users may experience greater organizational challenges in personal email than in work.

Size of the inbox and feelings of organization

We analyze Gmail strategies based on previous organizational strategies. Whittaker and Sidner found three strategies for managing overload: frequent filers, spring cleaners, and no filers [20]. Fisher *et al.* complemented this with the number of labels that filers use: many folder filers and few folder filers are also distinct organizational strategies [9].

Instead of classifying Gmail users according to their filing strategy, we use the number of emails in their inbox as a proxy for their filing strategy as this size gives us a general idea for the participant’s current state of email management. We do not aim to redefine Whittaker and Sidner’s categories, rather we want to apply their categorization to our participants to compare the email management behaviors across these studies. Those with similar behavior to frequent filers would have few emails in their inbox, while those similar to no filers would have many in their inbox. There are clear small inboxers who constantly aim for inbox 0, and large inboxers who never archive. In the middle, the behaviors are more difficult to map to the type of spring-cleaning behavior mentioned by Whittaker and Sidner. Yet, similar to spring cleaners, their email management strategy is in flux. The thresholds we use are: 0 to 100 emails in the inbox for “small inboxers” or frequent filers, 101 to 1000 for “medium inboxers” or spring cleaners, and 1001 or more for “large inboxers” or no-filers. The distribution of our participants is 5 small inboxers, 2 medium inboxers, and 10 large inboxers for their work account. In terms of removing messages from the inbox, more of our

participants were large inboxers (with 1001 or more emails in their inbox) in personal email than in work email (see Table 3). Two participants have small inboxes in their work account and large inboxes in their personal account, while none have a large work inbox and a small personal inbox.

We do not find an indication that a large number of emails in the inbox corresponds to a strong sense of disorganization. Most of our participants with large inboxes (over 1001 emails in their inbox) feel fine or indifferent about the number of emails in their inbox:

“If I look at the 7000 that just sounds egregious but I never notice it, my eye just really doesn’t even see it [laughs] it’s like, I’m always looking at what’s the freshest stuff at the top.” P18

“Indifferent, I don’t even really look at that number.” P3

“I never really think about the number of emails. It’s not important to me.” P2

“Pretty neutral. I’m not really in a hurry to get to these emails. The number of emails there are isn’t overwhelming.” P9

In these cases, the number of emails in the inbox does not all correspond to outstanding tasks. Many large inboxers (with over 1001 emails in the inbox) either do not understand archiving, or do not have a need for it, but overall they do not feel more disorganized than the small inboxers. This shows that a large inbox is not necessarily a problem.

DISCUSSION

The email behavior we found in our study builds upon the findings from Whittaker and Sidner 1996 study [20] and the Fisher *et al.* 2006 study [9]. Our participants had more emails in their inbox than in these past studies. This difference could be due to many factors such the email clients studied, or our participants might have had different email needs than employees at large software companies. Yet, what remains apparent across all these studies is that the inbox still contains more than just unread incoming mail.

We found similar organizational behaviors as those proposed by Whittaker and Sidner [20]. We still saw frequent filers who tried to actively reduce the number of emails in their inbox. And we saw no filers who did not reduce the number of emails in their inbox. Designing email clients with the goal of helping users reduce the number of emails in their inbox might not necessarily be a gold standard, especially when designing personal email.

From an information overload perspective, the fact of having a large inbox does not necessarily indicate that users feel overwhelmed. We argue that managing any type of overload is a problem only if users feel overwhelmed or disorganized. When we asked how organized our users felt in their email, overall they felt average or above average. This suggests that it is not necessary to file in order to feel in control of email overload. We found that high unread counts might be a better metric of being overwhelmed in the inbox. These findings suggest two ideas for future work.

Rather than categorizing people based on number of emails in their inbox, we could look at whether users can be categorized based on the number of unread emails in their account and strategies they use to keep this number low. We saw that our participants with high unread counts felt the most overwhelmed, future email studies could focus on this category of users in particular.

Second, users could be classified based on their email organizational goals. Users who wish to have few emails in their inbox expressed a need to maintain that state in their inbox. Focusing on this group of users to understand how they can accomplish a small inbox, or how email products could be designed to lessen the feeling of having emails accumulate, could also be valuable.

We saw that work email and personal email were different in terms of volume and in terms of organizational strategies. This suggests that one-size-doesn't-fit-all for designing email organizational tools between work and personal email. Workspaces such as offices are designed for a different experience than the home, however, we design email clients exactly the same for both habitats. Moreover, the distinction between what constitutes work email and personal email is not always clear-cut. In this study, we interviewed participants who had separate accounts yet they may have used them for overlapping purposes. A work email account could be used to send a one-off personal email for instance. Renaud *et al.* found that 70% of their participants sent both work and personal emails on a daily basis while at work [14]. Through this work, we hope to push forward a research agenda around how people manage their email in these different contexts. We expect this could have significant implications for social computing and personal information management.

Another design implication from our study is in terms of managing message importance. A difference between work and personal email is that personal email has more noise

email that is not important to the receiver. This indicates that the spectrum from important to unimportant might be wider in personal email than in work email. This differentiation might have strong benefits. For example, personal email clients could provide a wider selection of important markers.

We found that some users had trouble setting up labels. Email clients could help users learn a proper organizational strategy. Ducheneaut and Bellotti pointed out that email organization in companies is highly dependent on company culture [8], however this does not happen for personal email. In their personal accounts, users must develop their own organizational strategy with greater opportunity for errors. For example, email clients could leverage user behavior to provide a customized label structure such as automatically labeling emails that the user frequently searches or frequently revisits.

LIMITATIONS

We raise some differences between our participants and those in the studies we replicated to note some potential biases. Our participants might have been more positively biased towards the email client under study than the participants in previous studies. We recruited our participants from a participant pool of users who opted in to this type of study, rather than employees of a company that had imposed a certain email client. Moreover, our participants were from a variety of professional backgrounds rather than working for a large software company. While our sample size is similar to Whittaker and Sidner [19], it is smaller than Fisher *et al.* [9]. We focused on a qualitative approach to research changes in email usage behaviors rather than obtain quantitative metrics of email usage.

All our study participants had a clear separation in usage of work and personal email. Future work could look at accounts that are used for both work and personal purposes, or situations in which work accounts are used for personal purposes and vice versa. We expect that accounts used for these multiple situations are particularly complex to organize since they might combine multiple intricacies of work and personal email.

In this study we focused on desktop usage of Gmail. Many participants mentioned using a variety of different devices (tablet, smartphone, computer) to access email. Different devices offer different affordances for organizational tools, which might also affect how people manage their accounts. We expect mobile usage to have important implications for organizational tools in email.

In terms of methodology, this study was reflective. Users were recalling their general usage with email throughout the email tour. As such we could not uncover specific moments of struggles with email organization. Moreover, we looked at a snapshot in time (similar to Whittaker and Sidner [20]) rather than over time like Fisher *et al.* [9]. Future work could look further at behaviors over time, particularly for

those for whom the inbox might alternate between small inbox and large inbox. Specific times of the year or events that spark a need to clean could be of particular interest.

CONCLUSION

Email is a large part of people's communication technologies and Gmail plays an important role in this regards [13]. We replicated the analysis of two previous studies from 1996 and 2006, which found that the inbox contained many emails. We found that, sixteen years later, there are still many emails in the inbox; in fact there are more than in the previous studies. However, it is not the fact that there are many emails in the inbox that drives users to feel disorganized. Feelings of disorganization appear to be more driven by high unread counts.

Managing overload in personal email accounts is a different issue than managing overload in work. Research in email overload has, to date, mainly focused on work email accounts. Personal email often contains many different types of emails such as emails related to job searches, money transactions, communication with friends and family, and many others. As such, clients built for personal email contexts should be designed to support people in leading complex and meaningful lives.

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