Go with the Flow: How Users Monitor Incoming Email

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ABSTRACT
We have only a limited understanding of how users continuously monitor and manage their incoming *email flow*. A series of day-long field observations uncovered three distinct strategies people use to handle their incoming email flow: glance, scan, and defer. Consequently, supporting email flow involves providing simplified views of the email inbox and mechanisms to support the revisitation of overflow messages.

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INTRODUCTION

We currently have a very rich high-level understanding of how email fits into work practices of office workers [3,5,8,9]. Recently, researchers have undertaken efforts to understand how users manage and prioritize email at a more granular level [2,7]. Venolia et al. identified five activities that characterize email use (flow, triage, task management, archive, retrieve), of which we are interested in the flow activity: *how users continuously manage incoming email as it arrives to their inbox* [8].

The triage activity is a batch activity where users process and decide what to do with unhandled email after an extended period of inactivity [7]. The flow activity is distinct from triage because flow refers to the *ongoing, continuous* process of email management [1,8]. While the triage activity may comprise the majority of email use when users can only periodically handle email (e.g. on "meeting day"), users often handle email in an ongoing fashion—for example, during prolonged periods of workstation activity. Our interest is in understanding how to better support email activities under this common latter scenario.

Utilizing full-day contextual observations of four high volume email users, we identify three distinct strategies users employ to monitor and manage their message flow.

- *Glance*: where users quickly peek at their inbox to maintain an *awareness of the incoming email rate*.
- *Scan*: where users quickly view senders and subjects of new messages in the inbox to *find messages that demand immediate attention*.
- *Defer*: where users *postpone handling of messages* using a task or issue-centric approach.

Our users reported that email volume is now so large that notifications [8] can no longer adequately support email flow. As a consequence, they use many strategies to "keep up" with their email during the day.

We make two contributions: first, we identify and describe three empirical strategies users employ for handling email flow; second, from these strategies, we derive a set of design implications for email clients to support email flow.

UNDERSTANDING EMAIL FLOW

Since timely email communication is often task critical [3], users maintain an awareness of their inbox even when processing email is not the primary task [8]. Consequently, many users no longer periodically "check email" as they did in the past; instead, they leave their email clients open throughout the workday [3]. In this context, how do these users continuously maintain an awareness of, manage, and make sense of their incoming email? How do users decide when to move from awareness to action on an email? When users are limited by time, how do they decide what emails to leave behind? Building email clients to support modern email usage requires an understanding of these aspects of email flow.

To observe the brief, incidental email activities that occur throughout the day, we used extended contextual observations of people dependent on email for their work. We used this approach since common approaches used by email researchers (one-hour in-situ interviews [7,9], self-report surveys [2,8], and one-time offline inbox analysis [9]) fail to capture the contextual dynamics of a workday.

For example, [7] used in-situ interviews at the start of the user's day to understand triage activity. This approach

Name	Characteristics
Flora	• University administrative office worker • Accessible to students and faculty • Inbox is open all day (no folders)
Larry	• Lead program manager at a large software firm • Entire day "in meetings or doing email, sometimes both—doing email in meetings" • Inbox open all day (PC, laptop), and checks email on SmartPhone
Owen	• Head IT administrator at software firm • Manages team of four, delegating tasks by email • Two inboxes open all day (Windows PC, Linux PC), and checks email on Blackberry
Will	• University research lab manager • IT troubleshooting, inventory control • Inbox open all day (laptop)

Table 1. Descriptions of our participants

isolates email activity from the broader work context, and would not have been appropriate to capture *ongoing* email management through the day. Researchers have also made use of questionnaires in order to probe email related activity during the day [8], but self-report inquiry methods assume the user is retrospectively cognizant of all their email activities. Surveys are appropriate for assessing perceptions of email use (e.g. email filing strategies [8]), but are unlikely to capture our interest in transient email monitoring behaviours. Finally, some researchers have analyzed archived inbox files offline (e.g. [9]), yet this approach would altogether miss the dynamics of users' interactions with their email client.

Our workplace shadowing approach [4] complements these prior approaches, allowing us to record and identify contextual patterns of email use as they vary throughout the day. While our presence in the office may have influenced our participants' general behaviour, we do not believe our presence systematically affected email related activity. This was confirmed in the post-study questionnaire, where participants reported the investigators did not affect their general workflow.

Day-long in-situ observational methodology

Our aim was to gain an understanding of email use with the intuition that a single user will exhibit different strategies to handle email flow throughout the day. Each observation session began with a 20 minute interview to collect general demographic information and descriptions of job function. An investigator would then position himself behind the user with a view of the workstation and work surface. Detailed minute-by-minute field notes were taken to build a picture of the user's email usage, and any relevant work tasks that seemed to trigger email reading or generation. We limited asking clarification questions such as, "Why did you read that email first?" to once an hour in order to minimize our intrusion.

We noted all participants' email activity for the entirety of a workday, save for a brief time when Larry went to the restroom with his SmartPhone. At the end of the day, users were given a questionnaire to assess their perceptions of their email use and the study.

Participants

Our four participants (summarized in Table 1) were recruited from both industry and academia (one female, three male) using email broadcasts. Our participants came from a variety of job functions. All use email as a core communications medium for their work, with each receiving over 50 emails per day. To provide anonymity while referring to our participants, we will use gender-appropriate pseudonyms.

RESULTS: THREE STRATEGIES TO HANDLE FLOW

While participants did not exhibit identical behaviours, similar patterns emerged in their strategies for handling email flow. We used an open coding methodology to analyze our field notes [4], and to understand the email activities of our users in the context of their work. Due to space restrictions, we do not report on the full details of our analysis; instead, we highlight our main findings about the three major email handling strategies (summarized in Table 2) with actual examples drawn from our participants. Although we discuss each strategy as a distinct category, we emphasize that users transition between these strategies fluidly (and even sometimes to a full triage [7]).

Glance: Lightweight awareness of incoming email rate

Users *glance* at their email inbox to maintain an awareness of the volume of unread incoming email. This interaction often lasts for less than a second, and we saw this strategy employed at least once an hour even as users were deeply focused on non-email work tasks. Users only took further action if there was a surprising amount of email.

Glances are a lightweight form of email use and were observed to take place opportunistically (e.g. while transitioning from one application to another). Because they are so brief, it is unlikely the glance provides anything but a minimal awareness of the inbox. *Glances* provide a sense for *how much email is in my inbox*, and perhaps an

Type	Characteristics & Goals
Glance	• Brief and opportunistic during primary task • *What is the rate of my incoming email?* • *I care about:* # of unread emails in my inbox
Scan	• Short break to gain richer awareness of email inbox • *Is there email to be handled immediately?* • *I care about*: who sent me this and what is it about
Defer	• Explicitly or implicitly flag emails to be handled at a later time • *Can I handle this email later?* • *I care about:* who sent me this and what is it about

Table 2. Summary of email flow handling strategies

iconic memory for words.

11:21 am: Flora is working on a paper task. As she reaches for the "Sign Here" sticky notes, she glances at her email client, which has been left open and visible. The email client has 7 unread messages. Flora mutters "Holy smokes," and stops working on her paper task to scan through her inbox.

Glances are so brief that they likely do not provide an exact count of unread emails, but we suspect that users can use *glances* to gain some information about the *rate* of incoming messages. Incoming email rate is important because sudden fluctuations are often associated with "emergencies."

11:30 am: Larry's inbox suddenly "hiccups," scrolling down with 10 new unread emails. Within 5 seconds, Larry minimizes his current window, and opens up the newest email, which is an issue that needs to be resolved within the hour.

Users will sometimes initiate email-related activities based on a *glance*, but the main transition from a *glance* is to a *scan* of the inbox.

Scan: Finding things to deal with immediately

Users *scan* their inbox in search of new emails requiring immediate attention. These *scans* occur at work task transition boundaries, or when the user takes a break. When *scanning* their inbox, users primarily attend to the author and subjects of emails, actively searching for important emails that are expected or unexpected. In our sample of participants, *scans* were brief, user-initiated "interruptions" lasting no more than 5s-30s, occurring fairly frequently—often as much as twice an hour. Users took action if an important email had arrived; otherwise, our participants simply returned to their primary task.

3:21 am: Earlier in the afternoon, Flora spoke with Bill, who was to prepare a document for her. She expected him to have it complete since she is otherwise blocked on a task. In the meantime, she has been working on another spreadsheet task. Flora looks bored, and suddenly decides to check her inbox to see whether Bill has sent her the email. Flora recalls later, "Sometimes, when I'm waiting for someone to send me something, I don't really notice anyone else—I was just looking to see if they've sent it, because usually it's important."

3:35 am: Flora checks her email by bringing up her email window. This time, Bill's email has arrived. Flora immediately opens up the email, and deals with it.

The characteristic property of a *scan* is that users perform a cursory search of their inbox with the purpose of finding new emails requiring immediate attention. Users are interested in two aspects of each new email: *who sent me this piece of email,* and *what is this email about*. Efficiency counts when scanning since *scans* occur during extremely short breaks in the primary task. In only a minority of cases would participants briefly skim an email in the preview pane. In a few of these cases, our participants marked the email as "unread" again to *defer* it for subsequent revisit. This border between "read" and "unread" emails seemed to limit the scanned area. When scrolling through the inbox pane, users would not scroll beyond any email that had been "read," since presumably these would be emails already dealt with.

Scans are distinct from *glances*: scans are longer in duration, and are explicitly used to identify new important emails that need to be dealt with immediately. *Glances* sometimes transition to *scans* as we already mentioned. If many items from a scan were dealt with in succession, then users seemed to transition into a *triage*-like mode, and take the opportunity to complete an entire pass on unread mail. The difference from a full triage session is that the user's mindset is to return to their non-email task. In full triage (e.g. just arrived at the office), the user is dedicated to just handing email for an extended duration.

Defer: Taking care of the overflow

Users *defer* emails for later revisitation to manage *overflow*: emails that cannot or should not be dealt with now. While our users were generally good at keeping up in real-time with their incoming email stream, we observed many emails from past days having been flagged for later action (e.g. messages left in the inbox explicitly "re-flagged" through the client, being left opened on the desktop, or even half-written replies that were opened or saved in the "Drafts" folder). Since users selectively pick only important emails to read during *scans*, it appears that users *actively defer* messages for revisitation as a strategy for managing their attention budget.

We emphasize that the *"deferred"* nature of an email does not imply an "importance level." Emails can be deferred for several reasons: an email could be very important, thereby requiring careful examination and reply, or it may be unimportant and not deserving time immediately (if ever), or it may be long and informational, therefore it is being queued for processing when a long period of downtime presents itself [9].

Closely coupled with the *deferral* of emails is how users revisit these deferred messages. We observed two ways users revisit emails after being deferred. Revisitation often occurred when users hit task boundaries or finished immediately important tasks, or toward the end of the day.

Deferred emails are handled *after* more pressing activities are completed. In at least one case, a deferred email (containing a task) could not or should not have been handled when it was received.

12:30 pm: Michael got a request this morning on his Blackberry to setup an intranet website. He had deferred it since he could not handle the request earlier, but now has the time to action on the request.

Users were seen to run through all their unread messages at least once toward the end of the day to catch issues or tasks that should be read or responded to.

The *defer* activity is characterized by two features: first, users revisit deferred emails only when the majority of emails from "today" have been dealt with; second, the revisit activity (and therefore the defer activity) is often task or issue oriented. In the following example, Larry takes several steps to find emails related to a specific issue in a late-day revisitation pass.

3:16 pm: Larry is done with his "today" email (a few remaining unread emails are deferred). He groups his inbox by sender, finding one particular sender. Finding a subject line, he groups emails by subject, opening the most recent email in the thread. Satisfied the issue is resolved, Larry deletes the entire email thread. Larry groups again by sender, scrolls back to the original sender to check there are no more emails from that sender. Larry later recalls, "By reading the newest one, I don't have to read each email in the thread."

The revisit activity is distinct from the retrieve activity from [8] because revisit deals with *deferred* emails that may contain tasks, whereas the retrieve activity refers to archived emails—emails that have been stored or "handled." The revisit activity is more closely tied with handling email flow, whereas the retrieve activity is a form of information retrieval. Similarly, revisit is distinct from triage since the latter deals with unhandled mail [7].

DISCUSSION

Email flow is about helping users answer the question, "Does this email require my immediate attention?" [8]. But what constitutes "requiring immediate attention" is contextual [2] and changes throughout the day. Enhanced audio/visual notifications (found in Outlook) help support this flow-based decision-making [8], yet our participants stated that the notifications were no longer useful—likely because they must deal with an increasing barrage of daily emails.

Instead, to keep up with the email flow, users have developed a number of strategies (glance, scan, defer) that require the email inbox being open through the entire work day. All of our participants keep their email inbox open the entire day: for example, Owen uses two adjacent computers concurrently, keeping an inbox open on each in case he is using one computer. Yet keeping email inboxes open is a sub-optimal use of screen real-estate for supporting email flow—especially when email is not being attended to.

Instead, *email flow should be supported with simplified views of the email inbox with only contextually relevant information.* For instance, the primary interest in a glance is simply the volume of unread mail; for scans, the interest is in "who" and "about what." Finally, the decision to defer also requires sender and subject information, but additionally, a means to identify mails for later revisitation. As an example, the glance activity may be supported via an ambient peripheral display since the interest is only in the amount of unread mail [6]. Similarly, scans may be supported by a view that shows only new, "today" emails that have not been deferred. Finally, the deferral of emails and subsequent revisitation activity may be best supported via task-centric, threaded inbox views with some lightweight means to specify deferred emails [1].

CONCLUSIONS AND FUTURE WORK

Our interest is in how people continuously monitor and manage the stream of email that arrives in their inbox through a workday. From our field study, we observed three types of behaviours characterizing how users manage ongoing email flow: glance, scan and deferral.

In the next phase of work, we will validate these strategies with more objective measures including eye tracking, detailed client interaction logs, and field studies of more participants. For instance, some users periodically close their email clients [7]—how do these users maintain an awareness of their email? Because the daily barrage of email continues to grow, users require interfaces that understand and respect how they manage incoming email. With this field study, we provide promising first steps toward meaningful interface solutions to support email flow.

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