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Triage and Capture: Rethinking Mobile Email

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ABSTRACT
Current mobile email clients are essentially smaller versions of desktop clients designed with the assumption that mobile and desktop users engage in similar activities. Research on smartphone use, however, suggests that mobile and desktop activities differ, with mobile users focusing on triaging messages and deferring the handling of messages until they reach a desktop or laptop computer. The increased use of mobile email and the difference in practices presents an opportunity to reconsider the design of mobile (and multi-device) email user experiences. We contribute new guidelines for the design of mobile email clients that emphasize fast *triage* and the ability to *capture* intended actions. We also contribute the design, implementation, and evaluation of a new user experience meeting those guidelines that consists of a mobile email client, desktop email client extension, and web service.

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Mobile, multi-device, email, task management, triage

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The introduction of the latest generation of smartphones (e.g., iPhone, Pre, Android phones) has led to an increase in the use of mobile email. Current mobile email clients, however, remain in essence smaller versions of desktop clients, implicitly assuming that people use email on smartphones and on desktops (or laptops) identically.

Recent studies of smartphone use suggest that smartphone users actually work with email differently and that mobile email clients should emphasize different activities than their desktop counterparts. Matthews et al [5], for example, observed that mobile email users primarily triage messages (identifying which to delete, which to handle immediately, and which to defer) and defer handling most messages until they reach a larger computer. While previous desktop email research (e.g., [6, 8]) identified triage as an email activity, on the desktop it is only one of many activities. Not only does triage play a more prominent role on mobile devices, users also need to accomplish it more quickly because of the short, intermittent nature of mobile interaction [5, 7].

The increasing use of mobile email makes now an opportune time to rethink the design of mobile email clients. More broadly, the fact that users often defer handling email from their smartphones to their laptops or desktops also makes it an opportune time to reconsider the more general cross-device email user experience. Toward that end, we contribute guidelines based on existing and new user studies for the design of mobile email clients that emphasize fast *triage* and the ability to quickly *capture* intended actions.

We further contribute the design, implementation, and evaluation of a novel user experience meeting those requirements. Our experience allows users to triage messages and capture intended actions on their smartphones and subsequently access, edit, and complete those actions in a desktop email client. We describe these contributions in more detail in the following sections.

MOBILE EMAIL CLIENT DESIGN GUIDELINES
The short, intermittent nature of mobile interaction means that a mobile email client should focus on speed: quick load, quick triage, and fast action. While there are known approaches to improving load times (e.g., building a native rather than web-based application, storing data locally), the best approach to make triaging messages faster and easier remains an open question.

Previous research [3, 5] found that a common mobile email usage pattern is for users to focus on the view of their inbox and to make triage decisions without necessarily opening and reading messages. That pattern suggests that efforts to improve triage should focus on the inbox rather than on views of individual messages.

To determine what information a mobile client should display in the inbox to help triage messages, we interviewed eight iPhone users. We asked them both of the information their mobile client currently displays they find helpful and what additional information would make triage even easier. Of the information mobile clients currently display, users agreed that *the client should show the sender, subject, sending time, and read/unread status for each message in the inbox.*

The users also identified additional useful factors. They wanted to be able to quickly distinguish new and untriaged messages from merely unread messages. Because mobile users triage messages without necessarily reading them, triaged messages may still be marked unread. Several users mentioned that they open and immediately close messages just to mark them read so that any messages marked unread will actually be new, and thus untriaged, messages. To simplify triage *the client should allow users to clearly distinguish triaged and untriaged messages*.

Users also wanted information about other recipients of a message. As an example, consider a message requesting some action. The importance that users place on that message varies depending on whether they are the sole recipient or one of many recipients and whether they are a direct recipient (in the To: field), cc'd on the message, or bcc'd on the message. Despite the utility of such information, users noted that they had to open messages to find it. *A mobile email client's inbox should provide users with information about the other recipients of messages*.

Finally, users wanted to see part of each message's body. However, they were unsure as to how much was necessary. We therefore conducted a follow-up study with ten users. We asked them to avoid reading their email before the study, and then during the study showed each of them ten to twenty of their unread messages (103 messages total across users) in the inbox of a smartphone email client.

We initially showed just the sender and subject for each message and asked users to triage the messages from that information. We then revealed one line of the bodies in the inbox and asked users to triage their messages again. We continued revealing one additional line at a time and asking users to triage their messages with each new line until we had displayed five lines of each message's body. At that point we showed users the complete messages and asked them to triage their messages one final time.

This small study suggests that displaying part of each message body does help users triage. Without displaying the bodies, users could triage 53 of the 103 total messages (51%) accurately (using their triage decisions when shown the complete messages as a baseline). Showing one line of the body increased the number of accurate triage decisions to 82 messages (80%). Adding additional lines produced diminishing returns: showing two lines increased the total to only 83, three lines to 84, while showing four lines did not increase the total at all. Five lines did raise the total to 91 messages (88%), but required a significant amount of screen real estate. *Mobile clients should thus show at least one line of the message body in the inbox*, but additional lines appear to provide limited value.

After users make triage decisions, they need to be able to act quickly to carry out those decisions. Deletion is typically the first action users carry out [6, 8], so *mobile clients should support fast deletion of unwanted messages*. However, mobile users defer many non-delete actions until they reach a more capable device [5]. Current mobile email clients do not support capturing intended but deferred actions, leaving users to re-triage their messages once they reach another device. Some of our users reported that to cope with this lack of support they explicitly mark a read message as unread so that they will be more likely to notice and handle it on their desktop or laptop. Rather than forcing users to cope, *mobile clients should provide the ability to capture intended actions and make it possible to access and complete them on other devices*.

A mobile email client meeting these guidelines should better fit users' mobile email practices, allowing them to handle their email more quickly. In the next section we present a user experience that we created to both illustrate and test these guidelines.

A MOBILE, DESKTOP, AND WEB USER EXPERIENCE

Drawing on our guidelines, we designed, implemented, and evaluated a mobile email client that provides information to help mobile users quickly triage messages and allows them to capture intended actions for subsequent execution. While we primarily concentrated our efforts on the mobile client, we also wanted to explore how we could allow users to seamlessly resume and complete handling their email across their device. We therefore created a broad user experience, rather than just a mobile email user interface, that incorporates an extension to an existing desktop email client and an off-the-shelf web service.

In this section we describe the three components of our user experience. We also identify potential improvements learned from an initial deployment.

Mobile Email Client

While our user experience includes a desktop component, our primary focus was the mobile client (in part because previous research has explored how to capture and manage tasks in desktop email clients (e.g., [2]). We implemented our mobile client as a custom iPhone application.

Top-level view

We abandoned the more traditional inbox and folders organization to instead provide access to users' untriaged and triaged messages (Figure 1a). Providing separate views of users' untriaged and triaged messages allows users to quickly determine which messages they have and have not triaged without necessarily moving messages out of their inboxes. We also provide access to the tasks that we create for users' intended actions (since "action" is an overloaded term, we use "task" in the interface to describe a captured intended action).

The numerical badges in Figure 1a for the untriaged and triaged subviews communicate (from left to right) how many new (for untriaged messages only), unread, and read messages those subviews contain, while the badges for the tasks subview communicate the number of uncompleted tasks and the number of total tasks.
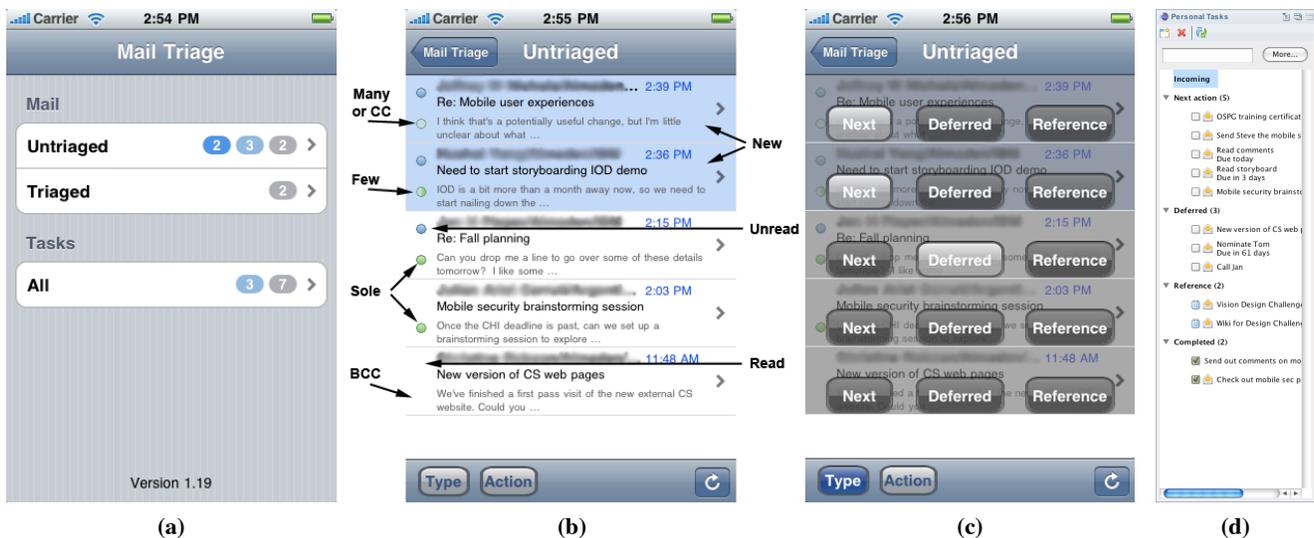
Figure 1. The top-level view (a), untriaged mail collection view (b), and type capture overlay (c) for the mobile email client. The sidebar (d) for the desktop email client extension.

Untriaged and Triaged mail collection views

The Untriaged mail collection view shows messages that the user has not yet triaged. The view applies the iPhone metaphor of a table of cells, one for each message. A cell provides an overview for a particular email message.

Drawing on our guidelines to determine what information to show to aid triage, we display the sender, subject, sent timestamp, unread status, and two lines of the message body (Figure 1b). We follow iPhone convention and use a filled blue circle, which we place on the top left of a cell, to indicate that a message is unread. We help users see at a glance which messages are new by changing the cell background to a light blue color. We convey information about other recipients through a green circle at the bottom left of a cell. If the circle is completely filled, the user is the sole recipient. If the circle is half-filled, the user is one of at most five recipients. If the circle is empty, the user is one of more than five recipients or is cc'd on the message. If there is no circle, the user is not directly addressed (e.g., the message is to a mailing list) or is bcc'd.

The untriaged mail collection view supports quick action. Users can swipe to delete messages. They can also specify intended actions for messages to capture them for later completion. Our current design allows users to specify the type for an action and the action itself. Inspired by Getting Things Done [1], users can set the type to Next (for an action that they can tackle next), Deferred (for actions that are not yet ready to be tackled), or Reference (for messages that provided information for a separate intended action). For the action itself we give users eight choices that we assembled by walking through hundreds of the authors' archived messages and identifying common actions. The actions are Call, Print, Read, Reply, Save, Schedule, Send, and Visit.

We initially allowed users to also specify the context where they could perform an action: at Home, at Work, or

while Mobile. However, an evaluation of this initial design with ten users revealed that it added too much complexity and inhibited fast action. Since users often implicitly specify the context by their choice of email account (e.g., email in work accounts typically requires action at work), we removed the ability to specify the context.

We experimented with a variety of different techniques to allow users to capture actions: one dimensional swipes, (left/right), two dimensional gestures (left/right, up/down), and techniques where the user first chose a type or action and then selected messages to which they wanted to apply it. However, users preferred an absolute positioning technique (feeling it to be faster) where they choose to assign types or actions and the client places a transparent overlay on top of the messages. Users can then directly specify the type or action for each message (Figure 1c). Because users varied in their preference for one-handed or two-handed interaction, we allow users to show or hide the overlays by pressing Type and Action buttons that they can set to act either as toggles (for one-handed use) or as muscle modes (for two-handed use).

Once users assign types and actions, they push a button to cause the client to triage their messages. The client then moves all messages with assigned types or actions (using the type Incoming for any message where the user assigned an action but not a type) from the Untriaged view to the Triaged view. It also creates tasks for each triaged message using the email subject as the task title and the email body as the task description. It preserves a link to the original message (allowing users to navigate from the task to the original message) and then saves the task both locally and on the web service. Users can access these tasks through the Tasks view and edit the title, description, type, or action; assign arbitrary tags; or assign a due date.

In our evaluations, some users did want to keep triaged messages in their inbox. However, others wanted to move

triaged messages out of their inbox so that they could also easily see on their desktop computers which messages they had not yet triaged. We therefore provide the option for the client to move triaged messages from the inbox to a user-specified folder. For users that prefer to tag rather than folder messages, the client can also apply captured types and actions directly to triaged messages as tags.

The Triaged mail collection view is largely identical to the Untriaged view. It does not provide controls for capturing actions for messages, and the entry for each message shows only a single line of the body. The reclaimed line shows the capture type and action for each message.

Desktop Email Client Extension
Our desktop email client extension is a plugin for Lotus Notes 8 that retrieves the user's tasks from the web service and displays them in a sidebar (Figure 1d). Users can double-click on a task to edit it or double-click on the task's email icon to open the original email message.

By default the desktop client shows a user's tasks organized by type, but users can modify this organization by adding new groups of tasks (e.g., all tasks due in the next week, all tasks with a given tag).

We do allow users to also triage messages on the desktop. Users can triage a message by dragging and dropping it into the sidebar extension; the extension will create a task for the message and save it on the web service.

Web Service
The web service serves as a central repository of information about each user's captured actions. We use an existing web service, the Activities component of Lotus Connections [4]. In addition to providing an Atom API to allow our desktop and mobile clients to read and write tasks, it also provides a web user interface that allows users to directly access and edit them. When working on a computer with the desktop email client installed, users can click on a link to a task's original message within the browser to open that message in the desktop email client.

Potential Additional Refinements
We deployed the final version of our user experience, including the mobile client, desktop client extension, and web service, to seven users. While use is ongoing, we interviewed users about their initial experiences (ranging from several days up to two weeks). While users' reactions to the user experience were very positive, we did identify potential areas for improvement.

The biggest request from users was for a tighter coupling of email and task. In our design they are loosely-coupled; deleting one does not impact the other. Users instead wanted to be prompted for what action the client should take if they deleted one of the pair.

While users appreciated the ability to easily capture actions for messages, in some cases they wanted to triage a message without creating a task for it. In most cases users wanted this ability because they intended to handle the message immediately upon reaching their laptop or desktop and thus perceived creating a separate task as unnecessary overhead (particularly since the current loose-coupling requires that they delete the task separately).

Other areas for improvement include modifying the desktop client to allow users to view tasks in the main part of the window and automatically processing messages based on their intended actions (e.g., extracting likely phone numbers for a Call). More usable mobile security is another potential refinement that is outside the scope of our work. Accessing our VPN from a smartphone requires configuring the smartphone to use an eight-character alphanumeric password; several users commented that they would use the mobile client much more if a more usable but equally secure authentication mechanism was available. All of these potential improvements are promising areas for future research.

CONCLUSIONS
Current mobile email clients are essentially small versions of desktop clients, despite research suggesting that mobile and desktop users handle email differently. We draw on previous and new studies to contribute guidelines for designing mobile email clients to more closely match users' mobile practices. We further contribute the design, implementation, and evaluation of a user experience following those guidelines that supports triage and capture across smartphone and desktop devices.

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