MAIL MANAGEMENT WITH OVERLOADING

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ABSTRACT

Email is one of the most successful computer applications yet devised. Our empirical data show however, that although email was originally designed as a communications application, it is now being used for additional functions that it was not designed for, such as task management and personal archiving. We call this email overload. We demonstrate that email overload creates problems for personal information management: users often have cluttered in boxes containing hundreds of messages, including outstanding tasks, partially read documents and conversational threads. Furthermore, user attempts to rationalize their inboxes by filing are often unsuccessful, with the consequence that important messages get overlooked, or "lost" in archives. We explain how email overloading arises and propose technical solutions to the problem.

Keywords: Email, Information Overload, Personal Information Management, Asynchronous Communication, Filing, Task Management, Interpersonal Communication, Ethnography, Empirical Studies.

I INTRODUCTION

Email is one of the most successful computer applications yet devised. There are millions of email users world-wide who often spend significant proportions of their work time using email. Research suggests that email has contributed to the growth of distributed organizations, by allowing people in different geographical areas to communicate across time and space. It has also led to the emergence of on-line communities by supporting asynchronous communication [8]. Email has been the subject of many studies, including pioneering early work that focused on the social and communicative aspects of email, comparing its usage with face-to-face communication [8]. Nevertheless, there is little systematic data on its usage and utility as a workplace technology. Furthermore, the success and popularity of email has led to high daily volumes of email being sent and received. Research has not yet addressed how people organize and manage large amounts of information. This study therefore presents a quantitative analysis of the mailboxes of 20 users, along with 34 hours of interviews to address these new questions.

Email applications were originally designed for asynchronous communication, but as our analysis will show, email has evolved to a point where it is now used for multiple purposes: document delivery and archiving; work task delegation; and task tracking. It is also used for storing personal names and addresses, for sending reminders, asking

for assistance, scheduling appointments, and for handling technical support queries. We use the term email overload to describe the use of email for functions that it was not designed for. We discuss three main email functions: task management, personal archiving and asynchronous communications. The central question is how well a single tool can support all these functions. Subsidiary questions must also be asked in each category.

Task management requires users to ensure that information relating to current tasks is readily available. This both preserves task context and allows users to determine the progress of ongoing tasks. Task management also involves reminding oneself about when particular tasks or actions have to be executed [1,2,4,6]. How do people do this in email?

Personal archiving or filing addresses how people organise and categorise longer term information, so that it can later be retrieved. Archives are not of immediate relevance to current tasks, but are constructed for reference or anticipated future use. Research shows that users experience major problems in generating appropriate folder labels when filing longer term information for later retrieval, and in reconstructing these labels when they engage in later retrieval [6]. To what extent do these problems occur in email?

Asynchronous communication is concerned with interaction in a permanent medium across space and time. Research has characterized face-to-face workplace communications as consisting of repeated brief communications [3]. Such interactions are seldom one-shot, and workers often engage in multiple intermittent interactions in order to complete a task. Workers are also usually engaged in several independent, but concurrent ongoing conversations, with the requirements of tracking separate conversational threads and switching contexts between conversations. Does email communication have these characteristics, and how are asynchronous communications conducted?

To provide preliminary answers to these questions, this study presents qualitative and quantitative information about the use of email for task management, personal archiving and asynchronous communication. We describe the problems people experience with each of these functions, and the strategies they invoke to address the problems. Finally we suggest potential technical solutions.

II EMAIL OVERLOAD: THE PROBLEM

Participants were generally highly positive about email as a communication tool. They stressed how it enabled them to collaborate with others across time and distance [8]. They also pointed out its advantages over other technologies such as the telephone, and even face-to-face interaction. Nevertheless certain individuals experienced major problems in reading and replying to email in a timely manner, with backlogs of unanswered email, and in finding information in email systems. The inability to effectively manage communication means lost information, and reduced responsiveness. These have clear negative outcomes for both individual and corporate productivity.

"Waiting to hear back from another ...employee can mean delays in accomplishing a particular task, which can ... have significant impact on our overall operations. Depending on the situation, it can either be critical or just frustrating."

"One of my pet-peeves is when someone does not get back to me, but I am one of the worst offenders. I get so many e-mails (average 30-40/day) and phone messages (15-20) that I cannot keep up and also do my real job..."

"Given the sheer volume of stuff that passes through here. I mean I couldn't even give you a percentage of how much is missed. I mean - -- not necessarily missed but certainly recorded but never followed up on"

"I dedicate somewhere between minimally two hours at the outlying range, up to ten hours on any given day trying to stay on top of email"

So why do these problems arise? A simple one-touch model of email might assume: incoming messages that are informational, i.e. those not requiring a response, are read, and then either deleted or filed, depending on their relevance. Incoming messages that form part of a correspondence, (i.e. requiring a response), are answered, and then either deleted or filed. According to the one-touch model, information can therefore be in two possible states: unread and filed. The user's inbox at any point should solely consist of a small number of unread incoming messages, and the rest of their mailbox consist of filed items.

Our quantitative data show the one touch model is patently incorrect. The mean number of inbox items is 2482, and the mean number of filed items (858) is small compared with the number of inbox items, so that the inbox constitutes on average 53% of people's mail files. It is implausible that users receive 2482 new items each day, so what is happening and why is the inbox so full? It turns out that there are two related reasons for this: (a) the inbox operates as a task manager, where people are reminded of current tasks, and where people can keep information relevant to those tasks accessible; (b) people find it hard to file information to remove it from their inbox, both because filing into folders is difficult and there may also be few benefits to creating folders.

III STRATEGIES FOR HANDLING EMAIL OVERLOAD

Given the dual problems of managing ongoing conversations and tasks, combined with the issue of filing, we identify three different user strategies, based on two criteria: (a) whether or not users currently use folders; (b) whether they "clean up" their inbox on a daily basis. This yields 3 strategies: no filers (no use of folders); frequent filers (folder users who try and clean up their inbox daily); spring cleaners (folder users who clean up their inbox only periodically). The data associated with each are shown in Table 1.

No filers: made no current use of folders (mean 11.33), but relied on full-text search to find information. Their folders were historic remnants from when two of the no-filersstill filed. As a consequence of not filing, their inboxes

were huge (3093.5 items, making up 95% of all their email). Their inboxes were overloaded: they included a large numbers of conversational threads. More significantly, over half of their inbox was old information that arrived more than 3 months ago. Their strategy for reducing the size of the overloaded inbox was periodic purges in which they deleted large numbers of old items or copied them to a separate independent archive. Four of the six no filers were managers.

Frequent filers: made strenuous attempts to minimise the numbers of inbox messages. They made daily passes through their inbox filing or deleting its contents. Their inboxes were relatively small, containing only 43.4 items, which was a very small percentage (5%) of the total number of mailbox messages. In addition, the inbox consisted almost exclusively of new items (90% were less than a month old, and only 5% were older than 3 months), and it was almost devoid of conversational threads (mean 3.6). They made frequent use of folders, and were relatively successful in their use of these, with only 21% being "failed folders". The five frequent filers included both the administrative assistants, but only one manager.

Spring Cleaners: dealt with the overloaded nature of their inboxes by intermittent clean-ups - normally every 1-3 months. They made extensive use of folders, even though this was often unsuccessful, as evidenced by the fact that over half of their folders "failed". They also had large overloaded inboxes (mean, 1492.3), containing large numbers of conversational threads (mean, 258). Over 40% of their inbox messages were more than 3 months old. Four of the seven spring cleaners were managers.

IV REDESIGNING EMAIL TO FIT ITS FUNCTIONS

There are both design and theoretical implications to these results. Although email was originally designed for asynchronous communication, the application is actually being used for multiple functions. Email therefore needs to be redesigned to support filing and task management as well as asynchronous communication. Our analysis of different users' strategies shows that both non-filers and spring cleaners experience problems with both filing and task management. These problems lead to backlogs of unanswered messages and "lost" information in archives. Furthermore, the group who experienced fewest problems, namely frequent filers, may only be able to operate successfully because of strenuous efforts to trim their inboxes. It is therefore important that we address overload. As email volumes continue to increase, even those users who are currently frequent filers may end up spending much of their energy in reading and responding to messages, leaving them with little time to maintain their inboxes, and folders. As a result, they may be forced to behave more like spring cleaners or even non-filers.

We now discuss possible techniques to support the three functions. We have shown that the inbox is often used as a place for incomplete tasks, unfiled information and ongoing conversations. In all these cases, users preserve working information in the inbox both to keep it available and as a reminder that further actions are required. We have also seen, however, that opportunistic reminding is compromised when the number of inbox messages is too large, because messages scroll off the screen and remain unseen. A key technical requirement is therefore to reduce inbox

clutter to allow visual reminding, but without compromising the availability of working information. We now present technical solutions for each email function addressing different ways of presenting and viewing the inbox to support both availability and reminding for working information.

Although email was originally designed for asynchronous communication, the current system has limitations in supporting this function. The key requirements for asynchronous communication are: (a) threading to support context regeneration and the management of conversational history, and (b) the ability to track the status of a conversation. Users want to avoid: scrolling back through large numbers of heterogeneous inbox messages to find all previous elements of a conversational thread; lost context when someone omits message history; forgetting who has the next turn in the conversational sequence.

How can we address these asynchronous communication problems? One solution to the problem of communication management automatically marks email messages from the same conversation using a common thread ID, allowing the user to collect related messages together, and trace back through conversations. The user would subsequently be able to view by thread. Viewing by thread allows a user to select any message, use that message to access all messages from that conversation, and hence view any message in its conversational context. This functionality is equivalent to having a single message containing the forwarded history of an entire conversation. Unlike a single message, viewing by conversation is not beset by the navigational problem of trying to follow a conversation that is many layers deep, where information may be buried within a single message. Viewing by thread provides several additional benefits. It helps determine conversational status: by looking at the last message in a thread, the user should be able see whether they "owe" or are "owed" a response. Furthermore, it should be possible to file an entire thread, but leave a representative message from that thread in the inbox. This serves the purpose of reducing inbox clutter, even when users choose to copy themselves on every response. As we have seen with frequent filing, a representative message in an uncluttered inbox can remind the user that a conversation is in progress. When the conversation is concluded, the entire thread can also be archived or deleted as the user wishes.

V CONCLUSION

Most e-mail-based studies conducted have focused on the individual level. Because e-mail communication always involves, at a minimum, two individuals, it is important to analyze the problem at a higher level, such as the group or organization level, to be able to obtain a holistic view. One way is to look at the problem from a social network perspective. A worker usually belongs to several knowledge networks and has different types of relationships with members of different groups. Complex e-mail interactions with numerous network members can often lead to results that are hard to anticipate otherwise. Simulation and network analysis approaches are well-suited for handling such problems.

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