Working Together Inside an Emailbox[1]

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Abstract. In this paper we look at a situation in which email is not simply a channel for collaboration and communication but a site of collaboration itself, involving email inboxes that are jointly accessed by more than one person. We conducted two studies of shared email usage. We learned about a diversity of shared email practices in 14 schools, museums, and support centers through semi-structured interviews and (where feasible) site visits. We also explored in depth one type of shared email usage: executives and assistants sharing an emailbox. We describe the strategies that people use today to meet their collaborative needs by exploiting mailbox structures they currently have. We close with a discussion of email as a site of reinvention – i.e., where users' work practices have given existing technology new meanings.

Introduction

Many studies in the past have examined the role email plays in people's work and personal lives, the methods they use to manage and organize mail, and the problems people face from ever increasing volume and overload (Bälter, 1998; Ducheneaut and Bellotti, 2000; Sproull and Kiesler, 1991; Whittaker and Sidner, 1996). In these studies, email is viewed as a tool for communication and collaboration, generally in support of some other task or activity (see also Bellotti et al., 2003; Boardman, 2002; Muller at al., 2004).

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[1] A brief report of this work appeared as a poster at CSCW 2002 (Muller & Gruen, 2002).

By contrast, this paper focuses on the interesting situation in which email itself is the object or site of the collaboration. Such situations exist in several contexts. One context is the collaboration that occurs between managers and assistants who share access and responsibility for the same mail file. A broader class of contexts occurs when organizations or individuals establish an email alias to a function or service, so that clients and/or customers have a simple way of finding that function or service. We will consider each of these cases, beginning with diverse examples of this broader class.

Email Aliases to Functions, Services, or Roles

Many organizations have provided an email alias to a function or service. Using generic wording, examples include the following:

- Information@museum.org
- Admissions@school.edu
- Recruiters-hotline@company.intranet.com
- orders@catalog-merchant.com

A common configuration involves a group or team in-box, to which information and queries are sent. In some cases, complete workflow systems are built to support these settings; in others, teams have devised procedures and tools to manage their work. In addition, individuals and organizations have made less formal arrangements to enable and coordinate activities in shared mailboxes.

This study helped us to understand the diversity of shared email usages, in which individuals and organizations have improvised working practices to make a technology designed for individual use into a technology suited for shared use – a process called "reinvention" in the sociotechnical systems literature (e.g., Tornatsky and Fleischer, 1992; see below). This first study also provides a general context for our second, in-depth examination of how assistants and their executives have adapted email for their joint use.

Executives and Assistants

During visits to our company's Executive Briefing Center, chief information officers and other high-level executives of our customers mentioned a need for mechanisms to support the way executives and assistants work together. It became clear that they were interested both in technological solutions, and in understanding the practices others in similar situations have developed. We also began to believe that executives and/or their assistants had begun redefining (or reinventing) email features – i.e., that they had taken existing features, but used them in novel and inventive ways.

The insights learned through this study also suggest features and capabilities that would be useful to individual email users in their own email work. And they

point to the fact that, to some extent, most users do have some need to collaborate around email; for example, the email writer who forwards a copy of a message to a colleague to check over it before sending it out, or the recipient who forwards a message to a colleague for handling.

An Earlier Study of Assistants

In an earlier study, we observed meetings in which assistants and managers reviewed received mail together ("Mail Sessions", discussed below) with the goal of informing the design of a computerized collaborative assistant by understanding human assistants work practices (Gruen et al., 1999). We reported five categories of work by the human assistants:

- **Pre-Processing:** Assistants frequently gathered additional information and prepared items in other ways before passing them to the manager.
- **Filtering/Prioritizing:** Assistants selected the messages that needed the manager's attention, and often ordered them by priority. They also determined if any required that they interrupt the manager immediately.
- **Adding Relevant Information:** Assistants provided additional information, such as a reminder of a sender's affiliation, both when first presenting a message and while the manager read it.
- **Delegating Complex Tasks:** Assistants frequently performed a number of complex steps in response to a single, often brief, request.
- **Peripheral Awareness/Drawing Attention to Items of Interest:** Assistants frequently pointed out information they thought their manager's would find important, such as the mention of a colleague in a message.

In the current study we look in detail at how assistants and executives communicate and collaborate around email, in service of the above goals.

Shared Mailboxes in Diverse Organizations

Our broad examination of shared mailboxes in organizations presented operational difficulties. The concept of shared mailboxes is so counter-intuitive that many people who work in this manner do not think about it in these terms. Further, some people who work in this way consider it to be a strange kind of work-around, and were therefore somewhat embarrassed to talk about it. Some companies arrange their shared mailboxes in ways that they prefer to keep private. In one example, a company did not wish to reveal that an executive's published email address was *never* read by that executive. In a second example, a company was reluctant to acknowledge that its customer care operations were conducted by a separate "out-sourced" company. As a result, our ability to collect sample artifacts and verbatim recordings of our interviews and observations was severely restricted.

Our interviews began with an explanation of what we meant by "shared email" or "shared mailbox." Discussions then proceeded in an opportunistic manner, pursuing the most interesting aspects of each informant's experience. We attempted to collect relatively simple data (e.g., "how many people share this mailbox or alias?"), but some of our informants considered even that kind of data to be too revealing. We also asked for stories or broad-based accounts (e.g., "how do multiple users of this mailbox coordinate their work?"), and we were somewhat more successful at collecting this kind of informal account.

In this broad-based approach, we conducted telephone interviews at three online catalogue companies, a corporate internal human resources hotline for recruiters, a corporate executive's public email addresses, two corporate webmasters, a college/graduate institution, and a student organization.

In addition, we conducted preliminary telephone interviews followed by field visits and observations a museum customer-relations site, two corporate customer-support sites, and one school.

Findings

Our report on the shared mailboxes begins with an introduction to the sites, and then a thematic summary of findings that showed interesting similarities and differences across sites, from the largest to the smallest team sizes. The Minority Student Organization's novel use of the shared mailbox is presented last.

Sites: Online Catalogue Companies

We conducted telephone interviews with three online catalogue companies, and conducted follow-up site visits at two of them. Each company published an email address on the company's website, and often communicated that address to customers in emails and in printed materials. When each customer's email arrived at the alias, it was put into a general mailbox or, for more specialized mail-handling technology, into a queue for analysis and processing. In some cases, a human agent gave each email a cursory examination, and routed it into an appropriate queue for a specialized team. In other cases, the company's website required users to self-categorize their emails through pull-down menus. The self-categorizations were recorded as part of the emails' headers, and were used for automatic queuing to specific teams with specific competencies.

These sites were the most operationally complex. They had the largest numbers of people *directly* involved in dealing with the emails (but see "Museum" and "Executives' public email addresses," below, for larger groups of people who might be involved in a more diffuse way). Teams of workers acted in an email version of a traditional customer-care call-in center. In all cases, the respective company offered more products than any one worker could know about, and workers made routine reference to both online and paper product

descriptions and help information. These sites typically applied well-defined work-quality norms to their work, including criteria for responsiveness, accuracy, and identity/branding requirements. These themes are pursued in the "Identity" theme section, below.

A second aspect of complexity at these sites was coordination. In the simplest terms, coordination was needed to make sure that each customer's email was answered by only one employee – however, this coordination issue became more complex in practice (see the "Coordination" theme section, below).

A third aspect of complexity – knowledge management – was a result of the size of the teams handling various customer requests or inquiries. While team size varied according to a number of factors (customer demand, particular sales campaigns, seasonal issues), the overall staffing of customer response centers was between 20 and 40 people. Sites varied in how they supported employees' responses to high-frequency customer questions. These observations will be pursued further in the "Knowledge Management" theme section, below.

Site: Museum

The Museum's shared email usage was similar in some ways to the online catalogue companies. The Museum' website maintained an active online presence, which was used by schools, other museums, and individual members/customers. The site provided information about exhibits, schedules, programs, and travel directions. The website provided an email alias through which people could ask questions and make arrangements for visits. A small team (fewer than 20 people, with much seasonal variation and only modest training) answered those emails.

In practice, the most frequent users of the Museum's customer response center were schools that wanted to arrange for class visits to the Museum. Arrangements for the visits usually involved steps that included initial inquiries, initial commitments, and then (in the majority of cases) major changes to those commitments. The customer response center was well-versed in dealing with all of those easily-recognized phases of visits.

A second high-frequency work item was the correction of unintentional double-billing of customers' credit cards. Again, the customer-response center had well-defined and well-documented ways to deal with these issues.

A third type of inquiry was less standardized. This inquiry was a request for information about the contents of a Museum exhibit, or about one of the topics that fell within the Museum's mission. In these cases, the task of the customer response center was to route the request to the appropriate staff expert. This set of work practices will be pursued in the "Coordination" theme section, below.

Site: Corporate Webmasters

We interviewed two members of an informal team of corporate Webmasters.[2] Members of this team worked in a diversity of roles within the company's Information Technology (IT) departments. They had a rotation of serving as "webmaster of the day," and one of the responsibilities of the webmaster of the day was to read the email addressed to "webmaster@[company-name].com", with an informal commitment to "leave the mailbox empty" at the end of their shift or day of webmaster duty. It was thus the responsibility of each webmaster of the day to resolve any issues that came through the mailbox – at least to the extent of assigning the task or problem to an appropriate staff member.

Site: Human Resources Recruiter Hotline

The Human Resources (HR) Recruiter Hotline was an internal support activity within its company, for technical members of the company's staff who spent a small amount of their time at university campuses, recruiting new employees. These recruiters were not professional HR workers. They therefore often fielded students' questions for which they did not know the answer; they also needed to hand off any resumés that they received to an HR professional. The HR department provided an intranet website to support these recruiters, but of course the HR department could not anticipate every question. Moreover, the recruiters were often at university campuses during the day, and could relay their questions to the HR staff only during the evenings (when no one was available to answer questions). The HR department provided a single email alias for recruiters' questions, as well as for electronic resumés; a small team (n=2-4) of trained, full-time HR professionals read the emails, returned answers (or obtained answers and then relayed them), and received and processed the resumés.

Site: Corporate Executives' Public Email Addresses

We found one corporate internet website that offered direct email access to certain executives – e.g., "send an email to Sean" (we have changed the name). We were surprised to learn that the named executive read exactly *none* of the emails. We were also surprised to learn that the company in question published email addresses for several key executives, and that all of the emails to those addresses were read by the same clerical worker. The clerical worker had no formal background or training for this task; it appeared that the worker and her supervision had defined the responsibilities in an ad hoc manner, over time. If the

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[2] The title of "webmaster" is used for an astonishing variety of corporate roles, ranging from very senior members of Information Technology organizations, to temporary workers who maintain the text contents of a few web pages. We restricted our investigation to people who had broad and senior responsibilities for corporate internet or intranet infrastructures.

executives read none of the emails, we asked, then what was the purpose of the published addresses? The manager of the clerical worker explained that many inquiries to the company were addressed to top executives, but were more properly handled by other people in the company. Some of the inquiries were about company finances, and some were about employment (often including an electronic resumé that could be relayed directly to the HR department's email alias, as described in the preceding section). Some of the inquiries were technical, including proposals for products; these were often referred to the relevant expert in the company.

We encountered a number of coordination and knowledge management issues with this role, as described in the appropriate thematic sections, below.

Sites: Grade School and Graduate Institute

We conducted telephone interviews with the people who read emails send to aliases of the form "information@school.edu" – one at a Grade School, and one at a Graduate Institute. We were permitted to make a site visit (but not an observation) at the Grade School. At both of these organizations, the person who read the email had primarily clerical and/or receptionist responsibilities, and acted largely as an initial screener and router of inquiries. Thus, the emails were part of a diversity of routine communication-routing tasks for this worker.

Initially, this responsibility appears to be similar to that of the Corporate Executives' Public Email Addresses (above), but there were important differences. The corporate situations involved large and (often) geographically distributed work forces; the clerical worker found experts either by consulting a corporate directory, or by asking for advice from local management. By contrast, at the Grade School and the Graduate Institute, the clerical worker relayed inquiries to people in the same building – often people with whom s/he was on a first-name basis. These differences in remoteness and impersonality will be discussed further in the "Coordination" theme section, below.

Site: Minority Student Organization

We interviewed a past leader of a minority student engineering association (we will refer to this group as the Minority Student Organization in this paper). The Student Organization's use of a shared email address was in subtle contrast with the use of the organizations profiled above. The Student Organization was largely unconcerned with *incoming* email, which was usually sent directly to named members of the organization in their own personal email inboxes. Rather, the Student Organization used its shared email address for *outgoing* emails, in order to present a consistent "face" to other organizations. This usage will be detailed in the "Identity" theme section, below.

Comparing and Contrasting Sites: Emergent Themes

Four major themes emerged from reflection and analysis of the broad investigation into shared mailboxes:[3] Generalized architectures; Coordination; Identity; and Knowledge management. We will consider each theme, in turn, integrating experiences at various sites to describe and explore each theme.

Theme: Architectures

Looking across the sites, we found several general architectural approaches to the problem of adapting the single-user technology of email into a multiple-user point of collaboration.

Relatively small-scale sites, including Human Resources Hotline, Webmasters, Corporate Executives, Grade School, and Graduate Institute, appeared to use a simple architecture, in which one or more email aliases fed directly into a conventional emailbox. In general, a single person would access that mailbox at a time, although there were significant exceptions. The small-scale architectures left emailboxes largely unchanged, except for the addition of an email alias. Most of the adaptations for sharing the mailbox were carried through work practices, such as the "webmaster of the day" role. This use of work practices to implement sharing of a single-user interface was also the case for the Student Organization.

In contrast, the larger-scale applications had a very different, customized architecture. The customer response centers divided their incoming emails into distinct groups of messages on different topics (e.g., different product groups or different industry segments). Different teams of employees handled messages from these different groups of emails. In some cases, employees were assigned to teams because of their knowledge or because of specific training that qualified them to resolve customer inquiries on particular products or for particular industry segments. In other cases, it appeared that employees were assigned to different teams as a matter of load-balancing among the message queues.

Although we did not interview systems architects, we discerned two distinct configurations to manage these groups of email messages. One configuration used formal queues into which email messages were placed, and the other configuration used separate but conventional emailboxes in place of queues. The queue-based configuration was a specialized application that took messages from email and put them into a different and non-email-mediated work-management system. The multiple-emailbox configuration was a sophisticated use of the kinds of resources that are supposed by some email systems.

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[3] In addition to these four content- and work- related themes, we also heard a lot about the problem of spam ("junk" email), which was described as having measurable impacts on productivity at some of the corporate sites. Strategies for dealing with spam are beyond the scope of this paper.

Theme: Coordination

The differences between these two architectures are important. In the cases of the queues, any number of people could work on the same queue, because the act of accessing a message also removed that message from the queue. In the case of the emailboxes, accessing a message did not remove it from the inbox, and therefore "we can have a maximum team size of two people" [informant, customer response center 2] for each inbox, with one person reading the newest messages, and the other person reading the oldest messages in the inbox.

Other differences were also important. Queue-based systems generally provided the means of tracking each message, if necessary, as well as means of tracking each person who worked on the queue. By contrast, mailbox-based systems were less governable. A common way to avoid having more than one person working on a message at the same time was for the first person to move the message from the shared inbox and into her/his own inbox. Unfortunately, "after that, no one can find the message" [informant, Museum]. If the person who had moved the message left work before the messages was answered or resolved, then no one else knew where the message was. An illness or a holiday could cause a message to remain "lost" (from the perspective of everyone else on the team) until the absent person returned

In general, managers of shared mailboxes believed "no, we don't have any coordination problems" [e.g., manager, customer response center 1]. However, our interviews and our observations showed that there were low-frequency and seemingly inevitable coordination problems, even in the queue-based customer response center. One manager admitted, "We are struggling as to how to organize our messages – by person [employee] or date or client or what" [manager, customer response center 1]. As the managers said, coordination around *single* email messages was easy in a queue-based system – but only (as the workers informed us) if a customer did not send in multiple messages. During an evening shift, our principal informant told us that he checked for multiple messages by calling out to the only other employee who was working that queue – "he's like my wing man" [informant, customer response center 1]. This strategy for coordination would, of course, break down with more people on each queue, or with a larger work force during a daytime shift.

A second set of coordination issues occurred around the forwarding of emails. As noted in the site descriptions, above, part of the work of many of the sites was to forward inquiries to a subject matter expert if they could not be resolved by the employee who first read the message. This was a common event at the Museum site, and a moderately frequent event at both customer response centers. It was the dominant activity on the executives' public email address site, where the clerical worker who read the email acted primarily as a router to other people in other parts of the company.

We asked how these forwarded emails were tracked, and we received very different answers. As noted above, queue-based customer-response operations often provided for tracking within the email-queue technology. By contrast, situations that made use of simpler mailboxes required more active human management of tracking. Some members of the customer response centers kept records of messages that they had sent to other departments, and followed-up to make sure that the recipient of the forwarded message answered it; this assurance of an answer had become part of the quality-of-service metrics for that center. By contrast, for the executives' public email addresses site, neither the clerical worker nor her/his management tracked any message, so there was no way to determine if a particular inquiry had received a response. The two educational sites both had informal, face-to-face-based ways of tracking responses.

Identity

The Museum site made an effort to send most outbound replies out through the same mailbox as the inbound inquiries, even if employees had to go through extra steps to make this happen. The manager of the Museum team spoke of maintaining a "single point of contact" – a concept which was echoed by the managers of both customer response sites (e.g., "a single identity to the customer"). This use of the same email identity for both outbound and inbound messages was considered helpful for several reasons:

- First, the practice made the emailbox (or its alias) a known and reliable way for customers to reach the company. In an informal way, the emailbox began to function as a brand.
- Second, the practice reduced the salience of any particular employee in the customer response center, because customers were encouraged to write back to the center as a whole, and not to a particular person in the center. This, of course, had both positive and negative implications – less personal treatment, but greater likelihood of a quick response.

Another customer care center added its own distinctive signature phrase at the end of each email, and required that all response emails have the same subject line, "[company-name] Replies…". Thus, the customer care center had turned the email subject line into a kind of brand.

The strongest case of identity-management for outbound messages occurred for the Minority Student Organization. This group was concerned to maintain its organizational relationships over a number of years with funders and recruiters, despite the fact that is officers changed every year or at times every semester. They believed that busy people at funding agencies or in human resource departments would be more likely to respond if the email's "from" line were the name of the Minority Student Organization, rather than the name of a particular student. In this case, the "from" line was used exactly as a brand is used. The company that required each response to a customer to have a subject line

containing the phrase "[company-name] Replies…" was accomplishing much the same objective – to re-purpose common features of email so as to emphasize an identity or brand to its email correspondents.

Knowledge Management

While many of the sites were concerned to manage their own identities *out* to their customers, none of the sites had any means of managing issues related to the *incoming* identities of their customers. The manager of customer response center 1 lamented that what was really needed was a customer relationship management (CRM) solution – i.e., a database that would track communications with a particular customer, in such a way that all workers in the center would be able to get background on the characteristics of that customer, and would be able to reconstruct the history of past interactions with that customer.

This inability to track emails by originating customer is one of a number of examples of knowledge management (KM) issues in shared mailbox systems and work practices. As noted above in the "Coordination" theme section, tracking of messages by any indexical term was a problem, and companies were "struggling" about the best attributes to use to organize emails into groups. These problems extended to the resources that employees used to find information and to resolve problems, including both printed materials (from one-page memos to technical manuals whose combined pages were almost a meter in thickness), and social knowledge of whom to ask for help (including both co-workers within each customer response center and subject matter experts outside of the customer response centers). Although there were databases of such information, we saw many instances of hand-annotated printed material, and place-marked technical manuals – i.e., inscriptions of private knowledge onto personal materials, with no way to share them to the larger team.

Another major area of KM difficulties occurred in the re-use of standardized or "boilerplate" text in multiple email messages. As mentioned in the site descriptions of customer response centers in Online Catalogue Companies and the Museum, workers often had to respond to similar or identical customer inquiries over and over again. In two of the sites, the company provided a set of standard paragraphs that could be copied into these responses; in a few cases, there appeared to be legal requirements that certain phrases or sentences be used. However, most employees also maintained their own collections of private texts that they would copy into their responses to customers. One company encouraged employees to share these resources, but other companies considered these employee-originated resources as being of questionable quality, requiring a formal approval process before they could be shared with other employees (for a more detailed examination of the production of knowledge, and of the authority to create knowledge for others, see (Muller and Millen, 2000).

Summary

Our study of work practices in shared email showed us
- A variety of architectural configurations supporting shared email usage
- A diversity of work practices, ranging from opportunistic use of standard email features (one worker at a time in small-scale sites) to re-purposing of common email features into new significance (e.g., branding in "subject" and "from" lines) to new application-like configurations for better tracking and load management (large-scale sites)
- Dense and varied patterns of coordination and collaboration, ranging from simple routing to collaborative problem-solving to situations requiring awareness of the work of others within a common online work environment.
- Many partially-realized opportunities to share knowledge, experience, and competence

These observations form a backdrop for our second, in-depth investigation into the issues faced by assistants and their executives in management of shared email.

Assistants and their Executives

For the in-depth study of executives' assistants, we conducted semi-structured interviews with sixteen assistants to high-level managers and executives in a large technology corporation. All assistants shared access to their manager's main email account, and were responsible in various ways for dealing with the mail.

This investigation aimed at analytic depth, in contrast to the breadth-oriented study of shared mailboxes in diverse organizations. We obtained access to the assistants through the corporation's Senior Assistant's Council, an organization established to support the corporation's higher-level assistants. The Senior Assistant's Council participated with us in the content and wording of the questionnaire we used to guide our interviews, to be sure it covered issues they knew were important in the language assistants commonly used. This process itself was an educational one for us, as we got a clearer understanding of the range of responsibilities assistants held. The council also gave us access to the online discussion space in which questions and tips, including several suggestions for dealing with email, appeared.

All assistant in this study used Lotus Notes as their main email application, and for calendaring and scheduling.

Interviews

Each of the sixteen semi-structured interviews lasted 45-60. All but two of the interviews were conducted by phone. All but one of the sessions was audiotaped

(one of the subjects preferring not to be recorded.). Throughout the interviews we asked for specific anecdotes, stories, and examples that illustrated the points the assistants were making.

The semi-structured interviews began with our asking about the setting in general and the role the assistant played, including the general business functions of the group, the people involved, and their collaborative tools. We asked the assistant to describe a typical day, or, if it was easier, to start by describing what they were working on that day. We then asked more directed questions about the email that arrived, its volume, how it was organized, how often they checked it, who had access to it, and to describe what they did with it. We asked how they communicated with their manager about mail, if they sent mail on behalf of the manager, how they knew to do so, and how the manager knew that they had sent the mail. We asked about deleting and filing of email. Finally, we asked generally about how the practices and systems the assistants and managers used together had evolved, what problems they had encountered, and what they had done to solve them.

Findings

Assistants described the overall goals of their work in terms of the performance of the manager they supported. One said simply the goal was to "make the boss look good." In practice, this involved keeping the office running smoothly, making sure managers were where they were supposed to be on time, and making sure they were prepared with the information and materials they needed to be effective.

Other descriptions of goals included:

"keep everything running smoothly and in order" (s1)

"make his day run as smoothly as it can, make sure he gets to where he needs to be"(s8)

"to make [the manager's] job as easy as possible, make the day run as smoothly as possible"(s9)

"insure the office is run smoothly, that there are no conflicts," and making sure the manager *"is confident whether he is going to meet with internal or external people." (s14)*

"trying to keep everything in order, to minimize escalations" (s7)

"to make sure he could make it through the day without missing something," and *"to make sure he didn't have to worry about preparing for things."(s16)*

"make sure [the manager] is where he needs to be and has all pertinent information for meetings." (s5)

Specific responsibilities included managing email, managing the calendar, answering phones, and making travel arrangements. As mentioned above, an overarching responsibility involved keeping the manager informed of the day's schedule, and making sure the manager had documents and information as needed throughout the day.

Eight of the assistants reported the manager receiving over 100 messages on a typical day, with half of those reporting 150 messages a day or more. Six estimated between 30 and 50 messages. One reported "at least 20", and one said the volume varied substantially from day to day. All but two of the subjects reported checking the mail "constantly" or "all day", with the others checking "about every half hour," or "several times a day, perhaps once an hour." The Lotus Notes program allows users to keep several mailboxes open at a given time, and assistants reported shifting frequently throughout the day between their own and their manager's mailboxes.

Most assistants reported preparing packets for their managers to use containing information they needed for each of their meetings throughout the day, or for each of the days during which they were traveling. These packets often included printed copies of crucial emails, the executive's calendar, and the (increasingly rare) physical mail that pertained to the meetings or travel periods.

Assistants' Shared Email Challenges

Several key challenges recurred in the assistants' discussion of how they worked with their managers' email.

Awareness of Past Activity

All assistants reported the need to be aware of actions the other person had taken on a given message. While in general, this referred to needing to know if a message had been forwarded, filed, or responded to, three assistant mentioned the importance of knowing if a manager had in fact read a message. As there was no direct way to have this awareness, assistants resorted to two main strategies:

- Assistants frequently checked the "sent mail" folder to see if the manager had replied to messages or generated new ones (5 assistants), and
- Managers and assistants copied each other when sending mail (9 assistants).

Assistants reported dissatisfaction with both of these mechanisms. Checking a separate folder (or even searching in a list) for messages required extra actions, and managers occasionally forgot to cc or bcc their assistant on mail they sent.

As mentioned above, three assistants reported the need to know if their manager had read a message. This is because they saw a part of their role being to keep the manager up to date on important new information. Absent any technological way to know if the manager had read a message, they resorted to calling, instant-messaging, or in some cases sending additional email messages asking "did you see the message about X."

These difficulties of the assistants are similar to some of the problems that we observed in the first study. In that study, we encountered difficulties in knowing who was doing what (or who had *done* what) in large-scale teams or queues in the customer response centers. And we observed that the clerical employees who

routed emails for the Grade School, Graduate Institute, and Corporate Executives' Public Email Addresses sites had no formal or online way of determining whether people had acted on the messages that they had forwarded. Similarly, only one of the customer response centers had any mechanism for closure on a forwarded message, and the informal work practices (also involving cc messages) were often not followed.

Awareness of Current Activity

Three assistants reported a desire to know what actions their manager was taking at that moment. They described situations in which this would have been useful both in seeing that the manager was already dealing with a message, and in being able to communicate additional information related to the message.

Communicating About Messages

All assistants described the need to communicate about messages and the actions to be taken with them. Mechanisms they used included:
- Using folders to indicate actions to be taken (such as "[*Assistant-name*]-To-Do", or "Print");
- Using folders to delegate items to others who shared the emailbox;
- Leaving notes by editing the messages themselves and inserting new text, in a way clearly recognizable as being added by the assistant;
- Sending separate emails about the message to the manager, or from the manager to the assistant's personal account;
- Using another medium, such as telephone, chat, or face-to-face discussion.

Some manager-assistant pairs used folders not only as a way to categorize messages for filtering or storage, but also to indicate actions in a way similar to ad-hoc workflow. For example, the manager would place an item they wanted printed into a folder marked "Print". The assistant would print the message, and then remove it from the folder or place in it a folder marked "Done."

In some cases, a team of assistants would share access to the manager's mailbox. For example, one manager had one assistant for email, telephone and calendaring, a second assistant who acted as an executive assistant and accompanied him to meetings, and a third "technical assistant" who served as the key liaison to the other managers who reported to the manager. Folders were used as a way of delegating a message to a specific assistant, or to indicate that an assistant had taken responsibility for a specific message. These practices are of course similar to patterns observed in the first study, in which messages in large-scale centers could be routed to specific inboxes or queues, to be worked by specific functional teams.

Four assistants reported editing an incoming email message to add comments for the manager to see. In many cases, these were summaries of a longer message, distilling the essential points for the manager, and sometimes including

other relevant information. In others, they would include a description of how the assistant had handled an item, or a question on what to do with it. For example, a long, wordy message inviting the manager to give a presentation might be summarized by a few words added at the top: "They're inviting you to give a talk. It's the week you're in Denver. I've told them no."

Assistants would occasionally send messages from their personal accounts to their manager's account to draw their attention to an important message, ask a question, or describe how they handled a situation. Managers sent messages to their assistant's accounts to ask questions or request actions, sometimes forwarding a relevant message they had received.

Keeping Up With Incoming Mail

Assistants expressed the importance of keeping up with the incoming mail. Two common methods for dealing with incoming mail were:
- Scheduling regular meetings with the managers to review the day's email
- Using folders to separate mail by priority.

Five assistants reported daily, scheduled meetings with the manager to discuss new correspondence needing the manager's attention. Although these meetings often covered a range of issues, they were commonly known as "Mail Sessions." All five reported conducting some form of these meetings by phone when the manager was traveling. A nice feature of these meetings was that they bundled together small discussions that would otherwise require separate interruptions, while insuring that the issues would be addressed in a timely fashion.

Four assistants reported creating electronic folders specifically aimed at separating new mail by priority. For example, one subject described a folder marked "Today", with items requiring immediate action or needed for that day's activities; a folder marked "For-Action", with items requiring some activity or decision by the manager; a folder marked "FYI", with items of the manager "would want to know about" but which required no specific action; and a folder marked "Personal", containing the managers personal Human Resources items and correspondence from family and friends.

Five assistants reported trying to keep the quantity of mail in the generic inbox down to a minimum, in one case to "about half a screen-full", in another "down to about ten or twenty messages". These messages represented items that required additional actions to file, delegate, reply, or act upon them in some other way. The set of messages in this view thus served as an indication of some of the work the assistant and/or manager still needed to perform.

Dealing With Volume of Saved Mail

Email messages were frequently saved, both for the specific information they contained and because they served as a record of past activities and contacts. Four assistants reported that they hardly ever deleted anything except for obvious

junk mail. One reported that she would often delete earlier entries in an email thread if the later messages contained the text of the prior ones quoted as history. Another reported going through saved mail older than 30 days every month and removing items that were no longer needed.

The assistants employed several strategies to organize the mail they saved:

- Filing items in folders by subject or project;
- Filing items by sender or category of sender;
- Filing items by date (typically current month and year).

These different filing strategies are almost identical to the problematic approaches that the manager of Customer Care Center 1 reported he was "struggling" with. However, perhaps because of the lower overall volume of emails, these strategies appeared to be more effective for the assistants. Despite the fact that the quantity of saved mail continued to increase over time, assistants reported little trouble in finding older items when needed. A common strategy for locating past messages was to go to an "All Documents" view which showed all messages regardless of the folders in which they had been placed. Assistants sorted the view by name and/or date, or ran a text search by keyword. Six assistants reported using this strategy as their main method for finding old messages, and each of the others mentioned it as a backup strategy in case they couldn't easily find a message by looking in specific folders.

Date-Related Messages

Three assistants used dated "tickler" folders to store printed messages that were relevant to events occurring on future days. Numbered from 1-31, these folders referred to the date in the current or next month, with a separate future folder for items more than 31 days in the future.) Each evening, the assistant would extract the documents the manager would need to be informed for meetings and other events the following day. These would either be given to the manager at night to take home, or left in a "today" folder to be looked at first thing in the morning.

Printing Messages

Assistants frequently printed messages, either to store in physical folders associated with a project or date, to have active items they needed to work on easily available ("hot items", in the terms of one assistant), for placement in the packets given to the manager (such as with material for a meeting or trip), or to bring in to the Mail Sessions that five of the assistants reported having. These printed items were often annotated with pen or sticky-notes indicating the actions taken or which needed to be taken.

Interestingly, one of the common requests by managers was for the assistant to print a message or attachment. At first this struck us as odd; why didn't the manager simply print the message? Upon further discussion, it became clear that the request meant more than simply instructing the software to send it to the

printer. The assistant would print the message, staple or bind it as needed, and then leave it in a place (such as on the manager's desk) where it would be seen.

Discussion

Bellotti and Ducheneaut (2000) described "Email as Habitat," arguing that email is more than just a frequently used application, but rather the place in which many workers spend most of their time and which guides and shapes their work. Our study suggests that it can be important to ask *who else is in that place with you*, and argues for email not only as personal habitat but as a shared, collaborative workplace. As such, it deserves the same support known to be important for teams in other shared environments. This includes situational awareness of current and past activity, joint understanding and construction of goals, communication, coordination of actions, and resources that can be shared, discussed, referred to, and jointly constructed (Schmidt & Bannon, 1992; Olson & Olson, 1999). In a related development, emailboxes and other messaging environments may also become sites of task management on an individual or group basis (Bellotti et al, 2003; Boardman, 2002; Muller et al., 2004).

In these studies, features of email that had been developed primarily with the single user in mind were re-purposed to support collaboration among two or more people. For example, folders were used as work-routing or load-balancing mechanisms, to signal priority or to communicate actions to be taken or which were taken. A feature allowing received mail to be edited was used to add additional information about a message, or to report on how an issue had been handled. Standard portions of the email header ("subject" and "from" lines) were re-purposed into statements of corporate identity or branding opportunities. Messages were forwarded between managers and assistants as a way of drawing attention to them, and to discuss how they should be handled. The size of the current inbox served as a representation of currently outstanding activities.

This use of available structures to support collaboration parallels a key aspect of the distributed cognition approach (Hutchins, 1995), in which cognition is seen to occur not just within the head of an individual but through the manipulation of representational state by actors in interaction with external artifacts. Here, various configurations of workers used traditional email features in novel ways to support and coordinate their collaborative email work. Activity Theory might characterize the shared email repository as a form of mediation, a social tool containing emails as social objects owned by a community of workers (e.g., Nardi, 1996).

These accounts are examples of reinvention by the users of existing features of email. Reinvention occurs when users discover new, unanticipated uses for existing technologies (Tornatsky and Fleischer, 1992). In our study, users treated message lists as performance reports, comment fields as instructions, mailboxes

as identity statements, and folders as action-requests or status indicators. By turning the technology to new purposes, they "reinvented" it in usage, even if they did not change its internal functionality. This concept has been important in HCI and CSCW studies of group decision support systems (Bikson and Eveland, 1996), telephony services (Antón and Potts, 2001), and IT adoption (Muller and Millen, 2001), informed in part by earlier research from social studies of technology (e.g., Rogers, 1995; Sproull and Kiesler, 1991; Tornatsky and Fleischer, 1992). Reinvention has also been a theme in users' re-purposing of technology in the participatory design tradition (Floyd, 1987).

When we consider our findings through the lens of reinvention, we see typical evolutionary cycles. As Bikson and Eveland note, "Successful technologies are usually those that can achieve reciprocal adaptation with the social organization" (1996, p.436). Our informants were in various stages of adapting the technology to their work practices (subfolders, workflows, special forms of forwarding, report-generation), and of adapting their work practices to the technology (assignment of incoming traffic, work-arounds to achieve a common "from" address, social protocols to track assignment to subject matter experts). As we consider improvements to email, we should be mindful of this dialogue between technology and use. As Bikson and Eveland conclude, "Without invention, there are no tools. Without reinvention, there are no uses" (1996, p. 437).

Conclusions

Collaboration through shared emailboxes is an example of how tools developed primarily with individual users in mind are re-purposed to support shared work. We have described a variety of situations in which formal or informal teams share responsibility for an emailbox, and as the use of email increases, we would expect the number of such situations to increase as well. A growing body of evidence supports the notion of email as the place in which many workers "live". The studies described here suggest expanding our view of email — not just as individual habitat, but as a collaborative space in which people work together.

Acknowledgments

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