# Life Beyond the Mailbox:

## A Cross-Tool Perspective on Personal Information Management

**Richard Boardman**[1] **M Angela Sasse**[2] **Bob Spence**[1]

[1]Intelligent and Interactive Systems Group
Dept. of Electrical and Electronic Engineering
Imperial College
London SW7 2BT, UK
{rick, r.spence}@ic.ac.uk

[2]Department of Computer Science
University College London
Gower Street
London WC1E 6BT, UK
a.sasse@cs.ucl.ac.uk

**ABSTRACT**

Email interfaces provide poor support for the personal information management (PIM) activities that users have adopted them for. This paper reports a user study that highlights how two aspects of PIM, information management and task management, cut across a range of tools, including email. We argue that effective support for such cross-tool activities cannot be provided through a focus on one interface - such as email - alone. Instead, a cross-tool approach is needed in PIM-related research and design. We present a prototype aimed at improving cross-tool support for information management, and report the results from an initial evaluation.

**Keywords**

Email, personal information management, task management, cross-tool research, reference task agenda

**INTRODUCTION**

Email is the most successful CSCW application to date, and millions rely on it in their daily communications. The success of email can also be measured by the extent to which it has outgrown its original *raison d'être* - the exchange of short plain text messages in an asynchronous manner. Various studies have noted its adoption in a wide range of personal information management (PIM) activities [1, 9]. However in many ways email has become a victim of its own success. Email interfaces have become bloated with unused functionality as designers attempt to keep up with this ballooning of usage.

The ubiquity of email means that much research is focused on dealing with email-related issues. Key challenges include the visualization of complex data structures such as message threads, and security-related issues such as spam. Other research, including our own, is aimed at providing more effective support for PIM-related activities such as task management. However, in contrast with the recent trend for *embedding* dedicated PIM support in email [1,7], our design approach is based on the *sharing* of PIM functionality between email and other tools.

**Towards a cross-Tool perspective on PIM**

Whittaker *et al*. [10] highlight the lack of progress in HCI regarding many fundamental computer-based activities, and call for the refocusing of research around *reference tasks* - core everyday user tasks such as those involved in PIM. Our approach is based on the notion of reference tasks, but extends it beyond the boundaries of individual tools such as email. In particular, our research is concerned with the problems users encounter across *multiple* tools whilst performing two PIM-related activities:

1. Folder organization – the management of items within a folder hierarchy made up of user-defined categories
2. Reminder Management – the use of items as implicit reminders (or "to-do" items)

Various strands of related research come together in our *cross-tool* perspective. In terms of theory, our work draws on the conceptualization of a computer as an *activity space*, populated by the tools and resources that facilitate action, and the constraints that limit it [8]. From this view, fundamental activities like information management are not confined to specific tools, but are distributed across many tools throughout activity space.

Recent empirical work has highlighted the cross-tool nature of many PIM activities including task and time management [2], communication and contact management [11], and PIM in general [1]. Blandford and Green [2] offer the term *ensemble* to describe the sets of tools that PIM activities are distributed across. Email is usually a key player in such ensembles. Thus as well as acting as a *habitat* for a range of user activities [6], email can also be considered as one tool within the extended habitat of an individual's activity space.

In order to provide effective support for such cross-tool activities, integration between tools is crucial. However there is evidence that this issue is not being given enough attention by designers. Bellotti and Smith [1] note the *compartmentalization* of PIM activities due to lack of integration between relevant tools. In terms of the theoretical framework above, compartmentalization may be considered as one set of constraints imposed on a user's activity space by poorly designed tools.

Whilst we acknowledge the need to improve user interfaces to email tools, we suggest that some of the most pressing issues faced by email users, can only be addressed through a cross-tool approach. Our work is based on this cross-tool

perspective, and aims to provide more coherent, integrated support for PIM – both in email, and in other tools. We first summarize empirical findings that highlight the cross-tool nature of many problems encountered in email.

## CROSS TOOL USER STUDY

We carried out a series of semi-structured interviews to investigate how users perform folder organization and reminder management within three collections of personal information: (1) documents, (2) email, and (3) web bookmarks - managed within the file system, email tool and web browser respectively. All twenty-five participants worked in an academic context and had at least five years of computing experience. Interviews were carried out in each participant's workplace, and were centered on their primary desktop computer. Interviewees included users of Windows, Linux and MacOS.

Firstly we asked about participants' main production activities – the real-world activities they were supporting through usage of the three tools. Typically these included research projects, lecturing, IT support, and administration. We then asked for a guided tour of the three collections. Participants were asked about the function of (1) any folders they had created; and (2) any unfiled items (e.g. emails in the inbox, or documents in the root folder). We also enquired about the strategies they employed, and the problems they encountered in each tool. Finally, if time allowed, participants were asked about other types of information they managed in the rest of their workspace (both digital and physical). Interview data consisted of our notes, and screenshots of the user's folder hierarchies. We carried out content analysis on the data to identify common user strategies and problems. Folder names were classified by type and compared between tools for each user[1].

As would be expected with such an individual activity, a wide range of behavior was observed, varying both between users, and between tools for individual users. We were often surprised at the vehemence expressed regarding PIM-related problems. We have coined the term *bugbear* for reoccurring problems that frequently or seriously affect users, and have a negative impact on their productivity and/or user experience. We were startled to find that failure to manage personal information can seriously dent users' self-image, e.g. they "feel bad" for "being untidy". This was probably made worse by the fact that we were peering over their shoulder!

Many of the activities and problems that users mentioned in the context of email involved other tools. The following sections summarize our main observations of cross-tool issues relating to folder organization and reminder management:

[1] Note that the quantitative results relating to folder overlap (folder names in common between tools) was carried out for seventeen users and is reported in more detail in [3].

### Information management as a cross-tool activity

All users emphasized the overheads of managing email, due to the higher arrival rate of messages compared to manually created files and bookmarks. However, subjects tended to be dissatisfied with the organizational state of all three collections, expressing feelings of guilt, stress, and lack of control. A particular source of exasperation was the existence of old unfiled items, such as emails in the inbox, icons on the desktop and lists of web bookmarks. In general, user dissatisfaction with the organization of their email was part of a general sense of dissatisfaction with the state of their entire workspace.

Most users said that they did not have enough time to organize the collections, and some went to great lengths to avoid managing multiple hierarchies. One subject had developed the habit of saving emails as files under document folders. However twenty of the twenty-five users did manage folders in two or more of the three tools (typically the file system and email tool). For many of these users a significant level of *folder overlap* was noted between tools in terms of the categories used to label folders. Folder overlap was particularly evident between the document and email hierarchies (an average of 21% for the first seventeen users). Overlapping folder names were generally based on participants' primary production activities, and were most commonly expressed in terms of role, project and interest [3]. Note that folder overlap occurred even though each set of folders was developed separately. Participants devoted effort to organizing resources relating to the same production activity in separate tools – in other words, there are redundant aspects to user's information management activity when viewed from a cross-tool perspective.

*Poor integration between tools*

Users also complained about the management of certain resources being compartmentalized between poorly integrated tools. Particular sources of *angst* were isolated documents and bookmarks embedded in email messages. Many users complained about the fact that these were not integrated with dedicated tools elsewhere in their workspace. Several subjects also highlighted the overheads of organizing compartmentalized email – i.e. local and web-based email collections.

*Difficulties coordinating multiple tools in cross-tool tasks*

Many pet bugbears concerned problems in coordinating tools whilst carrying out cross-tool activities, for example:

- Starting a particular production activity – setting up folders in multiple tools
- Finishing a production activity - archiving old information across multiple tools
- Gathering together *ad-hoc* collections of different types of resource for a particular purpose (e.g. handing over a project to another user)

*Inconsistencies between tools*

Many users expressed frustration about inconsistencies between different tools, in terms of how they implemented equivalent functionality. For example, interactions such as "create new folder" differed between tools. Users found this particularly irritating between tools from the same vendor.

**Task management as a cross-tool activity**

Our results confirm Blandford and Green's general observation that users typically employ an *ensemble* of tools in task management [2]. The majority of subjects did not make use of dedicated "to-do" managers, but relied on a range of tools instead: paper to do-lists, implicit reminders, and their memory. In addition, we noted that many participants managed numerous forms of implicit reminders across multiple tools. Participants referred to many types of resource as "to-do's" or "work in progress": application windows, desktop icons, email messages (especially those in the inbox), web bookmarks, documents and folders [3].

*Inconsistencies between tools*

Different mechanisms for marking items as reminders led to several complaints about inconsistencies. For example: MS Outlook allows the "flagging" of items, but other Microsoft tools that were used do not.

*Difficulties coordinating multiple tools in cross-tool tasks*

One important cross-tool task that is currently poorly supported was that of collating different forms of reminder into a common list. Instead, users developed various *ad-hoc* strategies for collating lists:

- Emailing web bookmarks to themselves as reminders of things to do online. These were then managed along with email-based reminders.
- Creating a text file listing particular email messages, URLs and document titles that they had to deal with. Several even went to the length of collating to-do's relating to their digital workspace on paper.

**Summary**

The findings highlight that, for many users, email-based information management and task management are part of wider cross-tool activities. In addition, many of the problems that users encounter in the context of their email tools are not intrinsic to that context – they manifest themselves through email's relationship with other tools, and include problems of consistency, integration, and coordination.

## CROSS-TOOL DESIGN

Our findings have motivated the design of several prototypes aimed at improving cross-tool support for various aspects of PIM. We echo Blandford and Green's call for less focus on specific tools and a greater emphasis on "harmonious commingling between tools" [2]. Their call was made in the context of time and task management, but we believe it also relates to PIM more generally.

Our approach is based on *sharing* PIM features between email and other tools. Although not aimed at email specifically, we envisage that the designs will ease aspects of email overload. Our approach contrasts with work aimed at *embedding* dedicated PIM functionality in email [1,7]. The embedding strategy attempts to take advantage of email as a convenient *focus point*, but causes us concern for two reasons: (1) it adds to the existing complexity of email tools, and (2) does not deal with wider cross-tool issues. Note that - although our designs change the underlying PIM functionality of multiple tools - they are based on modest incremental changes made to standard software. This has the advantage of allowing evaluation of new features in an environment that users are familiar with. Here, we focus on our most advanced prototype, WorkspaceMirror, which allows a user to share folders between the different tools involved in managing personal information. A second prototype for providing cross-tool support for task management is summarized in [4].

**WorkspaceMirror – cross-tool information management**

WorkspaceMirror (WM) allows users to share organizational categories and structure between multiple tools. The design was motivated by observations of folder overlap for many participants in our study, combined with a general lack of time for managing resources. Through this design we want to explore whether users really need the flexibility to develop distinct classification schemes for different types of personal information. Our findings lead us to predict that this is not the case – and that much folder-related activity is effectively redundant. WM is aimed at leveraging whatever organizational investment a user is willing to make as widely as possible.

Our current prototype is an extension to MS Windows and synchronizes three folder hierarchies: (1) email folders stored in MS Outlook, (2) "My Documents", used to store personal files, and (3) web bookmarks folders under "Favorites". The tool works in one of two modes: automatic or prompted. In prompted mode the creation, deletion or renaming of any folder causes a dialog box to be displayed asking the user if they want to replicate the operation in the other two tools.

**Preliminary evaluation**

We have carried out an initial evaluation with a small number of users to determine whether our design is workable, and also develop criteria for a more rigorous evaluation[2]. In particular we want to investigate whether users find folder mirroring beneficial before we add more cross-tool features to our prototype (see below).

Four of our colleagues have been using WM in their primary desktop workspaces over several weeks, and are

[2] Dillon [5] observes the limitations of traditional measures of usability for complex, ongoing, interleaved activities such as PIM.

providing feedback via diaries and weekly interviews. All had created folders in the three tools previously. WM was deployed in prompted mode, so as to give users more control over mirroring and allow them to retain the flexibility to organize each collection differently.

Three of the test users have been overwhelmingly positive about the tool. Although there was not always a direct one-to-one mapping between their folder requirements in each tool, they have all welcomed the chance to reflect on the relevance of the organizational decisions made in one tool, to other contexts. In general they find the idea of mirroring intuitive and are keen to keep using the tool. To our surprise, users did not find the prompting disruptive to their ongoing activity. Feedback has also included a number of design requests that we are considering adding to future versions. These include:

- Cross-tool navigation – enabling traversal between mirrored folders via a context-menu option
- Email attachment support – automatically saving attachments in a mirrored document folder
- Project management - provision of cross-tool high-level functionality such as "start project" and "archive"

The fourth test user did not see any point in mirroring folders between the three collections, preferring the flexibility to organize each differently. However he has left the software running to test its robustness. We are continuing our evaluation to explore the trade-off between lower management overheads, and reduced flexibility.

## DISCUSSION

### Extending the reference task agenda

In this paper we have highlighted the cross-tool aspects of the everyday PIM activities that are (partially) carried out in email. We believe that research carried out in any tool-specific context, email or otherwise, cannot fully identify the cross-tool needs that many users have in PIM. Research in this area that only focuses on improvements within specific tools runs a danger of producing results that are as compartmentalized as our current workspaces!

Whittaker *et al.* [10] highlight the need to investigate the appropriate granularity of reference tasks about which HCI research should be focused. We suggest that attention must also be paid to choosing reference tasks that represent relevant cross-tool issues such as integration and coordination. Whittaker *et al*. do raise the notion of a general task, one that is independent of data type. They observe that research on a general task in the context of one tool may be transferred to another tool where that same task is also relevant. However they do not consider cross-tool issues beyond this. Our study highlights potential cross-tool reference tasks including archiving the resources involved in a production activity, and collating reminders as a list.

### "Users from the suburbs"

Finally we want to highlight the fact that most email-related research carried out to date has focused on "professional" users, a.k.a. knowledge workers. We call for more attention to be paid to the masses of "social" email users – people who use their computers for personal, rather than work activities. Many studies, including this one, have shown how "professional" users struggle to cope with many problems in email. We envisage that home users, are even more badly affected by problems such as tool complexity. Our field should pay more attention to the needs of this important class of user. In terms of our work, we are keen to extend both study and evaluation to users with less technical know-how. We envisage that these "social" users of email will find the simplification of workspace offered by cross-tool designs like WM especially helpful.

## REFERENCES


1. Bellotti, V. and Smith, I., Informing the design of an information management system with iterative fieldwork, *Proc. of DIS'00* (2000)
2. Blandford, A. and Green, T., Group and individual time management tools: what you get is not what you need, *Personal and Ubiquitous Computing 5*, 213-230 (2001)
3. Boardman, R., An investigation of unified personal information management, *unpublished MPhil. to PhD. Transfer Report*, Department of Electrical and Electronic Engineering, Imperial College (2001)
4. Boardman, R., Workspaces that work: towards unified personal information management, *Proc. of HCI2002, People and Computers XVI - Volume 2*, 216-7 (2002)
5. Dillon, A., Beyond usability: process, outcome, and affect in HCI, *to appear in Canadian Journal of Information Science*.
6. Ducheneaut, N. and Bellotti, V. Email as a habitat: an exploration of embedded personal information management. *Interactions 8*, 30-38 (2001)
7. Gwizdka, J. Reinventing the inbox - supporting the management of pending tasks in email, *Proc. of CHI'02*, 550-551 (2002)
8. Kirsh, D. A few thoughts on cognitive overload, *Intellectica 30* (2000)
9. Whittaker, S. and Sidner, C. Email overload: exploring personal information management of email, *Proc. of CHI'96*, 276-283 (1996)
10. Whittaker, S., Terveen, L., and Nardi, B. Let's stop pushing the envelope and start addressing it: a reference task agenda for HCI. *Human Computer Interaction 15*, 75-106 (2000)
11. Whittaker, S., Jones, Q., and Terveen, L. Managing Long Term Conversations: Conversation and Contact Management, *Proc. of HICCS-34* (2002)