

# CMail: Action-Based Email To Reduce Cognitive Load

Benjamin Cowan, Vivek Nallur, Peter Lewis  
School of Computer Science, University of Birmingham  
Birmingham B15 2TT, UK  
{B.R.Cowan,V.Nallur,P.R.Lewis}@cs.bham.ac.uk

## Abstract

*We propose that an email-system should understand its users' place in the scheme of things, present tasks for the user depending on her mood and act as a central clearinghouse for communication. This, we argue, would be possible through re-imagining email as an action-facilitator, rather than a clump of inert text. We propose CMail, an email system that makes an action-based workflow, the centre of its utility.*

## 1. Introduction

Email use is pervasive. Everyday we receive a high amount of email communication be it domestic, work related or spam and junk communication. Although email volume has increased, and with it the demands on time to process and act upon this communication, email clients and systems have stayed relatively constant. Presentation of email is typically spatial (e.g. in a list) and tends to focus on chronological and priority driven organisation of the email received. Recent HCI work on email focuses on how people interact and behave with email opening [1] and the optimum frequency of email checking to reduce information overload [2]. This paper focuses on the client based interaction and discusses a hypothesised action based approach to email interaction termed CMail. This perceived representation prioritises the actions necessary to act upon the email over the chronological order of email receipt. In terms of the user of such email systems, the type of organisation proposed focuses on the wider elements of how email fits into a users current workflow, daily routine and mood state.

We posit that changing email from being one of the various data sources that an individual deals with, to a customizable workflow engine, will fundamentally change the users relationship with personal information utilities like alarms, calendars, addressbooks, daily schedules, etc. By reducing the extrinsic cognitive

load, required to arrange a busy life, email has the potential to become the central clearinghouse for a users informational needs. In an age, concerned with information overload and the consequent feeling of despair, an email engine that brings order to the chaotic need to arrange and merge disparate sources of information could be invaluable to users.

## 2. Background

Email is an important aspect of most peoples lives, yet little has changed in its interface and structure since its inception. Although email clients in their present form may demonstrate the core usability principles of efficiency, effectiveness and satisfaction (as defined by ISO 9241-210 definition of usability [3] and other core HCI texts [4]–[7]) when achieving message delivery it is still unclear whether email in fact possesses such concepts when applied to the users life. The way email is categorised asks for high attention to the most recent message received rather than the most efficient or effective to deal with at the time for the user. For instance, user may receive an email demanding a reply to an invite (a non-pertinent task), which does not need to be dealt with immediately, especially within a work scenario. However this email is categorised with other more pertinent emails. The clearing of such emails will therefore rely on prospective memory (i.e. remembering to remember to conduct certain activities). With the increased volume of messages this memory load increases and performance (in terms of successful execution of necessary actions towards the emails received) will likely suffer.

Furthermore, once the inbox has been scanned by the user, the user will implicitly make decisions concerning the action required for the email. However, this information which concerns the required action itself requires the human to retain this in memory, and update it based on the changing state of the inbox thus increasing the users cognitive load. Classic

email clients present simply the structure on which the categorisation is based; the furthest email clients usually go in supporting the user in this regard is a simple flagging mechanism. Tags and search have also been used to enable further categorisation. However, these do not actually decrease the cognitive load of the user.

In a typical email-client, emails are presented based on the time of arrival. Despite a large amount of email remaining to be processed, it is unclear what action (if any) is required for the emails presented. This type of categorisation can be likened to a large to-do list with potential to highlight priority rather than the action needed to conduct the task. There is no interface functionality to support a more life/mood/action orientated email organisation. Such a to-do list is inefficient in that users have to remember that each action needs to be conducted. Indeed when such an action is remembered it may not be appropriate and/or desirable to conduct that action at that moment. For example, remembering the need to reply to an email needing a long reply whilst in a business meeting leads to the likelihood of re-forgetting that action as it is not appropriate to act upon that at present. This could be avoided by taking a note of the need to do this in a diary or calendar thus increasing the amount of actions needed to remember to act upon an email. Such a need for this action is inefficient, ineffective and the constant need to remember likely to have a significant impact on the user emotionally, with frustration and concern when forgetting to act on emails. All this said, email users take such processes and linked inefficiencies for granted. We believe that our proposed alteration of email will lead to enhancements in the usability of email in terms of how email fits into the users life. A categorisation upon action leaves the user to engage with their email based the type of task they desire to conduct, likely formed by the situation they are currently in, rather than remembering the complex and varied amount of actions needed for the most recent emails received. This is likely to be a better fit in terms of a users life structure whereby instead of each email needing attention at the moment of arrival, each can be dealt with depending on the action the user desires to conduct in their daily routine, or indeed the user be alerted to such an action when it is deemed appropriate by the system. For instance social emails could be categorised as social/friend based communication and could be acted upon when in a lunch hour, at the end of the day or when people feel the need for a break from work based email. A more detailed example of the potential use of CMail is supplied in the following section.

### 3. CMail

The action-based email client proposed allows for users to record potential actions for an email, thus removing the need for this to remain in memory. Then, when they feel it is appropriate, they may act upon these emails, without having to either recall the intended action or rehearse the decision process. In this way, an action based email client enables the user to process email with reduced cognitive load.

An example of this workflow would be at one point in their day, scanning through recently arrived emails, deciding upon required actions (if any) and associating these emails with those actions. Subsequently, potentially later, should the user feel the desire to discuss issues with colleagues, reply to friends, or have time to reply to an email which demands a high amount of attention, the client provides the appropriate action based view of the relevant emails.

If users can access these messages at the points within their day which they feel they desire to deal with such tasks then this type of system is likely to lead a high user satisfaction, efficiency of process and effectiveness in that the user is motivated at that point to deal with the actions necessary to deal with such messages. Such a system would not impact on the usability of the message delivery system, as this would be identical to the older clients, however the organisation is likely to impact on the users experience of email in how they fit into their lives and govern their actions based on the communication.

Additionally research has also shown that the probability of prospective memory failure (i.e. forgetting to remember an action) is higher when there are high cognitive demands in situations where the recall of necessary actions is person-initiated [8]. Users are therefore more likely to forget to act upon certain emails as the amount of emails needing actions increase thus increasing cognitive load. In our proposed system there would be no need to rely heavily on procedural memory, just an action on the desire to conduct certain behaviour.

Using an action-based organisation of email is likely to lead to improvements in the email user experience as users experience less stress, frustration and a lower cognitive load when dealing with the overwhelming amounts of email communication present in todays environment. Due to the organisation-by-actions, users can select when they feel they desire to engage with the email and how pertinent such an email is, leaving the user in control of when the email and its related action is engaged with. Rather than the email being the catalyst for action, it is the mood/desire of the user to

conduct a type of action that is the catalyst to act. This therefore lends a truly human centred approach to email interaction.

#### **4. Realising Action-Based Email**

The way this is achieved is up for discussion, be it through user categorisation or automated means. Since the explicit intention of CMail is to reduce cognitive load, we believe that 80% of categorisation and presentation should be automated. However, human beings will probably always need to teach the system (initially) through manual categorisation. Such manual categorisation leads to less errors in allocation, and achieves a high degree of reliability. CMail would implement a learning algorithm to understand the user's activities, remember her friends, manage her schedule. Although there would still be some functionality of existing email systems (such as Send and Reply) further functionality based on actions could be added. These would highlight specific actions such as read later, categorise and action needed with related options to select depending on the users existing action set. Further to this, instead of forward, action specific functionality such as delegate to could be used with a built-in process to remind the user to check on the status of this delegation, in a certain amount of days. Through these changes, the interface could be more action specific and human focused. The easiest way to do this is to amalgamate tasks, calendars, addressbooks, alarms into one workflow, which can be customized by both, the system administrator as well as the user. To be fair, there are a few email clients that partially attempt to present a to-do list creation facility, along with email. However, the current attempts are more like bolt-ons to the core functionality. Key to understanding the workflow concept, is parsing email, remembering tasks arising out of those emails and scheduling them. While an organization's team structure, meetings, resources, etc. fit within a broad workflow, a user will also need to incorporate her personal/social customizations within it. For e.g., if the user has committed to attending a party, CMail should be able to remind the user of this upcoming event, well in time.

No doubt, at its most polished, CMail requires advances in Natural Language Processing, context-awareness, extensive search and learning ability. But the basic tasks of integrating email into a workflow and presentation of different tasks, based on time is certainly feasible with current technology.

#### **5. Implications, Challenges and Future Directions**

The proposition of such an email system brings many research and practical challenges which aim to be researched by the authors in the near future. Through future project funding the authors aim to develop a working prototype of CMail. With this the aspects of usability and user experience which are hypothesised to be of benefit in CMail can be explored. Due to the nature of the system and the perceived benefits to the users life rather than the process of email delivery, the testing of such an interface needs a long term approach. We aim to identify whether such an email system fits better into the lives of users compared to conventional email organisation. A comparative experiment would be an effective evaluation. However the concepts of cognitive load, efficiency, effectiveness and satisfaction needs to be observed over a period of time rather than through short user sessions. Indeed a further area of research development is the user experience of such a system. It is hypothesised that, due to its fitting with a users mood and desire for actions, the system will be more pleasurable and less stressful to use. However research is needed to measure whether indeed this is the case. There are two elements of measurement in terms of user experience which need to be take into account. The first being emotions during interaction with the interface of such an email system. The second is the users emotions due to the use of CMail in terms of the organisation of their life. The feelings of stress, frustration and annoyance due to current emails lack of affordance for the users mood and life-structure will likely be reduced by CMail. Although CMails focus on actions is of use to the individual, an opening of CMail organisation to other users may allow a window into the prioritisation and workflow of collaborators. This would give context to email in allowing others in specific projects to see other users priorities and action organisations and thus make decisions on others workload and whether actions can be passed to others. This may be a development area for CMail and one which will aim to be researched by the authors. Although such an open system may be of benefit to collaborators, the issues of privacy and the impact of socialisation of the system are not to be dismissed. The effect on the user experience because of this openness may be significant in that users may be concerned that others would be able to see their action categorisations and priorities. Indeed fear of judgement by others in terms of social systems (such as wikis and knowledge sharing communities) has been noted in research [9]–[11]. A similar factor

may be of importance if CMail is to be open to others. Users may also engineer their action based categorisations to seem more focused on activities that are of value to organisations rather than to their specific mood or action desire state. Such impacts are important to explore as part of the user experience of the system. Action categorisations may also lead organisations to turn off certain actions during specific times. For instance bosses may desire to turn off any social/friend based actions within CMail so that workers focus on traditionally viewed work practices, much like the blocking of facebook or youtube by many organisations for their staff within work hours. The lack of freedom this creates for users is something the authors feel is against the ethos of CMail, yet may be an action which would occur in a real CMail system. Although prototyping, designing the system and researching the user experience need to be conducted before real world deployment, this deployment would allow the authors to identify whether such an issue would arise and indeed identify any other issues in real word realisation of this system. The observation of this is however a long term aspiration of the authors, rather than of key focus in the initial research for this system.

## 6. Conclusion

The paper highlights a re-imagining of email to be more action based than it is at present. It argues that such an organisation is more life-focused and would be beneficial in the reduction of cognitive load due to a heightened focus on action desires rather than remembering to reply to emails. Such an organisation, it is argued, will also lead to higher satisfaction, efficiency and effectiveness when interacting with email. Further this the technical specifications of such a system, the dilemma of user or automated control of such categorisations and the ability to override such categorisations and priorities due to mood are also discussed. Although this is a proposal of an idea rather than a fully developed system, the aim for the researchers is to gather feedback about this idea, develop a prototype and test the hypotheses proposed in this paper. One thing is for certain, the re-imagining of email to focus on the user, their mood for actions and life structure is of prime importance in the development of the next generation of email systems. We feel that CMail is a development towards a truly human centred email approach.

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