RESEARCH PAPER

CURRENT STATE AND FUTURE DEVELOPMENT OF EMAIL

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INTRODUCTION

The objective of this paper is to investigate the increasingly overwhelming popularity of email use in the society and the problems associated with the design and functionality of email. In particular, the paper will discuss the use of email as a communication tool and the process through which email evolved as a knowledge management tool from the personal, social and organizational perspectives. The focus will be on the difficulties of currently available email clients in dealing with the explosion of email use and some potential solutions to these difficulties.

The emergence of email technology has changed the way people communicate, the practice of business management, and the norms of many social activities. However, despite the long development history, the overwhelming popularity and the low cost of email use, most email applications have not been substantially improved from their original designs (Moody, 2002). The wide spreading of email use has overloaded all current email clients, which were not originally designed to support all the activities that people are now performing through email. Functions first developed to serve the modest originally intended uses of email have failed to embrace much more complicated management tasks, from personal information management to organizational knowledge management. Additionally, there are several problems emerging from the abuse of email, such as spam and security, which call for the need for a revolutionary generation of email software. Several research projects have been put forward to redesign the frameworks for the future of email applications. These frameworks are expected to comply with the task-centered design principles, with the tasks approached from the perspective of information
and knowledge management, rather than solely from the communication perspective. There is also a need to address the diversity in users’ behavior and purpose in using email, therefore good email applications should also be designed with a user-specific principle in mind.

**USE OF EMAIL**

**Origin of email and its intended use**

The origin of email dated back in the 1960s at MIT as a file directory stored on a shared computer that allowed everybody to access at different times. The first local email programs called SNDMSG and READMAIL came into existence in the early 1970s. The birth of the local area networks in the early 1980s then gave rise to the wider spread of email use. Commercial email programs came to the market in the late 80s, which was quickly followed by the blooming of world wide free email services in the 90s, largely thanks to the incredibly rapid development and expansion of the internet. Despite the abundance of other kinds of services that the World Wide Web offers, email remains the single most popular activities among internet users. Email has become a dominant means of communication and has fundamentally changed the way people interact both in personal and professional aspects. It is now being used with the scope of tasks expanded far beyond its original intended use of emails as an electronic “bulletin board” for asynchronous communication.
Email as a communication tool

Email is becoming increasingly popular as a personal communication tool, especially when our work and our lives become so mobile that face-to-face or synchronous communication is impossible in many cases. Email is a great tool to keep in touch with friends and family. It also serves as an information resource as much information these days can be fed through our mailboxes. It is a single connection to the world that does not take any physical space, and can be used around the clock, at our convenience.

Email is also a very effective social communication tool. One important advantage of email over other means of communication is its powerful capability of effective one-to-many communication. With just a few minutes typing and a mouse click, you can get your message through as many people as you wish, a task that would cost a great amount of time and money if traditionally means of one-to-one communication were used. Email has reduced the cost of collaboration to virtually zero.

Email’s low cost and convenient access have gained the reputation to be one of the most widely used tools in the workplace for the last few decades (Rohall, 2002). It is estimated that over 500 million email messages are exchanged among American businesses everyday (Moody, 2002). A substantial portion of business correspondence that used to be communicated via regular mail has been replaced by email. Email use also increases in the tasks that traditionally involve fax machines and the telephone. In a study by Bowes (2000), users favorably preferred email to face-to-face communication and phone calls, sometimes as much as 5 times more. Most people report that their communication and professional relationship with colleagues and managers has been
improved by using email. The ease of one-to-many communication of email has also benefited businesses in their survey, marketing and distribution of goods and services. The electronically collected data facilitate a low-cost and convenient process of business analysis and renovation.

**Email as a knowledge management tool**

Although email was originally designed for asynchronous communication only, it is now being used as a versatile tool for several activities such as task management and information (or personal) archiving (Whittaker and Sidner, 1996). Email therefore can now be classified as a knowledge management tool.

The frequency and intensity of email use have greatly increased. Personal information received and stored via email now comes from several aspects of one’s life. It includes information from family, friends, colleagues, as well as about work, hobbies, entertainment, etc. Personal knowledge management tools that use technologies like RSS provide more ways for people to acquire information, which is normally delivered to their emails. A great deal of important information one has to remember is now recorded in emails as to-do lists and reminders. The growth in the comprehensiveness of inbox information leads to the need of better organizing it for future retrieval. Email has evolved to a task of personal knowledge management.

In the business setting, Ducheneaut and Bellotti (2001) describe email as a habitat in which people spend most of their time carrying out activities and keeping up with the information delivered to their inboxes. Many people use email as their electronic office where every business activity takes place. They store all the documents as well as
business dialogues and transactions in their email. Communication via email becomes a continuous task that they perform, not an intermittent kind of practice. This metaphor of a habitat emphasizes the important impact of email on the effectiveness of business operations. Email is no longer just a pool of information; it contains the vast majority of important knowledge assets of a company these days. There is an urgent need to develop email as a task-centered tool for business knowledge management since organizations need a better and more systematic way to make the most advantage of the invaluable information currently stored separately in random individual inboxes.

**EMAIL DIFFICULTIES**

Although email is now being used extensively in all settings, its functions are still underdeveloped and immature (Martin, 2005). There are several reasons for this: the complexity of information stored in emails these days, the change in the behaviors of humans when using this non-traditional communication means, and of course the inability of email designers to address the needs of their new generation of users.

According to a study by Moody (2002), the percentage of workers involved in interactive tasks requiring a great deal of information interchange was increased almost by four times from 1990 to 1994, from 17% to 62% of the workforce. The nature of the working environment is much more interactive and interdependent, and this change is clearly reflected in email use. Email has essentially become an information ecology where messages are just a source of input. Several tasks have to be done to process the information and then produce the output as outgoing messages and other documents. Facing the challenge to support these new complicated tasks, email programs become
obsolete and overloaded (Whittaker and Sidner, 1996). The most critical issues encountered in email use at work include information archiving, task management, and security.

**Information archiving**

If you often contact just a dozen of people via email, and you get about 5 or so emails per day, checking your mailbox might be a little pleasant moment of the day. An average user receives around 24 messages per day, and for users involved in more management and collaborative tasks, the volume might get to the level of hundreds (Levitt, 2000). The task of managing the inbox now becomes a real burden. Some messages can be dealt with promptly and then deleted or filed. Nevertheless, there are many messages that need time to acquire enough information to respond to, at a later time. This is one the main reasons for a full inbox: it is used for incomplete tasks, whether they are things to do, things to read, messages whose importance and relevance cannot be determined upon receipt, or messages belonging to an ongoing conversation (Whittaker and Sidner, 1996). Organizing this huge amount of information for easy future retrieval is a big challenge. This is also where most email applications fail to provide an efficient and effective tool that users can use to archive their emails.

The two most common methods for organizing information in the inbox are filing and searching. Current email systems have not been able to provide convenient methods to organize folders within the inbox with multiple levels of hierarchy (Whittaker and Sidner, 1996). The inbox is normally used to keep track of urgent tasks, for to-do list and reminders. The problem with filing is that it takes the “urgent” messages out of the
inbox, and these can easily be forgotten in some other folder. Furthermore, when filing
the user has to decide what the messages will be used for in the future in order to place
them in appropriate folders, and this is not easy to determine. The function of searching,
on the other hand, is not advanced enough to retrieve the exact piece of email being
looked for. Messages can be searched for using certain attributes such as sender, time, or
subject, but the search normally yields several results. Substantial further search is
required to narrow down the result and get the information needed.

Many messages sent in the business setting are part of a multi-dimensional
conversation. A study within Lotus revealed that about one third of messages are
connected via threads (Fisher and Moody, 2001). Managing those threads and locating
the piece of information needed in those series of email is a very challenging task that
most of the currently available email clients fail to support. There is therefore much room
for improvement if email is to be used as an effective information and knowledge
management tool for the future.

**Task management**

In business settings, email is very often used to coordinate collective effort of
performing certain tasks. The mobility of the workforce in modern projects sometimes
makes it a must to do so via email. For these tasks, email becomes the working
environment and the need for it to function as a task management tool is crucial. This is
very hard to achieve given the conditions of current email systems. Task management
requires a tool that functions with capabilities far beyond those of conventional email
application.
One of the biggest weaknesses of current email clients is visualization which seriously hinders users from retrieving wanted information. For example, there are very limited visual aids to hint users to messages of higher importance, messages with attachment, or messages involved in urgent tasks (similar to the concept of an alarm). Most email clients have just a couple of panes, therefore it is not easy to vision what to do at a glance for a certain task if information is scattered in different areas of the application.

Email these days is also being used as a file transfer tool, especially in the business environment. This gave rise to the need to support document management within email. There are a lot of times when messages related to an ongoing task can be deleted, but the attachments need to be saved (Belloti et al, 2003). Instead of saving them somewhere on the computer, it would be very useful if these can be kept and organized in one area dedicated for that task within the email environment. As mentioned earlier, functions like this are necessary to make email a real “habitat” in which several tasks can be performed in an effective manner, not just as a mail box for receiving and sending messages. This is an area of increasing demand, and hence the need to incorporate such capabilities is pressing.

Security

Security is a critical problem with many web-based email systems such as Yahoo and MSN. Problems such as password or username loss because of hackers are quite common. Even non-hackers with limited knowledge in the way email coding works can sometimes succeed in breaking the system if they know some personal information
about the account holder. This is a critical threat to the safety of information stored in email. It might be lost or altered. Even worse, fraud use of email might lead to serious unpredictable consequences that the owner of the email account can never be aware of. Imagine that someone assumes your identity and spread out false information to some people you know. If the person did that for a purpose, you will have to pay off the price for the action although it was not taken by you. Or imagine one day you realize the whole content in your inbox disappeared overnight. This could be a disaster and might cost you much more than time or money to recover, if it can be recovered at all.

The security problem calls for the need to incorporate an important function in email clients: effective backup features, and perhaps multi-level of protection. Most web-based email clients now do not offer these, and if an account is stolen, the owner might have to suffer the permanent loss of information. Secure information protection is therefore the first step towards effective knowledge management. In the business setting, this might also lead to the question of the boundary between knowledge sharing and knowledge protection: what to share, what not to share, and what kind of information is “safe enough” to be transferred via email. The threat of unauthorized email intrusion might change the way people access and release information. It might also change the architecture of email access to facilitate more secure protection.

**IMPROVING EMAIL**

In a trial to solve the problem of comprehensive task management in email, Bellotti et al (2003) designed an email client called Taskmaster. The authors observed users at work and analyzed the time allocated to different activities. The design
philosophy of Taskmaster is called “thrasks”: threaded task-centric collections. They also included features to treat attachments and links accompanying messages as equal items to the messages themselves. Taskmaster provides the aggregations of information for an overview so that at one glance, a user can picture how the wanted information is distributed (Figure 1). More panes and icons are provided to indicate the importance of a message, its ownership, whether or not it is clustered with other messages or it is urgent. The initial feedback of Taskmaster users was positive, which suggests that this model has potential application in a larger scale client.

Figure 1: A screenshot of Taskmaster. The top pane is the thrask list viewer, the middle pane is the massage and other thrask member items list viewer, and the botthem pane is the content preview (reproduced from Bellotti et al, 2003)
To solve the problem of excessive amounts of mail in the inbox, Isbell et al. (2002) suggest using classification filters and alarms for the corresponding mailboxes. This function is accompanied with automatic archiving and deletion. For example, a mailbox can be set up to hold no more than a certain number of messages at any time, and older messages are deleted automatically to maintain this “quota”. The authors also propose to have the deferral feature, that is, messages not of immediate importance are delivered at a later time. These ideas are interesting, however, difficult to implement and might create additional problems.

In investigating the reply relationships within email conversations (or threads), Venolia and Neustaedter (2002) developed a mixed model for visualization of threads that has great applicability (Figure 2). This is a combination of the sequential model (messages displayed chronologically) and the tree model (messages displayed based on the parent-child relationship of a message to its replies) of conversation. This model ensures that the ideas flow while the temporal relationships can still be kept track of. The authors also designed a pleasant window-like interface that is more friendly and comprehensible for users.

The idea of redesigning email was taken further by Moody (2002) to the concept of reinventing email all together. Apart from emphasizing the importance of features supporting two basic elements of modern email: threads and visualization, the author also suggested that it would be useful (and natural) to incorporate instant messaging into email. This way the asynchronous nature of email is balance to some extent with the synchronous nature of IM, and that would greatly improve the functionality of email, since currently IM has already been used in 84% of business.
As different user groups of email have different purposes, there would be no single email client, no matter how comprehensive and sophisticated, that could be suitable to everybody. This gives rise to the need of user-specific email applications, that is, applications that let users choose what type of role they want to take, whether it is a secretary, a project manager, a professor, or a grandmother. This choice will customize the functions and interface of the client so that it most suits the need of users. Venolia and Neustaedter (2002) also understood this problem and stated that comprehensive email client for business use might be too overwhelming for users with simpler tasks. Hence email design for the future needs to be not only task-centric, but also user-specific in order to become an effective tool in knowledge management.
CHANGING EMAILING HABITS

There are a lot of psychological differences in emailing compared to the traditional face-to-face or paper communication. The matters of trust, empathy, patience, expectation, and suspicion in this online communication medium define the behaviors of users, whether it is used for personal or professional purposes.

Up to this point, the issue we have been discussing is: how to manage the information stored in email effectively by redesigning the application. However, the more basic questions to ask might be: Does it have to be that full? Are all messages in your inbox complete and reasonably comprehensive pieces of information? What about your emailing habits? Do you really need to email people that often? Should there be a more responsible and more effective emailing practice? Understanding the psychology of emailing behavior might help to solve the problem of email overload in a more fundamental way.

In one of Gartner Inc.’s press releases, it was reported that 34% of business email is “occupational spam” (Gartner, 2001) that provides unnecessary information. Given the huge number of business messages, this one third is very significant. It is quite obvious that email is not being used in the most effective way possible. There is a significant amount of redundant information transferred via email. Information in many of inbox messages box is incomplete or irrelevant, ideas not well thought through or not yet appropriate to be raised at the time of sending. Because sending an email is so easy, people tend to fire a message to others every time they have some information (or a request for information) without questioning whether or not it is an appropriate time or if there is a better way to handle the task. This is something very different from face-to-face
meetings, in which each participant has his or her turn to get their voice heard. Because they know the opportunities are rarer, they are better prepared. It is likely that people will come to the meeting with their ideas more organized. In this case, using email (or abusing it) results in breaking the task into more steps, which might not always be necessary.

Research carried out at King’s College in London suggested that emailing can be very addictive (Dvorak, 2005), hence emailing practice is not always a result of logical and reasonable need. We sometimes take action (that is, emailing people) as the result of an unconscious habit without much reasoning of the necessity or appropriateness of it. This phenomenon makes us think about how we should change our emailing behavior in a way that would reduce the effort for others to follow up the information we are conveying. Instead of firing our thought away to someone in an email at the moment it occurs, we should hold on to it until a reasonably complete thought has been developed. Just as it is possible to inform someone immediately does not mean they should be informed immediately. If every email sender becomes more responsible for the relevance and completeness of the content of their messages, significant time will be saved in managing everyone’s inbox.

Another potentially misleading fact related to email that most email messages seem to appear more urgent than they really are. It is estimated that only 27% of messages sent require immediate attention (Gartner, 2001). However, most people feel the pressure to respond to most of their messages, and while these have not been deleted or filed, they still cause an uncomfortable feeling to inbox owners. Similarly, as the messages practically reach the receiver instantly, the person who sent the messages also expects that they are read and responded with an essentially prompt manner. This attitude
might create false pressure on email users in dealing with their inbox, which makes the already challenging task more unpleasant.

Related to this issue is a finding by Bailor (2005) that responsiveness to email in the customer service area is quite low. According to Bailor’s study, 51% of North American small businesses failed to respond to emails at all, and 74% did not give any response within 24 hours. One of the reasons for this might be that the messages from the customers do not provide complete information necessary for a response to be given quickly, and the procedure required to gather the complete information via email can be lengthy and frustrating. This leads to the issue of choosing the right tool to manage the information in different situations. Email might be the easiest, but not always the most effective tool for communication, especially when it involves problem solving tasks that needs complete and specific information. In this particular area, direct online technical help (e.g. IM) and telephone service seem to be much more efficient as the result of synchronous communication. Instant feedback can be given, and most of the time, is needed.

Another problem with using email is that the lack of human interaction might lead to inaccurate judgment of the information given as well as the position of the information giver. When not given complete information, people have to make assumptions, and these assumptions might be inaccurate and judgmental. This threat is magnified in the medium of online communication. Tran (2005) points out that the medium of email in general causes people to hold on to their prejudices. This is due to the incompleteness of information and the lack of social cues such as body language or tone of voice. Although this might be more of an issue in personal communication, however it also unavoidably
affects business communication as this type of communication relies largely on the effectiveness of a network of one-to-one communication.

The problems discussed above are intended to illustrate that the use of email in many situations is either being abused or not necessarily the best medium of communication. Together with solving the technical problems associated with the software, adequately addressing these psychological and practical issues will help improve email even further to make the most use out of this versatile communication and knowledge management tool.

CONCLUSION

Email has evolved from a communications tool used for simple tasks to an extensive knowledge management tool used in several contexts, from personal, social to business settings. The rapid expansion of email use has created many new and challenging demands for the tool. Compared to other IT applications, email is still in the immature state (Martin, 2005) and there exist “definite possibilities for improvement” (Ducheneaut and Bellotti, 2001). As a comprehensive tool for knowledge management, email should be able to function as a work station capable of exchanging information, locating documents and facilitating collaborative tasks. The principles for the design of such tool are task-centric and user-specific. However, together with reinventing the tool, there is a need to redirect the use of this tool so that it is appropriate, suitable and effective.
6. REFERENCES


