

Chapter 32

INFORMATION OVERLOAD AND ELECTRONIC MAIL: TAGGING MESSAGE CONTENT - A PARTIAL SOLUTION?

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Abstract

In UKAIS'98, Kimble, Hildreth and Grimshaw described some of the problems of information overload that resulted from the use of e-mail in a large organisation. This paper describes a prototype Message Distribution System for use in team based organisations that is designed to address some of these problems. The system we describe differs from other attempts to deal with information overload by focussing on the sender-side of the communication rather than the recipient-side. The paper begins by reviewing the literature relating to Information Overload and e-mail and the main issues identified. The essential features of the prototype Message Distribution System (MDS) are described together with its design objectives, its implementation and its evaluation. The paper concludes with a discussion of the results of the evaluation and some suggestions as to how the system might be further developed.

1 INTRODUCTION

Since the early 1980s, the use of the Internet and e-mail have grown in tandem and, following the emergence of the Internet and the World Wide Web there has been an explosive growth in the use of e-mail. E-mail has become one of the three “killer apps,” along with Telnet and FTP (Berghel, 1997). Although originally designed for asynchronous communication, e-mail has now evolved to a point where it is used for many purposes that were never originally envisaged. For example the e-mail inbox, besides being used to store incoming e-mails, also operates as a task manager, where people are reminded of current tasks and where information relevant to those tasks is

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kept accessible (Whittaker and Sidner, 1996). Fafchamps, Reynolds and Kuchinsky, (1991) and Eisenberg and Phillips (1991) show how e-mail helps with work group collaboration and conflict management as e-mail allows people to circumvent face-to-face interaction, to defuse or impersonalise problematic relationships and to manage their communication with others.

However, e-mail is not without its downside. Kimble, Hildreth and Grimshaw (1998) in their study with a large international organisation, found that:

- inappropriately addressed e-mail was a source of annoyance which seemed to be linked with inappropriate use distribution lists;
 - some managers were overloaded with e-mails due to the misuse of 'cc' facility.
- They argued that weak social cues did not provide sufficient context for senders to regulate their behaviour properly.

Social context influences information exchange through perception, cognitive interpretation and communication behaviour (Sproull and Kiesler, 1988). Senders and receivers must first perceive the social context of the communication, through both static (e.g. peoples' appearance) and dynamic cues (e.g. non-verbal behaviour such as gestures and facial expressions). Social barriers such as status difference will not constrain communication if senders and receivers are unaware of them. Once these cues are perceived, people adjust the target, tone and content of their communications according to their interpretation of the situation.

The social cues offered by e-mail are weak: there are no dynamic cues and static cues are minimal. For instance, the only signs of organisational position and personal similarity for senders and receivers are names and addresses while indications of both parties' job title, level in the hierarchy and appearance are masked out, although the use of 'signatures' at the end of messages may restore some of these indications (Donath 1996). Also, when using e-mail one does not expect or encounter reminders of the situation in which the communication is generated, or in which it is received.

Typically, when social context cues are strong behaviour tends to be other-focused and controlled. Lacking social cues, people may forget the nature and size of their audience and have reduced self-awareness making them believe they are anonymous. Without the reminders of an audience, people become less constrained by the norms of conventional behaviour (Weisband and Reinig, 1995). For example, the phenomenon of 'flaming' in electronic discussions suggests people lose their fear of social sanctions and criticism due to limited reminders of conventional human interaction (Sproull and Kiesler, 1991).

The problem with weak social cues does not end with flaming. It also gives rise to the increase in volume of 'unnecessary' e-mails. Inappropriate or unskilled use of carbon copying (cc) and distribution lists may result in information overload. Part of this problem lies, ironically, in one of the benefits of e-mail where users can easily send messages to many people as effortlessly as they can to one person. The main problem however, may be due to the sender not understanding the context into which their messages will be received.

2 SOME APPROACHES TO DEAL WITH INFORMATION OVERLOAD

Whittaker and Sidner (1996), in their article about e-mail overload resulting from the use of e-mail in task management and personal archiving, propose several approaches to deal with information overload due to e-mail. The main proposals are as follows:

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- Automatically mark e-mail messages from the same conversation using a common thread ID to allow the user to collect related messages together and trace back through conversations. (A thread is a topic or theme that generates on-going e-mail from interested parties.) The user would be able to view by thread and has the additional benefit of determining conversational status, i.e. whether the user 'owes' or is 'owed' a response.
- It should be possible to file an entire thread but leave behind a representative message from that thread in the inbox. This reduces inbox clutter. An uncluttered inbox can better remind the user that a conversation is in progress.
- Information retrieval techniques could be used to cluster semantically related documents automatically. The user may leave behind one semantic category exemplar in the inbox as a reminder and file the rest.
- Having the inbox temporally sequenced, and having threads and folders gradually 'decay' by scrolling off the screen if they have not shown recent activity, should help by keeping the important things in the inbox visible to the user.
- The ability to mark inbox items requiring action (action items) would also be helpful. Thus, action items that are not be filed away will serve a reminding function to the user.
- Action items that cannot be done immediately and have been filed away, should reappear as action items as the deadline approaches.

The approaches listed above may help e-mail users manage the problem of information overload. However, these approaches seem to suggest that the only way to manage information overload is via the recipient-side. In contrast, the approach we describe in this paper focuses on the sender-side.

3 TAGS: REDUCING INFORMATION OVERLOAD FROM THE SENDER

The study by Kimble, Hildreth and Grimshaw (1998) indicated that one source of information overload may be due to the misuse of the 'cc' facility in e-mail. It was argued that this was due to weak contextual cues in e-mail, resulting in behaviour that was more self-focused and less other-focused. The approach suggested here takes into account both of the concerns above. In other words, it may be possible to reduce information overload by removing the 'cc' facility in e-mail and by improving the social context cues in e-mail messages.

One way of improving these cues is by making use of a feature that is a functionally improved variant of the standard 'cc' facility. The facility proposed here involves having sender-inserted tags (markers) within the message body that indicate who will receive the tagged sections of the message. On sending the message, only the corresponding recipients will be able to read the particular tagged section or sections. This is based on the idea that by having to insert the tags, the sender is made to think who the readers of the message will be, i.e. the sender needs to be more other-focused. Note that this is different from inputting e-mail addresses into the 'To' field of an e-mail and sending out the message to all the recipients. The proposed method involves the sender inputting the tags as the message is being composed.

4 A PROTOTYPE MESSAGE DISTRIBUTION SYSTEM

It is clear that information overload is not a trivial matter. It affects both individual workers and workers collaborating within teams, either co-located or virtual, which form the core of many new networked organisational forms (Castells, 1996). These developments point to a need to reduce information overload in order to help business organisations remain competitive. The proposed system aims to improve the weak social cues that seem to be one cause of information overload and is focused on use within a team-based environment.

Design objectives

The basic aim is to help reduce information overload by designing and implementing a web-based message distribution system that allows the sending of personalised messages based on tags contained in the message content. In order to ensure the MDS is flexible and capable of responding to the fast-changing business environment, this system will be modular so that other applications can be added to, or integrated with, the system later.

Due to the limited development time, it was decided that a development-by-phases approach should be adopted. While keeping the above aims in mind, the objectives of the first phase of the project were:

1. Testing the feasibility of the core concept of the system, i.e. how receptive users would be to the idea of tags within the message body replacing the 'cc' facility found in most e-mail user agents (clients).
2. Designing a platform in the form of a working prototype specifically for use within a workgroup or team to use as a basis for requirements elicitation.

In order to be able to successfully achieve the objectives set above, a development strategy, known as a process model (Pressman, 1997), was adopted. The type of process model deemed most suitable was an iterative prototyping model. This model is particularly suited to situations where only a general set of objectives exist, or, where there is uncertainty about the applicability of an algorithm or the form of human-machine interaction that will take place (Pressman, 1997, p. 32). The model begins with requirements gathering which leads to the quick design of an initial prototype. Users test the prototype and the developer makes improvements in later versions.

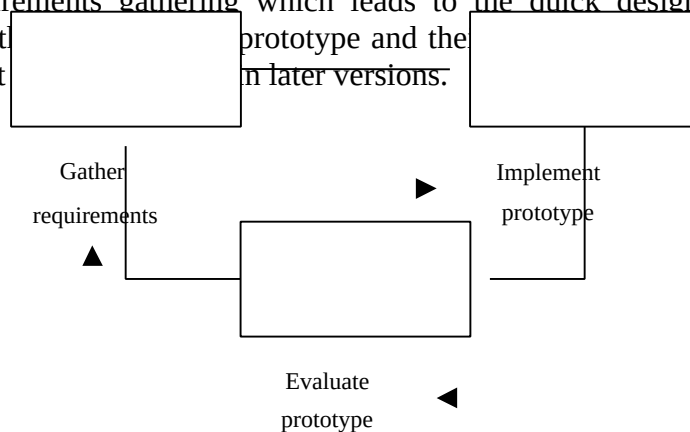


Figure 1: The Prototyping Model

Requirements

The initial requirements for the prototype were based on the works of Grudin (1993, 1994) and Grinter (1997). Grinter (1997) collated the findings of several workplace studies and argued that her findings offered designers a set of valuable guidelines to support their work. Similarly Grudin (1993, 1994), also identified a number of problem areas affecting the success of groupware which could act as guidelines for designers. The most relevant requirements for this system were identified as:

1. Consideration should be given to people's perceptions of technology and its functional capacity in supporting workgroup collaboration, as this will influence the way it is used.
2. Design processes, along with the technology, that create benefits for all group members.
3. There should be support for the distribution of awareness data between team members in order to maintain good co-ordination within a team.
4. The system should be platform independent to allow members of distributed teams to work on different software platforms
5. Provide a modular design so that additional features can be easily added or removed from the system in response to the needs of the particular workgroup.
6. The system should help people construct and share interpretations of their work-in-progress.

Implementation

From the above list, a number of key features of the prototype were identified:

1. The prototype system will resemble a web-based e-mail system.
2. The prototype system will have a modular architecture that allows its integration with other communication systems.
3. The prototype system will make allowances for future work on the system, such as the provision of information on the status of the message sender and the provision of a central depository for messages.

To achieve the required functionality of the system, it was decided that a combination of client-side and server-side scripting should be used. The client-side scripting language was JavaScript due to its good cross-platform compatibility; the server-side scripting language was CGI/Perl due to the availability of prewritten modules/subroutines and cross-platform compatibility.

The architecture of the system consisted of two layers: *interface* and *functionality*. Traversing the two layers are three parts: *User Log-in*, *Tags Editing* and *Message Composition, Preview and Send*. The division of the architecture into the layers and parts provides modularity of components that have the potential for future reuse.

The *User Log-in* part was used to obtain the user's name and e-mail address, which is used in the later parts, as well as to provide security for users' stored tags. The functionality here was provided by a modified CGI script originally written by Patchett (1998).

The *Tags Editing* part enables users to create and store the tags used in the system in a database. The functionality in this part is provided by two custom-written CGI

scripts (although these two scripts could be combined into one).

The final part, *Message Composition, Preview and Send*, is where users compose, optionally preview and send their message. Functionality here is provided by another CGI script. For example, if the message:

Everyone sees this <paul>but only Paul would see this</paul>

is sent to several people, only Paul (whose e-mail address has been defined in the *Tags Editing* part) would see the message:

Everyone sees this but only Paul would see this

Everyone else would see:

Everyone sees this

In order to help users familiarise themselves with this system, a three-tier help system in the form of a tutorial, a list of examples and a contextual help system was provided.

Evaluation

The evaluation of the prototype system is the last stage in the prototyping process model. The results of the evaluation will indicate the feasibility of the idea, as well as providing a starting point for subsequent requirements elicitation and system design. The evaluation of the prototype has two main objectives:

1. To test the usability of the system;
2. to obtain indicative data on the feasibility of the use of tags to help reduce information overload.

Usability is an important component of any system as it determines the ease of use of the system and may be a determining factor in the successful adoption in workplace. This is particularly important in this case as one of the objectives of the work was to design a platform for further requirements elicitation within a real workgroup or team setting, thus any future work will rely upon the acceptance of the system in such a setting. The results of the usability evaluation can be applied to improve the design of the system interface and hence ease the acceptance of this system.

There are a number of methods that can be used for usability evaluation. Heuristic evaluation was chosen mainly because it is quick and intuitive to perform and does not require the evaluators to be experts in using the system in order to be able to evaluate it properly. In addition, the use of this method fits well with the use of a small group of evaluators. For example, Nielsen (2000) claims that using only five evaluators will identify 85% of usability problems.

Heuristic evaluation however, does not provide sufficient information to achieve the second evaluation objective, i.e. evaluating the feasibility of the system. For this, semi structured interviews were used to supplement heuristic evaluation as this does not constrain the interview but can be used to direct it if the interviewee deviates from the topic (Preece et al., 1994, p. 629).

In accordance to Nielsen's findings, help was obtained from five *evaluators* to perform the heuristic evaluation and take part in semi structured interviews. In addition, e-mail comments from six volunteer *respondents* were obtained to supplement the two evaluation methods described above.

5 RESULTS

The evaluation results given here are summarised from three sources: the authors' notes from the heuristic evaluations, the semi-structured interviews and the voluntary e-mail feedback described above. The results are divided into two broad categories: system usability and feasibility opinions.

System usability

In all, eighteen problems were identified. The most significant were as follows:

1. There are no indications of a progression of steps that a user might follow.
2. The entering of tags by hand is tedious.
3. There are no indications of the other recipients in the sent-out message.
4. There are no indications that the sent-out message had been successfully parsed.

Feasibility opinions.

The general response to the feasibility of the idea of the system was mostly positive.

Respondent B: *"MDS itself appears to be simple and easy to use and to have a lot of potential. I like very much the idea of being able to have phrases in there which can only be seen by certain people."*

However, there was a cautious remark,

Evaluator 1: *"... novice users would need to be familiar with the HTML tagging system."*

On the issue of the probable acceptance of the system in an actual workplace, the key issue of reduction in workload for the sender was investigated. The following is a typical response.

Evaluator 2: *"... no need for typing different messages when message is sent within a group ... will also save time."*

The question of whether the tags system was a viable replacement of the 'cc' function yielded mixed responses.

Evaluator 1: *"The use of tags is a viable alternative to 'cc', probably better. There shouldn't be any problems in not having the 'cc' function if this system is used within a small group."*

Respondent F: *"Nice idea, although human nature being what it is it may just be easier to compose two notes one for general viewing and a second referring back to the first with comments"*

There was general agreement that the use of this system would result in the reduction in the volume of e-mail received and all agreed that the system should reduce the size of the messages.

Respondent B: *"... it will help in those cases where you don't want to wade through a load of text to find the piece relevant to you."*

Finally, it was also unanimously agreed that the use of tags would help improve the weak social cues in e-mail messages.

Respondent B: *"Where it will help in this case is that it will *force* the sender to think about the recipients. It does, of course, need senders to *know* what parts of the message are relevant to which recipient, but I can think of several cases where that would be true - and like I say, [one] of the main benefits is that it would make the sender *think*"*

6 DISCUSSION

Overall, the usability issues uncovered by the usability evaluations gave a very good indication that the usability evaluations had been successfully carried out. An interesting point here is that four of the issues raised originated solely from e-mail feedback. In other words, heuristic evaluation, while being able to identify majority of the usability issues, could benefit from the more informal evaluation employed by the e-mail respondents. A possible reason for this is that the use of heuristics may result in 'functional fixedness', where the evaluators unknowingly constrain themselves to what is mentioned by the heuristics.

The analysis of the issues raised indicates that, in general, this system had a rather steep initial learning curve. However, the fact that only one evaluator needed explicit help in using the system, whereas the others had been able to complete the tasks without help, shows that once this was overcome the system was quite straightforward.

Judging from the overall comments of both the evaluators and e-mail respondents, the concept behind the system was viewed positively. There was general agreement that the system should reduce workload and save time for the sender. This provides some indications that this system would be acceptable in a real workplace.

7 CONCLUSIONS

The evaluation of the system produced a number of interesting points. From the discussions in the previous section, it can be concluded that the broad objectives of the work were achieved.

First, a working prototype had been successfully developed. Its development had been guided by the aim of producing a modular system. The usability evaluation of the prototype indicated that it was a usable system, and the list of issues raised could serve as a starting point for further improvement of the design and for requirements elicitation.

It can also be concluded that the idea of tagging the message content is feasible. The general agreement that the system should help to reduce workload indicates that it has the potential of being accepted in the workplace. In addition, the general agreement that the use of the system would help reduce the volume of messages received, and that the tags help provide stronger social cues, show that the system might help to reduce information overload. Finally, it can be argued that the mixed views on the use of tags being a viable alternative to the 'cc' function points to the need for further study in actual workplace environments. This final point coincides with one of the earlier objectives. Thus, considering the views of the evaluators and respondents as a whole, the feasibility of the idea is very strongly indicated.

While it is fair to say that the objectives of this project have been achieved, there remain several aspects of the system where improvements can be made. For example:

1. Features such as support for sending file attachments, a mailbox for receiving e-mails and signature files have to be incorporated in order for the system to be fully-

testable in a real workplace environment.

2. Supplementary information, such as indications of the co-recipients of the message and the employment of tags in sent messages, should be provided.
3. A syntax checking facility should be provided.
4. The message-parsing algorithm should be improved to allow the use of nested tags.

Finally, some potential applications of the MDS might be:

1. As part of a more comprehensive solution to information overload by integrating the sender-side concepts behind this system with the recipient-side proposals of Whittaker and Sidner (1996).
2. As part of a knowledge management system that stores messages and patterns of communication between team members.
3. As a replacement for regular e-mail clients used in Intranets.
4. As part of a system that incorporates both information overload reduction and data awareness principles for distributed teams.

8 NOTES:

To view the working prototype system, go to:

<http://jashburn.hypermart.net/>

For the background to the project, go to

http://www-users.cs.york.ac.uk/~kimble/teaching/MSc_Students.html

References

- Berghel, H. (1997) 'E-mail - The Good, The Bad and The Ugly', Communications of the ACM, Vol. 40, No. 4, 11-15.
- Castells, M. (1996) The Rise of the Network Society, Blackwell.
- Donath, J.S. (1996) 'Identity and Deception in the Virtual Community', [Online]. <http://persona.www.media.mit.edu/judith/Identity/IdentityDeception.html> [Accessed Oct, 2000].
- Eisenberg, E. and Phillips, S. (1991) 'Miscommunication in organizations', in N. Coupland et al., (eds.), Miscommunication and Problematic Talk, Sage Publications, Newbury Park, Calif., 244-258.
- Fafchamps, D, Reynolds, D. and Kuchinsky, A. (1991) 'The dynamics of small group decision-making using electronic mail', in J. M. Bowers and S. D. Benford (eds.), Studies in Computer Supported Cooperative Work, North-Holland, pp. 211-224.
- Grinter, R. (1997) 'From Workplace to Development: What Have We Learnt So Far and Where Do We Go?', Proceedings of Group '97 Conference, ACM Press, New York, pp. 231-240.
- Grudin, J. (1993) 'Groupware and Cooperative Work: Problems and Prospects', in Baecker, R. M., Readings in Groupware and Computer-Supported Cooperative Work, Morgan Kaufman Publishers, pp. 97-105.
- Grudin, J. (1994) 'Eight Challenges for Developers', Communications of the ACM, Vol. 37, No. 1.
- Kimble, C, Hildreth, P. and Grimshaw, D. (1998) 'The role of contextual clues in the creation of Information Overload', Matching Technology with Organisational Needs,
- C. Kimble. and J. Abu Bakar. - Information Overload and Electronic Mail: Tagging Message Content - A Partial Solution? Proceedings of 6th UKAIS Conference, University of Portsmouth, Zeus Press, April 2001, pp 371 - 380.

Proceedings of 3rd UKAIS Conference, Lincoln University, McGraw Hill, pp. 405-412.

Nielsen, J. (2000). 'Why You Only Need to Test With 5 Users', Jakob Nielsen's Alertbox [Online]. <http://www.useit.com/alertbox/20000319.html> [Accessed July 2000].

Patchett, C. and Wright, M. (1998) CGI/Perl Cookbook, John Wiley & Sons, Inc.

Pressman, R.G. (1997) Software Engineering: A Practitioner's Approach, McGraw-Hill.

Sproull, L. and Kiesler, S. (1991) Connections: New Ways of Working in the Networked Organization, The MIT Press, Cambridge, MA.

Sproull, L. and Kiesler, S., (1988) 'Reducing Social Context Cues: Electronic Mail in Organizational Communication', in Greif, I. (ed.), Computer-Supported Cooperative Work: A Book of Readings, Morgan Kaufman Publishers Inc., San Mateo, CA, pp. 683-712.

Weisband, S.P. and Reinig, B.A. (1995) 'Managing User Perceptions of E-mail Privacy', Communications of the ACM, Vol. 38, No. 12.

Whittaker, S. and Sidner, C. (1996) 'E-mail Overload: Exploring Personal Information Management of E-mail', Conference proceedings on Human factors in computing systems, pp. 276 - 283.