

AN OVERVIEW OF RESEARCH ON ELECTRONIC JOURNALS

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ABSTRACT

The concept of the electronic journal is one which involves using a computer to aid the normal procedures whereby an article is written, refereed, accepted, published and read. With the help of suitable software an author may enter a text into a system, and the editor, referees, and ultimately the readers can access the article in its final form through their own computer terminals. The first research study of this concept was conducted in the USA in 1978 to 1980 via the Electronic Information Exchange System (EIES) at the New Jersey Institute of Technology. The second and more successful research study was conducted in Britain in 1980 to 1984, organised jointly by two Universities as the Birmingham and Loughborough Electronic Network Development (BLEND).

The background of electronic mail and computer conferencing, and the research studies into the possibilities of electronic journals, are outlined in this paper. Finally, some of the needs for the future are discussed. If technical conditions permit an on-line demonstration will be arranged.

1. INTRODUCTION

Electronic communication networks enable people to exchange information, views and ideas by media other than paper and the spoken word. Material to be exchanged is entered into a computer store by a variety of means, and is accessed on-line through local terminals. These networks are relatively new and little explored from the user's viewpoint. Research is needed to establish their potential and to assess the problems and costs of using them for different purposes, now and in the future. As acceptability of a system to users largely determines the extent of its use, particular attention is being given to the psychological and ergonomic aspects of these problems.

In this paper the basic characteristics of electronic mail and computer conferencing systems are first summarised. The background leading to the concept of electronic journals is outlined. The results of the first research study of this concept in the USA are then briefly discussed, and some results of the British BLEND project are reviewed. Finally, some issues and research needs from these studies for the future are presented.

2. ELECTRONIC MAIL AND COMPUTER CONFERENCING SYSTEMS

'Computer Conferencing' is a new and growing medium to aid scientific and technical work; it has some similarities to but is essentially different from 'Electronic Mail'. These two systems are electronic, computer-based ways of providing similar functions to conventional mail services and conference facilities. While voice and video methods will become common in due course, most communication at present is via typed and printed text. An important difference between electronic and conventional methods is that the mail or conference papers are not delivered to your desk; you dial up and 'log in' to a computer to collect your electronic mail or to join in the computer conference.

2.1 What is Electronic Mail?

When you subscribe to an electronic mail service you are allocated a 'mailbox' within the computer. Messages coming into the system for you are 'posted' to your mailbox and you can read them at any time. Similarly you can write messages and 'post' them to the mailbox of any other subscriber on the system as long as you know the mailbox number. Your message is normally typed in to the system using a simple terminal and the mailbox is interrogated in the same way. Note that it is usually necessary to interrogate the mailbox to see if there are any messages; few of the systems provide dial-out facilities to send the mail directly to your terminal.

At the heart of any electronic mail service is a computer system owned and operated by the electronic mail service providers. In the case of the Telecom Gold electronic mail system in Britain, the computer is owned and operated by British Telecom and this is a networked mail system with a number of interlinked machines, each containing a number of mailboxes. The UK Joint Academic Network (JANET) mail system is also networked with a large number of computer-based mailboxes at different University and Research Council sites. There are also 'star-connected' electronic mail systems

based upon a single machine which contains all the mailboxes. In Britain there are at least 7 commercial and 5 research networks providing nationwide electronic mail facilities. At present, there are only limited facilities for inter-connecting different electronic mail systems but industry enthusiasm for a recent CCITT standard (X.400) should result in products and systems which will make such interworking much easier.

Some electronic mail services, such as Easylink and BT Gold, allow you to receive telexes directly into your mailbox and to send telexes without having to own a telex machine yourself, thus making a saving on capital and operating costs. Other systems are designed to allow word-processors or personal computers to exchange messages and documents. These are natural extensions of the original simple concept of inter-personal electronic mail.

It should be noted that these systems should be considered merely as mechanisms for the movement of electronic envelopes - they do not concern themselves with the contents and they do not guarantee coding and format compatibility of documents or messages transferred.

2.2 What is Computer Conferencing?

When you join a computer conferencing system, you are registered as a named user and given instructions on how to log into the system. The method of operation is different from that of electronic mail. You are made a participant member of one or more conferences, and when you log in to the host computer you are given the choice of which conference you wish to join together with an indication of whether there is new material in that conference hitherto not seen by you. When you enter the conference itself, you will then be able to read any or all of the material in it. But this is not like a mailbox. All the 'public' material written there is for any participant member to read, and comment upon if he/she so wishes, as in a conventional conference. When you type any contribution into that conference, you do not have to address it to any mailbox, because it is automatically stored in that conference for other members to read.

Computer conferencing systems basically enable users to make 'public' statements which appear in a sequence of text entries very similar to the typewritten record of conference discussions. In any one system there can be many conferences, each with a different name, on different topics; the system keeps a record of every participant member and of the text entries

he/she has seen. Thus the user does not have to address his contributions to a list of recipients, but merely writes them and they will be seen by the other members on the next occasion of entering that conference. Most systems enable 'private' notes to be sent by one member to another, and in this way have some features similar to electronic mail. Because the system records what every person has seen, it can also inform members, by a suitable code, when new material exists which they have not seen.

Like electronic mail, the system is for the most part unaffected by the contents of the public entries or private notes, and provides a kind of 'envelope' for passing on these entries and notes to other conference members. However, some systems provide useful additional facilities, such as enabling questions to be presented for answering and votes to be taken. Similarly, most systems enable simple editing, filing of material, copying of material (for example, a note from one person copied on to another or into a conference as a public entry), etc.

At present there are no public or commercial computer conferencing systems in operation in Britain. There are two experimental systems and one being operated under the aegis of ESPRIT. The BLEND system was developed in an experimental programme, supported by the British Library, to explore the concept of electronic journals and various types of communication between scientists using a conference system; it is hosted at Birmingham University and the user communities are managed from Loughborough University. The COM system operated at the University of York is similarly experimental, to enable exploration of the COM computer conferencing system developed by Dr. Jacob Palme at the Computer Centre of Stockholm University. The European ESPRIT programme has installed a version of COM at a host computer in Dublin to provide communication for organisations participating in the ESPRIT programme; the Eurokom system is the nearest to a service and it is used widely by the many commercial companies and academic research groups involved in the ESPRIT programme.

2.3 The Current Position

It will be evident from the above that there is considerable activity and still much development going on with these types of electronic communication system. Almost all are 'first generation' systems in terms of the sophistication of the facilities provided and especially in terms of their ease of use. As experience is gained no doubt systems will be improved and

basically new generations of systems will be developed. But there is no need to wait for such improvements; these methods of communication are already widespread in Europe and North America, and anyone interested is encouraged to seek advice and gain experience in their use.

3. BACKGROUND - THE GROWTH TO ELECTRONIC JOURNALS

Several people suggested in the late 1970's that the electronic medium could be used to assist or even replace the traditional form of scientific publishing, that is to produce 'Electronic Journals'. The genesis for this development came from computer conferencing, which must be distinguished from the other types of teleconferencing. There are three familiar types of teleconferencing which can be summarised as follows:

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audio conferencing via telephone,
                        for which the medium is VOICE,
video conferencing via telephone + TV,
                        for which the medium is VOICE + EXPRESSION and
telex conferencing via telex system,
                        for which the medium is PRINTING.
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One of the important characteristics of the three methods above is that the communication is simultaneous and synchronous; within seconds of a message being transmitted it is received by the person at the other end. By contrast, the essence of computer conferencing (for which the medium at present is usually printing) is that it does not have to be and usually is not synchronous. Each user looks into the host computer, via his terminal and the public telephone network or equivalent connection system, at a time convenient to himself. He will then receive messages and other information which have been sent by other users perhaps hours, and even days or weeks, previously.

The beginnings of computer conferencing are to be found in military command and control networks, the Washington-Moscow 'hot line' via telex, and the ARPAnet message system initially supported from defence research funds but now used worldwide for experimental communication between scientists. The early research in computer conferencing began at the Augmentation Research Laboratory of Stanford Research Institute, at the Institute for the

Future in California, and in the Electronic Information Exchange System (EIES) at the New Jersey Institute of Technology. From this early work, computer conferencing is now already established as a medium to aid scientific and technical work (cf. Hilz & Turoff, 1978; Johansen, Vallee & Spangler, 1979). Several people have suggested the use of this medium to assist or even replace the traditional form of scientific publishing, that is to produce 'Electronic Journals' (cf. Senders, 1977); he pointed out their potential importance in view of the rising costs of materials, production, publishing and library facilities.

Taking a much wider view of the whole process of dissemination of scientific information (through primary and secondary publications) and of its storage and retrieval (through libraries and information services), Lancaster (1978) has envisaged the possibilities for paperless information systems to the year 2000. His enthusiasm may lead to some oversight of many detailed problems, but he may well not be too far in error with his general thesis and scenario. Meadows (1980) has also considered these future possibilities in a shorter but perhaps more pragmatic and rounded review of the practical realities. A study of the scientific information system in the U.K. was published recently (Royal Society 1981), in which it is shown that this system, so long taken for granted by scientists, can no longer be regarded as stable. Recommendations are submitted for urgent consideration by the public authorities responsible. In the chapter of the report which reviews the impact of various new technologies, the electronic journal is seen as 'perhaps the most radical innovation in prospect for the primary literature'.

4. THE FIRST USA ELECTRONIC JOURNAL PROJECT

The first 'Electronic Journal' project was established with funding from the National Science Foundation on the EIES network for 3 1/2 years from October 1976 to March 1980. Within that programme there was a project to explore a traditional form of refereed papers journal for 1 1/2 years, October 1978 - March 1980. This project did not achieve all its objectives (see the final report - Sheridan et al 1981), but some useful learning can be gained from the problems and possible reasons as suggested by various persons involved with it (see Figure 1, which contains the author's conclusions based upon the available evidence).

USA 1978-80 REFEREED PAPERS JOURNAL PROJECT

1. Too many projects and users - caused long and variable system response delays
2. Too complex command structure and editing system for 'computer-naive' users
3. Inflexible procedures -
 - only on-line input allowed
 - absolute assignment of copyright required
4. Unpublished experimental 'journal' has low prestige status so authors hesitate to give papers.
5. Terminals of limited capability probably discouraged users (great improvements since 1978)
6. Involvement of user community not stimulated by, for example, face-to-face meetings
7. Project duration probably too short (1.5 years)

Figure 1. Problems and possible reasons for limited success of EIES refereed papers journal project - note that many are human factors issues

Human factors issues, in particular, were noted in the final report (Sheridan et al 1981, p 80)

"many users commented on the human engineering and their difficulties with the hardware and software of the user interface",

and Senders (1980) drew especial attention to the ergonomics problems.

On the other hand, it would be wrong to suggest that the EIES project as a whole was not successful. Other types of 'Electronic Journals' on the system were more fully supported: a weekly newsletter was published and found very acceptable; an unrefereed papers journal (Paper Fair) received over 40 papers during 6 months; a structured enquiry response system among 25 scientific advisers to state legislatures was considered to be very useful.

5. THE BRITISH BLEND PROJECT

With the above background, the BLEND project was established in 1980. The initial aim of the British Library was to study the traditional type of journal in electronic form, because Post Office regulations at that time prevented the planned British involvement in the US EIES project. However, a review of some of these background factors led to a broader proposal which was accepted by the British Library Research & Development Department (BLR&DD). The aims of the BLEND experimental programme were therefore agreed to be those set out in Figure 2. The main stages of the BLEND programme are listed in Figure 3. Since the plans and progress have been fully described elsewhere (Shackel 1982a, 1982b, Shackel et al 1983) they will only be reviewed briefly here.

UK 1980-84 BLEND EXPERIMENTAL ELECTRONIC JOURNALS PROGRAMME

- Aims - to explore and evaluate
the usage of an electronic communication network
- as an aid to submitting and refereeing papers
 - and as a medium for other types of
scientific and technical communications
- Thus - the study was to concentrate much
attention upon many aspects of
human-computer interaction in the widest sense
- the method was to develop a system and
community and then to explore alternatives
(alternative procedures, types of journal, input methods, etc)

Figure 2. Aims of the BLEND Experimental Programme on Electronic Journals

UK 1980-84 BLEND PROGRAMME - STAGES

1. Set up software on a host computer
2. Set up first group of users
3. Set up various electronic journals
4. Enhancement of the system
5. Other groups of users introduced to the system
6. Analysis and evaluation of the system and groups of users
7. Appraisal

Figure 3. Main stages of the BLEND Experimental Programme

5.1 Types of Journal Explored

The types of communication between scientists can range from the very informal chit-chat over coffee, through discussion and questions at conferences, to the very formal refereed papers journal (see Figure 4). All of these were explored during the BLEND programme.

UK 1980-84 BLEND PROGRAMME - TYPES OF JOURNAL

1.	Chit-chat	Informal
2.	Work Messages	:
3.	LINC News - network & related information in a monthly newsletter	:
4.	Enquiry-answer system between experts	:
5.	Bulletin - project and work progress reports	:
6.	Annotated Abstracts Journal	:
7.	Discussion and Questions on Papers	:
8.	Poster Papers Journal	:
9.	Refereed Papers Journal	Formal

Figure 4. Types of communication and 'journal' implemented in BLEND

To study these types of communication and 'journal', it was planned from the start of the BLEND programme that several different communities, with different types of work and subject contents, should be brought on to the BLEND system during its operating life. The research summarised here is mainly that carried out with the first community established, the Loughborough Information Network Community (LINC). The members of LINC were approximately 40 scientists, all studying or involved in Computer Human Factors.

During the course of the BLEND programme all these types of journal (Figure 4) were explored to a varying extent. There was extensive usage of the chit-chat and work messages activities; these, together with LINC News were the first part of the news conference which formed the starting point of usage for all LINC members. The monthly newsletter, LINC News, was produced regularly throughout the four year duration of the programme. The enquiry-answer facility was not used as much as had been expected and the Bulletin formed more of an archive of progress reports upon project work and the record of the annual LINC discussion meetings.

The Annotated Abstracts Journal was an interesting and successful exploratory development; full details are given in papers by Pullinger and Howey (1984) and Shackel (1985). The Poster Papers Journal and the later Software Reviews journal, which contained papers as submitted by members without any refereeing, archived together 41 papers. The Refereed Papers Journal received more than 25 papers and archived a total of 18 fully refereed papers in four issues. Both these more formal journals contained appropriate areas for Discussion and Questions on Papers, and quite good use was made of this facility.

Considerable improvements were needed, during the course of the BLEND programme, in the software facilities (Dodd et al 1985, Pullinger 1984). Again, much work had to be done and advice given to members about communications and hardware. This advice, together with successive versions of user manuals, and with training and help via a telephone and answerphone service, provided extensive user support to the community. The final reports on the BLEND programme are being published in the British Library series of Library and Information Research Reports.

From the research so far, some more general views are now offered about the issues to be considered towards the future of electronic journals. Most are based upon evidence, but I must emphasise that some are more speculative and based upon opinion.

6. FUTURE NEEDS

Some general conclusions from the research so far are now suggested as the bases for approaches in the future towards regular electronic journal systems.

6.1 Software

Currently available computer conferencing systems are not well-suited for writing, editing and refereeing scientific papers by electronic means (not that they were expected to be). They are either too complex for easy use or cannot easily handle large texts. Similarly, electronic mail systems do not provide additional facilities to aid the handling of scientific papers in electronic form.

Although NOTEPAD, the software used for BLEND, is probably the most usable computer conferencing software suite, it is not 'ideal' even for that function. LINC members with experience of other systems have been able to indicate limitations in the NOTEPAD software. Several such studies could usefully be made to confirm the user needs and define the user-oriented specifications for prototype 'ideal' systems to subserve:-

1. Mailing activities
2. Conferencing activities
3. Journal activities
4. All three combined.

Of course, it may be that such studies will reveal the above distinctions to be inappropriate and will lead to more valid concepts. However, at present it seems that the software to subserve the future scientific communication system will probably need to combine both electronic journal and conference/mail systems. Similarly, it will need to interface & be compatible with information databases and retrieval systems. A vital facility will be to enable users to run programs, as subsidiary processes from within the suite, as NOTEPAD does; this is a principal way to ensure the required flexibility for the users.

6.2 Hardware and Communications

These are considered together because the user sees them all as one item of service and often all in one 'black box' - or they ought to be - apart from the remote host computer which he need never see and of which he should seldom be aware. The trend is now towards both the telecommunication items and a local computer all to be inside the user's terminal.

While computer developments may well overtake this structure of the remote mainframe host (with the system instead distributed among the local terminal computers), for the present it is still useful to view the future of electronic journal systems in this way. The type and size of the remote host are not matters for this review, vital though they are of course; however, one aspect should be noted - service.

An electronic journal system, combined probably with both mail and conferencing for scientists, will be seen as a basic service. Therefore, to be acceptable it must be available 24 hours per day, and it must have

adequate capacity. Users must never suffer a degradation of more than 5 sec. response time to any input, if delayed by a load-sharing polling system (and a delay more than 2 sec. should not occur more often than, say, once per 30 minutes); nor should there ever be more than 100 msec. response delay in duplex echo back when given a time slot by the polling system. Normally (ie. at least 95% of an assumed working day 8 am to 8 pm) the response should only be limited by the telecommunication channel speed in use.

6.3 User Support

Scientists using electronic journals are in effect intelligent but occasional discretionary users of the electronic medium. Therefore they need very full 'user-support' in the form of comprehensive but clear and simple manuals; the manuals may need to be supplemented by some training; or by on-line tutorial programs; in addition on-line 'help & advice', by being able to write to someone directly, will be useful; as also will be off-line 'help & advice' via telephone and answerphone. These user support methods have been proved essential by research and experience, but more research is needed to develop more efficient and cost-effective methods.

6.4 Broader Issues

The above has reviewed many technological issues which need to be considered. In addition, many organisational, bureaucratic, social or psychological problems were revealed by the surveys and experience, within the BLEND programme, to add to the present known technological limitations. The attitudes inside institutions towards 'ownership' and control of new technology may be expected to change as the general attitudes in society change. The technology will improve considerably; indeed all the facilities which we at present speculate to be needed do exist somewhere already, but of course at a price.

The ultimate and most important issues are those addressed by psychology/ergonomics/human factors. The terminals must be easy to use and appropriate for the tasks involved. The software must be easy to learn and well-matched to all the procedures required of it by the users. The whole system must be readily available, and either be easier and quicker to use than existing methods or be so much more powerful that the extra time or effort involved is considered by the user to be on balance an acceptable cost.

The basic ergonomic issue is, of course, that we are all very familiar with paper journals and other traditional forms of communication. By long-term adaptation to both the tools and the processes of using paper, we regularly glance at the pigeon hole or doormat to see what mail awaits us, with the envelope size, shape and colour frequently enabling assessment of the priority of dealing with its contents; again, a skim through a journal gives us the idea of how much effort will be required for a particular paper. Reading and other tasks are easy to stop temporarily in the middle, with a finger in the right place while doing something else, and then, with another glance to see how far we are and how much longer it may take to finish, we pick up and continue again. The computer medium does not as yet facilitate any of these well developed procedures between people and their tools - we shall need the aid of an 'electronic finger' as it were. To be successful, the electronic journal will have to provide the equivalent of these easy procedures and then add significant additional capabilities.

7. CONCLUSION

It is hoped that this paper has provided a fair summary of the research so far, and some useful suggestions for the possibilities ahead. It should be emphasised that the research so far is based entirely upon the author-referee-editor section of the journal publishing cycle with a closed reader community and not upon experience of 'electronic publishing' as such to a commercial market. Nevertheless, it is believed that many of the results relevant for the future have at least been discerned.

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