The Electronic Journal: A User's Perspective.

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Introduction

As a user, why should I care about the medium in which a journal is stored or delivered? To put it another way, what is wrong with the paper journal? If you ask academics that question, the replies you get will usually refer to the fact that the paper journals often seem to be missing (either in use by someone else, mis-shelved, gone for binding, etc.), difficult to search through when looking for a half-remembered item of information, and take up too much space in the book-case.

The problems of the paper journal are exacerbated by the fact that new journals are appearing at an alarming rate:

> "There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers – conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial."

Vannevar Bush, the first director of America's Office of Scientific Research and Development, wrote that comment in 1945 and few would suggest that the situation has improved in the intervening years.

On the other hand, if you ask people what they like about the paper journals the replies tend to refer to their portability, the ease of browsing through an issue and even the possibility of 'finding things by accident' while browsing.

How, then, could the electronic journal help the user? We can begin to answer this question by considering some of the experimental journals which have been developed.

Some Electronic Journals

BLEND

The BLEND project (Shackel, 1982; 1991) aimed not only to investigate the feasibility of an electronic journal but also the feasibility of supporting the entire communication process – from authoring and submitting, through refereeing and editing, to publishing – via computer. To this end, a central mainframe was used and the various participants in the process communicated through this machine, with the resulting issues of the journal *Computer Human Factors* being stored on it. Users accessed the system via a remote terminal either over the Joint Academic Network (JANET) or the Public Switched Telephone Network (PSTN).

In at least one respect, *Computer Human Factors* proved superior to a paper journal. Although each article was 'read-only' once issued, there was space allocated for comments to be entered on each article and these comments could then be seen by subsequent readers of the article. The fact that the articles' authors were also part of the 'electronic community' meant that they too could read — and respond to — the comments. The resulting dialogue created much more of a feeling of 'live' research

than is possible in the paper medium where the time between submission and publication is often over a year.

While successful in this respect, *Computer Human Factors* was not without its problems. For example, it suffered from the technology of the day — poor screens, low transmission rates and so forth. Movement through the articles was slow and so, not surprisingly, users preferred to print copies of articles that they wanted to read in their entirety. The articles themselves were restricted to plain ASCII text and 'typewriter graphics'. Also, at the time of the BLEND project, terminals were not so readily available. Typically, terminals would be located in the university's computer centre (which could well be in a different building to the academic's office) and would frequently be in use by other users. This is in contrast to the present position where most academics have some sort of computer on their desk (Shackel, 1990) and in many cases it is connected into the campus Local Area Network.

QUARTET

Project QUARTET aimed to investigate the implications of information technology for the scholarly communication process. It was therefore somewhat wider than BLEND, being concerned with a broad spectrum of communication activities including electronic mail, computer based conferencing, electronic document delivery, desktop publishing and electronic publishing (Tuck et al., 1990). As part of Project QUARTET, colleagues and I designed and built the world's first hypertext electronic journal, HyperBIT[1]. This was intended not as a replacement for the library archive copy of the journal but rather as an electronic version of the personal subscription. Our design was based on the results of various earlier studies by us of journal usage (e.g., Dillon, Richardson and McKnight, 1988) and, as such, specifically addressed the issue of user requirements. Hence, browsing through author/title lists at either the issue or volume level was supported, as was searching the entire contents of the journal. Each article was structured using the Guide™ hypertext system and cross-references in articles were made into active hypertext links, allowing the reader to move quickly and easily between articles. (A more complete description of the design is given in McKnight, Dillon and Richardson, 1991.)

HyperBIT offered the user several advantages over the paper version. For example, it was always available on the desktop (whereas the paper version might well have been borrowed by a colleague). The entire contents of the journal could be searched in order to locate, say, all articles which mentioned 'screen' or referred to work by 'Eason'. The ability to move between related articles using the hypertext links was also advantageous, as was a pop-up window facility which provided instant access to the bibliographic details of references without leaving the text[2].

The chief disadvantage of HyperBIT compared to the paper version concerned graphics. Although the Macintosh system on which it was implemented allowed the display of quite sophisticated graphics, animation and sound, the screen resolution was far lower than the resolution available to produce the average paper journal[3]. In many cases this is not a real problem — the line art typical of diagrams and graphs presents no difficulty. However, the display of half-tone photographs, for example, is not really feasible on a standard Macintosh screen.

1. The journal used was *Behaviour and Information Technology (BIT)*, published by Taylor and Francis whom we gratefully acknowledge for allowing its use.

2. This facility was provided on the basis of observations of many users who would keep a finger permanently in the References section of the article when using the paper version, turning to the section when they encountered a reference in the text and then returning to the text. In this sense it provided an 'electronic finger'.

3. Typical screen resolution is 72 dots per inch (dpi) whereas a typical typesetting machine has a resolution of 1200 dpi — roughly 16 times better!

ADONIS

Before I am criticised for mis-representing the ADONIS project, let me say immediately that the project itself was not concerned with the electronic journal. The principal aim of ADONIS was to utilise information technology in order to increase the profitability of document delivery without increasing the end user price (Campbell and Stern, 1987). To this end, a workstation was assembled comprising a desktop microcomputer with built-in CD-ROM drive, a high resolution (300 dpi) A4 screen and a laser printer. A total of 219 biomedical journals were digitally scanned as they were issued and the resulting images stored on CD-ROM, yielding one new CD-ROM each week on average. The workstations were sited in test libraries such as the British Library Document Supply Centre at Boston Spa and the idea was that where possible a document request would be satisfied by retrieving the article from the CD-ROM and outputting it to the laser printer. The normal alternative to this process involves locating the journal issue on the shelves and placing a marker there, taking the issue to the photocopier, copying the article and returning the issue to the shelf at the marked place.

As part of Project QUARTET, colleagues and I undertook various investigations of the ADONIS system. For example, the feasibility of requesting a document via electronic mail and having it delivered over a high-speed telephone line to a local fax machine was demonstrated. More interesting in the context of the electronic journal were the studies we made of the system as a resource for direct use by academics. Ostensibly, such a system might be thought to offer the scholar a great deal and the reasons why it failed to do so provide valuable insights into the problems of electronic journals.

Like HyperBIT, the ADONIS system suffered the problem of screen resolution. Although the system used a high resolution screen, biomedical journals make frequent use of photographic material which could not be displayed adequately. In addition, although the system software allowed for searching on normal bibliographic details, the fact that the journals were stored as bit images meant that a full text search was not possible. Display of the pages was extremely slow and movement through an article was only possible one page at a time so users found it frustrating as a way of viewing journals. Also interesting was the finding that 219 journals were simultaneously too many and not enough. They were too many in the sense that no single user was interested in more than a small proportion of the 219. However, as a proportion of the biomedical literature as a whole, 219 is only a small part — Medline, for example, covers about 3200 journals — and hence for most users the system did not contain their favourite journals.

LISTSERV

In recent years another model of the electronic journal has arisen based on the LISTSERV software. This name is an abbreviation of 'list server' which gives some insight into how the system works. In a typical system, a central computer holds a list of subscribers; when a new issue is available, the system sends subscribers a 'contents page' and abstracts via email. Subscribers can then request articles by sending an email message to the server, with the articles being automatically delivered as email by the software. The *Directory of Electronic Journals, Newsletters and Academic Discussion Lists* (Okerson, 1991) lists 27 such journals which are now distributed in this or a similar manner over the global academic network.

Although the concept of 'issue' is still used, the issue itself is effectively unbundled since subscribers can request single articles. However, the contents pages and abstracts can be stored for future reference and searching, and articles can be retrieved at any time on demand. Such a system makes

effective use of the network 'bandwidth'[4] since only requested articles are transmitted. How many academics could honestly say they are interested in every article of every issue of every journal they receive? Even when the journals are on their shelves, they don't remember what is in them.[5]

Unfortunately, in order to reach a wide audience, the LISTSERV journals are transmitted in a form which makes few assumptions about the type of computer which will be used by the recipient. In practice, this means that they are usually limited to plain ASCII text with fixed line lengths. Hence, the appeal to the lowest common denominator is still as real today as it was for the BLEND project.

So What is Still Missing?

One desirable aspect of the paper journal which to the best of my knowledge has not yet been tackled in the electronic domain is its portability. A survey by Simpson (1988) suggested that many academics like to read while on trains or at home rather than in their office or the library. A journal on CD-ROM could be carried easily between office and home but would require equivalent equipment at both places. However, there are certainly portable electronic books being developed and it may well be that the portable electronic journal will follow behind. The current growth in laptop computers and the imminent arrival of 'notepad' computers, combined with a storage medium such as the smart-card, could well support portable electronic journals.

4. The term 'bandwidth' refers to the amount of information per unit time which can be transmitted over the network. In hydraulic terms, it is analogous to the diameter of the water pipe.

5. Shackel (1985), for example, reports on an electronic search of a references and abstracts database: "...33 [references] were subsequently used in the preparation of the written chapter. Of these 33,16 were already known to me, but 17 were new, highly relevant references...In almost all cases the relevant journals were on my bookshelves."

Although systems like HyperBIT allowed a reasonable level of graphics, this was achieved by making the system machine specific. Displaying the same graphics on different systems is difficult — file formats such as the Graphical Interchange Format (GIF) do exist which allow this, but few software packages other than dedicated viewing programs can deal with such formats. Furthermore, the resolution of typical screens is not yet sufficient to allow the use of such graphic items as photographs — again, such systems do exist but they are far outside the purchasing power of most users.

Those electronic journals which are distributed over the network must also recognise the fact that they are most readily accessible to the academic market. There are many researchers located in industrial research laboratories who have no access to this network. In America at least, an increasing number of companies are connecting into the network, but in Britain the take-up rate is very slow in the industrial and commercial sectors.

Although The ARL Directory lists 27 active electronic journals, only seven of these are the subject of peer review. This raises an important issue which must be addressed by the distributers of an electronic journal, that of quality control. In the paper journal system, the process of refereeing acts as an important quality control mechanism. While the system is open to various criticisms, it does confer an aura of respectability on the journals to the extent that academic status and recognition rely on publishing in such journals. The early EIES project (Sheridan et al., 1981) had discovered to its cost that academics could not afford to risk publishing in experimental journals and the BLEND project had allowed authors subsequently to publish in paper journals specifically because this problem was recognised. Hence, if electronic journals are to be successful and attract quality articles, they must be seen to be applying the same

standards as their paper counterparts.

Some Other Issues

In this paper I have been specifically concerned with the user's view of electronic journals. However, there are many other important considerations in the development of an electronic journal which need to be taken into account. For example, the question of copyright control is of particular concern for publishers. Although the paper medium is relatively easy to copy using a photocopier, the resulting copy is of inferior quality to the original. In the electronic domain, copying is not only easy and fast but also the resulting copy is identical to the original. If I receive an article over the network, it takes me no more than a few key-presses to forward a copy of the entire article to someone else. This means that either methods of electronic copy protection must be developed or the concept of copyright must be reconsidered.

In the paper domain, if I order a journal I either have to pay for it myself (a personal subscription) or I must have agreement that the department or university library will pay. If I receive a listserv journal, however, it is not clear who pays. Certainly there are costs involved, but they are costs which are largely transparent to the user. The storage costs are met by the host institution, usually a university and in this respect we may be witnessing a return to the situation in which universities were also publishing houses. My access to the network is paid for as part of the general funding for computing within the university and I don't receive a bill. Hence, it may well prove necessary to develop new costing models for the production and distribution of journals in the electronic domain.

I have also used phrases like 'global academic network' when a more accurate term might be 'western developed nations academic network'. Although there are advantages to the development of electronic journals, it must be recognised that such developments exclude a large number of users of the paper journal system — those users in countries that do not yet have a stable network or even an established computer base. Clearly, the hope is that such countries will develop a computing infrastructure eventually. I would not argue that we should not develop electronic journals because they presently exclude such countries, but we must recognise that access for a large number of potential users is currently impossible.

The Future

While the paper journal will be with us for many years yet, it is clear that the electronic journal is here to stay and several projects are currently under way investigating different aspects of the phenomenon. For example, the CORE (Chemistry Online Retrieval Experiment) project's aim is to deliver a large majority of the journal literature needed by one academic area in electronic form to workstations in a library and terminals on the desks of academics. Articles are held in both text and bit-map forms and a variety of interface options are being investigated (Landauer et al., 1992). The CORE project represents a collaboration among five institutions: the Cornell University Albert Mann Library houses and administers the experiment; the American Chemical Society is providing ASCII and microfilm versions of the last 10 years of 20 journals; the Chemical Abstracts Service provides electronic versions of their hierarchical indexing scheme tagged to all of these articles; the Online Computer Library Center (OCLC) is contributing expertise in large database storage, access and search techniques; and BellCoRe is contributing expertise on text and graphic conversion and transmission as well as developing prototype user interfaces.

The TULIP (The University Licensing Program) project, due to have started in September 1992, also aims to make journals

available over the network. Elsevier Science Publishers will make 42 of its materials science journals available to the 15 colleges and universities (including MIT, Harvard, Carnegie Mellon, Cornell and Princeton) that are participating in the experiment. The project will examine the economic, legal and technical issues involved in the electronic transmission of journals as well as considering user issues. In the first instance the journals will be stored as bit-maps (as was the case with ADONIS) which will severely restrict the ability to perform searches at the document level, although bibliographic searching will be possible.

The American Association for the Advancement of Science (AAAS) and the Online Computer Library Center (OCLC) have also launched an electronic journal, *The Online Journal of Current Clinical Trials.* This was due to be launched in April 1992 but was beset by technical problems and has only recently got under way. In addition to the technical problems facing the project, Wilson (1992) reports that "the AAAS must persuade authors to submit high-quality papers in a new medium that may prove to be largely ethereal". Although this problem will obviously decrease as the number of quality electronic journals increases and authors become more confident of placing their work in the electronic domain, it seems that the situation is still not much different from that experienced by the EIES project mentioned earlier.

Lest it seems that currently only the USA is interested in the electronic journal, I would like finally to mention a British project involving the Institute of Physics Publishing (one of the few British companies that is connected to the network) and Loughborough University with support from SCONUL. This project, funded by the British Library Research and Development Department (as were BLEND and QUARTET), will look at a variety of economic, technical and user issues involved in the electronic distribution of a journal. In the TULIP project, collaborating libraries will receive the electronic version of the journal free of charge if they already subscribe to the paper version. However, in the British project (which does not yet have an acronym!), both the paper and electronic versions will be provided free of charge to collaborating libraries (including at least one industrial library).

What all of these projects suggest is that the development of an electronic journal requires the collaboration of all the participants in the scholarly communication cycle — readers and authors, libraries and publishers in addition to electronic communication and information technology specialists.

As a user, I don't care what medium my journals are delivered in as long as I can perform the tasks that I want to with them. Electronic journals could offer me several advantages over their paper equivalents, but it is not sufficient for them to be electronic — they must be usable. It is usability which will determine the eventual success of the electronic journal.

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