Designing the Electronic Journal: Why Bother?

Cliff McKnight

Paper presented at the UKSG 20th Annual Conference, Edinburgh, April 1997

There is now an established body of research relating to user interface design. However, publishers have ignored this research on a grand scale, preferring instead to produce electronic journals which depend on existing interfaces such as Adobe Acrobat. The present paper examines the success of such interfaces in supporting common user tasks such as browsing, skimming and reading. The relative advantages of the paper and electronic formats are briefly considered and it is suggested that research into the human acceptability (as opposed to the technical feasibility) of such approaches is needed.

Dr Cliff McKnight is a Reader at the Department of Information and Library Studies, Loughborough University, Leicestershire LE11 3TU
c.mcknight@lboro.ac.uk

Introduction

When Ben Shneiderman said "Frustration and anxiety are a part of daily life for many users of computerized information systems" (Shneiderman, 1987) he was drawing attention to the importance of user interface design. He went on to say that "Researchers have shown that redesign of the human-computer interface can make a substantial difference in learning time, performance speed, error rates, and user satisfaction."

The traditional approach to design typically began with some form of functional requirements definition, moving through design and build stages, with a late stage being user acceptance testing. Such an approach was often represented as a 'waterfall' model with the process continually flowing 'downwards'. As a metaphor, the waterfall certainly captured one of the difficulties of such a process in that problems identified at the acceptance stage were difficult to correct — it's hard (and expensive) to push water uphill!

More recent approaches to design have tended to be 'user centred', involving the user at all stages of the design process. The first stage in user centred design involves a user requirements analysis which in turn requires an understanding of the user's task domain and task requirements as well as an understanding of user characteristics. Such an approach does not deny the existence of other 'stakeholders' but does focus on the primary users since it is assumed that it is their satisfaction (or lack of it) which will determine the success (or failure) of the system. An example of such an approach to the design of an electronic journal interface can be found in McKnight, Dillon and Richardson (1991, Chapter 7).

Using the electronic journal

How do people use journals, what do they do with them? A variety of studies have considered this question from different perspectives (e.g., Pullinger, 1983; Sabine and Sabine, 1986; Dillon,

Richardson and McKnight, 1989). However, for present purposes I will concentrate on three broad categories of user behaviour: browsing, skimming and reading.

Browsing is a fairly non-specific process in which people gain a rough indication of what is on offer. Browsing journals in a library will typically involve looking along the shelves of current issues in the subject area of interest, picking up an issue and looking at the table of contents which usually contain little more than titles and authors' names. If you ask readers what they are looking for at this stage, they will typically say 'nothing in particular, I'm just seeing what is around'.

If a title or author 'catches their eye', they may turn to the paper and 'take a closer look'. This will typically involve a non-serial type of reading in which sections such as the abstract or results are *skimmed* and whole sections are ignored. Depending on the discipline, this stage may involve little more than looking at structure diagrams or equations and paying very little attention to the textual content of the paper.

For many papers, this is as far as it goes — the reader decides that the paper does not merit further attention and reverts back to the browsing process, perhaps selecting a different article or even a different journal issue. However, for some papers the reader decides that it merits more interest and therefore determines to *read* it at some stage. This third type of interaction will involve an essentially serial process in which most sections of the paper are read in detail. If the paper is particularly interesting, the reader may take a photocopy for retention and may highlight passages or write comments on the copy.

These three types of behaviour involve differing levels of cognitive engagement, with browsing being towards the low end of the scale and reading being towards the high end. The electronic journal must support at least these activities.

Designing the electronic journal

Given what we know about interface design and user tasks, we might reasonably expect designers to use such knowledge in order to

produce an effective and efficient interface to an electronic journal. However, the current trend in the publication of electronic journals is to side-step the design stage and make the journals available in a format accessible via existing software. For example, the Academic Press IDEAL[1] service relies on the user having a World Wide Web browser in order to access the Press's server and read abstracts of articles. The full text of the articles are held in Adobe's PDF format and therefore require the Adobe Acrobat reader in order to access them.

There are strong arguments in favour of using software such as web browsers. For example, they are free to individual academic users, available for several hardware platforms and many users are already familiar with them. Their use is certainly preferable to publishers each developing their own proprietary interface, which would then entail users having to learn (and possibly purchase) several different interfaces in order to access their journals. Such arguments lead to the question in the title of this paper — why bother designing a user interface? Unfortunately, such arguments neglect the suitability of the interface — given that the World Wide Web was not designed specifically with journals in mind, how suitable are packages such as Netscape and Acrobat as interfaces to electronic journals? In order to answer this question, we must consider how well they support the tasks which the users of journals perform since the electronic version will be required to support at least these tasks and preferably offer added value.

Supporting user tasks

Browsing electronically is clearly different from the paper-based activity. While the library shelves contain journals from many different publishers, a publisher's server will obviously

---

contain only their own journals[2]. Furthermore, on the library shelf, journals are arranged in subject groupings. On a publisher's server, they may well be arranged alphabetically — IDEAL, for example, has *Appetite* next to *Applied and Computational Harmonic Analysis*. In addition to the alphabetical listing, IDEAL also offers[3] the categories of Biomedical Sciences; Economics, Business, Law, Finance; Engineering and Material Sciences; Life Sciences; Mathematics and Computer Science; Physical and Environmental Sciences; Psychology; and Social Sciences. Selecting Mathematics and Computer Science leads to a further menu page offering a choice between these two categories, so browsing (say) mathematics journal titles (or at least those published by Academic Press) is possible. Selecting a journal title leads to a list of years available; selecting a year leads to a list of issues for that year; selecting an issue leads to an author/title listing, with abstract-only and full text available for each paper.

The process in arriving at an article, then, involves the following stages:

- launch web browser
- log onto IDEAL server
- select Mathematics and Computer Science from the IDEAL menu
- select Journals in Mathematics
- select Journal of Differential Equations
- select Journal of Differential Equations, 1997
- select Journal of Differential Equations, v 133, no. 2
- select either abstract (ASCII) or full text (PDF)

---

[2] While this is true for individual publisher sites, the recent entry into the electronic journal sphere by subscription agents means that a single password and interface to several publishers' journals is possible — see, for example, SwetsNet and Blackwell's Electronic Journal Navigator.

[2] This is true at the time of writing. Previously, only five categories (Accounting and Management; Biomedical and Life Sciences; Chemistry, Physics and Physical Sciences; Computer Science, Mathematics and Engineering; and Social and Behavioural Sciences) were offered, illustrating both the arbitrary nature of the category system and the fact that publishers' sites change without warning.

Although the precise order of actions differs in, say, the Chapman and Hall server, the general process is the same — drilling down to the bottom level of a hierarchy. Unlike the paper system where the latest issue is always in the same place (if nobody is currently reading it), the Uniform Resource Locator (URL) of the electronic version will change for each new issue and hence it is not possible to use a bookmark facility. It would be possible to bookmark, say, the journal top page and omit some of the above stages but a bookmark would be required for each journal — assuming the publisher allows direct login. At the time of writing, Academic Press and Institute of Physics Publishing have announced direct login facilities which check the Internet Protocol (IP) address of the user's computer.

When an article is selected, Netscape launches Acrobat and displays the article. If Acrobat's 'bookmarks and page' icon is selected, a list of the article's sections might appear as bookmarks. If so, it is possible to move easily from section to section. However, if the publisher has not included bookmark tags in the file, moving from section to section is more difficult, particularly in a long article. With the paper version, we have developed manipulation skills which allow us rapidly to 'flip' through pages looking for a particular heading. In the electronic version, such manipulation is not as easy.

When it comes to reading a paper in its entirety, I have yet to find a user who claims to have read an article of any substance on-screen using Acrobat. In all cases the response to seeing the article on-screen and attempting to read it has been to hit the 'print' button! (Even this can be a slow process if there are many fonts to be downloaded.) Acrobat presents a page image of the article and it is usually the case that when the page is displayed at a size such that the text is clear enough to read easily, only a small proportion of the page is visible. The problem is usually exacerbated by the facts that most screens are landscape orientation while most journals are portrait orientation, and many journals use a two-column format which makes simply scrolling down the page awkward.

Even if we could produce a legible Acrobat version, the question remains of whether it is appropriate to display the article as a series of pages. The page is the result of paper technology which is not necessarily the optimum solution for digital technology. Schwartz, Beldie and Pastoor (1983) reported that inexperienced users preferred paging to scrolling 'for the reading of a continuous text'. However, the 'continuous text' used was a list of 163 nouns which occupied two screen pages and the task was to read them aloud. It would be interesting to conduct a similar experiment with a realistic source document and realistic reading task.

Given that such interfaces do not adequately support user tasks, it is important to ask what they might have to offer instead. After all, if there is no clear advantage, why should users make the switch from paper to electronic format?

Advantages of electronic journals

One potential advantage of the electronic journal is that of access. In principle, the electronic journal offers the user 24-hour 365-day access whereas the library has opening hours which may be quite restricted at certain times of the year. Even when the library is open, journals can be missing for several reasons — in use, gone for binding, mis-shelved, not yet delivered. In practice, servers may be 'down' or 'busy' and network traffic can slow down access. Improvements in the technology may alleviate these problems but the problems may indicate that the model employed by, say, IDEAL is not optimal. That is, if the publisher's server goes down, all users are automatically excluded[4]. If the journals were held on a particular university's server, only those local users will be affected by server problems. The feasibility of such a distributed approach was demonstrated in Project ELVYN (Rowland, McKnight and Meadows, 1995) and can be

---

[4] Even a mirror site does not alleviate this problem — if the main site goes down, it simply forces more users to connect to the mirror site and therefore slows down access.

argued to make better use of the Wide Area Network bandwidth.

A further advantage is the ability to search electronic sources more easily than paper. The IDEAL system offers a simple search mechanism which will search the title, author, abstract and keyword fields of all the journals. An additional search mechanism allows the search to be restricted to a combination of fields.

Previous studies have demonstrated that the electronic journal can also offer hypertext links both within articles (e.g., from a citation in the text to the references section of the article) and between articles (e.g., from a citation in the text to the actual article cited). However, evidence that users find these links useful (as opposed to 'interesting' or 'neat') is still somewhat lacking.

A major potential added advantage of the electronic journal is the addition of other media. For example, the ability to view a rotating molecule structure in a chemistry journal means that readers can literally 'see what the author is talking about' (see, for example, Whitaker et al., 1996). However, like the question of hypertext links, research into the usefulness and usability of real multimedia electronic journals still remains to be carried out.

Advantages of paper journals

Although electronic journals have the potential to add value to their paper equivalents, there are still some areas in which the paper journal remains dominant. For example, a paper journal issue is still far more portable than an electronic version. While delivery to the user's desktop is the assumed aim of the electronic journal, studies show that academics often prefer to do their reading outside of office or even library environments (see, for example, Simpson, 1988).

The transient nature of computer interfaces also indicates an advantage of paper journals. As technology improves, it makes sense to take advantage of such improvements. However, will today's multimedia journals be readable with tomorrow's software, or will publishers be involved in a constant migration of their journals to the latest technology, with all the attendant costs? In contrast, 12th Century manuscripts are still legible — they have similarly posed preservation problems, but

reading them has not required any change of 'interface' over the centuries.

Acceptability -vs- feasibility

To date, then, the publishers who are making their journals available electronically are basically demonstrating the feasibility of such a process. This is an important stage in the development of electronic journals but should not be seen as the final stage. That is, once feasibility has been demonstrated, it then becomes important to assess their acceptability. The concept of acceptability has no clear definition but must involve consideration of functionality, usability and cost.

As part of the process of assessing acceptability, colleagues and I have recently completed a research project involving user studies of a mixture of commercial and free electronic journals. These studies were based on different groups of users (taught postgraduates, research postgraduates, research and academic staff) from several different academic disciplines performing a variety of tasks. The project, Café Jus,[5] (and others like it) will enable judgements to be made about the acceptability of such electronic journals to their potential users.

Conclusions

The present paper has considered various aspects of interfaces to electronic journals. There are many other factors in the equation — issues such as the role of the other current stakeholders such as librarians and subscription agents, problems of satisfactory archiving mechanisms and so forth. Electronic journals have other advantages over paper journals — their production does not deplete forests and the storage space required is considerably less than for paper journals. However, interface issues are obviously vitally important from the user's point of view. This provides the answer to the question in the title of this paper. That is,

although the process is currently being driven by publishers and technologists, it will be the human factors which will play the major role in determining the ultimate success or failure of electronic journals. That is why we *must* bother to design the electronic journal.

References

Academic Press IDEAL service URL is http://www.janet.idealibrary.com/

Chapman and Hall journals URL is http://www.thomson.com:8866/

Dillon, A., Richardson, J. and McKnight, C. (1989) Human factors of journal usage and design of electronic texts. *Interacting with Computers*, 1(2), 183—189.

McKnight, C., Dillon, A. and Richardson, J. (1991) *Hypertext in Context*. Cambridge: Cambridge University Press.

Pullinger, D.J. (1983) Attitudes to traditional journal procedures. *Electronic Publishing Review*, 3(3), 213—222.

Rowland, F., McKnight, C. and Meadows, J. (1995) *Project ELVYN: An Experiment in Electronic Journal Delivery*. London: Bowker-Saur.

Sabine, G.A. and Sabine, P.L. (1986) How people use books and journals. *Library Quarterly*, 56(4), 399—408.

Schwartz, E., Beldie, I.P. and Pastoor, S. (1983) A comparison of paging and scrolling for changing screen contents by inexperienced users. *Human Factors*, 25(3), 279—282.

Shneiderman, B. (1987) *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Reading, MA: Addison-Wesley.

Simpson, A. (1988) Academic journal usage. *British Journal of Academic Librarianship*, 3(1), 25—36.

Whitaker, B., Goodman, J., Casher, O. and Rzepa, H. (1996) Chemical collaboratories using Wide Area Networks. URL http://www.ch.ic.ac.uk/clic/demo.html

Woodward, H., Rowland, F., McKnight, C., Meadows, J. and Pritchett, C. (1997) Electronic journals: myths and realities. *Library Management*, 18(3), 155—162.

---

[5] Commercial And Free Electronic Journals — User Studies, funded by the British Library Research and Innovation Centre. See, for example, Woodward et al, 1997.