Design and Presentation of *Computer Human Factors* Journal on the BLEND System

D. J. Pullinger
Department of Human Sciences
Loughborough University of Technology, England

This paper reviews the various design decisions made during an experimental project in which a scholarly journal was presented on a CRT screen instead of on paper. It was found that decisions about how information was displayed were closely related to decisions about how to help readers move around within the text. For example, the contents lists itemizing those papers which were included in the journal had to include more information than is customary with printed journals. It was also found helpful to include a detailed contents list at the beginning of each article by which readers could quickly access specific sections of that text. For similar reasons the ways in which references were cited in the text had to be modified. It was found that readers and writers had problems with the multiplicty of numbering systems which arose and also with the technological limitations on the integration of words and graphics. Finally, consideration is given to some of the implications of the potential offered by the electronic medium for departing from conventional linear sequencing of journal articles.

In the last decade the use of computers to store text for others to access has moved from emergency situations to become a more general communication medium between scientists. This has allowed a large number of people to exchange messages with each other, replicating the kind of communication found in conferences—being called "computer conferencing". It was a natural development from the established use of computer conferencing to aid scientific and technical communication (Hiltz & Turoff, 1978; Johansen, Vallee, & Spangler, 1979) to envisage the use of such networks as a basis for publishing papers. Several people suggested the use of this medium to assist or even replace the traditional form of scientific publishing, that is to produce electronic journals (e.g., Senders, 1977). This appears attractive in view of the rising costs of materials, production, publishing and library facilities. The scientific information system in Britain has long been taken for granted by scientists. A recent study suggests that this system can no longer be regarded as stable (Royal Society, 1981). The report recommends that the matter be given urgent consideration by the public authorities responsible. In the chapter of

Visible Language, XVIII 2 (Spring 1984), pp. 171-185.
Author's address: HUSAT Research Centre, Elms Grove, Loughborough LE11 1RG, England.

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".

The need to explore and research these possible systems from a user's viewpoint led to funding by the British Library Research and Development Department to establish an experimental programme in electronic network communication. The University of Birmingham is responsible for operating and developing the system software on their DEC-20 computer and Loughborough University of Technology is developing communities of users, new usages, training and monitoring people, and assessing the results. Hence we have organised the Birmingham and Loughborough Electronic Network Development—BLEND (Shackel, 1982). Using the host computer, initially 50 scientists, now 130, are connected through the public telephone system to a small electronic "library". This library contains five types of electronic journal, and so the project is able to explore patterns of scientific communication through this type of network as well as the long, formally written articles which will be the focus of our present discussion.

In the move from paper-based publishing to the electronic medium, we can no longer rely on the solutions to design and presentation of text that have been developed over the centuries. Basic concepts linked to static text such as the proportion of white space on a page (to give an example) cannot necessarily be carried over usefully into computer storage when the text is then displayed dynamically to the reader. The proportion of white space cannot necessarily be assumed when, for example, the limitations of pages become inapplicable and thematic page breaks are possible. In order to place full text in a computer for people to read, the BLEND Development Team had to design a journal structure based on present day knowledge of users' needs and the ways visible language can meet these needs. It was important to consider the problems for both readers and authors of academic papers similar in text structure and content to this one.

There are many ways in which text is handled in computer systems for subsequent display to users at a VDU screen or a printer. Included among these are the usual computer files full of text whose display is controlled by manipulation of keys by the user - often only "pause" and "release pause"—and the much more structured information found on viewdata systems such as British Telecom's Prestel service. The initial concern among the BLEND design team was in how to present on the screen a journal with its multiplicty of papers and rather different sections of material: for example, the editoral, a contributed paper, a letter to the editor, etc.

As well as the matter of presentation, there is the aspect of how the reader is directed around the text. This is usually done by typographic cues to aid skimming and scanning and by referencing to page numbers and diagram or

figure numbers. Many of the standard strategies developed by scholarly communication and publishing in general raise questions to be answered afresh in an electronic medium, some of which will be discussed in this paper.

To issue or accumulate?

The first important difference between electronic storage and paper as media for communicating articles is in the way that the journal articles are distributed. In the former, at the present time, they are placed in a computer, which either acts as a host or transfers the material around a distributed network. Readers with suitable terminals can enter at their convenience to see the articles. When the articles are in paper form, they are sent out to subscribers and libraries at particular times, each issue containing a number of articles. It will be immediately apparent that the electronic medium enables us to move from the concept of distributed issues to that of making an article available to a prospective reader as soon as it is ready.

However, in an American experiment with an electronic journal (see Sheridan et al., 1981) it was discovered that newsletter readers expressed a preference for "publication" on a set date on a regular basis. The readers could then be assured that when they logged in at a certain date there was a new "issue" to read. It would seem to be a strategy to reduce the costs in a cost-benefit trade-off, so that readers need not regularly access the computer just to see whether there had been any new material, but could enter knowing that on certain occasions there would be something new of interest. In the BLEND electronic journal experiment, this thinking was extended to issues of the journal so as to reduce the cost to the reader of entering the system and searching it for new articles.

Presentation of the journal

One of the strategies which many readers use in their search for articles of interest in journals is to read the contents list. As an early policy decision it was agreed to start (but not necessarily keep) a mechanism which as far as possible enabled readers to use the strategies which they had developed over the years. Thus the issue style with contents list was an example where this was thought to aid the reader.

When entering the BLEND system, the reader is presented with a list of journals available. When one of these is selected, the reader is immediately presented with the equivalent of a contents list (Figure 1).

This contents list differs from that found in traditional journals in two respects: it indicates the discussion/question areas and it includes numbers to the right of the list of papers. The discussion/question areas are one of the many ways that an interactive medium can enhance academic or research communication by offering an easy way for readers to discuss papers among

Figure 1. Contents list of *Computer Human Factors* issue 1.

themselves and with the author. This discussion can then be stored in the same issue as the original paper and so is available for future readers.

The numbers on the right hand side of the contents list are one solution to the lack of a physically derived cue to the size of a paper. In a flick through a traditionally printed paper the reader can quickly gauge the length, how much of it is likely to be read and hence the probable amount of time that has to be set aside for that purpose. Flicking through an electronic paper is not so easy. Therefore the numbers were designed to give BLEND readers a guide to the size of the paper. The first number lists the number of "entries" which correspond roughly to screen "pages", and the second number indicates the number of lines of text. As can be seen from third and fourth papers, papers having the same number of entries can have appreciably different lengths. This reflects variation in authors' writing style and experience with formatting material for the electronic medium.

The structure of an article

After making a selection from the contents list of a journal, the reader gains access to the article and its sections. The word "sections" is used advisedly in that it is well-known that readers of articles do not necessarily start at the beginning and go through to the end. Although there has, so far, been no definitive research on the way that readers handle journal articles, various search strategies are known to be used. In interviews with 30 people who intended to use the BLEND system, three strategies for selecting parts of printed journal papers were reported in equal proportions: (1)The general pattern of filtering through the stages: title, abstract, results/conclusions, references, other sections, possible photocopy; (2)A preliminary filter of title and abstract

followed by a request for a photocopy for later reading; (3) Skimming through articles for new ideas without particular note of paper content.

What these three search strategies all have in common is the use of reader expectation about the structure of the article and the various typographic cues which will be available to aid the searcher, whether in finding a section or scanning the headings or diagrams. In the BLEND journal *Computer Human Factors* consideration of these two aspects, reader expectation of the structure and the use of typographic cues, contributed to the particular editorial policy adopted.

The limitation on the number of lines of text visible on a VDU screen (Cathode Ray Tube) is generally about 24, and so authors were requested to break the article into pieces of text limited to this number of lines, thus preventing the text from scrolling off the top of the screen. These text segments were the "Entries" referred to in the contents list. Indeed, one recommendation to the author went further in stating that each paragraph should be considered a separate accessible piece of text to be displayed on a single screen. There is good reason for adopting this recommendation, as an adherence to the normal syntactical structure of English should guarantee a partial conceptual closure in the logical argument of the content. Alternatively, an extension of this reasoning also suggested that if each section in an article was shorter than 24 lines, then several short paragraphs could be displayed on the screen with the greater conceptual closure of the section (Shackel, LINC Manual, 1983).

The lack of typographic cues such as larger point sizes for lettering in headings and other facilities for easy skimming and scanning, and the limited VDU screen size of 24 lines, caused a typical printed journal page to take 2 to 2.5 screenfuls. This meant that even when the structure of the paper is designed so that readers may access entries containing text, they would still not know where to locate parts of interest. The particular initial solution to this was to collect together all the major headings and figure into a contents list to be placed at a fixed point near the start of the structured article. The reader then always has the option of a search strategy based on knowing where this contents list is and consulting it for direction to other parts of the text. Although textbook chapters occasionally contain such a contents list, it is an innovation for scientific journal articles.

Thus the design decisions for the structure of electronic papers were to start the article with the title, contents, summary, and introduction, respectively, followed by the main body of the article. At the end of the paper there were to be the conclusions, references, and the author's full address. The start of this structure can be clearly seen in the example from the LINC Manual (Shackel, 1983) (Figure 2).

Computer Human Factors Number 2 1983 Paper 10 Rec'd 1 May 83

Computers and People
by
A. Smith
Department of People, Computer University.

		Entry Nos
(2)	CONTENTS OF THE PAPER	
(3)	Summary	3
(4)	Introduction	4
(5)	Background	5-7
(6)	Methods - Equipment	8-10
(7)	Methods - Subjects	11-13
	Fig.1 Data of Subjects Sample	13
(8)	Methods - Procedure	14-19
(9)	Methods - Statistical Analysis	20-22
(10)	Results - Data	23-26
	Fig.2 Performance Times Data	24
	Fig.3 Performance Errors Data	25
(11)	Results - Analysis	27-33
	Fig.4 Performance Times Graph Plot	28
(12)	Discussion	34-40
(13)	Conclusions	41-44
(14)	Acknowledgements	45
(15)	References	46-47
(16)	Full Address	48

(3) SUMMARY

3 The problem of . . . . . .

(4) INTRODUCTION

4 As a result of . . . . . .

Figure 2. The structure of the start of an article in *Computer Human Factors* journal.

Figure 2 shows similarities with the traditional presentation of a contents list as found in many books, with the set of numbers on the right corresponding to the screen "pages" instead of printed pages. Here the entry numbers are being used in a different way from that in Figure 1, for they are locators to enable the reader to find a screen of text. Hence the number of lines was thought not to be a useful addition. We will return to a discussion of the use of the several numbering systems evident here later in this paper.

The BLEND system is based on the NOTEPAD computer conferencing suite which has as its basic element a concept of Conference Entry, similar to a numbered and dated message of any length. It is upon this software that the journal structure is mapped and so the small pieces of accessible text or screen pages, as we have also referred to them, are called Conference Entries or just

Entries. The retrieval facilities for authored, numbered, and dated conference entries are not those required for reading the full text of an article. Consequently, the BLEND team embarked upon development of the software in order to enable the reader to move freely around the article. This development of the software is described elsewhere (Pullinger, 1984; Maude & Pullinger, 1984) and it is sufficient here to note the four main facilities which were provided: to step forwards and backwards one entry in the text, to jump to any numbered entry containing text, to return to the previously displayed section of the text, and to search for a particular string of characters on first lines of entries which enables jumping to named section headings.

In addition, the display of the text may be either by scrolling up from the bottom of the VDU or, with certain terminals, clearing the screen and scrolling from the top to give stationary text according to the readers terminal and personal preference. It is in this latter case that the retrievable small sections of text stored as Entries may be called screen "pages". Thus the reader can use some of the specific filtering and browsing strategies for reading journal articles which were reported in the interviews with prospective users of the BLEND system.

References and diagrams

The main impetus for the development of software to enable the reader to move more easily around the text came from a consideration of how readers might want to access references or diagrams. Using paper there are a minimum of two strategies for handling pointers in the text for references and diagrams, and several ways of presenting these pointers. For example, some journals use footnotes with the text marked with numbered superscripts; another use of numbers is in an ordered sequence of references numbered at the end of the article and marked in the text as superscripts (e.g., *Scholarly Communication*) or as a number in square brackets (e.g., *Computer Journal*); another strategy (e.g., *Behaviour and Information Technology*) is to have an alphabetic list of references at the end of the article and the text marked with the author and year of publication, with an additional lower case letter when the year proves insufficient identification.

Given this variety of pointing devices it seemed desirable to stick with whatever would be most familiar to readers. The electronic journal *Computer Human Factors* is concerned with (1) the study of development and design of hardware and software to make systems more usable, (2) the interaction between computer-based systems, people, and organizations, and (3) the psychological attitudes and responses of users to systems. Already in this area there are seven main journals available as printed publications. These are: *Applied Ergonomics, Behaviour and Information Technology, Ergonomics, Human Factors, IEEE Trans. Systems: Man and Cybernetics, International Journal of Man-Machine Studies, and Journal of Applied Psychology.*

Six of these journals point to the reference by author and date—for example, "(Shackel, 1982)"—and the other by a numbered sequence in square brackets. There is a reference list at the end of each paper, but this is organised differently in different journals. The six have reference lists which are essentially organised alphabetically with various differences (and inconsistencies) in the numerical ordering of the year of publication and its interaction with an alphabetic ordering of co-author(s); for example, in some "Poulton and Brown (1968)" might precede "Poulton (1969)". In the other case the numbered sequence may be in numerical order, alphabetic order, or broken into separate numeric lists within topics with headings, e.g., "Mathematic Theory" and "Applications".

Besides the *Guides for Authors* there have been many publications recommending the different systems; see, for example, Royal Society of London (1974), ASTM Committee on Publications (1973), Institution of Mechanical Engineers (1973), and Karger (1981). The latter, in particular, recommends only the two reference citation systems found in the journals in the *Computer Human Factors* field. The reference lists should be an alphabetic ordering in which single authorship and chronological order take preference over the alphabetically ordered co-authors. It was therefore decided as editorial policy to recommend authors to adopt the author and date reference citation with an alphabetic list of references.

There is less variety in the pointers to figures, diagrams, and tables, and by far the most frequent convention is to have two independent sequential numberings of figures and tables. However, there is great variety in the numbering system and actual form of the pointer. The text is usually marked with a reference to the figure, for example "(see Figure 4)". Nowhere, however, were seen more clearly the limitations of an enforced linear structure and a relatively slow display speed in an electronic journal than in pointing to the references and figures in this way. Consider the task of the reader when a pointer to a reference or figure is found marked in the text: (1) Note details of pointer; (2) Display contents list to note where reference or figure may be found; (3) Display reference or figure; (4) Search for reference or consult figure; (5) Return to section of text; (6) Possible return to reference or figure for further information.

Putting aside for a moment the complex nature of the commands necessitated by the early versions of the software in these circumstances, it will be readily apparent that the memory load is high and that both the pointer and the section of text have to be remembered accurately. Consider the difference between this and using the well-known "keeping a finger in the page" strategy with printed pages where the reader can flick between two sections of text.

A change of the pointer in the text to include the entry number in which the reference or figure is to be found, together with the use of a single entry for each reference and the command to return to the text previously displayed,

reduces the searching and memory load on the reader considerably. Thus each reference now appears as, for example, "(Pullinger 1984 [E37])", and each figure as "(see Figure 4 [12])". The task for the reader has now been reduced to: (1) Note details of pointer; (2) Type number to display reference or figure; (3) Type B for "Back" to return to reading place; (4) Typing a further B will retrieve the reference or figure again. As applied to references this change can now be seen to be a combination of two pointing strategies, numbering and the author and year of publication. The latter has been maintained for its inherent additional information given to the reader.

Too many numbering systems

There were then six numbering systems in operation, five operating within a journal paper: (1) the number of paper itself (to be cross-referenced to the subsequent exchange of messages about the paper by readers); (2) the number of lines given as a cue to the size of the article; (3) the entry numbering to be used as a basic unit for reading the article; (4) the conventional numbering of the article's main sections; (5) the figure and (6) the table numbering sequences.

It was found that the dual numbering of both the sequence of sections in an article (marked by digits in parentheses in Figure 2) and the sequence of entries/paragraphs (marked by digits embedded at the start of each entry following any heading) confused readers. The dual numbering system replicated that found in printed journals which sometimes refer the reader both to numbered sections and to page number where appropriate. In the electronic medium the situation is different because a pointer to a section is insufficient for the reader to find quickly the relevant part by skimming and scanning. In this situation the reader needs a mechanism which will point them to a particular screen of text — as has already been illustrated with references. The overt numbering of entries was also needed for the implementation of the specialised software to facilitate general movement around the article. Thus the section numbering was dropped.

In addition, the design of many VDU screens for reading text is far from satisfactory (Muter et al., 1982; Waern & Rollenhagen, 1983) and readers commented that they preferred short paragraphs broken by empty lines to be displayed on the screen. In general, articles are now structured so that as many paragraphs as will fit in a screen of 22 lines are concatenated. (The limit of an entry was unavoidably reduced from 24 lines to 22 lines by the software used.) This maximising of entry length also helps reduce the size of some of the numbering sequences.

Helping the reader, but not the author

The development of the *Computer Human Factors* journal on BLEND has sought to help the reader in four major ways: by issues of the journal, by

preserving the familiar structuring of the article, by developing a computer program to enhance the readers' display of the text, and by changing the reference citations to take advantage of the electronic medium to reduce searching.

Apart from the editor's fundamental decision at the start to keep as far as possible the traditional structure of a printed article, each of the other three decisions has in one way or another increased the load on the author. For example, the journal being made available to readers in issues means that authors lose out on one of the great advantages of electronic journals, which would be the absence of printing costs and queues. The development of the programs for reading meant adding entry numbers before each unit of text, and adding these entry numbers into references. Moreover, this reference citation system involves a higher workload than any other numbering system, for a coalescing of two entries would change each entry number and hence each reference citation. However, this should easily be managed by automatic aids in future, and relevant facilities are now beginning to appear in computer document writing environments (based largely on EMACS type systems).

A bigger penalty on the author using this technology is the lack of facilities for graphics other than those that can be managed on a typewriter. The penalties in electronic journals of not having integrated text and graphics seem very high. We have argued for standards in the area (Pullinger, 1983) in order to permit diagram elements to be exchanged as text can now be. This would mean that the high quality figures with which we are familiar should be available to those who purchase suitable equipment.

Future Developments

There is no doubt that there will be rapid development of equipment designed to handle reading through electronic communication media. Already there are cathode ray tubes with high quality displays of black on white, and terminals displaying A4 size paper with the larger side either vertical or horizontal. The development of split screen or dual screen will also enhance the display of article type pieces of text, to enable displaying simultaneously a diagram or table and the relevant passage in the text. Although cathode ray tubes are by far the most frequent visual electronic display unit, there are others in the development market which may also facilitate larger displays with greater resolution (e.g., plasma displays, see Anon., 1980; Elson, 1982) and hence allow use of the many skimming and scanning strategies that we already have.

Nor should the reader contemplate the visual electronic display unit as the only output of an electronic journal. There is in the BLEND system a recognition that many users have teletype printers or choose to use high quality communicating printers. The present software is designed to handle this in two ways. It enables an article to be printed out onto standard computer pages with

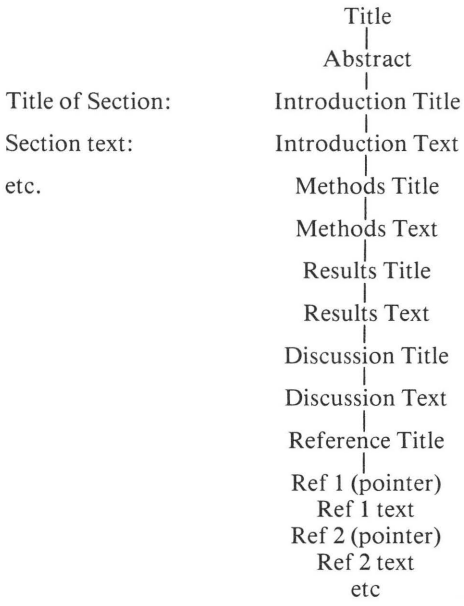


Figure 3(a). Examples of different text structures: linear.

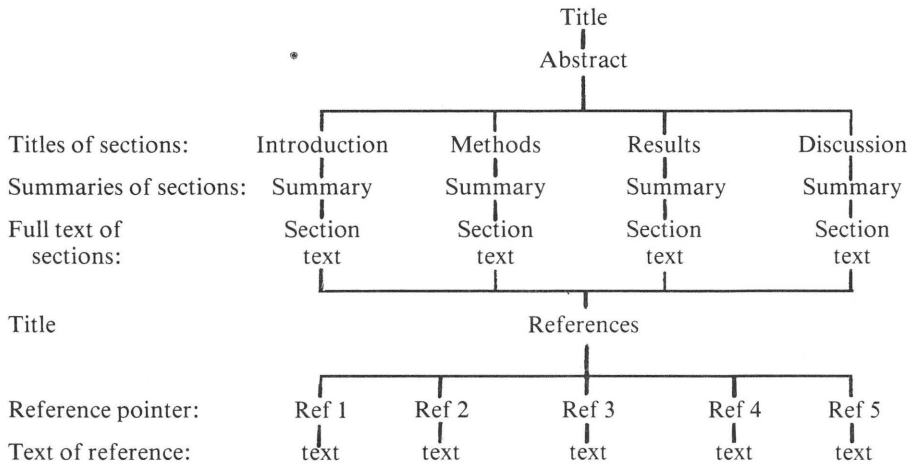


Figure 3(b). Examples of different text structures: Tree structured text.

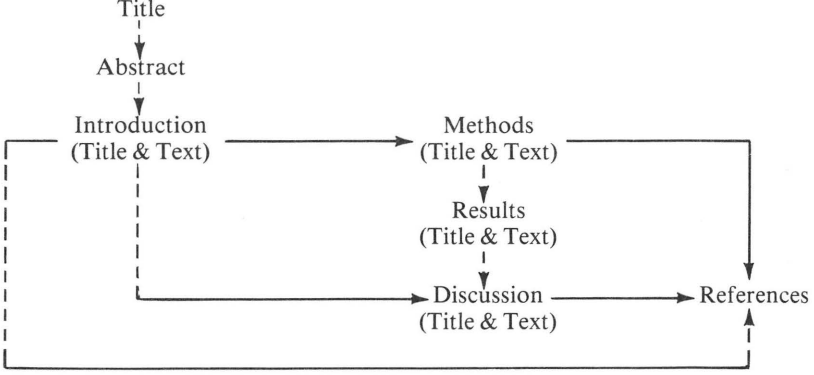
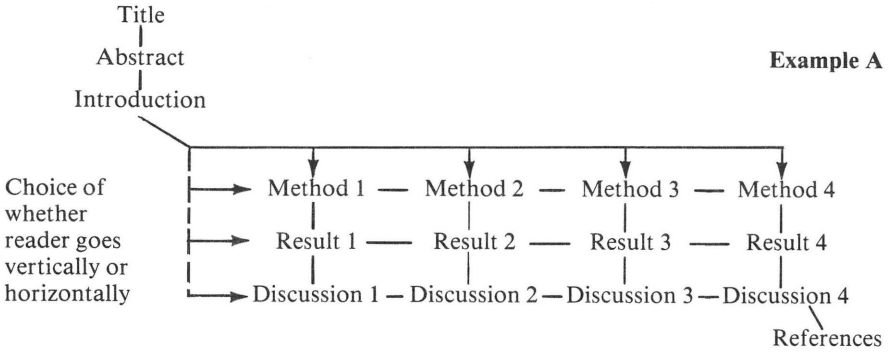


Figure 3(c). Examples of different text structures: Relational net.



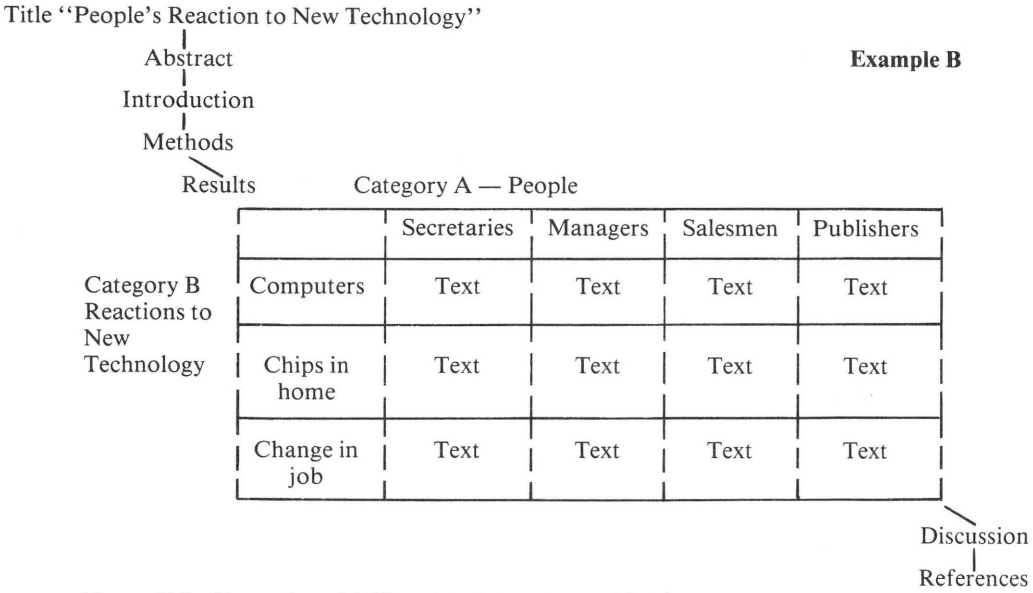
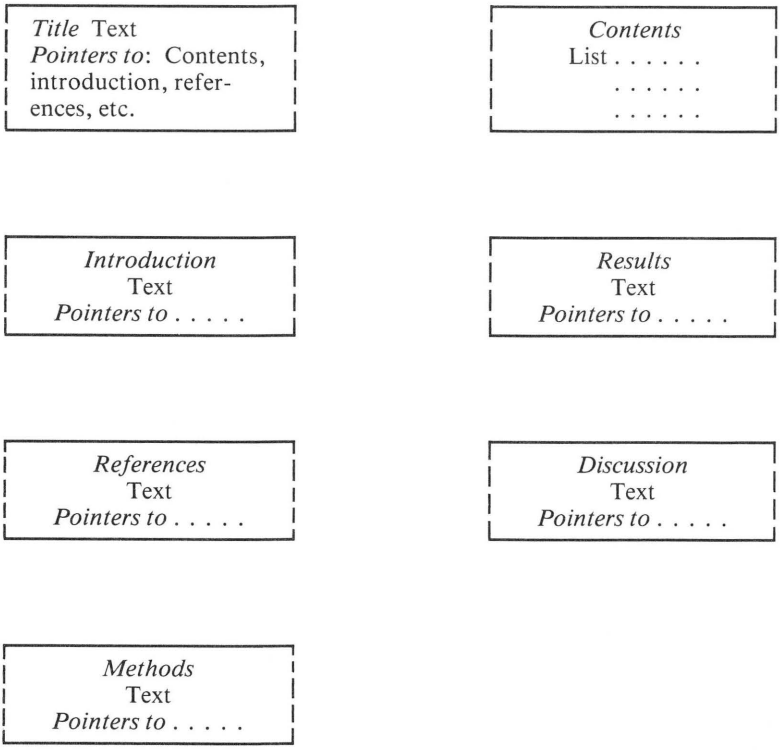


Figure 3(d): Examples of different text structures: Matrix.



The software will record which sections have been visited and may prompt the reader by a list or other display.

Figure 3(e): Examples of different text structures: Free browsing.

automatic page numbering and with a running header set. This header can be set either by the prospective reader or will by default be set as a shortened article title. The second option is for the text file to be transferred directly from Birmingham to the reader's microcomputer, where the reader can then access it with all the word-processing facilities available on that micro, printing out as much or as little as is needed, with or without personal annotations. There are other outputs which are quite possible. These include, for example, sending to a public viewdata service, braille output for the blind, voice synthesised text over displayed figures, laser printing for short run-offs. Obviously further changes to the visible language used in the articles may be necessitated by some of these options.

The consideration of alternative displays raises some interesting questions, because the most significant changes to scientific articles are likely to be in terms of the structure of the text. This need not be linear, as is required by the printed format, and might involve a hierarchical structure with gradually increasing amounts of information (see Line, 1981; Hills, Hull, & Pullinger, 1983), a relational net of sections of the text or a flexible modular structure allowing free browsing. Other types of structure such as a matrix of sections are possible but have not yet been tried (see Figure 3). These changes could have major effects on visible language in that pointers might change and the way that readers use the text might also radically alter.

The description of possible developments in electronic journals has so far assumed the concept of a host computer acting both as database for the text and providing software which will aid reading and manipulation of that text. This has been the mechanism on which the BLEND system has operated. There are, however, two other possibilities; the facility to access the host computer and then store text locally (either automatically or manually) to be read at a different time and/or the facility to apply local specialised reading or browsing software to text. With suitable local software the reader might in future be able to choose presentation of the new article structure and the text.

Conclusion

Just as a relatively standard form of visible language has been developed in scholarly publishing to enable readers to use the journals more effectively and authors to write for them more confidently, so one might expect a similar process of standardisation to occur in electronic journals. Because of the innovations possible within an electronic medium, this new format cannot be expected to emerge without a considerable number of attempts at different structures by readers familiar with electronic media. Only in this way will we discover the pros and cons of different designs. We hope that the description given here will add a little to the process of deriving an electronic journal structure that is easy to use and contributes to the passing of scholarly information between researchers and information users.

Acknowledgements The work described here has been funded by a grant from the British Library Research and Development Department under the project directorship of Brian Shackel of Loughborough University of Technology. As editor of the electronic journal *Computer Human Factors* he has been responsible for any final decisions described in this paper and a main contributor in the discussions leading to them. It is also a delight to acknowledge the many suggestions made by Patricia Wright for improving the readability of this paper.

References

American Institute of Physics Publication Board (1973). Style manual (Rev. Edn.). New York: American Institue of Physics.

Anon. (1980). Optoelectronic displays in Siemens data report. Special issue: Video workstation Ergonomics, Volume VIII. Berlin & Munich: Siemans Aktiengesell Schoft.

ASTM Committee on Publications (1973), Style manual. London: ASTM.

Chemical Society (1961), The presentation of papers to the Chemical Society. (3rd Edn.). London: Chemical Society.

Elson I.J. (1982). Designing readable scrolling displays. *Display, Technology and Applications, 3* (3) 155-157.

Hills, P., Hull, J., & Pullinger, D. (1983), An experiment on the redesign of journal articles for on-line viewing. Final report to BNB Research Fund. HUSAT Memo. No. 275, Dept. of Human Sciences, Loughborough University of Technology.

Hiltz, S.R., & Turoff M. (1978), The network nation : human communication via computer. Reading, Ma.: Addison-Wesley

Institution of Mechanical Engineers (1973). Guide to the preparation of papers. London: Institution of Mechanical Engineers.

Johansen, R., Vallee, J., & Spangler, K. (1979), Electronic meetings: technical alternatives and social choices. Reading, Ma.: Addison-Wesley.

Karger (1981), The manuscript: guidelines for the preparation of manuscripts and bibliographies of scientific papers (7th Rev. Edn.). Basel: Karger.

Line, M. (1981). Redesigning information packages for electronic transmission. In Design of information systems for human beings (Ed. K.P. Jones and H. Taylor). (ASLIB)

Maude, T., & Pullinger, D.J. (1984). Software for reading, refereeing, and browsing in the BLEND system. (To be published in *Computer Journal*).

Muter, P., Latremouille, S.A., & Treurniet, W.C. (1982). Extended reading of continuous text on television screens. *Human Factors, 24*(5), 501-508.

Pullinger, D.J. (1983). Text and graphics in "Electronic Journals." In proc. of BCS Conference: The storage and retrieval of integrated graphics and text.

Pullinger, D.J. (1984). Enhancing NOTEPAD teleconferencing for the BLEND electronic journal. *Behaviour & Information Technology, 3*(1), 13-23..

Royal Society of London (1974). General notes on the preparation of scientific papers (3rd Edn.). London: Royal Society.

Royal Society of London (1981). A study of the scientific information system in the United Kingdom. The British Library Research & Development Department, Report no. 5626.

Senders, J. (1977), An on-line scientific journal. *Information Scientist, II*, 1, March, 3-9.

Shackel, B. (1982), The BLEND system—programme for the study of some electronic journals. *Computer Journal, 25*(2), 161-168. *Ergonomics, 25*(4), 269-284. *Journal of the American Society for Information Science, 34*(1), 22-30, 1983.

Shackel, B. (1983). LINC manual. Dept. of Human Sciences, Loughborough University of Technology.

Sheridan, T., Senders, J., Moray, N., Stoklosa, J., Guillaume, J., & Makepeace D. (1981). Experimentation with a multi-disciplinary teleconference and electronic journal on mental workload. Unpublished report to National Science Foundation.

Waern, Y., & Rollenhagen, C. (1983). Reading text from visual display units. *Int. J. Man-Machine Studies, 18*, 441-465.