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Special Issue

SOME EFFECTS OF COMMUNICATION MEDIUM ON VISIBLE LANGUAGE

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Some Effects of Communication Medium on Visible Language

This special issue focusses on the way visible language inevitably has to change as new display techniques are adopted. Such changes are nothing new. There have been numerous instances in the history of typography where customary practice has been modified, both to accommodate the limitations and to exploit the potential, of new printing techniques. The pace of change seems now to be quickening. There is increased use of the computer, not only as a tool to aid the typographer and graphic designer, but as a new communication medium in its own right. As Baron points out in her paper, the activity of communicating "terminal to terminal" leads to a number of changes in the use of language, compared with its use in the activities of either writing a letter or telephoning.

The label "communication" can be a slippery term, meaning different things to different people. Sometimes there will be just one message sender and one message receiver, as in most messages or letters. On other occassions the information may be disseminated to a wide audience, where it may be just read and remembered (or perhaps filed and forgotten), or the information may subsequently be "used" (e.g., consulted/manipulated) by the recipients. Tabulated displays afford a good example of information which is consulted rather than just read. These differences in the kind of information transaction taking place have design implications: they will influence many of the characteristics of the visible language chosen by skilled designers to achieve effective communication.

In order to illustrate some of the ways in which the impact of the presentation medium on visible language will vary across a diversity of information transactions, this special issue will consider three distinct categories of communication. Two papers will address the issues within each category:

short messages
non-prose technical information
lengthy journal articles.

These three categories by no means exhaust the classes of information exchange which can occur within the broad domain of communication, but they serve to illustrate the range of problems that can arise as the communication medium changes. Perhaps even more importantly these papers show some of the contrasting design solutions which become appropriate for information of different kinds in different media.

Short Messages. Walker examines the ways in which the visible language of commercial correspondence changed when it ceased to be handwritten, and instead was produced by typewriter. Speed of production became a dominating influence on how the information within letters was displayed. Baron shows that people's choice of language varies with the communication channel chosen, and considers how computers may introduce yet further changes.

Non-prose technical information. Bryant explores the way the visible language of library catalogues can be tailored to the user's needs when the catalogues are computerised. Norrish develops the notion of "layers of information" within tables, and uses this conceptual framework to describe the design problems which faced a government organisation when they replaced their distribution of printed tables to members of the agricultural industry with a more readily updatable Prestel display (Prestel being the British viewdata/videotex system). Overcoming the limitations, both of screen size and typographic variation, required a sophisticated understanding of ways of exploiting the new medium.

Lengthy journal articles. Pullinger summarizes part of the research funded by the British Library Research and Development Department on electronic journals. He describes some of the problems that readers encountered and suggests the kinds of facilities that will be needed if people are going to be able to read lengthy electronic text as easily as they read print on paper. This theme is taken up by Wright and Lickorish who report on the difficulties encountered by a small group of academics who volunteered to referee journal articles presented on a CRT screen. The findings from this study suggest that the readers' need to be able to integrate the processes of reading and writing poses some problems in an electronic medium which have no counterpart in printed texts.

Conclusions

It would be a mistake to hope for neat solutions of the "how to do it" variety to emerge from these papers. Many of them represent initial explorations of the potential and the pitfalls of the new media. All the papers emphasize that visible language is inevitably modified as the means of producing and presenting information changes. From the papers concerned with computerised displays, a recurrent theme is the need to know in more detail just how people carry out various kinds of information transaction. Printed materials

can be sufficiently rich in structure and detail that readers are free to choose among several reading strategies; on a CRT screen these diverse strategies may need to be catered for explicitly. The research which will provide the mapping between these reading strategies and the design support they require is only just beginning.

Acknowledgments. The papers in this special issue have benefitted from the many helpful comments made by Jeremy Foster. His generous donation of time and expertise was much appreciated. The special issue also owes much to the support and encouragement received from Merald Wrolstad. And by no means least, my thanks to all the authors who contributed papers and responded so equably to suggestions about changes in their manuscripts.

Patricia Wright

How Typewriters Changed Correspondence: an Analysis of Prescription and Practice

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Typewriters began to be widely available in the 1880s and 1890s, and one of their first uses was for the typing of commercial correspondence. Because typewriters are relatively inflexible compared with handwriting, typing inevitably influenced the visual organization of correspondence. These changes in visual organization are evident in the reduced use of indentation and superscripts, increased width of margins, and line spacing being dependent on the length of the letter. This paper will discuss the development of such changes, drawing examples both from the prescriptions for, and the practice of, commercial correspondence.

Commercial handwriting

At the beginning of the twentieth century there were four main styles of handwriting for business and commercial work: business handwriting, civil service writing, text hand, and legal style. In basic letter formation these styles were similar, but each assumed individual characteristics by variation in slope, lateral compression, boldness, and letter spacing. These individual distinctions were determined by the requirements of the writing: the civil service hand, for example, had to be read easily, and correct letter formation and wide spaces between the letters were held to be essential (Pitman, 1904).

These commercial hands shared one major disadvantage: they were not fast enough to be able to cope with an ever-increasing work-load in the business and commercial field. The average speed of writing was twenty-five to thirty words a minute (Cleaver, 1895, p. 17). As early as 1876 it was being claimed that with a typewriter it was possible to write between sixty and ninety words a minute (Anon., 1876, p.254), but this is likely to have been one of many exaggerations. Adler gives the following more realistic figures: "For the most part of the 1870s, they [typewriters] were poor performers, packing up at maximum speeds in the vicinity of 30 to 40 words per minute. The type bars clashed and jammed, apart from other problems, and although the company claimed 30 to 60 w.p.m., the lower figure was the more realistic and even optimistic one" (Adler, 1973, p.42).

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Typing gradually began to supersede handwriting, particularly in the commercial field, though the transition was by no means abrupt: "The typewriter has now largely superseded long-hand as a means of correspondence, but, notwithstanding its introduction, a considerable proportion of clerical work is still done, and must necessarily be done, by the pen" (Grebby, 1913, p.59). By 1905, however, it appears that typewriters were widely used as the following quotations from *Pitman's journal* suggest:

> In the old days when the typewriter first came . . . . it was a question whether the typewriter as such would be of use to him in his business, and he was fairly entitled to his opinion about that. Now that question is to be settled by common consent and the only question the would-be purchaser has to decide is which of the many typewriters he will buy. (Anon., 1905a, p.604)
>
> Handwriting has fallen into disuse because the typewriter is quicker than the pen and typewriting is more legible than handwriting. There are probably as many good penmen now as there ever were, but we do not often see a specimen of their art simply because typewriting has taken the place of handwriting to a very large degree. (Anon., 1905b, p.663)

Mechanical constraints

Typewriters present users with limited means of visual organization: on a standard keyboard there are only eighty-eight characters available, spatial variation is limited to fixed vertical and horizontal increments, and changes in weight and size cannot be made. Compared with handwriting, which offers users the potential for infinite variety in size, shape, spacing, and colour, typing is very inflexible.

Typewriters also force users into making decisions about visual organization that, in handwriting, are intuitive to a large extent. Line endings are a good example of this: in handwriting, letters at the end of a line are often compressed or written in a smaller size to prevent making a decision about where to break a word; in typing, because character increments are fixed, decisions about word breaks are inevitable. Typewriter users at the end of the nineteenth century had to change attitudes and adapt to new sets of possibilities and constraints.

In Pitman's *A manual of the typewriter* (1893) a specimen of "bad" typing is illustrated (Figure 1) and the faults are identified as: irregularity of impression, irregularity of spacing, unevenness at the beginning of paragraphs, lines of typing not parallel with the top edge of the paper, uneven spacing between the lines, misuse of certain characters (i.e., representation of figures 1 and 0), bad alignment, and finger marks and smudges. The inclusion of such a list in one of the earliest typing manuals suggests such faults were commonplace at the time; a comment from the same manual supports this view: "The earliest specimens of work were unsightly in the extreme. They were full of errors, over-writings, and pen corrections. These blemishes still characterise typewritten MS., but not to the same extent as was the case some few years ago" (Pitman, 1893, p.8).

Articles written at the end of the nineteenth century and the beginning of the twentieth century provide evidence of debate about the quality of typing: to some it was the equivalent of "writing in print" (Anon., 1887), but to others reading typed material was like having been fed on sawdust! Despite such comments, typing was considered by most as equivalent to typesetting, and typing therefore attained status in terms of formality over handwriting. Typewriter manufacturers also emphasized this point in their publicity material with such statements as "The Williams typewriter writes like a press" (Anon., 1901).

User reaction

The earliest published user-reaction to typewriters I have seen is from a correspondent to *The phonetic journal* who had owned a typewriter for a week. He or she considered it to have the following advantages: "It feeds itself, spaces the lines, and only needs the writer to touch the letters before him and touch the hand-lever for an instant when beginning a new line. Any finger of either hand can be used. The machine also inks itself, by means of a ribbon that is said to need no re-inking for a year" (Anon., 1876, p.254).

The cost and non-alphabetic arrangment of the keys are mentioned as disadvantages, and it is said that typewriters do not hide careless spelling or initiate creative writing. The conclusion is very similar to comments written in relation to word processors and micro-computers in more recent times: "If, however, the machine is what it promises to be and what, so far as I have gone, I have found it to be, it is destined to work a great revolution in the course of a few years" (Anon., 1876, p.254).

Early typed letters

User manuals to accompany typewriters began to appear as early as 1888 with Harrison's *A manual of the typewriter*. Models for setting out commercial correspondence were contained in early typing manuals and remain a constituent in the 1980s. Early models for typed correspondence imitated handwritten commercial correspondence, models for which were frequently seen in books teaching commercial handwriting. As can be seen in the example in Figure 2, the dominant stylistic feature in both exemplar and copy is indentation—of the lines in the address, of the beginning of paragraphs, and of the lines in the complimentary close.

Figures 3 and 4 illustrate the similarity of visual organization in one of the last handwritten and one of the first typed letters of a company that appears to have acquired a typewriter towards the end of April 1887. The letters are very similar in their visual organization: width of left-hand margin, position of inside address, paragraph indents, indents on the second line of the address and position of salutation are almost identical. The most obvious difference

3Green St.

kensington, Aug. 9, 189[illegible]

gent.

ibeg to aply for the p st fo shorthaaderiter 7& typist advertsed bwyou inthe Dai ly Messenger. Ihave only had a week8s practice on th typewriter, but i feel sure that i co uld soonpickit up as havemade considable progres inveryshort time. ɪtis only a matt[illegible] o[illegible]practice, andIsould be readyto domybest tpleann.

Hoping

Hoppi g

to recvieve afavourrhà reply, U am, gent. Yoursfa

thfuly

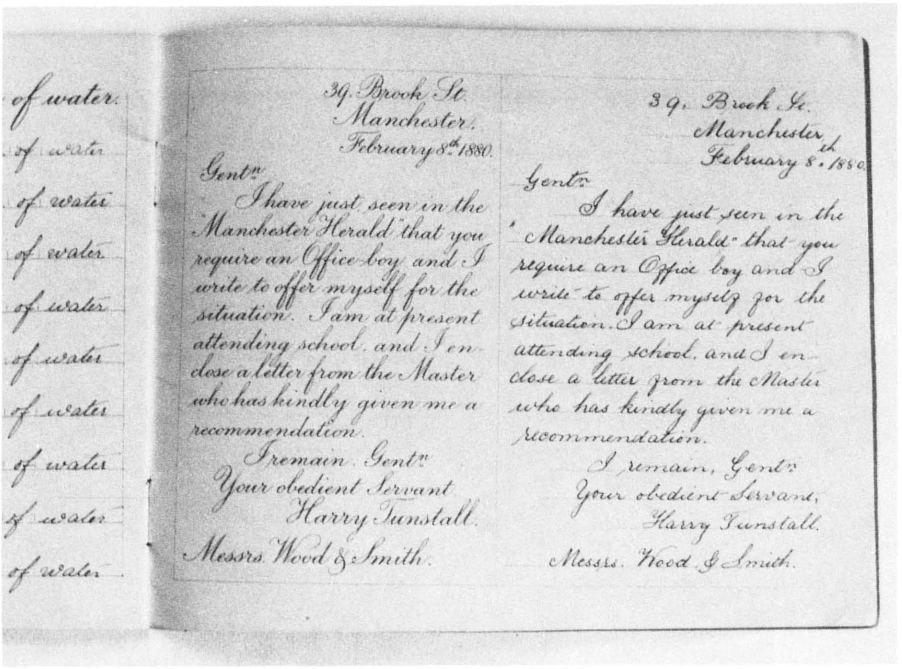
WILLIAM [illegible]

6

MESSRS brpwn & co., Piccadit[illegible].

Figure 1. Example of bad typing. (Pitman, 1893, plate I).

Figure 2. Model letter and copy. From Greenwell's Scientific Series, *No.10 commercial forms*, London, c.1880 (From the collection of V.H. Crellin).



HEAD, MORISON & BLAIR.

SHIPPING & FORWARDING AGENTS & INSURANCE BROKERS.

LONDON. 5, Gracechurch Street. | LIVERPOOL. 1, Rumford Place. | MANCHESTER. 57, Princess Street. | DUNDEE. 84, Commercial Street. | BIRMINGHAM. 86, New Street.

Refer to GT. Telephone No 4200.

London 8th May. 87. 1887

Telegram Address:
Headship — London
" " Liverpool
" " Manchester
" " Dundee
" " Birmingham

Messrs Nalder & Nalder Ltd.

Wantage.

Gentlemen.

"Odessa" (s). We have your favor of 7th inst, & note that the Machine will leave on Thursday next for this steamer & arrange shipment accordingly. We await usual particulars in due course,

And are Dear sirs

Yours truly.

Head Morison & Blair

HEAD, MORISON & BLAIR.

SHIPPING & FORWARDING AGENTS & INSURANCE BROKERS.

LONDON. 5, Gracechurch Street. | LIVERPOOL. 1, Rumford Place. | MANCHESTER. 57, Princess Street. | DUNDEE. 84, Commercial Street. | BIRMINGHAM. 86, New Street.

Refer to GT. Telephone No 4200.

London 29th April 1887

Telegram Address:
Headship — London
" " Liverpool
" " Manchester
" " Dundee
" " Birmingham.

Messrs Nalder & Nalder Ltd
Wantage. Berks.

Gentlemen

Braila We have your favor of 28th inst. We are glad to see that we have now arranged for the s/s Avoca to take the Threshing Machine at the freight of £19 in bulk, payable abroad. Including landing at Braila your paying Dock charges in London. Please despatch the Machine tomorrow consigned direct to the steamer in Hill wall Docks for our order, to be delivered by hand under usual advice to us as per form enclosed herewith

Yours truly

H&B

Figure 3. Letter from the Nalder & Nalder collection. 1887; 257 x 206mm; off-white wove paper pre-printed with very pale blue lines 8.5mm apart; written in black ink; black printed letterhead. (Figures 3, 4, 5, and 6 are reproduced with premission of the Institute of Agricultural History and the Museum of English Rural Life, University of Reading)

between the two letters is that the line length on the typed letter is shorter but this is probably because the typed letter is shorter in length (in later typed letters from the same company, the lines are longer). Other differences in the two letters are due to differences between handwriting and typing as methods of composition. In the handwritten letters, for example, abbreviations such as 3rd and Ltd use superior letters above a dash. In the typed letter where such conventions are difficult to do and time-consuming, the same abbreviations are shown as "3rd" and "Ltd." In the handwritten letter the reference "Braila" is underlined, and the reference "Odessa" in the typed letter is enclosed in double quotation marks. This is because in typing underlining necessitates going back over letters already typed.

In the Head, Morison & Blair examples the typewriter is being regarded as a substitute for handwriting, but this is not always the case. Slightly later examples from the firm T.C. & C. Graham (Figures 5 & 6) show characteristics of visual organization that indicate the typewriter is being seen as an alternative to the pen: the paragraphs are ranged left and line spacing is determined by the length of the letter (single if long, double if short).

Two longitudinal studies

In the rest of this paper such changes in visual organization will be studied in more detail by considering prescriptions for setting out correspondence in typing manuals from 1890 to the present day, and by considering the extent to which such prescriptions have been followed in practice as evidenced from two files of letters. In order to do the latter, two studies were made of the ways in which graphic conventions and the use of space have changed in typed business correspondence from the 1890s to the present day (Walker, 1983). The first, major, study is referred to as the "Macmillan" study and the second as the "Nalder" study. The majority of the letters in the Macmillan study are from the Macmillan archive, Reading University Library (RUL MS 1089) which consists of the correspondence of the publishers Macmillan & Co. Ltd from 1875 to 1940. Letters from 1940 to 1977 were obtained from the continuing archives of Macmillan at Basingstoke, and the correspondence of Routledge & Kegan Paul in Reading University Library (RUL MS 1489). Most of the letters in these collections were from authors to their publisher and their content was therefore of a literary rather then a commercial kind. A second study was made of the correspondence of an agricultural machinery firm, Nalder & Nalder. The letters from this collection are in the Institute of Agricultural History and Museum of English Rural Life, University of Reading, dated from 1878 to 1932. They were more commercial than the Macmillan letters, being originated by engineering and agricultural firms and insurance companies.

Figure 4. Letter from Nalder & Nalder collection. 1887; 257 x 206mm; off-white wove paper pre-printed with very pale blue lines 8.5mm apart; purple typing; black printed letterhead.

Telegrams:
Graham,
Skinner Street,
Newport.

Telephones { National 341
Post Office 501

T. C. & C. GRAHAM

COLLIERY AGENTS & EXPORT MERCHANTS

SHIPPERS OF
BEST RED ASH HOUSE,
SMITHY, STEAM & GAS COALS
ALSO
COKE

Newport, Mon.

October 27/08

Messrs. Walker & Walker.

W A N T A G E.

Dear Sirs,

We thank you for your favor of the 26th inst.
The Coal we have offered you for .....12/6. per ton, delivered at Wantage Road or Challow, is semi bituminous, but from our Forest Pit and not our Mantyglo. We have, however, quoted you for this particular sort fully believing that you will find the Coal suit your purposes almost as well as our Mantyglo Thro' & Thro' to which it is very similar.
We often supply it in place of that, where the rate makes it advantageous to do so, and in this case there is a saving of...3/-. per ton.
We would also point out that there is a very good percentage of Large in this Coal. Still, should you desire to have our Mantyglo, this would be....14/6. per ton, Nett C/d.
We shall be pleased to receive a line from you by return, as to which sort you would care to have forwarded.
We should, however, like you to be try that we quoted you for on the 26th inst, which would be more economical probably, seeing the difference in the price.
If you use Smithy Coal, we should be pleased to supply you with our very best at.....13/-. per ton. Nett, delivered Challow.
You would find this very clean coal, and we are sending it largely for Works purposes in the Oxford and Reading districts, etc.

Yours truly.

T. C. & C. Graham

Telegrams:
Graham,
Skinner Street,
Newport.

Telephones { National 341
Post Office 501

T. C. & C. GRAHAM

COLLIERY AGENTS & EXPORT MERCHANTS

SHIPPERS OF
BEST RED ASH HOUSE,
SMITHY, STEAM & GAS COALS
ALSO
COKE

Newport, Mon.

October 28/08.

Messrs. Walker & Walker.

C H A L L O W.

Dear Sirs,

We thank you for your post card of the 26th inst, and are pleased to note that you will try a truck of Thro' Coal as quoted for by us.

We feel sure that you will be pleased with the quality, and we hope to do regular business with you.

We are, Dear Sirs,

Yours truly.

T. C. & C. Graham

Figure 5. Letter from the Nalder & Nalder collection. 1898; 250 x 202mm; off-white wove paper; blue typing; blue-black printed letterhead.

Sender's address

Even the authors of the earliest typing manuals assume that letters will be written on paper with a printed letterhead and therefore give little information as to the position and form of the sender's address. Collyns in *The typist's manual* (1895) says, for example: "Business letters are generally typed upon letter paper with a printed heading, setting forth the nature of the business, style of firm, address, &c." (p.32). She adds, however: "In cases where the heading is not printed, type the address first and then the date. As a general rule commence the first line of the address at 30 on a No.2 machine, and 35 on a No.5, and indent each line of address 5 spaces from the preceding line" (Collyns, 1895, p. 32). ("No.2" and "No.5" refer to the model numbers of Remington typewriters; the numbers "30" and "35" refer to positions on the margin scale.)

Most of the letters studied from the Macmillan and Nalder collections were typed on paper with printed letterheads. When letters did have an address typed by the sender, it was usual for each line to be indented and positioned in the top right-hand corner. The most common alternative to this form, and one especially evident in typed letters from before 1900, was that of a shortened form of address comprising the name of a house and a town, written in a single line and positioned in the top right-hand corner. In letters written in the 1950s, 1960s, and 1970s there was some evidence of addresses typed with each line ranged left.

Style of inside address and letter as a whole

The term "inside address" or "direction" refers to the address of the person to whom the letter is sent, and this tends to appear on commercial rather than general or informal correspondence. As such it is used for identification and classification. The producer of the letter has to make decisions about: whether its inclusion is necessary, its position on the page, and its form and punctuation. The form and position on the page of the inside address in typed correspondence are dependent upon the style of the letter as a whole. There are four basic styles: fully indented, indented, semi-blocked, and blocked. These are illustrated in Figure 7.

Typing manuals published before 1915 generally concur that each line of the inside address should be indented by five or ten character spaces and that lines should be double spaced. Smith Clough (1915), however, lists five alternative forms including one where each line of the address is ranged left. During the 1920s the ranged left style began to be used for the inside address, and this coincided with a gradual shift in typing style form the fully indented to the indented form, which became standard practice until the late 1960s when it began to be superseded by the semi-blocked and blocked style of layout.

Figure 6. Letter from the Nalder & Nalder collection. 1898; 250 x 202mm; off-white wove paper, blue typing; blue-black printed letterhead.

Reaction from typing authorities towards a blocked inside address was mixed. Menzies writes: "The American method of display, which has become popular with many English firms, is to start each line of the address and superscription at the same point. The older method is to indent each line five degrees" (Menzies, 1924, p. 964). Smith Clough (1947), however, is in favor of an indented inside address: "The first (the 'block' method) is the quicker way, but with a tabulator, the second method [indented] takes very little more time and gives a neater appearance" (Smith Clough, 1947, p.56). The blocked style was American in origin and although it was not until the late 1960s that blocked styles were recognized by typing examination bodies, such as the Royal Society of Arts, examples of blocked letters occur in Owen (1920) and Drury & Pearce (1936).

One of the main promoters of the blocked style of layout in the 1960s was HMSO which instigated an Organization & Methods (O & M) investigation into Government stationery. The chief interest of O & M in a new typing style was to increase productivity: "If the adoption of a simplified form of layout could achieve this without significant loss of legibility or style (whatever this may objectively be), the efficiency of nearly 30,000 Government typists and secretaries could be painlessly increased, so enabling the conduct of public business to be expedited" (Fowler, 1969, p.124).

Fowler goes on to say that O & M officers studied previous simplification recommendations made by such bodies as the American National Office Management Association and the Institute of Office Management. Their chief recommendation was that to avoid time-consuming activities such as centring and space bar tapping, as many lines as possible should begin at the left-margin. O & M's original proposals were consequently for a blocked style of layout and these were submitted to Government Departments. Reactions were generally favourable, but some amendments were suggested. The most serious criticism was over the positioning of the date, subject heading, and subscription at the left-hand margin. After consideration it was decided to: "maintain the left-hand position of the subject heading (to obviate centring), to change the position of the date from left to right (for the sake of clarity and to facilitate filing), and to give Departments the choice of a left- or right-hand subscription" (Fowler, 1969, p.125).

O & M then went on to consider the effect of the new style of layout on productivity. Eighty-two letters were typed twice by four typists and the length of time taken was recorded. the first typing used the old layout, and the second the new (the typists were allowed four weeks to get used to it). The results reported in Fowler (1969) were as follows:

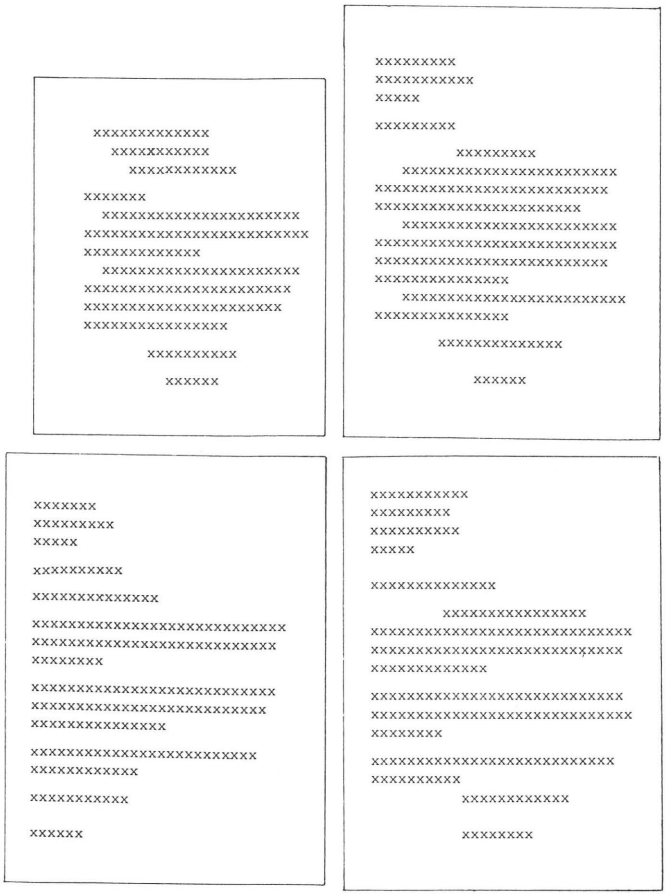


Figure 7. The four recognized styles of organizing typed correspondence. *Clockwise from top left*:

Fully indented.
Layout derives from nineteenth-century commercial correspondence. All lines of the inside address and paragraphs are indented. Complimentary close and designation are centred.

Indented.
All lines of the inside address are ranged left. Paragraphs are indented. Heading is centred. Complimentary close and designation are centred.

Semi-blocked.
There are a number of variations of this style (see Mackay, 1977, pp.135-6). Lines of the inside address are ranged left. Paragraphs are ranged left. Heading and complimentary close maybe centred, or aligned with the date if this is typed on the right-hand side of the paper.

Fully blocked.
All lines begin at the left-hand edge.

Typist	A	B	C	D	Total
Number of letters typed	31	29	16	6	82
Average time taken for each (minutes):					
Old style	4.0	4.9	4.5	4.0	4.4
New style	3.6	3.9	3.7	3.0	3.7
Average difference as percentage of saving over old style time	10.5	21.4	18.0	25.2	17.3
Percentage saving after "theoretical" addition for collation and decollation time	8.5	17.9	15.4	21.3	14.9

In each case a saving was made and Fowler concludes: "that the adoption of our specific new style layout for typed Government correspondence would save between about 10 per cent and 15 per cent of the average typist's time. Since even the lower of these two figures was obviously sufficiently high to justify the general adoption of the simplified format, a recommendation to this effect was recently made to all Government Departments" (Fowler, 1969, p.128).

Position of inside address

As well as the style, the position of the inside address has also changed during the last hundred years. In examples of commercial correspondence from the nineteenth century the inside address is positioned at the foot of the letter on the left-hand side, but today it is usually placed above the body of the letter on the left. The newly published typing manuals began to promote the top position during the latter part of the nineteenth century: "The forms of correspondence differ in different houses. Sometimes the name of the addressee is placed at the beginning of the letter, and sometimes at the end. It is, however, becoming increasingly frequent for the name and address of the intended recipient to be written before the body of the letter, as subsequent reference to the copying book is thereby facilitated" (Pitman, 1893, p.49).

By the 1940s most typing manuals accepted the top position in commercial correspondence, though Lockey (1948) still feels it necessary to state its advantages: first, so that it is never omitted owing to lack of room; and secondly so that in circular letters where individual addresses are entered separately, time is saved by inserting the address at the top of the page. The bottom position of the inside address did not disappear completely: in official correspondence (civil service letters), the correct position for the inside address was at the foot of the letter until the redesign of British government stationary in the late 1960s. The correct position in the new stationery is between the two

parallel lines at the top of the main body of letter and below the address of the originator. This position corresponds with recommendations in BS1808 (1970) so that if a window envelope is used the address panel serves the dual purpose of internal and external address: "The addressee panel is so positioned that when the letterhead or form is correctly folded and inserted, it registers with the window of the envelope. A specified area surrounding the addressee panel shall be kept clear so that no printed or typed matter other than the name and address of the addressee appears through the window of the envelope" (BS1808, 1970, p.7).

Apart from official letters, the only other reference to the inside address being placed at the foot of the letter in typing manuals published since 1950 is in W. & E. Walmsley's *Pitman commercial typewriting* (London, 1970, p.48): "In personal letters the name and address of the addressee are usually placed at the foot of the first page." The inside address is positioned at the foot of the letter. It therefore can indicate either formality (in the case of official typed letters until very recently) or informality (in the case of an informal typed letter).

Position of complimentary close

In typed correspondence, as can be seen from the diagrams in Figure 7, the positioning of the complimentary close and signature is dependent on the style of the letter as a whole. If, for example, a fully blocked layout is being used then the prescribed correct position is ranged left with the inside address and the body of the letter. In the case of one of the semi-blocked arrangements the beginning of each line of the complimentary close falls at the centre of the paper on which the letter is written, and with the traditional, indented layout the complimentary close is centred on the writing line.

Some typing manuals consider the disposition of vertical space around the complimentary close. Lockey (1948) and Heelis (1965) suggest, for example, that two lines of vertical space should be left below the main body of the letter above the complimentary close, and that a space of two double line spaces or two treble line spaces should be left for the signature.

Prescription leads practice

Prescriptions in typing manuals demonstrate clearly that changes in the overall layout of correspondence derive to a large extent from technical constraints inposed by typewriters. It has been shown how, during the 1920s, the fully indented style was superseded by the indented form, which remained the one prescribed until the 1960s when the semi-blocked and blocked styles began to be recommended too. Letters from the Macmillan and Nalder collections indicate that practice follows prescription: the letters revealed a shift from the fully indented to the indented style in the 1920s, and there appeared to be a

corresponding, though less marked, shift towards the blocked styles in the 1970s.

Body of the letter

The visual organization of the body of the letter is dealt with very thoroughly in the typing manuals that have been studied: "This [the body of the letter] contains the message or information to be conveyed and should occupy the centre of the page. Orderly arrangement greatly facilitates the reading, and a letter that is well arranged should fall naturally into paragraphs. Short paragraphs are preferred, as they have a more distinct appearance than long solid paragraphs, but excessive paragraphing should be avoided. Each phase of the subject should have a separate paragraph" (Drury & Pearce, 1936, p.237). These views are representative of those in typing manuals from the 1880s until the present day.

Line spacing

One change in prescription in typing manuals over the last hundred years has been a shift of preference from double line spacing to single line spacing for the typing of the body of the letter. Morton in *Practical typewriting and examination guide* writes: "The line spacing must be regulated by the length of the text and the size of the paper. *Double* line spacing should be used whenever possible, it being most effective" (Morton, 1907, p.57). Crooks & Dawson (1942) recommend single line spacing if a letter is long and double line spacing if it is short, but according to Crooks (1929):

> The modern practice is to type *all* letters in single spacing. The single spacing is adopted nowadays because it gives a much more compact and neater letter. If the single spaced letter is correctly typed, it is easier to read. In other words, it is more correct to say that the modern practice is "single spacing and *short* lines, instead of double spacing and *long* lines". The typewriter mechanism gives plenty of space between the single lines, so far as the eyesight is concerned, and with the short line the eye and the mind are able to get a quicker grasp of the letter as a whole than is the case with the average double spaced letter.(p.32)

Following recommendations in typing manuals, single line spacing gradually and steadily began to replace double line spacing in the 1920s, and 1930s, and 1940s.

Paragraphs

The most common ways of denoting the start of paragraphs in typing are by indenting the first line, by hanging the first line to the left of subsequent lines, and by starting every line at the same point. Before about 1965 the recommended form was indentation, but over the years the prescribed width of the indent has changed. Ten character spaces are prescribed in two early manuals (Morton, 1891; Collyns, 1895); in later editions of Collyns, however, the wider

indent is no longer mentioned which suggests it is no longer acceptable. One reason given for reducing the amount of paragraph indentation was to make typing similar to typesetting: "The modern view and practice is to reduce and not to increase the amount of space in the first line of a paragraph, and to bring the typewritten page more closely in accord with the method of printing, which does not allow the appearance of the page to be spoiled by wide gaps in the letterspaces" (Crooks & Dawson, 1942, p.202).

Although the blocked form of address began to be mentioned in typing manuals from the 1920s onwards, it was not until much later that the blocked style began to be suggested as an alternative to indentation for paragraphs in commercial letters. Drury & Pearce (1936, p.237), however, say that blocked paragraphs are often used in sales letters. Once the blocked style of paragraphing is adopted, some means other than indentation has to be found to indicate the start of a new paragraph. The most obvious way, and the one that is recommended in the manuals, is to increase the vertical space between paragraphs. By the time manuals began positively to recommend the use of blocked paragraphs (i.e., mid-1960s), single line spacing rather than double was seen as the norm for typed business correspondence unless the letter was very short, when 1½ line spacing was preferred.

According to prescriptions in typing manuals, therefore, the treatment of paragraphs and line spacing in the body of the letter should relate to the style of the letter as a whole. Blocked paragraphs and single line spacing are, for example, characteristics of semi-blocked and blocked layouts. As most of the letters in the Macmillan collection were typed in the indented or fully indented styles, one would expect the most common method of denoting paragraphs to be indentation: this expectation was confirmed. There was, however, considerable variety in the number of spaces left at the start of paragraphs.

Margins

In typing manuals the specification for the width of the left-hand margin is given either in terms of letter spaces or position on the margin scale, or is merely implied in specimen letters. The general rule seems to be either five letter spaces or five on the margin scale; in Pitman (1893), however, the width of the margin is given as ¾ inch. Sometimes the general principles behind the use of a margin are discussed:

> Correspondence with wide left-hand margins and narrow right-hand margins is a survival of the days when the left-hand margin was utilized for filing purposes. Present-day practice is to have centred letters with equal margins, in much the same way as the printed page of a book. Wide margins are desirable; narrow margins do not look well unless the page is full. If the use of wide margins means that a letter extends slightly beyond a page, a slight readjustment of the margins should be made to enable the letter to be typed on one page. (Drury & Pearce, 1936, p.232)

This extract is interesting for two reasons: first the change in the disposition of marginal white space from unequal left and right margins to equal margins around the text. Secondly, the reference to "the printed page of a book." It seems to be a characteristic feature of typing manuals dating from the 1920s and 1930s that the reader is referred to more formal kinds of typography as seen in newspapers and books.

Drury & Pearce's recommendation was reflected in the Macmillan letters: many of the early ones were typed with tiny right-hand margins, but from the 1910s onwards there was growing evidence of wider right-hand ones.

Resumé

It would seem from studying letters in the Macmillan and Nalder collections that it was in the 1920s that the visual organization of correspondence was significantly affected by the use of the typewriter. The publication of *The dictionary of typewriting* in 1919 and *Pitman's commercial typewriting* in 1922, two of the most thorough and comprehensive guides, may well have contributed to the consolidation of typing practice around this time. Visual organization was no longer solely determined by conventions in handwritten letters. In the 1920s the overall style of layout changed from fully indented to indented which meant that the lines of the inside address were ranged left. Line spacing began to change from double to single for letters of medium or long length, and this resulted in a change in the convention for denoting the openings of paragraphs from indentation to indentation plus space. A change towards blocked and semi-blocked styles occurred in the 1970s - a change advocated on grounds of speed and efficiency by the stationery office.

Typists make a significant contribution to the history of letter-writing because the *visual* organization of the letter plays the dominant role. Typists are not usually originators of the letters they type but producers, and are less concerned with the meaning of the language in the letter (though they may correct grammatical and punctuation errors), but more concerned with ordering and arrangement. Typewriters encouraged specialist operators because of the manual dexterity and accuracy needed by the technology.

Word processors are easy to operate and have simple correction procedures. Originators can work directly with the technology and know they can end up with a professional-looking job. The typist's expertise has, to a large extent, been replaced by the program or operating system. It is, for example, easy for an inexperienced word processor operator to produce copy that has centred headings and a right-justified margin — just two features of visual organization that are relatively difficult and time-consuming to produce on ordinary typewriters. It will be of interest to see to what extent word processors affect visual organization in the next few years, and whether these are comparable to the changes caused by the introduction and widespread use of the typewriter.

References

Adler, M.H. (1973). *The writing machine*. London: George Allen & Unwin.

Anon., (1876). The typewriter, *The phonetic journal*, 27 May 1876, pp.253-4.

Anon., (1887). Typewriting — introduction, *The phonetic journal*, 24 December 1887, pp.623-4.

Anon., (1901). Catalogue for *The Williams typewriter no. 4*. London, 1901.

Anon., (1905a). *Pitman's journal*, 5 August 1905, p.604.

Anon., (1905b). *Pitman's journal*, 26 August 1905, p.663.

BS 1808 (1970). *Specification for sizes and recommended layouts of commercial forms. Part 1: letterheads and forms other than those produced on rotary presses*. London: British Standards Institution.

Cleaver, F.C. (1895). *Papers on penmanship*. London: Isaac Pitman & Sons.

Collyns, E. (1895). *The typist's manual: an elementary text-book for commercial students*. Manchester: John Heywood Ltd.

Crooks, M. (1929). *The typists' companion*. London: Sir Isaac Pitman & Sons Ltd.

Crooks, M. & Dawson, F. (1942). *The dictionary of typewriting* (4th ed). London: Sir Isaac Pitman & Sons Ltd.

Drury, P., & Pearce, H.L. (1936). *The typist's deskbook*. London: Sir Isaac Pitman & Sons Ltd.

Fowler, G.H.E. (1969). Typing topics — towards a simpler letter layout, *O & M Bulletin*, vol. 24, no. 3, pp.124-9.

Grebby, J.K. (1913). *A first course in commercial correspondence and office routine*. London: Macdonald & Evans.

Heelis, F. (1965). *Pitman's business typewriting* (7th ed). London: Sir Isaac Pitman & Sons Ltd.

Lockey, F.J. (1948). *The theory and practice of typewriting*(2nd ed). London: Sir Isaac Pitman & Sons Ltd.

Mackay, E. (1977). *The typewriting dictionary*. London: Pitman Publishing Ltd.

Menzies, G.C. (1924). The main divisions of a letter: neat copies from rough drafts, *Pitman's journal*, 12 July 1924, p.964.

Morton, A.E. (1891). *Typewriting and typewriters and how to choose a machine*. London: Sir Isaac Pitman & Sons.

Morton, A.E. (1907). *Practical typewriting and examination guide*. London: Smith Premier Typewriter Co., and Sir Isaac Pitman & Sons Ltd.

Owen, M. B. (1920). *The typists' vade mecum. . . . with special chapters on setting out*. London: Stanley Paul and Co.

Pitman (1893). *A manual of the typewriter*. London: Isaac Pitman & Sons.

Pitman (1904). *Pitman's commercial handwriting and correspondence*. London: Sir Isaac Pitman & Sons Ltd.

Smith Clough, E.R. (1915). *A new course in typewriting*. London: Sir Isaac Pitman & Sons.

Smith Clough, E.R. (1947). *Rational typewritng (short course)* (15th ed). London: Gregg Publishing Co.

Walker, S.F. (1983). Descriptive techniques for studying verbal graphic language. Ph.D. thesis, Department of Typography & Graphic Communication, University of Reading, England.

Walmsley, W. and Walmsley, E. (1970). *Pitman commercial typewriting*. 7th edition. London: Sir Isaac Pitman and Sons Ltd.

Computer Mediated Communication as a Force in Language Change

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This paper develops a formalized linguistic perspective from which to explore how the medium of communication influences both what ideas can be expressed and how these ideas are expressed. This linguistic perspective enables the use of computers as a replacement for writing, and as a replacement for speech, to be examined in detail. The assymetric influences between writing and speech are discussed. It is possible to anticipate some of the changes that may occur to these traditional means of communication as people make increasing use of computerized systems for information exchange. The linguistic concept of "register" is extended to computer-based communications, and it is noted that there is an increased tendency for aggression to be displayed when talking terminal to terminal. Finally, the impact of developments in networking and computer conferencing on the social uses of communication are considered.

If a Martian were to land on planet Earth tomorrow, one of the first oddities he would need to come to grips with would be the computer. From media blitzes to classrooms to boardrooms, computers are — for better or worse — dominating an increasing portion of our personal and social lives. This snowball effect is especially hastened by the proliferation of microcomupters and interactive terminals that make it possible for users to get immediate "responses" from their computers or to communicate with other users.

Much has been written about the potential effects of computers upon various aspects of American life: democracy (predicted to increase, assuming the economically disadvantaged can get access to computers); the unemployment rate (feared to increase, as robots replace unskilled laborers and craftsmen alike); interpersonal skills (in need of safeguarding, if the stereotype of the dishevelled, antisocial computer hacker is to be believed). This paper, however, will examine the potential effects of computers upon a rather different aspect of human life: the effect of computers upon language.

In the world of computers, discussions of "computers and language" are usually about artificial computer languages, such as Pascal, FORTRAN, or C.

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Any talk of computers and *natural* languages (such as English or Japanese) is likely to concern so-called natural language processing—that is, the use of computers to analyze the syntax or semantics (or both) of ordinary language.

But there is yet a third dimension to the study of computers and language. That is the growing use of computers as *conduits* of natural language. Instead of speaking face-to-face with one another or using traditional means of writing, we express ourselves at the computer keyboard.

Computer mediated communication is used in a variety of communicative contexts. Perhaps the best known is word processing. Other common natural language uses of computers include questionnaires (such as used in taking medical histories) or business systems that allow the user to employ a subset of English vocabulary and grammar to pose questions of a data base. Finally, a growing number of universities and businesses — as well as private individuals — are developing the ability to exchange electronic mail or participate in real-time computer conferencing, where the participants are all logged onto the computer at the same time.

It is clear that the proliferation of computers will have a growing effect upon the physical means by which we use natural language with one another. Less clear is the issue of whether the use of the computer as a linguistic medium will affect the very shape and functioning of traditional language itself. The purpose of the present paper is to explore this question.

We begin (Part I. The linguistic perspective) by considering computer mediated communication in context of a broader set of linguistic issues. What modalities of human communication (e.g., face-to-face speech, telephones, writing letters) are possible, and how do they differ from one another? Does the modality of communication influence what we can express in language? Do the forms and functions of one linguistic modality (e.g., writing) ever influence those of another (e.g., speaking)?

Drawing upon this linguistic framework, Part II of the paper (The computer perspective) analyzes computer mediated communication as a formal modality of linguistic communication. We will look at the use of computers as a replacement for writing and as a replacement for speech, and see what our findings tell us about the communication spectrum more generally.

The final section (Part III. The future perspective) ventures into the domain of historical change. In addition to making some general predictions about the kinds of linguistic change we might expect as a result of continuing growth in computer mediated communication, we will also consider the possible implications of such change.

PART I. THE LINGUISTIC PERSPECTIVE

The Communication Spectrum

Theoretical linguists (e.g., Chomsky, 1965) are prone to speak of human language as if it were all of a piece. On the other hand, sociolinguists (e.g., Hymes, 1964, 1974) are traditionally more attuned to the variety of physical contexts in which linguistic exchange can occur, and, derivatively, to the linguistic implications of these physical differences.

Most analyses of linguistic interaction are based upon the paradigm of two people speaking with one another face-to-face. However, in literate and in technological societies, there are several other options as well. We can write books or letters, we can telephone one another, we can view and hear an interlocutor at a distance through teleconferencing, or we can send our interlocutor a message via a computer (so-called keyboarding).

In Figure 1 these communication options are arranged in a continuum that is organized with respect to the physical and visual distance between producer and perceiver (e.g., speaker/hearer or writer/reader). A concommitant variable is the extent to which the producer can receive feedback from the interlocutor. As you can see, at the far left end of the spectrum (face-to-face speech), the interlocutors are in one another's physical (including visual) presence, and feedback possibilities are maximized. At the far right end of the spectrum (traditional written language), the interlocutors may be separated in time and space, and feedback is difficult if not impossible. The other modes of communication fall somewhere in between. (For a more detailed discussion, see Baron, 1981).

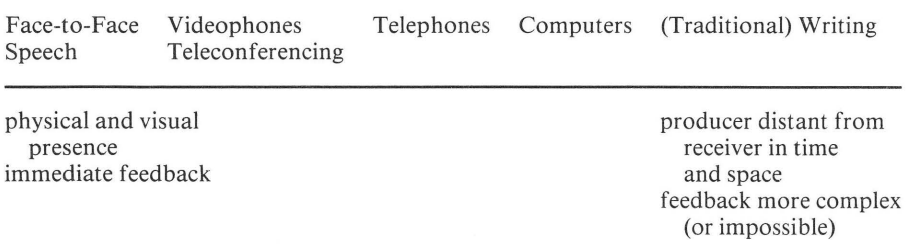

Figure 1. The communication spectrum.

What effect do the physical distinctions between these linguistic modalities have upon the character of the linguistic message itself or the effect the message may be expected to have? A useful way of thinking about this question is to identify at least some of the specific factors that are relevant in human communication, and to see how they vary along the communication spectrum we described in Figure 1. At the same time, we can note variables that are present in only a limited number of linguistic modalities.

Figure 2 offers some of the salient communication variables, grouped together in three categories: physical, linguistic, and social. The right-hand column ("Directionality it is typically associated with") pairs up the variables with the communication spectrum in Figure 1.

	Variable	Directionality it is typically associated with
Physical	physical presence (e.g., smell, nuance of kinesics, nuance of intonation)	decreases: face-to-face → videophone/ teleconferencing
	non-linguistic context	decreases: face-to-face → videophone/ teleconferencing
	possibility for immediate feedback	decreases →
	time for reflection	increases →
Linguistic	formality	increases →
	grammaticality (degree, complexity)	increases →
	logical coherence	increases →
Social	equalizing of social distance	increases →
	possibility for concealment (of fear, of physical conditions, of identity)	increases →
	degree of honesty/depth of feeling willing to express	increases →

Figure 2. Major communication variables.

The first two variables (physical presence and non-linguistic context) are only fully applicable to face-to-face spoken communication, where your interlocutor can, for example, see you wink as you say, "Of course I'll be home by five," or can see the glass you have broken just before uttering an expletive. These two variables still apply, though to a lessened degree, when the interlocutors can see one another yet are not physically proximate (e.g., I can't smell my interlocutor's perfume over a videophone). Once visual contact is removed (with telephones, computers, and traditional writing), the variables of "physical presence" and "non-linguistic context" become inoperative.

With the third physical variable—i.e., possibilities for feedback—the strength of the variable *diminishes* as we move from the left edge of the spectrum (face-to-face speech) to the right edge (traditional written language). I

can interrupt an insurance salesman and say I don't understand the terms of the contract he is proposing. There is no way I can ask Immanuel Kant for clarification of *The Critique of Pure Reason*.

All of the other variables suggested in Figure 2 *increase* in value in traversing the space between speech and writing. For example, as we move away from face-to-face spoken encounters towards the use of telephones, computer mediated communication, and finally writing, the interlocutors have greater time to reflect upon the message they will send, a greater chance of grammatical and logical coherence, and the opportunity to make significant alterations in their social relationships with one another.

The Role of Modality

To illustrate how these variables actually apply to a particular modality of human communication, consider the case of the telephone. Halfway between speech and writing on our communication spectrum, telephones remove the interlocutors from physical proximity, while retaining some possibilities for feedback.

It is typically assumed (e.g., Nash and Nash, 1982) that telephone conversations serve to *supplement* normal face-to-face communication, rather than to replace such face-to-face exchange. The lack of physical proximity is overcome because "Persons using the telephone retain impressions from previous [face-to-face] experiences" (Nash and Nash, 1982:195).

However, even in the early decades of telephone use, it became clear to sociologists that the very presence of the telephone alters normal face-to-face communication. In their first classic study of Middletown in the 1920's, Robert and Helen Lynd reported that "a steady historical decline in face-to-face neighboring in Middletown first began [with the spread of the telephone]; direct confrontation being slowly replaced and superceded by the more attenuated voice-to-voice social contact of the telephone" (Ball, 1968:63), More generally, telephones allow interlocutors to distance themselves from one another by, among other things, (1) concentrating on their conversational presentations and (2) ignoring or even misrepresenting "those aspects of appearance which might be not only relevant, but also damaging should they be seen and reacted to by the conversational other" (Ball 1968:71).

A number of studies have contrasted telephone behavior with face-to-face conversation. In a naturalistic study of how managers speak on the telephone and in person, Reid (1977) observed that telephone conversations were: (1) briefer, (2) more spontaneous (i.e., not planned in advance), (3) more single-minded (i.e., dealt with a single subject), and (4) basically initiated to inform or instruct (e.g., not to have general discussion or social conversation).

In a second set of experimental studies, Reid (1977) compared the use of telephones versus face-to-face communication where the goal was to

accomplish a variety of tasks. When the task involved conveying simple information or solving a problem, there were no significant differences between the conversations occurring in the two modalities. However, significant differences did appear when the task involved conflict resolution or expressing one's perception of other people. Use of the telephone had the following effects upon subjects' linguistic and attitudinal responses: (1) more failures to reach agreement, (2) longer time to reach agreement, (3) the side having the "stronger case" achieved more victories (while the side arguing on the basis of "strength of personal convictions" did less well), (4) more opinion change, (5) lower confidence in own judgment (e.g., less confidence in whether had explained something clearly or not), and (6) tendency to rate other people less favorably.

When we consider empirical studies of face-to-face versus computer mediated communication (Part II), we will observe striking parallels between the kinds of language and social behavior resulting from telephone use on the one hand, and computer mediated communication on the other.

Modal Influence

We have seen that by using alternative modalities of linguistic communication, we can produce markedly different sorts of linguistic (and resulting attitudinal or social) behavior. But the power of linguistic modalities does not necessarily stop there. When one mode of communication becomes well publicized or is valued as a source of prestige, that modality can actually influence the linguistic shape of *another* modality (see Baron, 1981). And so, for example, norms appropriate to speech may be adopted in writing, or more to the point, norms characteristic of computer mediated communication may change generally accepted standards for spoken or traditionally written language. Hence, the analysis of a particular linguistic modality (such as computer mediated communication) becomes important not only in its own right, but with regard to the influence it can have on the language more generally. (See Baron, 1979, for further discussion of cross-modal linguistic influences.)

Consider examples of the influence that written English has historically exerted on spoken English, and *vice versa* (Figure 3). In the case of writing influencing speech, one of the most obvious examples is so-called spelling pronunciation. Take a word like *lamb*. We all know that the final *b* is not pronounced. But what about words like *pound* or *thousand* or *blind*, which also end in a nasal consonant (i.e., /n/or /m/) plus a final voiced stop consonant (here a /b/ or /d/)? Today we pronounce the final /d/ in *pound*, *thousand*, and *blind*. Yet this may well be a pronunciation induced by looking at the spelling. There is evidence that in the fifteenth, sixteenth, and seventeenth centuries, the final /d/ was not pronounced (Bloomfield, 1933:488).

Writing influencing speech	Speech influencing writing
1. spelling pronunciations	1. written use of contractions
2. drawing quotation marks in the air	2. general tendency for writing to become a transcription of speech
3. professorial speech	

Figure 3. Examples of cross-modal influence.

Writing can also be seen to influence speech in more subtle ways. It is common place to see a speaker "draw" quotation marks in the air to highlight a word or phrase, and the abbreviations *e.g.* and *viz.* have made it into some academicians' vocabulary. As a final example, consider what we might call "professorial speech." It has often been observed on American college campuses that some members of the faculty "talk the way that they write." One student at Brown University observed that an English teacher on campus was the only person she had ever heard use the word *hence* in spoken conversation.

The influence of spoken English on written English is at once more pervasive but harder to detect. There are a few obvious cases, such as the blurring of traditional distinctions between spoken and written style with respect to contractions. (The conventional ban against using contractions in writing seems to have all but disappeared.) This blurring of stylistic distinctions is part of a more general tendency in American English to make writing increasingly function as a "mere transcription of speech" (Bloomfield, 1933:21). While traditional distinctions between spoken and written style in English have never been as stark as the comparable distinctions in, for example, Japanese (Clancy, 1982) or Chinese (Li and Thompson, 1982), spoken and written English have historically been distinguishable from one another in both form and function (e.g., Tannen, 1982a, 1982b; Kroll and Vann, 1981; Stubbs, 1980; Ong, 1982). Even casual familiarity with the "formal" writing of contemporary American adolescents and young adults suggests these distinctions are rapidly diminishing.

PART II. THE COMPUTER PERSPECTIVE

Defining the Variables

Having set the linguistic stage, we can now look at the use of computer mediated communication not so much as part of a discussion about computers in general, but rather as part of the study of human language. Therefore, the communicative variables that will be of interest to us are much the same as we saw in our discussion of speech or writing or telephones as alternative modalities of human linguistic communication.

In discussing empirical studies of computer mediated communication, we will need to consider the effects of physical, linguistic, and social variables (see Figure 2, above). In the case of *physical* variables, for example, we might consider whether computer mediated communication has evolved (or could evolve) means of compensating for the lack of physical presence or non-linguistic context. (How, for example, do you let your interlocutor know indirectly that you didn't have enough sleep last night and are in a foul mood?) In the *linguistic* domain, we might ask whether computer mediated communication increases (or decreases) levels of grammaticality or general linguistic sophistication. Similarly, we might investigate whether there are grammatical differences between spoken or written language on the one hand, and computer mediated communication on the other. (An example might be the choice of pronouns to refer to the second person interlocutor — e.g., *tu* versus *vous* in French, or *Du* versus *Zie* in German, or the use of honorifics in Japanese when addressing comparative strangers on the terminal.) And finally, there is the domain of *social* variables: Does computer mediated communication lessen or increase levels of social distance? Does it affect the extent to which interlocutors participate in a conversation, or how honest they are in expressing their opinions?

General Social Effects of Computer Mediated Communication

We will consider these communicative variables by looking at the specific ways in which computer mediated communication is being used to supplant traditional written and spoken language. In the process, we will consider the specific effects those forms of computer mediated communication may be having upon the other forms of human linguistic communication. First, though, it may be useful to get an overview of some of the general reactions that "initiates" have to using computers, since these general reactions may color the specific linguistic outcomes we will be considering.

The most important concept for us to understand here is that many people perceive computers (and the use of computers) as alien, intimidating, and a personal threat. Sara Kiesler and her associates at Carnegie-Mellon University (Sproull *et al.* in press) go so far as to characterize the process of learning to use a computer for programming, word processing, or class assignments as equivalent to entering an alien culture. Shoshana Zuboff (1982) of Harvard Business School, in her studies of employees' reactions to the introduction of computers into the workplace, cautions that for all their advantages, computers can end up introducing much unintended alienation. Workers feel manipulated by the computer ("You have to work the way the system wants you to" — Zuboff, 1982:145). Even managers lose a sense of what they are managing. As one collections supervisor put it: "If you work with a manual system and you want to see an account on a given day, you have a paper file

and you simply go to that particular section and pull out the file. When you're in the computer system, in a sense all your accounts are kind of floating around in space. You can't get your hands on them" (Zuboff, 1982:146). And in the domain of medicine, where so-called "expert systems" have been designed to aid physicians in making diagnoses and prescribing treatment, there is considerable suspicion of computer programs designed by unknown outsiders (Shortliffe, 1980).

In our study of computer mediated communication, we will not be able to look directly at the linguistic effects that these generally negative attitudes towards computers might be having on the use of, say, electronic mail or computer conferencing. However, we need to be aware that the results of empirical studies of computer mediated communication may well be confounded by more general attitudes towards computers. The user who believes computers to be "dehumanizing" may decide that only "objective" communication is appropriate in using a machine. The user who judges computers to be high tech's answer to CB radios and late night talk shows is already predisposed to use the system for baring some of his most private thoughts.

Types of Computer Mediated Communication

In studying the linguistic implications of computer mediated communication, it is useful to begin with a clear notion of the types of communication that can take place. The first distinction we need to draw is between uses of the computer to replace traditional functions of written language, and uses of computer mediated communication to replace speech. The second important variable is the number of interlocutors in the exchange: Is the computer mediated communication directed to one interlocutor, or to several? And third, there is the question of familiarity: Does the message sender know the identity of the interlocutor(s)?

Figure 4 presents the major ways in which computer mediated communication is used to replace traditional written language. There are at least five arrangements via which this replacement can be accomplished. In three instances (use of a data base, word processing, and electronic $mail_1$), the message sender is dealing with a single, known interlocutor — which may be himself or even a computer program. In a fourth case, electronic $mail_2$ can be sent to a finite set of interlocutors. Finally, in the instance of electronic bulletin $boards_1$, the sender "broadcasts" a piece of "writing" (such as a research report) to a broad community. The size of the community is not determined by the sender but by who has access to the bulletin board.

	Single Interlocutor	Multiple Interlocutors
Known Interlocutor	data base (other = computer program) word processing (other = self) electronic mail$_1$ (other = specific person not immediately available)	electronic mail$_2$ (other = known community of finite size, where community is not immediately available)
Unknown Interlocutor		electronic bulletin board$_1$ (other = non-enumerable community, where community is not immediately available)

Figure 4. Use of computers in place of writing

The use of computer mediated communication in place of speech can be described (Figure 5) with the same two-by-two matrix we have just used for writing. Electronic mail$_3$ can be sent to a single, known interlocutor where sender and receiver are logged onto the computer system simultaneously. This condition is most analogous to a telephone call between acquaintances. When more than one known interlocutor is logged onto the system, we enter the realm of computer conferencing$_1$. (The analog here is a conference call.)

	Single Interlocutor	Multiple Interlocutors
Known Interlocutor	electronic mail$_3$ (other = specific person immediately available)	computer conferencing$_1$ (other = community of finite size, where community is immediately available)
Unknown Interlocutor	e.g., medical history (other = physician, although immediately available other = computer program) social introduction (other = "blind date")	computer conferencing$_2$ (other = unknown community of finite size, where community is immediately available) electronic bulletin board$_2$ (other = non-enumerable community, where community is immediately available)

Figure 5. Use of computers in place of speech

A third case in which computer mediated communication is used in lieu of speech occurs when a message sender communicates with a single unknown interlocutor. Even when the message sender is directly interacting with a computer program, the sender knows that the message input will be interpreted by some specific (though unknown) person. Examples of this situation are the use of computers (rather than physicians) for taking initial medical histories, or the use of electronic mail systems as dating services.

Our final two cases involve using computer mediated communication to "speak" with multiple listeners with whom the message sender is not familiar. In one case (computer conferencing$_2$), the sender knows that his audience is limited, though he does not know who the members of that audience are. In the other case (electronic bulletin boards$_2$), the "speaker" broadcasts a message to anyone who happens to be on the network (much like a CB radio operator).

It is likely that as computer mediated communication evolves, new types of replacement functions will emerge for traditional writing and speech. They should, however, all be describable in terms of the framework presented in Figures 4 and 5.

Experimental Studies

Linguistic studies of computer mediated communication are still in their infancy, barely reaching beyond the realm of anecdotal observation. This paucity of studies is especially true of computer mediated communication in place of writing. Businesses extol the virtues of data based management systems, especially those such as Intellect, which can be accessed by means of natural language (Harris, 1983; Eisenberg and Hill, 1984). Writers (or typists) of all ilk praise the time-saving features of word processing, and teachers of writing frequently report that student compositions improve in overall quality when the process of revision doesn't require retyping the entire manuscript. Electronic mail offers a welcome respite from the endless game of telephone tag, and electronic bulletin boards provide a willing cadre of evaluators of new ideas or readers of first drafts. But few of these observations have been measured using the traditional canons of scientific methodology.

A handful of researchers are, however, now studying some of the uses of computer mediated communication in place of speech. One cluster of studies (Slack *et al.*, 1966; Grossman *et al.*, 1971) compares medical histories that physicians take from patients with the histories patients produce themselves at a computer terminal in response to a menu-driven questionnaire. The studies suggest not only that most patients are comfortable with their computer interaction, but also that patients sometimes give more complete and correct histories when interacting with computers than when facing the physician directly. This finding is consonant with results of earlier telephone studies (Lester, 1977) which found that the anonymity provided by telephones in

psychological counselling, psychotherapy, and crisis intervention often encouraged greater openness on the part of the person seeking help than was possible in face-to-face interaction.

Another type of study considers what happens when strangers "meet" on the computer. Kiesler, Zubrow, Moser, and Geller (ms.) compared physiological responses of strangers who conversed with one another on the computer or face-to-face. Measuring such factors as pore size and pulse, the investigators found that communication via computer is not as physically arousing as face-to-face communication. At the same time, while face-to-face meetings were initially more physically stressful, the participants meeting face-to-face ended up liking one another better than did their computer-conversing counterparts.

The major work on the use of computer mediated communication in lieu of speaking has been done on computer conferencing, with both known and unknown interlocutors. The primary researchers here have been S. Roxanne Hiltz of Upsala College, Murray Turoff of the New Jersey Institute of Technology, and Sara Kiesler of Carnegie-Mellon University (Hiltz and Turoff, 1978; Hiltz, Johnson, Aronovitch, and Turoff, 1980; Kerr and Hiltz, 1982; Hiltz, 1984; Kiesler, Siegel, and McGuire, in press; Sproull, Kiesler, and Zubrow, in press; Siegel, Dubrovsky, Kiesler, and McGuire, ms.). Hiltz and Turoff have done naturalistic observations of computer conferencing, along with experimental comparisons of face-to-face speech versus computer conferencing. Kiesler and her colleagues have focused on experimental comparisons of face-to-face speech versus computer conferencing, including comparisons between known and unknown interlocutors. In the various experimental studies of these researchers and their associates, participants in the experiments were set tasks such as resolving a dilemma, and the resulting language produced in the two experimental situations was compared.

Taken as a whole, the experimental studies of computer conferencing reveal a number of consistent and striking results. These are summarized in Figure 6. We have grouped these results in terms of the three broad communicative variables we defined earlier: physical, linguistic, and social.

Consider first the *physical* variables. Investigators consistently report that subjects take longer to reach a decision when communicating by computer than when speaking face-to-face. (Recall that we observed a similar finding with telephone communication.) What causes this longer conversation time? It might be argued that the increased time results, at least in part, from the lack of feedback from kinesic cues (e.g., head nods) that speakers often use to convey messages or ensure they are being understood (Kiesler, Siegel, and McGuire, in press). We know almost nothing about how participants in computer conferencing compensate more generally for lack of physical presence and non-linguistic context. Researchers have noted anecdotally (e.g.,

	Computer Sessions	Face-to-Face Sessions
Physical	took longer to reach a decision	shorter time to reach a decision
Linguistic	arguments and swearing (flaming) common reduction of register shifts efficient transmission of "hard data"; inefficient transmission of "soft" (subjective) data	arguments and swearing less common maintenance of register shifts both "hard" and "soft" data equally communicable
Social	more democratic (everyone got a chance) more shifting in position from initial position focus on message, not people	often one person dominated decision less shifting in position from initial position possibility of focusing on people or on message

Figure 6. General results of computer conferencing versus face-to-face communication.

Turoff, personal communication) that participants in computer conferencing literally type such messages as "I'm in a bad mood" or indicate laughter with "Ha Ha." Not surprisingly, deaf people communicating over teletypewriters express emotion, intonation, and conversational pauses (e.g., "hum") in much the same way (Nash and Nash, 1982).

Our current understanding of *linguistic* variables is especially tenuous, yet the existing research does suggest a number of testable hypotheses. The studies agree that computer conferencing fosters the use of a very particular (and homogeneous) conversational style. Most striking is the great frequency of arguments and so-called "flaming" (i.e., speaking incessantly, hurling insults, using profanity) in computer conferencing. In these studies, the conversation of participants in computer conferencing was consistently rowdier than that of their face-to-face counterparts.

Why is this so? There are several possible hypotheses. One is that the lack of visual and non-linguistic cues puts added pressure upon the participants to use any means possible (such as haranguing) to ensure they are being understood (Kiesler, Siegel, and McGuire, in press). (This hypothesis would not explain why deaf speakers using teletypewriters do not resort to the same linguistic tactics.) A second possibility is that computer mediated communication is so new that an appropriate etiquette for computer conferencing has yet to develop (Kiesler, Siegel, and McGuire, in press). Third, we might argue that the linguistic free-for-all so characteristic of computer conferencing results from the masking of status differences between participants (a point we will return to in a moment).

Whatever the explanation, it is clear that from a formal linguistic perspective we would predict a general reduction (or even elimination) of the register shifts that characterize traditional spoken and written communication (Hudson, 1980; Basso, 1974). In future studies, the following hypotheses might be tested:

In computer conferencing, participants use
(1) a narrower range of vocabulary (excluding both "formal" words and words they don't know how to spell)
(2) fewer subordinate clauses in sentences
(3) fewer markers of respect (e.g., words such as *please*, use of titles, choice of grammatical markers of respect such as *vous* in French or *Zie* in German)
than in face-to-face communication.

A second linguistic variable concerns the semantic nature of the message being transmitted. As with the telephone studies, the studies of computer conferencing report that "objective" information can be efficiently transmitted, but "soft" or "subjective" data are often difficult if not impossible to convey. (Recall that in the telephone studies, participants having "the stronger case" achieved more victories than those arguing on the basis of personal convictions.)

Finally, consider the *social* effects of computer conferencing. The most salient of these effects is the heightened degree of participation in computer conferencing as opposed to face-to-face communication. Shyness and inferior position in the organizational hierarchy, which often hamper full participation in face-to-face communication, are offset in computer conferencing by the mask of visual anonymity. In computer conferencing, it is difficult for one person to dominate the conversation and impose his or her views upon others. As a result, we should not be surprised to learn that participants in computer conferencing are more likely to shift their position in the course of conversation than are their counterparts in face-to-face communication. (The telephone studies yielded similar findings.)

An important social consequence follows from this increased "democratization," this flexibility in changing one's mind, and the linguistic finding that "soft" information is more difficult to convey than "hard" information. And that is, that participants in computer conferencing tend to focus on the "message," not the other participants (Siegel, Dubrovsky, Kiesler, and McGuire, ms.). Given the lack of non-linguistic cues, this finding should not surprise us. However, as we will see in Part III, it may give us reason for pause.

Interaction without Audience: A Summary of Trends

We have considered in some detail the style of communication that results from computer mediated interaction, and made occasional comparisons with results from telephone studies. At this point, we can use the findings about both telephone conversation and computer mediated communication to reflect upon our initial communication spectrum (Figure 1). As you recall, the basic organizing principle in this spectrum was spatial and temporal proximity of interlocutors. In the case of face-to-face communication, speaker and hearer are physically proximate. In the case of writing, writer and reader are typically removed in both time and space. Both the telephone and the computer represent intermediate points on this continuum.

Our discussion of telephone use and computer mediated communication pointed up some of the consequences of spatial and temporal distancing. In Figure 7, we incorporate this discussion into a more general analysis of the potential advantages and potential disadvantages that come with spatial and temporal distancing in language.

	Potential Advantages	Potential Disadvantages
Spatial Distancing (Not face-to-face)	anonymity social equalizer reduced distractions increased importance of logical argument	reduced feedback (loss of communicative nuance) social distancing
Temporal Distancing (Lag between production and perception, perception and response)	opportunity to contemplate message, response opportunity to reformulate, correct both production and response physical convenience	writer's block conditions (no impetus from interlocutor to continue) reduction of language as a means of phatic communication (social bonding)

Figure 7. Spatial and temporal distancing in human communication: some pros and cons.

Begin first with the advantages. By removing visual contact between interlocutors, the message producer attains a degree of anonymity that often allows a greater degree of forthrightness than is possible in face-to-face encounters. The importance of anonymity can also be observed in more traditional forms of communication such as graffiti. Besides the "flaming" found on New York subway cars or on bus station walls, one can also find graffiti that expresses more personal and even intellectual messages than their

authors are willing to convey to a known other. A recent example appeared in a ladies room at Emory University:

> Saw [former President Jimmy] Carter speak — said he hoped E[mory] U[niversity]'s student body would have a "stirring of social responsibility", which he said, at this point has not happened. I began running over in my mind — why not? Why do we, as the student body, lack social responsibility? What can we do to initiate and nurture this "stirring"?

Face-to-face discussions of this sort are rare at best on contemporary American campuses.

Along with anonymity comes not only the "democratization" we have discussed earlier, but a freedom from external distraction. The shy coed may feel more at ease asking questions of her professor over the computer than alone face-to-face in his office. From the other side of the table, the professor can concentrate on his message and not worry about how messy the office is or whether his shirt is torn.

Temporal distancing reinforces some of these same advantages, while contributing additional advantages as well. When the interlocutor is not "on line" (e.g., using electronic mail when the interlocutor is not immediately available to receive the message), the producer has the leeway of contemplating what he wants to say or of revising a message (or text) before transmitting (or printing) it. Finally, as we have earlier seen, systems such as electronic mail free interlocutors from waiting by the telephone or relying on the postal system.

Spatial and temporal distancing bear concommitant disadvantages as well. We have commented several times on the loss of communicative nuances that comes with decreased feedback. Such phenomena as flaming may be attempts to compensate for the absence of facial expressions or intonation patterns in computer mediated communication (perhaps analogous to children "signing" their letters *love and XXX*, i.e., kisses). And the negative consequence of anonymity, democratization, and reduced distractions may be a general social distancing between participants (a point we will return to shortly).

Finally, temporal distancing brings with it some familiar disadvantages. Since no interlocutor is physically awaiting a response, the message sender's opportunity for contemplation and revision can well change into writer's block. The temporal absence of the interlocutor also typically reduces the possibility that the linguistic exchange can be used for general purposes of social bonding between the participants. Exceptions can, of course, develop, as in the case of the important letter writing tradition of eighteenth- and nineteenth-century Europe, or in stylized genres such as love letters.

PART III. THE FUTURE PERSPECTIVE

We have been looking at the linguistic consequences of several types of human communication, especially those involving the computer. We then went on to evaluate the potential advantages or disadvantages of such consequences.

The act of evaluation can be interpreted in two ways. On the one hand, we can simply observe the limitations (or strengths) of a particular modality in and of itself, and assume that any limitations will somehow be counterbalanced by the virtues of other linguistic modalities. On the other hand, we can ask whether a given modality is likely to overshadow or even essentially replace other communicative modalities and, if so, what the consequences of such an event would be. In Part II, we dealt with computer mediated communication largely in isolation. In this section, we will focus upon the question of influence: Is computer mediated communication likely to influence the way we speak and write, and, if so, of what consequence might such influence be?

A discussion of future linguistic change and its potential consequences presupposes first, that it is reasonable to speak of predicting linguistic change, and second, that it is legitimate to evaluate linguistic expressions and judge one to be in some way "better" than another. Therefore, before considering how computer mediated communication may affect other linguistic modalities, we will briefly address the issues of prediction and prescriptivism in language.

Divining the Future

Is it possible to predict language change? According to the American structuralist tradition (e.g., Hockett, 1965), the answer was emphatically "no." Language change, at least at the phonological and syntactic levels, was assumed to be random.

Other models of linguistic analysis have argued that it is indeed possible to predict at least some types of linguistic change. In his study of language universals, Joseph Greenberg (1966) has argued that other things being equal, language change, when it occurs, can be predicted from statistical or implicational universals. For example, if almost all languages have at least one nasal consonant (e.g., /n/ or /m/), we would predict that any language *lacking* such consonants would be likely to develop one before it develops other consonantal distinctions. In my own study of language function (Baron, 1981), I have demonstrated that change in such formal linguistic properties as degree of syntactic redundancy or levels of iconicity in sign formation can accurately be predicted from a social profile of the linguistic community.

A third predictive approach to language change is based upon the study of contemporary language variation. Beginning with the Prague School of the late 1920's (Vachek, 1966) and extending to William Labov's contemporary studies of phonological variation (Labov, Yaeger, and Steiner, 1972), the

sociolinguistic tradition has demonstrated that the new linguistic variants of yesterday often become the linguistic norm of today. Therefore, by observing contemporary variation, it is possible to make reasonable predictions about the linguistic future.

Predicting the future is always risky. In real life other things are seldom equal, so there is always the strong possibility of being wrong. However, such risks are worth taking if some outcome hinges upon the prediction. In the present context, that outcome is the expressive power and functional range of traditional spoken and written English. If computer mediated communication does influence the way we speak and write, then the ability to predict change (rather than merely observe it in retrospect) may prove critical if we wish to contemplate doing anything about it.

Descriptivism versus Prescriptivism

To speak of "doing anything about" language is to reopen a long and bitter debate in the annals of linguistic history: Is the task of the linguist to "describe" language precisely as he finds it, or to work towards changing language to fit a normative model?

Since at least the early eighteenth century, Europe had focused much of its linguistic attention on "correct" language. The French and German governments directly oversaw the "purity" of their respective national languages, and England, with its rising middle class that needed tutoring in the polite speech of the gentry, became obsessed with the "doctrine of correctness" (Leonard, 1929).

This same attitude towards "correctness" in language was extended by missionaries and explorers who encountered strange peoples speaking even stranger languages. In almost all instances the Europeans assumed Latin grammar as the appropriate model for trying to understand these exotic non-European languages. Needless to say, the resulting grammars ended up characterizing these languages as radically defective, and similar inferences were typically drawn about the mental abilities of their speakers (see Hanzeli, 1969; Baron, 1981).

Rebelling against these "prescriptive" models of American Indian languages, Franz Boas set out to look at the languages in their own right. In so doing he hoped to establish that indeed these languages were highly sophisticated (rather than defective) and, derivatively, that their speakers must be culturally sophisticated as well (Boas, 1911; Herskovitz, 1953).

Boas and his students accomplished their task. In the process they also established an American tradition of descriptivism—a tradition that eschewed all attempts at evaluating languages with respect to one another, and a tradition that had little patience for doctrines of correctness. This commitment to descriptivism over prescriptivism was underscored in the 1960's by the

publication of *Webster's Third New International Dictionary*, which abandoned notations of formal and informal style, and introduced not only *ain't* but a range of other four letter Anglo-Saxon words as well. And in recent years, American students of language have typically rejected the efforts of such language "purists" as Edwin Newman (1974), William Safire (1980), and John Simon (1980) (see Nunberg, 1983, for a review of the contemporary debates).

Against such a linguistic backdrop in America, it is uncharacteristic to pose the question of whether the influence of one linguistic modality upon another is a good thing or bad. Yet this is precisely the question that I suggest we need to be asking about the possible influences of computer mediated communication upon speaking and writing. Is there any justification for even contemplating a prescriptive approach to cross-modal influences? I suggest that there is, although the arguments cannot be constructed on strictly linguistic grounds. Rather, justifications are more properly sociological.

Consider the scenario (admittedly wildly unlikely) that traditional spoken and written language come to have the precise linguistic character we have described for computer conferencing (see Figure 6 above). What implications would such linguistic change have for the functioning of human social interaction?

To begin with, human language would lose the majority of its functions. It is commonly acknowledged by language theorists (Bühler, 1934; Jakobson, 1960), anthropologists (Hymes, 1964), and philosophers of language (Austin, 1965; Searle, 1969) that the exchange of "objective" information is but one of the many functions that human language can serve. Most of the time we use language as a medium of *social* rather than informational exchange. Our language serves to convey our attitudes about ourselves or towards others. We use language to conceal or convince. Language is a means of accomplishing goals ("I hereby christen this ship") or of preventing action ("Don't!"). Even when we are ostensibly exchanging information ("I'm fond of spring in Atlanta"), our actual purpose may be to make the acquaintance of the person standing near us at the bus stop. As we have seen, computer mediated communication — at least as currently used — is ill-suited for such "social" uses of language.

Second, computer mediated communication may serve to discourage actual human encounters. Much as the Lynds observed that "neighboring" declined with the rise of the telephone in Middletown, observers of computer mediated communication have begun to notice scenes such as the following: "At our laboratory people have come to rely on their terminals, and sometimes seem to prefer electronic messages to conversing face-to-face. It is not unheard of for one person to see another in the hall and to say, 'I am going to send you a message,' and then go do so, forgetting that the information could have been easily conveyed then and there" (Norman, 1983:49).

The scene is strangely reminiscent of communication in a society imagined by Isaac Asimov in *The Naked Sun*. On the world known as Solaria, inhabitants almost never "saw" one another. Instead they "viewed" their interlocutors through a system of electronic communication much like videophones or teleconferencing. When force of circumstances actually brought two people physically together into the same location (such as occasional meetings between husbands and wives, or between doctors and patients), both parties were acutely uncomfortable.

Third, while computer mediated communication may be a boon for democracy, it may unwittingly undermine the basic social fabric that any society — including a democracy — needs to survive. Social distinctions based upon familial or social standing (such as respect for elders or for elected leaders) seems to be at odds with the prevailing linguistic consequences of computer mediated communication.

And fourth, the profusion of computer mediated communication would seem to challenge some of the very bases upon which human beings formulate their beliefs. The rhetorical tradition of persuasion would be supplanted by strict logical argumentation. It is unclear how the bias against "soft" information in computer mediated communication might affect our ability to talk about patriotism or charisma or religious belief.

In our hypothetical scenario, such are the kinds of social effects that cross-modal linguistic influence might have. It is in light of such possibilities — however extreme or however remote they might seem — that I venture into the murky domain of linguistic prediction and evaluation.

Cross-Modal Influence Redux: Computers, Speech, and Writing

And now for the crystal ball: Given what we have learned about cross-modal linguistic influence (in Part I) and about computer mediated communication (in Part II), what kinds of influence might we predict that computer mediated communication could have upon traditional speech and writing?

In making these predictions, it is useful to employ some new terminology that summarizes a number of the linguistic variables we have been discussing throughout the paper. I will use the term *vertical language* to refer to the use of language for logical sequencing. Vertical language is well suited for conveying "objective" information and for establishing logical connections between points. I will use the term *horizontal language* to refer to the use of language for description. Horizontal language is useful in expressing nuance, making subtle (or stylistic) distinctions, and more generally, using linguistic and non-linguistic context for crafting a gestalt.

Given these distinctions, we can now consider a simplified "map" of the potential influences that computer mediated communication might have upon spoken and written language. Figure 8 is organized in terms of a time line. Beginning at the left side of the figure, we see that even before the computer

became a relevant variable in human communication, spoken English was having an increasing effect upon the way educated language users formulated written English. With the introduction of computer mediated communication, we then encounter a slightly convoluted set of influences: On the one hand, because computer mediated communication—like typing more generally—is physically a form of writing, we assume that computer mediated communication is directly affected by norms of written language (e.g., punctuation, the need for grammatical sentences). On the other hand, since writing itself is increasingly affected by speech, we should not be surprised to find spoken language conventions imposing themselves as well on computer mediated communication (e.g., contractions, less formal vocabulary and syntax).

But then what? What effect might we predict for computer mediated communication upon future speech and writing? Consider first the case of speech.

If spoken language is indeed influenced by computer mediated communication, we might expect to see an improvement in the vertical

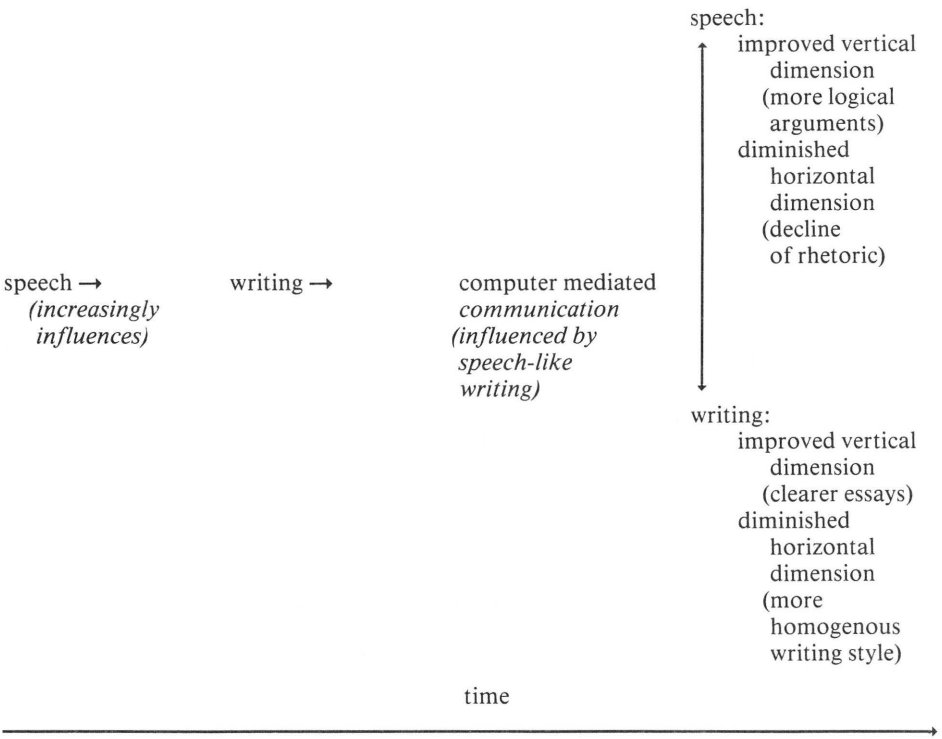

Figure 8. Potential influences of computer mediated communication on speech and writing.

dimension of speech. That is, the degree of logical coherence and grammaticality in our speech might begin to approximate more closely that of our written language. To borrow an image we used earlier in Figure 3, a growing number of us might develop a version of "professorial speech." At the same time, though, we would predict a diminution of the horizontal dimension of speech. Rhetorical skills (that have steadily been on the decline in America for almost a century) would continue to atrophe, since "objective" data are more successful in computer mediated communication than verbal suasion.

The written language would follow a very similar course if influenced by computer mediated communication. The vertical dimension would improve and the horizontal dimension would decline. Word processors, as we have seen, encourage revision. But the revision is more likely to be along the lines of logical coherence than stylistic richness. The result could be a more homogenous norm for "acceptable" writing that is clear but stylistically uninteresting. The recent development of grammar and style programs such as Writer's Workbench from AT&T Bell Laboratories may serve to hasten this already existing potential for increased homogeneity (Cherry and Macdonald, 1983).

There are few moments in human history when technological innovation has the potential for radically altering human society within the space of a generation. It is generally agreed that the computer has produced one of those moments. Our goal in this paper has been to explore the place of human language in this revolution. We have considered computer mediated communication as a new linguistic modality in its own right, and then contemplated how computer mediated communication might affect the existing forms and functions of spoken and written language.

No one in the computer industry has any hidden agenda for using hardware or software development to alter human language. Yet technology can indeed drive linguistic and social change. On Asimov's world Solaria, inhabitants did at one time physically "see" one another. But changing circumstances made that unnecessary. Because the population of Solaria was small, it was possible for inhabitants to develop large landed estates. And on a large estate, there is little likelihood of encountering one's neighbor. A Solarian sociologist described it this way: "A Solarian takes pride in not meeting his neighbor. At the same time, his estate is so well run by robots and so self-sufficient that there is no reason for him to have to meet his neighbor. The desire not to do so led to the development of ever more perfect viewing equipment, and as the viewing equipment grew better there was less and less need ever to see one's neighbor. It was a reinforcing cycle, a kind of feed-back" (Asimov, 1957:100).

What our future language will actually look like remains to be seen. What, if anything, we wish to do about it remains for us to decide.

References

Asimov, Isaac (1957). *The Naked Sun*. Garden City: Doubleday.

Austin, J.L. (1965). *How to Do Things with Words*. New York: Oxford.

Ball, Donald W. (1968), "Toward a Sociology of Telephones and Telephoners," in Marcello Truzzi, ed., *Sociology and Everyday Life*. Englewood Cliffs (N.J.): Prentice-Hall.

Baron, Naomi S. (1979), "The Functions of Cross-Model Representation," *Proceedings of the XIIth International Congress of Linguists*, Vienna, 727-730.

Baron, Naomi S. (1981). *Speech, Writing, and Sign*. Bloomington: Indiana University Press.

Basso, Keith (1974), "The Ethnography of Writing," in Richard Bauman and Joel Sherzer, eds., *Explorations in the Ethnography of Speaking*. New York: Cambridge University Press, 425-432.

Bloomfield, Leonard (1933). *Language*. New York: Holt, Rinehart and Winston.

Boas, Franz (1911), "Introduction," *Handbook of American Indian Languages*. Washington: Government Printing Office.

Bühler, Karl (1934). *Sprachtheorie*. Jena: Gustav Fischer.

Cherry, L.F., and Macdonald, N.H. (1983), "The Unix Writer's Workbench Software," *Byte, 8*, 241-248.

Chomsky, Noam (1965). *Aspects of the Theory of Syntax*. Cambridge (Mass.): MIT Press.

Clancy, Patricia M. (1982), "Written and Spoken Style in Japanese Narratives," in Deborah Tannen, ed., *Spoken and Written Language*. Norwood (N.J.): Ablex, 55-76.

Eisenberg, Jane, and Jeffrey Hill (1984), "Using Natural-Language Systems on Personal Computers," *Byte, 9* (no.1) :226ff.

Greenberg, Joseph, ed. (1966). *Universals of Language*. Cambridge (Mass.): MIT Press.

Grossman, Jerome H., G. Octo Barnett, Michael T. McGuire, and David B. Swedlow (1971), "Evaluation of Computer-Acquired Patient Histories," *JAMA, 215* (no.8): 1286-1291.

Hanzeli, Victor Egon (1969). *Missionary Linguistics in New France*. The Hague: Mouton.

Harris, Larry R. (1983), "A New Dimension in Software," *Computerworld Buyer's Guide: Software*, December: 10-16.

Herskovits, Melville (1953). *Franz Boas*. New York: Charles Scribner's Sons.

Hiltz, Starr Roxanne (1984). *Online Communities*. Norwood (N.J.): Ablex.

Hiltz, Starr Roxanne, Kenneth Johnson, Charles Aronovitch, and Murray Turoff (1980), "Face-to-Face vs. Computerized Conferences: A Controlled Experiment," Computerized Conferencing and Communications Center, New Jersey Institute of Technology, Research Report Number 12.

Hiltz, Starr Rozanne, and Murray Turoff (1978). *The Network Nation*. Reading (Mass.): Addison-Wesley.

Hudson, R.A. (1980). *Sociolinguistics*. Cambridge: Cambridge University Press.

Hockett, Charles F. (1965), "Sound Change," *Language, 41*:185-205.

Hymes, Dell, ed. (1964). *Language in Culture and Society*. New York: Harper and Row.

Hymes, Dell (1974). *Foundations in Sociolinguistics*. Philadelphia: University of Pennsylvania Press.

Jakobson, Roman (1960), "Closing Statement: Linguistics and Poetics," in Thomas A. Sebeok, ed., *Style in Language*. Cambridge (Mass.): MIT Press, 350-377.

Kerr, Elaine B., and Starr Roxanne Hiltz (1982). *Computer-Mediated Communication Systems*. New York: Academic Press.
Kiesler, Sara, Jane Siegel, and Timothy W. McGuire (in press), "Social Psychological Aspects of Computer-Mediated Communication," *American Psychologist*.
Kiesler, S., D. Zubrow, A.M. Moses, and V. Geller (Ms.), "Affect in Computer-Mediated Communication," Carnegie-Mellon University.
Kroll, Barry M., and Roberta J. Vann, eds. (1981). *Exploring Speaking-Writing Relationships*. Urbana: National Council of Teachers of English.
Labov, William, M. Yaeger, and R. Steiner (1972). *A Quantitative Study of Sound Change in Progress*. Report on National Science Foundation Contract NSF-GS-3287. 2 vols. Philadelphia: The U.S. Regional Survey.
Leonard, Sterling (1929). *The Doctrine of Correctness in English Usage 1700-1800. University of Wisconsin Studies in Language and Literature*, number 25.
Lester, David (1977), "The Use of the Telephone in Counselling and Crisis Intervention," in Ithiel de Sola Pool, ed., *The Social Impact of the Telephone*. Cambridge (Mass.): MIT Press.
Li, Charles N., and Sandra A. Thompson (1982), "The Gulf Between Spoken and Written Language: A Case Study in Chinese," in Deborah Tannen, ed., *Spoken and Written Language*. Norwood (N.J.): Ablex, 77-88.
Lynd, Robert, and Helen Lynd (1928). *Middletown: a Study in Contemporary American Culture*. New York: Harcourt, Brace.
Nash, Jeffrey E., and Anedith Nash (1982), "Typing on the Phone: How the Deaf Accomplish TTY Conversations," *Sign Language Studies, 36*:193-216.
Newman, Edwin (1974). *Strictly Speaking*. Indianapolis: Bobbs-Merrill.
Norman, Donald (1983), "The Computer Always Rings Twice," *Psychology Today, 17* (no. 10):46-50.
Nunberg, Geoffrey (1983), "The Decline of Grammar," *Atlantic, 252* (Dec.): 31-46.
Ong, Walter (1982). *Orality and Literacy*. Methuen: New York.
Reid, A.A.L. (1977), "Comparing Telephone with Face-to-Face Contact," in Ithiel de Sola Pool, ed., *The Social Impact of the Telephone*. Cambridge (Mass.):MIT Press, 386-414.
Safire, William (1980). *On Language*. New York: Times Books.
Searle, John (1969). *Speech Acts*. Cambridge: Cambridge University Press.
Shortliffe, Edward H. (1980), "Consultation Systems for Physicians: The Role of Artificial Intelligence Technologies," *Proceedings of the Canadian Society for Computational Studies of Intelligence* (CSCSI), University of Victoria, B.C.
Siegel, Jane, Vitaly Dubrovsky, Sara Kiesler, and Timothy W. McGuire (Ms.), "Group Processes in Computer-Mediated Communication," Carnegie-Mellon University.
Simon, John (1980). *Paradigms Lost*. New York: C.N. Potter.
Slack, Warner V., G. Philip Hicks, Charles E. Reed, and Lawrence J. Van Cura (1966), "A Computer-Based Medical-History System," *New England Journal of Medicine, 274* (no. 4): 194-198.
Sproull, Lee S., Sara Kiesler, and David Zubrow (in press), "Encountering an Alien Culture," *Journal of Social Issues*.
Stubbs, Michael (1980). *Language and Literacy*. London: Routledge and Kegan Paul.
Tannen, Deborah, ed. (1982a). *Analyzing Discourse: Text and Talk*. Washington: Georgetown University Press.
Tannen, Deborah, ed. (1982b). *Spoken and Written Language*. Norwood (N.J.): Ablex.
Vachek, Josef (1966). *The Prague School of Linguistics*. Bloomington: Indiana University Press.
Zuboff, Shoshana (1982), "New Worlds of Computer-Mediated Work," *Harvard Business Review, 60*:142-152.

Reading Library Catalogues and Indexes

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This paper gives a brief description of some of the work undertaken by the Centre for Catalogue Research at the University of Bath. Some of the Centre's research is concerned with visual factors affecting the design and performance of library catalogues and indexes. The involvement of computers in the generation of catalogues has enabled people's performance to be studied with alternative catalogue displays. One of the critical factors is the number of entries which can be scanned per page, the more entries the shorter the search time. Another critical factor is the way keywords in a title are displayed in relation to the context both of the other words in the title and the other entries in the catalogue. It is shown that major improvements are possible to the visual display of the information on some of the catalogue systems currently in use.

It was due to the influence of my father that I chose to be a librarian. A bookseller by trade, well read and with catholic interests, he always managed to produce some surprises. I well remember him telling me that he liked to read *Bradshaw*. He was not a railway enthusiast, but the mental activity of tracing routes and the delights of reaching destinations in the imagination gave him particular pleasure. For me, as a young boy, *Bradshaw* was an insurmountable obstacle to the prospect of ever getting anywhere by rail! Indeed, I still have my problems with British Rail timetables! The typography, the form of tabulation, the abbreviations and arbitrary signs and symbols used, were more likely to obfuscate than to enlighten me. Similar difficulties have faced the users of library catalogues and indexes for years. In his article "The crisis in cataloguing" Andrew Osborn wrote, "The card catalogue is at best a barrier between the reader and the book" (Osborn, 1941).

Computers effect changes in physical form

For many users the most significant development in the catalogue and index in recent time has been the change in its physical form stemming from the use of computers. First came the use of Computer Output Microfilm (COM) and latterly the emergence of the on-line public access catalogue.

COM resulted in a return to the page form for presenting catalogue data. This was previously exemplified by the guard-book and printed book cata-

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logues which predated the ubiquitous card catalogue and the less common sheaf catalogue. The card catalogue had been introduced in libraries to allow the facility of easy updating through the interfiling of new entries. Cards also offered the prospect of providing a centralised service, such as that inaugurated in 1901 by the Library of Congress, so that the same item did not need to be catalogued independently by scores of different libraries. Such services, however, placed great emphasis on the need for standardisation. There were two consequences for the user therefore: firstly the loss of the scannable array of entries provided by the page format, and secondly the development of more complex rules governing forms of heading and description which developed to cope with filing problems and standardisation requirements. An additional difficulty facing the compilers and users of catalogues which include subject headings, is the establishment of a satisfactory syndetic structure. Many users of card catalogues will vouch for the frustration which they have experienced when being directed through the catalogue by a system of "see" and "see also" references only to find that they reached a dead-end, or that they appeared to be back where they started! The same problem also applies to book and COM catalogues, but at least pages, or volumes of entries, allow the eye to alight on neighbouring entries. Serendipitous discovery of relevant items is made more possible: a point to which I will return later.

On-line access, in its earlier forms, reverted to the presentation of details relating to one title at a time and was more reminiscent of the card catalogue. Indeed, most existing on-line catalogues still do not provide pages of entries which can easily be compared to those provided by the book or COM forms of catalogue. The most significant advance for the user so far provided by the on-line catalogue has been the power made available for *searching* the file. Searching by separate data elements such as the publisher's name, searching for individual keywords within titles or subject headings, the implementation of Boolean logic using "and" "or" "not", the ability to use sequential searching to identify particular strings of alpha-numeric characters, have all opened up completely new vistas for file interrogation. Nevertheless, the data still have to be presented to the user in a comprehensible form. We may ask whether some of the undoubted plusses of enhanced searching power, are being offset at present by losses in the manner of the data presentation.

Centre for Catalogue Research

What factors have to be borne in mind when designing the new systems in order to ensure that users can more easily search for and identify items and then interpret the details presented to them more speedily and more accurately? This question is one of a whole series which the Centre for Catalogue Research has been, and is still, investigating on behalf of the UK library and information community and which also attracts a good deal of interest from overseas.

The Centre was set up by the British Library Research and Development Department in September 1977 and operates on behalf of all types of libraries in the United Kingdom as the national focal point for research, information, and instruction in the field of catalogue research and development. The catalogue has been the most costly tool produced by librarians. Given recent economic pressures, the growth in expenditure on computing, the opportunities for developing multi-functional files, and the new technology, the level of investment now requires justification. It is important to stress that the word "catalogue" in the Centre's title covers the use of bibliographic records for acquisitions, book issue systems, resource sharing schemes, and the study of methods of providing subject access, as well as for the traditional cataloguing function.

User Needs

It has been all too easy for librarians to engage in cataloguing as an arcane pursuit in its own right. Intellectually it can be surprisingly stimulating and possess considerable academic content, but what has often been lacking is any reasonably objective consideration of the impact of this effort on the service to the *user*: not only through the catalogue itself, but also through the possible imbalance in the allocation of resources within the library.

The principal emphasis of the Centre's work is on users and their needs and a particular feature of our work is that, as far as possible, experimental methods should be used. Many studies of catalogue use have been undertaken in the United States and UK over the past fifty years, but almost all of them have been questionnaire or interview studies of how readers used existing catalogues and indexes. Some of these studies also invited users to hypothesise about what they might like to have provided by the catalogue if it was possible, but very few indeed have created alternative files the performance of which could be measured against use. This has been due mainly to the unacceptably high costs of producing alternative parallel files (i.e. files for exactly the same titles but with variant forms of presentation) by manual means. The introduction of computerised production of catalogues and indexes in the mid to late '60s altered the situation significantly.

Bath University Comparative Catalogue Study

Between 1969 and 1971 I was responsible with Gillian Venner for the retrospective conversion of Bath University Library's card catalogue to machine-readable form (Bryant, Venner, and Line, 1972). The conversion was initiated by Maurice Line, the then University Librarian and now Director General of the British Library Lending Division. The decision was made to use catalogue records containing much less data than was usually included in a university library's catalogue. A proposal was submitted to the Office of Scientific and

Technical Information (now incorporated in the British Library Research and Development Department) pointing out that Bath University Library had complete card and complete machine-readable files of its catalogue, together with the programs able to produce a variety of output options. A grant was awarded to fund the Bath University Comparative Catalogue Study (BUCCS) from 1973 to 1975 (see reference note 1). The study compared four physical forms: card, computer printout bound into volumes, 16mm cassetted COM roll-film (indexed and unindexed, motorised and manual), and 42x reduced COM microfiches; and four different sequences, with entries being sequenced by author, title, classified (UDC) and KeyWord Out of Context (KWOC). Figure 1 illustrates a KWOC display.

It is not my purpose to give detailed results here, but fiche proved to be the preferred form, and the reaction to the KWOC sequence was enthusiastically positive. The importance of the BUCCS project lay in the fact that, although it took place in a small university (2,815 students in the academic year 1972/3), it had been a real-life experimental project and had studied the performance of the four physical forms and sequences of catalogue in relation to potential as well as regular catalogue users.

The success of this project, together with the rapid technological developments influencing the library world, led to the establishment of a more comprehensive programme of research in 1977. Two of the projects were especially relevant to those interested in the visual acceptability of data. These were: (i) A study of the performance of full and short entry catalogues, and (ii) A study of a variety of output options for keyword catalogues (i.e. catalogues using the free language of the words in the title, contents page, etc.).

Figure 1. Illustration of catalogue entries displayed with keyword out of context.

CENTRE FOR CATALOGUE RESEARCH: FULL MARC CATALOGUE 23/08/80

Warner, Thomas Everett
An annotated bibliography of woodwind instruction books. 1600-1830 / by Thomas E. Warner - Detroit: Information Coordinators, 1967
xv1.138p - (Detroit studies in music bibliography i.11) 0-911 772-31-6
Shelved at: M 128 W5 WAR
Book No: 10 0234884 1

Warnock, G. J
Sense and sensibilis / (by) J. L. Austin / reconstructed from the manuscript notes by G. J. Warnock - London: Oxford University Press. 1972
2x 144p: 21 cm: Pbk Index - 0-19-500307-1
Shelved at: Bf 311 AUS
Book no: 10 0017442 9: 10 0017440 0: 10 0249509 6

Warnock, Mary
Education: a way ahead / [by] Mary Warnock - Oxford: Blackwell, 1979
146p - (Mainstream series) 0-631-11281-2
Shelved at: LA632 WAR
Book no: 10 0255658 9

Warnock, Mary
Ethics since 1900 / [by] Mary Warnock - 3rd ed - Oxford: Oxford University Press 1978
1x150p: 20 cm: Pbk - (Opus) Previous ed: 1960 - Bibl: p.145-147 - Index - 0-19-289108-1
Shelved at: BJ 319 WAR
Book no: 10 0235584 2

Warr, Peter B
The perception of people and events / by Peter B. Warr (and) Christopher Knapper - London: Wiley. 1968
445p: ill - 24 cm 0-471-92109-2
Shelved at: MM 132 WAR
Book no: 10 0060168 5: 10 00663637 0: 10 0252547 4

Warr, Peter B
Psychology at work / edited by Peter B. Warr - Harmondsworth: Penguin, 1971
460p: illos: 18 cm: Pbk. (Penguin education) bibl p403 444 - 0-14-080284-3
Shelved at: H 5548-8 PSY
Book no: 10 0236945 8

The Warrant chiefs
: indirect rule in Southeastern Nigeria, 1891-1929 / [by] A.F. Afigbe - New York: Humanities Press, 1972
338p . (Ibadan history series) 0-391-00215-5
Shelved at: JQ 3099-E23 AFI
Book no: 10 0251368 1

Warrants and convertibles data book
: an index of warrants and convertible loan stocks available in the U.K. / [by] Peter Welham - Cambridge: Woodhead Faulkner, 1975
(1) vii. 109p: 21 cm: 5p 0-85941-022-6
Shelved at: HG 5441 WEL
Book no: 10 0235699 1

Content of catalogue entries

There has been heated debate regarding the amount of detail which should be included in catalogue entries since the days of the great Panizzi. On the one hand there have been those who believe that the local library catalogue should only be a finding list, and on the other there have been many committed to the bibliographic catalogue based on full records adhering closely to the highest standards. As my colleague Alan Seal (formerly research fellow at the Centre for Catalogue Research) has pointed out: "The recent growth of bibliographic networks, the escalating cost of output as files increase in size, the use of less-than-full . . . records in CIP (Cataloguing in Publication) programmes, the rapid growth of on-line information retrieval databases, and several other developments have all highlighted the need for more information on the relative merits of full and short entry catalogues" (Seal, 1983).

The use of a short entry catalogue affects a library system and library users in three main areas: system costs, user needs, and usability. The Centre's report on the project (Seal, Bryant, and Hall, 1982) commented on the latter two areas as follows:

> *User* needs . . . How often does the omission of data mean that a user would fail to find a title which he otherwise would have found? How often would a user be put to some inconvenience by having to check a source other than the library catalogue?
>
> *Usability* . . . It refers to speed of use, accuracy of searching, and preference . . . Usability interacts with both needs and cost. It is possible to have a catalogue which can cater for any need but this might only be achieved at greater cost and possibly be more difficult to use.

As with the BUCCS project a number of the constituent studies carried out by the Centre involved controlled experiments using parallel catalogue files. Two of these experiments were specifically concerned with usability. The bigger of them was undertaken at the library of the University of Bristol where parallel author/title sequences were produced, each of which contained 55,075 entries. (Figures 2 and 3 show sample frames from both the full and short entry files.) The second experiment was carried out using the library files catalogue of the City University.

Before the experimental COM catalogues were produced, I approached Herbert Spencer and Linda Reynolds at the Royal College of Art for advice on establishing a form of layout for the entries which would be neutral in its effect. We did not want the layouts selected for the tests benefiting the performance of one file at the expense of the other. As a result of this request Reynolds carried out a survey of a range of existing catalogues which demonstrated beyond question the scanty attention paid by librarians and COM producers to the importance of layout both in terms of cost, and, more importantly, usability (Reynolds, 1979a). Figure 4 shows a typical example of a

Warner I R
An anthology of modern Portuguese and Brazilian prose.
Shelved at: PG 9173 ANT
Book no: 10 0242593 4

Warner, Malcolm
Comparative union democracy: organisation and opposition in British and American unions. (by) J. Edelstein - 1975
Shelved at: HO 664 EDE
Book no: 10 0234241 9

Warner, Marina
Alone of all her sex: the myth and cult of the Virgin Mary - 1978
Shelved at: BT 645 WAR
Book no: 20 0242710 2

Warner, Robin
See
Warner, I R

Warner, Sam Bass
Measurements for social history - 1977
Shelved at: HT 123 WAR
Book no: 10 0230982 x

Warner, Thomas Everett
An annotated bibliography of woodwind instruction books. 1600-1630 - 1967
Shelved at: M 128 WS WAR
Book no: 10 0234884 1

Warnock, G. J.
Sense and sensibilia. (by) J. Austin - 1972
Shelved at: Bf 311 AUS
Book no: 10 0017442 9: 100017440 0: 10 0249509 6

(Warnung an hartherzige Frauenn).
Des armen Schoffthors "Warnung an hartherzige Frauen": (Andrens Capellanus: "De Amore". Dialogus De deutsch). (by) Schoffthor - 1979
Shelved at: PT 1651.534
Book no: 10 0250350 3

Warr, Peter B
The perception of people and events - 1968
Shelved at: HM 132 WAR
Book no: 10 0060168 5: 10 0063637 0: 10 0252547 4

Warr, Peter B
Psychology at work - 1971
Shelved at: HF 5549-8 PSY
Book no: 10 0236945 8

The Warrant chiefs
: indirect rule in Southeastern Nigeria. 1891-1929. (by) A. Afigbo - 1972
Shelved at: JQ 3099.E23 LFI
Book no: 10 0251368 1

Warrants and convertibles data book
: an index of warrants and convertible loan stocks available in the U.K. (by) P. Welham - 1975
Shelved at: HG 5441 WEL
Book no: 10 0235699 1

Warre, Michael
Designing and making stage scenery - 1966
Shelved at: PN 2091.SB WAR
Book no: 10 0251308 2

Figure 2. Traditional full catalogue entry.

Figure 3. Illustration of short entry in catalogue. Note increase in number of entries visible simultaneously.

SHROPSHIRE COUNTY LIBRARY — SUPPLEMENT — PAGE 44

AUTHOR	TITLE & CLASS	PAGINATION & COLLATION	PUBLISHER & LOCATIONS	PLACE OF PUBLICATION	YEAR	PRICE £	EDITION	ISBN
BALCHIN, NIGEL								
	FATAL FASCINATION - A CHOICE OF CRIME		HUTCHINSON	LONDON	1964	1.05		S0000003431 0
	364.152	200P	04 HA/02 AU/04 QN/71					
	IN THE ABSENCE OF MRS PETERSEN		COLLINS					
	F		16 BH/53 BH/53 BH/15 DA/09 FX/07 HD/14 MO/13 MY/11 NT/16 SF/01 SL/54 SL/51 SU/12					
	THE ANATOMY OF VILLAINY		COLLINS	LONDON	1950	0.63		S070010904 0
	301.151	256P I	02 HS/02					
	A WAY THROUGH THE WOOD		COLLINS		1970	1.25		0 00 221937 9
	F		01 DA/01 WN/71					
BALDER, ALTON PARKER								
	THE COMPLETE MANUAL OF SKIN DIVING		COLLIER-MACMILLAN	LONDON	1968			S0700053823 0
	797.23	302P BIK	04 ALP04					
BALDICK, ROBERT								
	THE SIEGE OF PARIS		BATSFORD	LONDON	1964	1.75		S0700152418 0
	944.08	248P BIK	00 05/66					
BALDWIN, FRANK ARNOLD								
	SIMPLE SHORT WAVE RECEIVERS		DATA PUBLICATIONS	LONDON	1970	0.80		0 900328 06 1
	621.384151	140P ID	07 CM/01 MS/07 MS/06 WN/02					
BALDWIN, JAMES								
	THE FIRE NEXT TIME		JOSEPH	LONDON	1963	0.67		S0700017057 0
	323.173	112P	06 HS/05 OA/06 WK/01					
	TELL ME HOW LONG THE TRAIN'S BEEN GONE		JOSEPH		1968	1.75		S0700031417 0
	F		08 BR/07 DO/08 HD/05 HS/06 MO/04 OA/01 05/66 SL/51 ST/52					
	NOBODY KNOWS MY NAME		JOSEPH	LONDON	1964	1.05		S0700062477 0
	323.173	196P	02 DO/02					
	THE FIRE NEXT TIME		WATTS	NEW YORK	1963	2.20	NEW.	0 531 00312 4
	323.173L	120P	03 BR/01 MD/03 MS/02					
	THE DEVIL FINDS WORK		CORGI	LONDON	1978	0.75	NEW.	0 552 10663 1
	791.430909352	125P	01 MD/01					
	GO TELL IT ON THE MOUNTAIN		JOSEPH		1954	2.50		0 7181 0161 8
	F		01 BH/52 BH/52 HS/03 SR/02 WR/01					
	GIOVANI'S ROOM		JOSEPH		1957	2.00		0 7181 0475 7
	F		19 BR/13 BY/03 FK/15 HL/17 HS/18 HY/14 MY/02 MY/71 MT/19 WN/16					
BALDWIN, MICHAEL								
	THE GREAT CHAM		SECKER & WARBURG	1967		1.38		0 436 03202 3
	F		08 BR/08 HL/07 SP/04 SR/06					
BALDWIN, NICK								
	FARM TRACTORS		WARNE	LONDON	1977	3.95		0 7232 2060 3
	629.225	64P IK	12 BY/11 HL/05 HY/01 LU/10 OS/04 OS/06 OS/09 SL/03 SL/12 SU/08 WH/04 WH/07 WK/02					

STAFFIN, H. K.
HENLEY, E. J.
Stagewise process design; by Ernest J. Henley & H. Kenneth Staffin. Wiley, 1963

xxx Shelved at 660.281 HEN in Loan Collection

(7305132) (01/01) (c801403260)

STAFFING & TRAINING FOR EDUCATIONAL CLOSED-CIRCUIT TELEVISION
NATIONAL EDUCATIONAL CLOSED-CIRCUIT TELEVISION ASSOCIATION
Staffing & training for educational closed-circuit television: the report of a joint Working Party of the NECCTA ACTT. NCET, 1971

xxx Shelved at 371.3358 NCET in Loan Collection

(7500726) (01/01) (c270432320)

STAFFORD, D. C.
CORNER, Desmond Carteret
Open-ended investment funds in the EEC and Switzerland; (by) D. C. Corner and D. C. Stafford. Macmillian, 1977
x. 254p. 111. 23 cm.

xxx Shelved at 332.6327 COR in Loan Collection

(7611759 7613427) (01/01) (o333154266)

STAFFORD, E. M.
ELLISON. A. P.
The dynamics of the civil aviation industry: by A. P. Ellison & E. M. Stafford. Saxon House. 1974

xxx Shelved at 387.7334 ELL in Loan Collection

(7501238) (01/01) (c270127790)

STAFFORD, J. E.
SMITH, Samuel V.
Readings in marketing information systems: a new area in marketing research: by Samual V. Smith, Richard M. Brien & James E. Stafford. Houghton Mifflin, 1968

xx Shelved at 658.83 SMI in Business School Collection

(7106531/7105632) (04/02) (c280681530)

STAFFORD, Joseph Hover
DE NEUFVILLE, Richard
Systems analysis for engineers and managers; (by) Richard de Neufville, Joseph H. Stafford. McGraw-Hill, 1971
xiii. 353p. ill. 24 cm.
Title page imprint: London

xxx Shelved at 001.424 DEN in Loan Collection

(7016443) (01/01) (0070163707)

Figure 4. Illustration of confusing display of catalogue information.

catalogue where the coherence of data relating to any one item is almost impossible to see. Line length, columnar spacing, and levels of indentation obscure and confuse.

Reynolds, in an excellent review article, has summarised some of the legibility research which has been undertaken relevant to modern documentation methods. She writes: "Legibility should be the concern of all those involved in the production of scientific and technical information . . . . It has been shown beyond doubt in numerous experiments that design variables can significantly affect the speed and accuracy with which reading tasks are performed. It has also been demonstrated that readers' subjective assessment of *the complexity of the content of a display of information* [my italics] are influenced by the design of the display in terms of typography and layout . . . . This is perhaps particularly true of complex printed information such as timetables and instructions, and of information presented in . . . media such as microforms and cathode ray tube displays" (Reynolds, 1979b).

The results of the Centre's usability studies of content showed that it is probable that the degree of fullness of catalogue entries in a COM catalogue does affect the speed and accuracy with which users and library staff can search for items. However, the difference is only small unless the difference between the catalogues is substantial in terms of the number of entries which can be viewed at a time, as was the case in the second experiment (see Figures 5 and 6). Although the single line entry catalogue (Figure 5) looks unattractive

compared with the full version (Figure 6), it was reliably faster (26% quicker) when searching for correctly cited items and even faster (36% quicker) for items which were slightly mis-cited.

Even if the difference in performance when using brief entries is not large, the results are important when considering other factors such as user preference, the page scanning facility, lower costs, and the enhanced possibility of providing free language access through the use of keywords and phrases from title pages, contents pages, and back of book indexes. The latter method of providing additional access to the contents of books is quite uneconomic using normal controlled methods of subject access. Both at Bath and elsewhere users have responded very favourably to the provision of keyword catalogues and the introduction of on-line access makes the free language approach even more effective.

Testing a variety of keyword catalogue output options

The principal means of providing users with a method for searching library catalogues for items on particular subjects has, until recently, been by just using controlled systems. In the case of subject heading catalogues this is through the use of an authoritative list of subject headings such as the Library of Congress Subject Headings (LCSH), and, in the case of classified catalogues through reference to the schedules of a classification scheme such as the Dewey Decimal Classification. I stated earlier that subject heading catalogues can present difficulties through the attempt to maintain a satisfactory scheme of cross references, but classified catalogues, where the entries are filed in the order of the notation of the classification scheme, are hardly used by anyone other than library staff. This is due to the fact that general users of public or academic libraries cannot readily understand the notation, and because a subject index has to be provided to the classification numbers used. This means that they are faced with a two-stage searching task.

The tradition has been for North American libraries to provide catalogues which use subject headings and for British libraries to use classified catalogues. Bath University Library uses the Universal Decimal Classification (UDC), a scheme better suited to the needs of a scientific and technologically oriented stock but which uses a more complex notation than Dewey, including a range of arbitrary signs and symbols. It was clear during the BUCCS project that readers' reactions to the KeyWord Out of Context sequence were very enthusiastic. It was preferred because it provided a one-stage process for searching, and because the words used were those of the author and not those of an indexer. However, the use of the computer to derive words from titles can lead to entry under words which may have no subject content, or which may even be superfluous. Homographs may also cause problems, e.g., GROUP is used in social studies and in mathematics. In KWOC, entry is normally only under single words (Figure 1) which can result in many entries under common

(IF YOU NEED MORE INFORMATION SEE THE MAIN FICHE CATALOGUE) 00000090

STAFFORD. The dynamics of the civil aviation industry. (ELLISON) 1974. 387.7334 ELL Loan
STAFFORD. The dynamics of the civil aviation industry. (Ellison) 1974. 387.7334 ELL Loan & Graduate Business Centre
STAFFORD. The economics of housing policy. 1978. 338.4730154 STA Loan
STAFFORD. The effect of investment incentive schemes on decisions of firms in the elctronics & electrical engineering industries. 1973. Theses
STAFFORD. The modern economy. 1976. 330.156 STA Loan
STAFFORD. Open-ended investment funds in the EEC and Switzerland (Corner) 1977. 332.5327 COR Loan
STAFFORD. Reading in marketing information systems. (SMITH) 1968. 658.83 SMI Business School
STAFFORD. Systems analysis for engineers and managers. (De Neufville) 1971. 001.424 DEN Loan
STAFFORD-CLARK. Psychiatry to-day. 1952.
STAFFORD-CLARK. Psychiatry today. 2nd edition reprinted with revisions. 1973. 157.9 STA Loan
STAFFORD- CLARK. Psychiatry today. 2nd ed. 1963. 157 STA Loan
STAFFURTH. The problem of selling & distribution 3rd edition. 1961. 658.8 INS Business School
STAFFURTH. Project cost control using networks. 1969. 658.1552 STA Busiess School
"THE STAGE". The stage guide. 1971. 792.025 STA Loan + reference
STAGE DESIGN THROUGHOUT THE WORLD. 1970-75. 1976. 792.025 HAI Loan
STAGE DESIGN THROUGHOUT THE WORLD SINCE 1960. (International Theatre Institute) 1973. 792.025 HAI Loan
STAGE FRIGHT (HAVAS) 1973. 787.20431115 HAV Loan
THE STAGE GUIDE. 1971. 792.025 STA Loan + Reference
THE STAGE LIGHTING HANDBOOK. (Reid) 1976. 792.025 REI Loan
STAGE RIGHT (Matthew) 1975. 792.0222 MAT Loan
STAGE-SETTING (Southern) 1937. 792.025 SOU Loan
STAGE SOUND (Collison) 1976.
THE STAGES OF ECONOMIC GROWTH. (Rostow) 2nd ed. 1971. 339.5 ROS Loan
STAGES OF SOCIAL RESEARCH. (Forcese) 1970. 300.18 FOR Loan
STAGEWISE PROCESS DESIGN. (HENLEY) 1963. 660.281 HEN Loan
STAGG. Criteria and assumption for numerical analysis of dams. (International Symposium on Criteria and Assumptions for Numerial Analysis of Dams. 1975) 1976. 627.81 NAY Loan
STAGG. A select bibliography of educational technology. (2nd ed.). 1975. 016.3713078 STA Reference
THE STAGNANT SOCIETY. (Shanks) 1961. 330.942 SHA Business School
STAGNER. Psychological aspects of international conflict. 1967. 327.11 STA Loan
STAGNER. Psychology of personality. 4th edition. 1973. 155.23 STA Loan
STAHL. Evironmental policy and welfare economics. (Hjatte) 1977. Loan
STAHL. Ethiopia. 1974. 333.00963 STA Loan

Figure 5. Single line allotted to each catalogue entry.

Figure 6. Illustration of the amount of extra space required by conventional catalogue displays, relative to the single line display of Figure 5.

EVOLUTION	Plate tectonics and crustal evolution (Condie, Kent C) 1976	LIB 0551.241 CON	2525100
"	The proofs of evolution (Lechman, J. T.) 1977	LIB 575.8 LEH	2625512
"	Pulmonates Vol.2A Systematics, evolution and ecology 1978	LIB 594.38 PUL	2663872
"	Recent advances in primatology Vol. 3 Evolution (International Primatological Society. Congress. 6th University of Cambridge. 1976) 1978	LIB 575.8:599.8 INT	2683202
"	Stellar evolution (Meadows, Arthur Jack) 2nd ed 1978	LIB 523.8 MEA	2637971 2 copies
"	A study of the evolution of concentration in the electrical appliances industry for the United Kingdom: a report (MLH Consultants Ltd) 1977	LIB 338:621.38 MLH	265633x
"	A study of the evolution of concentration in the food distribution industry for the United Kingdom (Commission of the European Communities) c19	LIB 0658.87 DEV	2654458
EVOLUTIONARY	Behavioural ecology: an evolutionary approach 1978	LIB 591.51:574 BEH	2651823
"	Biogeography: an ecological and evolutionary approach (Cox, Christopher Barry) 2nd ed 1976	LIB 574.9 COX	2679698
"	The development of behavior: comparative and evolutionary aspects 1978	LIB 591.51 DEV	2655489
"	An evolutionary application of advanced flight path prediction capability to the control of air traffic 1977	LIB PA3056	2638185
"	Evolutionary aspects of animal communication, and: Impriting and early learning (Association for the Study of Animal Behaviour) 1962	LIB 591.51 EVO 8950822	

words such as SOCIAL and PROBLEMS which, when combined as the phrase SOCIAL PROBLEMS, become quite specific. There were many other queries raised by the BUCCS project, but the unqualified success of the KWOC catalogue led to plans for further study of keyword methods for accessing library files being included in the 1977 programme of research. It was considered that, not only might lessons be learnt regarding the visual presentation of data which could be relevant in due course to VDU display, but also more knowledge could be gleaned for on-line systems about how users approach the catalogue when subject searching. One of the most interesting comments made by an interviewee during the BUCCS project relevant to this article was that KWOC was: "More likely to inspire you to keep looking." Several senior members of the academic staff commented on the ease with which the file could be scanned, and how interesting it was to be made aware of titles which the searcher had not realised previously were in the library's stock. In other words there was a tendency to actually *read* the catalogue.

Keyword indexing as used by abstracting and indexing services since the early 1960's has frequently been in the KWIC (KeyWord in Context) format. Each entry consists of a keyword together with the words which immediately precede and follow it (hence in context). Because of the single-line entry and the varying length and displacement of the phrases, both in front of and following the keyword, titles often have to be arbitrarily truncated. In addition, the rotation of words in order to align each keyword results in titles being cycled. This means the use of a slash, or asterisk, in order to indicate the first word of the title (see Figure 7).

The arbitrary truncation and cycling of titles, and the use of document numbers to refer to the complete entries for the sought items are likely to prove very discouraging for users of library catalogues. However, if a derived KWIC catalogue could be produced which would not truncate the entry, which would ensure that the entry could be read from left to right, and also be reasonably economic in its use of space, there could be great advantages. This would be because of the easier recognition of compound terms within their context and because these terms would file together and not be separated as in many KWOC sequences due to titles being filed by their first word under each keyword (Prowse, 1983).

Figure 7. Illustration of catalogue displaying keyword in context but having problems with truncated information.

```
cal metallurgy  Part 1  EQUILIBRIUM  and general kineti theory (Chr+
tions  of  single  stro/EQUILIBRIUM  properties  of  aqueous  solu+
owel/An introduction to EQUILIBRIUM thermodynamics in petrology  (P+
```

Figure 8 shows the first KWIC output produced by the Centre. This option was subject to testing by library users at Imperial College Library in 1983 when it was compared with five other variants of KWOC and KWIC layout. Both in terms of performance and user preference, this centre-aligned KWIC was the clear winner. A report giving the detailed results of these experiments is to be issued (Bryant and others, 1984). Of particular interest was the fact that, because the keywords were centred, the test searchers were able to see both the preceding and the following words in their peripheral vision. A final point for comment is that this was a file where the searcher's eye entered the body of the entry directly without first having to process a heading, or a classification number.

On-line public access to library files

One of the major areas of research which is currently being undertaken by my colleagues Alan Seal, Janet Kinsella, and Steven Prowse is the use and design of systems providing public access to on-line library files. The overall objectives are: (i) to compare the effectiveness of on-line access with alter-

Figure 8. Arrangement of catalogue entries displaying keyword in context which avoids truncation problems.

Plate tectonics and crustal	EVOLUTION	(Cowie, Ken C) 1976	LIB 0551.241 CON	2525100
The proofs of	EVOLUTION	(Learman, J. P) 1977	LIB 575.8 LEH	2625512
Recent advances in primatology Vol.3	EVOLUTION	(International Primatological Society. Congress. 6th. University of Cambridge. 1976) 1978	LIB 57.4:599.8 INT	2693202 2 copies
Stellar	EVOLUTION	(Meadows, Arthur Jack) 2nd ed 1978	LIB 523.8 MEA	2639971 2 copies
Stellar	EVOLUTION	(Meadows, Arthur Jack) 1967	LIB 523.8 MEA	2276321 2 copies
Channels of grocery distribution: changing states in	EVOLUTION:	a comparison of U.S.A. and U.K. (Padberg, D I) 1973	LIB 0658.87 PAD	2676990
Pylmonatas Vol.2Y Systematics,	EVOLUTION	and ecology 1973	LIB 594.38 PUL	2663872
	EVOLUTION	and the fossil record: readings from Scientific American (1978)	LIB 56 EVO	2645092
	EVOLUTION	and the genetics of populations: a treatise in four volumes Vol. 4 Variability within and among natural populations (Wright, Sewell) 1978	LIB 575.17 WRI	2639572
Molecular	EVOLUTION	and the origin of life (Fox, Sidney W) (1972)	LIB 573.522 FOX	2304821
Molecular	EVOLUTION	and the origin of life (Fox, Sidney W) Rev. ed c1977	LIB 573.522 FOX	2620693
Cement standards	EVOLUTION	and trends: a symposium, St. Louis, No., 7 Dec. 1977 c1978	LIB SHELVED AS PERIODI	****
	EVOLUTION:	concepts and consequences (Dillon, Lawrence Samuel) 2nd ed. 1978	LIB 575.8 DIL	2645099
Nonlinear	EVOLUTION	equations (Symposium on Nonlinear Evolution Equations Madison 1977) 1978	LIB 517.9 SYM	266965x

native forms, (ii) to examine alternative design options for on-line systems in order to provide guidelines for systems designers, (iii) to study the effect of on-line access on users' attitudes and use of libraries, and (iv) to investigate the potential of on-line systems for providing services which have not been available before.

The Centre will be especially interested in the use of classification for the internal structuring of data for on-line catalogues. Although users will enter the files using natural language, the system will be able to display titles on related subjects even though the same keywords do not necessarily appear in the records concerned.

The work of the Centre is proving to be relevant to institutions other than libraries. More and more information systems and inventories are being accessed using on-line methods. It is vitally important that attention is paid to the adequate design of data presentation to produce more usable and understandable products. If any reader thinks we may be able to be of assistance to them, please write to us.

The details and opinions included in this article are the responsibility of the author and do not necessarily reflect those of the British Library Research and Development Department.

Reference notes

1. Bath University Comparative Catalogue Study (1975). Final Report, 10 parts in 9 vols. Bath: Bath University Library. British Library Research and Department Reports 5240-48.
2. Bryant, P., and others. (1984). Keyword catalogues and the free language approach. Bath: Bath University Library.
3. Bryant, P., Venner, G.M., and Line, M.B. (1972). The Bath mini-catalogue; a progress report: Bath University Library.
4. Reynolds, L. (1979a). Visual presentation of information in COM library catalogues: a survey. 2 vols. London: British Library Research and Development Department Report No. 5472.
5. Seal, A., Bryant, P., and Hall, C. (1982). Full and short entry catalogues: library needs and uses. Bath: Bath University Library. British Library Research and Development Department Report No. 5669.

References

Osborn, A.D. (1941). The crisis in cataloguing. *Library Quarterly, II*, 393-411.

Prowse, S. (1983). *Software for producing library keyword catalogues*. Oxford: Elsevier International Bulletins.

Reynolds, L. (1979b). Legibility studies: their relevance to present-day documentation methods. *Journal of Documentation, 35*, 307-340.

Seal, A. (1983). Experiments with full and short entry catalogues: a study of library needs. *Library Resources and Technical Services, 27*, 144-155.

Moving Tables from Paper to CRT Screen

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This paper develops the notion of "layers" of information within a table, and discusses how such layers are typographically distinguished on paper and in a viewdata system (Prestel). A case history is presented of the difficulties facing a British government department wishing to communicate frequently updated tabular information to the agricultural community. Several approaches to design solutions are discussed in terms of the adequacy with which they handle the different layers of information within the table. This leads to a formulation of the kinds of questions which designers need to consider when transferring information from print to CRT screen.

In the last decade or so a significant change has taken place in the way we receive information. The advent of computers into the office and the home means that many of us now process some of the information that we need from a CRT screen rather than from paper. This article examines the ways in which tabular information can be structured and displayed in one of the new computer-based media and contrasts this with the way such information was previously presented in the medium of print. Examples of materials used in this article are taken from a case-study carried out as part of a British Library funded project, Graphic Translatability of Text, which is being undertaken in the Typography Department at the University of Reading.

Prestel is the name given by British Telecom to its version of the kind of information system known generically as viewdata. Such systems typically use a computer to store information, the telephone to trasmit it, and a TV screen to display it. Although originally seen as a home television information service, Prestel has found most of its users among specialist groups such as commodity houses in the City of London and travel agents . Some smaller specialist groups have been experimenting with the medium. Included among these is the Ministry of Agriculture Fisheries and Food (MAFF) whose material forms the subject of the case-study which will be discussed in detail later. These groups all benefit from Prestel's facility for constant and rapid updating.

When asked why people might change to computer-based media, with a

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screen rather than a printout as the form in which the information is presented, one is tempted to answer "because it is there". While this may be part of the truth, the main features which people find important for choosing such a system are listed below under the heading "Shortcomings of printed media". This list is adapted from Maslin (1983).

Advantages of printed media. They are: portable, copyable, annotatable, of high resolution, scannable (the reader can leaf through them), browsable (the reader can read at random in them).

Shortcomings of printed media. They are not: up to the minute, customised, delivered on demand, able to provide several levels of detail on a topic.

To Maslin's list can be added the fact that printing is becoming increasingly expensive and is, on the whole, slow to produce. Any information which changes rapidly may be out of date by the time it is printed. The telephone directory is a good example; its production cannot keep up with the changing telephone numbers of individuals and businesses. In France, PTT have been experimenting with a viewdata system in an attempt to combat this problem (McLaren, 1983).

In the case of MAFF (specifically the Agricultural Development and Advisory Service, ADAS) much of the information provided for farmers is of the "up to the minute variety". However, they also provide material that has a longer life. As Houseman (1983) states, "There is merit in providing material that is less perishable and time critical than, say, commodity information, perhaps on a seasonal basis. Crop variety information is a good example because of the benefits that accrue to the publishing organisation (extension service) rather than the user/farmer." The tables to be discussed here provide information of this "less perishable" kind.

There are considerable differences in the capability and flexibility of printed media and viewdata systems. These differences affect the way information can be displayed and structured. Figure 1 lists those features which relate to the graphic and spatial qualities of each medium.

Not only do the media differ in their graphic and spatial qualities, but there are also differences in the skills of the media manipulators and in the body of expertise on which they can draw. In print the conventions for displaying and organising tabular matter, making use of the features listed in Figure 1, are well established. On the whole these conventions are known and understood both by information providers and by users. Production and design is carried out by people trained in the long traditions of a craft industry. For those putting information onto Prestel no such conventions exist. Training in the use of the system is usually rudimentary and there is very little written guidance to back it up. Trial and error is the order of the day.

By a process that I shall call "layering", complex tabular arrangements permit a large amount of information to be displayed to the reader at one time.

Print	Prestel
Graphic Features	*Graphic Features*
* choice of typefaces	* one typeface provided by manufacturer
* choice of typesizes	* single and double height characters only
* choice of type variants (e.g., roman, italic, bold)	* one type variant — roman
* large character set	* character set comparable with typewriter
* characters vary in width	* single width characters
Spatial Features	*Spatial Features*
* page orientation can be changed	* no reorientation of screen possible
* orientation of part of text can be changed	* no reorientation of part of text possible
* space can be manipulated to allow fine placing of elements	* spatial increments relate to character width and line increments (no fine placing)
* copy can be reduced to fit page size	* size of final display depends on screen size

Figure 1. Comparison of the graphic and spatial qualities of print and Prestel.

Some of these layers provide quite explicit information, other layers provide coded information. The following lists indicate the ways in which these different kinds of layering may be instantiated in a table.

Explicit Layers

General text matter which may be given at the head or foot of the table.
Hierarchical headings which relate to more than one row or column heading.
Specific row or column headings which lead readers to one piece of data in the field of the table.
Data in the field of the table.

Coded Layers

Unfamiliar codes which need a decoding key, or explanation, in order that the information can be understood by readers.
Conventional codes which need no explanation (e.g., the use of italic for foreign words, or abbreviations such as a.m. and p.m.)

These six layers are potentially available for simultaneous use in any table. However, they will not necessarily be realised in any specific table, nor will they be equally transferable across presentation media. By the use of graphic and spatial features all these layers can be defined and separated, or arranged

together in such a way that the relationships between them are clear. This gives a table its graphic structure. In the tables which we will be examining in detail all layers are realised.

Figure 2 shows the kind of conventional printed tabular array which will be familiar to many users of technical information. Perhaps the first thing that most users would notice about the table is that its orientation on the page is different from the rest of the printed matter. The original booklet in which the table was published was in portrait (upright) format. The wide table would not fit unless rotated through 90 degrees. This kind of rotation is common and easily done in a printed medium. Such rotation can be applied to the table as a whole and to individual elements within the table. For example, reorientation of the column headings (see Figure 2) is also commonly done, and will be familiar to many people from bus and train timetables where long placenames have to be accommodated.

In Figure 2 additional information is given in headings which span the three groups of columns, and also by hierarchical headings above two groups of row headings. The main table heading is in bold, red type of a large size. Attention is drawn to the variety names which form the column headings by having them in bold, red type. The text about the table is in larger type size than the rest of the table. All of these methods are commonly used for headings, though until recently colour was less common because of its additional cost.

Within a table, grouping items together is recommended as an aid to horizontal reading (Wright, 1982). This is usually done by the introduction of space every five items or so, or by the use of rules. The tables shown in Figures 2 and 3 contrast strongly with each other in terms of grouping. In Figure 2 the table has a tight visual structure created by the use of rules. Heavy rules at top and bottom define and separate the table from headings, general text, and keys. Within the table fine horizontal rules have been used to separate groups of items which belong together. Fine vertical rules separate columns about a single variety from each other and a double rule separates the different groups of varieties. In contrast the table shown in Figure 3 uses space rather than rules, and achieves rather loosely structured columns. For example, the five columns under the heading "Diseases" are not immediately seen as columns. Similarly, the width of the columns and the space between them appears to be dictated by the length of the column headings. The rows have not been grouped in any principled way; the intermittent horizontal space, which seems to create some perceptual grouping, arises simply because a row heading or item is too long for one line.

Both tables in Figures 2 and 3 are fairly heavily loaded with reference devices and their keys. For example, in Figure 2 capital letters have been used in the column headings and the key to their meanings is placed in the top left hand corner of the table, an unusual location. It is more conventional to place

RECOMMENDED LIST OF SPRING BARLEYS 1981

The control for yield comparisons is the mean of Ark Royal, Athos, Georgie, Goldmarker, Porthos, Sundance and Triumph. Differences less than 3% among fully recommended varieties and less than 4% for comparisons involving provisionally recommended varieties should be treated with reserve.

Varieties classified for General use G, Special use S, Provisional recommendation P, Becoming outclassed O	Recommended							Provisionally Recommended								Becoming Outclassed				
	Goldmarker	Georgie	Athos	Tyra	Ark Royal	Midas	Keg	Triumph	Kym	Koru	Egmont	Flare	Atem	Claret	Tintern	Sundance	Aramir	Porthos	Lofa Abed	Mazurka
	G	G	G	S	S	S	S	PG	PG	PG	PG	PG	PG	PG	PS	O	O	O	O	O
Agricultural Characters:																				
Yield as % of control	103	100	99	98	96	95	95	107	107	105	105	104	104	103	97	98	97	97	96	96
Standing power	6½	7	8	5½	6	7½	8	9	6½	7	6½	8	7	8	6½	6½	8	7½	5½	6
Shortness of straw	8½	7½	6	7	5½	8	6½	8	7	6	5	7½	5½	7	6	6½	6	6	6½	5
Earliness of ripening	7	7	7½	7½	4½	6	7½	5½	7	6½	6½	7	6½	7	6½	6½	7½	7	5½	8
Resistance to mildew	8	5	7	7	6	7	5	8	8	5	8	6	9	9	5	7	6	4	6	6
Resistance to yellow rust ..	6	5	7	4	5	4	3	7	4	4	6	3	6	5	8	5	6	7	5	4
Resistance to brown rust ..	3	5	5	4	3	1	3	7	5	5	6	4	4	5	6	6	4	5	5	4
Resistance to *Rhynchosporium* ..	5	4	5	7	6	5	5	5	6	7	6	5	6	5	6	5	3	5	4	3
Resistance to loose smut ..	6	2	8	3	8	5	4	–	–	–	–	–	–	–	–	3	2	9	6	2
Resistance to cereal cyst nematode (R)	–	–	–	R	–	–	–	–	–	–	–	–	–	–	R	–	–	–	–	–
Resistance to ear loss	7	5½	4½	5	7½	7	5½	5	–	6½	6	7½	5½	7½	5½	5½	6	4½	8	3
Malting grade	4	1	4	1	8*	4	8*	9	7	1	1	1	6	5	5	4	3	6	1	2
1,000 grain weight	5	7	6	7	5	4	5½	6½	7½	7	8	7	7½	6	5½	6	6	6	6	6
Specific weight	6	6½	5½	5½	6	5	6½	6	7	6	6½	6	7	5½	6½	6	7	5½	6½	6
Year first listed	1978	1976	1977	1976	1976	1970	1978	1980	1981	1980	1980	1980	1980	1980	1980	1976	1975	1977	1971	1972

A high figure indicates that the variety shows the character to a high degree.

* Recommended by the Institute of Brewing as malting varieties, although new varieties may not have been proved on a commercial scale.

Figure 2. A common way of displaying tabular information in print. This figure is reproduced by courtesy of the National Institute of Agricultural Botany, Cambridge.

Figure 3. A multi-column table in which the use of vertical space is determined by the length of items rather than the structural relationships between items. This figure is reproduced by courtesy of Her Majesty's Stationery Office.

Fungicides — Winter wheat mildew

Active ingredient	Proprietary name	Latest time of cleared use (GS)	Approx cost of fungicide £/ha (£/acre)	Diseases controlled or partially controlled
ethirimol	Milgo E*	51	7.26 (2.94)	Mi
fenpropimorph	**Corbel**	59	12.66 (5.12)	Mi Br Yr
	Mistral	59	12.66 (5.12)	Mi Br Yr
prochloraz	Sportak	59	17.00 (6.88)	Mi Ey Sep
propiconazole	Radar	71	14.08 (5.70)	Mi Br Ey Sep Yr
	Tilt	71	14.08 (5.70)	Mi Br Ey Sep Yr
propiconazole + carbendazim	Tilt mbc	59	16.90 (6.84)	Mi Br Ey Sep Yr
sulphur (†)	Brooklane 85*	up to harvest	4.32 (1.75)	Mi
	Elosal*		3.53 (1.43)	Mi
	GRN Flowable Sulphur*		7.80 (3.16)	Mi
	Thiovit*		7.96 (3.22)	Mi
thiophanate-methyl	**Cercobin Liquid** (b)	31	11.90 (4.82)	Mi Ey
triadimefon	**Bayleton***	71	13.41 (5.43)	Mi Br Yr
triadimefon + captafol	Bayleton CF*	70	24.70 (10.00)	Mi Br Sep Yr
triadimefon + carbendazim	Bayleton BM*	71	19.07 (7.72)	Mi Br Ey Sep Yr
tridemorph	**Bardew***		9.19 (3.72)	Mi Yr
	Calixin*		9.21 (3.73)	Mi Yr
	Ringer*		9.24 (3.74)	Mi Yr
tridemorph + carbendazim	**Bardew + Focal Flowable**	6 weeks before harvest	16.54 (6.69)	Mi Ey Yr
	Calixin + Bavistin*		18.70 (7.57)	Mi Ey Yr
	Calixin + Bavistin FL*		18.70 (7.57)	Mi Ey Yr
	Ringer + Carbate		15.57 (6.30)	Mi Ey Yr
tridemorph + carbendazim + maneb	**Cosmic***	71	(a) 21.52 (8.70)	Mi Br Ey Sep Yr
triforine + carbendazim + maneb + mancozeb	Brolly + Kascade	59	17.25 (6.98)	Mi Br Ey Sep Yr

Approved products in bold type

Br — brown rust, Ey — eyespot
Sep — septoria, Yr — yellow rust
Mi — mildew

*Cleared for aerial application
(†) Repeated applications of sulphur may be required
(a) Cosmic Approval (for moderate attacks only) and cost are for 2 spray programme
(b) Cercobin Liquid Approval is for moderate attacks only

keys at the foot of the table, as in Figure 3 where several keys are used to explain the use of reference devices (asterisk and dagger) and the abbreviations of the disease names which have been given in the field of the table, and the alphabetic parenthesis given beside some entries.

Typographic variants such as italic and bold are frequently used to show relationships between parts of a text (e.g., all headings of a particular level in bold). They may also be used to emphasize a word or phrase in the text. Such variants have been used in both tables. In Figure 2 italic has been used in the conventional way to signal the latin name of one of the diseases: in Figure 3 bold has been used to show which fertilisers are approved. Strictly speaking, underlining is not a typographic variant; it is usually associated with typewritten material where it is so often used in place of italic. However, in Figure 3 underlining has been used to show which diseases are controlled. It is interesting to note the different ways in which readers are given explanations of the meanings of these typographic variants. Whereas the use of bold in Figure 3 is explained in a note at the foot of the table, the use of underlining is explained by example (the word "controlled" in the column heading being underlined). This kind of decoding by example is also used in Figure 2. There the explanation of the capital letter R in the field of the table is given in parenthesis at the end of the row heading of the line on which it occurs, i.e. the heading "resistance to cereal cyst nematode (R)".

From year to year the overall visual structure of these printed tables tends to remain the same. Sometimes the size of type will be different for one or other layer of information, generally depending on how many items of information have to be accommodated. Other small changes may be made; for instance, row headings may be indented under a hierarchical heading, but the information in the tables seems to be sufficiently usable by the intended audience for there to be no pressure on the information providers to enhance their presentation.

Although the visual structure of the printed tables tends to be static, the same cannot be said of the tables when presented on Prestel. Different approaches have been tried at various times. These changes no doubt reflect the difficulties of transferring such large quantities of information onto a system which can only display small quantities at a time. Before looking in detail at the tables on Prestel, we should examine the restrictions which that system imposes on the quantity and quality of the material which can be displayed at any one time. Design decisions have to take these constraints into account.

Space limitations are severe. There are only 40 character positions across the screen, and only 22 usable lines down the screen. This gives a total of 880 character positions, and it must be remembered that space between words usually occupies one position. This capacity can be contrasted with the

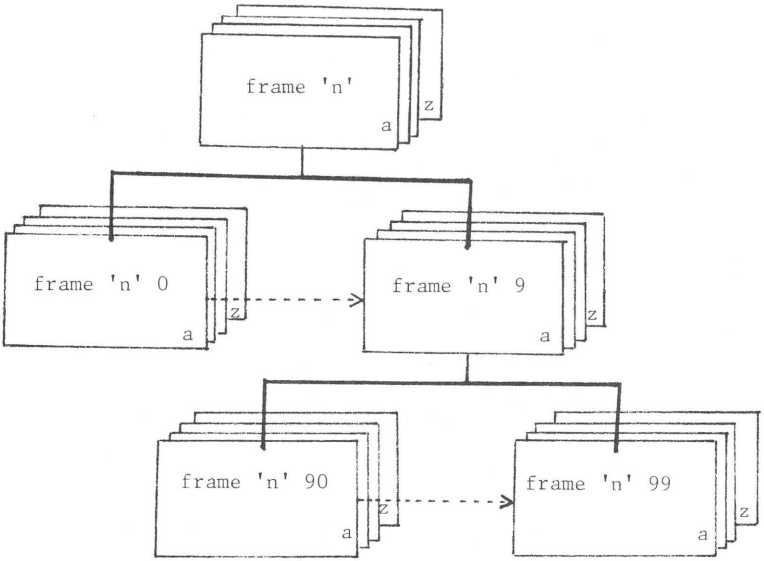


Figure 4. Diagram showing the tree structure of Prestel in which the user works through successive frames (screenfuls of information) from the top of the tree moving towards the bottom.

demands of the table shown in Figure 2, which has about 50 lines and about 140 character positions across the row in the type size of the footnotes—a total of about 7000 character positions. On Prestel the number of usable character positions is further reduced if extra facilities such as colour, double height characters, or flashing are used, because the codes for these special facilities take up a character position even though the codes do not appear on the screen.

Space on the screen may be severely limited but Prestel deals with this in two ways. It provides continuation frames which are sequentially accessed by pressing the key labelled #. These continuation frames give additional information at the same level within the viewdata structure; Prestel also has the advantage of a tree structure database. This is outlined in Figure 4 where the continuation frames are denoted by the letters a-z and the menu choices are denoted by the numbers 0-9 indicating that from any frame up to 10 alternatives may be offered to the reader. Within Prestel a specific region will be designated by a number "n" at the topmost level of the tree. This number will be carried forward through all subsequent levels, picking up additional numbers at each level, which are in turn carried forward to the lower levels. Although only three levels of the tree are shown in Figure 4, in practice the number of levels can be much more than this. People familiar with the system can jump straight to any frame at any level if they know the number of the

£5:BASE 20313111b 0p
SPRING BARLEY VARIETIES - RECOMMENDED

VAR	YLD	RESISTANCE			STDG POWR	EARL NESS	RES. to EAR LOSS	Q
		Mil dew	Yel rst	Br rst				
Recommended								
Tri	106	8	7	8	8	5	6	9
Atem	106	9	5	5	5	6	6	6
Kym	105	6	5	6	4	7	5	6
Provisionally Recommended								
Patty	106	7	8	7	5	7	-	5
Carval	105	7	7	8	8	5	-	6
Golf	103	4	7	6	7	6	-	1
Tasman	103	8	8	8	9	5	-	9

Key # Outclassed Varieties 9 Triumph
Type CMD (CTRL C) to leave

Figure 5a. The limited space on the screen here leads to stacking of information in the column headings and to the intrusion of row subheadings across several columns.

Figure 5b. This is a continuation frame for Figure 5a. It contains information which the designer was unable to display in 5a because of the severe space limitations on CRT screens.

£5:BASE 20313111c 0p
SPRING BARLEY OUTCLASSED VARIETIES

VAR	YLD	RESISTANCE			STDG POWR	EARL NESS	RES. to EAR LOSS	Q
		Mil dew	Yel rst	Br rst				
Egmt	103	6	7	6	4	6	6	1
Gldmk	100	6	7	4	4	7	7	3
Koru	100	2	6	6	4	6	6	1
Athos	98	7	8	6	7	7	4	3
Georg	96	3	6	6	5	7	5	1

Key 9 for Triumph and Atem

Type CMD (CTRL C) to leave

frame they want. Typical frame numbers are shown to the right of the top row in Figure 5.

In the preceding discussion of printed tables I have gone into several of the typographic features, particularly the graphic and spatial features, by which the various layers of information within a table are realised. These features give tables their visual structure. On Prestel one way of realising the visual structure of information is by the use of colour. It is usually cited as one of the advantages of Prestel that seven colours are available free as part of the system. These can be used for text or graphics but, as has been mentioned, their codes take up valuable character positions on the screen. Those who write about design for viewdata and other similar systems urge great caution in the use of colour (Reynolds, 1979; Whelan, 1982). The Prestel tables created by ADAS did include colour. Although this will be mentioned in the following discussion where appropriate, a fuller discussion of the colour facility would be more meaningful in a medium which allowed these colours to be communicated faithfully. This illustrates that not only are there problems moving from print to CRT but there can be difficulties encountered when moving in the other direction as well.

I have introduced the notion of different layers of information—some explicit, some coded—which can be provided simultaneously in tabular matter. The problem of the information designer on Prestel is how to handle these different layers. Can the layers be separated from each other, and so enable the designer to take advantagae of the tree structure? Or are the layers inseparable? If this is the case then the limited screen size means that the amount of data within the field of the table must be reduced. When making any reductions to the information in the table, care must be taken to retain the layers of information leading to the interpretation of the data.

Some layers of information are more obvious candidates for separating onto single frames. Explicit information contained in text matter at the head or foot of the table falls into this category, as do headings. An example of the way in which the column headings in Figure 2 might be put onto separate frames will be discussed later in conection with Figures 7a and 7b.

Coded information seems, logically, to be inseparable from its key. If the information is to remain coded, space must be provided for these codes and for the key to be given on the same frame. Anyone who has tried to interpret a television weather forcast in which symbols are used, but in which the key is shown on a separate frame, will be aware of the dangers of separating the two. However, coded information can always be made explicit to allow for a different approach to structuring.

Various approaches have been tried by MAFF/ADAS to the problems of translating their printed tables for Prestel. Figures 5a and 5b show a structure which is recognisably tabular and in which little restructuring of the layers has

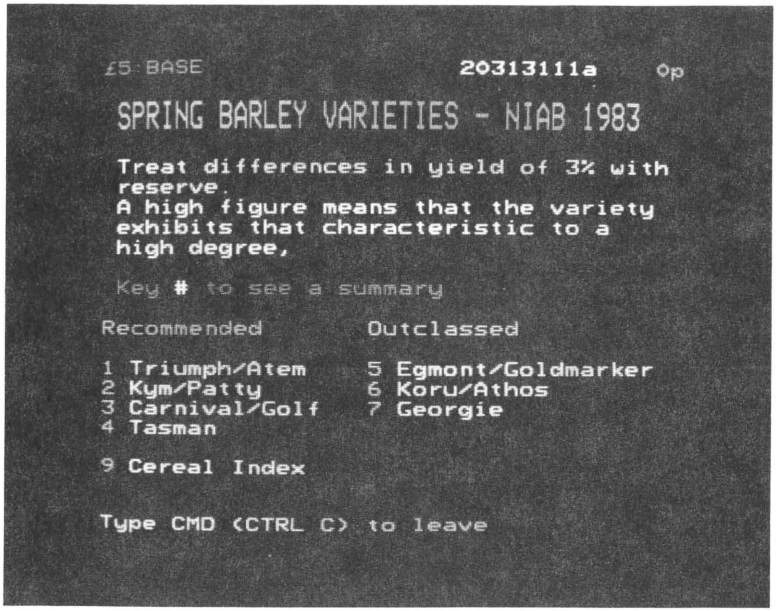


Figure 6a. A visual display which capitalises on the tree structure of Prestel by displaying only the headings from the printed table.

taken place. However, row and column headings have been swapped around and some information has been omitted: there were 15 rows in the printed table, but there are only 8 columns here. On Prestel column headings cannot be rotated through 90 degrees to make them fit, so instead they have been stacked. This has led to some rather unconventional and inconsistent use of abbreviations—a problem made even harder for the reader because no key is provided. The table is visually structured by the use of hierarchical row headings which have been allowed to run into the field of the table. Help for horizontal reading has been provided by alternating the colour of the rows (headings and data). The table is given additional structural unity by the use of space and by the lines separating the column headings from the field of the table. This kind of display reflects the attempt to maintain similarity of visible language between print and screen.

In Figures 6a,b,c we can see that the potential of the medium is beginning to be understood by the information designers. A move has been made away from the kind of tabular structures used in print. Figures 6a shows an index frame combining explicit information taken from the table heading, the general text matter, and the column headings. Users can choose to see either "Recommended" or "Outclassed" varieties which are paired for comparison. These options are arranged in a headed list structure (two columns). Figure 6b

```
£5 BASE                          203131111a   Op
 SPRING BARLEY VARIETIES - TRIUMPH

YIELD                              106
STANDING POWER                       8
EARLINESS of RIPENING                5
RESISTANCE TO
   Mildew                            8
   Yellow rust                       7
   Brown rust                        8
   Rhynchosporium                    7
   Loose smut                        3
RESISTANCE TO
   Cereal cyst nematode              -
   Ear loss                          6
MALTING GRADE                        9
1000 GRAIN WEIGHT                    6
SPECIFIC WEIGHT                      6

Key # for Atem
Key 9 for Variety List

Type CMD (CTRL C) to leave
```

Figure 6b. The information display resulting from selecting option 1 in Figure 6a. This is information at the next level down in the Prestel tree.

Figure 6c. The information display resulting from keying # in Figure 6b to access the continuation frame.

```
£5 BASE                          203131111b   Op
SPRING BARLEY VARIETIES COMPARED WITH
            TRIUMPH
                                  Atem    Triumph

YIELD                              106       106
STANDING POWER                       5         8
EARLINESS of RIPENING                6         5
RESISTANCE TO
   Mildew                            9         8
   Yellow rust                       5         7
   Brown rust                        5         8
   Rhynchosporium                    7         7
   Loose smut                        3         3
RESISTANCE TO
   Cereal cyst nematode              -         -
   Ear loss                          5         6
MALTING GRADE                        6         9
1000 GRAIN WEIGHT                    7         6
SPECIFIC WEIGHT                      7         6

Key 1 for Kym
Key 9 for Variety List
Type CMD (CTRL C) to leave
```

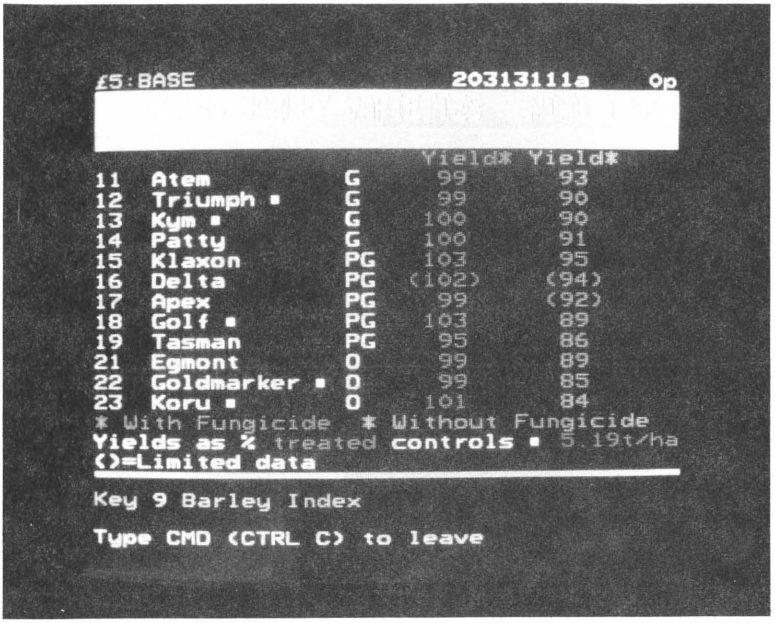


Figure 7a. An illustration of a Prestel frame which allows readers to access the data through the information which had been given in the column headings of the printed table (Figure 2).

shows the frame that is reached by choosing "1" from the "Recommended" list given in Figure 6a. In Figure 6b the information is presented as a simple kind of table structure with hierarchically arranged row headings (similar to the printed table in quantity and arrangement) but with only one column of information relating to one variety "Triumph". By keying # to access the continuation frame, the user can see data about a second variety alongside the first (Figure 6c). The column structure in Figure 6c is emphasized by the use of space (a little less might have made it easier to relate row and column headings and data). The use of hierarchical headings in the rows leads to some spatial grouping of information within the columns. All the layers of information displayed in this table are explicit.

A third approach does away with the conventional tabular structure and sorts the layers of information in yet another way. In this instance explicit and coded layers of information, of the same kind as the printed table shown in Figure 2, have been used but their ordering and display are rather different. The first Prestel frame encountered by the user functions as an index to the other levels (Figure 7a). Its visual structure is tabular but the columnar "sub-structure" is emphasized by using a different colour for each column. This index contains both explicit and coded information. Some of the coded

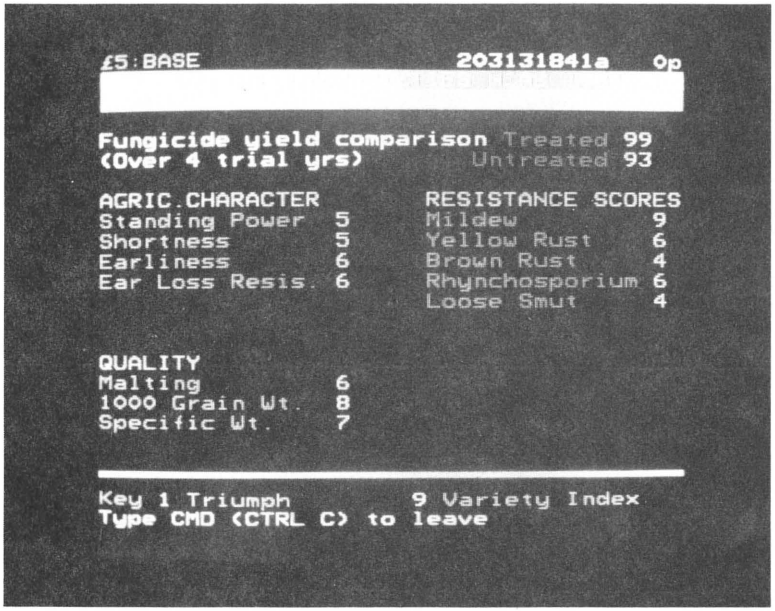


Figure 7b. An alternative to Figure 7a for readers who wish to access the data through the information given in the row headings of the printed display.

information (e.g., the use of asterisks) is explained in a key at the foot of the table, but the use of the capital letters "G, PG, O", which had been explained in the printed table, is left unexplained in the Prestel display. By keying 11 from this frame the user arrives at the frame giving explicit information about one variety (Figure 7b) and some general information of the kind usually given at the head of a printed table. The overall visual structure of this frame can be contrasted with that of column 14 in Figure 2. Note the omission of fractional values on the Prestel frame, where only decimal values can be easily displayed without ambiguity.

So far we have been concerned with Prestel displays of the printed table shown in Figure 2. The problems are slightly different for the table shown in Figure 3. Figures 8 and 9 show two approaches to handling this kind of printed information. The visual structure shown in Figure 8 closely resembles that of the printed table. Although in essence a tabular structure, the columns have been additionally emphasized by putting them in different colours. Two explicit layers of information have been omitted: the names of those fungicides not recommended, and the "active ingredient" column.

At first glance the two Prestel tables shown in Figure 8 and 9 look similar in structure, each being a simple matrix. However, there is a big difference in the way coded layers of information are handled. The function of separation

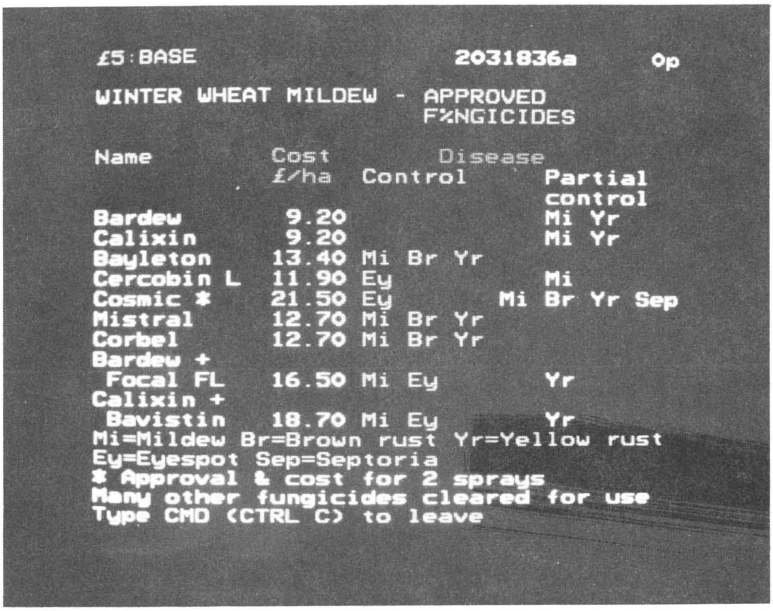
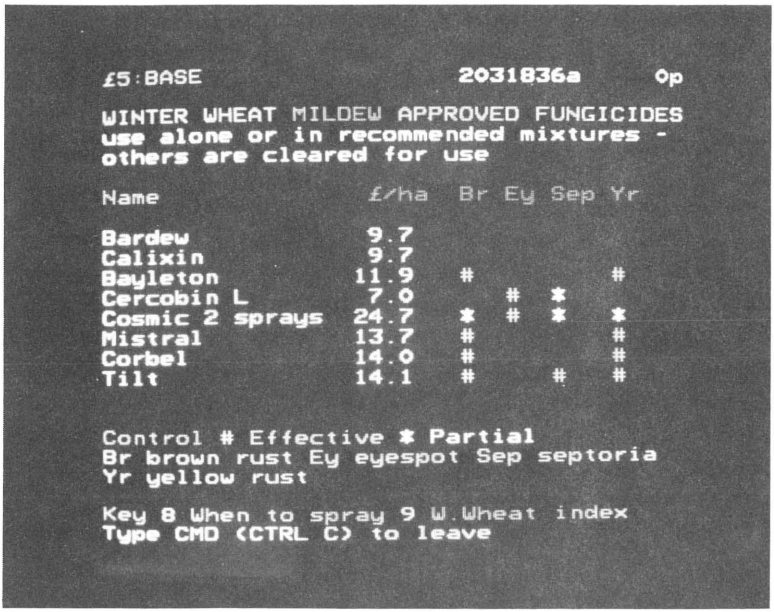


Figure 8. A Prestel display of the information from Figure 3, showing some of the effects of limitations on space and typographic variants such as underlining.

Figure 9. As a way of coping with the space limitations of the medium, the matrix of Figure 8 has here been inverted, the body of the previous table now provides the column headings.



between total and partial control, which was fulfilled in the printed table by underlining, is carried out in Figure 8 by having two separate columns for disease control, one being headed "partial control". The separation is further emphasized by presenting each column in a different colour. The data given under these columns is still in coded form (abbreviated disease names) and a key is provided at the foot of the table. Spatial limitations of the CRT screen prevent the alignment of these diseases which was a feature of the printed display. The use of different colours for each column of the Prestel display is potentially more useful if there should at some future date be four diseases appearing in the "control column". The data in the two columns would then start to interleave and colour would show which heading related to which item of data.

In Figure 9 an attempt has been made to come to terms with the spatial restrictions of Prestel. Here the relevant section of the printed table has been inverted and the abbreviated disease names have become column headings. Control and partial control are now signalled within the body of the table by the symbols # and *. As these two symbols are not visually very distinct from each other, they are also coded different colours.

It is difficult to discuss and illustrate the visual structuring of the Prestel frames in the same kind of detail as the printed tables because of the limitations of printed journals, but the intention has been to give sufficient information to exemplify the different approaches to handling explicit and coded layers of information with tables which MAFF/ADAS has adopted. One problem relating to the presentation of tables on Prestel which has not so far been mentioned concerns the simultaneous display of numbers some of which are data and some of which are menu selections for proceeding to the next frame. Figure 7b illustrates the potential for confusion. Perhaps in time new conventions will emerge.

Clark (1983) states, "Presentation begins with the questions, 'What do you want to show about the data?'" If we apply that question to the printed tables we have been discussing, the answer seems to be "everything". In the case of Prestel the particular features of the medium inevitably force constraints on the amount of information that can be displayed simultaneously. Consequently, when moving tabular information from print to CRT screens, information providers need to ask themselves four kinds of questions:

1 What information do I want to convey and what do I want to say about it?
2 What kinds of information will the user want combined at any one time?
3 What strategies can people be expected to use to get the particular data they want?
4 How can the spatial and graphic features of the medium be exploited to aid the user?

In short, the information provider needs to ask the kinds of questions which ensure that the display of information will result in an efficient communication with the user. Our detailed examination of some approaches to displaying information on Prestel shows this to be a considerable task.

In printed media the flexibility and capability of printing systems allows information providers to sidestep some of the questions listed above. Instead the professionals can be more single-minded and can construct what Clark (1983) calls "efficient storage" for the data. The responsibilities for knowing how to access the data, correctly interpreting it, and using it effectively are delegated to readers. These readers need considerable skills to be able to carry out this task (Wright, 1981). Whether the demands on these skills are increased or reduced by moving tables from print to CRT screen will depend upon how successfully information designers find ways of answering the four questions listed above.

Presenting information in a new medium is not just a question of transferring, or even translating, the information from the old to the new. It involves coming to terms with the medium, understanding the structure of the information (the different layers); as well as having knowledge of the users and their requirements. Printed media have been around for so long now that it sometimes seems as if the need for these different kinds of understanding are no longer appreciated. Maybe the advent of new communication media will force people to look again at the underlying dimensions of successful information design, particularly as it applies to tables.

References

Clark, C. (1983). Statistical presentation —of what, to whom, and for which purpose? Language of Data Project. Paper presented at Joint Statistical Meetings, Toronto.

Houseman, C.I. (1983). Videotex systems and their impact on European extension services. Paper presented at the Sixth European Seminar on Extension Education.

Maslin, J. (1983). Videotex world wide from a publishing perspective. *The Seybold Report on Publishing Systems, 12*, 3-24.

McLaren, I. (1983). Videotex - glimpses of some facets. *Information Design Journal, 3*, 231-238.

Reynolds, L. (1979). Teletext and viewdata - a new challenge for the designer. *Information Design Journal, 1*, 2-14.

Whelan, H. (1982). Designing for Prestel. In M. Katzen (ed.), *Multimedia Communication*. London: Frances Pinter.

Wright, P. (1981). Tables in text: the subskills needed for reading formatted information. In L.J. Chapman (ed.) *The Reader and the Text*. London: Heinemann Educational Books.

Wright, P. (1982). A user-oriented approach to the design of tables and flowcharts. In D. Jonassen (ed.) *The Technology of Text*. Englewood Cliffs, N.J.: Educational Technology Publications.

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

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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.
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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

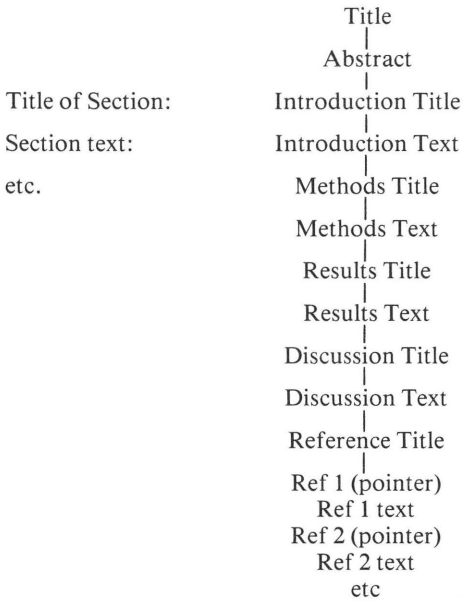


Figure 3(a). Examples of different text structures: linear.

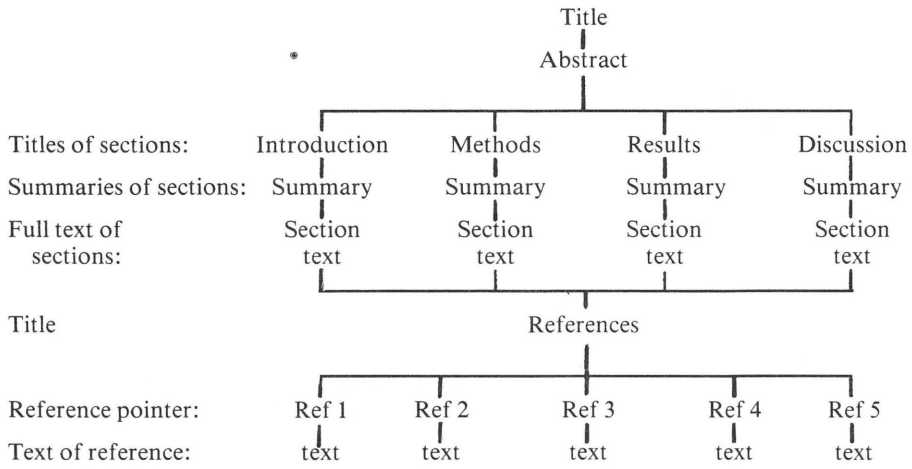


Figure 3(b). Examples of different text structures: Tree structured text.

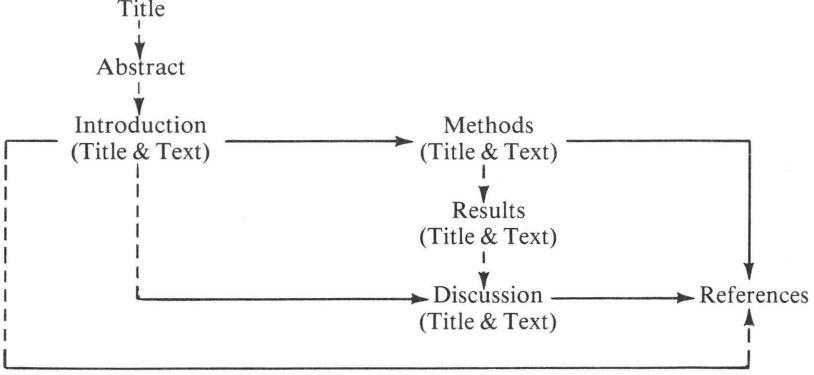
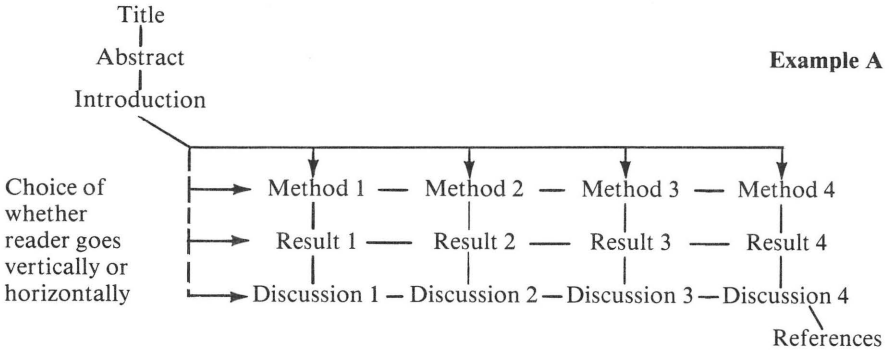


Figure 3(c). Examples of different text structures: Relational net.



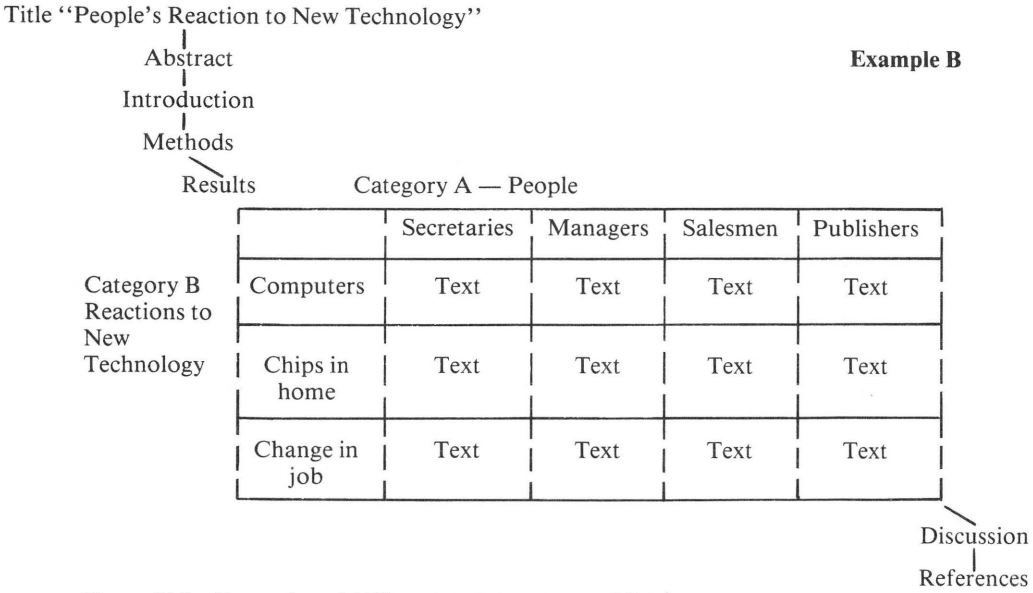
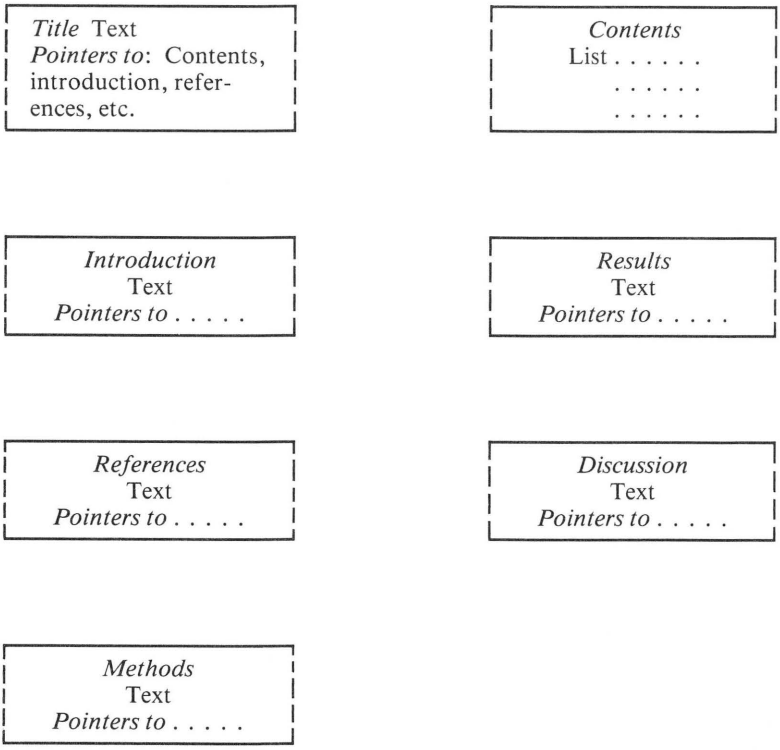


Figure 3(d): Examples of different text structures: Matrix.



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.

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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.

Investigating Referees' Requirements in an Electronic Medium

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The performance of eight academic refereeing two scholarly journal articles is examined when the articles are presented either on paper or on a CRT screen. Three aspects of performance are analysed: (a) details of how the task was undertaken by each referee, (b) individual assessments of the two presentation media, (c) the effect of presentation medium on the evaluation of each article's merit. The results showed that there was considerable variation among referees in the way they undertook the task and in their evaluation of each article. Referees tended to be slower with the CRT text and made several criticisms of the facilities available to them in the electronic medium. Suggestions were put forward concerning the support needed for refereeing academic papers presented in an electronic medium. In this study evaluative assessments of the merits of each article were not affected by the presentation medium.

> *Society is in the midst of transforming itself to use the power of computers throughout its entire fabric — wherever information is used — and that transformation depends critically upon the quality of human-computer interaction.* — Card, Moran, and Newell, 1983, p.3.

1. Introduction

The impact of the new information technologies is changing the ways in which professional groups communicate with each other. Scholarly communications are no exception. Inglis (1983) suggests that the academic author has a great deal to gain from the new information technologies because "the tasks on which the academic author spends most of his time, editing and rewriting, are the very tasks which the computerised text editor is most able to assist."

A greater use of word processing facilities does not necessarily lead to a move away from print on paper as the primary source of communication among academics. Yet those who have an eye for looking into crystal balls suggest that, in time, the traditional printed journal may be replaced by a video disc, accessed from a microcomputer. The technology has not yet made this practicable, but the forecasts are that the economics both of production and storage could make this a very attractive option before too long (Blunden,

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1981). In the mean time the growth of electronic mail and teleconferencing systems offers the academic community some potential advantages over postal and telephone services (Meadows, 1983). Perhaps the three most obvious advantages are: much faster long distance communications, potential savings in effort and therefore costs, and enhanced opportunities for extended interactions among readers and writers. These advantages make the electronic medium attractive as a means of communication not only between publishers and their readers but also between editors and those whose opinions they seek on the suitability of a manuscript for publication: the referees.

Whatever the final form of the publication, it seems likely that the new information technologies will play an increasing part in the preparation of material prior to publication. Sophisticated graphics packages allow alternative page makeups to be explored easily by editors (e.g., Walker, 1983; Davies Cooper and Cooper, 1984). There are optical character recognition systems which convert typescript into electronic form without further manual keying being necessary. Already, as Inglis has noted, many authors choose to prepare their texts on word processing systems. With the increased availabiity of electronic networks, such authors might welcome the opportunity to submit to the editor an electronic version of their text rather than a paper version. Naturally some topics may be more suitable for this than others. A journal article rich in photographic illustrations, particularly colour plates, would not at the moment fare very well in electronic transmission. But there are many other kinds of journal article where such factors do not arise. Even where they do, a parallel submission of text and figures may be feasible, with the text being sent electronically and the accompanying camera-ready figures transmitted on paper.

It is by no means a matter of trivial convenience to transmit text electronically. This method of communication can result in a sizable reduction in the time taken by the editorial review process. The normal sequence of interactions when an article is submitted to an academic journal is listed below. Each of the arrows indicates a communication delay, usually postal. Where the post is intercontinental this can easily be a delay of 10 days.

1. author ---> editor
2. editor ---> first referee
3. first referee ---> editor
4. editor ---> second referee
5. second referee ---> editor
6. editor ---> author

Even if the editor forwards the article to both referees at the same time, there will still be four waiting periods (perhaps a total of 40 days). This is essentially dead time during which nothing at all is done to further the course of the article. This dead time is even further increased if, as often happens,

authors are invited to revise and resubmit (Bradley, 1982). Electronic transmission removes these dead periods. In principle it is possible that all six steps, from author to editor and back to author, could be accomplished in a single day if the referees were able to deal with the article as soon as they received it.

Apart from speeding things up, the savings in cost and effort made by retaining the text in electronic form can also be considerable. Many journals require three copies of the paper to be submitted, some require six copies. Producing these multiple versions via a photo-copier takes time and, unless expensive equipment is available, laborious collation of the pages. The photocopying charge can itself be sizable for a lengthy paper. International airmail charges must then be added and it is clear that economic factors can make a good case for at least exploring some of the alternatives. The text file could be transmitted by telephone in a matter of minutes. The exact time would depend upon transmission rates, but at 1200 baud (120 characters per second) a 5000 word article would take only 4.2 minutes to send. Even on a transatlantic phone call this is cost effective, and there are systems available which will automatically send files from one computer to another over the telephone network during the night at cheap rates. There are no problems of collating pages and the recipient can make as many subsequent copies as are needed, or even transmit it further electronically.

The advantages discussed so far have been those which accrue to the author of an article or the editor of a journal. In the middle of this system are the referees. In principle they too may benefit from a change to electronic communication. If they wish to work with a paper copy then they are free to print out the file they have received, but in an electronic medium they have the option of combining the activities of reading and making comments. These comments can then be revised by the referees if they wish and returned to the editor without secretarial intervention, often a further source of lost time. Such a suggestion presupposes that the refereeing process can adequately take place in an electronic medium. This assumption may not be well founded. During the early stages of the British Library's experimental project on an electronic journal (BLEND, see Shackel, 1982) several people who were asked to referee an electronically transmitted article chose to do the task using a paper version of the text. The reasons for this are unclear. It might be that there is something about the electronic medium which makes it inappropriate for a task such as refereeing, or it may be that the activity of refereeing requires special support in an electronic medium. In order to examine these possibilities let us consider the requirements that referees have, and how these might be affected by a change from paper to video terminal.

2. Requirements of referees

2.1 Legibility. A basic requirement of referees, as for all readers, is that the text be legible. In this respect the readers of electronic text may often be at a disadvantage compared with those reading print on paper. There is a wide variability in the typographic quality within both media, so generalisations are not very meaningful, but at the present stage of technological development it is often the case that the electric typewriter produces more legible displays than many CRT screens.

2.2 Movement. A second general requirement of referees is the ability to move back and forth in the text, comparing the information in different sections. Here the paper medium has the advantage that the sheets can be spread out and several pages viewed concurrently. The limited size of the CRT screen prevents this. It is also a fact that for printed texts readers have acquired the skills of page turning, which may include leaving a finger in the place to which one will return, and can call upon these skills in relatively automatic fashion as the need for them arises. Comparable manoeuvres may be possible in an electronic medium, but their execution will be less familiar. As a consequence, the attention they require may detract from the primary task of following and evaluating the author's argument.

2.3 Annotation. A third requirement of referees relates to the ability to comment on the article as it is being read. Such comments may sometimes be written directly on the text itself or on other occassions they may be noted on a separate sheet. They are essentially private remarks which referees are addressing to themselves, in contrast to the considered opinions which will later be forwarded to the editor. From anecdotal information it would seem that these annotations often tend to reflect affective responses (such as agreement, disagreement, or puzzlement) rather than being well-articulated comments about the substance of the article. It is possible that these concurrent comments are an optional strategy which only some writers use, and perhaps not for all papers. But it is important to appreciate that when they occur they form part of the reading task rather than being related to the subsequent task of writing a report on the article.

2.4 Communication. A fouth requirement of referees is that they formulate an opinion about the text and communicate this to the editor. Often two parallel communications are requested, one being suitable for further transfer to the author and indicating where improvements might be made to the text, the other being predominantly a judgement about the article's suitability for publication. Here again referees have the choice of composing these comments by any method and, if they wish, the keyboarding and transmission to the editor can be done by secretaries. But when referees choose to generate the electronic report themselves, there arise further issues about how the use of

word processing facilities may change the character and the quality of what is written. At present we know very little about the psychology of report writing.

The above discussion has sketched out the referee's task using an armchair-based task analysis. When it comes to empirical evidence concerning how referees go about their task, again there seems to be relatively little hard data to draw upon. Several studies of refereeing have cast doubts on the objectivity and reliability of the process. For example, not only is disagreement common among referees but changing the author's name or academic affiliation appears to influence the judged quality of the article (Peters and Ceci, 1982), so too does the pattern of data being reported by the author (Gordon, 1980). If the process is as labile as this it may well be influenced by a change in presentation medium. At present one can only guess whether these known deficiencies in the refereeing system will disappear or will be exacerbated by a change from the display medium of paper to that of the CRT screen. A better understanding of the constituents of the refereeing activity might provide some basis for assessing how these will be affected by changing the medium of communication. The findings from one such small-scale study are summarized in the next section.

3. Investigation of how people referee journal articles

3.1 Design and procedure

It would obviously be inappropriate to ask members of the general pubic to carry out a professional task such as refereeing an academic paper. Therefore a group of 8 senior academics, 2 women and 6 men, have been kind-hearted enough to act as unpaid volunteers. All are tenured members of the scientific staff of the Medical Research Council, working at the Applied Psychology Unit in Cambridge, England. All have considerable experience in refereeing papers submitted for publication in academic journals.

The expertise of these volunteers lay in different areas of cognitive psychology, so it was necessary to find journal articles of general interest on which these referees could be expected to pass an informed judgement. Two articles were chosen from those available on the BLEND system. One was in the *Computer Human Factors Journal* and dealt with a comparison of the feedback obtained from software editing tools and that obtained from human editors (Hartley and Frase, 1983 and 1984). The other was in the *Bulletin* and dealt with the prospects for the development of electronic journals (Pullinger, 1983). Referees were asked to evaluate the suitability of these articles for "an interdisciplinary journal in the general area of design and human factors". All the referees were familiar with one such journal, namely *Applied Ergonomics*.

Another reason for choosing these articles was their length. Each was roughly 2800 words and took about 15 minutes to read. This meant that both

articles could be dealt with by referees in approximately one hour. Only one referee took so long on the first article that the second was done on a subsequent occasion. For convenience the two articles will be referred to as A and B throughout the following discussion. Because of differences in the use of space by each author, although roughly matched in numbers of words, article A required 23 screen pages whereas article B required only 16 screen pages.

The experimental design required each volunteer to referee both articles. One article was presented as white text on a black background on a 12-inch Hitachi monitor driven by an Apple II computer. The other article was the printout from the italic font of an Epson FX-80 dot-matrix printer. For each article the layout of the screen and paper versions was identical, except for the font changes mentioned. Both used single line spacing. The text itself was confined to a maximum line length of 65 characters and each page had only 24 lines. The printout was centered on the page with wide headings and footings and corresponded exactly to the visual display on the screen. The texts were altered as little as possible from their "published" versions on BLEND, but additional line spacing was introduced where appropriate to have page breaks correspond to thematic breaks within the article. Every line of text had a line number on the left, both in the screen and paper versions. On the right of the screen display there was a reserved margin of 4 characters which could be used by referees to record annotations as they read the article (see below for details).

Four referees began with the article on paper and four had the screen article first. Of each group of four, half started with article A and half with article B. All referees were given written instructions which explained the purpose of the experiment and the criteria to be applied to the papers: "Your task is to make comments on each paper that can assist an editor in deciding whether the paper is suitable for publication. At the editor's discretion your comments will be forwarded to the author(s). The points which you should bear in mind when assessing the paper are listed below; but any negative comments are much more helpful when they are specific and related to particular parts of the text rather than being global expressions of dissatisfaction."

In order to encourage referees to consider several facets of the text, and perhaps increase the homogeneity of the standards being applied, the following written checklist remained available for consultation by referees throughout the experiment:

POINTS TO ASSESS WHEN REFEREEING

1. Does the paper advance our knowledge of issues relating to design (either specifically or in general)?
2. Are the procedures and techniques which are reported in the paper appropriate to the issues being discussed?

3. Are the issues adequately related to the experimental research and design literature?
4. Is the paper intelligible to a non-specialist audience?
5. Please rate the paper on a scale from 1 to 5 (1 = good; 5 = bad) for each of the following characteristics:
   (a) content, (b) presentation, (c) appropriateness.
6. Should the paper be accepted for publication:
   (a) as it stands, (b) after minor revision, (c) after major revision
   (d) after further work, (e) not at all

The instructions to referees also discussed ways of commenting. These instructions said, "You are welcome to annotate the text as you read, you also have a notepad for any notes that you may wish to make, but your comments to the editor should be written on the headed paper provided." The paper was headed "The Journal of Communication Studies".

When the article appeared on the screen, referees were told that they could use the three symbols ?, !, and S to make "comments" in the right-hand margin. These keys were made distinctive on the keyboard by fitting green caps to the keys, and they were grouped together by re-assigning the keys Q,S,X. These symbols would appear at the cursor location in the margin, and this location could be controlled by two other green keys labelled U (for up) and D (for down) which were assigned to the qwerty keys U and N. Two green keys labelled B and F were assigned to the qwerty keys F and L, and enabled readers to move backwards to the previous page and forward to the next page.

After the referees had evaluated both articles, they completed a short four item questionaire about the two display methods. The first of these questions was a series of multiple choice items with the answers all being selected from the following five-point scale:

1 = text on screen much better
2 = text on screen slightly better
3 = no difference
4 = text on screen slightly worse
5 = text on screen much worse

For half the volunteers the word "screen" was replaced by the word "paper". The second question asked about the need for extra facilities when dealing with electronic text. The third question asked about the acceptability of reduction in page size to allow space for writing comments on the screen. The final question solicited any other comments.

3.2 Results.

There are three potentially independent aspects of the results and each of these will be considered in turn:

Table I. Summary of the times in minutes taken by referees to deal with articles on paper or on a CRT screen.

	Total time	*First read*	*Write report*
Paper			
Article A	36.62	14.01	18.97
Article B	22.40	14.23	8.17
Mean	29.51	14.12	13.57
Screen			
Article A	41.72	18.06	21.48
Article B	29.45	19.98	9.48
Mean	35.59	19.02	15.48
% Screen Slower Than Paper			
Article A	13.9	28.9	13.2
Article B	31.5	40.4	16.0
Mean	20.6	34.7	14.1
Screen	35.59	19.02	15.48

(a) The way referees conducted the refereeing task when the article was on screen and on paper. Relevant performance measures include how long it took, how referees divided their time between reading and writing, how much they moved back and forth through the text.

(b)The assessments made by referees of the two presentation media. This includes their preferences, criticisms, and suggestions for improvements which would faciliatate refereeing in an electronic medium.

(c) The impact of medium on the evaluative assessment of the article being refereed. This focusses on the content of the final report written for the editor.

3.2a Referees' performance. Table I summarises the times taken to complete the refereeing task when the article was on paper and when it was on the screen. Six of the eight referees took longer refereeing the screen article. As a group the referees were taking 20.6% longer to deal with the screen article, but this difference was not statistically significant (Wilcoxon T = 6).

From the total time, the period spent on the first reading of the article and that spent writing the report for the editor are shown separately in Table I; subtraction of these two periods from the total time will indicate the time spent in a second reading of the article and in activities such as turning to other parts of the text in order to make comparisons. Table I shows that it was the time spent on the first reading which accounted for most of the difference between

screen and paper. Referees spent on average an extra 5 minutes reading when the article was on the screen whereas they spent only an extra 2 minutes in writing the report to the editor. The time spent on the first read through of the article was in the order of 34.7% more when the articles were on the screen than when they were on paper, which is comparable to the decrement of 37.3% reported by Wright and Lickorish (1983) in a proof-reading task when detected errors were recorded on the screen. However, in the present study this difference was shown by only six of the eight referees and was not statistically significant (Wilcoxon $T = 5$, for significance at $p < 0.05$, $T < 5$).

The extra 2 minutes spent writing can be accounted for by the slightly longer comments which referees made when the article was on the screen (225 words) compared with when it was on paper (196 words). Detailed analysis of the content of the referees' reports will be given in section 3.2c, which deals with the way the change in media influenced the evaluative assessment of the texts.

Four of the referees annotated the text as they read. One did so only when the article was on paper, one only when it was on the screen, and two did so in both conditions. All four referees who did not make marginal annotations made notes on the pad as they read, so did one of those who made marginal annotations. For those who used the pad, the mean number of notes made was 9 for the screen article and 6 for the paper article.

Four of the referees carried out a second read of the article. Two did so for both the screen and paper articles, two did so only when the article was on paper. In all but one instance the second readings were very much faster than the first reading, usually less than 20% of the first reading time. Clearly these numbers are too small for safe generalisations, but the emerging picture seems to be one suggesting that there is no common set of procedures adopted by experienced referees for carrying out the task of refereeing a journal article.

Variability is also evident in the reading patterns adopted. For example, some referees made quick flips back to a previous page. The mean number of such flips per referee was 5.3 for the screen article and 3.3 for the article on paper. This mean difference was not statistically reliable, and only four of the eight referees ever made more than two such flips; all four did this when the article was on the screen and three of these made more than two flips when it was on paper. So if a "quick flip" facility had been provided it would have been used by only half this group of referees. Extended searches for earlier information were even less common than quick flips to a previous page. Although only two referees never made an extended search during the course of refereeing, there were only two people who made more than two such searches; one did this for both the screen and paper articles, the other referee did it only for the article on paper.

In interpreting these data as characterising what referees do when they referee, it must be borne in mind that the nature of the task inevitably had a

Table II. Referees' responses to questionaire rating scale. (Cell values show how many referees gave this rating, max = 8)

	Screen Worse 1	2	*No Diff* 3	4	*Paper Worse* 5
Between sections	6	1		1	
Legibility	4	3	1		
Between pages	4	1		3	
Annotate*	2		3	1	
Make comments		2	6		
Follow theme		2	5	1	

*Two referees wrote comments which could not be interpreted on this scale.

certain artificiality. The referees were conscious that they were being monitored, they were working under time pressure and evaluating papers which did not lie in their particular area of expertise. Nevertheless, it had been anticipated that these experienced referees would have established some stable strategies for doing a task which they do frequently as part of their professional life. In so far as this assumption is correct, the data suggest people develop different refereeing strategies. Referees differ both in the way they read an article and in the way they integrate writing activities with such reading.

3.2b Assessment of media

Referees were asked to contrast the two media for each of six factors related to actions that referees might want to carry out. The five-point rating scale used to answer these questions was mentioned earlier. The questions themselves were presented in the following order:

(a) How legible was the text?
(b) How easy was page turning?
(c) How easy was moving between different sections of text?
(d) How easily could you follow the author's argument?
(e) How easy was it to make marginal annotations?
(f) How easy was it to compose comments to the editor?

In Table II, which shows the distribution of answers, the questions have been re-ordered so that the upper rows of the table show those factors which the referees said were at a disadvantage for the screen article. The referees considered that having the text on the screen made no difference to activities such as making annotations, or commenting to the editor, or following the author's argument. However seven of the eight referees felt that legibility was

reduced and that moving about within the article, particularly moving about between different sections of the text, was much worse when the article was presented on the screen. These aspects of the electronic display were mentioned by several referees in their written comments.

In response to the question about additional facilities which would have been welcomed when refereeing the screen text, 20 suggestions were made. This is an indication that the system used in the present experiment was far from perfect. But it should also be noted that people have different expectations concerning texts presented under computer control. Several of the facilities requested are not feasible with conventionally printed texts. The comments made by referees are summarized below, where they have been categorised in relation to four areas of interface design: legibility of the display, ease of access to specific information, movement within the text, writing facilities.

Legibility Several referees commented on legibility problems, three mentioning text characteristics (such as the need for descenders, although these were present in both the screen and printout displays used here). One request was for more space between the lines and another was a general comment about eye strain when reading material on VDUs. There is an additional reason for thinking that this screen display may have been less legible than the printed text. Wright and Lickorish (1983) reported similar differences in a proofreading task using the same screen display but their comparison was with a different dot matrix printer, and they later suggested that much of the difference they had found may have been attributable to annotation factors (Wright and Lickorish, 1984). Nevertheless, the legibility implications have no generality outside the specific typographic characteristics of the displays used in this study. As the technology improves there is no inherent reason why legibility differences should persist.

Access There were five requests for improved access to specific parts of the text, and four of these specified that the access should be via a single key. Such single key access was requested to the contents, the abstract, the reference list, and the specific points that the editor wanted referees to consider. The remaining request for better access concerned the simultaneous display of different sections of the text (i.e., multi-windowing). Such simultaneous comparisons are much more easily achieved with paper than within the confines of the small screen sizes which are most commonly used at the moment.

Movement Eight comments from referees related to moving back and forth within the text. Three referees simply noted that movement would be irksome in a paper longer than that used in this study. One person requested a scrolling facility, another suggested that it should be possible to use the cursor to make

selections from the contents page and jump straight to the required part of the text. Two people wanted the ability to do keyword searches, and one asked for the marginal annotation keys to include a "new page" option with a repeat function which enabled changing multiple pages. The tradeoffs here are not easy to compute. Nor is it simply a question of the economic costs of the alternative systems. The more facilities that are provided, the harder the system is to learn. On the other hand, any one referee may choose only to bother with a managable subset of the available facilities. Perhaps an ideal refereeing package would need to be customizable, to satisfy the preferred strategies of individual referees.

Writing Only two comments were made by these referees about facilities needed to support their writing activities in a more satisfactory way. One request was for the opportunity to mark within the text itself, and the other was for an auto-repeat function on the marginal annotations. It is possible that if the referees had had greater experience with handling text on a VDU screen (some but not all were regular users of word processing packages running on microcomputers) then full screen editing facilities might have been requested. For editors receiving such modified text from referees there are some obvious difficulties relating to a clear separation between the original text and the referees' suggested changes. With increasing use of colour (or even of reverse video) maintaining such separation need not be an insurmountable problem.

3.2c Evaluation of articles

Given that the CRT display used in this study was felt by those using it to be inadequate in a number of respects, it is of interest to consider whether this will have coloured referees' assessments of the merits of the articles. There is evidence in other contexts, such as examinations, that the characteristics of the visual presentation (e.g., handwriting — Briggs, 1980) may influence the examiner's evaluation of the content.

All referees were asked to assess on a five point scale three separate aspects of each article: its content, presentation and appropriateness for the defined non-specialist target audience. On each of these measures there was a non-significant tendency for the article on paper to be given on average poorer ratings (see Table III). This bias occurred for article B on all three evaluations and for article A on the evaluations of presentation and appropriateness. Such bias may have arisen because the referees were trying to compensate for any carry-over effects which they felt might have arisen due to their irritation with the electronic medium. Whether such compensation would be similarly made outside an experimental setting it is not possible to say.

Referees were asked to make an overall recommendation about the suitability of each article for publication. The distribution of recommendations for each article are shown in Table IV where it can be seen that there was

Table III. Referees' evaluations of three aspects of each article. (Mean rating on 5 point scale, 1 = good 5 = bad)

	Content	*Presentation*	*Appropriateness*
Paper			
Article A	3.50	4.00	3.25
Article B	2.75	3.00	2.50
Mean	3.13	3.50	2.88
Screen			
Article A	3.00	2.75	1.75
Article B	2.75	3.50	2.50
Mean	2.88	3.13	2.13
Screen	2.9	3.1	2.1

Table IV. Distribution of each of the eight referee's final recommendations on publication for articles A and B.

Recommendation	*Screen*		*Paper*		*Overall*	
1. YES: as it stands	A		A		AA	
2. YES: minor revisions		BB	A		A	BB
3. ?: major revisions			AA	B	AA	B
4. NO: needs further work	A	B		BB	A	BBB
5. NO: not at all	AA	B		B	AA	BB

considerable variation in opinion. Such differences among reviewers are not uncommon (Peters and Ceci, 1982).

The summary column shown on the right of Table IV indicates that recommendations about article A were fairly evenly split. Three referees thought that it should be published either as it stood or after minor revisions, and three people thought that it should not be published at all or at least not until further work had been carried out. The diversity in respect of article B is only slightly less, and this is the result of agreement that the article should not be published as it stood. Given such diversity it is clearly optimistic to imagine that the effects of presentation medium might be detectable. Yet it is possible to ask whether those who were tough-minded were equally tough on screen and paper, and similarly whether those who were tenderhearted maintained this outlook across media. Figure 1 shows the recommendations on publication for each of the eight referees, as a function of presentation medium, text

content and serial order. The picture that emerges seems to be one of unsystematic variation rather than one of any general trends.

The reports for the editor which were written by each referee were analysed in several ways. The total number of words in each report was counted. It has already been mentioned that the presentation medium had only a small influence on length (paper = 196 words; screen = 225 words). However the length of each referee's report was related to their personal evaluation of the article. The evaluation measure used was obtained by pooling the ratings across the assessments for content, presentation and appropriateness. Each of the two articles seen by a given referee was allocated to either the category "better" or the category "worse" for that referee. This categorisation depended only on the two evaluations made by that referee. For article assigned to the "better" category (mean evaluation rating 2.37) referees wrote on average 256 words, whereas for the article assigned to the "worse" category (mean evaluation rating 3.60) referees wrote on average 166 words (Wilcoxon T = 1, p. < 0.02). It is not possible to say from the present study how general a characteristic of referees' performance this is. There may be a tendency to make fewer comments at both the good and the bad ends of the scale. The

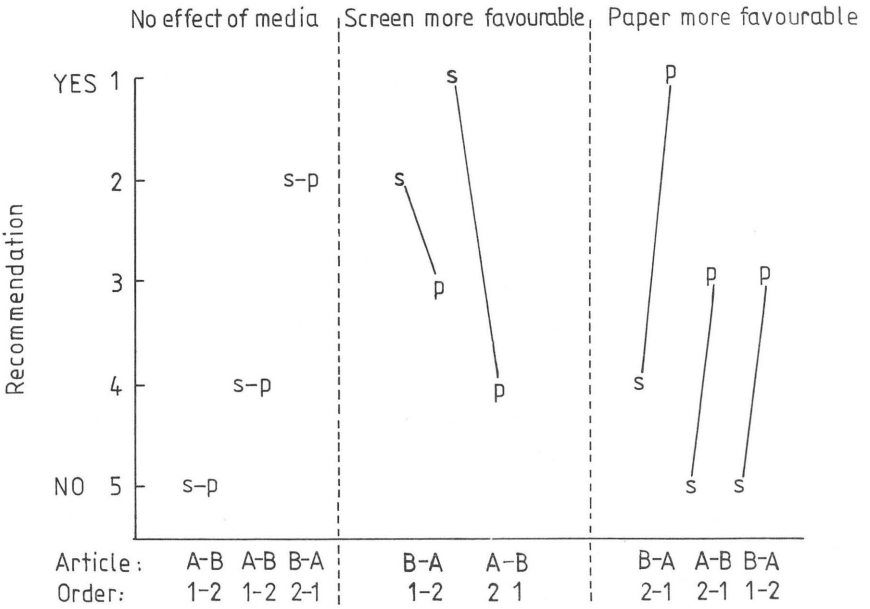

Figure 1. The evaluation made by each referee of the suitability of the two articles for publication, as a function of whether the article was presented on a CRT screen (S) or on paper (P).

Table V. Analysis of content of referees' reports to editor. (Mean number of comments per referee)

Comment	*Article A*	*Article B*	*Overall Mean*
Facts from text:			
paper	2.3	5.5	3.9
screen	7.0	1.0	4.0
Evaluative comments:			
paper	6.3	12.5	9.4
screen	9.3	7.8	8.6
Suggestions:			
paper	3.5	3.5	3.5
screen	4.5	3.8	4.2
Total comments per referee:			
paper	12.1	21.5	16.8
screen	20.8	12.6	16.7

articles used in the present study, in the opinion of these referees, appear to have sampled the bad end rather than the good end of the distribution. In support of this interpretation of the relation between the amount written and evaluation of the article, one referee wrote down on the questionnaire that if the article had been better written they would have made fuller comments to the editor, but that as it was they felt it was not worth doing anything more to the article.

The content of each referees' report was analysed for the frequency with which information from the article was cited, evaluative comments were made, and suggestions were put forward either about presentation or about further research. Table V summarizes the results of this analysis, but again it must be remembered that there were wide ranging differences among the referees. Some people wrote short essays to the editor, others restricted themselves to addressing those points to which the editor had asked them to give attention. An indication of the extent of individual differences is given in Table V, bearing in mind that the referees who read article A on the screen were those who read article B on paper. For example, in the rows headed "Facts from the text" the referees reading article A on the screen made more than three times as many comments on each article as did the other subgroup of referees.

Table V shows that the most frequent catagory of comments made in the reports to the editor were evaluative (51%). These comments were wide ranging and conveyed both positive and negative feelings. Some referees used phrases such as "well written", "enjoyable", "surprising" of the same article which

other referees found "disjointed", "predictable", and "not worth doing". Because of the diversity of comments and the small sample size there were no observable differences due to the change from paper to screen. There is no evidence in these data for the kinds of negative halo effects which have been reported elsewhere (Briggs, 1980).

4. Implications for support of on-line refereeing

Although generalisations from this study must be made cautiously, in view of the small sample size both of referees and journal articles, there is enough evidence here to indicate some of the reasons why participants in the BLEND experiment were reluctant to referee journals on CRT screens. At a purely practical level it would almost certainly have taken them longer to referee an electronic article. In order to be able to redress this disadvantage in the design of future systems it is necessary to have some understanding of the reasons for the slower performance. These reasons concern cognitive costs imposed by the computer-based communication system. For convenience these costs can be considered to fall mainly into three broad problem areas: perceptual problems, memory problems, writing problems. These three areas will be considered in more detail below but technical developments, in both hardware and software, will enable some of these problems to be reduced or eliminated, if system designers are aware of the requirements of users such as referees.

Perception Perceptual problems relate not only to the legibility of the characters on the screen itself but also to the referees' need to be able to see different parts of the text, either simultaneously or in rapid succession. One technical solution to this problem is a larger screen with multi-windowing facilities. But even this does not adequately meet the referee's need to know where certain information is located and how to access it. When the reader formulates an objective (such as making Figure 3 visible in a window alongside a certain passage of text) there are both conceptual and physical aspects of the operation to be performed which can disrupt the efficiency with which the article is read. The implication is that providing multi-windowing facilities will not necessarily solve these problems for referees. Indeed disrupting the linearity of the text might even make it harder for readers to keep track of where they are and where they are going. They may even fail to notice where they have not been. What is needed in addition to a multi-windowing display is a procedure for accessing different sections of an article which is as cognitively undemanding as turning the pages of an MS in typescript.

Memory From the referees' responses to the questionnaire it appeared that people found it as easy to follow the thematic construction of the author's argument when the article was on paper. Yet several referees mentioned, either in the questionnaire section for "general comments" or in conversation

afterwards, that when the text was on the screen they appeared to lose some of the incidental location cues which they normally pick up when reading a wad of paper sheets. That is to say, people felt less certain whereabouts certain information was after they had read it. Several studies have shown that the readers of articles printed on paper remember many irrelevant aspects relating to the location of information on the page and to its serial order within the articles (e.g., Rothkopf, 1971). Probably an ideal solution would be to make the visible language of the electronic journal sufficiently distinctive so that readers had available "background" cues, which they might incidentally pick up while reading and subsequently use for retrieval - just as they seem to use the thickness of a pile of typewritten pages. However, it is not immediately obvious what visual characteristics to select for this purpose. Wright and Lickorish are currently exploring the ways in which colour might serve such an incidental cueing function in some kinds of text.

Writing Although comments were made about the annotation facilities, referees did not mention writing the report for the editor as being a problem in this study. Among the reasons for this may be that the report was written by pen on paper for both the screen and paper articles. This is the traditional method of communication with which these referees were familiar. Moreover, half the referees did not annotate the text but made notes on a pad while reading. As a consequence these non-annotators could access their notes as easily when writing the report about the screen article as they did with the paper article. We can only speculate what requirements might have been mentioned if these referees had been sitting at their own terminals reading the aricle on a VDU screen and composing their report for the editor with full screen editing facilities available. It is likely that this would not only have increased the demand for split-screen displays (for viewing whichever part(s) of the article the referee wished), but there would also have been a demand for multi-tasking facilities so that referees could annotate what they read and also write separately to the editor, these two writing tasks being capable of being performed as overlapping, essentially concurrent, rather than sequential activities. The present data suggest that any such multi-tasking facilities would need to be very flexible to meet the varied working patterns adopted by referees. Enabling the tasks of reading and writing to be engaged in concurrently is an aspect of text display which does not have to be considered when articles are presented on paper.

5. Future prospects for referees

The techniques of communication are changing rapidly as the new information technologies become more widely available. It would therefore be rash to try predicting how specific communities, such as academics, might be affected. There is a current impetus to develop the "fifth generation" of computer systems, which will provide knowledge based and therefore more intelligent tools for many academic functions (Feigenbaum and McCorduck, 1983). One fairly trivial area of application for such an "expert system" is in some of the routine aspects of refereeing/editing, such as checking the correspondence between references cited in the text and those listed at the end of an article. With regard to developments outside the domain of intelligent assistance, three further points can be made with some certainty. One concerns the technology itself; the second concerns the overlap and intermingling between visible and auditory language; the third concerns some of the invisible correlates of visible language.

Technology The investigation reported here was undertaken because of the authors' involvement with the British Library project on an electronic journal (Shackel, 1982). Yet for a variety of reasons it seems unlikely that electronic communications among the academic community will have developed sufficiently for this kind of interchange to be feasible for the next couple of years. One reason is simply that the present economic climate is not encouraging the use by many university departments of networks and workstations that have the necessary power for handling multiple extensive texts. This is necessary if one wishes to access journal length articles and seems likely to be a state of affairs which may change as networks become more widespread.

Among our colleagues here in Cambridge are several who frequently referee papers while travelling by train to meetings. At the moment the highly portable "lap computers" do not have the memory capacity that would enable single texts of 20 to 30 pages to be handled easily. However the predictions are that by the end of 1984 there will be available 32 bit machines with ample processing capacity for this sort of task (Winer and Winer, 1984).

Even if the money were available, the technology is not yet ready for the demands to be made upon it. The limitations relating to articles that require high quality graphics have already been mentioned. A temporary solution is the separate and parallel submission to the editor of figures and text. But even the successful transfer of text will depend on the computer industry's readiness to overcome the current limitations of incompatible systems which are reluctant to communicate with each other. International standards for electronic data transmissions are being worked out, but the standards once agreed have to be implemented by product developers. It all takes time.

Visual auditory Not only will the new technologies create demands for changes in the characteristics of visible language in many domains, they will also blur some of the distinctions between the uses of visual and audio communication. At present the circumstances in which each modality is used are reasonably well defined. Auditory communication is used predominantly for real time person-to-person interaction, visual communication is used when the interaction is asynchronous. In future, voice may be an option for both input and output. Perhaps the referees of an electronic journal article might have their spoken comments captured and transmitted electronically to the editor, who might then have the option of considering these in either spoken or written form. There is already evidence that dictated letters are faster, and therefore more economic, than handwritten-to-typist letters, without there being any evident drop in the quality of the letters (Gould, 1982). Those concerned with the design of visible language have yet to work out the implications for generating messages whose modality may be changed by the recipient. For example, what happens to headings?

Invisible factors One of the points which was emphasized when discussing the results of the present study concerned the difficulties people reported when wanting to move about within the text. This is one of the invisible correlates of visible language. Its importance to successful communication is easily overlooked, perhaps because it has virtually no counterpart in auditory language, although people do hunt for specific portions on a tape recorder and on a dictaphone. When text is printed on paper both readers and writers make use of the opportunity to move back and forth between different sections. The crucial role of this aspect of visible language becomes more obvious from comparisons of people's interaction with text presented in different media. It is not confined to ease of movement, it also includes ease of integrating the reading task with other activities. Sometimes these other activities will be decision making (e.g., the manager taking decisions on the basis of spread sheet information). In the present instance the other activities were annotating and report writing. From the findings of this study it seems likely that irrespective of the ease of reading itself, the acceptability of a new medium for presenting visible language will depend on how smoothly some of these other activities can be integrated with the use of the displayed information.

References

Blunden, B. (1981). Computer aids in publishing. In E. Than (ed.)*Computer Graphics Manual* Key papers from computervision '81. London: Nord Media Ltd.

Bradley, J.V. (1982), Editorial overkill. *Bulletin of the Psychonomic Society, 19*, 271-274.

Briggs, D. (1980). A study of the influence of handwriting upon grades using examination scripts. *Educational Review, 32*, 185-193.

Card, S.K., Moran, T.P., and Newell, A. (1983). *The Psychology of Human-Computer Interaction*. Hillsdale, N.J.: Lawrence Erlbaum Assoc.

Davies Cooper, R.F., and Cooper, C.L. (1984). Effect of new technologies on the work and methods of the typographic designer. *Design Studies, 5*, 21-29.

Feigenbaum, E.A., and McCorduck, P. (1983). *The Fifth Generation: artificial intelligence and Japan's challenge to the computer world*. London: Pan Books.

Gordon, M.D. (1980). The role of referees in scientific communication. In J. Hartley (ed.) *The Psychology of Written Communication*. London: Kogan Page.

Gould, J.D. (1982). Writing and speaking letters and messages. *International Journal of Man-Machine Studies, 16*, 147-141.

Hartley, J., and Frase, L.T. (1983). Human and Computer aids to writing. Archived in electronic form as part of the British Library Electronic Network Development experiment, in *Computer Human Factors 2*, entries 1-51.

Hartley, J., and Frase, L.T. (1984). Human and computer aids to writing. *IEEE Transactions on Professional Communication, 27*, (in press).

Inglis, D.A. (1983). New developments in typesetting and their implications for graphic and instructional designers. *Information Design Journal, 3*, 183-197.

Meadows, J. (1983). Scholarly communication in transition. *Journal of information Science, 7*, 81-97.

Peters, D.P., and Ceci, S.J. (1982). Peer review practices of psychological journals: The fate of published articles submitted again. *The Behavioural and Brain Sciences, 5*, 187-225.

Pullinger, D. (1983). Reading electronic journals on-line. Archived in electronic form as part of the British Library Electronic Network Development experiment, in *Bulletin 7*, Entries 1-35.

Rothkopf, E.Z. (1971). Incidental memory for location of information in text. *Journal of Verbal Learning and Verbal Behavior, 10*, 608-613.

Shackel, B. (1982). The BLEND system: program for the study of some "electronic journals". *Ergonomics, 25*, 269-284.

Walker, C. (1983). Between the lines. *Design*, 409, 48-49.

Winer, D., and Winer, P. (1984). Portables - 1984 and beyond. *Byte, 9*, 243-262.

Wright, P., and Lickorish, A. (1983). Proof-reading texts on screen and paper. *Behaviour and Information Technology, 2*, 227-235.

Wright, P., and Lickorish, A. (1984). Ease of annotation in proof-reading tasks. *Behaviour and Information Technology* (in press).

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