# TELESOFTWARE—VALUE ADDED TELETEXT

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## INTRODUCTION

The average person regards a radio receiver as a consumer device which he can buy at a relatively low cost from any multiple store, and which will supply him (at no extra cost) with entertainment, information and education. This radio is usually equipped with only a small number of controls (e.g. on/off, tuning, bandchange, volume) and it is very rare to find someone who is unable to operate it satisfactorily.

The radio receiver is a commonplace item in the households of the western world, and the microcomputer, also, will become commonplace since it too offers entertainment, information and education. But it also has the tremendous added dimension of 'interaction' (from the transitive verb 'interact' - to act upon each other), so that the value of this entertainment, information and education is enhanced by the microcomputer and the user both providing reciprocal actions, one to the other.

For the microcomputer to become as accepted in the average household as the radio it must, like the radio, be simple to set up and use, and must be available (by purchase or rental) from the high street store.

This analogy can be taken further. The earliest radios were constructed by their owners who then proudly demonstrated the results to their friends and neighbours. Any sound, even a faint crackling one, was an improvement on what had been before - no sound at all. Even today there are people who design and construct their own radios, and, of course, there are the 'hams' who are concerned not so much with broadcast radio as with 'networks' of like-minded individuals.

At the present time the domestic microcomputer scene can be likened to those early days of radio. Microcomputers are bought or built by enthusiastic amateurs, and demonstrated by their proud owners (and only they seem to know the secret place on the case which has to be kicked to make the machine perform!) Like the radio 'hams' there is a band of microcomputer users who are much involved in the interconnection of their microcomputers by networks, but these worthy individuals, and indeed all 'hobby' computerists are very much a minority and will stay so, since the average person has no wish to become involved in any such exercise. Indeed, the average person is still very wary of 'computers' and anything that appears remotely like 'Big Brother' is likely to frighten him off!

How then can microcomputers be introduced into households so that the ordinary citizen will accept then and use them to provide information, education and entertainment, while retaining simplicity of operation and low cost?

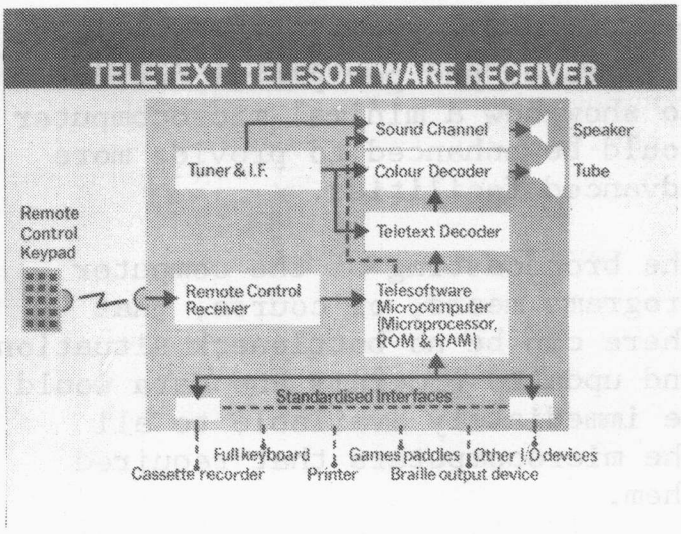
The television receiver is an obvious device to examine for clues to the answer to this question. It is ubiquitous, and because of this has the low cost that only mass sales in the domestic market can provide. Also because of this ubiquitousness it is a very familiar (sometimes too familiar!) object around the house - nobody, from the youngest to the oldest, is afraid of the television set (at least in the obvious sense!) This is very important if it is to form the basis of a domestic microcomputer, since such a computer, being allied to the television, would already be a considerable way along the 'acceptance curve' for the average citizen, who is, and rightly perhaps, reluctant to become involved with products which appear to him, on the surface at least, to be beyond his conceptual grasp.

Of course, the various adjuncts to the television (such as video recorders and TV games) which are already available and used in considerable quantity are of great benefit here, since they point the way to the television receiver being the central module in the 'home information centre' of the future.

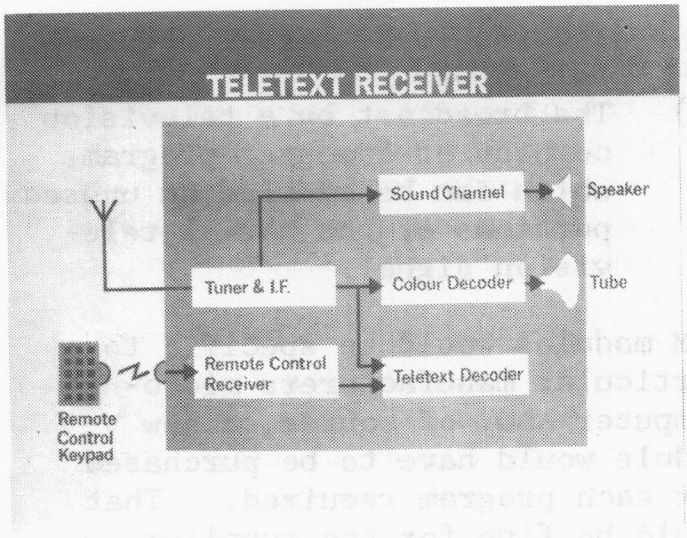
Fortunately, a rapidly growing number of households (in the United Kingdom at least) are equipped with Teletext TV receivers, which contain some of the modules required for a domestic microcomputer (fig. 1). The keypad, usually having 12 - 16 buttons, can be used as an input device to the microcomputer, and will allow the input of numeric data, menu item selection and simple control functions.

The teletext decoder and the colour television itself form essentially a computer-type display, with the ability, for example, to present up to about 950 textual characters at a time, in a variety of colours, or a mixture of characters and low-resolution colour graphics. (Future teletext decoders in the UK will have considerably enhanced graphics capability, in line with the policy of both the broadcasters and the set manufacturers to continually enhance the features of teletext while retaining complete upward compatability with the existing standards and receivers.)

What, then, is still required to turn a teletext receiver into a simple, but nonetheless powerful, domestic microcomputer? Firstly, of course, a microprocessor chip is required, and it may even already exist, hidden away as an unassuming component within the teletext decoder! Secondly, extra memory is required for this microprocessor, to hold its programs and data. Thirdly, a means of loading programs and data into the microcomputer, and last, but by no means least, the programs and data themselves.




(Fig. 1)




(Fig. 2)

Let us now examine each of these items in turn. The microprocessor chip and the associated memory required for a useful microcomputer can be provided at a cost estimated to be comparable with the cost of adding the teletext facility to the basic television receiver. The cost of this teletext add-on is proving to be reasonable (even in the harsh economic climate of England!) and will become even more so as production volumes increase. There is no reason to suppose that the microprocessor and memory additions, which use a similar technology to the teletext decoder, will not follow a similar route.

Several schemes are potential contenders for the means of loading programs into this microcomputer, such as:-

(a) Read-only-memory (ROM) modules, like those used for some programmable calculators and TV games.

(b) Audio cassetes, like those currently used to distribute programs for hobby computers.

(c) A dial-up network based on the public switched telephone system, where customers phone a program supply service (a private company or a public utility), which then transmits a copy of

the required program down the telephone.

(d) The broadcast by a television company of computer programs which can be carried on unused portions of the normal television signal.

ROM modules would be specific to a particular manufacturers microcomputer and, of course, a new module would have to be purchased for each program required. That would be fine for the supplier, but not so nice for the customer. Audio cassettes have somewhat similar characteristics with the added complication of requiring a tape player to be connected into the microcomputer. A program dial-up service is in pilot operation in the UK, using pages in the Prestel viewdata service, but the (relatively) high cost of the basic service plus the program supply service makes it more suitable for business rather than domestic use. Another complication with the dial-up service when applied to the domestic market is the bottleneck situation which could occur at peak times, e.g. accessing programs (and the data) to analyse sports results on Saturday evenings.

Broadcasting the computer programs allows the function of the program loading device of the home microcomputer to be provided by existing parts of the television receiver : the tuner, IF strip and teletext decoder. The hardware of the home microcomputer then takes on the appearance as shown on the block diagram of fig. 2. The only essential additions which have been made to the teletext receiver of fig. 1 are the microprocessor and its memory, although shown in the diagram are optional standardised interfaces and peripheral devices to show how a minimal microcomputer could be enhanced to provide more advanced facilities.

The broadcasting of the computer programs means, of course, that there can be no bottleneck situation, and updated programs and data would be immediately available to all the microcomputers that required them.

The final and most essential item required for the home microcomputer is a steady supply of programs to enable a wide variety of tasks to be performed. Using the premis that was mentioned earlier about the average citizen not wishing to become involved in the actual 'computing' or programming of his microcomputer, merely wishing to treat it as yet another household gadget, there is no need for the standard home computer to even be capable of being programmed by its owner. Any one of the relatively small number of people who wish to get involved with the internal operations of the device will use a 'conventional' hobby computer, but by far the larger market will be the supply of non-owner-programmable devices for the average citizen. These (supplied) programs fall generally into four groups:-

(1) Self-assessment programs, such as mortgage and tax calculations, and welfare rights examinations. A major characteristic of this group is that they are of a question-and-answer nature, with numeric and logical calculations to be performed

by the program upon (numeric, logical and textual) provided by the user. Although uses such as mortgage and tax calculations would generally only require numeric (e.g. monetary values and time scales) and logical (e.g. options) data from the user, other uses, such as welfare rights, would require that textual data was also supplied by the user.

(2) Educational programs. This is a vast subject, and some typical groupings are:-

(i) Language and literacy training.
(ii) Mathematics and numeracy.
(iii) Scientific and technical areas, and
(iv) 'Non-numerical' topics, such as histroy and general knowledge, and
(v) 'Skills' such as first-aid, cookery, and appliance maintenance.

The use of the domestic microcomputer for educational purposes will, we believe, become very widespread, and this topic is addressed in the latter part of this paper.

(3) TV games. These tend to fall into two categories:-

(i) Verbal and reasoning games, such as word games and chess, and
(ii) 'Dexterity' games, such as car racing and space battles.

The simpler reasoning games are ideally suited to a minimal microcomputer since a numericakeypad is often adequate and memory requirements are modest. 'Dexterity' games, however, present a different set of requirements. The most obvious is the need for paddles, joysticks, or whatever other input mechanism suits a particular game. This type of game introduces the need for a timing mechanism in the microcomputer, either for merely controlling the rate at which the action proceeds on the screen, or for more overt reasons, such as giving a player a limited time to perform a particular action.

(4) Database manipulation. Here, fairly small databases, such as stock market information, are available and can be analysed in various ways by a program under the control of the user.

Since these programs will be specifically designed for use by members of the general public with probably no firsthand knowledge of computers whatsoever, it is vital that they are completely reliable. It is also essential that the program loading mechanism should detect recording or transmission errors on the incoming programs so that the possibility of the microcomputer executing an incorrectly loaded program is very small.

The most important aspect of these programs, and the most difficult to achieve, is that they should be thoroughly tested and be very 'robust'. The ultimate requirement must be that the microcomputer never produces meaningless, obscure

or incorrect information for the user, regardless of what data the user supplies to the program, and the microcomputer must never 'bomb out'.

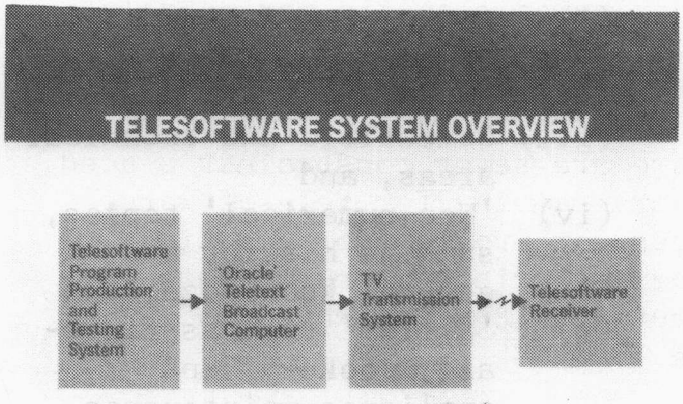
## ORACLE TELESOFTWARE

Having described the requirements for a microcomputer to be used by the average citizen, we will now examine the ORACLE Telesoftware system, which fulfills these requirments to a high degree.

ORACLE has been operated by ITV in the United Kingdom as a broadcast teletext service since 1975. Its value as a means of distributing computer programs was soon recognised, and the word 'Telesoftware' (software at a distance) was coined to cover the concept of broadcasting computer programs as part of a normal teletext service. By the end of 1977 a great deal of discussion had taken place on the subject, but no equipment had been produced to test the idea and prove its viability. So ITV, together with Mullard Ltd. (who had been, and still are closely involved in the developments of the teletext system) embarked upon a joint experiment to design and construct a prototype telesoftware receiver which would capture and execute telesoftware programs broadcast as pages of information in the normal ORACLE system. The experience gained with the use of this experimental system has been put to good use in the design of the next experimental phase - the proposed installation of telesoftware receivers (of a new design produced by Mullard Ltd.) into selected schools in the United Kingdom. The installation of these receivers is scheduled for the fourth quarter of 1980, and the plans and objectives of the project are described later in this paper.

## CHARACTERISTICS OF A BROADCAST TELESOFTWARE SERVICE

The main components of a broadcast telesoftware service are shown in fig. 3



## Program Production

The Telesoftware Program production and Testing System (PPTS) will supply fully tested and highly reliable programs to the standard ORACLE teletext system, as pages of data immediately suitable for broadcast. The PPTS must be able, without reference to the ORACLE system itself, to produce and test them, on both simulated and real telesoftware receivers, before sending the proven programs to the ORACLE database. The PPTS would essentially be a standard multi-access computing system with the addition of specific peripherals to allow sophisticated testing of the programs.

There are severe constraints placed on programming for telesoftware. Ideas for programs or existing programs written for conventional comuting situations have to run the gaunflet of:-

(i) Broadcast limitations. The programs have to reside on standard teletext pages, and the timing cycles and sequences of broadcasting the pages influences the structure of the programs at the outset.

(ii) The programs are targetted at naive users, and this will influence the design (and size) of the programs more than any other consideration. Each program will require that extensive explanatory text is given to the viewer, who will not have written material relating to the program at all - it all has to come 'off-air'. No assumptions can be made as to what sort of viewer will be using the programs, so the text has to be copious, and will probably be 'layered', so that viewers with some preliminary knowledge or previous experience with the programs can 'short-circuit' sections of the explanation. Thus, even with 'simple' programs the amount of text required might well be quite considerable.

(iii) The programs must possess a very high degree of credibility in the eyes of the viewers. Each program must be 'break-proof' at all costs, so that whatever variety of data is given it by the viewer it will always perform in a sensible manner and never 'bomb out' or give incorrect or meaningless information in return.

These constraints imply that the production of programs for the broadcast telesoftware service cannot be a haphazard operation like that currently applying to hobby computers. On the contrary, very high quality professional programming standards are required indicating the provision of sophisticated software tools, such as structured programming, high level languages, rigorous and powerful testing systems, and comprehensive program documentation.

## ORACLE and TV Transmission System

It must be emphasised that the ORACLE teletext database computer and the TV transmission system are completely unaffected by the introduction of telesoftware, as are the conventional teletext

receivers. Each telesoftware program resides on one or more pages in the teletext database, and the system cannot distinguish these pages from any other pages in the database.

## The Telesoftware Receiver

The telesoftware receiver has been described above, but it is useful to outline the functions which the microcomputer within it may be called upon to perform.

(i) Control the teletext decoder. The microcomputer will have within it a 'resident control program' which will be responsible, amongst other things, for the capture of programs via the teletext decoder.

(ii) The acquisition of teletext pages via the decoder may be due to either:

  (a) The control program requiring telesoftware program pages, or
  (b) The telesoftware program requiring access to conventional pages of teletext information for processing by the program. This is an important concept and is at the heart of the idea of using telesoftware programs for information manipulation.

(iii) The pages of software have to be verified as they are received to ensure that there are no transmission errors present which could result in incorrect program execution.

(iv) The telesoftware program, when it has been received correctly, has then to be run under the aegis of the control program, and converse with a selection of devices taken from: the numeric keypad, the teletext decoder, various peripheral devices via standardised interfaces (such as joysticks, paddles, printers and tape recorders) and possibly the TV sound channel for sound effects or even speech output.

## The Programs

The programs will be broadcast in a high level compacted language, especially designed for the purpose, and will, of course, be completely free of charge to any viewer who has a suitable receiver. The cost of the production, maintenance and broadcasting of these programs will have to be borne by advertising revenue. Some programs will be solely for the purpose of allowing the viewer to peruse a particular advertiser's teletext pages in depth. Others may be advertising 'stunts' to promote a particular

product. Programs whose function is not directly related to an advertiser may have advertising slogans embedded within them, either as a direct 'commercial break' at the beginning or during the running of the program, or more deeply embroiled within the program, e.g. a maze program could use an advertisers logo as the basis for the maze design.

## Applications

Having described how telesoftware came about and how an operational service would appear, let us now examine some examples of its use in the four main application areas: self-assessment, education, information manipulation and games, to give some flavour of what telesoftware can achieve.

However, while considering these applications of telesoftware, it should be firmly borne in mind that a dominant charactertistic of broadcast telesoftware is that, once a receiver has been acquired, the viewer has a complete, no-cost access, with that single receiver, to a wide variety of applications and new applications can be added continuously by the broadcasting service with no additional cost whatsoever to the viewer.

## Self-assessment

Some typical applications in this area have already been mentioned. One of these, a program to allow viewers to assess their welfare rights, would be of particular social value, since considerable amounts of benefits go unclaimed because potential claimants are unaware of the benefits due to them.

This type of program would usually begin by getting a 'profile' of the viewer's situation by asking a set of quite personal questions. (Here, a particular advantage of the broadcast system can be claimed. Since there is no possibility of 'feedback' to a central computer of information supplied by the viewer, the system is completely confidential and viewers can supply information truthfully in the full confidence of knowing it can go no further than the television receiver - pull the power cord out and the slate is wiped clean!) Having asked the viewer several questions about the situation to be investigated, supplemented with explanatory text, the program would then supply details of benefits which could possibly be claimed and how to go about claiming them, as well as allowing the viewer to try out various (possibly hypothetical) situations; a 'What would happen if ..?' dialogue. For example, a pensioner may be interested to know his tax position if he were to take a part-time job to supplement his senior citizen's pension, and what the relationship between his gross earnings and his net income might be.

## Education

There are so many application areas in the category (for example: computer assisted learning programs, 'question-and-answer' or 'drill' programs, simulations, and educational games), but again

let us use as a 'social benefit' example a program to alleviate the adult literacy problem.

It has recently been estimated that there could be over 2 million adult illiterates in the United Kingdom (population about 55 million), and any method of reducing this figure would be of great value, not only to the individuals concerned but also to the country as a whole. Adult illiterates are very reluctant to admit to their handicap, with the result that extra-mural courses for them are usually poorly attended. By providing 'initial reading' telesoftware programs for them, which they can use with complete confidentiality in the privacy of their own homes, the problem of 'being treated like children' can be avoided, since most adult illiterates are willing to try to learn to read if only an acceptable teaching method is available and the shame of admitting to requiring such an aid can be avoided.

## Information Manipulation

A simple example is to provide a program which will search pages of conventional teletext information for particular references to key-words or phrases supplied by the viewer. E.g. searching the news pages for references to a particular person or topic, the viewer might ask the receiver: 'Search all new pages for references to President Carter', or, more selectively, : 'Seach all news pages for references to President Carter in connection with Georgia'. Thus the search can be made as selective as required, so that the sifted information contains as little unwanted text as possible.

Searches and manipulations of more numeric information can be made, too, such as: 'Tell me all the share prices in a particular group which have gone up by more than 10 pence since yesterday's closing figures'. Alternatively, by making the details of his shares portfolio known to the telesoftware program (possibly by loading it from a cassette recorder) the viewer could then use the program to access the stock market pages of teletext and compute the rise (or fall!) in the value of the portfolio.

One particular novel use for an information manipulation program is associated with the subtitling of television by the teletext service for hard of hearing viewers. The teletext services in the UK (BBC's CEEFAX and ITV's ORACLE) adhere to a teletext standard which dictates that sub-titles can be broadcast as pages in the teletext service, received by a normal teletext receiver, and displayed at the foot of the television picture. Only viewers who select the subtitling facility on their receivers will have them displayed, other viewers may not even be aware that the subtitles exist. One of the trade-offs that has to be made is the amount and rate at which subtitles are displayed. Too much text will be difficult and tiring for the viewer (who has to watch the action as well as read the words!) while

too little text makes the viewer feel that he is 'being left out of things'. By having a telesoftware program running which will retain some previous subtitles, the viewer can have the opportunity to 'replay' these, maybe during a lull in the action, and so recover any dialogue that the did not previously assimilate. This program could also be used to recapitulate the 'story so far'.

## Games

TV games are well known to all of us, and it is sufficient to say that, given that the receiver has sufficient hardware in or connected to it (processor power, memory, graphics capability, timers, peripherals such as joysticks, etc.) then any type of TV game can be broadcast and played without the viewer having to continually insert coins, or purchase new modules when the previous games lose their popularity.

## The Telesoftware in Education Project

In the autumn of 1978, the Faculty of Education Studies of Brighton Polytechnic, Sussex, undertook a project to evaluate the field trials of the educational possibilities of teletext in secondary schools (pupils between 11 and 17 years), a project established by the Schools Broadcasting Council with the BBC's CEEFAX and ITV's ORACLE teletext services.

When the educational possibilities of telesoftware became apparent and feasible, a subsequent project was commissioned to explore the use of telesoftware in various aspects of education in secondary schools.

The objectives of the project can be divided into two classifications: a technical appraisal of this new medium, and an educational evaluation in an action-research context.

The technical objectives are:-

(i) To examine the viability of transmitting educational software nationally via teletext.
(ii) To carry out field trials of telesoftware receivers in schools.
(iii) To establish guidelines for setting standards for telesoftware, and
(iv) To assess the educational marketplace for telesoftware.

Although only secondary schools will be used in the project initially, the likely impact on primary schools will be assessed in the latter stages of the project.

(i) To compare this new style of computing in schools with more 'conventional' methods, such as hobby computers and terminals accessing time-sharing bureaus via PO lines.
(ii) To check the viability of this new medium as a means of providing interactive follow-up material for television educational broadcasts, either directly linked or as a further resource.
(iii) An investigation into the suitability of telesoftware as a means of disseminating and validation of educational software at a time when there is a growth of microcomputers in schools.

(iv) To investigate the use of telesoftware receivers as 'black box teaching aids', especially in schools which have no computers and no experience of computing.

Raising their sights to the more distant future the project co-ordinators are also planning to evaluate some other possibilities such as:-

(i) The subtitling of educational broadcasts for hearing defective children.
(ii) The motiviational effect of telesoftware receivers in remedial education.
(iii) The dissemination of fully validated educational programs from some central organisation in order satisfy the appetite of the rapidly growing educational microcomputer scene.
(iv) The development of home-based learning packages allied to formal education, for:

  (a) Children unable to attend school.
  (b) Pre-school children.
  (c) Mature students whose education may have been interrupted or ceased at an early age, and
  (d) Compensatory education programmes.

An area which may have a lot of possibilities is the potential that a telesoftware receiver with medium resolution graphics can offer to those undertaking creative adult education courses, such as the maintenance of cars or electrical/electronic appliances.

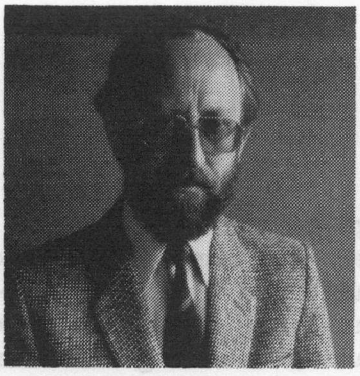
The scope for using telesoftware as a means of enhancing the artistic creative process should not be forgotten, either. The idea of using a microcomputer to allow design students rapidily to sketch out their thoughts as patterns on colour, and then study, for example, the visual impact of combining various patterns, is a far cry from today's staid image of the microcomputer as merely a mathematical aid.

## Conclusions

By merging three modern technologies: teletext, microprocessors and TV games, a composite technology called teltsoftware has resulted.

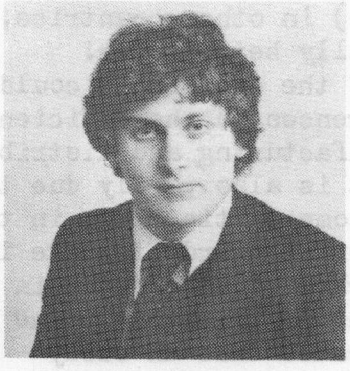
Teletext itself aims at a three-cornered target, consisting of the provision of information, education and entertainment, and telesoftware is designed to enhance the normal teletext service by providing the ordinary citizen with the opportunity to have considerable computing power available at his fingertips. He can use this computing power for a wide variety of purposes, without any knowledge or experience of computers being necessary on his part, since the entire system allows him to converse with his television receiver in a way not previously possible, and it can enrich and enhance the information already available via teletext by manipulating it exactly according to his wishes.

## BIOGRAPHIES



J. Hedger

John Hedger was born and educated in London, England. He joined London Weekend Television in an administrative capacity, but later spent some time working on programme production. He joined the ORACLE teletext project at its commencement and has since been closely involved with all aspects of the development of broadcast teletext. He now holds the post of System Co-Ordinator, and has special responsibility for subtitling for the deaf, telesoftware and related new technology.



M. Raggett

Michael Raggett, MSc, Dip. Ed. is project Director of the Telesoftware in Education project at Brighton Polytechnic, England. He was educated at several Universities and taught in schools before beginning work in higher education. He is now Faculty Coordinator for Research and Development in the Education Faculty of Brighton Polytechnic. He has been a consultant to the Open University, is on editorial boards of several journals and is a Director of an educational publishing company. He previously carried out an evaluation of the use of teletext in education.

Tony Warburton BA(Oxon) is 43 years old, married and has one daughter aged 14. He was educated at the Manchester Grammar School and Oxford University, England, graduating in Psychology and Philosophy in 1958. Having married into IBM he entered computing in 1962 with Cadbury Brothers Ltd. Birmingham and moved in 1965 to become deputy data-processing manager with Liverpool Corporation. Since 1969, he has been Head of the Computer Centre at Brighton Polytechnic. He is a member of the British Computer Society and during this academic session is Chairman of the (national) Association of Computer Units in Colleges of Higher Education.