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ABSTRACT
              This four-section paper begins with a brief
description of videotex and the paths its development has followed
during its short lifespan. The second section examines how videotex
systems should present and display information, and how such
information should be internally organized so that it is maximally
useful for the reader/user. The analysis, which draws heavily on work
done during several videotex field trials in the United States,
Canada, and other countries, incorporates insights from human factors
studies of video display terminals, research on typography and
graphic display, and work on the design of interactive systems and
computer help facilities. The third section addresses some
significant policy issues that affect instructional uses of videotex,
including questions of equity, privacy, and secrecy. Finally, several
possible future scenarios for the development of videotex as an
instructional medium are discussed, and the suggestion is made that
the convergence of videotex with other emerging technologies may
result in novel arrangements for electronic publishing and new
opportunities for improved instructional design. Fifty-six references
are listed. (LMM)

Videotex in Education:

Current Developments in Screen Design, Data Structure,

and Access Control

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Abstract

Development of videotex information systems is currently proceeding at a fast pace. While these systems are expected to be popular for business and home use, educators have as yet paid scant attention to their potential for instruction. Three questions about the design and use of videotex systems should be of special concern for educators. First, the way in which information is presented on the screen may differ markedly from traditional norms of layout for printed texts; typography, text density, color, and the use of graphics all become problematic when one is preparing videotex screens. Second, provision must be made carefully for "way-finding systems" in videotex so that users do not become lost. Third, important policy questions remain to be discussed around such issues as equity, access, and privacy. Videotex promises to change educators' thinking about the nature of text materials in general, and about the design of electronic information in particular.

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Videotex in education:

Current developments in screen design,

data structure, and access control

Prologue: Videotex Icebergs on a Technological Ocean

Technological advances are like icebergs. Delightful to observe from afar, they may become ominous as one moves closer. And like icebergs, changes in technology are often not what they seem to be at first glance: what appears as a large and substantial mass may on further inspection turn out to be merely a weak shell, whereas something that seems to be relatively insignificant when spotted on the horizon may later reveal hidden qualities that make it a force to be reckoned with.

Publishers, writers, and educators attempting to discern the future of printed instructional materials and the ways that technology may affect that future must feel themselves uneasily in the position of yesteryear's transatlantic steamship captains: they know that there are icebergs out there, but they find it very difficult at present to tell which pieces are just patches of floating pack ice, and which bergs are the truly significant ones, hiding the bulk of their impact in the ocean depths until time brings them close enough to discern more completely.

Videotex is one such iceberg. Publishers, broadcasters, and (to a more limited degree) writers and educators are aware that videotex information systems are "out there"; but members of these groups probably evaluate differently the changes that videotex may bring to the design of materials for instructional purposes. It is my intent here to offer an outline of several central issues involved in this question.

The analysis may serve as a kind of iceberg detector that would allow us
to assess the significance of videotex for the design of instruction; it
may also permit us to make judgments about the potential impact of
videotex as a tool for education rather than as a consumer service.

Introduction: Issues in Designing Videotex for Instruction

This paper is divided into four sections. In the first, the reader
will find a brief account of what videotex is and what paths its
development has followed during its short lifespan. The intent here is
not to be exhaustive, for there are already works that do an excellent
job of outlining the history of videotex, but rather to give an overview
for the uninitiated.

The second section of the paper tackles the essence of the problem:
how should information that is to be made available via a videotex
system be presented and displayed, and how should it be internally
organized so that it is maximally useful for the reader/user? The
analysis here draws heavily on work done during several videotex field
trials in the United States, Canada, and other countries, but it also
incorporates insights from several related areas--human factors studies
of video display terminals, research on typography and graphic display,
work on the design of interactive systems and computer "help"
facilities, and so on. The central thrust of this section is summed up
in the dual question, "Compared with information that is presented in
book form, how should videotex information look, and how should that
information be structured so as to allow users maximally efficient
access?"

In the third section of the paper, some significant policy issues
are addressed that affect how videotex may be used toward instructional
ends. These include questions of equity, privacy, and secrecy.
Finally, the last part of the paper deals with several possible future
scenarios for the development of videotex as an instructional medium,
and suggests that the convergence of videotex with other emerging
technologies may result in novel arrangements for electronic publishing
and new opportunities for an improved instructional design.

A Brief History of Videotex from Earliest Times to the Present

This is not the place to give a comprehensive history of how
videotex came to be, why it has developed as it has, or how it can best
be marketed to executives in multi-national corporations. Those tasks
have already been performed admirably by others, and the truly curious
reader should consult Tydeman et al. (1982), Sigel (1980), Fedida and
Malik (1979), Woolfe (1980), or Godfrey and Chang (1981) for complete
treatments. My desire, rather, is to provide an overview for those who
may have at present only a sketchy idea of what videotex is and how it
works.

Some definitions. "Videotex" is a term used to describe electronic
systems for storing and retrieving textual and graphic information by
using a modified home television receiver. Under this general heading,
we can identify two varieties of videotex:

(1) Teletext--a form of videotex that is broadcast by a television
station as part of the video signal. Broadcast teletext is relatively
limited in the scope of information that can be presented to about 100

pages. This contraint is imposed both by the time needed to broadcast

the entire cycle of pages and by the delay users are willing to put up

with before a page they have selcted appears--about 25 seconds in most

systems. And teletext is essentially a one-way medium; the user can

request (using a "keypad") any of the 100 pages available through that

channel, but if the desired information is not on those pages, there is

no other place to look. (A variant on regular broadcast teletext is

"cabletext," in which an entire cable television channel is devoted to

teletext signals. This increases the potential capacity of a teletext

system to several thousand pages.)

(2) Interactive videotex--in which the user is linked directly

(usually via telephone lines) to a large computer database containing

many thousands of pages of information. Such systems may also offer

enhanced possibilities for interaction through "teleshopping" or

"telebanking" facilities. The user can search for any item of

information that is in the database, and is guided through the

structure of the information by a set of "menus" that make it feasible

for those without extensive training in computers to participate. (The

use of the term "videotex" in both a generic and a specific, interactive

sense is one of the stumbling blocks to those entering this field for

the first time; the British, who pioneered in the area, at first used

the term "viewdata" in a generic sense.)

It is difficult to give a good idea of the content of a videotex

database (whether teletext or interactive videotex) in the absence of a

television screen and keypad for calling up frames of information.

Typical contents of operating systems feature a variety of news items

(including sports results), weather, and current financial information

e.g., market results, commodity prices, etc.) Additionally, there may

be special "entertainment" sections with recipes, how-to columns, advice

to the lovelorn, horoscopes, and perhaps a bulletin board or -

"classified" section of some sort. Interactive systems may have more

sophisticated facilities for making travel reservations, shopping or

banking from home, receiving microcomputer software from a central

computer file, and having various sorts of material (e.g., school

catalogues, consumer information) sent to one's home.

British and European contributions. The initial development of

videotex took place in Britain. In the early 1970s, British Telecom

(the government agency responsible for operating the telephone system)

hoped to find a way to encourage more use of the telephone network

during evening hours. A system that would link home television sets to

computer databases using telephone lines was proposed and trials were

started by 1974. By 1979, those with access to a television set had

available two operating teletext systems--"Ceefax" on the BBC, and

"ORACLE" on ITV--and an interactive videotex system, British Telecom's

"Prestel." Public acceptance of Prestel has been slow--there are still

only about 20,000 subscribers; teletext, however, appears finally to

have reached a point of "take off": the number of teletext sets in use

grew from fewer than 200,000 in 1981 to a projected 600,000 by the end

of 1983.

Other European countries set to work on their own videotex systems.

France has undertaken field trials of a videotex system ("Teletel") that

would eventually replace the telephone book and allow citizens to do

much of their shopping from home. West Germany has its "Bildschirm-
text"; and German designers have been particularly interested in the
possibilities of using the system as a surrogate for banking and other
financial transactions. Japan's "Captain" system has also been
undergoing field trials, although the Japanese have had to cope with
some significant problems involving the generation and on-screen display
of the Chinese ideographic characters (kanji) that are used in
conjunction with the phonetic Japanese characters.

North American developments. Canada pioneered in videotex in the
late 1970s by introducing a new standard, "Telidon", that permits much
more precise graphic images to be created on the screen than is the case
with the British Prestel system. Telidon, which can address individual
points on the screen (and is thus "alphageometric", in contrast to the
cruder "alphamosaic" images possible in Prestel), promises to become the
North American standard.

The United States government, for a variety of reasons too
complicated to go into here, decided not to support officially the
development of videotex as had Canada and the European countries. To
date, the US has witnessed only a few field trials and some "hobbyist"
videotex systems (notably Compuserve Information Service and The
Source). Warner-Amex has been operating the "Qube" system, a kind of
modified videotex arrangement, in Columbus, Ohio, for the past five
years. Field trials and market tests abound--CBS, AT&T, IBM, Time-Life,
and many of the nation's largest newspaper chains have been involved;
one recent compilation lists 53 systems either in operation or in some
stage of testing or planning (Status, 1983). And a few articles have

begun to appear in the popular press, perhaps preparing the citizenry for

future advertising campaigns by system operators (Friedman, 1983;

Kiester, 1983).

Differing views of the future. During the first few years after

the introduction of videotex systems in Great Britain, the tone of

popular writing about this new technology was markedly optimistic. The

title of one article is indicative: "Fireside access to sum of human

knowledge" (Hamlyn, 1981). When initial counts of subscribers failed to

meet expectations, however, the emphasis changed; videotex was now

hailed primarily as a tool for business, a way for the executive to tap

a variety of useful data sources. That confusion continues today in the

field trials and market tests of videotex in the United States. Some

operators maintain that they are only interested in designing and

running systems for business, while others seek to define the "home

market" and discover what services people might be interested in having,

using, and (perhaps most significantly) paying for.

Partly because of this confusion, and partly because of the

miscellaneous nature of the content of early videotex databases (such as

Prestel, Compuserve, and The Source), the community of educators,

publishers, writers and others concerned with the instructional design

of printed materials has not taken much notice of this new medium. My

strong sense is that this lack of attention is a mistake, and that

videotex is in reality much more than the sum of its parts.

What we need to do is think of videotex not as limited by present-

day technology or the specifics of any one of the competing "brand-name"

systems, but rather as a general approach, a way of preparing, storing,

and using textual and graphic materials at a distance. The real impact of videotex will eventually stem from the fact that such systems will affect large numbers of people. Videotex will, for the first time, force a significant portion of the population to deal with information stored and presented in electronic form. The remainder of this paper is devoted to an exploration of several issues that it will be important to bear in mind as we move toward that transformation in consciousness.

The Design And Presentation of Information on the Screen

The first significant difference between information presented traditionally through books or other printed materials and that presented through videotex-like systems is the way in which the information itself meets the user's eye. The design of printed materials is based on several centuries of art and science, and we have built up a goodly collection of guidelines to tell us what a printed page should "look like" (see, for example: Hartley, 1978; MacDonald-Ross, 1978; Rice, 1978, for examples of our current best knowledge about the design of printed materials). Perhaps because we started from the assumption that video displays and paper pages were identical (and have only recently realized that they are not), we have just begun to get a sense for what a CRT screenful of information should look like. . And it is becoming increasingly clear that it does not necessarily look like a printed page at all.

This section reviews several variables that have an impact on screen design: typography (the style, size, and shape of letters); the density of text (line and paragraph length, spacing, and so on); color;-

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the value of and most effective use for graphics of various kinds; a variety of other human factors that must be taken into account when designing screens; and finally, the overall effect of the designer's particular combination of text and graphic elements in the screen layout. Each of these will be treated in more detail below.

Typography. It has become something of a truism to urge that the typographical designer of printed materials eschew two things: the use of sans-serif type for extended text, and the use of upper-case lettering in any but the most restricted applications. These caveats were based on considerable research on human perception and pattern recognition. Lower-case letters, it seems, are more distinctive than upper-case, and therefore easier to read when massed together. Likewise, serifs (the short "bars" on the ends of many letter elements; note, for example, the bottom of the letter "l") appear to help the eye make out which letter is which.

These two limitations posed immediate problems for the designer doing layout for a videotex screen: the low resolution that videotex engineers had to plan for (given use of home television receivers) meant that obtaining adequate resolution with lower-case letters would be difficult. Also, the matrix of pixels (individual dots on a screen) used to form characters was in most cases not sufficiently large to show serifs accurately. Consequently, those considering typography for videotex systems at first cautiously recommended guidelines based on print norms: use a mixture of upper and lower case letters, and try to develop type faces specifically adapted for video display (Carey, 1981a; Reynolds, 1979).

Recent work, however, has cast some doubt on these earlier recommendations. One important realization has been that, given present-day costs and technological limitations, people are unlikely to sit down and read large amounts of information of a screen. As one wag noted, it is fully possible, with today's videotex systems, to enter the full text of War and Peace, and for system users to call it up and read it, buit no one is seriously proposing that this be done. Rather, users tend to scan videotex screens, searching for particular items of information (Champness & DiAlberdi, 1981) and that therefore the "net effect is additive, not continuous (Siegeltuch, 1982, p. 32).

Recent empirical studies have shown that in fact it may take users somewhat longer (although not significantly so) to read all-upper-case materials on videotex (Foster & Champness, 1982). Also, when queried about their ability to read videotex materials easily, a large majority of users (between 88 and 97%, depending on the particular study) indicated that they had no trouble (Elton, Irving, & Siegeltuch, 1982; Teletext, 1982). In one field trial, the number of users who reported problems declined by several percentage points as they "got used to" the system (Irving, Elton, & Siegeltuch, 1982).

What this recent empirical work shows is that we should not be too swift to generalize from research on print typography to videotex systems that display print in a new format. While the processes involved in reading from printed page and video screen may appear to be parallel, they may in fact be quite different; users may be developing a new way of scanning printed information that will allow them to compensate for the lower quality of letter respresentation possible with

today's video screens.

   Text density. Videotex frame designers soon realized that they
were working with a medium different from print when they confronted the
physical limitations of the screen for displaying information. In most
videotex systems, the screen format allows for a maximum of 80
characters per line, and 24 lines per screen. From the beginning,
designers were urged to use only about one-third of the total screen
capacity, or roughly 70 words per screen (Reynolds, 1979). This
restriction meant that one screen would hold about as much as one inch
in a standard newspaper column; in the case of broadcast teletext, where
one would be working with a maximum of perhaps 100 screens, this would
put the total content of the database at somewhat less than the front
page of a daily newspaper (Nisenholtz, 1981).

   Given the tendency (noted above) of users to scan pages rather than
read them, it should come as no surprise that using considerable amounts
of space to break up the screen leads to significantly improved
legibility. Indeed, designers are urged to make "paragraphs" no more
than three to six lines long. Interestingly enough, users still seem to
prefer a line of text with more characters in it (70-80) rather than a
35-character line (Kolers, Duchnicky, & Ferguson, 1981). And, as with
the typography of videotex, it seems that experienced users become more
tolerant of the limitations of the medium--a survey of teletext users
found that 56% wanted more information packed onto single screens
(Teletext, 1982).

   Another unusual phenomenon is the sense that appears to be
developing among both designers and users that each videotex screen

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should be thought of as an entity unto itself, rather than as one in a sequence of pages or screens. In an electronic database, there is not necessarily any "before" and "after"; frames are accessed in the order that the user prefers. There is evidence that less than half of users will pursue a story that begins on one screen to a following screen, and that the percentage diminishes even further when more than two screens are linked together. Consequently, a new definition of "page" may be coming into being--one specialist has likened the preparation of videotex screens to the writing of 25-second radio spot commercials, a style of writing "with no obvious middle or end" (McFarland, 1982; see also Siegeltuch, 1982).

Color. Again in the case of color we find that norms that have evolved over the years for how to present material on the printed page may actually hinder the designer when it comes to preparing videotex screens. The print-based designer always had to assume that to add color was to add expense--each additional color meant an additional run through the press, with concomitant losses of time, wastage of materials, and increased labor costs. Consequently, color was used only when absolutely necessary, and usually as a way of distinguishing material that was truly different or important. Readers, over the years, became used to these conventions, and came to expect color to have significance.

In preparing videotex screens, however, color is no longer an expensive option; rather, it is now available at the push of a few keys. The designer is therefore faced at once with the pleasant prospect of being able to use color extensively, but also with the quandary of how

to use it effectively and with some sense of its place in the overall
design of the screen.

In videotex, what is significant about color choice is not the
color itself, but rather the context in which the colored material is to
be viewed. The eye perceives differently light that is reflected off a
page of print and that which is emitted from a phosphorescent video
screen. On a page, red ink on a white background may stand out, but the
effect may not be as pronounced on a screen because of differences in
luminance. As it happens, white, yellow, and green are the colors with
highest luminance when displayed on a video screen (especially when
shown on a dark background, the norm for most videotex presentations),
and it therefore seems to make sense to use one of these colors as a
basic text color (Carey, 1981a; Reynolds, 1979). In fact, there seems
to be a general tendency for humans to perceive differences in
brightness more easily than differences in color, which would also
support the use of white/yellow/green for text (Champness & DiAlberdi,
1981; Engel, 1980; Siegeltuch, 1982).

Color coding is a formatting procedure that it is much easier to
use in videotex than in print. Some research that has been done on this
technique shows that this sort of emphasis will be most effective when
applied to blocks or groups of rows of text, rather than to individual
rows (Foster & Champness, 1982). Although some have expressed doubt
about the value of color coding (e.g., Tullis, 1981), there seems to be
a general consensus that it can be useful at least on occasion (see
especially Sutherland, 1980, and Waller et al., 1982).

A recommendation for coding information that contains data of

varying levels of significance is to use the brightest colors to
indicate the information of greatest import, with less bright colors
showing less critical material (this appears sensible, given the results
on luminance discussed above; Reynolds, 1979). All in all, the
watchword in use of color seems to be to use it consistently from screen
to screen, and not to devalue through overuse its residual impact as a
marker of significant information.

Graphics. Videotex seems likely to encourage the design of
graphics to compress complex information and to help users conceptualize
problems. The reasons that the word "likely" seems justified here are
two: first, the current technical specifications for most videotex
systems make relatively simple graphics (outlines, charts, diagrams,
etc.) comparatively easy to create, store, and display, whereas other
graphic material (photos, moving television or film images) would be
very difficult to incorporate in videotex databases. Second, and
to some extent because of the limitations noted above, videotex may be
able to capitalize effectively on what is now increasingly perceived as
a general feature of human information processing: a tendency to
receive, organize, and store information in the form of simplified
("outline" or "cartoon" graphic) figures.

This preference for graphics appears to be rooted in the basic
nature of the perception. Humans are "edge perceivers"; that is, we
have special physical abilities to discern the outlines of objects, and
when our visual acuity is tested, we spend more time examining the edges
of objects, their contours and textures, than we do looking at the mass
of the objects themselves. This trait probably helped assure survival

millions of years ago when it was convenient to see the fangs of a

sabre-tooth tiger protruding over the lip of a cliff, or to perceive the

outline of a fish swimming in a brook (see Mills, 1981 and 1982, for a

useful summary of the research on these points).

Graphics, whatever the origins of our preference for them, do

contribute importantly to our interest in viewing and using videotex

screens: surveys of user satisfaction consistently show that people like

graphics (Carey & Siegeltuch, 1982; Elton, Irving, & Siegeltuch, 1982),

that they would like to see more of them (Teletext, 1982), and that they

would be less likely to subscribe to a pay service that did not include

graphics (Irving, Elton, & Siegeltuch, 1982).

If graphics are entertaining on first viewing, they apparently do

not retain that impact over the long run. For example, Tullis (1981)

found that trainees using video displays to learn how to test telephone

lines took significantly less time to reach a criterion level when they

used a database containing graphics than when they only had access to

screens displaying narrative text. With practice, however, they could

learn to use the straight-text presentation to achieve equally quick

results (accuracy in carrying out the task was not affected by presence

or absence of graphics). Other studies on videotex per se also suggest

that viewers who are familiar with a particular database may find the

time delay necessary to construct a graphic on the screen to be an

irritant (Nisenholtz, 1981).

We may eventually see systems develop in which users can specify

the degree of graphic enhancement they want--novices to a particular

subject might choose to view a considerable proportion of the

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information they request in graphic form, while experienced users could

request fewer illustrations with their text. And, for everyday use, it

seems certain that videotex will continue to put heavy emphasis on

graphics for showing such mundane information as weather, economic news,

and so on.

One powerful stimulant to further development of graphics-based

systems is the high level of popular interest that has greeted

microcomputer programs and hardware that incorporate extensive graphics.

The Star microcomputer recently introduced by Xerox did not achieve

great success, but its innovative use of graphics (including the use of

"icons"--images of familiar office objects such as files and waste

baskets) was widely acclaimed (Canfield-Smith et al., 1982). And

critics have been impressed with the even more extensive use of icons

and graphics in Apple's Lisa system (Stewart, 1983; Williams, 1983).

Human factors. There are a number of other variables that may

affect how people react to videotex systems. Some of these are very

basic: parts of the population, for example, are color-blind (5%) or

functionally illiterate (10-15%); many have not kept their eyeglass

prescriptions up to date, or have other problems that prohibit them from

seeing as well as they should (perhaps as much as 33%). All these are

conditions that would make it difficult to use parts of a videotex

system (Carey & Siegeltuch, 1982). Other problems include basic

mechanical ineptness (empirically shown to be more common among older

people and less common among teenagers)--a survey of TV repairers, for

example, showed that 15% of service calls revealed sets that were not

plugged in (Carey, 1981a).

Another potential problem is that some--perhaps most--of the
graphic and design conventions used in videotex systems will be novel.
There is no commonly agreed-upon "grammar" of graphic elements at
present (Nisenholtz, 1981; Warfield, 1979), and although users may
figure out the specifics of a particular system and even develop their
own ways of adding graphic patterns to their "electronic mail" (Carey,
1980), it will doubtless take some time for users to become familiar
with a new range of symbols and conventions that will develop around
videotex.

The tendency of videotex users to scan, rather than read, screens
poses a further problem. Among other things, reading is a habit, and
people have become used to the way that printed pages look. Readers
thus have patterns built up that allow them to peruse a page of printed
material in ways that are familiar and comfortable. While some of these
ways of dealing with printed matter have to do with the psychological
manner in which the material is processed, other aspects of reading
habits include the physical setting for reading and the time of day
during which one reads, and the amount read at any given sitting (see,
e.g., Carey, 1981b, 1982). While some of these habits may continue
unchanged when one switches to reading videotex materials, other habits
will need to change, and this may create problems for some readers.

Overall screen design. The above discussion should make it very
plain that there is at present no agreement on a single aesthetic for
he design and presentation of screen information. One interesting
study attempted to separate out the factors that contribute to users'
preferences for particular screens over others. Three factors were

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identified: attractiveness, which includes the separate elements of
color and graphics; clarity, which has to do with the arrangement of
material on the screen, the legibility and size of individual "chunks"
of information; and usefulness, which relates specifically to the
perceived value of the content (Champness & DiAlberdi, 1981).

What seems to be developing is a set of standards that are somewhat
different from the existing canons of print materials design. These
standards take into account users' tendencies to scan (rather than read
carefully) videotex screens; to see color as important to meaning, and
to perceive certain colors more readily than others; and to find
graphics convivial tools for learning, especially when new material or
new concepts are involved. Should videotex or its offspring achieve a
significant role in providing information to the populace at large,
these standards may eventually come to be as formative an influence on
our thinking as have standards for the design of printed materials.

Finding One's Way: Of Indexes, Menus, Keywords and Audit Trails

Videotex is based on a novel premise--that members of the general
populace need the kinds of information that can readily be converted to
electronic form and made available through such systems, that they are
willing to take the time and spend the energy to look for that
information, and (most importantly) that they have the requisite skills
in information science to search effectively. As we shall see in this
section, those are large assumptions; the extent to which designers are
warranted in making them may determine the future of electronic
information systems in general and of videotex in particular.

On using a videotex system, the novice soon comes to feel that only
a small fraction of the total time spent is devoted to scanning
information on the screen. A large, and sometimes frustrating, amount
of time is spent finding out where one is, where one wants to go, why
one didn't get where one thought one was going, and how one can retrace
one's steps through an often-confusing electronic landscape. If that
landscape is well marked with directional signs to answer thome
questions that arise, then the search for information can be less
exasperating. But when there are few clues to guide the seeker's way,
the task may become so difficult that the user simply gives up. In this
section, we shall consider two central aspects of this question of "way-
finding" in videotex: the design and use of indexes, and the user's
sense of location within the database at any given moment, or what
some have called "interpanel navigation."

Menu-based indexes. As videotex began to develop in the 1970s, it
quickly became clear to system designers that indexing would be a major
problem. Large databases with access provided by computers had existed
before, of course, but they had been used only by small groups of
specialists--data processing professionals, on-line search librarians in
large research libraries, and so on. Access to the materials in such
databases (of which the numerous bibliographic systems in the sciences,
medicine, and law are excellent examples) was to be provided through
keywords--terms that would be selected in advance, defined to have
particular meanings, and used to enter and extract material from the
computerized "master file." Although amateur searchers could use
without undue hardship the printed indexes that usually accompanied

these databases, the real potential of on-line bibliographic searching

could only be realized by someone who not only had a terminal connected

to the system, but who also knew something about Boolean operators and

how to tie keywords together to create an efficient search strategy.

How then to get around the seemingly large obstacle of a public

untrained in on-line searching who now nonetheless were to be expected

to operate a sophisticated computerized information system? Designers

of early videotex databases turned to the use of "menus" (also

sometimes called "index trees") as the least problematic solution. The

menu--a list of choices presented to the user on the screen--would

compensate for lack of computer expertise by forcing all decisions into

simple "yes-no" or "which-of-the-following-do-you-want" formats. The

menu could also limit the amount of information that the user would have

to deal with at any given time by presenting even the most complicated

searches as a series of relatively simple choices from a succession of

menus (or "roots" to the tree). While this approach might be slow, it

was argued, users would benefit over the long run by having an "idiot-

proof" system.

The user would not even need to learn how to type; all menu options

would be numbered, so that everything could be done using a keypad

similar to a telephone touch pad. Virtually all of the videotex systems

in operation today--Prestel, Ceefax, Oracle, and many of those

undergoing field trials in the US--employ some version of a menu

indexing system.

Menus are in fact relatively efficient in some ways. In a survey

of British teletext users, 76% said that information was "easy to find"

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