DOCUMENT RESUME

ED 208 891 IR 009 805

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TITLE Home Information Systems: A Primer.
INSTITUTION West Virginia Wesleyan Coll. Buckhannon, W. Va.
PUB DATE Jul 81
NOTE 38p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Broadcast Television; *Cable Television; Communications; *Family Environment; Information Networks; Information Retrieval; *Information Systems; Microcomputers; *Online Systems; *Telecommunications; Video Equipment
IDENTIFIERS Home Information Systems; *Videotex

ABSTRACT

The evolution of online home information systems, the nature and function of such systems, and their potential for wide-scale use are discussed in detail. Different types of home information systems, including one- and two-way interactive television, are described, and the unique technological features of the teletext, viewdata, and videotext systems are reviewed. The state-of-the-art of each of these types of systems is outlined. A number of experimental commercial systems, among these Warner Amex's QUBE, AT&T's Viewtron, and CompuServes's Micronet, are briefly discussed. Some of the barriers to the immediate growth of interactive video-based information systems are mentioned, and the issues of control over the flow of information and preserving individual privacy are addressed. A table listing terms commonly used in the discussion of video-based information systems and two figures supplement the text. A 56-item bibliography is also provided. (JL)

HOME INFORMATION SYSTEMS: A PRIMER

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July, 1981

INTRODUCTION

Since the creation of man, there has been a need to communicate. Starting as a simple transfer of ideas (to hunt, to eat, to love,) communication grew to encompass formal conversation for purpose and for socialization. Learning, to insure the permanence of society and culture, required the retrieval of knowledge so that it might be passed on to the young; writing and recording systems and utensils were developed. In fact, the stone and cave wall were probably the first extensions of man's communication ability - the first applications of communication technology.

Using man's knowledge to develop systems and hardware to enhance the quantity and quality of man's communication ability in modern times has traditionally been thought of as the mail, telegraph, telephone, and television (21, 268). Not until recently has the impact of television, beyond the entertainment and news medium, been explored with regard to its role in more advanced communication, and its promise for the future.

Since its introduction in the late forties, television has revolutionized the leisure and information environment of the world. Vast sums of money are spent on the devices, meals are scheduled around its programming, furniture has been arranged around the set, and it has become a source of recreation for countless millions of people. Although passive in nature, "television appears to (have become) in America an agent of socialization (18, 16)." It is primarily a medium of entertainment programming, rather than a source of special information, but none the less continues to mesmerize individuals daily.

A favorite theme of futurists in general seems to be an "intelligent" television set, or large screen home "manager" that can be talked to, and talks back. It can control all household functions, provide entertainment, and through it, one can communicate with friends and relatives, much like

a telephone. Early reports of the Bell Systems Picturephone seemed to confirm the arrival of "1984." Yet to the layman, these "visions" never came true; people soon forgot about them.

No longer on the horizon, but now in the homes of thousands of Americans is, what surely will be, the ultimate communications invention, the home information system. The extension of communication is facilitated by the application of the family television set and a computer. These systems will record, retrieve, edit, transmit, and process all types of information. Similarly, the unit can provide endless forms of entertainment and conventional television programming - all within the confines of one's own living room at an unbelievable low cost.

"The basis of our (lives is) going to be changed to a degree that (has not been changed) since the well-born German goldsmith, Gutenberg, began that mysterious ten year process that eventually led to the creation of a quickly reproducible....bookmaking machine....(Home information systems) will be the "impossible ideal," all information in all places at all times (26, 1)." Alvin Toffler, author of Future Shock, and now The Third Wave, comments on this communication revolution. He sees the use of television evolving in three stages: first, "it will be passive entertainment and information, the second stage will be the utilization of (television) for interactive consumer purposes, and the third stage will be the use of..... television and the wired society for work (61, 13)." Recent communication developments in the field of television have shown that society is readily adopting a swift movement from stage one to stage two.

Toffler believes that all these predictions will occur via cable television, i.e., the transmission of information will utilize that utility rather than by telephone or broadcast. These mediums of transmission will be explored

shortly. However, it is the concept of the cable television "wire" that characterizes Toffler's "wired society" and "electronic cottage," which have extended McLuhan's "global village." As such, vast networks will link society seldom requiring an individual to leave his home - even to go to work. For, as is seen in stage three, man will utilize his home information system (and home) as a cottage industry (an electronic cottage)...."the use of electronics for production rather than consumption (63, 13)."

Toffler says of his stage three, "there are millions of workers out there typing, filing memos, writing out invoices, who will no longer need to be in central locations like offices. They can do their work from their homes, sometimes with the aid of the rest of the family. And they can start new cottage industries with the electronic information and services available to them within arms reach....All of this may sound utopian now, but.... declining energy and improved telecommunications at favorable cost definitely points in that direction (63, 13)."

Of primary concern here is the movement of the human based electronics of the home information systems into Toffler's stage two. These innovations in interactive television technology promise to change life as we know it.

WHAT ARE HOME INFORMATION SYSTEMS?

Information is an amplification of human intellect, and as such is fundamental to all aspects of life. The implications of a home information system, a network of instant communication, touch all of us. "....Advances in communications and data processing technologies provide unparalleled capabilities for developing an extremely powerful network for information exchange (22, 78)." At the heart of this "window of knowledge" is of course the television, but also computer technology.

Computers have long provided for the storage and retrieval of data. Now the home information system can make use of, and take advantage of, the same abilities for the use and improvement of the average consumer. Computer/communication systems are resource sharing mechanisms "analogous in a superficial sense to conventional resource sharing utilities....but information is not really a commodity (it is an extension of man) (26, 70)." Computers have managed, stored and ordered information for banks, credit card companies; word processing and electronic publishing have flourished, experiments in electronic mail and teleconferencing have met with a great deal of success. As the prime resource for facilitating these activities, the cycle will be completed when the computer's capabilities are put to work in the home.

Current "interactive" or "two-way television" systems are the first step toward a home information system similar to those visualized by Toffler and others. Essentially, there are two types of "interactive" home information systems currently in use. They are termed: one-way interactive (also passive) and bi-directional.

A one-way or passive system allows a consumer to request some information via a simple key pad. A built-in microprocessor "reads" the command and "grabs" and displays the requested information on the home television screen for the consumer's use.

Bi-directional systems can be subdivided into participational and interactive bi-directional services. A participational system operates much like a one-way system in the retrieval of information. However, an added feature allows a viewer, during special programs, to participate (or vote) by depressing certain buttons in response to questions aired during a television program. A master computer tabulates the polling and reports the

results instantly on the screen. Interactive bi-directional systems are the most advanced home information services available today. The viewer is permitted to enjoy all the functions of the two previously mentioned formats, but also to produce, record, and transmit their own personal data. All three systems are made up of a keyboard (keypad), display device (television screen), and for the "intelligent" systems, a link between the units microprocessor and a host computer.

These two types of home information, interactive systems provide a combination of microprocessor and visual display between man and machine. Generally, these systems are referred to as videotext, which is used here as catch-all term referring to information service systems. A further delineation can be made with regard to the type of system. One-way operations can be generically referred to a teletext operations; bi-directional systems as viewdata, as such the terms are presented in the lower case. This point is made because a tremendous degree of confusion exists as to names, especially since several videotext operations have chosen close approximations of the terms as their proper names.

THE TECHNOLOGY OF TELETEXT

Teletext, or a one-way interactive home information system, transmits text in digital form, augmented with graphics, to a consumer's color television receiver. In the most simple operation, the digital code is included in a television broadcast signal and is cyclically repeated. These analog representations of digital bits are inserted on two lines of the television receiver's vertical blanking signal. On command from a keypad, a decoder built in, or added to the receiver, "grabs" the information item of interest selected by the viewer and displays it on the screen (14, 63).

The home television set is a functional part of the system. This is a very important aspect in the development and adoption of this new technology because such a large percentage of individuals already own televisions (and the prohibitive cost of trying to get consumers to buy a separate terminal.) In addition, maintenance of the home receiver will be cheaper, and possibly most important, it is a familiar piece of technology. Display is limited to CRT representation, at least until low cost printers are available.

Technically, "(the teletext) system is based upon a decoder using four LSI (Large Scale Integration) devices with a page memory, a remote control system using a low cost LSI encoding IC in the transmitter and a signal decoding IC in the receiver (56, 63)." Essentially what occurs is that information is continually broadcast over the vertical blanking interval in a "page" (or full screen of information) format. Via a keypad, resembling a hand-held calculator, the units microprocessor is accessed. The user is presented with a hierarchical list of key words representing categories of information. After selecting the number of a corresponding category, a second list appears giving specific information available in the category chosen. Once the desired information is located, pages (or screens) of information in that category begin to appear. The user simply stops the sequence when a page of interest comes on the screen.

Information retrieval is theoretically infinite, limited only by data capacity of the VBI and the transmission computer. Problems with quantity of data and wait time are being reduced by a technique called FP teletext (front-porch.) This method conveys two bits of information on each front-porch of the VBI thus significantly reducing retrieval time.

There are four different ways a user can mix television and teletext: one medium at a time (either television or teletext), partial television picture with partial teletext information, a television picture with a small

window for teletext, or a programmable override of the television picture by the teletext signal (for very important or significant events). Teletext is not utilized as a passive information source but requires active acquisition and reading by the user. Therefore, the service is most frequently utilized when an individual has time to sit and watch.

Teletext information and graphics, on most systems, can be highlighted in up to eight colors (and countless variations,) displayed on a background of one of these colors, made to flash, display characters double height, or even partially conceal an item until the viewer decides to reveal the "answer." There is currently no inexpensive method of providing half tone photographs via teletext.

THE TECHNOLOGY OF VIEWDATA

Viewdata is a fully interactive computer/communication system that uses a telephone or cable television line as a link with a host computer. The user interacts directly with that computer by accessing it directly through his own microcomputer which is an essential component that makes viewdata different from teletext. Viewdata has the capability to perform all the previously mentioned functions of teletext in retrieving and displaying information, however it has the added ability to store that information for later use. Interactive bi-directional systems can also produce, store, edit, and transmit information on command.

A viewdata system does not "grab" a page of information, it sends a request to the host computer for a specific item which is then specially sent to that "address." Effectively with an infinite capacity for storage and retrieval of information, this unique system allows for diverse applications of technology thus creating a home computer system.

As such, users can plug into and search large computer databases. In fact, "it is not beyond the realm of imagination that multinational computer linkages could put the resources of the world's largest libraries (and other information depositories) at the command of the smallest neighborhood library (or your home) (44, 10)."

Viewdata, as an extension of teletext systems, is made up of the same components with the addition of a microcomputer (for cursor location) and interface circuits between the microcomputer and host computer via telephone or cable television lines (59, 67). With this added memory and requirement of a physical link to information providers and their computers, search, access, retrieval of information can be billed to the user (53, 18). The access of material is once again via hierarchial trees or menu, although other methods are being explored and will be discussed later.

The bi-directional user input is primarily accomplished via keyboard, but can be done via several other methods: light matrix, sound pen, light pen, potentiometer, and graphic tablet (all of which use the screen of the television as the means of giving feedback to the computer.) Experimentation has shown screen feedback to be an exciting alternative to the keyboard, and the graphic tablet as the most promising. This method involves the projection of a keyboard onto the receiver screen for use by the consumer.

Presently, "a person sitting in his living room can just push a button on a lap-size computer and connect with view data central computers (27, 56). The user can then select numerous channels of information, entertainment, or regular television programming. A versatile home terminal must have the following features: independence of oral communication, frame grabber or modern interface with the host computer, display unit (or printer,) signal for confirmation of input, keys to restrict access in owner absence, and

possibly a key to set a dollar limit for purchases and information use charges (21, 192). In essence, the home information system is designed for maximum use of technology, minimum mistakes, and realistic operation for an untrained consumer.

It may seem that teletext and viewdata are competitors. That is not true. Viewdata is a highly specialized system and needs teletext operations so that it can be released from routine information retrieval tasks of certain types that would otherwise jam the viewdata switchboard to the computer. Viewdata complements teletext services because the latter can't fully handle the needs of special users or business. Because of system capacities and characteristics, it is unlikely that either system will try to duplicate the other. More likely will be the evolving of two different services which may be likened to newspapers and magazines.

VIDEOTEXT TRANSMISSION

There are three methods by which videotext systems can transmit information signals to the home. These are: broadcast (open air), telephone link, and cable television link.

Only teletext services can utilize any one of the three modes of transmission. Most commonly, teletext information is sent via broadcast over the vertical blanking interval (VBI) of a television signal. First, the VBI is an interval of time that is required for a receiver's electron scanning beam to travel from the bottom of a picture back to the top of the screen to rescan a picture. This interval is enough time to send the equivalent of twenty-one scanning lines of video information. Since some of these extra lines are used for pulsing and synchronization purposes, teletext has available to it ten to sixteen lines. Therefore, every 1/30 of a second,

data can be sent to the television receiver. As was said earlier, this information is sent cyclically and a decoder selects the information desired for display.

Encoding data information on the VBI of a composite video signal is the most attractive method of transmission because existing transmitters and channels can be used to reach residents. Additionally, decoders utilize circuitry inherent in receivers and are therefore inexpensive.

There are, of course, some problems with this "piggy-backed" data transmission. Some picture faults and degradations acceptable for television may not be able to be tolerated for data services and may even cause some data recovery problems. Second, the data capacity of the VBI is limited since the rate of transmission is already at the top of the bandwidth. Third, since the billing of users is impractical, operations must be subsidized in some way.

A teletext alternative is to broadcast its signal on a dedicated channel (if one is available, and if the cost of building and licensing a station for that purpose is practical.) This choice would eliminate all but the billing problem. The best alternative would then be broadcast via land line (telephone or cable television which can provide a low cost dedicated channel.) This method would eliminate broadcast interference and ghosts, provide for a billing framework (since one is billed for the amount of time he is actually in the data bank searching or retrieving,) and, at the same time, enable the system to expand to bi-directional in the future. Cable links, depending on national or regional networks, are expected to be the most versatile and inexpensive of the alternatives, however, only 30% of the homes in the United States currently have cable television, and until that number increases, it is likely that VBI will continue to be the prime method of transmission.

Two-way, interactive, or view data systems are much more complicated, and expensive. First, data cannot be broadcast. It is digitally encoded and then modulated onto an audio frequency carrier that is usually transmitted over a telephone line or two-way cable television line. As such, a prime component of the system, in addition to the microcomputer and television receiver, is a modem to encode and decode the transmissions to the computer. Data is sent to the user "on demand" and therefore requires that special link with the host computer.

Since 95% of all households have telephone, and nearly 30% cable television, intercommunications between any two persons will be possible. As systems grow and expand it is more likely that cable television will become the prime means of transmission since broadband communications can be multiplexed to reach large masses of people simultaneously and can handle a much larger data rate than telephone lines (21, 247). Likewise, picture telephone type transmissions, via interactive systems will be more economically accommodated via television lines rather than telephone lines (21, 249).

The videotext picture has recently been clouded by a unique (in the United States) hybrid system called "Touch-Tone Teletext." A combination of teletext and viewdata the user calls the teletext computer via telephone and requests a certain page of information. This page is then transmitted on the VBI (on the same frequency as the page the user currently has displayed on his screen.) The decoder "grabs" and displays the new page. Although allowing some direct interaction with the computer, resulting in expanded data access, this system is still essentially a one way retrieval system.

Interactive means on-demand communication. That is, the audience can control the timing and content of messages, and transmit those messages to other individuals via mechanical means (21, 266). Just as the mail service,

telegraph, telephone, and television grew, videotext promises to grow quickly. As demands increase and technology changes, home information systems will become an indispensible part of life. Just two of the more promising developments on the horizon are optical fiber cable and Direct Broadcast Satellites (DBS). "Optical fibers provide a wideband transmission path of extremely small physical cross section that is free from power and radio frequency interference....(14, 64)." As DBS develops, home information terminals will of course be able to receive signals via roof-top earth stations, but there may be prospects for local uplinks allowing simultaneous worldwide communication without the restriction of landlines and microwave networks, at a much cheaper cost.

EARLY INNOVATIONS IN VIDEOTEXT

Videotext is still very much in its infancy in the United States. But as long ago as the early 1970's both Great Britain and France developed workable systems. Teletext arose from the efforts of British television to transmit signals within the television network plant. An intermediate goal was captioning for the deaf, which began about 1971. By 1974, a teletext standard was developed and in 1976 the first public service system was in full operation. Viewdata grew out of teletext and was fueled by disappointment over the inability to be able to provide picture telephone service, which was intended to transmit pictures as well as text and diagrams. Again, the British took the lead and developed the Prestel viewdata system.

While systems were gearing up in Europe, the United States was only on the verge of studying interactive video. In 1974, the National Science Foundation funded three experimental studies of interactive video; studies were located in Reading, Pa., Spartansburg, S. C., and Rockford, Ill.

To date, these studies are still the only extensive research programs to be conducted and their results are still the basis for current pilot programs and planned expansion. Prompted by a 1960's government report that, "cable could overcome broadcast spectrum "scarcity;" cable, when combined with computers, would be the foundation for a wholly new information and communication application for business, government, and private citizens; and that cable would ultimately be a public necessity (12, 145)," the NSF funded consortiums of academic, public, governmental, and community associations to "create knowledge about the application of two way cable television to urban social service delivery and administration (12, 145)."

The Reading study was based on the needs of senior citizens with programming coming from educational institutions, local government, and social service agencies (41, 163). The experiment evaluated two way cable exposure, groups viewing television but participating in programming via telephone call in, and those that had no access. The results showed that the experimental group exposed to two-way cable had greater awareness of community problems, knowledge of social services, and were much more involved in the socialization process.

Spartansburg's experiment looked at the effects of interactive cable on education. Experimenting with a high school equivalency program at Spartansburg Technical College, students using interactive cable instruction did equally well as students in a traditional classroom situation (39, 175).

Rockford evaluated the training of firefighters and inservice education of teachers via two way television. The firefighter training group, using digital return capability for answers and comments, showed significant differences in cognitive understanding of material when compared to the control group. The experiment for inservice education was meant to diffuse

ideas about new teaching methods. Discussions were successful, but adoption and use of the ideas or teaching behavior were not observed as part of the experiment and therefore results could not be reported.

Generally, the results of the experiments can be summarized as successful, even though problems with programming were experienced. The studies found that the applications of the medium were more complex than the technology (of the day,) point to point interactions were technically workable, and digital return of information was viable and socially acceptable (12, 147). The residents of Reading were so excited and pleased with their system, that the local community continued and financed its operation after the end of the study. Likewise, results were impressive enough, that Reading served as a foundation for the development of the Warner Amex QUBE interactive television system.

VIDEOTEXT TODAY

The NSF studies provided the basis and rationale for expansion of two-way television into U. S. homes. One early operation of teletext termed TICCIT, was established by the Mitre Corporation in Reston, Virginia for education. Shortly thereafter, the Digital Broadcasting Corporation of McLean, Virginia established the first large scale teletext operation in Washington, D.C., Dallas, and San Francisco. This operation tends to approximate electronic mail allowing subscribers, basically chain businesses, to transmit information to its branches.

Probably the largest and most well known operation is the Warner Amex QUBE interactive system which began operation in Columbus, Ohio in 1977. Offering a thirty channel capacity with satellite uplinks and participational interactive capability, Warner has been able to spread their success by

securing cable franchises in Pittsburgh and Dallas - each offering eighty channels of programming.

Warner's exclusive QUBE channel measures public response to broadcast questions by computer tabulation of viewers answers when they depress one of five response buttons on the QUBE channel selector. Seeing a demand for a truly bi-directional system, just a few months ago Warner Amex introduced QUBE III, a home computer console that will go beyond simple viewer participation; it will allow data retrieval, video entertainment, home energy and security services, can accommodate up to 110 channels of programming and, say Warner officials, it can handle those services and demands likely to arise in the next decade.

QUBE offers a much better than typical menu of movies, news, sports, and a variety of networks. The interactive programming crosses a rather wide spectrum of interests. A full channel of children's programs are carried as are, local public interest programs, interactive game shows, religious programs, a book club, and programs on local and national consumer affairs. QUBE has also become "the medium of education for adults and children, a marketplace for goods and opinions....it has polled citizens on issues ranging from marijuana consumption to urban renewal, to the name of a new baby....(15, 38)."

The most recent "full blown" interactive system was recently announced by AT&T in Coral Gables, Florida. Named Viewtron, the system is of the viewdata variety with signals carried via telephone lines. Information consists of local and national news contributed by the Associated Press and the Miami Herald; it offers games, consumer tips, and public service information. This operation is actually the only viewdata system presently functioning in the United States, with only minor "tests" as exceptions.

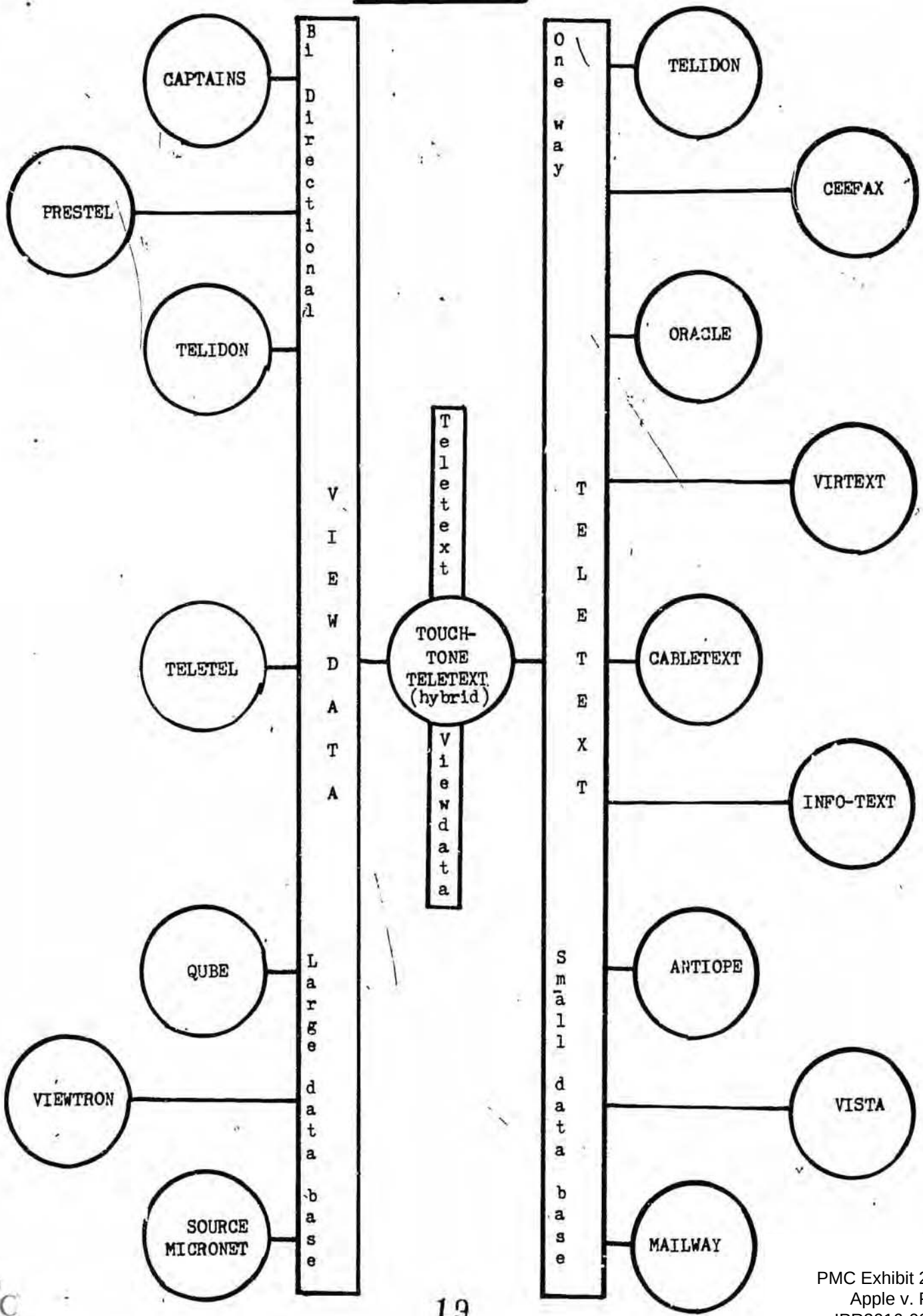
Viewtron offers a bank bill paying service, short educational tutorials on energy and financial management, a real estate service listing homes (and their floor plans) for sale, ordering service for some goods or requesting a "viewpon" to get an advertised sale item. A travel agent promotes vacations, community bulletin boards keep viewers abreast of local events and, an "art gallery" allows viewers to electronically doodle, enter their picture into the computer "gallery," and once a month compete for a prize.

Utilizing telephone lines as the transmission link, the system handles 120 characters per second, and will display a page (or screenful) of data every eight seconds. There is presently no sound capacity to accompany the system. It indexes data indirectly, i.e. information is retrieved via a menu of keywords that lead the viewer to his specific area of interest.

The most impressive and advanced graphic capability of Viewtron makes it different than any other videotext system. Using Dynamically Redefinable Characters (DRCS) the resolution and complexity of pictures exceed even the Picture Descriptor Instructions of the Telidon system. Viewtron allows the use of 800 Pre-determined graphic positions by a host computer that determines a dot pattern to be projected into each position by the home microcomputer in sixteen colors. The result is a smooth, curvilinear, complex, and detailed drawing that is far more impressive than other systems often choppy graphics. As is currently true of all systems, perfection of an economical and reliable method of transmitting half tone photographs or video pictures is not yet possible.

Small trial experiments of Ceefax and Oracle teletext systems are being conducted by KMOX-TV in St. Louis with the cooperation of CBS. The network is also sponsoring tests of the French Antiope viewdata system at KSL-TV in

VIDEOTEXT SYSTEMS



VIEWDATA

Generic term referring to a bi-directional, large data base, data information system

CAPTAINS	often called "picture Prestel", transmission via Nippon Telephone, high resolution graphics to handle the Japanese alphabet.
PRESTEL	The first viewdata system, developed by the British Post Office, now licensed for marketing in the United States to GTE.
TELIDON	Canadian system, known for its high quality graphics using PDI, currently in use by Cable Systems Pacific in Portland, Oregon
TELETEL	Developed by CCETT in France, utilizes telephone transmission.
VIEWTRON	First full blown viewdata experiment in the United States, sponsored by AT & T in Coral Gables, Florida, telephone transmission.
QUBE	Participational bi-directional system first in Columbus, Ohio now expanding to other US cities, has the capability to be expanded to a full viewdata system.
SOURCE	Cooperation between The Source and Cox Cable of Atlanta to provide computer sharing services via cable.
MICRONET	Exclusive off-peak time computer service developed by CompuServe, now cooperating with Radio Shack to market the service and build terminals.

TOUCH-TONE TELETEXT

A highly effective combination of teletext service via a telephone link to a host computer providing the large data base of viewdata, is primarily still a one-way information system using Antiope teletext, now being tested at KSL-TV in Salt Lake City by CBS.

TELETEXT

Generic term referring to a uni-directional, small data base, data information system

CABLETEXT	A cooperative venture of Southern Satellite Systems and Micro-TV to provide teletext services via a cable network.
CEEFAX	One of the first two teletext systems, developed in Great Britain by the BBC, currently under testing by CBS at KMOX-TV in St. Louis.
ANTIOPE	The French version of British teletext systems, favored by CBS for adoption as the teletext standard in the United States, this system is the teletext transmission portion of the TOUCH TONE system at KSL-TV.
INFOTEXT	A venture by Micro-TV to provide electronic publishing services via the basic teletext transmission system.
MAILWAY	The recently announced electronic mail service offered on a three tier subscriber system by Wang Laboratories, primarily designed for business purposes for internal communication, official electronic mail service has not yet been approved in the United States.
ORACLE	The second teletext system developed in Britain by the IBA (see CEEFAX)
TELIDON	Operated by Communication Canada, can be expanded into a viewdata system
VISTA	Canadian teletext system operated by Bell Canada in Toronto.
VIRTEXT	Cooperative effort between Soutern Satellite Systems and the Zenith Corporation to provide teletext services via satellite transmission.

Salt Lake City. GTE is soon expected to begin a pilot viewdata project via the British Prestel system, which was recently franchised exclusively to them for marketing in the United States. Cable Systems Pacific just began a "tiered" subscriber service offering teleshopping and emergency services, using the Canadian Telidon viewdata system, in Portland, Oregon. Kansas City, San Diego, and New Orleans will soon be the site for a computer sharing, viewdata experiment sponsored by the Cox Cable Corporation and The Source. Southern Satellite Systems in Atlanta will begin experimenting with a teletext decoder built by Zenith designed to broadcast test by satellite, and known as Virtext. WTBS in Atlanta and Micro TV recently began an experimental news teletext service called Cabletext. Using the VBI, it sends news from UPI, AP, and Reuters in a similar fashion to that of the Ceefax and Oracle systems. Infotext is an experimental electronic newspaper service. When in full operation, equipment, circuits, satellite time, etc., will cost $120,000 per month for a sixty page newspaper. Given subscription bases of cable superstations (like WTBS, Atlanta,) costs are approximately three cents per viewer or less.

Several corporations or agencies have been established to provide the videotext services. The two most familiar are CompuServe's, Micronet and The Source. Both groups are view data information utilities providing off-peak time computer sharing for hobbyists, businesses and others. Charges vary, but can be as little as $5.00 per hour, and gives a user access to thousands of financial, educational, and recreational programs. These "utilities" are growing very rapidly. In its first year of operation, The Source signed nearly 6,000 subscribers; CompuServe just reached an agreement with Radio Shack to market its Micronet service, and production of a low cost viewdata terminal. The terminal will include a TRS-80 keyboard,

built in FCC approved receiver and telephone connection, and will cost only $400.

Radio Shack made this commitment after their successful experiment, "Green Thumb," in cooperation with the U. S. Department of Agriculture. In this trial, 200 Kentucky farmers, using specially adapted TRS-80 microcomputers, could access twenty-two different kinds of agricultural information including: weather, commodity prices, irrigation water levels, harvest data, and much more.

Other services include: Play Cable, by Mattell and Jerrold Electronics, using a plug in adaptor and the electronic game Intellivision, subscribers can receive new games (and ultimately information) via cable television; The Reuter Monitor, a one way cable teletext system in New York providing quotes, stock information, and gain and loss monitoring for stock brokers; The National Captioning Institute provides teletext captions for deaf television viewers for selected programs on line 21 of the VBI over ABC, PBS and NBC. Lastly, Wang Laboratories announced an electronic mail system called Mailway. Tier service on the first level provides communication between work stations, creation and editing of documents; tier two adds addressing and sorting functions; tier three combines computer communication, electronic mail and data processing into complete electronic links between workstations.

SO WHERE IS YOUR VIDEOTEXT TERMINAL?

With all these amazing systems beginning operation, why are they so spotty, not widespread, and reach so few people? Basically, the United States is still in the testing or pilot program mode. Bold systems expansion will not occur until standards are decided upon by the industry and the FCC. Additionally, there is no information/network policy statement established by the U.S. government. No corporation wants to risk that their system will fall by the wayside.

All the worlds teletext and viewdata systems generally operate alike. There are, however, three barriers to immediate and interchangeable operation of these systems: language, signal format, and page format (including graphics,) used by each.

Language barriers to adopting systems are easily overcome via human intervention and programming changes. Likewise, signal format can easily be altered from standard to standard by using relatively inexpensive analog and digital equipment. Page format, the quantity and organization of characters contained in a screen display, is causing the greatest barrier to adoption of a system in this country.

First, page format is not compatible to U. S. broadcast standards. Videotext manufacturers agreed in 1974 to a standard of twenty-four rows of forty characters. Since the United States is not manufacturing systems, but adopting European versions, expensive changes are required. Currently, operations in the United States are using twenty rows of information, some with less than forty characters. The NTSC Standards can support a forty character row, but the transmission signal exceeds the U. S. bandwidth. Likewise, the U. S. 525 line raster requires compression in the decoder if twenty-four rows are used. Industry representatives have not been able to agree on standards for the operation of videotext systems, and thus different pilot tests of teletext and viewdata have modified their page format differently.

The second aspect of page format that is presenting a barrier to deciding on standards is graphics. American corporations have not been able to agree on which of the four graphic formats they desire, which incidentally are characteristics of certain videotext systems and are not interchangeable. Alpha-mosaic graphics used by the Prestel and Teletel systems produce

characters and pictures from a mosaic of dots. More advanced is the Canadian Telidon system rising alpha geometrics or PDI (Picture Descriptor Instructions) which build characters and pictures from a computer storage of basic geometric designs. This method offers more smooth and high resolution graphics. Alpha photographic graphics is a characteristic of the Japanese Captains system, often referred to as "picture Prestel." It incorporates the basic alpha mosaic design but stores completely formed characters for screen reproduction. This is extremely helpful especially in storing the complete Katakaha Japanese alphabet. Probably the most advanced system of graphics is DRCS (Dynomically Redefinable Character Set.) This procedure utilizes a dense character position, capable of utilizing a large number of mosaic dots for high resolution graphics. Additionally, the host computer can store complete special purpose characters.

Once the page format and graphics problem have been solved, U. S. system expansion is sure to be swift. To date, British Ceefax and Oracle and the Canadian Telidon systems seem to be receiving the most support for teletext adoption. Telidon, of course, offers more refinable graphics and seems to be the best bet, along with its ability to fit broadcast standards much more easily than European systems. Both the British Prestel and French Antiope viewdata systems are competing for American markets. Prestel has recently been franchised to GTE for U. S. marketing and has received the International Consultative Committee on Telephone and Telegraph endorsement as meeting requirements of recommended international standards for information retrieving systems. Antiope, is a PAL, SECAM and NTSC compatible system. It's Didon packet transmission system has been endorsed by the International Standards Organization X.25 protocol for Data Communication.

The Indusiries Association in the U. S. has not been agreeable to proposed

standards or a system to adopt. CES, in a departure from the standardization process, has individually petitioned the FCC to approve the Antiope system saying that it has the greatest potential for future advances and interfacting with other compatible computer based information systems. There has not yet been any FCC action. It is likely that until that time videotext services will continue to be experimental and sparce.

PROMISES FOR THE FUTURE

Once home information systems become established they will become more central to living than anything else has ever been. Viewdata systems show the most promise for the future. Serving primarily as an information and communication service, this new utility will have as its mission four basic objectives to serving people. First, politics or government can be more responsive in individual needs, decisions could be made as a direct result of citizen involvement, and individuals could be more knowledgable of governmental operations. Second, education of the masses could be conducted in their own home. Courses for credit or enrichment would enable large numbers of people to simultaneously participate in an interactive of tutorial class. Books would be transmitted to the home; once data becomes of sufficient size any home television could be a complete dictionary or encyclopedia. People could have access to the world's best libraries. Third, social relations could improve via communication between homes, work, and businesses. Personal teleconferences, family visitations, and interviews could easily be held. Individuals would also be able to perform some civic and state functions such as: voting, driver's license renewal, and payment of taxes. Lastly, the services that can be provided are almost infinite. Pilot programs are proving that the technology exists for serving many of the daily

routine needs of individuals such as shopping, paying bills, and securing information from agencies and groups (21, 191).

Much of what has just been said is often dismissed as "poppycock." Yet, in a study of individuals asked if they would desire and pay for such services, (if the cost of the service was similar to their monthly telephone bill) an overwhelming majority surveyed said yes (20, 340). In fact, another study answered the question, how would an individual make use of these services when his typical day is spent doing so many other things? First, technology is continuing to reduce working time, some work will soon be able to be done at home, technology will reduce time traveling and performing routine tasks, and finally, already an individual's day is said to be 34% leisure time. The result, there is more than enough time to utilize the interactive terminals, and as they become more sophisticated their mere use will result in more leisure time (36, 196).

Several forecasts are presently available as to all the possible benefits that could be realized via the home information system. Six seem to be the most often referred to (26, 71):

1. A cashless society, the home information system could become the family financial manager keeping records, balancing books, paying bills, and placing orders.
2. True participational democracy, the individual could directly input responses and opinions, even vote, on issues of local, state, and national importance.
3. Individualized computer assisted instruction on thousands of topics, general or specific.
4. Medical information network, ready and available to consult, providing information, symptoms, and referral services.

5. Specialized information services for individuals with very specific interests from thousands of data bases.
6. Automatic publishing, computer shopping, and a whole spectrum of home entertainment services.

Some of the most interesting trials now underway deal with merchandizing. Store catalogs on the terminal allow individuals to see and choose from a larger selection (than in printed catalogs or in the store,) and to order from the comfort of one's home. Crocery stores provide prices and ordering services, restaurant and theatre information is complete and immediate and permits instant reservations (and payment,) and a host of other applications.

Warner Amex recently announced that, via their QUBE system, they will shortly be offering services to manage the energy utilities of a subscriber's home, and a house security system. As the first home information security service, and the most extensive security package available, Warner provides smoke and heat detection, door and window sensors, motion sensors, and strobe lights and sirens. Monitoring the home every ten seconds, the host computer will call the home if trouble is indicated. If the security of the home is not confirmed, the police are immediately notified providing them with whatever information is needed, i.e., health histories, nature of the problem, house construction, medication requirements, and any other pertinent information the subscriber has given the service.

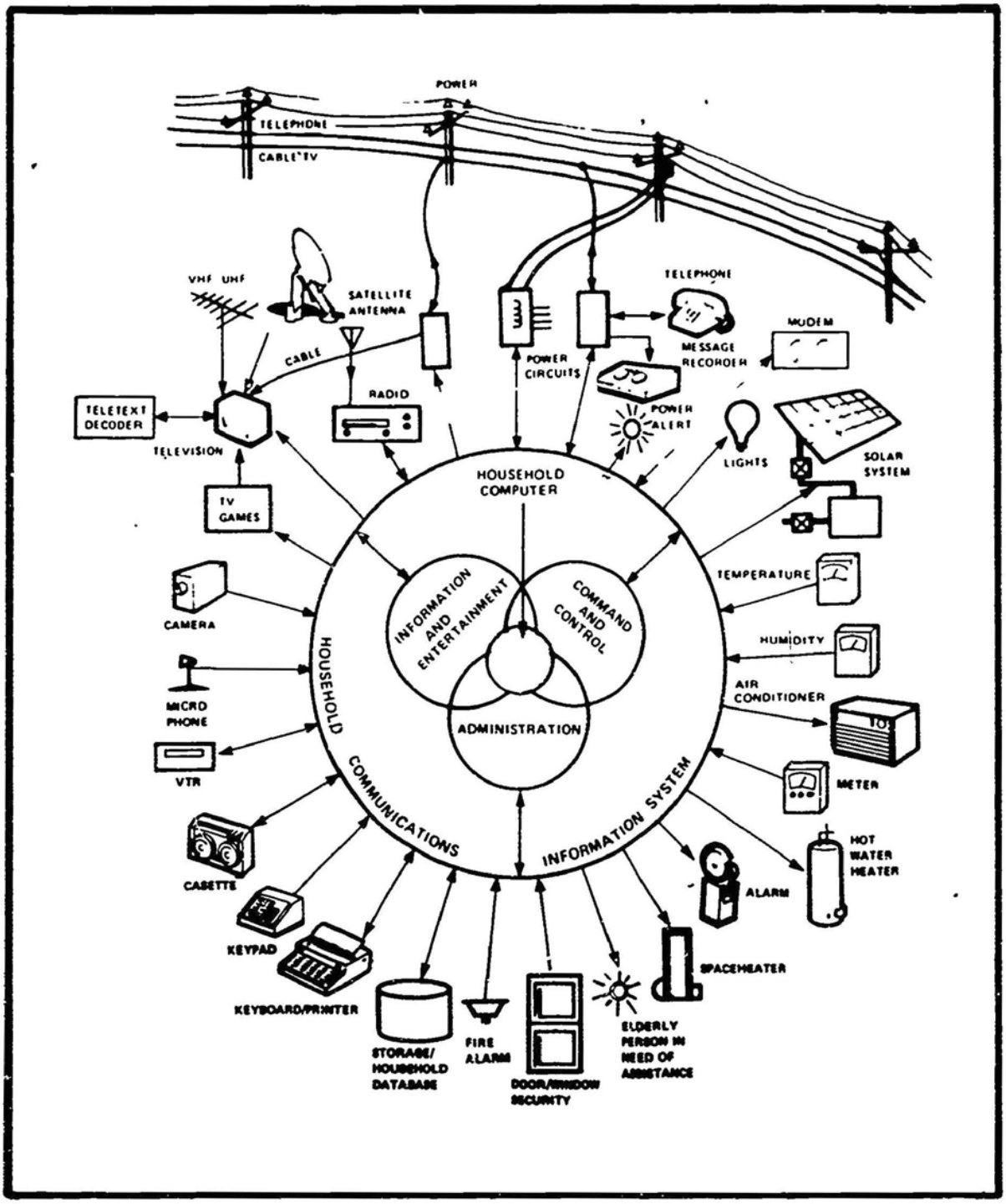
Educational institutions can realize many benefits from home information systems. Colleges without walls will reach entire populations. Educational travel will not be needed, textbooks can be broadcast. The ramifications are tremendous, the level of education and literacy of the citizenry can increase at a very small cost. Piloting a program of this nature is HECC, the Higher Education Cable Council of Colleges in Columbus, Ohio. Ohio

State University, Ohio Dominion College, Capital University, Columbus Technical Institute, and Franklin University are offering college credit, inservice, and enrichment education programs that are showing great promise.

Business probably stands to reap the greatest benefits from home information systems. Small concerns can equally compete with large outlets, population penetration of advertising will be much greater than presently available (at a fraction of the cost.) Entire stores could exist as "terminal and delivery" enterprises with no traditional store locations. Tens of thousands of items can be offered for sale via an unlimited data base versus limited store space. Money, checks, and bad risks are eliminated as instantaneous billing and payment occurs with each order. Maybe most important (to business) repricing, inventories, shelf stocking can all be accomplished via computerization and relevant information simply transferred to the home.

Electronic publishing, carrying the present capability of electronic composition, editing, typesetting, to its logical conclusion: electronic information delivery promises to provide all individuals and institutions with all of the information they need whenever they need it. Electronic mail, a form of publishing, will eliminate the need to physically transport paper copies between individuals. In fact, engineers are working on ways to simplify the input of information by allowing a person to speak into a microphone, be understood by the terminal and have the message processed and/or sent (55, 50). Teleconferencing will virtually eliminate the need for traveling, if desirable to users.

The ultimate foreseen development, is one in which every household and institution contains a computer communication and information system so sophisticated that it receives and transmits data by powerline, telephone, cable television, and broadcast services. It would be linked to a nation-



A total home communications and information system that utilizes a variety of methods in securing and transmitting data via a central home computer. This household computer provides information and entertainment, monitors household appliances, and administers family records.

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From: Carne, E. Bryan, "The Wired Household," IEEE Spectrum, Volume 16, Number 10, October, 1979.

wide communication network and also control household appliances, use of energy, people and security monitoring, provide entertainment, and a multitude of other applications.

CONTROL (!) (?)

There are some very interesting issues that revolve about this information ideal; they need to be studied and explored before home information systems do infiltrate most aspects of life. Some of the problems or issues include: invasion of privacy, access to unauthorized files, possible eavesdropping on private messages, "monitoring" of all sources and uses of communication and information via the system, monopolies on data and programming by information suppliers, denied access to information for those who can't afford to pay for the service, effects of electronic publishing on legal positions and copyright, and possible effects (desirable and otherwise) of direct citizen involvement in governmental decision making.

The problem of primary concern, which has a direct bearing on the previously mentioned issues, is one of control. Who will be responsible for programming information and who will control the flow (sending and receiving) of information in society? The host computer, via your daily use, will know you, outward signs of your thoughts, desires, habits, interests, decisions, friends, affiliations - in short, you will create in the computer's memory a personality profile that can be misused.

Several options exist to insure free flow, unbiased access to information and confidentiality of systems files. One might say, rather naively, that one must assume that the computer people will morally approach their responsibility. Some advocate industry controls that may take several forms including governmental regulation.

Industry asserts, "it is....of vital importance that we establish.... fundamental principles concerning freedom to publish, freedom from censorship that lie behind the time-hallowed slogan, "freedom of the press" (26, 80)." Past experience has shown that maintaining unregulated, truly competitive industry will not insure proper use of (in this case) data. Misuse and manipulation of information for selfish or illegal ends is a real possibility and cause for concern. Likewise, previous questionable governmental activities leads one to parallel governmental control of information with that which occurred in 1984.

The issue is not necessarily one of access to the systems. Competition and free enterprise will allow the development of many sources of information retrieval. However, as reliance on the systems grows, as larger networks of information grow, the fundamental problem of control will become more acute. There are no simple answers. Any agency, coalition, corporation, or consortium formed, even those constructed for the express purpose of maintaining strict controls, can become a "controller" in and of itself. The end result may be the necessity of relying on the nature and integrity of man not to misuse and manipulate knowledge for amoral purposes.

In an era of diminishing energy resources, telecommunication is looking more and more attractive as an alternate delivery system for goods, services, and even employment. Videotext services may well prove to be the ultimate application of technology to the communication process. As a prime component of the home information system, teletext and viewdata are now providing thousands of individuals with electronic information that previously was unavailable, expensive, or very difficult to retrieve. Improved transmission, display and systems application will continually enhance the prospects

for use of this technology in all aspects of life.

From early interactive experiments to current pilot tests, information systems are assisting people in work, education, entertainment, and simple information gathering. Innovations are taking shape that will eventually result in the systems assisting individuals in the command and control of daily living conditions and the administration of personal records.

Indeed, this author is of the opinion that the world of the future is unfolding in front of our eyes. Life will revolve about the home information system and videotext services. Just as sure as the technology is developing and will be deeply rooted in society, a firm belief is also held that not enough study or planning has been done to determine the extent of change, value of that change, or desirability that may result.

Nearly ten years ago, the only true experiments in interactive television took place. Since then, simple pilot programs to determine user preferences and marketability have been done - surely motivated by business' desire for success and profit. Before the technology pervades every aspect of society, advantage must be taken of the lull in expansion and adoption of the systems, to study to sociological, economic, and legal issues which surround the systems.

Man must control technology. Decisions must yet be made with regard to standards of operation and transmission, information supply and programming, flow of information and access via the system, and the moral issues of misuse and manipulation.

Man will have at his fingertips "on demand communication" to serve him (21, 78). "The future household will, in all probability, be a giant electric "appliance" that will be plugged into a nationwide communications network (14, 61)." Planning, study, and foresight will result in information

systems being the greatest technological advancement since the printing press, otherwise, it might well become a boon for the wealthy, for business, even for social control.

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