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The Market for Wired City Services

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ABSTRACT

This paper attempts to develop estimates of the amount and pattern of home use that might ensue if home information/computer systems were introduced into the contemporary social system. This discussion is not intended to have a technological orientation. The services described are possible, and exist, on a small scale. The problems involved in building a large system providing multiple services are deliberately not discussed. The effects of different regulatory climates are also not explored in any detail. We shall be concerned primarily with the market for home use of wired city services.

INTRODUCTION

Recently there has been considerable excitement generated by home computers and terminals and their possible connections with computer based information services and communications networks. Typical scenarios have the citizen of this "wired city" using his home system for education, fast and selective news access, information retrieval, banking, work, shopping, entertainment, message services, and so on.

In any conceivable social setting there must be some demand for a service for it to exist. Most current work on wired city technology assumes the demand exists with little or no justification for this claim. In this paper I shall attempt to explore the market for wired city services.

Most wired city studies focus on either the technology involved or the regulatory climate in which the services are provided. Technologically oriented studies focus on the physical aspects of the system. They are concerned with evaluating various communications media, terminals and system configurations along a cost/benefit axis. They concentrate on the technological problems involved in providing the services of the wired city.

Studies concerned with the regulatory climate of wired city services generally explore a number of regulatory options including government ownership of the system (as in the United States Postal Service), regulated monopoly (such as public utilities), licensed competition (as with radio and television), and the unregulated or "free" marketplace (as in the computer industry). The regulatory stance taken by government will be an important factor in determining the nature of the wired city but it is not the only factor.

Predicting the patterns of use of a new technology is a difficult task. Predictions, whether made by scenario, "Delphi" study or opinion poll, are usually made by experts in the technology being studied or in the political climate in which it is presumed to exist. They tend to be mainly concerned with physically possible, rather than socially probable, uses. They also tend to be strongly influenced by the predictor's lifestyle rather than that of probable users, and rarely consider the externalities, or secondary consequences, of

technologies.

To form predictions for the amount of use of wired city systems expressed in this paper I have chosen to use extrapolation from analogous systems in use today. For example in studying the future of cable television analogies may be drawn between it and conventional television (which cable resembles in form) and radio (which cable resembles in the number of channels available). Differences between the technology being studied and its analogue are also important. Cable television typically differs from both radio and conventional television in that cable systems are usually regulated monopolies.

Prediction by analogy has definite limitations. It is only as powerful as the analogies that can be drawn. Hence it is not a powerful tool for evaluating dramatically different new technologies such as computing was in the 1940's, or for predicting new uses for existing technologies as in the growing use of computer systems in information retrieval rather than calculation given only that computers had been heavily used in complex calculations.

WIRED CITY FACILITIES AND SERVICES

Let us offer the "plugged in citizen" [Brunner, 1975] the following facilities:

1. a home computer of "sufficient" power (this is similar to having sufficient money).
2. a high fidelity, high resolution video and sound system.
3. a hardcopy reproduction system (possibly including color and graphics).
4. communications facilities for voice, facsimile, video, and high speed data transmission to and reception from other personal users and larger public or private systems and databanks.

We may now try to use predictive analogy to study the following possible home uses of this system:

1. Electronic communication: This could include the telephone with the added plus of video presentation, conference calls, an alphanumeric keyboard, and an automated answering service. Another service, facsimile transmission, would make sending graphics possible. Communications networks could also make electronic mail and computer conferencing available to the general public.

2. Information access: This involves access to "electronic" libraries, newspapers, and magazines (including the classified ad sections). This access could be two way with the user a possible contributor to the various databases. This category also includes "tele-shopping" where one may browse through a "catalog" and order products and services for later delivery.

3. Electronically enhanced education: This includes the video classroom and the use of several types of computerized aids to the learning process.

4. Work at home: Rather than going to work our plugged in citizen could simply connect to his firm's computer through his home terminal.

5. Entertainment: Here are found dial up movies, pay TV, a multitude of new television and radio stations, and computer games.

SERVICE ANALYSIS

Electronic Communication

Communication methods may be characterized by two factors: the degree of interaction involved (two-way or one-way) and the time required to perform an interaction (real time or delayed). Face to face conversation is both highly interactive and real time, newsmagazines are (largely) one-way and delayed. In this section we shall consider only two-way systems.

Real Time Message Systems

The telephone system is the primary example of a real time, two-way electronic communication system. One possible method of improving telephone service is to add picture to the sound. Intuitively this should decrease the perceived impersonality of the telephone and hence make it more desirable.

A.T.&T's Picturephone™ did not achieve a great deal of popularity. Reasons given for this include the high cost of the service compared to regular telephones and the low resolution of the image [Martin, 1977]. Since the cost of video is primarily in providing high bandwidth communication lines rather than in the cost of the instrument itself it is possible that sharing these lines with other services could bring the cost down to a more affordable level. As it stands consumers are unwilling to pay high prices merely for video phone service. The same arguments should apply to raising the quality of sound afforded by telephone service.

A second method of improving telephone service is to increase the intelligence of the instrument. One of the simpler ways of doing this is to use a telephone answering device to provide the caller with a prerecorded message and record his reply. Most such devices may also be used to screen calls by allowing the called party to wait until the caller identifies himself before coming on the line. Thus this inexpensive device serves some of the functions of both an answering service and a secretary.

This convenience is not without its price. Many callers dislike talking to a recording and may suspect that the owner of the device is actually present and simply does not wish to talk to them. Furthermore if both the caller and the called party have telephone answering devices they may find themselves talking in thirty second segments.

Another way to add intelligence to a telephone is to build in a computer. Existing devices of this type can remember a list of phone numbers, dial a number at the push of a single button, redial the last number dialed in case of a busy signal, and hold calls. The computer could also be hooked into home systems. This would allow the user to call home and query or control devices. Systems such as this are under consideration by utility companies to read meters and to turn off such high consumption devices as water heaters during peak periods. With current technology such control systems are not trivial for the average consumer to set up and the benefits of the utility companies' use to the consumer are unclear.

Barring unforeseen developments, drastic change in the telephone system is unlikely to occur. Video telephones with high fidelity sound require massive changes to the communications lines and switching systems which cannot be paid for by the existing demand. While answering devices and "intelligent" telephones increase the versatility of the instrument they seem unlikely to make drastic changes in the patterns of home telephone use.

Delayed Message Systems

The second general class of interactive communication systems is the delayed message type. The classic example is the mail system. For the plugged in citizen mail might arrive electronically. Messages could be sent and received on the home terminal and filed and retrieved by subject and other headings for later review. Unlike the telephone, "computer mail" need not interrupt, yet unlike conventional mail the message arrives within moments of its sending.

Such a system makes possible computer conferencing, a new form of communication which lies somewhere between the telephone and the letter in terms of speed of interaction and cost. Participants in a computer conference send messages, via a computer controlled communications system, to each other. Messages need not be read immediately (or at all) and may be retrieved at a later time. It is also possible for conferees to "whisper" to one another without anyone else's knowledge. Participants in computer conferences report that the ability to reflect on what has been said, absent in conventional

and tele-conferences, is a definite plus [Turoff, 1977].

With the growing energy crisis more and more people will be seeking alternatives to conventional conferences. The computer conference is one such and with increasing travel costs can only become more attractive. While conventional conferences are primarily attended by business and academia the greater ease of participation offered by computer conferencing could make it attractive to the general public.

Currently the primary advantage of electronic mail over conventional systems is in its speed. Equipment and communications costs have so far limited electronic mail to those users who send a high volume of messages and place a premium on speed and sureness of delivery [Barna, 1978]. The steadily decreasing price of electronic equipment and the advent of new forms of communication (e.g. packet switched digital networks) may bring the cost of delivery down to a point where home users can enjoy the benefits of such systems.

Electronic mail has a number of problems which may slow its adoption. One problem that has become increasingly annoying in present systems is "junk" mail. One recent invention of questionable social worth is a device that will automatically call all of the phones in a given exchange and deliver a prerecorded message. Similar devices could so clog electronic mail systems as to render them useless to the average consumer.

Another possible opposing force is the perceived impersonality of electronic communications systems. A personal letter may lose much of its impact if it is not handwritten. Facsimile may be a partial solution to this problem but it is expensive both in terms of devices for sending and reception and communications costs. Even with facsimile the sending of high quality graphic material is difficult.

Electronic mail may face strong opposition from the present postal service. If it were successful the Post Office could well be reduced to a mere package delivery system. Since the Post Office is one of the nation's largest employers of unskilled labor the effects of such a restriction could be far reaching and strong opposition to systems that might cause it can be expected.

Another problem with electronic mail for the general public is that, until saturation is reached, many people will not be reachable via the system. This is similar to the problems with video telephones. Consumers may not be inclined to invest heavily in the system until it is fully developed. Because of this the system may be expected to lose money for some time.

Information Access

The Electronic Marketplace

One of the basic services of the wired city is the electronic marketplace. This service could include the complete coverage of local business of the Yellow Pages, the depth and mail order features of the Sear's catalog, the up to date prices found in newspaper advertisements, and the private offerings and diversity found in newspaper classified advertisements. Hopefully it might transcend the limitations of current media: lack of pricing information in the Yellow Pages, coverage of only one company's products in catalogs, and lack of depth in classified ads. Another proposed electronic marketplace service is the automated supermarket where a busy housepouse could contact the local supermarket, scan their automated catalog and order whatever is needed for dinner that night.

Two systems suitable for the electronic marketplace use an ordinary television set and information accessed by telephone (Videotex or Viewdata) or sent "between the lines" in television broadcasts (Teletext). Current systems, developed in Europe, include the BBC's Ceefax and ITV's Oracle (Teletext systems) and the British Post Office's Viewdata [Johansen et al, 1979]. The primary differences between Teletext and Videotex systems are in breadth versus depth of coverage. Although Videotex systems can provide in depth access to a vast number of databases the number of simultaneous users is limited by the telephone system's capacity. In contrast Teletext systems are limited in the amount of information they can offer due to the necessity for local storage of all information accessible and the need for frequent updating of this information [CW, 1978].

Some major driving forces for the electronic marketplace are convenience for the consumer in finding sources of products and services and checking prices without having to visit several stores, and, of course, the above mentioned depth, breadth, and immediacy of information. The system could also be a great asset to mail order companies who could update their catalogues more frequently and, if system design permits, place brief advertisements with pointers to a more complete catalog. In the case of the automated supermarket it has been claimed that store overhead could be lowered by eliminating the necessity of keeping a large number of items on the shelf [Martin, 1977]

One force opposing the creation of the electronic marketplace is the difficulties involved in starting up--the system is very volume dependent and could incur substantial start up costs [CW, 1978]. Another important factor is ease of system use. Unless the system is much easier to use than most current computer systems the average consumer may be reluctant to access it, much less place an advertisement.

A problem with the automated supermarket involves the cost and speed of delivery. Home delivery has been fading from the scene for some time, and given current transport and labor costs is unlikely to

return. The cost of delivery would seem to outweigh any gains from not having to shelve items. Many shoppers also want to see (and handle) the actual items they are buying (this is especially true in shopping for groceries). Nevertheless similar systems may supplement or supplant conventional mail order for products where very rapid delivery is not a crucial factor.

Despite its problems the electronic marketplace has enough going for it that, given the necessary consumer saturation and ease of system access, and excepting the automated supermarket, it could achieve considerable popularity. The major requirement would seem to be some entity (private or public) able and willing to absorb the start up costs.

Electronic Newsservices

A second class of information services in the wired city is electronic news (referring here to 'printed' news rather than voice or video). This service could be as timely as the newspaper's daily stories yet provide the in depth analysis of newsmagazines. Computerized search routines and personal interest profiles might allow a user to automatically pull all news from his home town or search a 'morgue' for stories of interest.

Existing prototypes of electronic news systems include the wire services (UPI, AP), Wall Street tickers, Teletext, and Videotex systems (see the preceding section). The Central Intelligence Agency has developed a Machine Aided Dissemination (MAD) to route incoming messages based on stored user interest profiles that might serve as a preview of daily news delivery in the electronic world [Lancaster, 1978]. Nonetheless direct impact of electronic newsservices on the general public (again excepting conventional radio and television) has so far been slight.

Two strong points of electronic news include great savings in paper and delivery costs, and simultaneously great selectivity for the user combined with availability of in depth coverage of selected topics. In addition, unlike radio and television news broadcasts, the system can be accessed whenever the user wishes.

A major drawback to electronic news is that conventional printed matter is easier to read and has better graphic quality than CRT screens or their popular alternatives. There is some question also about the economics of the system--television, radio, newspapers, and even popular magazines are largely supported by their advertisers and the consumer incurs little direct cost. Unless the electronic newsservice is priced very low, paid for by some other service (by selling advertising etc.) or is perceived as much more valuable than conventional systems, it may have problems finding a large enough audience to ensure profitability. This problem is compounded by the fact that it is necessary for users of electronic newsservices to have access devices which greatly increases the cost of the service for those who do not already have suitable devices. These problems, combined with large capital costs for the system itself, imply a slow rate of return on investments on the system. Finally there could be

opposition from existing systems which might feel threatened--television, radio, and conventional newspapers.

In balance, electronic newsservices, despite some handicaps, show promise of finding some niche in the market. The timespan between startup and profitability along with regulatory problems and opposition from vested interests may slow investment in such systems.

Electronic Libraries

An electronic library is composed primarily of machine readable materials indexed by computer. Partial prototypes of these systems include MEDLINE, the New York Times Data Bank, the OCLC system for book indexing and a number of other, similar systems.*

Some driving factors include the rising costs of conventional publishing and delivery (particularly of scientific journals), the increasing number of publications, and the failure of library budgets to keep pace. The low publishing and delivery costs that may be possible for electronic journals are a major selling point. Due to the advent of computerized typesetting much current published material passes through the computer on the way to the printed page and leaving it in electronic form saves an important portion of the publishing cost. There are also a number of advantages to computer indexing including multiple access points and the ability to rapidly perform complex search strategies [Lancaster, 1978].

There are several obstacles to the establishment of the electronic library: First, while much new material may be in machine readable form most old is not. Second, books are in many ways more convenient than computer terminals. (The facilities necessary for reading a book are generally much more available and portable than those for accessing a computer database.) Third, start up costs for computerized information systems may be quite high. Fourth, there may be considerable resistance by current library systems and the publishing industry.

The electronic library may become a fact of life for the scientific community where, due to the low circulation and lack of advertising support for journals, the problems of publishing and delivery costs and the resultant costs of the journals are greatest. Use of the electronic science library will depend on two factors--the completeness, accuracy and timeliness of its data and indexing schemes, and its ease of use [Lancaster, 1978]. There is, however, little reason to suppose that reading a terminal will replace reading a book for the lay public in the near future.

* See, for example, Lancaster [1978] for a more complete listing

Work at Home

One claimed benefit of wiring the city is a vast increase in the number of people working at home. One author predicts that work at home will account for 23% of total network use in a wired city [Sackman, 1977], another foresees the beginning of a return to "cottage industry" through home network services [Martin, 1977]. Other predictions include the replacement of the daily commute to work with a weekly, store minding, visit, and suburbs stretching for hundreds of miles around vastly reduced city centers [Price & Wicklein, 1972]. The wired city, it has been claimed, will both move many current jobs into the home and create new jobs which can be done at home. Let us explore each of these in turn.

Current jobs

There are a number of workers who currently work at home. Many small shops and other businesses are adjacent to their owner's homes, some answering services are run from private homes, and many writers and scientists have a desk at home. Computer programmers frequently have home terminals. One programmer who frequently worked at home commented "I can mix manual work and programming in a way which makes me more efficient" [Palme, 1978]. Even a programmer who generally works at an office may appreciate the facilities of the wired city when he has to fix a problem at three a.m.

There are a number of benefits that might be gained by moving a large part of the workforce home. Rush hour congestion could be greatly reduced, the enormous capital outlay involved in the construction and maintenance of office buildings could be cut down (although this might be counterbalanced by the necessity of providing office space in the home) and the worker need no longer live within commuting distance of work. Working at home might also permit more flexible working hours for many people and, in particular, might make it easier for people to work at night. Home may also be a more comfortable environment for many people to work in, especially the physically handicapped.

Martin [1977] lists three factors opposing the movement of work into the home. First employees may see working at home as an unwarranted invasion of their leisure time, second either employee or employer may feel that the environment is unsuitable for work, and third employers may feel that employees should be at their desks, where they can be easily supervised, from 9 to 5.

The first objection is difficult to evaluate. If the employee were working his eight hours (or whatever) a day at a regularly scheduled time it would seem that he could hardly complain of encroachment on his "leisure" tme. Naturally if the employer considered employees "on call" at any time of the day or night some resentment might be generated.

The second objection warrants more careful consideration. Some homes are simply unsuitable as working places. This is especially true of small homes and those containing small children. The

continuing decrease in the size of the average home makes it more and more difficult to physically obtain the inviolate private office space that working at home would seem to require. Even without the distraction of families and the interruptions of doorbell ringers and telephone calls many people find it difficult to concentrate on work at home. This may be because there are too many tempting distractions at home or it may simply be a desire to keep the worlds of work and home separate.

Martin's third objection is also powerful. Many employers are simply unwilling to believe that employees will work well without close supervision. Employers and colleagues want some evidence of productivity to ensure that employees are working and not shirking. While it might be possible for employers to monitor the work of remote employees by telephoning or checking via the computer this is scarcely as convenient as simply looking out the door, and supervision and instruction via the telephone may be difficult in some contexts. It should also be noted that remote monitoring via computers has proven unpopular in many work environments.

A further problem is that there is little economic incentive, beyond the necessity of providing office space, for most corporations to support work at home. Costs of commuting are typically borne by the employee, costs for communications equipment would probably have to be borne by the employer [Hiltz & Turoff, 1978]. This picture may change in the future if energy costs and other problems render the commute to work more difficult leading to increased employee absenteeism or difficulty in attracting new employees.

Related to the above problem is the home worker's need for access to facilities which may not be available in the home. Typical of such facilities are sophisticated office equipment such as copiers and word processing systems, manual files, and audiovisual equipment. Providing each employee with the full range of facilities shared by an office staff might be considered prohibitively expensive.

New Jobs

Another important class of jobs is those which may be created by the wired city. Many of these jobs might be done at home. Certainly there will be jobs for computer and network experts. However there is no shortage of current and projected jobs in these categories even without the wired city. It is more useful to look at openings for those who are currently underemployed such as the unskilled laborer and the liberal arts graduate.

Martin [1977] suggests that computer software development might be a good small home business. He claims: "Most technical fields are too complicated or specialized for the amateur to make a name for himself but programming new computer applications has endless scope. ...new territories await the ingenuity and care of a dedicated amateur."

Stating that software development is not complicated or specialized is an excellent way to get a computing specialists attention if not his agreement. One expert in system development states: "...software systems are both the most intricate and complex of man's handiworks." [Brooks, 1975] Furthermore the cost of software failure can be extremely high. In medical and air traffic control applications software failure can literally kill and even in more prosaic systems such as payroll programs a software failure can be expensive.

Most software also requires considerable maintenance to remain useful. It is probably safe to say that the majority of businesses would like to have somewhat more quality assurance and maintenance support than can be provided by even the most "dedicated amateurs".

This is not to say that the wired city will produce no jobs that can be done at home. One which would be created would be network service consultant. There will be definite need for people who know their way around the wired city. How great the need is will depend largely upon how many services the wired city offers and how much use is made of them. The job would require considerable specialized knowledge although much of this might be acquired on the job. Good opportunities for self-employment may exist for the consultant just as they do for today's computer consultant.

There may also be opportunities for the relatively unskilled in such unglamorous, but essential, jobs such as data entry. If communications and equipment cost are low enough there may exist definite possibilities for freelancing and part time work.

Working at home has many advantages. The problem is that those who can work at home constitute a small minority of the workforce. Nor is it easy to envision much in the way of "cottage industry" springing up as the result of wiring the city although there will be some opportunities for independence for both highly skilled individuals and clerical workers.

Education at Home

Electronically enhanced education can be split into the video classroom and the use of the computer as teacher, manager, environment simulator, or a tool in problem solving.

The video classroom is the recording and broadcast of lectures and other class related materials over an audio visual system. For home use materials might be broadcast over a standard or cable television station or available on a video cassette or disc. The best known example of a school system making heavy use of the video classroom is probably Britain's Open University; another is Orange County California's Coast Community College both of which use television broadcast facilities. To the best of my knowledge there is no courseware offered to the general public on video cassette although there are some video tape courses used by industry.

Computer aided education can be divided into Computer Managed Instruction (CMI), Individually Programmed Instruction (IPI) and, the use of the computer as a tool for problem solving or an expressive medium in its own right.

The first of these, CMI, involves using a computer to present and/or score tests and to make recommendations for future study based on these test results. The best known application of computer scored testing is the tests presented by the Educational Testing Service including the SAT tests most college bound high school students take. CMI is currently being heavily used by the Cincinatti Public Schools where, in combination with traditional materials, it is used to allow students to proceed at their own pace while monitoring and guiding their performance [Peters, 1976]. CMI is also a critical component of the Individually Programmed Instruction systems discussed below.

In Individually Programmed Instruction the student interacts with the computer in a one to one fashion as with a private tutor. IPI courseware is generally self-paced in that the student proceeds to the next lesson only when he has mastered the previous one. The most successful system, to date, is PLATO which was originally developed at the University of Illinois and is currently marketed by the Control Data Corporation [Bitzer & Skaperdas, 1970] [Peters, 1976]. Smaller systems also exist at a number of universities and some secondary schools.

The computer itself can be an important learning tool. Many science problems can be expressed in the form of a computer algorithm leading (hopefully) to better understanding of the principles involved. Both the hard sciences and the social sciences can benefit from the use of computer simulation.

Finally the computer itself can be a means of expression. With a computer system linked to the appropriate peripherals the student can draw, generate music or even write poetry. Computers have also been used in animation studios most recently in the making of the movie Star Wars.

The size and consistency of the market for education at home will have a considerable effect on the success or failure of home education systems. We can divide students into two categories: conventional students, who attend school on a full time basis in pursuit of a formal degree, and students who are seeking knowledge but are not conventional students in the sense that learning is not their primary occupation.

Most schools are geared toward the conventional student--age between six and twenty-one, involved in a formal program at one of three stages (primary, secondary, university), and attending school full-time during daylight hours. While this population is declining slightly as a result of demographic factors it is neverthess enormous and likely to remain so for the forseeable future.

Nonconventional students include the housespouse busy with children and chores, the working person with little free time seeking to learn new skills, the handicapped person who has difficulty attending conventional schools, the professional seeking to update his skills, and the retired person seeking new interests. Currently these students are served by adult education programs, extension courses, educational television, and correspondence courses. They constitute a major possible market for home education facilities provided by the wired city.

What is the size and consistency of the nonconventional student market? In 1975 adult education classes reached over seventeen million Americans. The adult education market grew over 30% from 1969 to 1975 and there is little reason to suppose this trend will not continue [Smith, 1978].

The above figures do not include those whose education may be outside of any school. Many of this group may obtain their education through educational television and public libraries. Survey results have shown that, of the approximately 50% of the nation that can receive educational television in 1973, only 66% ever watched and only 40% watched at least once a week. The median time spent watching educational television in the group that watched most regularly (college educated persons watching at least once a week) was one hour and 50 minutes [Bower, 1973].

Statistics for the use of public libraries are similar. A 1967 study on the use of public libraries found 76% of grade school adults, 41% of high school adults and 21% of college educated adults had not read a book in at least three months [Mendelsohn, 1967]. Thus it would seem that most Americans, particularly among the less well educated, are not involved in education outside the classroom.

Electronically enhanced education would be unlikely to have much effect on the educational system if the avoidance of travel were its only strong point. There are a number of other positive factors involved as well. With both the video classroom and computer aided education great performances in teaching need no longer be ephemeral experiences. Good lectures can be taped for future use and good teaching programs saved. This not only allows reuse of materials by future generations of students but also allows students to proceed at their own pace through courses. Combinations of video classrooms and computer scored tests allow larger lecture classes to be run more economically. In IPI courses lecture attendence is often optional and, in any case, tends to drop dramatically after about the fourth week [Bowles, 1978]. If the earlier lectures are video taped and the student has the facilities for viewing them he may start the course at any time and proceed at his own pace throughout.

The computer allows the simulation of experiments that are not possible in the real world, the use (simulation) of equipment that is prohibitively expensive, and the simulation of very hazardous experiments. With simulations laboratory accidents need not be disasters but instead may be learning experiences [Jenkins, 1976]. Furthermore students seem to need less time to perform the simulated

experiments than to do the real thing [Lagowski, 1970]. Simulations can bring new life to economics theory or allow a peek inside a star.

Alternatively the computer can be a means of expression. The Learning Research Center at Xerox PARC has demonstrated a system called a Dynabook. This tool combines computer graphics with high quality facsimile output, a simple yet powerful programming language and several other experiments. Experiments in the use of an interim Dynabook by children are claimed to be extremely promising and such devices may enrich the home learning experience in the world of the future [Xerox, ????].

The advantages of electronically enhanced education for conventional students are claimed to be enormous. It is felt by some to yield the possibility of eliminating the "lock-step", self-contained classroom" type of school replacing it with a "learning resource center" consisting of a computerized library and (presumably) the staff involved in preparing CAI programs and video-taped lectures. Instruction would be "idividualized", geared to the current needs of the particular student [Holtzman, 1970]. In this type of school scheduled classes would be rare. Teachers would spend their time with individual students and serve largely to counsel students. Outside of teacher-student conferences physical attendence by the student might not be required. Furthermore, after completing whatever portion of their education is required, students might continue their education, informally, as their time and interests allow.

There are, however, some difficulties in eliminating the classroom. More preparatory work is involved in setting up both computer aided and video tape courses than conventional courses. Even with the most advanced conceivable systems, systems capable of building their own teaching programs once the instructional database was created, it would still be necessary to "teach" the machine. At best the cost of preparing a CAI course might be approximately equivalent to writing a textbook for the course (it is currently higher) [Bitzer & Skaperdas, 1970]. The economics for video systems are similar.

Many advanced courses in universities do not use a textbook. Either the potential market for the book is too small (most advanced courses have a limited audience) or the material is too new to allow time for textbook preparation. Even when materials for courses exist they are often scattered through a number of publications and must be collected by the instructor. Similar limitations might be reasonably expected to apply to the preparation of electronic materials for the class.

There are also classes at all levels of education which are difficult to evaluate by computerized methods. These include both classes in which the student is expected to provide new and original work and classes whose purpose is not the instillation of knowledge but rather the acquisition of skills that are not purely intellectual in nature. Some examples are classes in the arts, language classes, and physical education.

There has been considerable resistance from faculty to televised courses. Even successful courses from quality institutions find only a small market. One list of reasons given for this opposition includes faculty perceptions of their role as being more guides to than transmitters of knowledge, skepticism of the effectiveness of television and fears for job security [Adler & Baer, 1973]. Similar opposition might be expected for computer enhanced education.

Even if faculty is in favor of electronically enhanced education there are grave difficulties in choosing courses. Even now the immense amount of material available and the nature of the media make selection of courseware extremely time consuming. Many institutions feel it is easier to develop their own courses than to attempt to select from those available [Hartline, 1973].

Finally there is the social role of the school in American society as seen by students, parents, and school administrators. Schools are, or at least should be, more than places where education is shoveled into student minds. Schools are also places that bring people together, places where people learn how to interact with new and varied people. For many conventional students, especially younger ones the schools plays a supervisory role, serving as a part time child care center for many families. All of these roles require physical attendence at the school.

The social aspects of going to school are important not only to conventional students but also to many nonconventional students. Some 10% of adult students were in community issues programs, 15% in "personal and family living" programs and 16% in social life and recreational programs. These are the fastest growing areas in adult education [Smith, 1978]. For many of these students the chance to interact with other people with the same interests and problems is an important part of their educational experience and it is questionable whether education at home could satisfy these needs.

In conclusion it may be reasonably expected that electronically enhanced education will become an important factor in the American educational picture. It may help to relieve much of the drudgery and boredom found in many classrooms. The computer can be a tool in exploring the sciences and the arts. It is, however, premature to claim that electronic education will completely change the educational scene in America. Improved media should certainly increase the amount of home education but the figure of 34% of <u>total</u> network use being used for education projected by one researcher [Sackman, 1977] seems somewhat optimistic. The classroom and "going to school" may be expected to remain with us for some time to come.

Entertainment.

Many writers on the wired city downplay the role of entertainment. (Sackman [1977] claims only 10% of total network use will be for entertainment and many other studies don't even mention it). Yet the average American spends over 45 hours a week glued to his television screen! [I.T.A., 1977]. Since the new technology should yield, at the very least, many more television channels there is no reason to suspect that people will watch less TV. Nor can one reasonably expect that light entertainment will lose its seductive value.

Greater competition among the airwaves may cause better programming but the main effects may be simply due to the increase in channels. There has not been enough viewer demand for the fine arts to give them much of a role in commercial television entertainment but there may be enough channels in the systems of the future to give them a home much as less popular forms of music find homes on FM radio. There may also be all news stations and stations catering explicitly to minority groups and small communities. Add to this the possibilities of "Pay TV" systems showing uninterrupted movies and sports events and one begins to wonder if the plugged in citizen will ever quit watching.

If one ever did tire of just watching he could play. Computer games are fascinating (witness the sales of the primitive video games we have today). Furthermore some of the most popular games are action games rather than "mind-stretchers."

"Improved" entertainment facilities could well be the impetus that makes the whole plugged in society function. The question is: is a society whose members spend most of their time watching or interacting only with machines truly functioning, or even a society as we use the term?

CONCLUSION

It is not necessary for the wired city services to exist as an integrated whole. Different services may be provided by different vendors. Nevertheless there are advantages to be gained by ensuring some degree of compatibility between services.

Of all the services considered only entertainment can clearly attract a market large enough to economically justify the large investments required by both service providers and consumers in order to construct the wired city. However, once the network is in place other services can be added to it at comparatively low cost--provided they can share the facilities already in place. Hence a possible scenario for the establishment of the wired city would have entertainment facilities built first followed by the other services. For this to be possible some thought should be given to the design of the entertainment system so as to easily allow addition of the other

services.

This paper has explored the acceptance problems for the wired city. It has, in effect, looked at the effect of the social system on the acceptance of a technology. Other, possibly even more important questions, concern the effects of technology on social systems. In this context we should ask: How might the wired city affect its society? What are the possible social gains and losses caused by use of this technology? How can its problems be minimized and its benefits maximized? Such questions are assuredly deserving of future research.

More data is needed in both these areas of research. The systems emerging today should be studied to gain knowledge on both society's acceptance of the system and the system's effect on society. The wired city technologies are extremely potent and the way in which they are shaped may have great effects on the shape of society in the years to come.

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