

2001: An information society?

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Received 23 June 1979

What are the benefits and challenges of an increasingly information conscious society? What role can information play in improving the conditions of poor people and others who do not derive their full measure from modern life? And how can educators prepare the general population for day-to-day life in a world where sophisticated information systems will be commonplace? These and other questions are discussed pragmatically, recognizing that predictions of the future are often ethereal.

Keywords: Information society, prediction, information literacy, information overload

1. Introduction

I find it a little unusual that you've asked me to talk to you about the future. After all, I've made my living and reputation as what might be called an 'information engineer'. I can recognize what kinds of information people need, and I can design services that will help them get that information. But I do not think I am particularly well qualified to talk about the year 2001 simply because I have been able to design services that people can use *now*.

Nevertheless, if you insist on playing the game of futurology, I will go along. Hardly anybody will remember any absurd predictions I make, and by 2001 I will be able to take credit for the ones that came true. I will be able to remind you of how far-sighted I was back in 1979, so you will listen to me when I tell you what the world of the year 2050 will be like.

First of all, I want to draw your attention to the

Paper presented to the 21st Annual Conference of the Institute of Information Scientists, Torquay, 5-8 June, 1979.

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Journal of Information Science 1 (1979) 209-215.

question mark at the end of the title of my talk: "2001: An information society?"

2. Information conscious society

Before we talk about whether we will have an information society, we have to define our terms. 'Information society' and 'information-conscious society' have become clichés in discussions of the future. These terms tend to be used synonymously. In my opinion they are not synonyms. An 'information-conscious society' is a society in which people realize the importance of rapid access to information. But in the information-conscious society, people do not necessarily have the information they need. The information-conscious society is a necessary prelude to an 'information society'. An 'information society' will be a society in which we take for granted the role of information as it pervades and dominates the activities of government, business and everyday life. The information society will be characterized by the fact that the rapid and convenient delivery of needed information is the ordinary state of affairs.

Some of you may recall my address to the 1971 meeting of the American Society for Information Science on "Information Science and the Information-Conscious Society" [5]. Less than a decade later we have already arrived at the information-conscious society. You can see plenty of evidence for this if you just look around. People are conscious of information today because they are frustrated when they can't get the information they need. In the US you are supposed to be able to get train or airplane schedule information over the telephone rapidly. Unfortunately, you may be in for a long wait between the time you contact the airline office and the time you get your information. You may get put on hold, you may hear a taped voice tell you that the lines are busy and ask for your patience. Of course, nobody enjoys delays for any reason. But the frustration people feel from these particular delays shows that people take this kind of information service for granted. The importance of this kind of information needs no further discussion. People want travel information immediately, and expect it to be delivered efficiently. Hence their frustration - which psychologists know

is the result of heightened expectations.

We can thank the telephone company for another reason why people in the US are becoming more information-conscious. When you have to start paying for information you once received free of charge you appreciate it more. In the US people can dial the operator and ask for a phone number listed in the telephone directory. This service used to cost nothing. Not any more.

How can we measure how far we have progressed from the information-conscious society to the information society? One way is to count the number of computer terminals. In the United States, the growth has been astronomical. We had 14 000 terminals in 1959, and 415 000 in 1969. Today there are well over 2 million. By some estimates we may have 10 million by 1989. This incredible growth reflects how much we are coming to depend on computers. The growth is also one measure of the increasing demand for information processing and retrieval.

To these figures must be added the 130 million TV sets in America which can also become part of the interactive information networks of the future. As I said before, one way to estimate the growth of the information-conscious society is to examine how many information services we now take for granted. I am not speaking here about the bibliographic products of ISI® and other information companies. But stockbrokers now take for granted rapid electronic access to market quotations. Their clients, of course, also depend on these market quotations. This is an area of human endeavor that was practically untouched by the computer just a decade ago. The information consciousness of the people in this industry is characteristic of what we can expect in the society of the future. But even there we have only scratched the surface of possible information services.

Another way to measure the development of the information-conscious society is to note when people begin to realize that the information industry exists. Many people in the States think that the information industry began in 1968, with the founding of the Information Industry Association. But many IIA members had been in business long before the IIA was founded.

ISI, one of the five founders of IIA, was about ten years old by 1968. The other four founders were Pharmaco-Medical Documentation, Inc., CCM Information Services, University Microfilms, and Herner & Company. On the roster of IIA today are such long-established publishers as Williams & Wilkins and

Academic Press, microfilm companies like Bell and Howell, computer companies like IBM and CDC, information companies like Dunn & Bradstreet, and even newspapers like the *New York Times*.

Of course, the information industry was there before the founding of the IIA, but nobody called it an industry. The situation of about 20 years ago was a lot like the situation in the Soviet Union today. No one questions that in the USSR there is a chemical industry, a steel industry, a textile industry, a petroleum industry, a drug industry, and so on. But in the Soviet Union they do not speak of their information industry. While there are all sorts of information activities in the Soviet Union, they do not yet have the cohesiveness of an industry. This is because, among other reasons, the Soviet Union exports very little information or information technology. This could change once they recognize the potential for information in the world market. This is already happening in Western Europe and Japan.

3. Information literate society

While I think society as a whole has become very information conscious, unfortunately, it is not yet information literate. The IIA defines an "information literate" as a person who knows the techniques and skills for using information tools in molding solutions to problems. The IIA estimates that only about one-sixth of the population in the US is information literate. This prompted the IIA to call for a major national program designed to achieve universal information literacy in the near future. As the information society evolves, we can hope that educators will recognize the importance of training more people in the methods of information handling.

Fortunately, some steps are being taken today to educate children in the use of computers. The Lawrence Hall of Science at the University of California offers computer science classes for children. This year it expects to enroll 40 000 students, 80% of them under age 14. The Marin Computer Center in San Rafael leases small computers to children for \$ 2.25 an hour. The Boston Children's Museum has a major exhibit on computers. In Ann Arbor, Michigan, the Parent Teacher Association recently raised \$ 650 to buy a computer for the school mathematics lab [11]. We may even see children taught how to use computers at home. It seems a logical development from having computers *in* the home. I think it's possible that organized education may be bypassed entirely

in making ourselves and our children information literate. Whether information literacy is achieved inside or outside our school systems, we clearly have a long way to go before it is achieved on a large scale.

4. The information society

But the more information literate society becomes, the greater the demands for services which will make ours an information society. When people in all parts of society have rapid access to the information they want, we can say that the information-conscious society has become the information society. What, exactly, will the world be like then? One can imagine all sorts of scenarios for 2001, but it seems to me from the program for this meeting that the future has been pretty well covered. Need I elaborate on the implications of the personal computer revolution? The PRIMATE™ system, a home and office computer system on the horizon at ISI, would help scientists and scholars keep track of their personal libraries. PRIMATE users would index incoming books or papers according to a system chosen by the user. They could then retrieve information via video screen or printout [8].

Tony Cawkell sees the CONSUMERSOLE as the next step after PRIMATE. CONSUMERSOLE would be a personal information center a person could use to conduct computer searches, exchange electronic mail, display full text copies, and manipulate graphics [2,3]. And I'm sure you are all familiar with PRESTEL, which is now being tested by about 1500 users in the UK. PRESTEL allows the user to tap a central data bank by telephone and read the output on a home television screen [6].

These developments are just a few facets of the personal computer revolution. Reduction in the cost and size of computers can only accelerate the process. The mini and micro computer revolution was not even foreseen a few years ago, but already it looks like PRESTEL, PRIMATE and CONSUMERSOLE may well be the forerunners of the 'World Brain' conceived by H.G. Wells.

Personal computing has even changed our perceptions of what the World Brain will actually be like. Until the last few years, most of us pictured it as an enormous data bank that you could tap through telecommunications channels with a home terminal. Now it is beginning to look as though it will be possible to store something almost as good as a World Brain on

your own floppy disks. As memory becomes cheaper, it might be more economical to duplicate rather than centrally store certain kinds of information, such as graphs, tables, mathematical formulas, and the like. We may not need a centralized World Brain at all. Decentralization seems to be an important implication of the minicomputer revolution.

One could imagine firms competing with each other to sell floppy disk data bases on the same topics. Home computer users will have to decide for themselves what to include in their personal World Brains. Nobody else will make the decisions for them. Fears that government or industry will obtain a monopoly on the flow of information may thus be assuaged.

Once large numbers of people have computers at home, we can expect them to have a great impact on education. Isaac Asimov, an old hand at creating scenarios for the future, sees in computers the possibility of making life better for the elderly. This can be done, he says, through computerized education. Asimov argues that today society assumes education is something only for the young. Graduating from high school or college is a sign of growing up. After that, people tend "to want never to read another book or have another thought." But the wide availability of information through computers will erode this prejudice. It may make it possible for people to continue being educated until the day they die. Thus, the elderly will lead lives that are much more interesting and creative than the way far too many of them live today. Many people will no doubt become self-taught in many subjects before their old age [15]. I think in the UK you would refer to this as the universal open university. In this respect it seems ironic or paradoxical to us that you have the great BBC in the UK while it is in the USA that mass graduate education has been a hallmark of American democracy. Our Public Broadcasting System is only beginning to catch up with the BBC but I think it eventually will. But today BBC and other British material constitutes 6% of the US PBS broadcasting.

I can't see much evidence that the activities of our information-conscious society have yet done much to improve the lot of the elderly, as well as the poor and other underprivileged groups. But the potential is certainly there, certainly if the price for terminals can be brought down to that of the portable typewriter or the transistor radio. Actually, once society realizes how much such devices can cut down the costs of maintaining the handicapped, there will be less reluctance

to spend money on equipment. Today we are seriously contemplating supplying to blind people OCR readers that cost from \$ 5000 to \$ 20 000!

The physically handicapped or shut-ins stand to benefit greatly from developments such as home terminals. It may be difficult for them to make a trip to the library, but this need not deprive them of the use of the library. They could receive information about books, magazine or journal articles, and audiovisual materials through home terminals. Conceivably home terminals could give them the information they need to order hard copies through conventional or electronic mail.

Access to legal information would certainly help women and minorities combat job discrimination. People who feel they are facing economic discrimination could use the terminal to look up the latest court rulings or government regulations on discrimination. They might also find out which agency or court their case should be referred to.

Home terminals could also increase our access to medical information. This would certainly be a boon for everyone, regardless of income level. People could use terminals to read the latest medical texts or articles. They might even retrieve their own medical records. Thus, people may have access to enough information to treat simple diseases, or take steps to prevent major ones like heart disease or cancer. The world of 2001 will be very different from the world of 1979, but some things won't change. It will still be easier and cheaper to prevent most diseases than to cure them.

The management consultant and marketing firm called International Resource Development likens the acquisition of medical information via home terminals to a return of a form of the doctor's house call [9]. We have heard a lot about how technology will dehumanize medicine, as well as drive up the costs. Many of the fears expressed are quite valid. Yet this is an example of how technology might give us back some of the things we have lost. And remember that most patients respond better to a computer than to a doctor in the conduct of examinations. Many patients feel more relaxed dealing with a computer than with an interviewer.

A lot has been said about how our daily lives will be changed in the information society. If you are a music or theater or sports lover, but also travel a lot, imagine how convenient it will be to have access to information on the dates of live cultural or other events anywhere in the world.

The information society can help travelers in other ways, too. Imagine how much money and time the traveler could save if airlines finally write the software for calculating fares on international itineraries. Since some airlines now use computers to print fares on tickets, you might think they have this capacity today. You would be wrong. Just try to make the slightest change in the itinerary and you will soon learn that neither the sophisticated New York air travel agent nor his counterpart in a student travel bureau in Greece has such a capability. The complexity of the tickets issued today is beyond the average human memory. The net result is also total inflexibility in travel except for the very rich.

Telecommunications will no doubt continue to evolve at a tremendous rate. It will be one of the most conspicuous and dramatic elements of the information society. Already such developments as cable TV, communications satellites, and home video recorders promise to change the shape of the entertainment industry. Many people spend large chunks of their lives in front of a TV set. So any change here could result in changes in the way people live. There are signs that this is already happening. For example, I read in a recent *New York Times* story on home video recorders that a woman in Miami has taped a collection of old Shirley Temple movies. She plays them back when she is depressed [12]. Conventional TV networks cannot offer services so immediate and personal. On the other hand, I can assure you from personal experience that the availability of a TV tape recorder in your home or office is a terrible temptation and a costly vice. I have already got a dozen TV programs taped that I have yet had time to see! Nevertheless, I wish I had taped the series on the Holocaust. Since I did not I tried to do so at the New York Museum of Broadcasting. As luck would have it, the day I arrived the Museum was closed for repairs. In any case, the Museum stores thousands of TV programs in its library and makes them available for a fee.

We can expect many problems on the way to the information society, of course. Librarians are going to face challenges adapting to the increased availability of audiovisual materials. They will have to meet an increasing demand for video cassettes, for example. They will have to make room for private and public viewing of cassettes, and determine whether cassettes should be circulated. In America many librarians are facing the problem of censorship of novels and textbooks. The availability of award-winning but con-

troverial films on cassette will only compound the problem [6].

Videotapes and cassettes are already raising another censorship problem outside the library. You can buy cassettes of classic films like *Citizen Kane*, but you can also buy *Deep Throat* and *The Devil in Miss Jones* and *Behind the Green Door*. One videocassette salesman in New Jersey says his store sells 50 times as many tapes of sex films as any other kind! We can expect many to advocate censorship of such cassettes. Related to this is the problem of 'film piracy'. Several American film companies are worried that their films, both the classics and the sexually explicit ones, will be duplicated and sold without the payment of royalties. RCA and Magnavox are already planning to undersell film pirates by marketing videodisk playback systems that will be cheaper than videotape players [13]. All you need to duplicate a tape is a home video recorder. But the equipment used to duplicate disks requires a large capital investment. The expense should temporarily discourage many would-be disk pirates. But I am sure they will find ways to convert disks to tape if necessary. Only a really low cost for disks will discourage large-scale piracy.

5. Electromagnetic pollution

Electromagnetic pollution threatens to be a major problem for the information society. The US National Bureau of Standards says that in the US there are over 8000 radio stations, 900 television stations, 30 million citizens' band or CB radios, and 35 million industrial radio sources. There have been reports of the disruption of many electronic devices, from heart pacemakers to household toasters and televisions. In 1975 about 18 000 trucks were recalled by manufacturers because CB radio interference triggered braking mechanisms [16].

Electromagnetic pollution is obviously not completely the fault of the information community, and its solution does not lie in our hands alone. But our telecommunications systems are going to be a source of this pollution, and our computers may be affected by it. So it may be time to start thinking about how to cope with it.

Regimentation and lack of privacy are other problems we may face. Most adults in the US have memorized their social security numbers out of necessity. Many forms ask for it. We have student IDs, driver's

licenses and credit cards. Many of you have health ID cards issued by the British national health program. We already have MEDICAID and other medical insurance cards in the United States, like Blue Cross cards. Possibly all of these different cards we carry around could be combined into a universal ID card. You could use the same card to pay for medical care or medical information, take a book out of the library, serve as a driver's ID, and so on. Such a universal ID card may represent a great convenience. But it may also pave the way to invasion of privacy, since so much information about you may be accessible to so many. *Washington Post* columnist Fred Reed points out that even benign governments and corporations might, without meaning to, pose a threat to privacy. He says: "Being able to cash a check quickly in a strange city is a blessing that is hard to refuse even though it means having credit records in a data bank." [14]

The US Congress last year passed an important law to protect the financial records of citizens from being examined by the government. Before the act was passed, it was possible for a government agency to examine financial records of citizens without informing them. The new law doesn't forbid the government to seek that information. But it does require agencies to inform citizens that their records are being sought. It also gives a person the right to take the agency to court to challenge the effort, and limits the distribution of personal data between government agencies [4].

I can sympathize with those who worry about privacy because I have fallen victim more than once to the errors that can occur in identification networks. I often get stopped at US customs when returning home. It seems there's another E. Garfield running around the world who is a suspected drug trafficker.

One way to help prevent problems of mistaken identity might be to insist that everybody has enough extra initials to distinguish them from all other people with the same first and last names. In the UK I notice that three initials are not at all uncommon.

Another problem we will encounter in the information society is one that is rooted in the nature of information itself. Lewis Branscomb of IBM wrote in *Science* that the more information you have, the more you want and need [1]. People will have access to large quantities of information, but they will still encounter frustrations precisely because they have

such access. Each new answer generates new questions.

Of course, this disadvantage might be seen as an advantage. Since new discoveries are being made all the time, information is very perishable. In an information economy, this is just the sort of situation you need in order to create employment.

While we are thinking of the problems we may face in the information society, we would do well to remember that the problems are preferable to no information society at all. Information consciousness has gained so much momentum that the development of the information society may seem all but inevitable. Indeed, its development would be hard to stop. But there are ways it could be slowed down. Many of you are probably aware that electronic mail is available in the UK on an experimental basis. It is now being offered to PRESTEL users [16].

The US Postal Service is also trying to start an electronic mail system for business. It says its system could eventually move more than 15 billion pieces of electronic mail a year. But the US Federal Communications Commission blocked the proposal twice within a month's time. The problem appears to be political. The Postal Service has traditionally been in charge of the mails, but the FCC regulates the electronic media. The two agencies can't agree which one of them should regulate electronic mail [9]. I suppose the problem would be similar to competition in the UK between the BBC and the British Post Office! This jurisdictional dispute could delay the introduction of electronic mail in the US for years. Thus, we will have to beware of political pitfalls as well as technological and economic ones.

I have not tried to be comprehensive in my remarks. We will have ample opportunity to discuss these and other topics later in the meeting. I am merely supposed to get you off to a happy start. I certainly cannot promise you that we will all love the world of 2001. But I think most of us are optimistic about the future. The very fact that we have gathered here to talk about it indicates that the future holds a great deal of excitement and fascination for all of us. I mentioned earlier that it was impossible to predict precisely what is going to happen. But that does not mean that making forecasts and constructing scenarios is without value. Trying to anticipate the future will help us to shape it.

6. Conclusion

I've said a lot about the gadgetry of the future. But in closing may I suggest that in the area of fundamental understanding of the basic laws of information science we may well have progressed very far since I entered this field about 25 years ago. Perhaps, like so many other areas of human endeavor, we have a better understanding of our ignorance. And it is precisely because there is so much more we need to learn that our profession remains a challenge both to the young and to the experienced scientists of information.

Just as there is some small percentage of the population which can become competent professional mathematicians or scientists, there is also a limit to the number of qualified information scientists society can produce and support. I believe that in the US, and certainly in the UK, we have far from reached our limit. It is therefore my prediction that by 2001 this Institute of Information Scientists will have grown at least ten-fold and unless everything else I have said here today is absolutely cockeyed then we should not be too surprised if it is closer to 50-fold. If that figure seems absurdly optimistic I will be glad to come back in 22 years and listen to the opening speaker tell me how wrong I was.

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