# SOME THOUGHTS ABOUT THE SOCIAL IMPLICATIONS OF ACCESSIBLE COMPUTING*

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Prominent among the products of technology that have shaped our society are automobiles, electric power, and telephones. They provide us with personal transportation, with aids in our physical labor, and with convenient communication. They have radically altered the pattern of our business and private lives. Nobody will deny that these products of technology have substantially increased our mobility, have eliminated a great deal of tedious physical labor, and have contributed vital threads to the fabric of society and commerce.

Yet, they have also brought to our society ills, frustrations, and problems, few of which seem on the wane. The flight to suburbia in search of more elbow room and greenery has left a disproportionate fraction of economically and culturally underprivileged families in the cities. The same technology which has given us new dimensions in communication has been used to implement eavesdropping equipment. The same power tools and machines that are at the foundation of our industrial society

caused great grief to people whose obsolete skills were their only source of livelihood and pride as working members of society. Finally, automobiles and power tools are causing us to lose our physical stamina, thereby making us easier prey for disease.

The full influence of these products of technology was felt only some years after the underlying technical advances had come to pass; namely, at about the time each of them became accessible to a large segment of the population. We are now at that stage with computers. Technical means are now available for bringing computing and information service within easy reach of every individual in a community. What will be the effect on our society?

Such service will provide to the individual "thinking tools," somewhat analogous to power tools, to aid him in his daily intellectual labor. These thinking tools will increase the power, skill, and precision of his mind, just as power tools today increase the power, precision, and skill of his muscles. As a matter of fact, there is some question whether our increasingly complex society can survive much longer without falling apart from its own weight, unless individual thinking aids become

available. At the same time, the benefits they may bring to society will unquestionably be mixed with a dose of new problems and frustrations.

The following remarks cannot help being superficial because of the great complexity of the issues involved. Not one but several papers would be required to analyze these issues to any depth. Thus, this paper is being presented primarily to stimulate discussion and further thought.

## A HANDLE ON COMPLEXITY

The increasing sphere of influence of all events and human decisions is a characteristic of our society. Any change or perturbation in the status quo has reverberations which reach often into unexpected quarters. The increasing complexity of provisions embodied in our laws, regulations, and business operating procedures means that the individual has to contend more and more often with situations that he cannot personally master. Frustration and loss of time are among the least painful results.

The tax laws are a good example, as well as one of considerable importance to all of us. As a matter of fact, the tax situation of any one particular individual or business is usually rather straightforward. The difficulty lies in reducing general laws and regulations to one's own specific case. The laws and regulations must apply to a great variety of situations and their complexity is probably unavoidable. Examples, which are intended to illustrate application to common situations, are seldom useful, because they differ in some minor detail, not obviously unimportant, from the case of interest. The crux of the matter is that the number of special situations differing in some material details is so great, it would be impossible to explain for each of them the implications of the applicable laws and regulations. Even if it were possible to do so, the individual would still have the problem of finding the one applicable to his case among all possible special situations.

On the other hand, it would be perfectly feasible to write a computer program that would ask pertinent questions, in sequence, and provide necessary instructions and warnings on the basis of the answers supplied by the individual. In its simplest form, such a program would operate as a mechanized income tax form, with the important difference that it would not ask questions clearly inappropriate in view of preceding answers. Of course, com-

putations would be made automatically on the basis of the data supplied, but this would be the least important and least helpful aspect of the program. Such a program would not have to store a dictionary of specific situations, but could work out the logical consequences of the laws and regulations in each particular instance. Where choices were available, an individual could investigate their implications in his own special case and follow the course of action most advantageous to him. One can conceive also of having the program approved by the Internal Revenue Service so that no question would exist about its correct interpretation of the law. Even further, we can envision the income tax laws and regulations being originally prepared in the form of computer programs so that legislators and Internal Revenue officials could explore more accurately and efficiently their consequences. Speculating about such matters is merely an amusing exercise, and at this time we are bound to invent merely the equivalent of a horseless carriage, rather than the modern automobile.

One can think of many other instances in our society where accessible computing service, with the appropriate software, could help individuals to contend more successfully and with less frustration with the complexities of the modern world: from paying bills and balancing one's bank account to planning a will; from budgeting the family income to selecting investments and making plans for retirement. It may seem strange at this time to envision the average man and housewife using a computer. Yet, to some people years ago it must have seemed equally inconceivable and perhaps sacrilegious to allow the average housewife to turn on powerful motors and operate such complex machines as today's automatic washing machines and driers. Not many years ago we would have winced at the thought of allowing teen-agers to spend hours monopolizing such a priceless creation of human inventiveness and technology as the telephone.

## A HANDLE ON INFORMATION

Information is alarmingly plentiful these days. We are dutybound to acquire, record, search, and use it. While a great deal of effort is being spent in acquiring and recording information, our effectiveness in searching and using it still leaves much to be desired. Information has the unfortunate habit of most often being outdated, hard to locate, and re-

corded in a form poorly suited to one's needs. One reason information is often outdated is that it takes so long to collect and process it. Perhaps nothing short of a widespread information and computing service could provide an effective handle on information.

If such a service were in widespread use, information could be acquired and digested in near real-time and automatically recorded in the mass memory of the computer system. Thereby inventories, abstracts, bank balances, and on and on could then be available on a topical basis. The cost of storing information in the mass memory of a computer is still high, but not inordinately so. A page of single-spaced text stored in the disk file of the current MAC computer system costs approximately 10 cents per month. We see no reason why recording in the mass memory of a computer system should not become competitive with other recording media. With all significant actions being taken with the aid of a computer system, the contents of the system's mass memory would provide a complete, up-to-date representation of the state of the community that it serves. Technical means are not lacking for protecting private information from unauthorized access, while at the same time making it available for statistical surveys and other legitimate purposes.

Once the necessary raw data are automatically available in a computer system, we envision the development of programs to answer any well-defined queries; even those not specifically envisioned by the developers of the programs. We do not intend to imply that we or anybody else knows how to prepare such programs yet, but we do not see any major roadblock to progress in this direction. We are optimistic about technological progress, and can envision computer systems that permit communication (voice and other) interspersed with data processing. On a "conference telephone call," the third party would be a computer. Such a system would enhance, by orders of magnitude, the ability of people to interact and cooperate with one another in a manner both convenient and meaningful to each of the individuals concerned.

## THE THREAT TO PRIVACY

The very power of advanced computer systems makes them a serious threat to the privacy of the individual. If every significant action is recorded in the mass memory of a community computer system, and programs are available for analyzing them, the daily activities of each individual could become open to scrutiny.

While the technical means may be available for preventing illegal searches, where will society draw the line between legal and illegal? Will the custodians of the system be able to resist pressure from government agencies, special-interest groups, and powerful individuals? And what about the custodians themselves? Can society trust them with so much power?

These are very difficult questions indeed. For many purposes, information can be depersonalized before it is put into the central file. We can devise means for providing the equivalent of safe deposit boxes for private information. A hierarchical file system, personal and modular on the lower levels, and impersonal and merged on the upper levels, is another possibility. Processing and access by other than the owner could be restricted to the upper levels. In any case, privacy can be preserved if the lower levels are left decentralized.

## THE CULT OF IMPERSONALITY

The use of identification numbers and the issuing of authoritative and authoritarian instructions and answers are associated in the public mind with computers. Of course, these associations are the results of attempts, for the sake of efficiency, to fit people to the capabilities and idiosyncrasies of computers. The attempt to bring computers within easy reach of individuals is in the opposite direction. Proper names and other means of identifying individuals and locations are just as understandable to computers as identification numbers, and are much more pleasant to people. Computer programs can ask and answer questions in a very polite manner, and can even be made to chitchat realistically enough to fool a person for a little while. Computer programs don't have to be authoritarian and can be made to act unpretentiously. They can make suggestions that leave room for choice, simply warn the person that his course of action may be ill-advised, and still allow him to proceed.

There is nothing we can see inherent in the use of computers that will impersonalize, institutionalize, or automate our behavior. The danger lies in ourselves. Through mental laziness, or fear of accepting responsibility, or just plain neglect we may

delegate to computers prerogatives that should remain ours. Computers are literal-minded, as the late Norbert Wiener was never tired of pointing out. They will not take into account any premise, any limitation, or any fact that has not been made available to them. We should never delegate to them either the formulation of our problems, or decisions as to the adequacy of the solutions they produce.

Our institutions are continuously changing, and some of these changes may appear impersonal simply because they are in conflict with the customs ingrained in us from our youth. The widespread availability of a computing and information service will encourage institutions to change in new directions which may well be inconsistent with our present customs. These changes will not be required by the use of computers, but by the needs of institutions themselves. An example we can foresee concerns financial transactions.

Years ago, money consisted of gold and silver coins whose intrinsic value was identical with the nominal value marked on them. With the increasing number of financial transactions, gold coins proved to be too heavy and inconvenient and were relegated to the vaults of banks and to the strongboxes of individuals. Paper currency came into being, and with it a clear separation between the evidence of wealth and wealth itself. The value of paper currency was both guaranteed and enforced by government. Eventually, it became inadequate to the needs of private individuals and businesses, and personal checks came into use. Checks are twice removed from wealth itself, but one can still touch them and carry them in his own pocket. They are still a tangible evidence of wealth.

We are now at the threshold of a further step away from tangible wealth, in our financial transactions. With the same computer system serving banks, stores, business organizations, and private individuals, we will have available a more convenient form of implementing financial transactions. It will no longer be necessary to mail bills and return checks. Yet, each individual will always be able to have a current accounting of his financial affairs and to authorize payments by simply pressing a key. However, will people be willing to accept the reply of a computer system as evidence of their wealth? We think so, given time. But we are also mindful of the fact that many people around the world are still unwilling to accept personal or even travelers'

checks, some don't trust banks and hide currency in their homes, and some refuse to accept anything but gold and silver coins.

UNEMPLOYMENT

Much has been written about unemployment that computer automation has caused, and may cause in the future. An answer often given is that computer automation will create more jobs than it will eliminate. It has been said too that a good man will always find a job, and in any case our affluent society will surely provide a more than adequate livelihood for the jobless. We think such statements miss the mark. The economic aspects of unemployment are only part of the problem. Work is not only a way of making a living, it is also the channel through which one contributes to his family and to society as a whole. Without a job one loses his self respect and the respect of those around him. This is particularly true when the job has been lost to a machine. In our present society, not only must one work to be happy, but one must also feel that he is contributing through some special skill of his own. Competing with a machine is difficult and frustrating, and so is the acquisition of new skills. The most distressing aspect of unemployment is common to the forced retirement of the man who is still physically and mentally fit. Feeling useless in an active society is a sad lot indeed.

Perhaps we can devise better ways of educating people to meet the demands of a changing world and enable them to learn new skills as older ones become obsolete. Perhaps our job-centered society must change many of its present attitudes. In any case, neither of these alternatives seems likely to provide the whole answer. Women have long been faced with "early retirement" to the household, which holds few satisfactions for many. Some women compete with men for jobs effectively; many more spend much of their creative effort in service, social and community or government. Many take up art or music or sports. When all routine and perhaps some nonroutine data collection and processing tasks are performed by computers, many men may have to make similar adjustments. Already our economy is service-oriented. The U.S. Office of Business Economics estimates that today 55 percent of U.S. jobholders are in service industries. The decline in manufacturing jobs began in 1953, but has not produced the expected unemploy-

ment because of an explosive increase in service jobs. Certainly, this is a hopeful sign, but an effort is needed to make a wider range of service jobs socially acceptable.

It has been said that many, perhaps a majority, of people in our society are incapable of anything except routine work. We are unwilling to accept this as a basic premise. Experience shows that people have vast resources, both intellectual and otherwise, which can be brought to the surface by appropriate means. We share the enthusiasm of Dr. George Gallup in the vast potential of people, as yet undeveloped.[1] The limitations we see today in the crystallized part of our population are probably more a result of their past experience than of their basic abilities. One particularly impressive piece of evidence comes from the several high school curriculum revisions undertaken since the middle 1950's. Children are now being taught in high school what their parents or older brothers and sisters were taught as sophomores in college. Typically, it has been found that children can be taught almost anything; the limitations lie in teachers who have difficulty in overcoming their past. The remarkable progress in high school education came from massive efforts in both subject matter and pedagogy.

Similar efforts are underway in continuing education and retraining programs. These are vital to solving the problems of people and machines.

## CONCLUSION

We do not pretend to have answers to the many questions raised here. While we have opinions which tend toward the optimistic, we take for granted that the new resources, among them computers, will be abused as well as used. We believe, however, that abuses (namely those uses which rob us of opportunity and individuality) will be recognized as such, for computers can affect our ethics, creeds, or standards only slowly compared to technological change. Preservation of these will, as always, depend upon the thoughtful and conscientious action of individuals and institutions. In the end, exploitation of computers for the benefit of society hinges upon two pivots: education, and responsible considered action by those of the technical community able to exert some influence.

## REFERENCES

1. G. Gallup, *The Miracle Ahead,* Harper and Row, New York, 1964.