THE COMPUTER AND THE STATE*

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ERRATA SHEET

PAGE	LINE	
1	-3	delete , after computer
2	-12	Gideon → Giedion
3	15	millenium → millennium
5	-2	delete , after old
6	-10	prominance → prominence
	-2	lead of a → lead to a
7	-2	insert , after that
11	13	supposed → supposedly
12	-15	interpendence → interdependence
13	11	cooprative → cooperative
15	-7	principal → principle
19	12	ammended → amended
20	-12	acquitals → acquittals
20	-7	delete ,
21	2	assets → asserts
	8	insert , after technical
	-2	Pesumably → Presumably
23	1	now to turn → now turn

CONTENTS

ABSTRACT

It is obviously difficult (if not impossible) to predict the impact on society of technological innovation. However, it is clear that such major events as the industrial revolution recreate society in a profound and enduring manner. In our own time, the development of the computer promises to transform dramatically the major industrial countries of the world. The resulting effects on the so-called Third World countries will hardly be less significant.

The purpose of this paper is twofold. First, we wish to catalogue many of the ways computers have affected and are likely to affect our daily lives. A second purpose is to employ this analysis to explore the effect of the massive "computerization" of society on a number of its institutions. It is hoped that the material provided will be useful to those whose major concern is the evolution of the modern state in response to technological innovation.

THE COMPUTER AND THE STATE

1. Introduction

Let me begin with the following quotation:

> "There is a time when the operation of the machine becomes so odious, makes you so sick at heart that you can't take part; you can't even passively take part, and you've got to put your bodies upon the gears and upon the wheels, upon the levers, upon all the apparatus and you've got to make it stop. And you've got to indicate to the people who run it, to the people who own it, that unless you're free, the machine will be prevented from working at all."[1]

This may be familiar to some of you. It is taken from a speech by Mario Savio at a sit-in at Berkeley, California on December 2, 1964. For many it was the rallying cry of the protest movement of the 1960's and early 1970's in the United States. What is of concern to me is the metaphor of the state as a powerful machine, not a particularly novel image, I admit, but a surely a persuasive one.

Indeed, in cover story in TIME magazine of April 21, 1980, titled "Is Capitalism Working?",[2] the cover illustration was a stylized machine with a central "$" symbol. This connection between the economy and the machine is not accidental. For the purposes of this paper, the machine should not necessarily be viewed as being composed of gears, levers, wheels, etc. Rather, as befits our age, the ubiquitous computer , is the machine - a number of indescript boxes, a television screen, a keyboard, several tape machines and disk drives - quiet, clean, and somehow threatening.

It is not possible, of course, to present in this brief space a comprehensive critique of the role of computers in our lives. Given that computers are in a very strong sense a natural continuation of technological development, we could turn to a large existing body of commentary on the effects and dangers of technology itself. This includes the writings of such important critics as Lewis Mumford, Siegfried Giedion, Jaques Ellul, Herbert Marcuse, Norbert Wiener, and others. Here we find a number of important warnings and insights which will be a useful guide to what follows. Among these are the following:

- Machine-like notions can be readily perceived in human situations. For Mumford[3] the slave population involved in building the pyramids can be seen as a megamachine, the individual humans analagous to cogs and gears, each performing a limited, repeatable task. Gideon[4] views the assembly-line in a similar manner.
- The claim that technology is neutral and merely a tool which can be used for good or ill is subject to a major critique by Jaques Ellul.[5]
- The association of technology with totalitarianism in the advanced industrial state is a subject for study by Herbert Marcuse.[6]
- Norbert Wiener[7] points out that by virtue of their size and speed, computers go beyond being a tool and in some sense create a new reality.

In an important paper published in 1969 John McDermott[8]

describes technology as "the opiate of the educated public, or at least its favorite authors." He gives a representative list of the fruits of the cornucopia as seen by a number of the so-called prophets of technology; "An end to poverty and the inauguration of permanent prosperity (Leon Keyserling), universal equality of opportunity (Zbigniew Brzezinski), a radical increase in individual freedom (Edward Shils), the replacement of work by leisure for most of mankind (Robert Theobald), fresh water for desert dwellers (Lyndon Baines Johnson), permanent but harmless social revolution (Walt Rostow), the final come-uppance of Mao-Tse-tung and all his ilk (same prophet), the triumph of wisdom over power (John Kenneth Galbraith), and, lest we forget, the end of ideology (Daniel Bell)." We might ask how the computer will make its contribution to the coming millenium?

Contrary to popular opinion, the computer is best thought of not as a giant calculator, incredibly fast and thorough, but rather as an information processor, with almost unlimited potential. Information can be viewed as both its raw material (input) and finished products (output). The ability to process information is what makes the the computer such a significant step in the history of technology. While in the first industrial revolution, machines replaced human muscle, in the second (or third?), computers are replacing the brain. The ability of computers and computer controlled machines to engage in activities formerly the sole province of human beings, brings with it a potentially serious challenge

to human dignity and even human survival. This is a familiar theme in science fiction but unfortunately is not likely to remain fiction.

2. Work: Blue and White

Among the many areas in which computers have had a significant impact we will consider education, health care, justice, privacy, and the political process. But first, there is an effect of modern technology which cuts across all of the above areas, namely, the changing nature of work. From Mowshowitz[9] we have

> Many of the problems associated with automation in present-day industry are traceable to the accomplishments of the previous century, for it was during this period that the principle of treating human labor as an adjunct to machine-based processes was firmly established.
>
> The rationalization of production methods was carried further in the development of the assembly line. Mass production of uniform, inexpensive goods became the central fact of modern life through the pioneering efforts of Henry Ford and others in the first decades of the century. Although mass production methods placed the products of industry within the ordinary worker's reach, they also condemned him to a work discipline characterized by endless monotony and the total absence of any intrinsic satisfaction. The alienation of labor was virtually complete at this stage. What remained for technology to accomplish was the complete elimination of the human element in production.

The words of the workers themselves are striking in that it requires no theoretical appreciation of historical developments to understand one's plight. The aim and methods of the employers are clearly recognized. The effect on one's mind and body are overwhelming, numbing and unrelenting. From Studs Terkel's Working[10], here are the words of a twenty-seven year old, spot welder on the Ford Assembly line on the south side of Chicago:

> I don't understand how come more guys don't flip. Because you're nothing more than a machine when you hit this type of thing. They give better care to that machine than they will to you. They'll have more respect give more attention to that mchine. And you know this. Somehow you get the feeling that the machine is better than you are. (Laughs).
>
> You really begin to wonder. What price do they put on me? Look at the price they put on the machine. If that machine breaks down there's somebody out there to fix it right away. If I break down, I just get pushed over to the other side till another man takes my place. The only thing they have in their mind is to keep that line running.

One might argue that the computer has not played a major role in this situation given that the assembly line predates the development of computer technology. But as is the case with most technological innovation, there is no sharp dividing line between the new and the old. The assembly line itself is becoming increasingly automated with the cry of "Reduce the robot gap" occasionally achieving prominance over references to that other so-called gap. The longstanding fear of widespread unemployment resulting from increased automation may finally be realized with the integration of the computer into the assembly line. This will be real unemployment, not the displacement of workers, for in some real sense there will no longer be jobs available anywhere for displaced workers. In some industries such as newspaper printing the introduction of the computer will inevitably lead of a drastically reduced work force and a dramatically altered workplace. The

printers' union in New York has been willing to acquiesce in its own eventual extinction in exchange for improved benefits for its current members.[11]

Much concern has been voiced recently about the increasing use of robots on the assembly line. The main focus has been to point out the large lead presently held by the Japanese over the United States. Industrial robots have come to serve as yet another explanation for the failings of that former paragon of the United States industrial might, the automobile industry. To a greater or lesser degree the robots being used on the assembly line are controlled by small computers or microprocessors, yet another instance of the considerable impact of computers on society.

In the white collar environment the increasingly frequent introduction of computers is producing a situation which is similar to the existing industrial model. The computer centralizes control and decision-making thereby reducing individual responsibility. Jobs are redefined, circumscribed, fragmented, and deskilled. Workers no longer see the larger picture but, in direct equivalence to the limited range of jobs on the assembly line, perform a small, repeatable task. The computer manager and his* top staff (* not sexist but all too accurate) have access to information associated with the structure and functioning of the division or company while the average office worker has been reduced to that by now familiar, cog or wheel.

Middle management will suffer the most as their

responsibilities are assumed by the data processing division. Ordinary office workers, mainly women, will find their jobs integrated into computer related activities including data input, word processing, and report generation. Senior management will still be involved with decision-making with the computer providing processed data. Next we turn to some specific applications of computers.

3. Computers Everywhere

In the various areas under consideration, the major concern is with what is unique to and most directly a result of the introduction of computers. Thus the purely administrative use of computers is not an important issue except as related to the more general questions of the transformation of the work environment. Therefore, I take it for granted that computers are used for worker records, payroll, inventory, sales, taxation information, scheduling, and many other purposes.

3.1 Education

The introduction of new technology often creates a new academic discipline and in this case the new field of study is called computer science. The major effort of departments of computer science, whether in universities, colleges, or technical institutions is to train programmers to assume their roles in companies both large and small. Even a casual perusal of newspaper want ads will show a continual demand for computer operators, programmers, and managers. And so the educational establishment ever responsive to the needs of society - industry - is turning out ever increasing numbers of technicians.

Aside from their use in the training of technical specialists, computers are gradually becoming more involved in the basic process of education itself. Such terms as

computer-aided or computer-assisted instruction are used to describe the direct incorporation of computers into the educational process. The virtues of such a system are supposedly many, including the maintenance of detailed and comprehensive records, infinite patience and attention to detail, the freeing of the teacher for more personal interaction, and, at least for the future, an improved cost-benefit balance sheet. Consider the following paragraph taken from a study by U.S. News and World Report[12]:

> A well-programmed computer can keep a student at an assigned task until it is mastered, while a teacher might present a lesson and move on to something else - whether the student understands or not. Also, unlike most teachers, the computer is endlessly patient, running until it is shut off. "When I want to shut it up, I can shut it up," remarked one youngster seated at a terminal apparently trying to prove that he controlled it, not him. In addition, the computer can substitute for missing teachers. And it has no biases. As one young user is said to have remarked to a classroom visitor: "I like the computer. It doesn't know I'm black!"

Trust this magazine to inform us that computers have no biases. Granted, at present, they cannot perceive the skin colour of the user but they have surely been programmed with some purposes in mind beyond purely educational ones. Furthermore, given the large cost of developing software, it will be necessary to centralize the educational system to take advantage of computer programs. Thus as in many other aspects of computer technology the centralizing tendency will manifest itself; it will be more economical to minimize the number of computing sources of educational programs.

The dominant role of the state will be continually

increased as the use of computers becomes more widespread. Education as a integral component of the current political orthodoxy will become even more important. The design, development, and distribution of educational technology will itself be a major industry largely under the control of those companies large enough to finance the start-up costs. It is no accident that such giants as IBM, Xerox, and Honeywell are major corporations in the rapidly growing field of educational technology. And note that these companies did not become large and powerful because of their expertise in education but rather because of their technical, marketing, and financial expertise.

One of the supposed favourable features of computers in education is their neutrality or lack of bias. Thus a student sitting in front of a terminal is supposed to feel quite comfortable in the knowledge that he or she will not be picked on, or singled out for special treatment. What is being encouraged is a form of alienation of a particular insidious kind. The message is that people are problematical; they get irritated, angry, sometimes they are pleased, sometimes nervous, occasionally rude, often friendly, usually busy. In other words they are human whereas computers are even-tempered, patient, uncomplaining, always ready, never too busy. The message is clear - for a hassle-free life deal with machines.

Within the computer trade, people who spend inordinate amounts of time with computers at the cost of developing human

relationships are called hackers. A recent issue of Psychology Today[13] contained a series of letters (all written on a computer, of course) called the "Hacker Papers" in which one such individual bemoaned his fate and promised to give up computers and return to people. This is probably not a widespread phenomenon but, as for the future, the question is open.

In contrast to this extreme form of alienation, Ivan Illich[14] holds out the possibility of the creative use of computer networks in fostering what he calls, conviviality, defined in the following:

> I choose the term "conviviality" to designate the opposite of industrial productivity. I intended it to mean autonomous and creative intercourse among persons, and the intercourse of persons with their environment; and this in contrast with the conditioned response of persons to the demands made upon them by others, and by a man-made environment. I consider conviviality to be individual freedom realized in personal interpendence and, as such, an intrinsic ethical value.[15]

Now the crucial point for our purposes is his notion of "tools for conviviality".

> Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his meaning in action.[16]

Although Illich does not mention computers explicitly, they have the potential to be tools for conviviality, par

excellence. Indeed, there are attempts to use computers creatively in education by exploiting the natural curiosity of children. Programming a computer which is connected to such devices as a music synthesizer, a mechanical bug with a retractable pen, and a video screen, can be an exciting intellectual experience and fun to boot. The involvement is not just between the child and the computer but takes place in a community of children and instructors interacting cooperatively.[17] It is even possible to extend such interesting and, yes, exciting, play to the community at large. In a number of cities cooprative computer networks have been established to promote and encourage the active participation of as many people as possible. This is a hopeful precursor to the development of a grass roots computer literacy.

3.2 Health Care

If any field is ripe (or overripe) for computerization it is health care where rapidly rising costs and degraded service go hand in hand. It is easier to find money for costly hospital facilities, and special purpose equipment than for say para-medical people who can help reduce illness and death by improved educational and preventive methods. A significant improvement in general health could also be achieved by requiring corporations to be responsible both towards their employees at work and towards the public at large with respect to environmental hazards and pollution. As

part of increased expenditures on capital equipment, computers are being promoted in such areas as medical record taking and keeping, and automated monitoring and diagnosis systems.

As a record maintenance system, computers are invaluable and make possible the quick accessibility of records. With computers hooked up over long distance lines into networks it will be straightforward to transmit medical files, as well as general medical information. All this is good but several issues emerge. There is the question of who has access to medical records. (After three years of hearings an Ontario Royal Commission[18] on the use (and misuse) of medical records recommended that a fine of ten thousand dollars should be levied against anyone releasing information without the owners' permission. The report noted a considerable traffic in medical records without regard to privacy and sought to define guidelines. In a society in which private information is just another commodity available for profit, it is not surprising that the right of the individual to control personal information is barely recognized.

The patient's right to view his or her own medical file is similarly not yet recognized. Among the parties interested in medical records are insurance companies, health plans, drug companies, medical equipment manufacturers, employers of all kinds, educational institutions, and governments at various levels. Underlying the discussion in this paper is the claim that the trafficking of information is a major industry. A

variety of companies, as is often the case in a free enterprise system, have seen an area for exploitation. After a sufficiently long lead time, governments finally hearing the complaints of the aggrieved citizenry, begin to consider a system of regulations, careful not to violate existing "legitimate" business needs.

Another issue to be considered briefly is the possible dehumanization of the patient - doctor relationship. Of course one may immediately question the quality of such a relationship in a system of medical care as currently exists in the United States and as may come about in many parts of Canada if doctors opt out of medical plans. But even if we assume an acceptable relationship, the increasing intrusion of medical diagnosis by computer may seriously alter it. It is argued that computers will be able to incorporate vast amounts of knowledge and diagnostic skills beyond the ability of ordinary physicians and in fact have been and will be programmed to simulate the behaviour of the physician.

Such systems are not currently operating independently but play both a support function and an educational one in the training of doctors.[19] In principal one should welcome such an advance which permits the best knowledge and methods to be saved and used for future service but there are some nagging doubts. How will computers respond to a patient's fears and needs? Given computer support, will doctors increase their work load and have less time to spend in face-to-face situations? Where will the responsibility for error lie -

with the physician from whom the original knowledge was taken, with the programmer, computer manufacturer, or operating company? Will the benefits reach the poor or, as is not uncommon, only the rich who are already well-served? Who will regulate the new industry?

3.3 Privacy and Justice

Privacy, as an issue, has already emerged in the discussion of the control of medical records. It is a difficult concept to define adequately, but consider the following:

> Judge Louis Brandeis: privacy is "the right to be let alone is ... the most comprehensive of rights and the right most valued by civilized man."[20]

One of the leading figures in the exploration of the role of privacy in the age of computers is Alan Westin, of Columbia University. The privacy concept is:

> "the claim of individuals, groups or institutions to determine for themselves when, how, and to what extent information about themselves is communicated to others"[21]

It is difficult, if not impossible, to define the concept of privacy in an absolute sense. For example a balance must be achieved among the right to privacy, the freedom of speech, and freedom of the press. From the government's point of view a right to privacy may interfere with its essential operations. For example, census information is necessary to facilitate government planning in

a variety of areas. Conversely an informed citizenry demands that most of the operations of government be open and available for inspection. These problems are not new but once again the computer has changed the scale of operations in a dramatic fashion. Massive files can be accumulated, accessed, updated, searched, and interchanged, usually without the knowledge of those involved. The real and potential impact is enormous.

Consider the variety of information which is held somewhere on every individual in society: medical, educational, financial (credit, savings), taxation, criminal, property, marital, political, family, etc. We are well aware of many of the uses and misuses to which this information can be put. And unfortunately those agencies large enough to accumulate and service the enormous data banks necessary to store such information are not always benign in their aims or methods. One need only think of the massive surveillance effort in the United States during the Vietnam war the purpose of which was to identify actual and potential dissenters to the American war effort. Although peaceful dissent is a constitutionally guaranteed right, there was nothing to prevent the F.B.I., the National Security Agency, state and local police, the department of defense, the attorney general's office, and others from compiling dossiers on any individual considered to be a possible threat.

In Canada, recent revelations of the behaviour of the RCMP give the average citizen much to be concerned about.

Investigations were launched, individuals were placed under surveillance, offices were broken into and records removed, infiltrators were placed in legitimate organizations, and crimes were committed to discredit these organizations. All this was done apparently without the knowledge of superiors or the consent of the judiciary. There is little comfort in all this for the future security of computer-based private information.

The role of computers is indispensable in this activity given the large number of people under investigation. Their use also makes possible the rapid searching of different data bases in order to assemble information from a wide variety of sources. Thus another powerful tool has been put at the service of precisely those institutions whose historical purpose has been the increase and concentration of power. Any analysis of the structure of government must be concerned with these issues.

In the so-called private sector a major industry has arisen in the last few years whose sole concern is the supplying of credit information on individuals to such clients as banks, credit-card companies, insurance companies, and department stores. One of the largest of these is the Retail Credit Company with headquarters in Atlanta, Georgia.[22] As of 1974, this company had thirteen hundred branches in North America and maintained files on forty-eight million citizens gathered by five thousand field investigators. Its total revenues were two hundred and sixteen million dollars in that

year. They claimed to be making reports at the rate of twenty million people a year. It was only with the revelation of rapidly proliferating abuses under such a system that governments, both in Canada and in the United States passed legislation to control the worst violations.

Individuals refused insurance, loans, or mortgages on the basis of adverse credit ratings provided by such companies have been given the right to examine their files and answer the negative entries. But depending on the legislation, individuals may or may not know if information is being held on them, if it has been made available to other agencies, or if it is being ammended. Thus there exists a vast information network, in parts disjoint, in others loosely connected, with an incredible variety of information about anyone who has become involved in any aspect of the credit system. In addition, much if not all of this information is regularly available to law enforcement agencies without special court injunctions. As it turns out the police have their very own data bases as well.

In the United States, there is something called the National Crime Information Center (NCIC) which, as of 1975, contained 5,500,000 active records covering such areas as wanted persons, vehicles, identifiable stolen articles, guns, criminal histories, and others. In that same year, 62,000,000 inquiries were made resulting in 323,000 verficiations.[23] Superficially it would seem that the NCIC is a useful example of computer technology, helping police and protecting the

public. However when a small community in Massachusetts was considering hooking its police department into the system, Stanley Robinson, a computer expert, raised some persuasive arguments against this. He claimed:

> that the "criminal histories" maintained by the NCIC are usually nothing more than ordinary arrest records. In many urban ghettos nearly every adult male has been arrested at one time or another during intense police "sweeps" in the area. Thus the system tends to discriminate against "the poor, the black, and the political radicals ('troublemakers')[24].

Also many forms of arrest records do not contain information on the results of the arrest, such as, dropped charges, acquitals, and appeals. As Robinson points out,

> Even when complete records are kept, arrests that do not stick are still listed, creating suspicion - indeed, a presumption - of guilt that can lead to further arrest and harassment.[25].

Political dissent, continues to be a dangerous way of life. The threats to the open exchange of knowledge, to the peaceful petitioning of governments to redress grievences, and to the holding of meetings to express political views are self-evident given the powerful information gathering and processing capabilities of various agencies of government and the private sector.[26]

3.4 The Political Process

> Today political power assets itself through its power over the machine process and over the technical organization of the apparatus. The government of advanced and advancing industrial societies can maintain and secure itself only when it succeeds in mobilizing, organizing, and exploiting the technical scientific, and mechanical productivity available to industrial civilization. And this productivity mobilizes society as a whole, above and beyond any particular individual or group interests. The brute fact that the machine's physical (only physical?) power surpasses that of the individual, and of any particular group of individuals, makes the machine the most effective political instrument in any society whose basic organization is that of the machine process.
>
> Herbert Marcuse[27]

In developing his theme of the One Dimensional Man, Marcuse describes the relation between people and their things to which may be added, in a natural extension, the computer.

> We are again confronted with one of the most vexing aspects of advanced industrial civilization: the rational character of its irrationality. Its productivity and efficiency, its capacity to increase and spread comforts, to turn waste into need, and destruction into construction, the extent to which the civilization, transforms the object world into an extension of man's mind and body makes the very notion of alienation questionable. The people recognize themselves in their commodities; they find their soul in their automobile, hi-fi set, split-level home, kitchen equipment. The very mechanism which ties the individual to his society has changed, and social control is anchored in the new needs which it has produced.[28]

Marcuse argues that ultimately automation will lead to a socialist state after the capitalist industrial machine has done its worst. Pesumably, when the workers assume control of the means of production, they will humanize the work place,

freeing the workers from boring and dangerous jobs, not to maximize profits but to liberate the human spirit. Evidence for such a transformation is not forthcoming in the experience of contemporary socialist states other than perhaps from the printed word:

> "The Party regards scientific and technical progress as the core of its entire economic policy. It must penetrate all fields of production, encompassing daring scientific discoveries, hundreds and thousands of improvements in technology, new mechanisms and instruments - all that saves and facilitates work, that makes it more productive and interesting. 'In the final analysis,' said Lenin, 'labour productivity is the most important, the most essential thing for the victory of the new social system.' This Leninist injunction has assumed particular importance in the present epoch, an epoch of scientific and technological revolution. And our party never forgets about it."[29]

The political process itself will be profoundly affected by the increasing mechanization (or computerization) of society both in the process of selecting governments and in the behaviour of such governments. Witness the reliance on polls, computer projections, and the role of computers in political organizations. Consider the effect on the last presidential election in the United States of special interest groups with large computerized mailing lists. Together with a narrowing of issues, and an appeal to somewhat primitive passions, such groups were able to raise large amounts of money and to bring about the defeat of a number of liberal politicians. The use of computers in elections is relatively limited in Canada but we can expect the larger and wealthier political parties to use them to the detriment of the

population at large. We will now to turn, briefly, to some of the uses of computers by governments, noting that their use in record keeping and surveillance has already been mentioned.

We should not be surprised that governments, at least in industrialized countries, are the single largest users of computers. They are obviously indispensable for budgeting, health and welfare, taxation, the census, communication, natural resources, in fact almost any area of one can think of, but especially the military. For planning, control, communication, and administration, computers are an absolute necessity to a modern military establishment. For the United States, the Vietnam war has been called the most computerized war in history. Consider the following from a book which explores the role of computers in defense policy:

> Almost from the outset, Vietnam has been the fullest gamed, fullest analyzed, and most intensively "planned" war in history. It may not have been literally planned by computer. (To my knowledge, no operational decisions have yet been taken on the basis of computer games like AGILE.) But all the neat concepts of the computer games are directly interchangeable with those taught at U.S. Army and Special Forces schools.[30]

The entire system of nuclear threats, built on missiles and bombs requires a vast computer network for recognizing dangers, evaluating alternatives, determining appropriate responses, and implementing these decisions.

Governments, their power enhanced by computers, can attempt activities not previously anticipated by political theorists. Granted these activities may not be discontinuous with past performance, but the scale has changed and increases

in scale can mean both changes in degree and kind.

3.5 Future Developments

The future seems to hold more, smaller, faster, and cheaper computers (or microprocessors) appearing everywhere. One hears about computerized houses, in which computers control the lights, the heat, the ventilation, the entertainment, the security and fire alarm systems, the planning of meals, the keeping of records, etc., etc. Electronic games, digital watches, calculators, home computers are by now pervasive. (One sometimes longs for hands on a clock and sure enough, a company has marketed a watch which has both hands and a digital display!) Automobile manufacturers, in an attempt to improve fuel consumption, have developed microprocessors to monitor engine performance and determine optimal fuel flow. There hardly seems to be a threat or danger in any of this except for the inexorable process of mechanization.

However, there are potential developments arising from research in an area known as artificial (or machine) intelligence which may not be harmless. For example in the mid 1970's a major research effort was launched by the Advanced Research Project Agency of the U.S. Air Force to develop a speech understanding system. This would permit a computer to receive tapes of spoken language and to produce accurate transcripts. Even though the specifications, in terms of subject matter, variability of speakers and

conditions were restricted, only limited success was achieved. Nevertheless, it was pointed out that such systems could be used by intelligence agencies to monitor the large number of tapes produced from phone taps and bugs. The computer would not have to understand the conversations merely be able to recognize certain topics triggered by key words.[31] Such fears were scorned with replies that the direct military applications were obvious, for example, in voice activated systems on aircraft. But would governments resist the use of such a tool if available?

Other applications on the horizon include the automatic and intelligent analysis of satellite images for agricultural, mining, forestry, and fishery purposes, to say nothing of military ones. The improvement in abilities of industrial robots is also an important aim. This could be done in a number of ways by equipping them with sensory devices such as fine touch and vision. And of course such robots could be used in areas other than assembly lines - mining, ocean exploration and rescue, and other hazardous jobs. It will also be possible to allow non-specialists access to large data bases by the development of natural language (read English) interfaces. The major direct beneficiaries are likely to be company managers, and military commanders, reason enough for large military funding in this area.

Finally, I would like to mention the development of home information systems and the computerization of national and international finance. There has been considerable

publicity about a Canadian home information system called Telidon.[32] The average citizen sitting in front of his or her television set, equipped with a keyboard, is to be given access to vast amounts of information stored in central computers, transmitted over telephone lines and displayed on the video screen. This network will ultimately have the capacity to link individuals as well. The enormous resources of the communication and computer industries are being brought to bear in this area. There is enormous competition among Canada, the United States, Britain, and France to produce the standard system for the rewards are also enormous, or so it is believed. Some people believe that Telidon has great potential for bringing to the general population the benefits of the computer without the necessity for capital investment. Illich's tools for conviviality may be realized in a Telidon-like network.

The acronym EFT may not signify much at this point; it stands for Electronic Funds Transfer.[33] The idea is to eliminate the role of cash, cheques and credit cards in financial transactions. In the future (and in some places now), a purchase will involve the electronic debitting of an account the purchaser's - and the almost simultaneous creditting of another - the store's. If the funds are not available the transaction will not be completed. Such a system will require a network of 'point-of-sale terminals' controlled by very large computers. Electronic records of every transaction made by an individual will be available for

scrutiny. For the average person yet another aspect of life will be centrally controlled with no obvious benefit to the individual.

4. CONCLUSIONS

As may be appreciated the issues raised here are representative not exhaustive. The euphoric predictions presented at the outset should be contrasted with such clear and present dangers as the threats to privacy, growing alienation, the possible fruits of automation, and an increase in the power of the state. We have failed to mention the role of computers in world affairs. In sheer economic terms the importance and predominance of the United States cannot be overestimated. Unfortunately in many instances, computers supplied by western countries have been used to support suppression in various parts of the world. A significant example is South Africa where IBM, Burroughs, and other companies have provided computers used by the military and police forces.[34]

It is a difficult problem to determine the effect of technological change on social and political structures. A study of the past is informative but predictions of the future have not been particularly accurate. Any analysis of the future of society must take into account developments in science and technology, of which computers both large and small, are an important ingredient.

As with most technological innovation, the choice of when and how to proceed is not usually left up to the individual members of society. Governments and companies, both large and small, multinational and local, have the power

and money to make the decisions. As ordinary citizens we must live in a world which for the most part is not of our making. We must try to regain and maintain our humanity in a world of machines. Discussing the nature of a liberal democracy, C.B. Machpherson discusses the opinions of John Dewey and notes:

> He had few illusions about the actual democratic system, or about the democratic quality of a society dominated by motives of the individual and corporate gain. The root difficulty lay not in any defects in the machinery of government but in the fact that the democratic public was 'still largely inchoate and unorganized' and unable to see what forces of economic and technological organization it was up against. There was no use tinkering with the political machinery: the prior problem was 'that of discovering the means by which a scattered, mobile and manifold public may so recognize itself as to define and express its interests'. The public's present incompetence to do this was traced to its failure to understand the technological and scientific forces which had made it so helpless.[35]

NOTES

1. From a speech by Mario Savio, Sit-in Rally, December 2, 1964, Berkeley, California. Transcribed from "Is Freedom Academic?" A documentary of the Free Speech Movement prepared by radio station KPFA.

2. Cover of Time, April 21, 1980, "Is Capitalism Working?"

3. Lewis Mumford, The Myth of the Machine, Vol. 1. Technics and Human Development, Vol. 2, The Pentagon of Power. (New York: Harcourt Brace Jovanovich, Inc.) 1967, 1970.

4. For a brief but excellent discussion of Siegfried Giedion see, William Kuhns, The Post-Industrial Prophets (New York, Harper Colophon Books, Harper and Row, Publishers) 1971, pp. 65-81.

5. Jacques Ellul, The Technological Society (New York: Vintage Books) 1967.

6. Herbert Marcuse, One-Dimensional Man (Boston: Beacon Press) 1968.

7. The following sources are useful for an understanding of Wiener's position: N. Wiener, "Some Moral and Technical Consequences of Automation," Science, Vol. 131, May 6, 1960, pp. 1355-1358.

   (See also A.L. Samuel, "Some Moral and Technical Consequences of Automation - A Refutation", Science, Vol. 132, Sept. 16, pp. 741-742).

   N. Wiener, The Human Use of Human Beings (New York: Avon Books) 1967 (originally appeared in 1950).

8. John McDermott, "Technology: The Opiate of the Intellectuals," New York Review of Books, Vol. 13, July 31, 1969. McDermott's article is a review of the Program on Technology and Society Fourth Annual Report: 1967-8, Harvard, 96pp.

9. Abbe Mowshowitz, The Conquest of Will: Information Processing in Human Affairs, (Reading, Mass.: Addison-Wesley Publishing Company) 1976,pp. 85-86.

10. Studs Terkel, Working (New York: Avon Books) 1975, p. 223.

11. An interesting and detailed analysis of the issues involved in this agreement can be found in a recent book. Theresa F. Rogers and Nathalie S. Friedman, Printers Face Automation (The Impact of Technology on Work and

Retirement among Skilled Craftsmen) (Lexington, Mass.: D.C. Heath and Company) 1980.

12. This quotation is taken from a chapter titled, "A New Tool in Education" in the book, The Computer: How It's Changing Our Lives (Washington, D.C.: Books by U.S. News and World Report) 1972, p. 44.

13. "The Hacker Papers," Psychology Today, Vol. 14, No. 3, August 1980, pp. 62-69. In the same issue see Philip G. Zimbardo, "The Age of Indifference", pp. 71-76.

14. Ivan Illich, Tools for Conviviality(New York: Perennial Library, Harper and Row, Publishers), 1973.

15. Ibid., p. 15.

16. Ibid., p. 23.

17. Much of the interesting work in this area has been done at the Massachusetts Institute of Technology under the direction of Seymour Papert.

    Seymour A. Papert, "Computers and Learning." In Michael L. Dertouzos and Joel Moses (eds.), The Computer Age: A Twenty-Year View (Cambridge, Mass.: The MIT Press) 1980, pp. 73-86.

18. Report of the Ontario Royal Commission of Inquiry into the Confidentiality of Health Records. (Toronto, Ontario: The Queen's Printer) 1980.

19. Much of the discussion of work in this area is quite technical but the introduction in the following book is helpful: Edward H. Shortliffe, Computer-Based Medical Consultation: MYCIN (New York: Elsevier) 1976.

20. Judge Louis Brandeis, U.S.A. Supreme Court minority opinion, 1920. Quoted in Tom Logsdon, Computers and Social Controversy (Potomac, Maryland: Computer Science Press, Inc.) 1980, p. 136.

21. Alan F. Westin, Privacy and Freedom (New York: Atheneum) 1970, p. 7.

22. For an introduction to some of these issues see, Thomas Whiteside, "A Reporter at Large: Anything Adverse?", The New Yorker, April 21, 1975, pp. 45-101.

23. J. Mack Adams and Douglas H. Haden, Social Effects of Computer Use and Misuse (New York: John Wiley) 1976. Quoted in: Logsdon, op. cit., p. 147.

24. The Quality of Justice in Lower Criminal Courts of

Metropolitan Boston, Lawyers Committee for Civil Rights Under Law, 15 Broad Street, Boston, 1970. Quoted in Logsdon, op. cit., p. 147.

25. Ibid., pp. 148-149.

26. This is a very important subject and many studies have been carried out. Of particular importance to Canadians is a report called, Privacy and Computers by a Task Force established jointly by Department of Communications/Department of Justice, Information Canada, 1972.

27. Herbert Marcuse, op. cit., p. 3.

28. Ibid., p. 9.

29. L.I. Brezhnev, Following Lenin's Course, p. 444. Quoted in, Soviet Democracy in the Period of Developed Socialism (Moscow, USSR: Progress Publishers) 1979, pp. 250-251.

30. Andrew Wilson, The Bomb and the Computer (New York: A Delta Book, Dell Publishing Co.) 1968, p. 203.

31. For a discussion of these issues by a serious critic of the intrusion of computers into human affairs, see the following:

Joseph Weizenbaum, Computer Power and Human Reason (From Judgment to Calculation), (San Francisco: W.H. Freeman and Company) 1976, pp. 270-280.

32. David Wright, "Telidon: Is there a Good Market for a Good Technology," In Search, The Canadian Communications Quarterly, Winter 1979.

33. A good source of information on EFT is a Special Issue on Electronic Funds Transfer, Communications of the Association for Computing Machinery, Vol. 22, No. 12, December 1979.

34. Richard Leonard, "Computers in South Africa: A Survey of U.S. Companies", In Rita Arditti, Pat Brennan, Steve Cavrak (eds.) Science and Liberation (Montreal: Black Rose Books) 1980, pp. 191-214.

35. C.B. Macpherson, The Life and Times of Liberal Democracy (Oxford, U.K.: Oxford University Press) 1977, p. 73.