Computer Illiteracy and Human Services
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The current electronic information revolution has produced several negative effects, one of which is computer illiteracy. This article discusses the causes, major victims, and consequences of computer illiteracy. The article concludes with the new challenges that this modern day social problem poses for human services

Introduction

The aim of modern technology has been to solve a variety of problems. However, technological revolutions leave in their wake social upheavals, as new technologies trigger sweeping changes in people's values, emotions, modes of communication, life styles, norms, rules, and sentiments. (McHale, 1976). Illich (1976), for example, referred to the negative effects of modern medical technology creates while solving existing problems. Perwitt (1983) referred to these negative effects as the "bittersweet" principle of technological change. Lawless (1977) cited over fifty cases in which technology has side-effects detrimental to society. He noted that the first stage in society-technology relationships is adaptation, but that it is only when negative consequences are publicised that the later stages of criticism, shock, and awareness to new problems follow.

Cnaan (1985) noted a wide range of possible negative consequences which may stem from the electronic information revolution. The most fundamental problem associated with this new technology is, undoubtedly, computer illiteracy. Some claim that computer illiteracy is an ephemeral social problem that will be solved within a few generations (Meznies, 1982; Simon, 1977), while others disagree. Nevertheless, computer literacy is the gateway to the new information age. Human services therefore have an important role to play in developing new methods to cope with the problems caused by the new technological tools and to help people adapt to the new technology.

This article focuses on computer illiteracy: its origins, potential victims, and consequences. In this article, computer illiteracy is reviewed as a social problem, one that poses a new challenge for human services which must develop new social policies to address as well as help prevent the problem.

Computer Illiteracy: Major Causes

There are many reasons why individuals cannot acquire basic computer skills. First, those who can neither read nor write obviously have not mastered the basic alphabet. This presents a major obstacle to even minimum computer literacy.

Second, in the United States, the availability of computers in schools is limited. In 1983, the median student-to- computer ratio was 125-to-1 at the high school level (The Johns Hopkins University, 1983). The average time that students actually worked on computers was 15 minutes a week. It is obvious that only the most motivated students, who are willing to work on the computer after school, will become computer literate. Moreover, many school computers are often used solely or mostly for computer-assisted learning (CAL). In such cases, students get very little experience and time for real computer literacy (Becker:1982; Sheingold, Hawkins and Char, 1984).
Third, the student-computer ratio in schools, mentioned previously, is by no means uniform. This unequal ratio, as will be later discussed, favours white, suburban, male students over minorities, inner city, rural and female students. Generally, the schools in wealthier communities not only have more computers but also buy more equipment (Quality Education Data, 1984; Zakarya, 1984). Thus there is an issue of diffusion and opportunities.

Fourth, computer languages are wrongly compared with foreign languages. Learning a computer language is not primarily a matter of linguistics but of a precise new logic that requires an adjustment in thinking methods. Once the thinking method is acquired, additional computer languages may come relatively easily. The problem however is learning the first computer language. Learners find it difficult to adjust to the rigid logical restrictions required by the computer language. For example, computer languages require detailed and exact repetitions over and over. Few deviations are tolerated. There is no body or sign language, terms cannot be defined ambiguously, and more often than not, a minor mistake can be responsible for failure to get results (Kemeny, 1983). Comparing computer science to the natural sciences is also misleading. Menosky (1984) noted that many people wrongly assume that computer programming requires a background in advanced math and even physics and chemistry.

Fifth, Sproull et al. (1984), in their study of undergraduates required to take computer courses, identified three stages of psychological adjustment to this unfamiliar new technology. First, almost all new students encountered reality shock followed by confusion. Next, the students attempted to re-establish control. Finally, successful attempts to control led to adaptation, while failure to regain control led to anger and feelings of loss. Anger possibly could lead to successful control but, "if control attempts are successful, anger or withdrawal ensues and the person is likely to become a cultural dropout" (Sproull et. al, 1984: 35).

Sixth, people who once were computer literate and had mastered one or more computer languages, either in school or on their jobs, may either move to non-computerised jobs or be required to use a different type of computer. In the latter case, the switch, whether from a mainframe to micro, from batch to interactive, or from IBM to Digital, may be too demanding and involve logic that seemed to be totally different. As a result, those who once considered themselves computer literate become illiterate. Continual learning is essential in order to keep up with the rapid developments in computers and computer languages.

Seventh, resistance is the term mostly associated with automation in the workplace. Taylor (1981: 57) argued that "the computer always threatens to disrupt the power balance within an organization". The threat of the computer is perceived in many ways: constant monitoring, loss of autonomy, status struggle, information leaks, legal concerns, and fear of an imbalance of power (Boyd et al., 1980; Hammer and Hile, 1985). Furthermore, members of the organization may have different, even contradictory expectations concerning the computer (Craig, 1984). Whatever the reason, resistance to computer applications in the work-place is another cause for increased computer illiteracy, since those who object to computerisation are unlikely to learn new computer skills.

Eighth, resistance to computerisation is rarely due to cyberphobia (computer-related anxiety) or technophobia (anxiety related to the use of many modern tools). Frideres et al. (1983) found little
evidence of technophobia in today's society. Rice, (1983), on the other hand reported a few studies which specifically measured cyberphobia. One such study found that nearly one third of the people who approached terminals exhibited galvanic-skin responses at the level of anxiety. In such cases, cyberphobia could be an obstacle to computer literacy.

Ninth, Lindblom (1959), in his seminal paper on the science of "muddling through", has unintentionally predicted opposition to computerisation. As Lindblom noted, as long as we can "muddle through," doing what we did yesterday and making minor adjustments here and there; successfully using intuition, experience, rule of thumb, experts; opinion and messages from our environment, why invest in planning and data processing? According to such thinking humans solve problems, not by wasting resources, but by incremental adjustments, therefore computerisation is opposed as contradictory to human nature and a waste of energy. When this kind of technological conservatism prevails, computer literacy is ignored.

Finally, a major cause of computer illiteracy is the lack of appropriate role models. For example, most parents cannot be models for their children as they themselves are computer illiterate. The burden is then shifted to schools. However the teachers themselves are no longer certain about what is expected of them. Prewitt (1983) argued that the shortage of high school science teachers is a major cause of increasing scientific and computer illiteracy. Lockheed and Mandinach (1986) found that most teachers who were asked to teach Basic were not well prepared. Similarly, in business and industry, the company trainers themselves are often barely computer literate. They teach what they know regardless of its specific value to the setting and students (Hall-Sheehy, 1985). Kemery (1983) argued that most decision makers in government and industry today are computer illiterates. Thus, they do not request computerised analyses and they use computers and computerised data only as status symbols.

Computer Illiteracy: Major Victims

As mentioned previously, computer illiteracy rates vary among groups. In this section, we will review seven major groups whose computer illiteracy rates greatly exceed those of the general population. These groups should be of particular concern to human services since their computer illiteracy has important implications for the future which will be discussed later.

The groups most likely to be computer illiterate are: women, poor people, blacks, minorities (non-English speakers), elderly people, the unemployed, and rural communities. As Brown (1981) noted, "the opportunity to adopt (new technologies) is egregiously and in many cases purposely unequal and that individual behaviour does not represent free will so much as choices within a constraint set and that it is government and private institutions which establish and control the constraints".

Boys outnumber girls 2 to 1 in academic-based courses in computer programming (Lipkin and Martin, 1986). Sanders (1986) found that 64 percent of boys and 51 percent of girls reported computers at home. However, girls were three times as likely to say they did not use their home computer. Miura and Hess (reported by Sanders, 1986) found that boys outnumbered girls in computer camps. They also found that the boy-girl ratio favoured boys as the age increased, as the
curriculum became more difficult, and as the cost of computer camps increased.

A study by Quality Education Data Inc. (1984) revealed that wealthier communities are more likely to have computers. Gilliland (1986) reported that 70 percent of the schools in affluent areas had computers for students’ use but only 40 percent of the schools in low-income areas. Furthermore, low income families are seldom able to purchase computers so that their children can learn at home. Poor children therefore are less likely to be computer literate.

A large proportion of the inner-city poor are black. Current statistics indicate that 35 percent of the US black population are at poverty level. They also have higher rates of illiteracy than do whites. Thus blacks do not have equal opportunities to acquire computer skills. Lee (1986) noted that the emphasis that black communities place on relational reasoning puts blacks at a further disadvantage since computers are primarily based on analytical reasoning.

Many Hispanics and other ethnic minorities who use English as a second language often do not have a high level of fluency. Therefore, they lack even the prerequisite for computer literacy, the language in which computer commands are given. Bilingual or foreign language software, although available, has limited usefulness. Elderly people are usually defined as those at the age of retirement and older. In this article, old age differs for each individual and is based on past experiences, habits of new learning, and biological strength. Old people are reluctant to replace old familiar methods with computers. Giving up things that have worked for them in the past creates a sense of loss in elderly people. However, as long as modern knowledge, technology, and tools continue to develop so rapidly, old people will have little chance to keep pace. For example, old people avoid modern technology such as VCRs, microwave ovens, and automated banking machines more than any other age group. Many people who did not become computer literate in school often find the opportunity in the workplace. However, unemployed people especially those who are chronically unemployed, are denied this opportunity. In Europe and the U.S.A., it is estimated that about 10 percent of those aged 16 to 30 are chronically unemployed. These people do not come into contact with computers and any knowledge they gained in school is rapidly outdated. They also cannot afford home computers.

The final group at high risk of computer illiteracy are those in rural areas. Every technology, with the exception of agricultural inventions, tends to spread first in cities and last in rural areas (Nora and Minc, 1980; Brown, 1982). There have been a few attempts in Europe to establish computer centers in rural areas but they have had no appreciable effect on accelerating the spread of the technology in non-urban areas. Computers, as most other technologies, still reach rural areas last and sometimes in already outdated versions. Village schools, like inner-city schools, have a high ratio of children per computer. On the average, only is percent of the 13-year-olds from rural and inner city schools reported use of computers. However, over 30 percent, of their counterparts in wealthier urban suburban schools used computers (Lipkin and Martin, 1986). The end result is that many rural and inner-city communities are apathetic about computer literacy (Nowotny, 1981).

It is evident from the preceding discussion that some of these groups
overlap one another. Those identified with two or more of these sub-
groups are at an even greater disadvantage and therefore less likely
to become computer literate. These seven sub-populations have a
common characteristic: their relative weakness in comparison with
groups which are stronger politically, economically, educationally
and culturally. The computer illiteracy of these groups in today's
technological age widens the gap even more and may help to perpetuate
current social stratification.

The causes for computer illiteracy in each group may vary.

Computer Illiteracy: Major Consequences

Recognition of the possible consequences of computer illiteracy
should spur society to take measures that will help increasing
numbers of people to become computer literate.

The first and perhaps most alarming consequence may be unemployment.
Nora and Minc (1980), in a document presented to the President of
France, noted that productivity in agriculture and industry remained
remarkably high, despite a decline in the number of employees. They
proposed that the majority of new workers were hired by banks,
insurance companies, social security offices, and postal services.
Robinson (1980) pointed out that most of these services require
employees who are computer literate. Thus, people without computer
skills will be unemployed as computerised industries and services
proliferate (Kemeny, 1983). Some non-computer related jobs such as
printers, some auto-building positions, bookkeepers, and assembly
line jobs have already become obsolete.
Second, computer illiterates may also be deprived of access to
services. In more and more offices and services, people must now
interact with a computer. Although most programs are user- friendly,
the computer illiterate finds them frightening and too complex. As a
result, the computer illiterate often requires special assistance
which can be embarrassing and sometimes costly. Computer illiterates
may also be shut out of major services and information networks which
are linked to home computers. As Garrett and Wright (1980) noted, the
domestication of computers and computer networking are two
significant trends in computerisation. The end result of these trends
is a society in which many services are ordered and delivered via
computers at cheaper rates. Those without the skills to use these
services will be restricted to the traditional, more expensive and
time-consuming, methods of service.

Third, computer literacy influences society in other ways. First, it
changes modes of thinking, second, it creates new social rules,
jargon, behaviour, communication, and habits. The changes in thinking
are mostly cognitive and involve the development of problem-solving
and debugging skills (Haigh, 1985), accuracy in definitions, and the
division of complex tasks into smaller components (Kemeny, 1983). In
addition, the computer will cause socio-cultural changes. Haigh
(1985) and Sheingold et al. (1984) noted that computer literacy
teaches children to develop task-oriented patterns of communication
while working on problem solving. Burns (1985) noted that the
dialectic interplay of new technology with human action provides an
occasion of the re-structuring and transformation of the rule system
of culture and institutional arrangement of society. People who did
not experience the mental and social process required for computer
literacy may feel somewhat alienated and isolated.
The fourth possible consequence of computer illiteracy has to do with
learning. Advanced learning, whether in formal institutions, at home, or in libraries, will require computer literacy. Gaining access to computerised knowledge and data bases also requires computer literacy. Just as computer literacy will become a prerequisite for advanced literacy, real literacy will be the basis for computer literacy. Any missing link in this process will prevent the next step to a higher level.

The final possible consequence of computer illiteracy concerns the political sphere. Nora and Minc (1980) claimed that the political implications of computers are more important than the economic ones because computers throw traditional power games into disorder. Concerning the consequences of computer illiteracy on the democratic system Prewitt (1983: 11) asks, "What is the foundation of intelligent citizen participation in a society increasingly directed by scientific and technical processes often beyond the comprehension of any save the experts". Society in the near future may be composed of many techno-peasants (computer illiterate) who will be unable to function and to understand major political and social issues and policies.

Is computer illiteracy sufficient a force to create a two-tiered society: one that offered great opportunity and reward to the few who control the information age technology but little opportunity for others? The future is unclear, for other social forces can also influence human-machine relationships. However, the social services should be prepared to confront these possible consequences and to alleviate their impact.

Computer Illiteracy: Challenges for Human Services

Computer illiteracy, is a special problem that has enormous implications for policy makers and planners in human services. Some may choose to ignore the possible consequences of computer literacy and concentrate instead of enhancing traditional practices and client services. Others may choose to fight computerisation. As historical precedent for such action was set in the early 19th century when a group of unemployed English workmen - the Luddites - destroyed the new mechanised looms in protest.

In the author's opinion, inaction and confrontation are draconian choices. Human services therefore must consider their unique role in today's technological world. Human services originally created to cope with; the negative effects of the industrial Revolution, must now prepare to deal with the consequences of yet another revolution - the technological revolution. This revolution is causing new social problems which will require special assistance now and in the future from human services (Brouns and Kramer; 1985). Should human services fail to provide the necessary solutions, many people will needlessly suffer before, new types of service delivery arise to meet their needs. The primary responsibility for computer literacy rests with education. It is important therefore to highlight those major issues which should be considered in formulating educational policy concerning the social impact of computer literacy. These issues are:

1) There should be equitable distribution of computer resources in schools with regard both to the pupil computer ratio and to quality.
2) A definitive course curriculum should be developed. The curriculum should consider the different needs of different students from various backgrounds and encourage all of them to become computer literate.
3) Educational programmes that enhance use of computers by minorities and females should be developed.
4) As more children in the near future will be computer literate, the emotional, social, and cognitive impact of computers should be studied to determine effects on literate and illiterate children. Changes are expected with regard to self-esteem, competitiveness, social interactions and other
personal traits. 5) Special computer education programmes should be required for those who fail regular computer literacy courses. 6) There should be more female and/or minority teachers and computer instructors, who can serve as role models for the underuser groups. Since educators alone will not be able to cope with all these challenges, they will require help from the human services. While education is society's major agent for computer literacy, social services are and should be the safety net. It is the basic premise of this article that human services must shoulder new responsibilities and initiate new modes of intervention. Proactive and concerned professionals must be prepared with new programs that will compensate for computer illiteracy. The government, private foundations, and the computer industry itself all have stake in a computer-literate society so that they should be very supportive, both in principle and with finance, support of efforts by human services. A few human services are already engaged in computer literacy. For example, Schubert (1986) reported that the Big Sisters Organization has a computer literacy programme. A Philadelphia centre is being established to help poor inner-city residents to become computer-literate (Metzendorf, 1987). In this respect, teaching of computer skills has a social context that goes beyond the purview of the education sector just as teaching ADK skills to ex-mental health patients or teaching interpersonal skills in family therapy.

Human services can and should bring computers and computer literacy to disadvantaged subpopulations and neighbourhoods. Klein (1984) found that only 10 percent of the computer programmes financed by the Department of Education are geared toward computer literacy. Furthermore, only 9 percent are geared to minority students, 6 percent to rural populations, and 2 percent to females. The percentage of programmes for economically disadvantaged students is even lower. The most distressed neighbourhoods are the settings where computer literacy should be taught. It is an awesome challenge, one which should be initiated and carried out at least temporarily by the human services professionals.

The workplace is another area for intervention by human services. Personal computer training is woefully neglected by most employers (Hall- Sheehy, 1985). Thus human services should urge employers to expend greater effort on employee computer literacy as part of Employee Assistant Programmes. Such programs will contribute to the overall quality and productivity of workers.

Human services must be concerned with social policy related to potential abuse of computers. There is a need to assure people's rights regarding personal data, computer-based discrimination, and social participation. Social action groups will be needed to urge new legislation and enforcement of a more humanistic approach to computer use. Social workers will have to alert individual and society to potential problems so that computer illiterate people will not fall prey to apathy and victimisation. Human service professionals must serve as social advocates, willing to lobby on behalf of the computer illiterates.

Many adult computer illiterates will find it necessary to get organised either for mutual learning or for mutual support. Self-help groups can be useful in this respect. Although there are no such groups for computer illiterates at present, it is likely that such groups will emerge in the coming years. Human services professionals should be prepared to pave the way so that these groups might he successful. Self-help groups could provide services for computer illiterates, access to jobs which are not computer related, and ensure citizen participation by and for the computer illiterate.
Human services should take a more active role in assuring a more equitable distribution of home computers. This will require lower prices, subsidies for poor families, or even free computers. In this instance social workers should be the link between needy people with the potential for computer literacy and those who, for reasons such as tax deductions, public image, and new markets, are willing to furnish either funds or computers. The role of these professionals does not end with providing computers. Once the home computers are available, the professionals should also advise parents on the ways to give their children a head start in becoming computer literate.

Parents also need to be made aware that the computer is also for girls. Too often, it is boys who are enrolled in computer camps and courses and who are encouraged to use home computers. The human services should stress for gender equality in the use of computer resources. Parents should also be reminded that their daughters too will need computer literacy for successful careers.

Finally, human services should provide information and encourage public debates about the computer revolution and its social consequences. Public surveillance of the electronic information revolution and of its impact on society is extremely important.

Public debates, projections, and forecasting may prevent unnecessary negative effects, ease the transition period, and enable people to accept modern technology without undue human and social costs. It is hoped that human services professionals will involve themselves more creatively and passionately in this newest social problem. The problem of computer illiteracy must be met not merely with traditional methods of problem solving, but by new methods of intervention as well. The human services must make their choice: either to be reactive, wait for events to occur, and only then compensate the new victims; or to be proactive and experiment with methods that will help prevent the potential negative consequences of computer illiteracy.

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