Learning and Technology:
Dangers and Opportunities*

By Peter S. Sindell

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Introduction

Speaking to educators these days I get a strong sense of doom and gloom. Budget cuts, falling enrollments, and federal-provincial altercations about transfer payments are some of the causes of this negative tone. Educational institutions and the educators in them seem to be depressed, adrift, at a loss. They seem to be gearing down, or perhaps, winding down would be a better image. Winding down without much conscious analysis of the alternative — which is to consciously gear up for a new role in society, look ahead with excitement and energy to a new and different vocation.

Looking ahead even to 5 to 10 years — the near to medium term horizon — I assert that educators should be gearing up, not down. Why? The short answer is microelectronics. No one could accuse a humanistic anthropologist such as I am of being a blind idolator of the Goddess of technology, seductive as she may be. Yet I am optimistic because I see the ways in which the new microprocessor base technologies — microcomputers at home and at school, videodiscs, computer aided learning, satellite based learning systems and networks — all these and more can impact our schools and our citizens in a positive liberating way. Microelectronics is not a panacea but it can and will offer much to the world of education. Your fields stands to benefit the most from these new technologies if you can seize the challenge and make it yours.

You have heard a great deal, I dare say far too much for some, about the miracles of microelectronics and the ubiquitous chips on which these miracles are based. 1k, 16k, 32k, 64k bits per chip, LSI, VLSI, RAMS, ROMS — these and other technical terms are becoming common parlance. The technology is easy to get a hold of, to understand in a general way. Its implications are not.

Microelectronics is a transformative technology which is diffusing in Canada at a staggering rate. Most scientific or technological discoveries take 50-100 years before they are developed to the point of commercial viability. In contrast the microprocessor (the computer on a chip) was invented in 1971 and yet is already a multi-billion dollar industry which is affecting dramatically almost all other industries. Products using microprocessors are making possible the automation of our offices and our factories. How fast this process is going even in education is illustrated nicely by a comment Ontario Minister of Education, The Honorable Betty Stephenson, made on October 6th, 1981. She reported that an OISE Study in June of 1980 showed 649 microcomputers in Ontario schools (presumably primary and secondary only) while her ministry found 3239 microcomputers in September, 1981 an increase in a little over a year of more than 500%.

The changes coming in the wake of this technology will have so much impact on learning and on almost every other aspect of our daily lives that we can say, without exaggeration, that we are in the beginning stages of a profound revolution, an "information revolution". Controversy abounds about the effects on employment, about the potential invasion of privacy the revolution could bring, about the psychological and physical effects of living more and more with and through machines. What *is* clear at this point is that we will be searching for understanding, for the human meanings of this revolution for many years. Like chasing *butterflies* the search will take a great deal of energy, lead us into unexpected byways but, when we succeed, be most satisfying.

What I would like to explore in this paper are the two faces of this revolution — the dangers, on the one hand, and the opportunities, on the other. Because the changes which we shall see will be so pervasive they offer great risk or great promise. What we do in our daily work and life, as educators and as citizens, can and will influence the future shape and character of this revolution in Canada and in your home provinces.

Emotional and Intellectual Coping

Each of us has a role to play and we must, therefore, begin with our own feelings. Based on your feelings right now would you perceive yourself as a *technophobe*, someone who is afraid of microelectronic technology? Or are you a *technophile*, someone who feels comfortable with this technology? How you and I react to the new information machines, whether technophilically or technophobically, or some mixture of the two, will very much influence whether we accept the revolution, resist it, or reject it. In our work at GAMMA we have developed three key scenarios for an information society — the telematique, the privatique, and the rejection.

The Telematique Scenario (from the French *Tele-informatique* which refers to telecommunications-computer linkage) is characterized by a central electronic highway linking offices, homes, factories, schools, etc., the ubiquitous presence of terminals and computers in production and consumption activities, and international interconnection via satellite. In the educational context examples of the telematic approach would be networks built around databases about such subjects a continuing education courses available — where — when — cost, or jobs available for graduates (the federal employment database called CHOICE) or dial up networks offering access to specialized educational software and courseware which could be down loaded into your local microcomputer or "smart" terminal.

The Privatique Scenario is characterized again by the omnipresence of computers but interconnection via satellite and the central electronic highway is minimal. The Privatique Scenario in educational terms would imply stand alone word processors, computers — micro and maxi, and the individual purchase of, for example, VTR tapes, videodiscs. In contrast these could be ordered up telematically on line and sent to a cable compatible computer or another kind of terminal, even an ordinary television set.

The Rejection Scenario is characterized by the rejection of high-technology machines and a return to direct non-technologically mediated communication. GAMMA believes that the latter scenario ranks with the others in importance. Thus GAMMA has an ongoing programme of research which specifically concerns the person-machine interface and how this interface can be made harmonious and productive instead of threatening and destructive. This research relates to our research focus on the social impacts of the Information Society — privacy — education — employment — health — politics, etc. The other focus of the GAMMA Research Programme on the Information Society is industrial — balance of payments, industrial strategy, productivity, energy, etc.

Promoting Lifelong Learning

As I asserted before one of the most fruitful opportunities which is emerging for us all is the use of these new technologies to enrich and expand learning opportunities. With satellite transmission we are no longer bound by the constraints of geographical location. OECA and U.B.C., among others, have shown us how we may link willing learners and excellent teachers though they be separated by hundreds of miles by using this new tool, with a microprocessor managing the transponder in the satellite, time barriers too can be erased when a learner can access a computer at his or her convenience and enjoy access to data banks or CAL — Computer Assisted Learning — at any point in the 24 hour cycle of our day. Ontario and Alberta educators are leading the way in research on the potential uses of videodiscs in education and industrial traning as many other provinces explore the educational potential of Telidon. Preconceptions about the proper time in our life cycle for learning — 6 - 16, 18, 20 or 22 — must and will change.

Lifelong learning can change from being a tired cliche to a meaningful reality. The need for lifelong learning will become more and more acute as CAD/CAM, robotics and office automation are introduced by government and industry to reap the bountiful gains in productivity which they promise. The dilemma then becomes how we distribute the fruits of these productivity gains. Do we let hundreds of thousands of jobs go by the wayside with all the human tragedy this implies? Or do we seek other answers? Answers such as educational leave for everyone, regular sabbaticals for everyone, reduced working hours for the same pay, job sharing and so on. If we focus on people's needs for income — which can come from the productivity generated by the productivity by the new technology and not on saving jobs per se then, I believe, we shall be on the right track. Naturally this will require extensive cooperation between government, industry, and labor — what we have called "concertation" at GAMMA in our work on *Industrial Strategy and the Information Economy: Towards a Game Plan for Canada.*

In such a transition to a new kind of economic base educators and education will be central to a successful transition in human terms. In such a scenario we shall need both vastly improved opportunities for retraining and much greater activity in the leisure area in which adult and continuing education is a key stone.

Although Telidon cannot be used without a keyboard for truly interactive CAL, Telidon, personal computers, and microcomputers especially designed for educational uses will indubitably add up a new kind of *University of the Air*. Some have said that the epitome of the information revolution would be reached when we each can access all information in existence from anywhere at any time. Daily this rather extraordinary image is becoming closer to actualization. Already on the market there is an electronic briefcase with a built in screen, memory storage, communications capabilities, and features such as word processing. One California company even claims to have a briefcase sized satellite receiver station in the works. Many thinkers in this field have delineated the possibilities of a small plastic card which could hold and protect all of our personal medical, financial, business, educational, and other records. For those who are more Sartorial in their approach but still want the convenience of carrying their personal electronic filing cabinet, there would be neck ties like mine which hold a silicon memory chip.

Thus if I want to check a reference or see if I have paid a bill I just plug into my tie. Of course that's the opportunity side — no bulging filing cabinets taking up space, ready and immediate access via key word so you don't have to remember in which file you put any particular document, and so on. The danger is of course that others who you don't want to have

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Knowles, M.S. **The modern practice of adult education.** Chicago: Follett Publishing Company, 1970.

Kolakowski, L. **Marxism and beyond.** London: Pall Mall Press, 1968.

Lipset, S.M. and Dobson, R.B. The intellectual as critic and rebel. **Daedalus,** Summer, 1972, **101**(3), 137-198.

Martinez, E.L. The printed word and extraverbal language. **Cultures,** 1979, **6** (3), 98-113.

McDermott, J. Technology: The opiate of the intellectuals. **New York Review of Books,** 1969, 13(2).

McPhail, T.L. **Electronic colonialism.** Beverly Hills, CA: Sage Publications, 1980.

Meadow, D.H. et al. **The limits of growth.** New York: Universe Books, 1972.

Mitchell, P.D. Operational research models applicable to educational technology for life-long learning. In Lionel Evans and John Leedham (Eds.) **Aspects of Educational** Technology (Volume 9), London: Kogan Page, 1975.

Mitroff, I. Towards a logic and methodology for "real-world" problems. In N. Bjorn-Anderson (Ed.), **The Human side of information** processing. Amsterdam: North-Holland Publishing Company, 1980.

Myers, D. **U.S. business in South Africa.** Bloomington, IN: Indiana University Press, 1980.

National Academy of Sciences, **Databanks in a free society.** New York: Quandrangle Books, 1972.

Nisbet, R. **History of the idea of progress.** New York: Basic Books, 1980.

O'Brien, C.C. Politics and the morality of scholarship. In Max Black (Ed.) The **Morality of Scholarship.** Ithica, NY: Cornell University Press, 1967.

Ohliger, J. Is lifelong adult education a guarantee of permanent inadequacy? Lecture at the University of Saskatchewan, March 7, 1974.

Polanyi, M. **The tacit dimension.** New York: Doubleday, 1966.

Popper, K. The rationality of scientific revolution. In R. Harre (Ed.), **Problems of scientific revolution.** Oxford, England: Clarendon Press, 1975, 72-101.

Reddy, A.K. Problems in the generation of appropriate technologies. In Austin Robinson (Ed.), **Appropriate technologies for the Third World,** New York: St. Martin's Press, 1979.

Scher, J. Computer-based human communication systems. In Frank Feather (Ed.), **Through the 80s.** Washington, DC: World Future Society, 1980, 317-321.

Schiller, H.I. **Communication and cultural domination.** White Plains, NY: International Arts and Sciences Press, 1976.

Tiedeman, D.V. Guidance mediation and the career: A look at social invention and deployment. **Media and Adult Learning,** 1981, 3(2-3), 2-12.

Tricker, R.I. Order or freedom — the ultimate issue in information systems design. In N. Bjorn-Anderson (Ed.), **The human side of information** processing. Amsterdam: North-Holland Publishing Company, 1980.

Wiener, N. **I am a mathematician.** New York: Doubleday, 1956.

Williams, D.C. The spectre of permanent schooling. **Teachers College Record,** 1974, 76(1), 47-62.

access to your history, your records, your ideas may also be able to plug in.

Divergence and Convergence

Two other difficulties which accompany the emergence of an information society are (1) *technological overload* and (2) *information overload*. A technological tower of Babel is emerging which bodes badly for facilitating communications between people and organizations. This is occurring because, like the 19th Century florescence of railways, we are putting machines in place which cannot easily communicate with each other because their programs are written in several different languages. There is a pressing need for agreed-upon standards or at least interfacing mechanisms. Some progress is being made such as Xerox's Ethernet concept and Bell Canada's Envoi 100 system, but we need much more progress in this area. In this context I would like to congratulate the Ontario Ministries of Education and Industry and Tourism for their bold initiative in establishing the functional specifications for a microcomputer for use in education.

Naturally we must also work toward a common use in education. We must also work toward a common programming language, perhaps NATAL, perhaps another, so the courseware we create can be used by all Canadians and, hopefully, even exported. Canada has a tremendous opportunity here both in educational and industrial terms but to grasp it we must work together on a cooperative, concerted national basis. One exciting Canadian hardware development is NABU, the cable compatible personal computer.

Perhaps a national user oriented body of educators is needed to sort through hardware and courseware, provide advice to users, and encourage communication between the educational and commercial worlds both vis-a-vis hardware and courseware. This would avoid the waste inherent in false starts and duplication. As Canadians we have a strong tradition of cooperative effort and in these days of scarce resources such as course is even more desirable than in the past.

Developing our analytic and perceptive capacities to deal with the hardware and software is difficult but even harder is coping with the flood of data, information, knowledge, and ideas which will be increasingly and productively in our daily activities. Managing it effectively will be even harder than in the past so we need much creativity in this domain too.

The new role of education here too is absolutely central to the successful use of the new information technologies in Canada. Central because education as an industry can generate effects — multiply productivity — increase efficiency — in almost all other industries. How? By disseminating the new knowledge about the potential value of these technologies and teaching people and organizations how to use them. In Great Britain the government has spent millions of pounds giving firms money to hire consultants to do this. In Canada — with a new vision of our role as educators we can use our existing institutions to fill much of this need. Redirecting some of our resources in this direction and learning more ourselves so we can teach others are required but we have a solid base on which to build. This is the economic concept of "forward linkages".

Turning from the individual level of analysis we must be conscious of our increasing dependance upon machines and the vulnerability this creates. We are becoming more and more wired but what happens if our *electronic highways* break down or deteriorate. Our banking system is already highly vulnerable to disruption by union action, sabotage, or natural disaster. Can you imagine the equivalent of our postal strikes in the banking system?

Speaking of banking I should tell you that even criminals are having trouble adjusting to the impact of computerization. Bank robbers are having a particularly bad time and may be faced with severe technological unemployment in the very near future. Fortunately Canadian criminals are a visionary lot — there is a dramatic increase in requests to colleges and universities, continuing education departments for computer science and programming courses. This phenomenon clearly implies a danger in the white collar crime area but a vivid market opportunity for adult educators.

New Learning Opportunities

Thinking about opportunities more broadly, if robots and computer based office equipment take over most of the boring and/or dangerous tasks then the possibilities for personal development of all kinds including *self development through learning* become prodigious. I have argued elsewhere in a paper on public policy that with our extraordinary high quality cable, satellite, data, broadcasting and telephone networks in Canada we have fantastic opportunities to innovate in the cultural industries. We can distribute plays, films, dance, music and all other kinds of creative productions so widely to so many more people on a pay per channel or per program basis that the arts can rise from their present impoverished state and all our creative artists can begin to reap the rewards they so richly deserve.

With more leisure, assuming that this leisure is not accompanied by the loss of income, so much is possible. Gordon Thompson has developed the technological model for Ivan Illich's learning exchange concept, the computer based "serendipity machine". Every person becoming his own publisher is moving closer to realization.

Again here our educational system has marvelous opportunity which at once is liberating and delight giving and will, in my opinion, be extremely important to Canada's economic future. Helping people realize their creative and artistic potential, while building a Canadian base in the cultural industries, is one of the key industries of the future. My opinion, that these industries will be central to the economic development of the western countries, is bolstered by Japanese initiatives in videodiscs and other cultural products.

Conclusion

We have seen in this brief conspectus some of the dangers and some of the opportunities which are emerging from the technologically driven information revolution. If this revolution is to liberate and serve the human spirit then we must forsee and forestall the dangers and seize the opportunities. The alternative is repression and enslavement.

In seeking a harmonious relationship with the machines and the changes they will bring with them, we have a particular responsibility as educators. Your active participation and engagement in the learning experience facilitated by conferences, workshops and special journal issues like this, will be an important step in this process. Concretely, I hope your learning about the technology and its potential impact will lead not only to new understanding and insights but some clear recommendations for action which you personally, and your organization, can implement.

AV Standards Report

By Alan J. Powell and Tom Rich

After the Ottawa Conference of AMTEC '79 at Carleton University, an article was published in **Media Message**[1] (the forerunner of the CJEC), which described Canada's involvement in international standards for education and training.

An AMTEC advisory committee was established to permit Canadian participation in the international committee[2] representative of media professionals from coast to coast. A formal proposal was made during the following year (1980) to the AMTEC Board of Directors for AMTEC support in the formation of such an advisory committee.

At the AMTEC '80 conference in Edmonton, a document was circulated to the membership asking for volunteers to give their time as a long term commitment in the development of international standards.

The circulation of this document produced the names of 16 media professionals willing to commit their time and expertise to this work and to present a specifically Canadian viewpoint to the International Committee.

In the fall of 1980, formal approval by the AMTEC Board of Directors was given to this activity under the proviso that **no AMTEC** funding would be committed to the activity.

Over two years have now elapsed since the involvement of the AMTEC advisory committee in the circulation and development of international standards documents in audio visual. At present 19 AMTEC members are on the committee mailing list.

The principle areas of work covered in the standards documents are:

1. Equipment
2. Operating practices
3. Safety standards
4. Interconnections
5. Methods of measurement

Table I shows typical titles which were circulated for comments and then forwarded to the Canadian sub-committee chairman for coordination. They were then returned to the Canadian Council of Canada, International Standardization Branch, for transmission to the IEC in Geneva, where they were recorded as a national Canadian viewpoint, in the long process of adoption as an international standard.

TABLE I

1. "Electrical Requirements for Interconnection Between a Video Tape Recorder and a Television Receiver by Means of an 8 Pin Connector." IEC Document No.60C (Secretariat) 49, July 1980.
2. "Mechanical Requirements for Interconnection Between a Video Tape Recorder and a Television Receiver by Means of an 8 Pin Connector." IEC Document No.60C (Secretariat) 50, July 1980.
3. "Proposed Standard for Audio Pages." IEC Document NO.60C (Secretariat) 52, July 1980.
4. "Labelling for Audio Cassettes." IEC Document No.60C (Secretariat) 52, July 1980.
5. "Control Systems for Two Still Projectors — Operating Practices." IEC Document NO.60C (Secretariat) 53, July 1980
6. "A Guide to the Safe Handling and Operation of Audio Visual Document." Working Group Document — Circulation. IEC Document No.60C WG4, December 1981.
7. "Questionnaire on the Application of Connectors for Remote Control of All Functions on 50x50mm Automatic Slide Projectors." IEC Document No.60C (Secretariat) 58, June 1981.
8. "Video Recording Systems — Operating Practices to Facilitate Video Browsing." IEC Document No.60C (Secretariat) 59, July 1981.
10. Working Group Document on Learning Laboratories. IEC Document No.60C WG5, March 1982.
11. Draft Proposal on Labelling of Audio Cassettes. IEC Document No.60C (Secretariat) 63, June 1982.

Table II gives a listing of standards documents which originated in Canada, as a result of specifically Canadian applied research and development work, carried out in an audio visual centre.

Both items of work were reported on at AMTEC conference in Truro 1981[3] and Winnipeg 1982[4].

TABLE II

1. Report to Working Group 6 on "Projection Television." IEC Document No.60C (Canada), No.1, 1981.
2. Report to Working Group 7 "Audio Visual Environments and Equipment Standards." IEC Document No.60C (Canada) No.2, 1981.

The AMTEC advisory committee has provided the Canadian Committee, IEC CSC 60C with consistent and solid support over the past two years. The result has been the presentation of a specifically Canadian viewpoint on a wide range of areas in audio visual standards for education.

At AMTEC '83, which will take place in Montreal in June, a concurrent session on Audio Visual Standards is in the planning stages. It is anticipated that the session will cover the work of the Standards Council of Canada, and the background and future directions of audio visual standards work.

The article provides an opportunity to thank the members of the AMTEC advisory committee for their hard work and support on a long term commitment to a vital area of work in the future of audio visual operations, planning and development. Any others who would be interested in contributing to the work of the committee are invited to submit their names to either of the authors.

REFERENCES

1. International Electrotechnical Commission on Standardization. (IEC) Sub-Committee 60C (Education and Training Equipment and Systems.)
2. Powell, A.J. "Canada's Involvement in Standards for Education and Training Equipment and Systems." **Media Message.** Vol. 8, No. 4, p. 23.
3. Powell, A.J. "Audio Visual Equipments." Unpublished presentation to the AMTEC '81 conference. Copies available.
4. Powell, A.J. "Projection Television for Combined Video/Computer Displays." Proc. AMTEC '82 Conf. ISBN-O-9691044-0-5. pp. 165-179.

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