

**The Role of
Communications
and
Information Resources
in Canada**

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Program on Information Resources Policy

Harvard University

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Preface

This paper looks at the entire range of Canadian communications and information matters in terms of the underlying political, economic, and social forces in Canada which must deal with them.

It is intended to serve as a base for future examinations of U.S.-Canadian communications and information relationships. Further, by the examination of the entire communications and information spectrum in one country, this paper serves as a point of departure for study of similar spectra elsewhere in the world, and of their importance to the United States.

The information base for this paper ends in Spring, 1979. The paper does not take into account the Canadian political campaign or elections of May 22, 1979.

The Role of Communications and Information Resources in Canada

Oswald H. Ganley

Executive Summary

Canada is moving increasingly toward a comprehensive communications and information resources policy, integrated into the mainstream of their political, economic, and cultural thinking.

Since the earliest days of radio, the Canadian government has recognized the importance of communications and information as vehicles which can bring their country together or tear it apart. But, while the basic premise has remained unchanged over time, the uses of communications and information have expanded to include broadcasting, both by TV and radio, newspaper, magazine, and book publishing, films, advertising, computers, computer/communications, telephone and telecommunications, communications satellites, remote sensing, and to a point, industrial know-how and research and development. In this paper these diverse but interconnected matters, which cut across political, social and economic questions, are examined in the context of Canada's three main concerns--unity, economic viability, and cultural identity.

Because of Canada's proximity to the U.S., Canadian information and communications are thoroughly intertwined with or affected by those of the U.S. Yet most Americans are unaware of this fact or the importance which is attached to it by Canadians.

The computer/communications (communications) industry is a vital economic area for Canada. Problems of transborder data flow (TBDF),

currently being attributed by several European countries to concern for individual privacy, are recognized by the Canadian government and industry to be essentially economic. What they fear is loss of jobs, negative balance of payments, and loss of opportunities for their top management. The Canadian government is leaning in the direction of some control of TBDF. Canadian industry, on the other hand, wants less regulation and the freedom to compete.

In the broadcasting, publishing, and film industries, the Canadian government is greatly concerned by the massive inflows of American content. Here their concerns are in large part social, since this puts strains on their already troubled unity and deprives Canadians of their own sense of identity. There are economic problems, too, of loss of jobs for creative artists and loss of advertising money for TV and magazines. The Canadian people adamantly want American shows and information, and Canada admits its economy and its relatively small population compared to the U.S cannot compete with the influx of U.S. mass media products. This is a source of resentment, especially by the Canadian government, and efforts have been made through tax laws to curb American influence. This, in turn, is resented by Americans.

The Canadian telephone system is one of the best in the world, and the Canadians are leaders in applications of domestic communications satellites. Investment in R&D in telephony is proportionally equal to U.S., and Northern Telecom is rapidly becoming an important competitor to Western Electric in the United States. Whether Canada can afford to maintain its domestic communications satellite system, which now has excess capacity, remains to be seen. Canada is probably the most "wired"

society in the world with 40% of the TV viewing market having access to cable TV. In terms of Canadian cultural identity this is not necessarily to be seen as a triumph, since it was accomplished as a direct response to government measures to restrict U.S. programming on CBC.

The real Achilles heel in communications and information in Canada is its low level of investment in R&D. Canada ranks last among OECD countries in this regard, and there is a disproportion between the government and industrial sectors in funds supplied, R&D conducted, and scientists and engineers employed. The Canadian government is disturbed that not enough R&D is performed, especially by it's industry. Canada's electronics industry, which covers much of the information and communications area especially suffers from this problem, much of which is due to the high level of foreign ownership of companies (usually American). Increasingly severe trade deficits are recorded in high technology manufactured goods in this highly developed country. These things lead some Canadian government officials--at least for domestic political purposes--to speak of Canada as a developing country.

Canada believes it has come up with a major technological breakthrough which could make two-way TV a reality in most Canadian homes by the 1980's. Formerly called Videotex, now Telidon, this system--said to be imperivous to obsolescence in terminal hardware, bit rate, and data base construction--is believed to have the potential for creating a multi-million dollar industry in new communications hardware and in information services to the public.

A healthy industry in the communications and information area is considered a high economic priority by Canada and technological sover-

eighty in this area is viewed as essential to the future well-being of the country. The development of satellites, of telecommunications, of broadcasting, of publishing industries, of communications, and last but not least, their own R&D are felt to be central to finding answers for Canada's most pressing problems.

Introduction

Since the earliest days of radio, the Canadian government has recognized the importance of communications and information as vehicles which can bring their country together or tear it apart. Just as road and rail transportation were seen as necessary to build the Canadian nation, so it was recognized that radio could play an even greater role in this regard. But the heavy influence exerted by "the neighbor to the south" (the U.S.) was also recognized.

In 1929, a government report (AIRD Report) made the following statement:

"At present, the majority of programs heard are from sources outside of Canada. It has been emphasized to us that the continued reception of these has a tendency to mold the minds of the young people in the home to ideals and opinions that are not Canadian. In a country of the vast geographical dimensions of Canada, broadcasting will undoubtedly become a great force in fostering national spirit and interpreting national citizenship."¹

This statement, written 50 years ago could just as well be written today. But, while the basic issue has remained unchanged over time, the uses to which information and communications can be put have steadily grown. The scope of the issue has therefore also increased.

Included under the heading of communications and information today are such diverse but interconnected matters as broadcasting, both by TV and radio, the newspaper, magazine, and book publishing industries, the film industry, advertising, computers and all computer communications, telephone and telecommunications, communications satellites, remote sensing, and, to a point, industrial know-how and research and development.

Background to Canada's* Three Main Concerns: Unity, Economic Viability,
and Cultural Identity¹

With no other country in the world does the U.S. have such an intimate, intertwined, and all encompassing relationship as with its northern neighbor, Canada. These relationships involve defense, trade, overall economic and political matters, and cultural and social likenesses. Yet only the few Americans who have direct dealings with that country have a clear perception of the complexities which contribute to the well-being of the peoples of Canada, and have a heavy bearing on the quality of the relationships of that country and the United States. Canadians in general, however, are aware of, and feel themselves affected by everything that takes place in what they call The Giant to the South.

Unity

It is little understood by Americans that Canada's vast land mass comprises 10 percent of the earth's inhabitable land, but has only one-half of one percent of the world's population. Canada is 10 percent larger than the U.S., but has only 1/10th the population, 23 million people. With a population density of less than three people per square kilometer, Canada stands in contrast to a European nation like the Netherlands, where there are almost 1000 people in the same unit of space.

* While to the extent possible in this paper the author will attempt to differentiate the views of the Canadian government, the private sector, and various groups, the generic "Canadian" is used to convey a dominant view as observed by the author in the literature and during personal interviews.

Canada has been a Confederation only since 1867. It consists of two territories and 10 provinces, each with governments having considerably more power than the states in the U.S. The two enormous but sparsely populated Canadian territories lie to the far north and west, and the four maritime provinces are located on the extreme eastern coast of Canada or off that shore. The six remaining huge provinces, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia, are strung out like beads along the more than 3000 mile U.S. border. Alberta, for example, is six times the size of New York State.

Ninety-eight percent of the Canadian people live in a 200 mile east-west corridor along the top of the U.S. However, the six large provinces extend deep into the north and the two territories wholly so. Small groups of individuals (about 40,000 people) live widely scattered in rugged northern terrain and under difficult climatic conditions. These people and this land are known as The Northern Fact, which comprises Canada's future frontier. Providing communications links to these far flung settlements is a very real political and emotional Canadian commitment.²

Americans in general are well aware of Quebec, the highly publicized French-speaking Canadian province with its separate culture and sense of identity which is at odds with the English-speaking Canadian majority. That Canada's future may well depend on how it will be able to deal with the Quebec Fact is fairly well understood. Not so well known are the other centrifugal forces which tear at the seams of the Canadian Confederation. The Western and Prairie provinces -- one of which, Alberta, has recently found wealth in oil -- and the Maritime provinces -- which would like to share in that wealth -- are attempting for one reason or another to gain

greater and greater levels of independence from the Federal Government. The other provinces look to Quebec to gain concessions which they, in turn, can emulate and exploit against the Canadian Federal Government.

These centrifugal forces, then, constitute the most critical problem for the Canadian government and its peoples, which is the very preservation of national unity.

A recent report by the government-owned Canadian Broadcasting Corporation (CBC) pointed out:

"Two main linguistic communities, many ethnic identities, a vocal native people, and growing regionalism contribute to (Canada's) diversity."

"In fact...sometimes it seems all we have in common are the parliamentary system of government, a few national transportation and communications links, and a robust distrust of federal bureaucrats."³

Economy

If national unity and the fear of the disintegration of Canada are its first concerns, the country's economy runs a close second. An inflation rate of more than 9 percent, a slowing of the real GNP, the fall of the value of the Canadian dollar on international money markets, increasing trade deficits, and high and rising unemployment have the Canadian government and peoples greatly concerned. Trade deficits in the manufacturing sector especially are very disturbing, and the constantly increasing trade deficit in high-technology manufactured goods in this highly developed country is even more so. This latter is contrary to trends in the United States, where a favorable balance of trade in high-technology sectors has been maintained and increased.

The U.S., the European Community (E.C.) and Japan together account for over 80 percent of all Canada's external trade. Of this three-way grouping, more than 60 percent is Canada's trade with the United States. U.S.-Canadian trade amounts to \$65 billion and is more than U.S. trade with the E.C. U.S. direct and indirect investment in Canada is \$40 billion -- more than it has invested in any other nation in the world. Great Britain, Canada and The Netherlands, in that order, have the greatest direct investment in the United States. Thus, according to the Minister of External Affairs:

"You have a situation where not only is the U.S. our neighbor in a geographic sense...it is also the major customer of our products and the most important country in terms of whether our economy will move forward or not."⁴

When Canadians express their concern about "foreign trade" or "foreigners," it is safe to read this as meaning the U.S.

Cultural Identity

Cultural identity or a Canadian national identity, is the third major item of concern to the Canadians, although it often seems to be at the top of the list. As the Deputy Minister of Communications, Mr. Ostry, puts it:

"Culture, however we define it, is central to everything we do and think. It is what we do, and the reason why we do it; what we wish, and why we imagine it; what we perceive and how we express it; how we live, and in what manner we approach death. . ."⁵

The same observer continues

"...in the first hundred years of confederation, Canadians conducted their common life by...habits of mutual toleration, restraint, and liberty. That they were also habits of staying in

our own cultural backyards may be explained by the fact of geography, history, and demography that preceded confederation, as well as by the provisions of a constitution which has given us a dozen educational systems and two official languages."⁶

Canada is made up of many separate groups of people who retain their own identities rather than emulating the American melting pot. The Canadians' lack of a clear-cut, unified culture means that English-speaking Canadian school children know more about American history and American folklore than about the conquering of the Canadian West. The lack of a unified Canadian identity (and the proximity to the U.S.) means that the majority of Canadians read American books, watch American TV shows, read American magazines, view American films, and enjoy other American entertainment. As stated by one Canadian official:

"the endangered species...is the Canadian expression of our own experience; the Canadian creative content."⁷

The Canadian government officials say that they are ahead of the people, and that the government needs to lead the people to understand the necessity for Canadian culture. Canadian intellectuals generally appear to agree with that view. But not all Canadian observers see the Americanization of Canadian culture as necessarily bad. The population as a whole watches the prime-time light entertainment shows offered by U.S. television. This, notwithstanding a mandatory Canadian content of programs on the Canadian Broadcasting Corporation's network.

All three issues -- unity, economic problems and the Canadian search for identity -- color the Canadian government's perception of the need for a healthy, strong, independent and Canadian communications and information policy. Out of its special circumstances, Canadian public policy reflects a

far greater awareness than the U.S. of the power exerted by communications and information resources. Unlike the U.S. government, the government of Canada looks at communications and information resources in an integrated fashion, and has gone to great lengths to study their role and importance for its country.

Communications, both as to physical ability and content, is seen by the Canadian government and some political figures, as one of the major forces which could halt the disintegration of their country. A healthy industry in the communications and information area is considered a high economic priority, and technological sovereignty in this area is viewed as essential to the future well-being of the country. (See pp. 28-41.) The development of satellites, of telecommunications, of broadcasting, of publishing industries, of computer communications and last but not least, their own R & D are felt to be central to finding answers for Canada's three main problems.

"Nowhere is it more necessary for Canadians to find viable, unique solutions attuned to their own needs than in the area of information control. Only by controlling their own information can they insure technological sovereignty and gain bargaining power."⁸

The Canadian government has not only studied the problems of communications and information carefully, but has taken them into consideration when instituting specific or more general programs. From the beginning, telecommunications has been a major dynamic force in Canada, with many "firsts" in applications occurring there. According to an analysis of Canadian telecommunications policy contained in the 1977 Simon Nora Report in France, Canada was one of the first countries even in the Nineteenth Century to apply telephone and telegraph communications technology.⁹ While an American,

Samuel Morse, invented the electric telegraph in 1844, it says,

"...it was Canada who less then two years later had established the first commercial telegraph service between Toronto and Niagara."

Canada's telephone system is one of the most highly advanced in the world and just over 96 percent of Canadian households have telephones.

It was Canada who put the first operational domestic communications satellite system in place, beating the U.S. by about two years. Canadians are still leaders in the application of satellite communications. They have, however, procured all of the spacecraft for this system to date from U.S. prime contractors (Hughes Aircraft Corporation and RCA Astro-electronics Division). They are also in the forefront of new approaches to interactive television (videotex) and are well along in a rather extensive demonstration project in fiber optics. Canada is probably the most "wired" society in the world, and has made phenomenal progress in the introduction of cable TV into the homes of its peoples. This is not necessarily to be seen as a triumph, since it was accomplished by private industry as a direct response to government measures to restrict U.S. programming on CBC. (See pp. 18-28.) The number of subscribers to cable TV is over 2.7 million, or 40 percent of the TV viewing market in Canada. Television is available to 96.8 percent of all Canadian households and radio to 98.5 percent.¹⁰

Canadian Computer Communications (Communications)

A fundamental revolution in both computing and communications -- the blending of communications and computing (communications) -- is taking place all over the world. Communications and data processing are merging technologically. However, the marketplace remains fragmented, with a regulated communications sector and a non-regulated computing component. Both are served by the telephone and data processing companies. The area of most obvious overlap is the communications-based information systems, a new market which it is estimated will grow by 15 to 20 percent per year for at least the next decade.¹

This revolution is well understood in Canada, and underlies all Canadian discussion of communications. In Canada, the debates fall under the headings of "information sovereignty" and "privacy", and they may focus on the cultural content of the information, on Canada's dependency on foreign nations, on infant industry problems, on research and development budgets, or on know-how. But they always center on the fundamental questions of their potential effects on Canada's unity, economy, and cultural identity.

Some of the communications and information questions under constant discussion between the public and private sectors in Canada are: To what extent can and should Canada develop its own industrial and services industries? To what extent can Canada rely on imports of these services from abroad? To what extent can Canada afford to have corporations in the United States make decisions in U.S. headquarters regarding R & D, or perform data processing services affecting vital Canadian interests? To what extent can Canada afford, or -- from a political and cultural and economic view-

point -- be willing to permit basic data regarding Canada's economy, banking, finances, industry, or private health records of its people to be processed in a foreign nation, or data bases to be kept outside their country?

In short, how important are computer communications to the future well-being of Canada?

The Canadian government has fostered a number of studies on this subject. The first in recent years was one in 1972 called "Branching Out: The Report of the Canadian Computer Communications Task Force".² This report indicated "considerable concern" about the attraction of U.S.-based data processing and data communications services into Canada. It was concluded that positive, competitive, and stimulative approaches would best serve the needs for advancing the development of computer communications services in Canada. But the Task Force went on to say that

"If a trend to increasing losses to Canadian processing activities gains momentum, certain measures for protection... might be considered."

The government's 1973 Green Paper on computer communications policy expressed concern about:³

"The problem involved in exercising Canadian jurisdiction over companies operating in Canada, which store and process business data outside the country, and the role of multinational corporations in the computer communications field, which in turn touches upon general economic policy."

The 1972 Report of the Task Force on Privacy and Computers examined the issues related to storage of personal data outside Canada, primarily in the United States.⁴ It was concluded that

"The principal problem...is not one of the privacy of Canadian data subjects being invaded by data about them stored in the United States. It is rather that data processing and communications business may be lost to Canadians as a result of this foreign flow; that data in United States data banks might be preemptorily withheld abroad for a variety of reasons, including security regulations, court injunctions, etc.; that United States laws might change and leave Canadians less well protected; and that, as a sovereign state, Canada feels some national embarrassment and resentment over increasing quantities of often sensitive data about Canadians being stored in a foreign country."

A former Canadian Minister of State for Science and Technology, G.U. Faulkner, stated five potential dangers of transborder data flows for Canada as:

- 1) The potential of growing dependence rather than interdependence.
- 2) The loss of employment opportunities.
- 3) An addition to balance of payments problems.
- 4) The danger of loss of legitimate access to vital information.
- 5) The danger that industrial and social development will largely be governed by the decisions of interest groups residing in another country.⁵

The influential Science Council of Canada, a quasi -independent advisory body, in a 1978 position paper on communications and computers, stated the problem this way:⁶

"A new wave of technology is about to sweep Canada. The critical question is the extent to which Canadians will participate in this rapidly growing area."

The Science Council emphasized that developments in this field are moving remarkably quickly, and that even knowledgeable persons in the industry have trouble keeping abreast of developments. The Council stressed that

Canada does not have the luxury of time, and that if it wants to become or stay a part of the revolution, it has to act now, examine the questions now, and take action now.

"New developments are leading to new technological ventures. Either they can be introduced in an orderly way, for the maximum benefit of the various sectors of Canadian society, or introduced as new technology embodied in a new wave of imported products and services,"

says the Council.

The question of computer communications and its influence on the Canadian economy has been extensively studied by an Interministerial Group headed by Dr. Peter Robinson, now with the Ministry of Communications. One of the studies estimates that the cost of computer communications to Canada will increase from the 1975 total of \$2.7 billion to about \$5.6 billion in 1980 and to \$9.5 billion in 1985.⁷

In 1975, according to these estimates, it cost Canadian users about \$2.7 billion to obtain the required computer communications goods and services. The bulk of this cost, about 81 percent, was incurred by in-house producers of data services to acquire and maintain staff, equipment, supplies, accommodations, data transmissions, and other necessary components. The remaining 19 percent was incurred through the acquisition of data processing services from other firms or institutions -- the commercial computer services industry, parent companies, neighboring firms, and so on.

The proportion of services supplied by other than in-house sources is projected as likely to show a steady growth, from 19 percent in 1975, to 25 percent in 1980, and to about 30 percent in 1985.

Imports of services have gradually increased since 1973. They grew to a value of about \$155 million by 1975, which represented about 30 percent of the services obtained by Canadian users from other than in-house sources. But it is expected that if present trends continue, imports of these services will reach some \$560 million (about 41 percent of outside services) by 1980 and \$1.5 billion (about 52 percent) by 1985.

The major part of these imported services are supplied to Canadian subsidiaries by foreign parent companies. In 1975, the proportion was about 90 percent, but was expected to decline to 85 percent by 1980 and to between 75 and 80 percent by 1985.

It is unlikely, according to the same study, that Canada will be able to offset this growth in imports by greater exports. They have found no evidence to suggest that even by 1985, Canada's annual exports of computer services will be greater than about \$60 million.

Government pronouncements and speeches by government officials stress the importance of the loss of Canadian jobs in the continuing purchase of foreign information services. Seven thousand five hundred U.S. workers who are now estimated to be working in the United States on Canadian data processing needs represent the equivalent of 6 percent of all information processing jobs in Canada, they say. A projection for 1985 is that the equivalent of 14 percent of all information processing jobs serving Canadian needs will be based in the United States. Or, to put it another way, it is estimated that the number of jobs created abroad (rather than in Canada) to meet Canada's requirements, had amounted to about 4,400 by 1975, and 7,500 by 1978. This is expected to increase to some 11,000 (\pm 8 percent of Canadian data processing jobs) by 1980 and to about 23,000 (\pm 14 percent) by 1985.⁸

While most of the U.S. based jobs will be in systems and programming, computer operation and management activities, Canadian officials say the lower paid data conversion staff and some data control staff will form the greater part of the jobs remaining in Canada. In fact, the deepest concern of Canadian officials and other groups is that with the export of data processing activities from Canada to the United States, top management will also move steadily to the U.S. Decisions will thus be made, and management of information industries will increasingly be located in U.S. corporate headquarters rather than in Canada. Canadian middle and upper management may become superfluous, they say, since they will have nothing left to manage. This state of affairs is considered potentially disastrous to the further healthy growth of the Canadian economy and the country as a nation.⁹

Transborder data flow (TBDF) as such is considered by Canadians as being secondary to the above problems. The movement of data by computer to computer from one country to another is increasingly emerging as a lively issue among developed western nations. TBDF is a subject of intense discussion in the Council of Europe, the Organization for Economic Cooperation and Development(OECD), the European Community, and elsewhere. Generally, the issues related to transborder data flow are couched in terms of deep concern by nations for the privacy of the data of their citizens. But there is no doubt that a good part of the problem is economic and national sovereignty. All developed nations have concerns in this regard. The United States passed a Privacy Act in 1974, and other western industrialized nations have followed suit in the years since. Canada also has a Privacy Act, restricting the use of certain data collected by the Canadian Federal Government.

It is clear that in the case of the free flow of data from computer to computer across the U.S.-Canadian border the question is not essentially one of privacy. Canadian observers are quite candid that the main issues are economic and cultural, and are the concerns of a developed country economy struggling for its future.

While the Canadian government ponders the possible restrictions on data flow, Canadian industry is seeking more freedom, less regulation and less interference by the government. The Canadian computer services industry feels itself second to none. Two or three of the largest Canadian companies export between 10 and 20 percent of their services to the United States and almost \$10 million worth of processing of American data is done annually in Canada. The Canadian computer services industry altogether does about \$600 million in business per year. Canadian industry would like to see the business climate in Canada made less expensive and therefore more competitive. Tariffs and a 12 percent federal sales tax on equipment, plus higher Canadian than U.S. salaries make computer services 20 to 25 percent more expensive than in the U.S. Canadian industry would like to see the tariffs on computer imports removed, thus making it cheaper for Canadians to buy U.S. or other foreign-made equipment.

Some Canadian industry spokesmen emphasize that an omnibus approach to the flow of data is not productive, and feel that the government should concentrate on the correction of abuses rather than on universal prohibition of data flows.¹⁰ They think the government should arrange international treaties for the "extradition" of data which may be stored in another country and should allow data to be freely stored in countries where such mutual data extradition treaties exist. They further suggest that in the case of information for which the Government has a need-to-know,

a license for the storage of that data should be required from countries where no such treaties exist. Industry also feels that government should require that such information be kept in duplicate within the country's own borders, and that penalties for violations could be quite severe. Industry recognizes that there are some classes of need-to-know information which may be deemed by governments to be vital to the national interest rather than for the protection of individual privacy, and that for such information -- clearly designated in advance -- retention within the country's borders could be specified.

There are now some 23 Federal Acts in Canada having bearing on where information may be stored, and an additional 92 provincial laws and regulations which may be relevant to the same subject.¹¹ Up to now, these laws have not been especially enforced and they have so far had an imperceptible effect on the voluminous flow of data and information between the U.S. and Canada.

There is now, however, a law pending before the Canadian Parliament, introduced this year, as an amendment to the Bank Act, which may put an end to processing of Canadian bank data in foreign countries. The amendment reads, "A bank shall not process, store, or otherwise maintain any of its corporate clients' records at a location outside Canada, or transmit data relating to any such records to a point outside Canada with the object of having that data processed, stored, or maintained outside Canada." The penalty for violation is set at \$5000 and/or six months in jail.

Another piece of pending Canadian legislation is an amendment to the Combines Investigation Act. The Canadian Government auditors want to be able to put their hands on business records no matter where they are processed or stored. The amendment thus requires that everyone who stores

data in a computer, wherever situated, on business carried out in Canada must keep on Canadian premises: 1) a description of the data and the forms in which the data can be received plus copies of the access codes for data retrieval, and 2) a description of how the data can be retrieved in Canada, whether through a terminal or not. According to the amendment provisions, an auditor will not actually come in and retrieve the data, but will ask for printouts retrieved by the method shown in the description.¹²

Neither of the two pieces of legislation just described have anything to do with privacy or protection of individual records. Whether these will pass into law cannot be said at this time. The Canadian Association for Data Processing (CADAPSO) protested some of the implications of the Combines Investigation Act, and asked especially for clarification of search and seizure provisions.

The overall Canadian Computer Communications situation is in a flux. Uneasiness, and a feeling of being pressured to "do something" prevails within the Government, as illustrated by the following two statements:

The Honorable Frank Maine, Member of Parliament, and former Parliamentary Secretary to the Minister of State for Science and Technology, says: "While the Government of Canada, like many other governments of the developed world, has not yet completed its study of all the elements of a policy concerning transborder flows of data, it seems quite unlikely that a Canadian cabinet will decide in favor of an entirely unregulated regime. It appears to me that there are too many forces at play to allow ourselves indefinitely the luxury of zero regulation, no matter how reluctant we might be to leave such a stance. "¹³

Dr. Peter Robinson, former Chairman of the Interagency Committee on Computer Communications says: "The information infrastructure of every country, I think, is so fundamentally important to the future development of industry -- future economic well being of the country -- that one cannot afford to let it slip out of one's control...and I use control not in a strict sense but in a broad sense. Because of geographic proximity to the States, and

the fact that Canada is really a narrow strip just north of the border, there is a tendency to sort of look South rather than east-west. Because Calgary is closer to a major center in the U.S. than it is to, say, Montreal...if government takes no action whatsoever, I feel that a lot of this information infrastructure could just slide south of the border. And I don't think we can afford to let that happen..."¹⁴

As seen by Canadian industry (and U.S. industry and the author would agree) the danger both to Canada and to the United States is that governments will take action in the area of a poorly understood, infant technology which may be prematurely and harmfully regulated.

The Canadian Broadcasting, Publishing and Film Industries

As Quebec tries to establish its separate cultural and ethnic identity, English-speaking Canada reels under the impact of American mass media. Many Canadians are uncertain of what it means to have a Canadian mass media, or whether it is important to have a separate media in cultural and social terms called Canadian. Intellectual forces in Canada believe there is such a need, as do some of the politicians. The majority of the Canadian people seem to have mixed feelings. On the one hand, to them American television programs shown in Canada are just part of the Canadian right to a shared experience in North American life.¹ This also includes American films, books, magazines, and televised sports. On the other hand, some polls indicate that Canadians are becoming more aware of the possible cultural costs of what their government calls "American domination" of the mass media. The percentage of Canadians who believe that the "Canadian way of life" is being too much influenced by American television grew from 49 percent in 1970 to 59 percent in 1975.²

If one looks at what TV programs the average English-speaking Canadian watches, one can see why. For example, in Vancouver, B.C., 80 percent of the available television is received by cable, and most of the programs provided through this means are not Canadian. In Calgary, Alberta, Canadian programming content is less than 23 percent, and between 8 and 11 p.m., it is as low as 12 percent. One survey in Toronto indicated that in the peak hours from 7 to 11 in the evening, only 18 percent of viewing time was devoted to Canadian programming -- half of which was hockey. For CTV itself, a nominally Canadian network, only 20 percent of viewing in prime hours is devoted to Canadian programming. Perhaps most telling of all is that more than four out of five hours of TV watched by Canadian school-aged children in the English language are American shows.³

As of 1977, Canada became the top foreign market for U.S. television programming. The use of American materials is further illustrated by the situation of the six competing Toronto stations. Assuming that they stay within the guidelines set by the Canadian Radio and Television Commission (CRTC) -- that is, that no more than 40 percent of the overall schedules of these stations should be devoted to U.S. programming -- this would still mean that they would collectively be showing 336 hours of U.S. TV products a week, or 17,472 hours per year. At a low estimate of \$500 a half hour (allowing for repeats), this would amount to almost \$17.5 million a year being paid out for U.S. shows from the Toronto area alone. According to some estimates, Canada imports about \$50 million worth of TV shows per year. The cost of these shows has gone up astronomically in the last year, to approximately \$20,000 an hour. Five years ago the price of an hour show was only about \$2,500.

In the past, U.S. influence on TV and radio has been a problem peculiar to Canadian English-language television, while French-Canadian broadcasts did not have to compete with the U.S. Their problem, rather, was to master a new electronics pathway in a relatively closed society.

Since more than half of French-speaking Quebecers are unilingual, many of CBC's radio and television policies have been directed at overcoming some of the antagonisms between Quebec and the nine English-speaking provinces. Using an indigenous culture and a shared history as a resource, CBC French television produced original, high-quality, and frequently popular programs.⁵

Because of CRTC initiative, CBC has expanded its French TV service across the country, establishing French language stations in Toronto, Edmonton, and Vancouver, as well as re-broadcasting transmitters in other predominantly English-speaking provinces. To increase the flow of news from across the country to the Montreal news center, the number of Ottawa correspondents has been increased. The nightly newscast, *Téléjournal*, has been lengthened, and there are plans to extend the weekend news. The French Service is also committed to increasing local current affairs and variety programming.⁶

French radio stations reach 81 percent of the French-speaking population. With an additional 4 percent reached by low power relay transmitters, the 90 percent goal has almost been attained.⁷

In recent years, American TV programs have made some inroads even into the French language stations. So far this is not perceived as a threat. The majority of foreign programs on French TV come from other than

the U.S. Canadian programs are very popular on French language TV, comprising 66 percent of the current 6 to midnight programming, and accounting for almost the same proportion of average viewing time.⁸

In the area of films the situation is, from the Canadian viewpoint, no more encouraging than English language TV. Of rental paid by Canadians for motion pictures, \$65 million went for Hollywood films where only just about \$3 million went for Canadian films.⁹

Canada not only imports light U.S. entertainment for TV broadcasting, but also depends heavily on the U.S. wire services for its international news. A special Canadian Senate study of the mass media complained that the Canadian press seemed content to let the AP staff do its foreign reporting. In a different study, Canada found that 25 percent of the U.S. news in Canadian newspapers came directly from U.S. sources. While other stories had Canadian press bylines this, according to the study, does not mean they were originated by Canadians. One report indicates that in the case of U.S. news reported in the Canadian press, 77 percent of coverage comes from the U.S., while for U.S. coverage of Canada, 92.1 percent of coverage comes from the U.S.¹⁰

There is a sizeable difference in amount and content between U.S. coverage of Canada and Canadian coverage of the United States. The average Canadian daily newspaper devotes 273 column inches to American news, while the average American daily newspaper devotes just 5.12 column inches of news space to Canada. In percentage figures, Canada devotes 49.5 percent of its foreign news or 13.2 percent of all its news, to the United States. The American press, on the other hand, devotes 2.33 percent of its foreign news space to Canada, which is about .2 percent of all news carried.¹¹

A comparison of the types of news carried showed human interest stories comprised 16.4 percent of the total Canadian coverage of the U.S., while public affairs accounted for 36.9 percent. In the American press, on the other hand, human interest stories accounted for 37.3 percent of the coverage of Canada while social, economic, and political news accounted for 23.1 percent.¹²

Whether these comparative statistics of amounts of news and types are important, we do not know. Unfortunately, very little is known about interaction between foreign news flow, public opinion, and foreign policy, even in such a close relationship as that between the U.S. and Canada.

In any case, the Canadian newspapers are obviously dependent upon American news sources for their international copy, not simply for news about the United States itself, but for all foreign news. The question Canadians are asking themselves is how well they are being served by news stories which are basically written by Americans for American audiences.¹³

What is true for the printed media is largely true for the major Canadian television newscasts. It is said that the main reason for having Canadian news at 11 p.m. is that Canadian television news relies heavily on film footage from earlier broadcasts on American networks, which is then appropriately dubbed with Canadian commentary for late evening broadcast in Canada.¹⁴

To deal with what it feels is too much American influence on its people, the Canadian government has attempted to impose Canadian content on broadcasts from the Canadian-owned stations. This has for several years been set at 60 percent. However, the Canadian people responded to this

governmental restriction by acquiring cable TV, on which they can watch American programs unobstructed. This is in addition to the large number of Canadians who switch directly to U.S. stations along the border.

The Canadian government is not deterred by this obviously defiant mood of its population. The fact that the kind of light entertainment the Canadians seem to want comes from the United States is no reason not to try to provide Canadian content and entertainment, they say. The CBC, in a lengthy report in support of its renewal license, recently stated that it plans to continue to replace U.S. programs with Canadian programs during the prime time from 6 p.m. to midnight. The CBC fall 1977 schedule, it said, had eliminated one half hour of U.S. prime time programming, and displaced an additional one hour. The fall 1978 schedule was to include an additional half hour of Canadian prime time programming.¹⁵

However, Canadianization of television is an expensive proposition. The CBC report states that it would like to spend an additional \$1 million a year (approximately 0.2% of its program budget) for the next five years on program development. This would make it possible to add one half hour of Canadian programming to prime time each year until 1982, at which time 80 percent Canadian content would be achieved.¹⁵

One might expect more or less shared political agreement on this identity question which is considered so important by the Canadian government. But, on his return from the Bonn summit in the summer of 1978, Prime Minister Trudeau cut \$71 million from the CBC 1979-80 budget. According to the CBC president, this budget cut will mean the elimination of any possibility of realizing plans to "further Canadianize the English TV network, broaden French TV network services, increase regional programming, and promote drama and the arts on the radio" in 1979.¹⁵ Prime

Minister Trudeau cut equally deeply into other Canadian cultural programs meant to stimulate cultural and spiritual attainments of the Canadian people.

Notwithstanding contradictions -- which exist in all government programs in all nations -- Canada sees television as an important vehicle for its future development. In March 1978, the CRTC disapproved the introduction of pay TV in Canada at this time because the Commission

"has concluded that no single proposal achieved an acceptable level of commitment to present broadcasting policy objectives and requirements. The objectives of the Broadcasting Act are to be respected, and pay television must be predominantly Canadian service." ¹⁶

Whatever the wish of the elusive entity called the Canadian people, Canadian private industry, the government and quasi-governmental organizations and regulated groups have taken action to make Canadian cultural content more real in quality and quantity. A rather unique alliance between Canadian regulators, Canadian law, and Canadian private enterprise has ensued.

Possibly the best publicized example of this occurred in connection with what is known as Bill C-58. This bill made it impractical for Canadian advertisers to buy space in Time-Canada or in the Readers Digest, which, at the time of the bill's passage, had profitable Canadian-based operations.

Time-Canada was established as a Canadian subsidiary of Time Magazine in 1943. It contained a separate 4 to 6 page section of Canadian news which was considered excellent and insightful reporting of the Canadian scene by many Canadian observers. Importantly, the magazine was filled with numerous ads paid for by Canadian firms. In 1964, an amendment to the

income tax law was passed which disallowed income tax deductions for advertising in non-Canadian magazines. By a special grandfather clause, Time and the Digest were exempted at that time.

This situation changed in 1976, however. To qualify its subsidiary as Canadian under the 1976 tax bill, Reader's Digest was forced to surrender a greater degree of U.S. parent control. In addition, the subsidiary had to be 75 percent Canadian-owned, published in Canada, and not be substantially the same as the foreign publication. The 33-year-old Time-Canada, however, announcing that it "had no choice but to cease publication," fired 40 editorial employees and closed its doors.¹⁷

Whether the cessation of publication of Time-Canada was necessary or not is a matter of debate. According to one source, Time's Canadian net revenue dropped from \$1,629,000 in 1974 to \$1,296,000 in 1977. Other reports say Time made out very well financially by this closure and now makes more profit by exporting its American edition to Canada than it did by publishing there.¹⁸

The American side of the argument saw and still sees C-58 as flagrant discrimination against American business interests. The Canadians, however, perceived that the American publications were "methodically...destroying Canada's periodical press." The Canadian government takes the view that Bill C-58 is a purely internal matter and contends that it affects the actions only of Canadian companies. In other words, economic considerations aside, the Canadian government sees the issue as one bearing on sovereignty of the country and, as such, non-negotiable. Canadian observers including Peter Newman, editor of Maclean magazine, as well as several government officials, feel that C-58 has made it possible for Canadian publishing houses to count on sufficient advertising revenue

to develop a viable magazine industry in Canada.¹⁸

Maclean magazine has gone weekly with more news and fewer long feature articles. While it is not likely to have the news depth of Time or Newsweek, and its foreign coverage will still be severely limited, it is felt that Maclean is an important beginning. The magazine will double its 35-member editorial staff for the weekly operation, and move its offices to a modern building. It expects to sell almost 33 million copies per year, which, according to Mr. Newman is "tremendous for Canada." Time-Canada had annual sales of about 525,000 and Time sales are estimated to be down now to about 300,000 per year in Canada. Newsweek, which never had a Canadian edition, sells only about 55,000 to 60,000 copies per year of its American edition in Canada.¹⁸

Newman defends C-58 as absolutely necessary to stimulate Canadian investment in the publishing business and to create a climate in which firms like Maclean "were not afraid to put big money into magazines." Before, it had been a totally marginal operation, in which Maclean had lost money for a decade or more. According to Newman and other vocal Canadians, something needed to be done to safeguard Canadian culture. The massive influence of U.S. media threatened to overwhelm the expression of Canadian creativity, they say. Bernard Ostry, presently Deputy Minister of Communications, describes the situation as follows:

"Cultural policy cannot lock out American influence; it can only seek to strengthen Canadian self-confidence. Measures such as C-58 are meant to do exactly that." ¹⁹

A similar unresolved controversy is now raging over the restriction of Canadian advertising on U.S. border station TV shows.

In the area of book publishing, Canadians have taken some action to prevent books by Canadian authors which are copyrighted in Canada from being remaindered in the United States and sold at huge discounts in Canada. The Canadian government is now prohibiting the import -- by wholesalers and institutions, but not by private individuals -- of books from the U.S. for which Canadian authors and publishers hold a Canadian copyright.²⁰ Again it is hoped this will stimulate the Canadian book publishing industry. Not everybody is happy with this. Some individuals, including intellectuals and some of Canada's best authors, feel that this is simply subsidizing second-rate Canadian writers. The Canadians have not yet sorted out this dilemma.

The government concept of the necessity for exposing Canadians to Canadian materials, conceptions, and perceptions of the world around them is especially strong in the broadcasting area. The present Broadcasting Act is unequivocal in its requirement that the broadcasting system must be predominantly Canadian. Section 3-D of the Act declares that the programming provided by the Canadian broadcasting system should be "of high standards" using predominantly Canadian creative and other resources. It also states that the Canadian broadcasting system should be effectively owned and controlled by Canadians so as to "safeguard, enrich, and strengthen the cultural, political, social, and economic fabric of Canada."

A draft comprehensive telecommunications law, which includes broadcasting, had its first reading on November 9, 1978.(Bill C-16), and expresses these views even more strongly. It states:

"Efficient telecommunications systems are essential to the sovereignty and integrity of Canada, and telecommunications services and production resources should be developed and administered so as to safeguard, enrich, and strengthen the cultural, political, and social, and economic fabric of Canada."

(That) "Telecommunications links within and among all parts of Canada should be strengthened and Canadian facilities should be used to the greatest extent feasible for the carriage of telecommunications within Canada and between Canada and other countries...(that)...a system should provide for a balanced opportunity for the expression of differing views on matters of public concern and should reflect the diversity of Canadian cultural and social values...(that it)...should be high standard, using predominantly Canadian creative and other sources...(and) ...contribute to the development of national unity and provide for a continuing expression of Canadian identity."

The Canadian Telecommunications System Including Domestic Communications Satellites

Canada has one of the best developed and most modern telephone systems in the world. Just over 96 percent of Canadian households have telephones. In 1976 there were some 13.3 million telephones in use in Canada and this is expected to increase to about 24 million in the next decade.¹

Plant investment in telephony in 1976 was about \$12.6 billion,² or about 10 percent of that of the U.S., correlating with the Canadian population, which is also about 10 percent that of the U.S. Beginning this year, Bell Canada will introduce large digital switches -- the Digital Multiplex System (DMS series) -- into its toll and local networks and initiate Canada's move to an integrated digital network (IDN). Manufactured by Northern Telecom, this equipment was developed jointly by Northern Telecom, Bell Canada, and its research arm, Bell Northern Research, Ltd. As with other nations, digital circuit switching, packet switching, and digital transmission will figure prominently in the telecommunications systems of the near future.

Canada's telecommunications system philosophically and politically operates more like that of the United States than the European system of State-owned PTT's. The two largest telephone companies are under federal jurisdiction. These are Bell Canada (serving Ontario, Quebec, and a large part of the Northwest Territories), and BC Tel, serving British Columbia. These carriers are regulated by the Canadian Radio-television and Telecommunications Commission (CRTC), which also regulates the national carriers Teleglobe (responsible for overseas traffic), Telesat (the domestic satellite carrier), and CNCP Telecommunications, which provides business service and public message (telegraph) service. Other carriers are regulated by provincial and municipal governments.³

As stated in a recent U.S. report, "Canada has evolved its own unique mixture of monopoly, competition, regulation, and cooperation in industry structure and government oversight." This system has served Canada well. Canada has demonstrated possibly the lowest degree of regulatory lag in any western industrial democracy. While the U.S. was still unresolved in its regulatory policies, Canada introduced low-cost digital networks.⁴

In the words of Bell Canada, Canada's largest single telephone company, "Out of that mixture of monopoly, competition, and cooperation between the two competitors (Bell and CNCP), has evolved for Canada a telecommunications service which has been recognized to be one of the finest in the world..."

But not all is as tranquil as it would appear on the surface in the telecommunications area in Canada. There are a number of highly significant telecommunications matters which presently concern governments, users, and industry alike: competition, interconnection, federal/

provincial jurisdiction, and the role of the cable industry.

Excluding monopoly public telephone services, which account for approximately 85 percent of the Canadian telecommunications market (gross revenue dollars), the remaining 15 percent is characterized by vigorous competition in private line and data communications. This market is expanding rapidly. This battle is being waged in terms of competing services, for instance by Datapac, a nationwide system of digital computer communications using packet switching technology introduced by the telephone companies in 1977, and the CNCP's competitive service, introduced the same year, called Infoswitch services. While both Infoswitch and Datapac use digital packet switching technologies, Infoswitch offers users the flexibility of digital circuit and packet switching technologies as opposed to packet only. CNCP claims that this is the first such hybrid system commercially available in the world.

More crucial in the competition struggle is CNCP's request for interconnection to Bell Canada's local switched distribution network. The application is now before the CRTC, and the case is seen by both CNCP and Bell Canada as a landmark in Canadian telecommunications. Without interconnection into Bell Canada's local switched distribution network, it would be difficult if not impossible for CNCP to effectively compete with the telephone companies in the data and related markets. It should be kept in mind, however, that whatever CRTC's decision, it will have no enforceable impact on those telephone companies that are provincially regulated.⁵ *

* On May 17, 1979, CRTC ruled in favor of the CNCP request for interconnection.

Another important event is the recent change in government policy, allowing common carriers to own and operate send/receive satellite earth stations. This change also permits cable companies to own receive only stations. The change in policy is expected to promote the use of satellite facilities.

Still another event is the emergence of cable companies as carriers. In a decision on March 26, 1979, the CRTC approved the application by a number of cable firms to provide non-programming communication services. This is significant in the light of the extensive local plant distribution and the ability to own receive earth stations. It thus alters the traditional role of the cable company as a broadcast receiving undertaking only, by allowing cable to compete with the established carriers, that is, the telephone companies and CNCP.⁶

Questions related to federal/provincial constitutional discussions have been raised previously in this paper. Many provinces have made it known that they feel they should be responsible for all forms of communications, including telecommunications, within their boundaries. This question was unresolved before the election campaign of May 1979. It surely will be an important question in the months and years to come.

Canada's advances in digital switching have made Northern Telecom, Ltd. a competitor on the U.S. market, as seen when Citicorp recently bought a Northern Telecom system for \$2.5 million dollars.⁷ The Citicorp telephone system is one of about 300 Northern Telecom Systems around the U.S., and the company's U.S. sales last year totaled about \$467 million, up from \$39 million in 1971. Northern Telecom now has 23 manufacturing plants and over 11,200 employees in the United States. Western Electric considers this company to be "an important competitor," and Northern Telecom has,

in fact, lofty objectives in the U.S. It projects U.S. sales of more than 1 billion dollars for 1982, and says it won't be satisfied until it ranks number two in the U.S. behind the Bell system's manufacturing arm, Western Electric Company.

The rationale for penetrating the U.S. market is described straightforwardly by Robert Scrivener, Chairman of Northern Telecom, who says that the company realized in the late 1960's that the Canadian market alone would not be sufficient to support rising research and development costs. It was decided then that "...if we didn't do something, we would be dead." The annual research and development costs of Northern Telecom are about \$100 million dollars.

Canada excels in satellite communications, along with agriculture, some machinery, and atomic energy research according to many Canadian and foreign observers. As previously stated, it put the world's first domestic satellite in place, beating the U.S. by two years. This was due, in no small measure, to Canada's low degree of regulatory lag.

Satellite communications is exceedingly important to Canada, which, with its huge northern land mass must provide communications and other facilities to 40,000 widely scattered individuals. There is a major political commitment to provide these people, who rely on communications for medical care and education, with radio, television, facsimile, and other facilities. In the absence of substantial government subsidies, it is doubtful whether an operational system would be economically feasible.⁸

Although Canada is very advanced in microwave relay facilities, it is presently impossible to use this means over these long and difficult distances. Satellites are at present the only practical and economic means of providing communications services to the north.

Cooperative research and demonstration projects are carried out in cooperation with the United States, but Canada has done much on its own. It produced in cooperation with the U.S. an experimental communications technology satellite called Hermes (US CTS), which was launched from Kennedy Space Center in Florida, January 17, 1976. Hermes is the world's first satellite with an operational 12-14GHZ transponder, which was produced in the U.S. Its experiments were broadly subdivided into two groups, 14 with "social" emphasis, and 12 predominantly technological. Social experiments encompassed tele-education, tele-medicine, community interaction, and administrative services. Both Canada and NASA declared the Hermes mission a great success.⁹

Canada's domestic satellite communications system is considered among the best in the world. At this time Canada, however, has excess capacity. Since very large investments must be made to maintain a domestic satellite system, the question is whether Canada has the resources to continue an independent domestic satellite communications system, and how this system will interact with U.S. domestic systems in the future.

Canada has an extensive research program in remote sensing by satellite which is highly advanced. In this area there is close cooperation with the United States.

Research and Development in Canada

R & D, innovation, and research intensive industry are the driving forces behind the communications and information sector. Without high past performance of these factors we would not now be dealing with an information revolution. Without robust and dynamic future activity in these areas the sector will stagnate. Thus our concern with R & D, innovation, and research intensive industry in this study.

Canada has one of the highest standards of living in the world, and between 1967 and 1976 experienced a growth rate surpassed only by that of Japan. The gross national product rose by 53 percent (compared to a 26 percent increase in the U.S.), and real disposable income jumped by 74 percent.¹

Notwithstanding this, there is a deep concern in Canada about the economic future. Inflation appears to be out of hand. Economic growth has been insufficient to reduce an unemployment of more than 8.5 percent.² Canada's trade position in R & D intensive (technology-intensive) products has deteriorated over the 1964-1976 period, and there was a particularly marked drop in the trade balance from 1971 to 1976. For the entire period of 1965 to 1976, Canadian imports of research-intensive products grew at a faster rate than exports. The deficit grew from \$.6 billion in 1965 to \$2.6 billion in 1976. This appears, however, to have leveled off since 1974, despite the fact that, due to cyclical factors, Canada's overall trade balance declined sharply in 1975.³

By 1976, the Canadian imports of research-intensive manufactures exceeded exports by more than double. The United States has traditionally run a surplus in trade in research-intensive products, and its trade posi-

tion in these products has strengthened in recent years. Only 9 percent of Canadian exports of manufactures are research-intensive, compared with 41 percent for the U.S. Seventeen percent of Canadian imports are research-intensive, compared to 21 percent for the U.S.⁴

Much of Canada's information and communications industry is included in statistics for electrical products (which includes electronics). Trade performance in this area strengthened considerably in the late 1960's, when the level of exports reached 50 percent of that of imports, but this position deteriorated rapidly in the 1970's, and in 1976 the level of exports was only one-third of the level of imports. In the 1964-1970 period, exports of electrical products grew at almost twice the rate of imports, but in the period from 1971 to 1976 the exports growth rate halved and the import rate then exceeded it. The overall result has been a rapidly growing trade deficit in these products which reached \$.9 billion in 1976.⁵

Among all the industrialized nations, including the U.S., Japan, the U.K., France, West Germany, and Sweden, only Canada has failed to increase significantly the share of the GNP attributable to electronics. It has averaged only 1.7 percent of the Gross Domestic Product over the past 10 years, while in all other countries, it has been increasing by leaps and bounds.⁶

There are more than 700 electronics firms in Canada, but almost 70 percent of these have sales of less than \$1 million, and only 8 percent have sales over \$25 million. While only 20 percent of Canadian electronics firms are said to be foreign-owned, these account for 55 percent of the industry's sales.⁷ No other industrialized country in the free world has such a high degree of foreign ownership of its electronics industry.⁸

(Other statistics show electrical products to be 65.6 percent foreign-owned -- and in that context it is said to be the seventh most foreign-owned industry in Canada.)⁹

Some studies have been conducted by the Canadian Ministry of State for Science and Technology which contrast the performance of high technology and low technology industries in Canada in terms of employment, output, productivity, and price movements over the 1961 to 1974 period.¹⁰ High research-intensive industries were found to have out-performed low research-intensive industries by registering over the 1961 to 1974 period:

- 1) 50.3 percent higher growth in employment,
- 2) 23.5 percent higher growth in output,
- 3) 29.4 percent higher growth in productivity,
- 4) 55.6 percent lower growth in prices.

Similarly, research-intensive industries outperformed industries which did no research and development by

- 1) 231.5 percent higher growth in employment,
- 2) 66.5 percent higher growth in output,
- 3) 43.0 percent higher growth in productivity,
- 4) 57.2 percent lower growth in prices.

While Canada has better figures for proof than most countries, this is a result that could have been anticipated.

Unfortunately, Canada's performance in the overall area of R & D is not so good as it should be.¹¹ \$1.9 billion were designated for research and development in Canada in 1977. Although total Canadian expenditures for R & D have increased in current dollars each year since 1963, in constant (1971) dollars, these expenditures have fluctuated between \$1 billion and \$1.1 billion since 1968. Consequently, the ratio of R & D to GNP has

declined steadily since the peak of 1.28 percent in 1967. Most industrialized countries devote substantially more resources to R & D than does Canada.¹²

Gross expenditures on R & D (GERD) as a percentage of Gross Domestic Product (GDP) are lower than the other major OECD countries. Germany and Japan have recorded substantial growth in this ratio, and although there has been a net decline in the U.K. and the U.S. these two countries still allocate more to R & D than does Canada.¹³

Within GERD, the business sector in most industrialized countries is the source of 40 to 50 percent of R & D monies and performs 50 to 65 percent of all R & D. In contrast, business in Canada provides only about one third of R & D expenditures, and performs only about 40 percent of R & D, although this proportion has been increasing steadily in the last 15 years. For every scientist and engineer engaged in R & D in the government sector in Canada, there is slightly more than one in the business sector. In the U.S., Japan, Germany, and Sweden there are approximately 5 scientists and engineers in the business sector for every one in government or universities.¹⁴

Thus, statistical summaries reveal two major concerns about Canadian R & D: it is low overall, compared to that of other industrialized countries, and there is an imbalance -- with a significant deficiency in the industrial sector -- both as a source of funds and as a performer of R & D.

An important component of the research and development problem in Canadian industry is the degree of foreign ownership (largely U.S.). The Ministry of State for Science and Technology (MOSST) is waging a strong campaign to have foreign-owned companies do more R & D in Canada and complains bitterly of their failure to do so. Canada does, however, benefit substantially from invisible inflow of U.S. technology which do not show up in the

statistics. For the year 1976, according to a special study of the Canadian Ministry of State for Science and Technology, this invisible R & D has been estimated at between \$600 million and \$700 million. In the electrical products field alone this amounted to \$87.5 million in 1976, in addition to the \$85 million in research performed in Canada. When viewed in the context of domestic and invisible R & D combined, Canada's technology resources are more commensurate with its other economic indicators in the worldwide industrial picture. For example, the inclusion of invisible R & D raises Canada's GERD as a percentage of GDP to 1.37 percent, which is above that of Australia (1.3 percent), or the combined Scandinavian countries (1.33 percent), regions that may be likened to Canada for their similarity of industrial beginnings and/or the similarity of their populations, terrain, or climate.¹⁵

If one subtracts out the effect of Canada's relatively smaller industrial sector, and treats the R & D resources of the business enterprise sector as a proportion of the sector's own GNP, Canada's position among industrialized nations improves significantly when invisible R & D is included. With it, Canadian business enterprises have access to R & D resources equivalent to 4.2 percent of their GDP. For Australia, the figure is only 2.29 percent and for the combined Scandinavian countries, 2.92 percent. In fact, only the U.K. with 4.6 percent and the U.S. with 6.45 percent exceed the Canadian figure.¹⁶

However, the Canadians are quick to point out that the import of technology and invisible R & D has three major disadvantages for them.

- 1) It often does not relate to an exportable product.
- 2) It leaves Canada vulnerable to foreign decision making.
- 3) It limits Canada's ability to offer adequate employment opportunities to its highly qualified scientists, engineers,

technicians and technologists.¹⁷

A report to the Parliament in 1978 by the Minister of Science states the issues facing industrial research as follows:

"The amount spent on R & D in Canada is low compared to other industrialized countries...The distribution of the R & D effort among the three main performers shows a serious deficiency in industrial research...A better balance among the main performers can only be achieved through a larger industrial R & D effort, and not through a redistribution of the existing effort. The high degree of foreign ownership, while of substantial benefit to the economy, has truncated the development of R & D in Canada."¹⁸

In an effort to improve the situation, the Canadian government has offered the following plan to encourage Canadian industry to take advantage of the results of research conducted by university and government scientists, and to create job opportunities in research and development.

1. That a new national priority be set to reach a target of 1.5 percent of GDP for R & D expenditures in Canada by 1983.
2. That Federal government procurement be used to stimulate industrial research and industrial development in Canada.
3. That greater private sector spending on R & D be encouraged through tax allowances and other measures.
4. That more job opportunities be created in science and technology.
5. That institutions and other mechanisms on the interfaces between government-industry and between universities-industry be established which will be specifically devoted to the transfer of ideas, innovations, information, skills, manpower, and technical capability.

6. That the establishment of centers of excellence across Canada responsive to national needs be encouraged and assisted.
7. That university research in areas of national concern be encouraged. The granting councils will be given additional funds for this purpose.
8. That national goals and priority areas for research and development growth will be identified and the necessary effort used to achieve these goals to establish an industrial productive capacity in Canada which is competitive in world markets.¹⁹

Canada's dependence on foreign ownership and invisible R & D has led to a sense in certain circles -- especially stressed by the Canadian Science Council -- that for all its high standard of living, Canada has many elements of a developing country. The danger is felt that Canada is deindustrializing; that its trade and prosperity are too highly dependent on the exploitation of natural resources. This leads Canada to identify itself,-- at least for domestic political purposes -- with the Third World. The Science Council strongly advocates that Canada look closely at measures taken by Brazil and other developing countries as models for how high technology industries may be nurtured and protected.²⁰ As a part of this argument, it is pointed out that ever-increasing rates of investment capital are leaving Canada. Between 1950 and 1974, \$20 billion in foreign capital entered Canada, while more than \$40 billion left the country in the form of interest payments (\$7 billion), dividends (\$17 billion), and service charges, such as licenses and management fees (\$16 billion). In 1975 alone, \$6 billion left Canada in these ways.²¹

An important fear of some Canadian government agencies, namely the MOSST and the Canadian Science Council, is that other advanced nations, and especially the U.S., may restrict technology transfer to Canada. They have watched the debate in the United States over the negative economic and strategic effects for the U.S. of the transfer of technology with exceeding anxiety. When the Canadian Minister of Science visited the U.S. two years ago, this perceived problem was discussed with U.S. officials at high levels. The Canadian Science Council emphasized this anxiety and called for action to neutralize the possible negative effects of restricted technology transfer from the U.S. While it is most unlikely that the United States would restrict the transfer of technology to Canada (Canada has been exempted from all strategic restrictions of technology exports), even the existence of the possibility strongly affects Canadian policy. What worries Canadians is the political dependence engendered by the fact that the United States has the power to even potentially hold this over their heads.²²

That is why they feel they must have more control over their own R & D. It is what they mean by Technological Sovereignty.

Canadian Innovations in Communications
and Information

As previously indicated, Canada is competitive with or well ahead of other industrialized nations in applications in such areas as their telephone system, cable television, domestic satellite communications, and numbers of radios, televisions and telephones in private homes.

Canada now believes it has come up with a major technological breakthrough which could make two-way television a reality in most Canadian homes by the 1980's. Originally called Canadian Videotex and now Telidon, this system, according to the Department of Communications, has the potential for creating a multi-million dollar industry in new communications hardware and in information services to the public.¹

Although functionally similar to British Viewdata and French Antiope interactive systems, Canadian Videotex is technologically considerably more advanced in that it is independent of the receiving terminal hardware communications network, higher bit rate and database construction. The system, which has been designed to fully utilize the presently available technology and data formats is said to permit unrestricted development in all areas for the foreseeable future.

The system is claimed not to be vulnerable to obsolescence as technology advances to permit higher resolutions and more versatile home and business terminals. The Canadians thus foresee that it could lead to a whole new way of computer processing and a whole new type of publishing industry.² The system is being given extensive pilot trials.

It has been announced that as part of the effort "to improve communi-

cations in rural Canada and to stimulate industrial activity" the Canadian federal government will conduct rather extensive field trials of fiber optics technology in Manitoba.

Fiber optics is a promising new means of transmitting telephone, TV, radio and other services using light waves conducted through ultra-thin fibers. Trials will determine whether fiber optics is suitable technically and economically for improving telecommunications services in rural areas of Canada. The trial will deliver, through the fiber optics transmission system, simple party line telephone service, at least five and possibly more TV channels, FM radio, and some two-way computer interactive signals to allow experiments in new services such as teleshopping or information retrieval.

While rural development is ostensibly the major purpose of the trial, the Canadian government is perfectly aware of the tremendous potential of this new technology, and is determined that Canadian industry be at the forefront, notwithstanding R & D leadership of the U.S. and Japan in this field. A 33 percent average growth rate per year in worldwide optical fiber consumption has been predicted for the 1990's. In North America alone, the value of fiber optics investment is projected to reach more than a billion dollars a year by that date.³

Internationally, Canada is quite influential in multilateral bodies such as the International Consultative Committee on Telephone and Telegraph (CCITT). Canada realized at an early stage that the acceptance of internationally approved standards by all carrier administrators and equipment providers is essential for the growth of national and international communications, and Canada's strength here lies in its leadership as an applications innovator and user. Particularly striking was Canada's role in the evolution of the CCITT X.25 protocol, a basic

protocol for access to packet switched data networks. The links between Canada's Datapac and the U.S.'s Tymnet and Telenet are the first examples of transnational internetworking of public packet switched networks using that new protocol.⁴

The Importance of Communications and Information
to Canada's Future¹

Proclaiming that the subject matter of communications and information "...is not only economic and technical but deals ultimately with the stuff of the spirit and imagination...", Canada's Communications Minister, Madame Jeanne Sauvé, announced last November that an independent group of "distinguished, informed Canadians" to be called the Consultative Committee on the Implications of Telecommunications for Canadian Sovereignty would produce specific recommendations on a "strategy to restructure the Canadian telecommunications system." The announcement said in part:

"The Canadian communications system is in the midst of a crisis more profound than any that has affected it since the 1930's...Many have drawn special attention to the need to safeguard Canada's cultural sovereignty...The recent hearings before the CRTC on the CBC license renewals, the spectacle of U.S. broadcasters seeking redress against Canadian legislation and tax laws, and the recent applications by the cable companies to deliver non-programming services (which are opposed by the telephone companies) provided other opportunities for the public and the media to add their voices to the chorus of concern.

At the same time, developments in the areas of fibre optics, satellites, interactive television and computer technology threaten not only to exacerbate the existing problems, but also to bring new ones and new opportunities in their wake. Among other things, these new technologies could: radically increase the amount of American television programming entering into the country; further aggravate the balance of

payments problem in electronic products; increase the difficulties being experienced by the Post Office, schools and universities, publishing industries, and the clients they are meant to serve; and compromise the country's capacity to control future fundamental economic, political, social and cultural directions. On the other hand, these technologies could -- if imaginatively and quickly applied -- permit a significant re-patriation of the electronics industry; provide a new base for the development of the high technology area; stimulate the growth of a whole host of new programming and information-based services, and generate more private support for a revitalized cultural sector. It is apparent, therefore, that the new technologies constitute both threats and opportunities, which could be used either to further erode Canadian sovereignty or to strengthen it considerably."

This report (Clyne Report) was issued in April 1979.² The recommendations of this report are included as an Appendix.

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Canada

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Jean Baillargeon, Secretary, Press Council, Quebec

Robert Bennett, Director of Network Development, Department of Communications, Ottawa

Pierre Camu, President, Canadian Radio Television Telecommunications Commission (CRTC), Ottawa

William Cundiff, Senior Research Associate, Institute for Research in Public Policy, Montreal

J. Stefan Dupré, Visiting Professor, Harvard University; Professor, Toronto University

George Fierheller, President, Systems Dimensions Ltd., Ottawa

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Ken Hepburn, Director General, Department of Communications, Ottawa

Denis Hudon, Deputy Minister, Ministry of State for Science and Technology, Ottawa

John Leman, Department of Justice, Ottawa

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Peter Robinson, Policy Advisor, Department of Communications, Ottawa; former Chairman of Inter-Agency Committee on Computer Communications

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Jeff Trew, Manager, Environmental Monitoring, Canada Post, Ottawa

Zavis P. Zeman, Project Leader, Institute for Research and Public Policy, Montreal

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Scot Cohen, Senate Foreign Relations Committee, Washington, DC

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John Day, Counselor for Political Affairs, American Embassy, Ottawa

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Hugh Donaghue, Vice President, Control Data Corporation, Washington, DC

Arthur T. Downey, Sutherland, Asbill and Brennan, Washington, DC

John Eger, Lamb, Halleck and Keats, Washington, DC

Charles Ferris, Chairman, Federal Communications Commission, Washington, DC

Bart S. Fisher, Patton, Boggs and Blow, Washington, DC

William Fishman, Special Assistant to the Assistant Secretary for NTIA, Washington, DC

Harry Freeman, Vice President, American Express Company, Washington, DC

Jerry W. Friedheim, Executive VP, American Newspaper Publisher's Association, Washington, DC

Hans P. Gassman, OECD, Paris, France

Wreatham Gathwright, Policy Planning, Department of State, Washington, DC

Robert Graff, President, Sextant, Inc., New York, NY

Norman Hinerfeld, Chairman, Kayser Roth Corporation, New York, NY

Don Hollis, Vice President, Chase Manhattan Bank, New York, NY

Alexandra Karlow, American Express Company, Washington, DC

Wayne Kay, Office of Science and Technology Policy, Executive Office of the President, Washington, DC

George Kroloff, President, Ruder and Finn, Washington, DC

A.W. Kunberger, Manager, North American Long Lines AT&T, Bedford, NJ

Dan Lacy, Senior VP, McGraw-Hill Inc., New York, NY

Ronald Lepkowski, Federal Communications Commission, Washington, DC

Wyngate Lloyd, Deputy Country Director of Canadian Affairs, Department of State, Washington, DC

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Marc Porat, Aspen Institute, Washington, DC

William H. Read, Research Fellow, Harvard University

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- APPENDIX -

RECOMMENDATIONS OF THE CONSULTATIVE COMMITTEE
ON THE IMPLICATIONS OF TELECOMMUNICATIONS FOR
CANADIAN SOVEREIGNTY

Recommendation 1

- a) Given that cable companies have been granted territorial service monopolies, they should be regulated on a rate-of-return basis.
- b) To this end, action should be taken to amend Bill C-16 for a new Telecommunications Act so as to allow the CRTC to regulate cable companies both as broadcasting receiving undertakings and as telecommunication carriers.
- c) For the purpose of implementation of a), the first cable companies to be regulated as telecommunication carriers should be those offering non-broadcast services which they are not now authorized to offer, such as fire and burglar alarm services, Telidon, etc.
- d) Cable companies should be allowed to provide non-broadcast services other than telecommunications carriage. When they do so, they should be required to incorporate a separate company for that purpose; if the separate company has the same ownership as the cable company, it should have a separate management and maintain a relationship sufficiently distant to ensure that fair access can be afforded to all competitors who wish to use the cable company's facilities. Under the amended legislation, the cable companies would, in their capacity as telecommunication carriers, be required to offer public access to their services and facilities, without discrimination and at just and reasonable rates.
- e) The CRTC should, in preparation for the eventual regulation of cable companies as carriers, institute effective cost-separation procedures by the cable companies, so that the cost of distributing broadcast signals received off-air, as directed by the CRTC, can be identified as one of the costs to be included in the rate base.

Recommendation 2

The pace and extent of plant integration for local delivery of telecommunications services should be determined by future technological, economic and social considerations.

Recommendation 3

The federal government should consider the introduction of amendments to Bill C-27 (for the creation of a Post Office Corporation) with a view to clarifying the role of the Corporation in the telecommunications structure as a whole, which must continue to include the private telecommunications carriers.

Recommendation 4

In our view the high level of long-distance telephone rates, an outgrowth of the uncoordinated regulatory process in the industry, is a barrier to national communication and understanding. We recommend that the governments and agencies involved cooperate to create a mechanism which will review long distance rates and determine that they reflect national as well as regional interests.

Recommendation 5

The broadcasting services provided by the CBC are the main national instruments for the preservation of Canadian social and cultural sovereignty and should be recognized as such. The CBC should be afforded whatever means may be required to reinforce its function in that regard.

Recommendation 6

A Task Force should be appointed by the Governor-in-Council under the Inquiries Act to report on and make recommendations with regard to the management, programming, and funding policies of the Canadian Broadcasting Corporation, with particular but not exclusive reference to:

- quality and diversity of programming;
- "make-or-buy" policy for program production;
- the reflection to each other of the two principal linguistic communities in Canada, and the promotion of exchanges between the English-language and French-language networks;
- the proportion of the operational budget being devoted to program production;
- the decreasing audience-share of the CBC network, in particular the English-language television network;
- responsiveness to the public;
- the financial resources necessary to carry out the CBC's responsibilities under the Broadcasting Act;

- additional channels (off-air or on cable) to be used for CBC programming.

Recommendation 7

The CRTC should be authorized to issue broadcasting licenses to independent corporations established by provincial governments to operate broadcasting facilities and broadcast programs of a general character, subject to the provisions of the Broadcasting Act and the Radio Act.

Recommendation 8

Bill C-16 should be amended so as to require private broadcasters to provide, inter alia, for a continuing expression of Canadian identity and to contribute actively to the flow and exchange of cultural and regional information and entertainment, as is already the case with the CBC.

Recommendation 9

The CRTC should introduce a points system for measuring Canadian content combining qualitative, quantitative, and prime-time aspects, without relinquishing the present concept of a minimum quantity, but with strong emphasis on quality.

Recommendation 10

The CRTC should establish classes of broadcasting stations as a base for determining the percentage of revenue, in each class, that should be devoted to program production.

Recommendation 11

a) Some of the revenues from cable subscription fees should be paid into a fund to be used for the production in Canada of programs to be viewed on television. All subscribers should contribute to this fund; it should be noted, however, that rate-of-return regulation for cable will mean in the case of many systems that a levy can be made for the purpose of the programming fund without increasing the present subscription fees. In some cases, the amount of the levy may have to be added to the subscription fee.

b) The Canadian Film Development Corporation (CFDC) or a new agency created for the purpose should be empowered to receive and administer the proceeds of the levies recommended in a) for the purpose of promoting Canadian production of programs to be viewed on television (including films), following the procedures now authorized and in use for the promotion of film production by the CFDC.

Recommendation 12

The federal and provincial governments should take action, as a matter of urgency, to introduce incentives to promote corporate sponsorship of Canadian television programming and to assist the production, programming, and marketing of Canadian programs and films to be shown on television. Governments should consider the possibility of tax rebates for advertising on Canadian programs.

Recommendation 13

The problem of transplants - American stations carried in their entirety on Canadian cable systems - presents a perplexing mixture of conflicting needs, desires and rights.

1. The existence of the transplant system is inherently unfair to Canadian private stations and the CBC. The showing of U.S. programs on the transplants detracts from the commercial value of those programs to Canadian stations, even though the Canadian stations have bought Canadian rights to them. The Committee has concern that a time may arrive when, most of the country having been reached by cable, there will be little or no commercial value to Canadian stations in using U.S. programs.
2. In addition the transplants on cable spread foreign advertising far beyond the border areas and make it unnecessary in some cases for international corporations to buy advertising in Canada; they are covered by the "overflow" of their American parent companies' advertising.
3. The majority of the Committee proposes that when a Canadian broadcaster buys exclusive rights to a program for a given area, cable companies in that area be required to respect these rights and the CRTC to enforce them. This action should not be taken before public discussion and debate, including CRTC hearings.*

Two members of the Committee (Clyne, Fulford) firmly hold the view that this would be unacceptable to Canadian viewers who regard the watching of transplants as an incremental right, given the technological capability of cable.

4. It has been proposed to the Committee that Canadian cable simply delete all commercials from U.S. transplants. The Committee rejected this suggestion on the grounds that it would amount to unethical treatment of the U.S. stations.

* We note that in the United States the ownership of programs within a given area is protected by law and practice and that cable systems routinely black out programs from distant stations in order to protect the rights of local stations. Were Canadian cable companies to follow a similar rule, it would not be at variance with U.S. practice.

5. The Committee holds the view that eventually this issue may be resolved in terms of property ownership under a revised copyright law.

Recommendation 14

The federal government, which has traditionally exercised jurisdiction in the field of copyright, should urgently undertake a full revision of the copyright law, having regard to the extensive report made by Keyes and Brunet at the request of the Department of Consumer and Corporate Affairs and published in 1977.

Recommendation 15

The CRTC, in authorizing the carriage of television stations by cable, should continue to give precedence to Canadian stations, and should not increase beyond four the number of U.S. stations that may be distributed.

Mr. Clyne, Mr. Fournier and Mr. Beigie have reservations about this recommendations, and would allow the CRTC to have discretion as to the number of U.S. stations that may be distributed.

Recommendation 16

The federal government should renew the discussions with the United States with a view to resolving the border television dispute at an early date.

Recommendation 17

- a) Pay-per-program television should be recognized as more appropriate for Canada than pay-per-channel. Pay-television should be introduced as soon as the technology for pay-per-program is developed.
- b) Pay-television should be provided by licensed Canadian-owned program undertakings.
- c) Attention should be given to the elaboration of Canadian-content rules appropriate for pay-TV.
- d) There should be a levy on profits from pay-TV, to be used for Canadian programming, with the amount to be determined by the CRTC.

Recommendation 18

Any satellite policy for Canada should support and strengthen Canada's social, economic, and cultural goals. Accordingly, Canadian stations, networks and other program undertakings should be the only sources of radio and television feeds (regardless of the origin of the programs) to be carried on the Canadian satellite service.

Recommendation 19

The Committee fully supports the continued use of satellites to give Canadians access to the television programming of other countries. It recommends, however, that for such purposes the facilities of Canadian carriers such as Teleglobe Canada and Telesat Canada should be used. Except for the operations of Telesat and Teleglobe, commercial and community satellite receiving earth stations should be licensed for the reception of signals from Canadian satellites only. This recommendation does not apply to the operation of small individual receiving antennas owned by Canadians for their own use.

Recommendation 20

The Committee's view is that the Canadian satellites could be more fully used in the distribution of Canadian TV to all parts of the country. The federal Government should, as a matter of urgency, initiate detailed studies, in consultation with the Governments of the Provinces, to determine the best means of establishing and financing a satellite transmission package that would provide alternatives to existing CBC programming (e.g. CTV, the House of Commons debates, educational television, TVA, and other CBC programming) as widely as possible throughout the country.

Recommendation 21

In light of Recommendation 20, Telesat should review its pricing policy to encourage optimum use of its satellites.

Recommendation 22

The federal government should vigorously promote the development of plans for the manufacture and marketing of the Telidon information system and ancillary equipment. This should probably take the form of a joint venture involving major participation by the private sector and investment from both the federal and some provincial governments. It might also suitably involve "chosen instruments" in the manufacture and the commercial development. In following this course the Department of Communications should assume leadership.

Recommendation 23

The federal government, in concert with the governments of the Provinces and the private sector, should stimulate forthwith the development of plans for the creation of Canadian-owned private databanks, as well as others funded by governments. Tax and other incentives should be devised for that purpose.

Recommendation 24

The Government should act immediately to regulate transborder data flows to ensure that we do not lose control of information vital to the maintenance of national sovereignty. Therefore the Government should:

- a) Launch a national awareness campaign to explain the social, economic and cultural implications of the new electronic information society. Without a much wider appreciation of the fundamental nature of the changes now taking place it is unlikely that effective mechanisms for considering the issues will be developed, let alone the implementation of appropriate solutions. It should be the responsibility of the Department of Communications to monitor the developments in this area.
- b) Require that data processing related to Canadian business operations be performed in Canada except when otherwise authorized.
- c) Consider the feasibility of extending the provision in the Bill to revise the Bank Act related to the prohibition of exporting client data for processing and storage abroad. This might be extended, for example, to the insurance and loan industries.
- d) Provide greater access to risk capital for Canadian corporations in data processing, to prevent foreign take-overs. Use government procurement more effectively in promoting Canadian enterprise in this area.
- e) Promote more effective education and training for high calibre programmers, systems analysts, and others required for developing Canadian systems. The emphasis should be on application development rather than on machine-oriented research and there should be an effort to exchange personnel between government and industry.

Recommendation 25

We recommend that the government:

- a) Move quickly and aggressively, in consultation with private industry, to exploit Canada's technological leadership in such areas as Telidon, fibre optics and communication satellites.
- b) While recognizing the significant contribution that will continue to be made by small companies in high-technology industries, actively foster the formation of large Canadian-owned firms through mergers and consolidations (as in the case of Spar) in order to achieve production volumes necessary to compete in both domestic and export markets.
- c) Revise the combines law to reflect the need to rationalize the industry and to develop large companies.
- d) Encourage research and development through very substantially increased tax rebates on all research and development expenditures.

- e) Establish an environment of greater certainty for manufacturers by developing design standards that will facilitate adoption of Canadian technology.
- f) Recognize the fundamental importance of a secure domestic market base to the development of high-technology industries.
- g) Support, on a selective basis, qualified Canadian-owned firms through contracts for both research and development and production.
- h) Ensure that foreign technology is imported in a manner that will optimize its exploitation in Canada and abroad by Canadian firms.
- i) Be prepared to provide low-cost financing of loans to foreign governments, where necessary to facilitate export sales.
- j) Provide tax incentives to encourage the flow of venture capital into high-risk electronics undertakings.
- k) Foster the development of an indigenous mini-computer industry.
- l) Continue the highly desirable program of technological research at the Communications Research Centre and encourage the diffusion of the results of this research to private industry.

Recommendation 26

We note that in this area there is a serious lack of co-ordination of government policies and programs. We direct the Governments's attention, as a matter of urgency, to the reorganization of interdepartmental leadership and the making of decisions in regard to telecommunications.

CONSULTATIVE COMMITTEE ON THE IMPLICATIONS
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