GAMMA
UNIVERSITÉ DE MONTRÉAL ☐ MCGILL UNIVERSITY

PHASE I

PAPER NO 4

Information Society Project
Projet: Société Informatisée

# PUBLIC POLICY AND THE CANADIAN INFORMATION SOCIETY

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April, 1979

Prepared for the Department of Communications
Under Contract Number OSU 78-00253
Contract Period: November 9, 1978 - March 31st, 1979

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TABLE OF CONTENTS

# EXECUTIVE SUMMARY

The introduction to this report argues that the western industrial world and Japan are on the brink of structural changes of such depth, scope and magnitude as to deserve the label revolution. These transformative changes, driven by process I label "tele-computerization," are leading us to an "information society," a society economically based much more on the production, transmission, processing, and storage of information than on industrial goods. This revolution poses threats to the economic, social, and cultural wellbeing of many countries. Thus far the governments of Japan, the United Kingdom, France, and West Germany have responded on a priority basis and have committed several billion dollars to ensure that their countries are not affected negatively by the information revolution.

Chapter 2 briefly describes some of the potential threats posed by the emergence of an information society. These include potential problems with our international competitiveness and the resulting effects on our balance of payments, labour displacement caused by imports and by the adoption of microprocessor based technology in the service sector, problems related to individual privacy, cultural identity, and national sovereignty.

Chapter 3 argues that the negative scenariosdescribed in the previous chapter do not need to occur if we perceive information technology in a new way and turn it to our advantage, economically, culturally, and socially. I argue that our focus in considering the information society should in the long run be more on content, software, systems development, education, and creativity of all kinds rather than on hardware.

Vis-a-vis hardware I propose that Canada build on its strength in telecommunications and word processing equipment and its innovative

software applications in such areas as banking, oil and gas, transportation, and data communications. Utilizing its extraordinarily rich ensemble of networks (telephone, cable, satellite, data) we should create a "Test bed Canada" environment to stimulate experiments and development of new hardware, software, and for export and for the domestic market.

Rather than being of folkloric interest I submit that the cultural industries will play an ever greater role in an information society and could both assist us in recapturing control of our cable, air waves, book-stores, and theatres and gain an international comparative advantage by exporting the products of our excellence.

Our educational system must also change so as to assist people in developing the creativity and the computer literacy so necessary for the information industries and for new careers made necessary by technological unemployment.

In conclusion, I present specific recommendations designed to stimulate coordinated public policy initiatives, increase funding for the cultural industries, initiate a cost-benefit analysis of Canada's potential as a chip manufacturer and develop a major program of consciousness raising about microelectronics. Another recommendation propose that every policy tool possible be deployed to promote the application of micro-electronic technology in both manufacturing processes and product development and to support the marketing and export of the results of this program. Recommendations 7 and 8 advocate identifying and supporting in a major way the development, marketing, and export of information hardware, software, and systems applications where Canada has a lead or could develop it. Recommendations 9 and 10 propose the educational, counselling and retraining programs necessary to respond to the information revolution and an advisory committee to evaluate the need for regulatory or legislative action concerning transnational data flows.

# 1. INTRODUCTION. PUBLIC POLICY IN THE FACE OF A REVOLUTION

GAMMA's Information Society Project is based on the premise that the western industrial world and Japan are engaged in an historical transition, a movement toward an "information society." Such a society would be economically based much more on the production, transmission, processing and storage of information than an industrial goods, This movement implies a depth, scope, and magnitude of structural change - economic, social, cultural and political - which deserves to be called a revolution, "the information revolution."

Kimon Valaskakis and Iris Martin (Papers 5 and 7 in this series) describe the process underlying these changes as "informediation," which they define as "the increase in mediated information or, in other words, the processing and transformation of information through the use of media in the largest sense of the word. Media here refer to the high technology computer and communication devices used to process information."

While I appreciate their originality in coining the term I prefer to employ the term tele-computerization to refer to the process underlying the transformative change toward an information society. Tele-computerization, which is effectively a translation of the French "telematisation," refers to the societal penetration of telecommunications and computerization, together and individually. The term thus emphasises a process which, in the individual sense, can refer on one hand to the ever greater range of one way and interactive audio and audiovisual communications instruments and, on the other, to the implantation of microprocessors in consumer products such as toys, stoves, automobiles, vacuum cleaners, etc. In the collective sense of course the term refers

to the marriage of computers and communications so apparent for example in a terminal tied into a remote computer data bank via the telecommunications system. A microprocessor in a stove would collect and process information relevant to its functioning but somehow the notion of mediation implies to me more than a stove talking to itself. Consequently, although I am not truly happy with tele-computerization either as a term I shall use it in this paper because in my opinion it refers more clearly and directly to the phenomenon under study.

Daniel Bell has argued that we are in a post-industrial society which is service oriented while Fritz Machlup, Edwin Parker, and Marc Porat have essayed the task of quantifying the economic dimensions of the information sector, which includes of course many services. Although the details of Porat's calculations are controversial his finding that 50% of the U.S. labour force is engaged in information activities is nonetheless striking. The comparable figure for Canada is said to be 40%-45%. These figures become positively electrifying when considering the potential impact of tele-computerization on the service sector in terms of labour displacement. Computerization in banking, retailing, and offices of all kinds is picking up momentum and will accelerate dramatically as equipment costs fall in line with the swiftly decreasing unit costs for computer components documented by Jean-Louis Houle in his paper for this series (Number 3).

Manufacturing will also be dramatically affected both in terms of processes and product development as described in Dickson and Marsh's The Microelectronics Revolution: A Brief Assessment of the Industrial Impact (1978) and McLean's The Impact of the Microelectronics Industry on the Structure of the Canadian Economy (1979).

Dickson and Marsh state:

> "The trend in all advanced societies has been for the total proportion of the working population employed in manufacturing industry to decline steadily with a corresponding increase in the proportion employed by the service sector. However, the application of microelectronics to the service sector has created the fear that, it will not only be unable to absorb redeployed industrial workers but that it may contribute itself to the growing class of the unemployed." (1978:35)

Earlier the same authors discuss numerically (computer) controlled (NC) and direct numerically controlled (DNC) machine tools and state:

> "Many such applications are in existence throughout the world which would seem to indicate that the fully automatic factory with no production line labour is within sight and within the scope of DNC technology." (1978:23)

When one is at the beginning of a revolution it is naturally difficult to document and chart it fully. However, in my opinion there are enough faits porteurs d'avenir to justify the immediate, urgent, and high priority attention of decisionmakers and policy formulators in Canada and elsewhere in the industrial world. Such attention has been given by Japan, the United Kingdom, France, West Germany, as described by Kimon Valaskakis in his integrating report on this project. Hopefully the present project and the work of the Institute for Research on Public Policy will assist Canadians in their evaluation of the information revolution.

The purpose of this paper is to describe briefly the potential threats which the emergence of an information society poses for Canada and by the

same token the potential opportunities which Canada could, and indeed must, seize if it is to remain unscathed in the coming decades. Finally, I shall present some tentative strategies which Canadian public policy could activate so as to maximize the positive effects and minimize the negative impacts of the coming information revolution.

## 2. POTENTIAL THREATS ARISING FROM THE INFORMATION SOCIETY

By the late 1980's the world electronics industry is expected to grow from about 100 billion dollars U.S. (1977) to about 325-400 billion dollars U.S.. "In either case, electronics in 10 years would be the world's fourth largest industry. Only automobiles, steel, and chemicals - each totaling about $500 billion - would be larger." (Business Week, September 18, 1978:69). According to Jouandet-Bernadat (Paper 2 in this series:36) Canada accounts for only 2.3% of the world's production of electronic products while this industry represented in 1974 only 1.7% of our Gross National Product. As he remarks this compares unfavorably with France (1.9%), Japan (4.2%), the United Kingdom (3.3%), the United States (3.3%), West Germany (2.2%), and Sweden (2.2%). Imports comprised 54% of the Canadian market in 1976 compared to 40% in 1966 (Sector Task Force on the Canadian Electronics Industry 1978, Profile:5) leading to a negative trade balance of - $1,267,000,000.

McLean gives an example of the impact of using integrated circuits in a product when he tells us that in the early 1970's many Japanese television set producers reduced their labour costs by up to 70% through replacement of discrete components by integrated circuits. Concurrently the penetration of the Canadian television set market has increased from 45% in 1974 to nearly 70% in 1978 (1978:15-16). As in the television manufacturing industry (ten firms each with production of around 100,000 sets per annum), the electronics industry in Canada is characterized by small producers: 704, employing 89,000 people, with 491 having sales of less than $1 million and only 8 with sales of over $50 million. (Sector Task Force 1978, Profile:10). Even our giant, Northern Telecom is only medium sized by world standards, being exceeded in size by more then 30 firms, "15 of which each have sales greater than the total domestic demand for electronics products in Canada." (Ibid.:10). These multinationals have moved a great deal of production off shore so that only Japan and West Germany showed rising positive trade balances in electronics as of 1976 with the United States declining, the U.K. about even and France negative and declining,

although not as strongly as Canada (Ibid.:6).

Given the increasing integration of office equipment into electronic systems, the rise in innovative consumer products based on microprocessors such as Texas Instruments' "Speak and Spell," the enormous growth in the use of microelectronic technology in both cutting production costs and enhancing existing products, vastly increased imports seem inevitable if we do not adapt to this new situation. The foreseeable effects on our international competitiveness and, in turn, on our balance of payments and unemployment figures are likely to be draconian unless we begin to act now.

Considering the unemployment question we should note that there is little concrete evidence in the service sector vis-a-vis the impact of text processing, point of sale terminals, and electronic banking but what little there is seems to show that those employers use these tools to enhance productivity using the same number of staff, which does not result in immediate job loss therefore. However, there certainly does appear to be much less growth in new employment (Russel 1978), which will affect significantly the opportunity to find a job when people first enter the labour market. Manufacturing of course, as noted previously, is likely to suffer important and immediate labour displacement unless international competition can be met and exports can take up the slack resulting from increased productivity. Greatly increased levels of unemployment represent personal tragedy for hundreds of thousands and will strain our social fabric dramatically. The dilemma will also arise that jobs can be saved in the short term by protectionist measures although this would mean a more severe impact over the longer run. Labour-management problems will escalate in the environment which appears to be on the horizon at present.

Turning from the international competitiveness question we can identify another threat of immense cultural importance, that our present problem

with American programming on television may become just part of another much larger problem - foreign domination of many new spheres of content - computer software for personal and business use, home videotapes, video-discs, computerized information banks, etc. As our communications system becomes even vaster and more interconnected it allows greater penetration into every sphere of our life together - homes, businesses, universities, libraries.

Potential threats to our privacy as individuals also abound. Just to take one example, with the rapid advances in electronic funds transfer and the establishment of electronically based Canadian Payments Association transactions made by an individual will be identifiable and trackable. Already some cable systems have the capacity to monitor exactly what television programs one has watched. Storage of confidential or sensitive information in foreign countries also poses many problems of course.

This latter aspect of transnational data flow is just one of many raised by the increased interdependence made possible by satellite and other forms of international data communication. Sovereignty as well as individual privacy can be called into question when data are transmitted to another country for processing and/or storage. It is far too early in the view of many Canadian data processors to determine the effects of this international traffic but, on the other hand, the Department of Communications has estimated that by 1985 23,300 jobs could be lost through processing data in the United States (Jouandet-Bernadat, Paper No. 2 in this series:35). The conclusions of the conference sponsored by the Institute for Research on Public Policy seem to reinforce the former view: "Computer industry participants, who were in the majority, were far more concerned about the possible negative effects on them (and on various aspects of the Canadian economy) that might come from misguided government regulation than they were about any trend in job losses (actual or potential)." (Cundiff and Reid 1979:3).

The protection of domestic computer services might be counter productive, it was argued, while great concern was expressed over the "inadequate supply of trained people to match the demand."

Although the Clyne Committee was not approaching the problem of national sovereignty, including economic, technological and cultural aspects, from the perspective of the forthcoming information society the issues are well documented in their report. Suffice it to say here that domination by foreign technology and content in our computer and communications systems, massive imports and the accompanying unemployment, and lack of a coherent policy concerning these developments certainly would call into question our ability to shape our own future as a nation.

The preceding brief sketch of the potential threats to our culture, our economy, our society, our individual well being, and our national sovereignty is indeed bleak. But we do have a choice. We can let these potential threats become actual problems or we can try to seize the emerging situation and turn it to our advantage. The next chapter concerns the potential opportunities offered by the emergence of an information society.

## 3. POTENTIAL OPPORTUNITIES ARISING FROM THE INFORMATION SOCIETY

The foreign control, economic problems, social disruption, and threats to our quality of life as individuals coupled with Kimon Valaskakis' (Paper 7) scenarios of networks filled with trivial content or used for totalitarian purposes presents a dismal vision of the future. It does not have to turn out like that. Whether it does depends on our perceptions of the new technology and our actions in using and mastering it for our country and for our citizens.

Drawing on Gordon Thompson's excellent work (1977) we can distinguish clearly the importance of our perceptions in planning for the future. He argues that most of our present ideas for ways to use the new information technology reflect old habits shaped by our experience with industrial technology. Industrial technology assumes bigger is better, is based on economies of scale, mass production of identical goods and low unit costs, and reinforces central control. The old computer utility idea, conventional radio and television reflect these values. In contrast information technology can be easy to use, "convivial" in Ivan Illich's terms, non-centralist in character, and can facilitate the individual conversion of labour into capital without massive investments leading to the development of unique goods and idiosyncratic products tailored to one individual's needs, interests, and joys. Frank Branscomb, the Chief Scientist at I.B.M., has coined the term "personalized manufacturing" to describe the way information technology can serve to respond to individual differences rather than some abstract standard individuals. He relates the example of a person going into a shoe store and having foot measurements taken by a computer which then transmits the information to another computer along with style, colour, and leather preferences, which computer then directs

one computer to instruct machines to make the shoes while a second computer prepares a bill, which is then printed out at the retail store when the shoes are ready.

Much more important in the long run of course in Thompson's view and in my own is the development of the content side of the equation. On one hand electronic magazines, data bank searches, newspapers tailored to an individual's interests and, on the other, access to an enormous network of potential consumers of information by poets, writers, scientists, philosophers, dancers, artists, and ordinary citizens concerned about a public issue or just wanting to send a message to a friend.

Collectivities such as the members of a neighborhood could hold a meeting about a proposed development via teleconferencing or computer conferencing, hold a meeting (verbally or on a screen), communicate plans and other graphic information, and finish by taking a vote and printing out the results and/or sending the results to other groups of citizens, politicians, or government agencies. Naturally groups sharing linguistic, ethnic, regional, occupational, professional, and a vocational interests would also use these systems locally, regionally, nationally or internationally.

The argument I am making is that our focus in considering the information society should in the long run be more on content, software, education, and creativity of all kinds than on hardware. Creativity we have already briefly adverted to. It is the wellspring behind our cultural industries, which I submit will play an ever greater role in our society if we choose to go in that direction rather than importing ever more foreign mass produced content which has little to do with our history, culture, and identity. I am not at all arguing from a xenophobic point of view that we should exclude foreign films, television, books, newspapers, records, and so

forth but rather with an increased focus on informational goods and services we can indeed positively develop our own resources, gain a comparative international advantage with our excellence, on one hand recapturing our own cablesystems, air waves, and bookstores while, on the other, developing new Canadian databanks and cultural activities which can serve export markets.

Extending the argument to the computer-communications area per se I would argue for building on our extraordinary opportunities for technological experimentation in the systems development, software, and data communications areas. We are blessed with the most advanced broadband set of local networks in the world, an excellent telephone system incorporating some of the most advanced electronic switching systems, two packet switching data networks, and considerable satellite channel capacity and expertise. In terms of applications our banking system is dominated by large national institutions who have the enormous resources necessary to develop electronic banking and funds transfer and who have been world leaders in actually doing so. Our software in the resource area and in the rail and urban transit area is also gaining world recognition - but too slowly for lack of marketing. Our lead in electronic switching, fibre optics, and data communications are also at the forefront.

Heretofore in the electronics area other than the exceptions noted above we have been weak in hardware and hardware systems development leaving this principally to the multinationals, but we have been strong in software systems and computer service areas, so much so as to be competitively successful in the United States and other foreign markets.

Lets build on these strengths and consider our fabulous array of diverse communications and computer infrastructure and networks as the basis for a "Test Bed Canada." Lets view our whole country as an oppor-

tunity to develop the new hardware, systems, and software necessary to offer the new services possible in the context of a heavily tele-computerized society.

At present public policy concerning both the cultural industries and vis-a-vis development of Canadian hardware, software, and systems has been criticized for woefully inadequate funding and a poor appreciation of the problems. For example on this point the Sector Task Force on the Canadian Electronics Industry stated:

> "The government's influence over decisions on R & D programs has often been negative because of the poor design of its programs and measures for technological assistance." (1978:8)

The "stop-go"character of supportive measures, an incremental approach in a field of rapid and dramatic technological change and "the entrenched emphasis on basic rather than applied research" were singled out as some of the culprits vitiating the government's relatively small efforts (by international standards) in this area.

Another opportunity, and at the same necessity, if we are to benefit from the advent of the information society, is to expand dramatically our understanding of the world of computers. Computer literacy at the highschool and perhaps even primary levels coupled with technical training perhaps in highschool but certainly in post secondary institutions is crucial to our development as an information society. We lack skilled labour now in many areas of computer hardware, software and maintenance while we also lack sufficient Canadian script writers, film directors, cameramen, stage designers, lighting and sound technicians, and so forth even to satisfy current demand. This implies that not only for humanistic reasons but also for economic reasons we should increase the quantum of

experience and training in these various fields. Humanistically we can develop as individuals better with experience in the arts, while if we do not demystify computers they can easily come to be the rarefied purview of technocrats rather than the tool to enhance individual creativity and development which is their promise.

We shall also need an educational system which is geared to helping people develop their own autonomous creativity and adaptability if, as we expect, retraining and reeducation will become necessary in the fall of technological change. In this context we shall also, of course, begin to seriously rethink the roles of work and leisure in our society and the relationship between work and income.

In summary I have argued in this chapter for a perspective on the information society which exploits the positive new possibilities for individual growth and, intellectual and artistic creativity rather than focusing wholly on the hardware. The content domain is the one where in I believe Canada can both adapt successfully to the new technology, develop export markets in cultural products, software and systems products and consulting expertise thus obviating many of the potential economic problems, and offer to her citizens a new way of life which enhances rather than demeans the lives of individual Canadians now and in the future.

# 4. CANADIAN PUBLIC POLICY: PAST RESPONSES AND FUTURE STRATEGIES

## 4.1 PAST RESPONSES

Considering the communications sector some policy initiatives have focused on the question of foreign influence over the cable and broadcasting industries in terms of ownership and in terms of programming. On the question of ownership as a country we have successfully repatriated 100% control. Most observers would agree that our Canadian content rules vis-a-vis programming have not been as successful in realizing the goal of strengthening our production industry.

A reorientation with a bit less emphasis on quantity and more emphasis on quality geared toward investment rather than minutes of prime time seems to be emerging as a concensus in the industry. A Federal initiative along these lines using tax incentives seems to be working very well in the feature film industry although it is too early to speak definitively on this. The use of the tax system and direct subsidies has also appeared to strengthen Canadian magazine and book publishing, particularly the former via the Readers' Digest - Time Magazine decision.

Canada's early appreciation of the value of geostationary satellite communications coupled with the recent recognition of the industrial importance of creating a domestic satellite manufacturing industry through a subsidy of twenty million dollars to Spar Aerospace Ltd. and loosening up ownership policy for earth stations represent another potential success in the communications field stimulated by conscious policy. The funding of Telidon development and testing in all modes (via broadcast, cable, and telephone) and field trials in Elie, Manitoba and London, Ontario for fibre optic applications to cable and telephony represent two other

areas where policy decisions have assisted Canada to remain in a strong world class position. Jean-Louis Houle (Paper 3) has documented in detail Canada's high international status in these and other areas such as data communications. It is truly remarkable that we have two national packet switching networks in operation (Datapac and Infoswitch) when the United States does not yet have one coast to coast system. The X25 international protocol was also developed in Canada. As Kimon Valaskakis has noted, citing Philippe Lemoine's paper in the Nora Report, Canada's public-private collaboration in production of the Telecommission studies, Branching Out and other future oriented planning studies is highly regarded internationally.

However, there are a number of tangled, difficult and confusing areas of communications policy which are still to be resolved. These include notably the Federal-provincial jurisdictional dispute, how to improve and strengthen the Canadian production industry (T.V. programming), definition of the appropriate roles for the cable industry and the common carriers in the context of the new home and business services, attachment and interconnection policy, cross-ownership of the media, questions of access to the new media by suppliers and choice by the consumer, technical standards for Videotex and many other new potential communications terminals, and, finally, the questions of appropriate scale, appropriate degree of vertical integration, and appropriate level of competition vs. monopoly. Naturally these do not exhaust the list but they represent in my opinion some of the most pressing concerns in the field.

Turning now to consider policies related to computers and microprocessor technology we find that little action has been taken compared to the communications sector per se. Despite Branching Out and the other policy oriented papers produced (green paper, etc.) early in this decade we find little concrete action. The Clyne Committee notes this neglect

and states:

> "Branching Out contained 39 formal recommendations (and some 'suggestions'); of these, 36 were addressed to the federal government. Action was taken in four cases. Action taken in five cases was later discontinued. In 24 cases, no action has been taken. It was suggested that the Department of Communications be the "lead department" for computer-communications, but instead the government set up an interdepartmental committee to be the focal point; the committee was disbanded early in 1978." (1979:59)

The Human Rights Act deals in a cursory fashion with the question of individual privacy vis-a-vis computerized databanks and so on but has no enforcement provisions. The recent Bank Act revisions tabled in Parliament (Bill C57) proposed to restrict the processing of financial data on individuals outside the country and sought to establish an electronically based Canadian Payments Association which will have significant implications for individual privacy and consumer interests. It is important to note that Bill C-57 was attacked vigorously by the Canadian Association of Data Processing Organizations on the ground that banks should not be allowed by the new Act to engage in commercial data processing activities given their size and privileged position in our financial system.

Our government's activities vis-a-vis the computer industry reflect lack of interest and lack of a policy. Although it has supported AES Data Ltd.'s development via purchasing policies and investments by the Canada Development Corporation, it allowed the other principal Canadian entry in the world market for text processing equipment, Micom, to be purchased by Philips of Holland. In terms of purchasing data processing services Evans Research Corporation states in their report on EDP User Spending Patterns:

> "The emerging Federal Government spending pattern indicates an attempt to keep money in-house by acquiring more hardware and attempting to make it more effective through systems development funds. Although this represents an admirable attempt at fiscal restraint, it is unfortunate that government funds will be distributed among predominantly U.S. owned hardware suppliers at the expense of Canadian owned and operated service bureaus." (1978:4)

The contrast with Japan's 1976 plan to spend $1,000 million over four years to support the development of Very Large Scale Integrated Circuits, with West Germany's research and procurement policies, and France's "Plans Calculs" and "Plan Periinformatique" is striking.

When we compare the apparent total lack of consciousness and policy activity in Canada to the British programs, it becomes even more apparent that Canada is very far behind indeed. In addition to support for their national champion, International Computer Ltd. (starting 1968), Britain has been funding applied research and product development in the software area. In July a massive 400 million pound five year program was announced to encourage the application of microelectronic technology. This money will fund education, consultancy and development costs relating products or processes using the new technology as well as funding Britain's entrant into the international integrated circuit market, Inmos Ltd.

## 4.2 FUTURE STRATEGIES

### INTRODUCTION

The dilemma facing the policy maker in a situation which is still very much in flux is difficult on one hand but valuable in another. If changes are still occurring at a significant rate and the final shape of things to come has not yet hardened, then public policy can influence the course of events. If we fail to take a strong role in shaping our own destiny through ignorance or neglect the information era will find us in a woeful state. As the Science Council said in their position paper on Communications and Computers (1978:11), "We do not have the luxury of time." In concluding they say "Without a national policy in the near future, the full benefits of the system could be lost to Canadians... Canadian economic historians will, in the 1990's, wonder why so little planning was done. The sense of urgency is great because the magnitude of the situation is great..". (1978:38) McLean echoes this view in arguing that "a planned and co-ordinated effort to develop and adopt microelectronics technology on a wide scale" is necessary to "ensure a return to healthy growth rates and full employment." (1979:46)

In the integrating report on this project the argument for a coordinated policy is also made, including the need for an analysis of other countries' game plans. The argument for concertation of the public and private sectors is also strongly recommended.

I share strongly the sense of urgency expressed by my colleagues at the Science Council, the Institute for Research on Public Policy, and GAMMA, and recommend priority action in the areas described below. Given the large amount of the GNP disposed of by the Federal government, Federal Crown Corporations-Petro Canada, Air Canada, the CBC, Canadian National,

and the provincial governments and their crown corporations, including for example the powerful hydro enterprises, the B.C. Resources Corporation, Sask Comp, Manitoba Data Services, the provincially operated telephone companies, the Alberta Energy Corporation, SaskOil and the Saskatchewan Potash Corporation, it is clear that as well as economic levers these governmental organizations and departments represent an entree point into numerous industries.

*RECOMMENDATION ONE:* Formation of an interdepartmental task force, with appropriate subcommittees, reporting to the Prime Minister's Office and to the First Ministers' Conference with membership from both the federal and provincial departments most concerned.

Building on Canada's unique richness in networks (telephone, cable, data, satellite) maximum effort should be made to interconnect these various networks so as to maximize the possibilities for experimentation in the development of new services. With CATV one has great bandwidth (presently 30-36 channels, in the next five years up to 65 channels), with telephone one has the ability to differentiate unique points, raising the policy question, as Gordon Thompson said, (1977:31) "of how to get maximum capacity at lowest cost with the highest addressing and switching characteristics." The more one can achieve this goal the more feasible a true "information market place", again in Thompson's words, we shall be able to create.

*RECOMMENDATION TWO:* Resolve as quickly as possible the outstanding policy and regulatory questions as to competition-monopoly, the appropriate roles of cable, the common carriers, information providers vis-a-vis new services, attachment policy (especially network addressing devices), and inter-

connection (Bell-CNCP case). With this done, the variety of system combinations we have in Canada can be used as a test bed for developing the content, system and service software, and operating expertise necessary for innovative services to business and the home. The use of Telidon in all of its potential modes is a good beginning in this direction although we are still far behind the British Prestel system in terms of content development.

Given our present problems in the T.V. program production area and the huge demand for programs which will arise when Pay T.V. and other new services are allowed to develop, and the successful use of tax incentives to stimulate the film production industry I would submit that the cultural industries (television, radio, publishing, theatre, dance, music, the fine arts, etc.) should be viewed as a vital economic resource as well as being crucial to our cultural identity, our quality of life, and our understanding of each other as Canadians from different language, ethnic, and regional backgrounds. If we are not going to be inundated with foreign programs, productions, publications, and data, we shall need a greater support for the cultural industries.

*RECOMMENDATION THREE:* Vastly increased funding for the cultural industries based on tax incentives and other means with a view to supplying from our own resources the new capacity of our communications and computer systems and with a view to exporting the results. Part of this funding should be to identify and back economic ventures based on new technologies such as digital records and videodiscs, conventional videotapes and discs oriented to the world market, and so forth.

Unless we get our systems in place in the next two to three years, the massive marketing efforts of Texas Instruments and other multinationals to sell stand alone "home entertainment centers" and home computers at low cost with plug in software may well destroy the market for network based systems like Telidon. (See Business Week, September 18, 1978)

Turning now to industrial strategy considerations the first major decision we face is how deeply to go into the chip business. Competing in basic chip manufacturing is beyond our capabilities as a country using presently available resources but, as McLean notes, we must nevertheless evaluate the issue seriously. If we fail to produce advanced components we lose "opportunities to design end equipment in parallel with design developments, and in turn to influence component development in the light of end-equipment market needs" so that while "U.S. competitors will be able to plan the most effective components and end-equipment and the introduction of new products," other firms will only be able to react to U.S. innovations. (1979:42) Whether we decide to get into the basic component business or not, it is urgent to support those manufacturers who produce chips for their own products, for example, Mitel and Northern Telecom. We also desperately need a program to diffuse this technology to those firms in the manufacturing sector who are unaware of the new applications possible with microprocessors.

*RECOMMENDATION FOUR:* Initiate a cost-benefit analysis of Canada's potential role as a basic component manufacturing country. This analysis should be sponsored jointly by the Federal and provincial governments and the private sector.

*RECOMMENDATION FIVE:* A major program of education and consciousness raising about microelectronics should be initiated with specific subprograms aimed at educators and students, civil servants, journalists, and, most

importantly, business persons and their employees and unions.

*RECOMMENDATION SIX:* That every policy tool available to government - research funding, tax incentives, purchasing, regulation, and legislation be deployed to promote the application of microelectronic technology both in manufacturing processes and new product development. Following up on this, often a weak point in Canadian industry, all appropriate policy tools should be used to support marketing studies, and export market development.

As Russel Wills notes in his paper for this project (No.6) 80% to 90% of the capital investment in a new product is made after the R and D stage. Thus it is not enough to support R & D expenditures, particularly in the case of small firms, which includes most Canadian companies.

Wills also remarks on the fact that few Canadian firms in the electronic area are able to provide whole systems as opposed to components. As mentioned before we have a unique opportunity to develop systems expertise - both in hardware and, more particularly, in software because our computer service bureaus are primarily Canadian owned and managed as opposed our computer hardware suppliers which are almost all subsidiaries of American multinationals.

In concluding my thoughts about the industrial policy area I would like to emphasize that 80% to 90% of the cost of any computer system concerns software and systems development costs. As just mentioned, the majority (23 of the 31 largest) of our service bureaus are Canadian and many have expanded into the United States on the basis of their excellence, for example I.P. Sharp Limited. Thus I would argue that although we should support fully the efforts of Canadian hardware suppliers, particularly in our strong areas of data communications technology (Gandalf for

example), and telecommunications equipment (Northern Telecom and Mitel for example) our principal policy thrust should be in the applications area - software and systems development. As noted previously, our banks, especially the Bank of Montreal with its many online banking services and 4,000 plus terminals installed, have become world leaders in electronic banking and funds transfer via innovative development of software and systems. Yet none of the banks to my knowledge has tried to market their innovations in these areas in the United States to bank holding companies or to banks in countries like Australia which have banking systems similar to ours. The public sector, for example the Ministry of Transport and Communications in Ontario with its urban transit control system, has also developed numerous innovations as has for example the oil and gas industry We should capitalize on these talents and export the resulting products and consulting services related to them.

*RECOMMENDATION SEVEN:* That hardware suppliers in areas where Canada has or could gain a significant lead including for example space receiving stations, data communications technology, and telecommunications equipment be identified and supported in a major way in the development and marketing of new products and systems.

*RECOMMENDATION EIGHT:* Software and systems applications in existence or under development of an innovative character should be identified and supported and that companies or consortia of companies be aided to develop export markets based on these innovations.

Finally, it is clear that the negative effects in terms of labour displacement considered in Chapter 2 need to be ameliorated and that potentially negative impacts on personal privacy and national sovereignty arising from the transnational flow of data need to be prevented.

*RECOMMENDATION NINE:* Education, counselling, and retraining programs should be designed 1. to assist youth to become literate in computer sciences, to foster the development of talents relevant to the cultural industries and 2. to assist those who have lost their jobs because of the impact of the new technology.

*RECOMMENDATION TEN:* An advisory committee on the impact of transnational data flows composed of people from the private and public sectors be empowered to collect presently unavailable data and evaluate the need for regulatory and/or legislative action concerning the various kinds of flows extant.

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