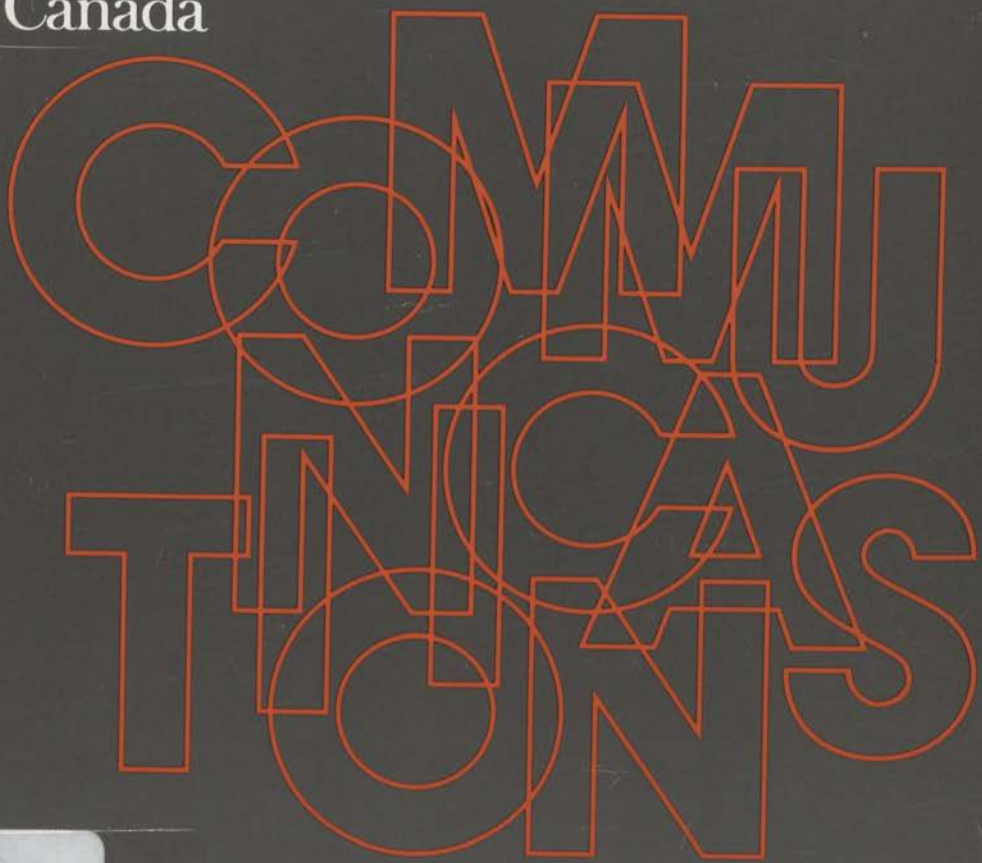
Report of the Communications Research Advisory Board

1982-83

Canada



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Gouvernement du Canada
Ministère des Communications

1' Canada Communications Research Advisory Board

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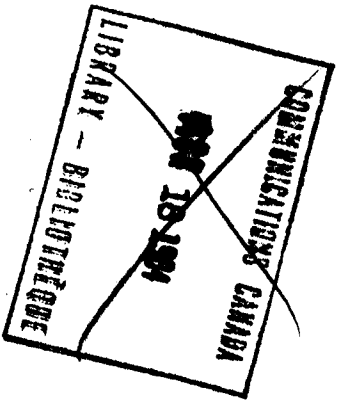
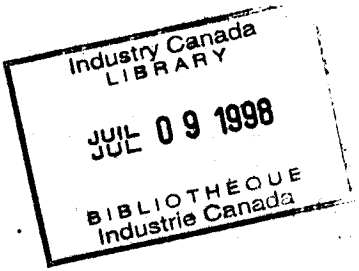


March 29, 1983



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Preface

The annual report of the Communications Research Advisory Board (CRAB) is made public in the interest of promoting a greater understanding of the issues involved in publicly funded communications research in Canada.

The Communications Research Advisory Board (CRAB) was appointed in 1974 to advise on the research program of the federal Department of Communications. Its members distinguished experts in the fields related to communications, are appointed by the department for terms not normally exceeding three years.

The mandate of the board is to advise the Department of Communications on the quality, management, and relevance of its research program to departmental goals. It also recommends measures to improve co-ordination with similar programs in industry, universities, and elsewhere in government, and offers advice on matters specifically referred to it by the department.

July 13, 1983

Mr. Robert Rabinovitch
Deputy Minister
Department of Communications
Ottawa, Ontario
K1A 0C8

Dear Mr. Rabinovitch,

On behalf of the Communications Research Advisory Board, I am pleased to submit our report for 1982-83.

The United Nations has declared 1983 as World Communications Year and dedicated this event to the development of communications infrastructure. In light of this, we thought it would be appropriate to centre our report on the topic of "the new teleservices". While technological advance has opened almost limitless possibilities for new service offerings, the long-term success of these ventures will depend on whether or not they respond to real human needs. The importance of understanding the human side of technology was brought home to board members during last year's discussion of the integration of culture and communications. This year, we wanted to continue to explore this theme and to deepen our understanding of its significance.

Once again, we are grateful to your staff for their briefings on the department's activities, plans and priorities, as well as for the other assistance they provided to members of the board. Our task would have been much more difficult without their support.

Yours truly,

Ran Ide
Chairman
Communications Research
Advisory Board

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Introduction

The theme of this year's report is the new teleservices that are transforming the way we communicate. This is in keeping with the fact that 1983 has been declared by the United Nations as World Communications Year and this year is dedicated to the development of communications infrastructures.

While Canada is developing completely new communications infrastructures much of the world does not have basic communications services. As noted by the Minister of Communications:

> ". . . it is difficult for Canadians to imagine that some countries do not have even the most basic communications services that we take for granted. For example, of the more than 550 million telephones in the world, some 75 percent are found in only eight countries, one of them being Canada."[1]

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1 *Hon. Francis Fox*, "Canada's Role in World Communications Year", notes for an address, February 24, 1983.

2

The new teleservices

Communications technologies, such as digital switching systems, satellites and optical fibres, are merging with information processing technologies to create new possibilities to deliver both traditional (banking, shopping) and new services such as video games. The rapid growth of the video games market to the level of a $10 billion industry within the space of a few years has demonstrated the willingness of people to explore the new possibilities presented by the electronic media. However, like video games, the other services offered will have to be in touch with consumer demands.

The trend seems to be inevitable. Time savings, convenience and cost savings will combine to drive the demand for new teleservices. The applications, such as those shown in table 1, appear to have significant market pull, not only because of today's higher levels of disposable income but also because of the greater value that people place on time. Field trials in a number of countries including France, Germany, the United States, the United Kingdom and Canada have demonstrated initial consumer acceptance and have illustrated some of the difficulties of interactive or two-way transmission services. An estimate of consumer spending on video home services in the United States to 1990 is shown in figure 1.

Table 1

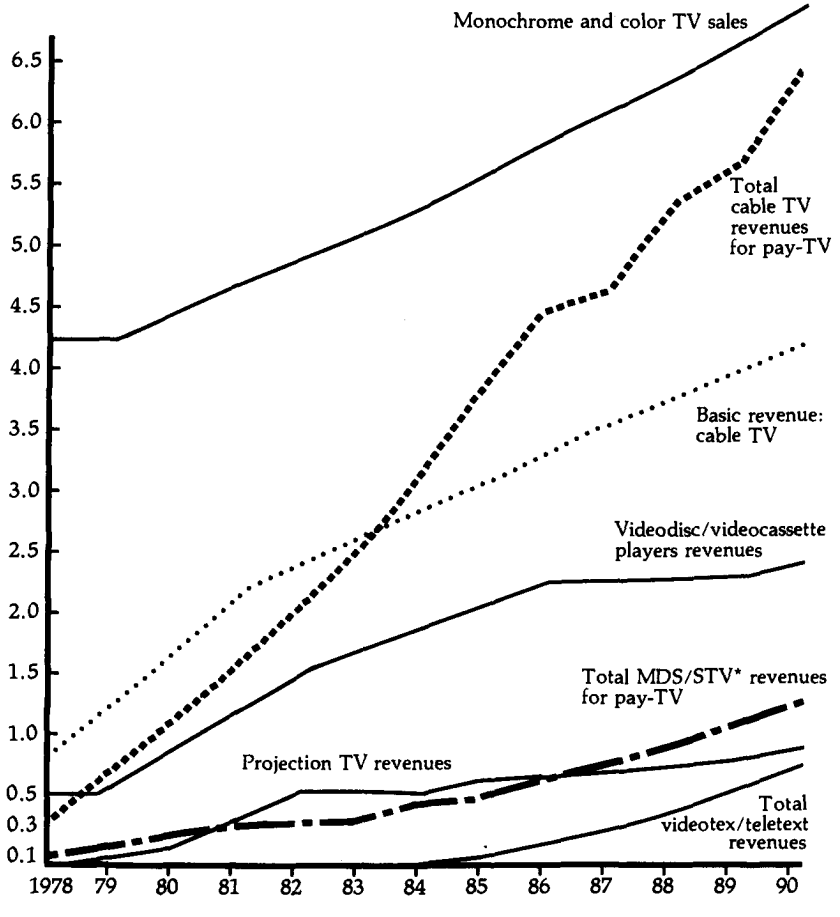
Teleservices applications

Applications	Examples	Revenue source
Activity related	Participant and spectator sports, crafts and travel	Supplier and advertiser financing for ticket purchase and reservations Consumer financing for specialized services
Structured dialogue	Audience polling, market research	Supplier and advertiser support for data collection
Educational	Formal and informal learning	Consumer financing
Entertaining	Games, horoscopes and comics	Consumer and advertiser support from other entertainment services
Informative	News, weather and feature articles	Consumer and advertiser support from printed sources, other electronic media
Message related	Store and forward, point-to-point messaging	Consumer support from telephone and mail
Shopping related	Direct sales, consumer information	Supplier and advertiser financing from other distribution techniques
Personal business, home management and working at home	Planning services and banking	Primarily supplier financing, offered as "value added" service by bank or brokerage firm
	Security services, word processing	Consumer support from traditional sources

Source: CSP International

Figure 1

Projected U.S. home video consumer spending in selected areas



* Multi-point distribution system/subscription television.

Note: This chart relates to consumer spending, not units sold; thus, it takes into account the fall in unit costs projected for higher-volume, increasingly competitive manufacturing as the product life-cycle gains maturity.

Source: Kalba Bowen Associates Inc., *High Definition Television to the Year 2000*, a report for the CBS television network (January 1982), p. 17.

For example, in Canada, the Groupe Vidéotron has launched, in co-operation with the federal government, a pilot project aimed at developing the technology to delivery a variety of teleservices to the home. As shown in figure 2, the system, known as Vidacom, uses advanced data processing, telecommunications, cable TV and micro-computer technologies to distribute mass, selective and interactive information. The NABU Manufacturing Corporation of Ottawa is developing a similar technology based on "downloading" software through cable systems from a central computer to terminals in the subscribers' homes.

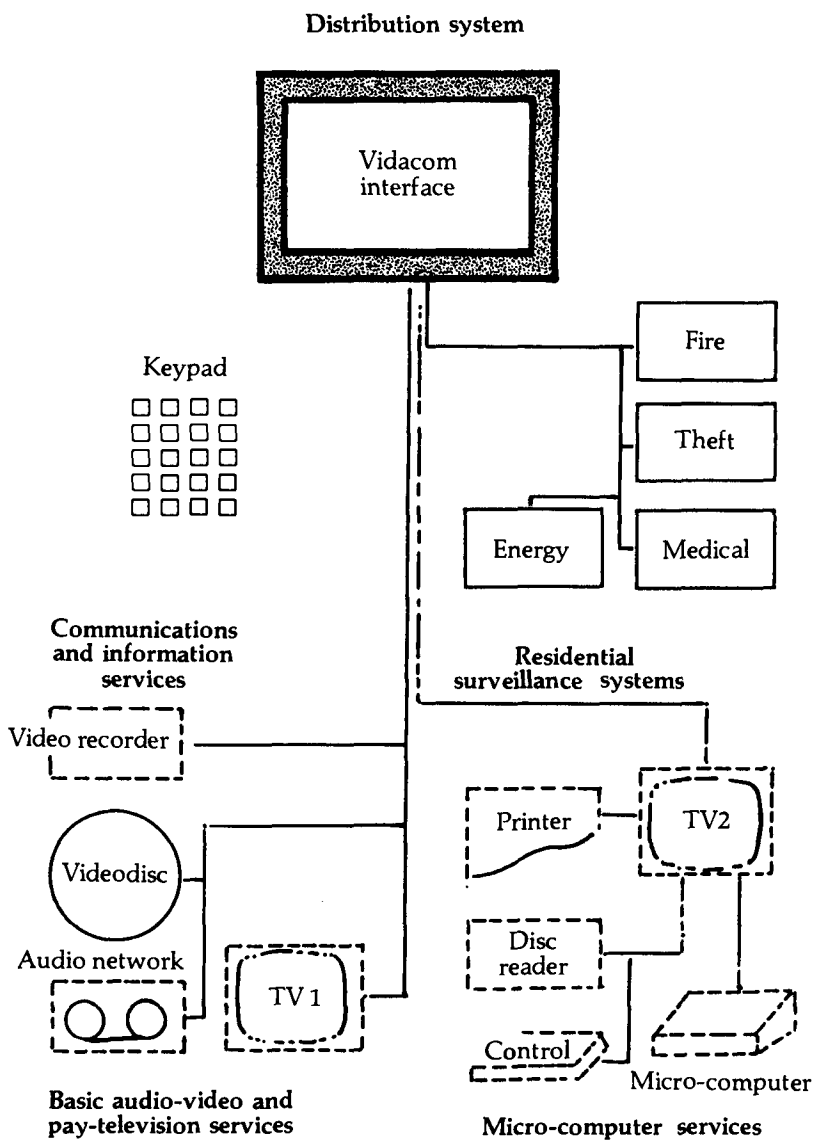
The delivery of a wide range of entertainment and information services is beginning to fundamentally alter the way we do things. The home is increasingly becoming a focal point for both leisure and work activities. Firms are beginning to evaluate the relative merits of consolidation of activities at one site versus a network of "nodes" spread across a territory. These "nodes" could be satellite offices or work-stations in the home. Such corporate considerations are paralleled by a number of public policy questions related to the regulation and orderly delivery, as well as the related human aspects of new teleservices. These questions are becoming increasingly difficult to answer as traditional demarcation lines in the telecommunications sector become increasingly blurred.

Trends in the use of teleservices are in keeping with what some observers have called a shift from our industrial society to a more "symbiotic" society which is less hierarchical and bureaucratic and which is more open and pluralistic through the development of numerous communications networks.[2]

2 H.V., Perlmutter, "Building the Symbiotic Societal Enterprise — A Social Architecture for the Future," Tokyo Conference of the Club of Rome, Oct. 26-28, 1982.

Figure 2

Vidacom: A Canadian Field Trial



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Human aspects of the new communications technologies

Better understanding of the ways that humans interact with the new communications technologies is an important area of research. The 1980s is a period of radical change involving tough economic conditions and new information technologies. The Department of Communications has already recognized the transformative influence of developments arising from micro-electronics. It has reassessed the relationship of culture and technology, and now faces the challenge of dealing with situations which no longer fit past assumptions and established patterns or organization. The changes involve government in the human and social implications of technological transformation.

The proliferation of computer-related technologies connected to or implanted in communications technologies creates new relationships between people, culture and technology. The integration of telecommunications, data processing and broadcasting already transcends the limits of departmental jurisdiction and control. Government policy and procedures have difficulty keeping pace with innovation. As software becomes more important than hardware, users and manufacturers need to complement each other in their reciprocal field of developments.

The potential of micro-electronic technologies lies in its ever increasing capacity for continuing development through programming, application and modification. The cost of electronic components has fallen by about 7 percent each year for nearly 20 years and the trend could accelerate with the mass production of very large-scale integrated circuits. The concept of standardized hardware as a "finished" product serving predetermined goals is becoming obsolete. Manufacturers, anxious to

capture markets through control, can easily lose out by making technologies fit their own limitations. Compatibility, interface and open options can release hidden potentials leading to essential software support and user allegiance.

Communications research now relates to wide ranging, open-ended activities spanning a variety of areas and interests. It involves new possibilities relating to context, interface and feedback. It also involves self-motivated cultural activities as an equivalent to pure research. The diminishing cost of programmable hardware multiplies options and provides innumerable opportunities for success through trial and error. Innovation in the field can lead to product development and product development can lead to innovation in the field. Customization can balance standardization in a variety of trade-offs as appropriateness becomes the measure of success in terms of information and application.

The Department of Communications is to be complimented on its proposal for an Information and Intellect Research Network. The development of new communication technologies relates to the field as well as the laboratory and involves individuals as well as groups, institutions and corporations. The wider the participation the more human and beneficial the results are likely to be.

Artists are already working creatively with robotics, artificial intelligence, cybernetics, voice synthesis, word processing and data bank structure, manifesting ideas in the tradition of Leonardo da Vinci.

Individuals can now own, build, modify, design, program and operate sophisticated micro-electronic equipment. Professionals, such as doctors, musicians and engineers can use their own initiative to personally integrate special knowledge, skill and understanding with computer-related applications. The untapped creative resources of a wide range of Canadians can be applied to new fields of research and development without the isolation and high capital cost of institutional or corporate environments. Canada needs its high technology industries to take full advantage of the communications environment in the 1980s.

The interactive potential of new technologies could provide an infrastructure through which the Department of Communications could foster research and development by encouraging the formation of research networks and the exchange of information among many different users. This would promote collaboration, interaction and the sharing of information and resources across Canada. Appropriate equipment should be placed in the context of application, and creative initiative should receive appropriate financial support.

The Department of Communications should ensure that discretionary funds are available to supplement a wide range of creative initiative relating to research and development of information technologies in the 1980s. This may call for collaboration with other departments, provincial governments and organizations such as the Canada Council. The Special Program for Cultural Initiatives, or some variant, should be continued.

People are Canada's greatest resource. At a time of deep economic recession and high unemployment, government must give people the opportunity of developing new skills related to the new information technologies so that they can participate actively in the information revolution. Government should seriously study the advisability of a National Program that would give those coming into the labor force and the unemployed access to the new tools so that they can learn to adapt to the new communications technologies. The self-actualization potential of such a program would lead to new employment opportunities in industry and to increased productivity throughout the Canadian economy.

Technological developments in the foreseeable future will impinge strongly on the life of every citizen, not only in providing him or her with a new range of consumer products and services but also in altering and extending his context of work, first through the progressive introduction of robotics, and computer-assisted design/computer-assisted manufacturing (CAD/CAM) and then through automation of the office place. The result will be to make the individual an increasingly important participant in communication networks. The department began its existence as primarily a hardware department but has increasingly recognized the urgency of software and human development. We foresee a new need: for the department to become concerned to a much greater extent than it now is in the people issues that are being brought to the fore by the transition to an information society. Specifically, it would be desirable for the Department of Communications to develop a stronger emphasis on social research particularly where the focus is on the discovery of principles of system design which take account of the human dimension. This could be in terms of impacts on individuals, on regions, on institutional life or on cultural entities of all kinds. There is a leadership role here which CRAB believes that the department can usefully play, not only in research but in creating a wide-ranging public dialogue around the key issues.

4

The rapidly changing policy environment: the need for research

The Communications Research Advisory Board (CRAB) is constituted to advise on the research program of the federal Department of Communications. Research in telecommunications is a multi-faceted function which extends to and includes such vital public interest matters as telecommunications policies and regulation including the relevant regulatory policy issues. Indeed, the very essence of how new technologies will be put to use in advancing the well-being of all Canadians impinges on the framework issues of effective national telecommunications policy. New technology will be demanded by the marketplace which in turn will require new developments in policy.

The information society is upon us. Canada's ability to make a successful transition to an efficient integrated information society depends on the strength of the telecommunications infrastructure. Canada has one of, if not the most advanced and efficient telecommunications systems in the world. The possibility is offered of new and improved uses of evolving technologies.

At the policy level, Canadians expect that national telecommunications policy and regulations be developed by the relevant governmental agencies to avoid confusion concerning ground rules; to avoid wasting resources and time, critical in the global race to develop networks; and

to accommodate existing and new players as well as emerging new technologies. This is very important if Canada is to maintain an advanced telecommunications system. Some of the confusion and balkanization in the telecommunications environment are illustrated by the following:

- Newfoundland has developed a province-wide four-wire dedicated audio teleconference network which now plays a significant role in health and education in the province. Approximately 50 communities are involved. The annual budget is $400,000 and its cost effectiveness has been demonstrated. To allow Memorial University to set up this system, the Newfoundland Telephone Company has co-operated fully and has had to "bend the rules" to do so. Newfoundland has two sets of regulations, Public Utilities Board (P.U.B.) governs Newfoundland Telephone and CRTC governs Terra Nova Telephone (CN). About half of the network is in each territory. It would be desirable to add a 20-port "meet-me" bridge, however, the bridge cannot be bought by Memorial University and interconnected with the network in St. John's where the control centre is located. To lease a bridge would be less desirable and financially prohibitive, at this time. A bridge can be purchased by Memorial University and located in Gander in CN territory but this would mean setting up a separate control centre with duplication of technical and co-ordinating personnel.

- University and health groups in the Atlantic provinces are interested in developing teleconference networks. The problems encountered, because of the separate jurisdictions of New Brunswick Telephone and Maritime Telegraph and Telephone Company, appear to be inhibiting the rapid development of a necessary service. Not unnaturally, there is competition between the two companies. The use of certain regulations to protect company territories to the disadvantage of the region seems to be counterproductive.

- The Royal College of Physicians and Surgeons of Canada and the Toronto General Hospital have bought a 20-port "meet-me" bridge and without difficulty connected it to the network. The Royal College with a national interest has distributed microphone/speaker kits to 20 universities and hospitals across the country. This means that at least eleven regulatory territories are involved. Because of regulations there were substantial, problems incurred in interconnecting some of these units across the country.

- In one western province it is illegal to inter-connect microphone/speaker kits and access a bridge. Students taking teleconference courses in that province have gotten around this by dialing into a bridge in an adjacent province. Of course, the university giving the course also has to dial in to the other province.

A federal government initiative in unraveling such problems would also be responsive to some recent calls by concerned Canadians. For example, the Science Council of Canada stated:

> "Co-operation and co-ordination between federal and provincial governments is essential if Canada is to have a role in an information dominated future. The Science Council recommends the creation of a national communications policy that is forward looking, integrative and comprehensive."[3]

and the Clyne Committee expressed:

> "Although our terms of reference explicitly exclude questions of jurisdiction, we cannot refrain from stating the obvious: there can be no possibility of establishing a rational structure for telecommunications carriage in Canada until the federal and provincial orders of government understand the necessity for it in national terms and agree to work together to achieve Canadian as well as regional or provincial objectives: the latter are important, but they differ from one part of our country to another and there will have to be some give and take, not only between Canada and the provinces, but also among the provinces themselves."[4]

To this end, the Department of Communications should be in the forefront exercising its responsibility to recognize the problem and to propose effective solutions for early implementation, backed by relevant research results as needed. No other department is so well positioned nor indeed vested with a greater duty to speak out here as the federal Department of Communications. Indeed no other federal department has the statutory duty "to promote the establishment, development and efficiency of communications systems and facilities for Canada."[5]

CRAB, in turn would become more effective in its role advising on research programs in support of such national policy.

The lack of a national communications policy framework narrows the focus of policy research to ad hoc issues which are dealt with in isolation of one another. And there is no lack of discrete issues. For example, Mr. A. Gourd, Senior Assistant Deputy Minister Policy, at the November 9 meeting of CRAB, referred to the following three issues:

- coping with an increasingly competitive international environment;
- the gradual move towards "open-skies";
- "re-regulation" in a number of areas (e.g., broadcasting, direct broadcast satellite).

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3 *Planning Now for an Information Society - Tommorrow is too late*, Science Council of Canada, Report No. 33, March 1982, p. 57.

4 Clyne Committee Report, *Telecommunications and Canada, Consultative Committee on the Implications of Telecommunications for Canadian Sovereignty*, 1979, n. 2 at pp. 27-28.

5 Ibid.

These are extremely important issues that would benefit greatly from policy research and analysis within an accepted communications policy framework. The ability of the United States, for example, to link the border broadcast dispute with the export of Telidon technology illustrates the urgent need for the government to be able to look at the communications environment in as complete a fashion as possible to be better able to determine where Canadian interests lie.

The main issue facing Department of Communications' decision-makers is not that technology creates policy problems, as this will always be the case, but that the policy context is too diffuse and thus inappropriate to deal effectively with the problems generated. The elaboration of a clear policy context however has always been elusive in democratic societies and Canada is no exception. The issues generated by the communications revolution and the fact that the Department of Communications must address the full spectrum of communications issues, from new technological developments to the human aspects of communications, means that the department must have a strong policy research and planning dimension. It is only through the planning process that a systematic review of problems to be addressed can be undertaken and advice given on new research directions.

The Department of Communications recognized the need for planning when it appointed a senior planner who has the important task of giving advice on the mission of the department and, in light of this mission, the task of mediating among key decisionmakers inside and outside the department. CRAB believes that outside advice is essential to DOC planning. The department has shown its willingness to listen to outside advice, not only by setting up CRAB but also by establishing other advisory bodies such as the Canadian Videotex Consultative Committee (and its sub-committees) which is able, through a process of open public meetings, to provide grass roots advice to the department. This type of consultative process needs to be enlarged.

The Department of Communications has now embarked on a planning process that could eventually result in the communications policy framework that many are seeking. The policy and planning process related to the articulation of the departmental mission will also sharpen the R&) planning process.

5

Mobile communications and teleservices

Emerging issues related to mobile communications provide an excellent illustration of the need for a comprehensive set of research activities in both policy and technological areas. Mobile radio has many uses. These include military, public services, aviation, marine and land mobile. We deal here specifically with land mobile, but there are ready extensions to some if not all of the other areas.

The traditional non-military users of mobile radios include public service agencies such as the police, fire, and ambulance services, and main dispatching services for such operations as taxis, couriers and delivery services. In addition, mobile radios have also been used by transit authorities with a view to optimizing route mangement and improving service. In the resource industries the exploration sector has been particularly attractive to the mobile radio industry since exploration tends to take place in locations served by little else in the way of communication facilities.

Canada has undertaken pioneering work in several of these sectors. The Department of Communications has a natural research interest in this area because of the opportunity it offers to improve the management of the spectrum. However, research activities will only have long-term value if they are complemented by appropriate policy measures. Therefore, policy research must be undertaken as well as technological research.

Mobile teleservices offer an opportunity for the department to build on a small existing body of industrial capability and at the same time to improve the efficiency of spectrum management. Approximately 30 percent of the department's budget and nearly 50 percent of its manpower is concerned with spectrum management, which illustrates the economic importance of this area.

For many years mobile radio has been used primarily for voice based services. The advent of new digital technologies and improvements in mobile radio design have created the opportunity to introduce digital technologies to areas previously served by voice radio systems.

Spectrum management

Traditionally, spectrum management activities have centred on programs which optimize the allocation of channels. More recently, attention has been paid to improving the manner in which an individual channel is used. In the traditional role of voice use, the scope for optimal use of channels assigned was relatively limited. Apart from improvements in radio signalling, such as, amplitude companded single side band (ACSB), the technological advances of digital based systems offer much greater potential. As an example of this, the radio spectrum requirements for channel allocation in the taxi industry have traditionally been based on the ability of one dispatcher to handle roughly 150 cars on a radio channel. With the introduction of automated dispatching systems and digital transmission, up to 500 cars per channel can be handled, a three-fold improvement in spectrum efficiency for the same function.

Not all sectors of the mobile radio user population are as amenable to improvements of this order. However, it is not generally recognized that spectrum management should encompass not only the efficient allocation of channels but also the efficient use of those channels.

International co-operation

Canada has worked extensively with the United States in establishing co-operative agreements on spectrum allocation close to the border areas. These have been subject to bi-lateral agreements struck between the two countries. Exchange of information is essential to ensure compatibility of Canadian and U.S. signalling requirements for digital systems. The Federal Communications Commission (FCC) in the United States is about to permit, for the first time, digital transmission in mobile bands. The approach taken will be in keeping with that in Canada. Continued international co-operation to develop common approaches to spectrum management is essential if Canadians are to enjoy the benefits of an overall North American system that gives Canadian industry ready access to the U.S. market.

Economic considerations

The principal thrust of Canadian innovation has been in the area of computer aided dispatching for either the public sectors or the courier and taxi sectors. In these environments an innovative approach to spectrum use has resulted in the efficiencies noted earlier as well as many other benefits, from relief of human stress to improved delivery of the end service. The export potential of these various developments is now being explored and should represent a substantial market to Canada.

The transit sector is at the present moment dominated by the United States. There is a standard specification for transit equipment, maintained by the Urban Mass Transit Authority, under which purchasing is governed in the United States. While there are innovative developments in Canada these do not meet the U.S. specifications and thus have limited export potential to that market. There is a lack of co-or-dination of transit radio usage in Canada and each transit authority appears to be proceeding down its own route. If allowed to continue this could result in the implementation of incompatible radio systems and a badly fragmented market. This will surely result in higher cost to the transit authorities and a poor export potential for Canadian business. Some attempt at co-ordinating transit radio usage in Canada and ensuring that specifications facilitate access to the U.S. market is badly needed.

Recommendations

It is recommended that:

1 The regulation for licensing mobile radio channels should increasingly encourage efficient use of the channels themselves, as well as efficient channel spacing. Operators of mobile radio channels should be encouraged to introduce digital technology.

2 The Department of Communications should continue its active co-operation with the FCC in the United States to establish a common North American set of rules for mobile radio allocation in North America, keeping in mind the export potential of key Canadian innovations.

3 The Department of Communications should accelerate its work with the communications authorities in other jurisdictions to develop appropriate guidelines for the implementation of radio based transit systems to provide a common marketplace across Canada.

4 The research activities of the Communications Research Centre (CRC) should include more work in support of efficient spectrum use and common North American regulations. In undertaking this work the CRC should involve Canadian industry to ensure that industrial opportunities are recognized and developed.

5 Through its standards work the Department of Communications should promote spectrum management standards that promote Canadian industrial development within the International Radio Consultative Committee (CCIR) and other appropriate standardization bodies.

6

New directions for the research program

A Canadian Communications, Information and Satellite R&D Institute

The Science Council of Canada recommended:

> "that the Communications Research Centre of the federal Department of Communications be restructured to form the nucleus of a national research institute for the development of advanced systems and applications software associated with the theory and practical use of the new technologies"[6]

The Department of Communications is developing this concept as a mixed private/public corporation at arms length from government and has advanced goals and program objectives that such an institute could have.

Goals

- to provide valuable services to both the private sector and government;
- to provide a vivid demonstration of the federal government's commitment to this area of high technology and of Canada's determination to play a major role in the rapidly developing information revolution;

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6 Science Council of Canada, op. cit. Report No. 33, March 1982, p. 57.

- to provide new opportunities to obtain leverage out of the private sector, significantly improve the management of government resources and eliminate the many problems associated with the performance of R&D in the public service environment;
- to provide a powerful focus for a number of co-operative government/industry initiatives that would maximize the effectiveness of Canada's limited R&D resources in an area that is of vital importance to the future of the country;
- to strengthen the quality, relevance and management of government R&D in this area.

Program objectives

In association with related provincial organizations, industry and universities:

- to provide an understanding of the technical, social, economic, cultural and institutional aspects of the information revolution and their significance to both Canada and the world;
- to foster the development of the new systems and service that will permit Canadians to derive maximum benefit from the new technologies that are the basis of the revolution;
- to expand the scientific and technical base that is essential to the maintenance of Canada's competitive position;
- to support the development of new industries with the thousands of new jobs and multi-billion dollar markets that are involved.

An institute at arms length from government would certainly overcome a number of problems related to undertaking industrially-oriented R&D within a public agency. Among the attractive features are:

- fast response time and corporate flexibility, the ability to respond quickly to changing customer needs, to move people and quickly hire additional personnel, consultants, short-term employees, without manpower limits of public service regulations;
- sponsoring organizations can receive services as necessary without complicated contract negotiation and renegotiation, without continuing obligations beyond their basic support, and free of conflict of interest problems;
- more flexible employment practices;

- effective utilization of employee skills. As envisaged, the organization would have a relatively lean core staff that would be augmented as necessary by contract people to respond to specific demands without any employer-employee relationship problems as currently exist in the public service. The objective would be to provide as quickly as possible, the necessary resources to serve the customer mix at any particular time;

- ability to grow as demand increases, would have access to numerous different sources of funds including normal financial markets;

- simple, obvious measures of effectiveness, i.e. customer satisfaction and willingness to pay for services;

- acceptability and credibility to customers;

- possibility of close, continuing and confidential relationship between customers and the institute;

- customer left free to concentrate upon broad policy-making and planning functions, leaving details of day-to-day technical management to the institute; and

- economies of scale reflected in the ability to amortize over many customers expensive but essential facilities and resources whose long-term average utilization per customer may be low.

CRAB believes that the Communications Research Centre (CRC) must be a world class national centre of excellence whose expertise should be available to all Canadians. Therefore, we believe that the institute could be viable and we recommend that the concept be fully explored. However, we believe that such an institute should work closely with like groups across the country. Therefore we recommend that a regional presence be integrated into whatever concept is adopted.

Protecting the existing research base

While institute models are investigated, it is essential to protect the CRC research capability and re-establish a stable longer term research base as major projects such as Telidon, Office Communications System (OCS) and Elie project come to an end or are transferred to the private sector. We therefore support the development of a five-year R&D plan that will arrest the erosion of the research capability (i.e. 60 percent decrease in the current base over the last five years) and establish the R&D program around major themes such as those suggested.[7] It is within this framework that we make our recommendations regarding future R&D directions.

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[7] The Department of Communications five-year R&D plan is centred around four major themes: 1) Information Research, 2) Information Technology and Systems R&D, 3) Broadcasting and Telecommunications R&D, 4) Transmission and Environmental R&D.

Telidon

The Department of Communications pioneered the graphics protocol of the Telidon interactive communication system which is now accepted as a videotex standard. While Telidon is a sunset project, the department must not "throw out the baby with the bathwater." Telidon technology is evolving rapidly and the department must keep in the forefront of technological development in support of the industry that is now commercializing the current generation of Telidon technology. CRAB was gratified to learn that funding for the Telidon program has been extended for two years. However, we stress the need to develop content for the Telidon system since it is critical to the future development of the technology.

There are a number of R&D issues that need immediate attention. These include:

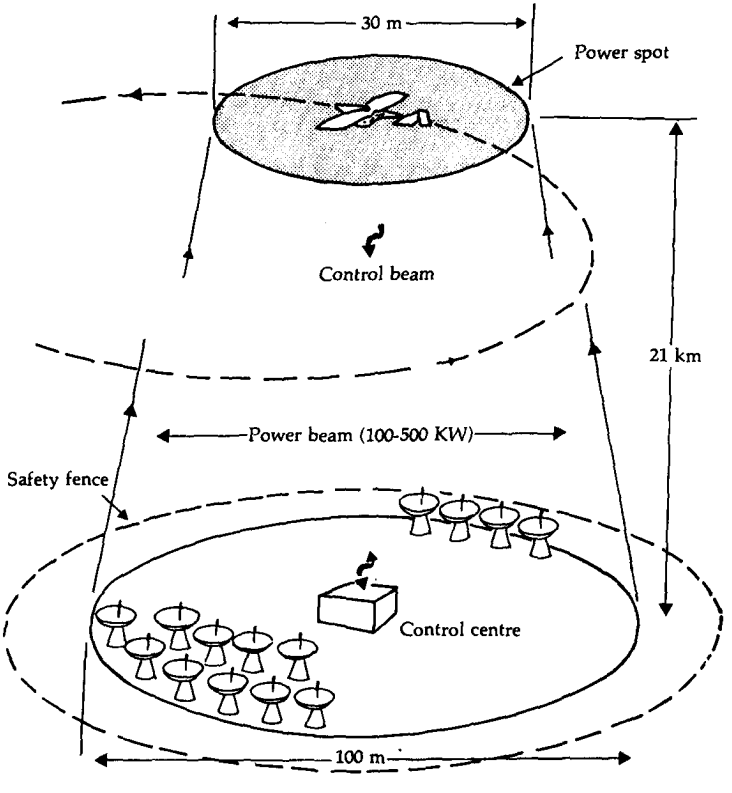
- reduction of the cost of Telidon equipment;
- increasing the interactive capacity and reducing the complexity of accessing the system;
- human impact and user research;
- development of content at acceptable cost;
- support of industrial development; and
- development of interfaces with personal computers.

On-going departmental research is needed to ensure that Canadian firms retain a competitive edge in the videotex area.

Stationary High Altitude Relay Platforms (SHARP)

The SHARP concept is based on using a network of widely separated unmanned lightweight airplanes, flying at altitudes of 21 km, to relay telecommunications signals between points within a radius of coverage of 500 km. Lightweight telecommunications equipment on each airplane could be used to (i) relay signals between portable telephone terminals, (ii) broadcast FMTV signals and broadband data signals to small diameter parabola antennas and (iii) trunk telecommunications signals between one region and another. Such high altitude relay platforms could potentially meet the needs of subscribers using low power and low weight transmitters and antennas. They also could permit re-use of telecommunications frequencies between regions (see figure 3). Because of the concentration of the signals over a limited expanse of territory, this approach to relaying signals lends itself to export markets of smaller countries and remote areas.

Figure 3


30 m
Power spot
Control beam
21 km
Power beam (100-500 KW)
Safety fence
Control centre
100 m

This communications concept has been developed in Canada over the past two years, following early work by National Aeronautics and Space Administration (NASA). Currently, Canadian industry and CRC staff are carrying out work on a novel method of powering airplanes with electrical motors by using microwave power transmitted from a large antenna system.

There are a large number of rural homes in Canada which currently receive only two channels of TV broadcasting. It is known that many rural homes want as much choice in TV programming as urban homes. Further, there are many Canadians in rural and remote regions who are inadequately served by fixed and mobile telephony services. Finally, there is the quite different need for extending the range of radar surveillance systems for military and civil needs, over both mainland and offshore locations. We believe that the technological and economic merits of this approach to relaying telecommunications signals should be fully investigated as well as the impact of SHARP on alternative communications modes.

Space research

To maintain Canada's reputation in space, the Space sector needs the freedom to be able to explore technology which is some ten years ahead of application. Of course, successful technological developments should be transferred to industry at the earliest possible indication that these technologies can be commercially viable.

There are a number of opportunities for advanced R&D which fit with Canadian priorities in space. For example, the mobile satellite (MSAT) program presents major long-term opportunities in the mobile communications sector. As well, the Department of Communications could be in the vanguard of earth-station development. For example, the development of antennas that are more in keeping with the harsh Canadian environment than current dish antennas, such as the adaptation of synthetic aperture radar (SAR) antennae, could be a Canadian niche. Also, associated with earth-stations is the development of low-noise amplifiers based on gallium-arsenide technology. Being at the forefront of gallium-arsenide technology will become very important in the years ahead because the electrical properties of this product make it very attractive for micro-electronic applications. As well, there are satellite research opportunities related to the development of high definition television (HDTV) as described in the following section. The space sector should direct some of its R&D activities along these lines.

High definition television: a major new opportunity

With the advent of third generation television, specifically high definition television (HDTV), the Canadian industry has the opportunity to enhance and strengthen its competitive position. At a time when the marketplace is demanding better quality at lower cost, this evolving technology has the potential to revolutionize the industry. The Japanese already have major research efforts in this area. Opportunities related to

this third generation television, that is enhanced and more particularly HDTV, were discussed at a recent conference in Ottawa.[8]

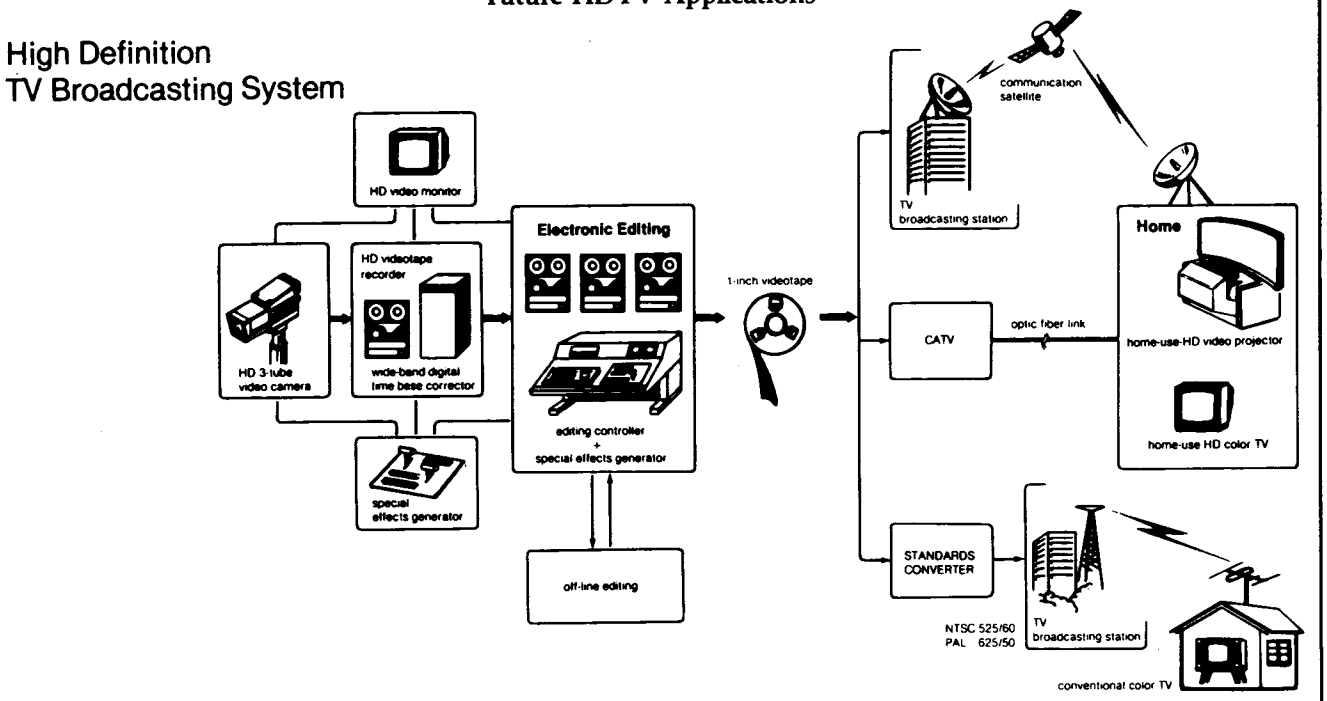
The most visible direct benefit of HDTV is its impact on the user terminal. HDTV offers much better resolution and realism than typical National Television System Committee (NTSC) signals particularly on large screen displays such as projection units. Indirectly, but more importantly this technology offers significant advantages in the realm of motion picture production, distribution and projections, facsimile, visual data storage, document retrieval and training to name but a few (see figure 4).

The potential impact on the Canadian motion picture production industry in the near future could be the most significant advantage. It could provide the Canadian industry with a much needed competitive boost through more efficient production as well as the production of new generation software. This is particularly important when considering Canada's fledgling pay-TV service and its associated content and consumer cost constraints. In addition, with the expected role of the CBC vis-à-vis the new teleservices, the rationalization of film and television production technologies should ensure that any of the financial incentives provided are used in the most efficient and effective manner.

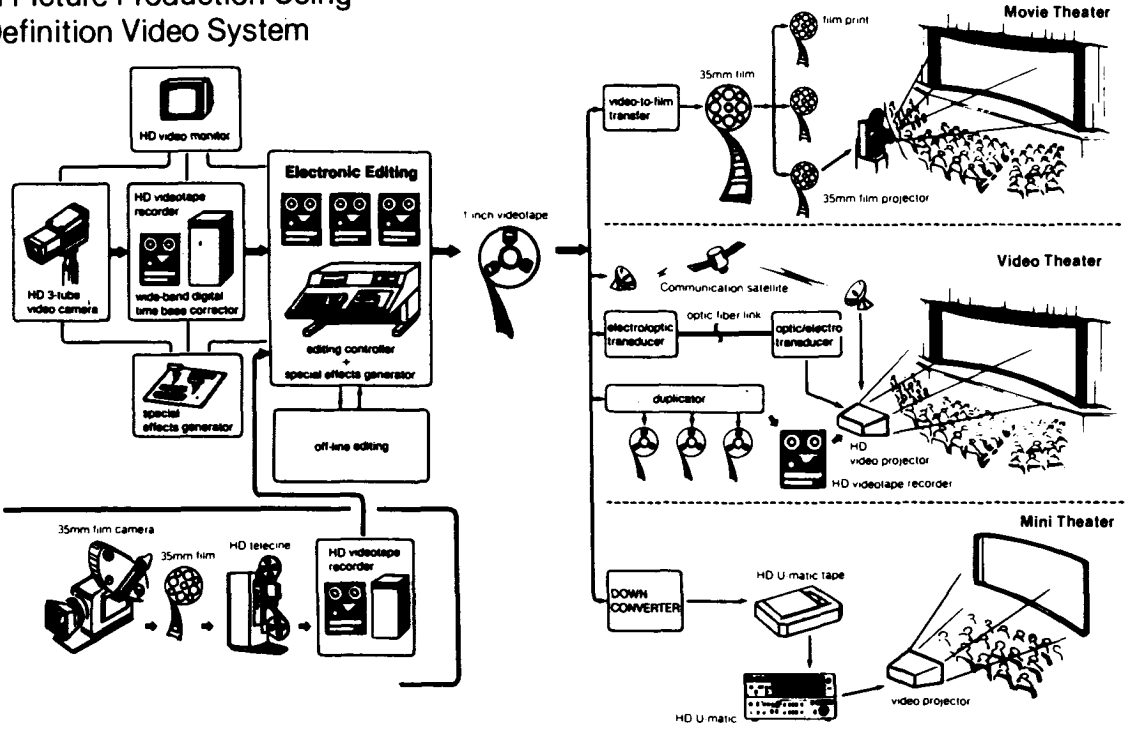
A major advantage of this technology to the motion picture industry is the movement away from standard 35 mm camera techniques to electronic video recording. This offers the advantage of immediate play back, minimized reshoots, reduced film processing cost and computerized editing and special effects. The Canadian production industry is still in a relative state of infancy as compared to the fully matured American industry. Canadian industry can, as part of its growth, invest directly in the new technology.

8 *1982 High Definition TV Colloquim;* October 18-21, 1982, Ottawa, (Discussion papers) Department of Communications.

Figure 4
Future HDTV Applications



Motion Picture Production Using High Definition Video System



As well as providing benefits to producers and technicians, HDTV technology could open new opportunities for those involved in the performing arts. With the advent of HDTV, the quality of television images may finally begin to approach the quality of the original performances. This technical breakthrough may in turn stimulate public demand for access to the performing arts via television. The potential contribution of HDTV to the growth of the performing arts is yet another argument in favor of combining responsibility for communications and culture in a single government department, a theme which was stressed in last year's CRAB report.

The potential advantages of this technology are not without certain potential drawbacks. Because it is still in the early stages of development, adequate standards have not yet been defined for HDTV. It is extremely important that these be developed immediately on a national and international basis so that this technology evolves in an efficient manner. Opportunities for co-operation with U.S. and Japanese industries should be fully explored.

By virtue of the fact that HDTV involves more stringent requirements than standard video signals it will certainly have an impact upon present and foreseeable transmission systems. Canadian broadband networks are for the most part of the coaxial variety. Most of these are being considered for enhancement to 300 or 400 MHz to provide additional channel availability. Because of its bandwidth requirements, a limited number of HDTV signals will be available, even on enhanced networks.

The network of the future has been touted to be fibre optics. However, even this network of the future may encounter difficulties in adequately accommodating HDTV. Therefore, it would be advantageous to investigate any such difficulties through trial endeavors to allow Canadian networks to evolve accordingly. The Elie fibre optic system could be considered an ideal candidate for such a test.

Canada is in the midst of launching new satellites of the Anik C and D vintage. In considering such aspects as direct broadcast via satellite as well as point to multipoint wholesale distribution, provision should be made for the carriage of HDTV signals. Such provisions should take into consideration and be in accordance with developing standards.

It is opportune now, given the present emphasis on service enhancement and the growth of Canadian industry, for Canada to actively pursue this economic opportunity and exploit all potential advantages associated with it.

In order to achieve this end, efforts must be made to:

- Establish a focal point or central co-ordinating body either wholly within the Department of Communications or jointly with the CBC, other broadcasters and industry to pursue this technology and encourage and actively take part in the following activities;

- Review the report arising out of the "High Definition Television Colloquium '82", its comments and recommendations;

- Conduct market research to assess the potential of this technology and its economic impact on the various segments of the marketplace;

- Influence the evolution of HDTV on a national and international scale such that it will be compatible with the parallel evolution of the respective transmission media;

- Participate in and influence the development of national and international standards;

- Conduct a detailed application analysis to identify all potential areas in which the application of this technology could maximize efficiency, quality and economics, thereby being an enhancement to Canadian industry as well as providing new opportunities for the artistic and cultural community;

- Influence and aid the Canadian film production industry to actively participate in the development and commercial application of this technology to enhance and strengthen its competitive position in the industry;

- Influence the development of this technology in Canada such that its application is as compatible as possible with both current and future consumer terminals;

- Conduct appropriate analysis and provide sufficient evolutionary direction that user terminals, networks and network devices evolve in concert and cognizant of the requirements of this technology;

- Encourage, aid, and participate in trials using this technology in the production, transmission and distribution segments of the industry;

- Consider the pilot application and testing of this technology in a test bed to demonstrate its potential;

- Consider Elie as an ideal candidate for a pilot application in view of an already established fibre optics network.

7

Conclusions and recommendations

The Department of Communications research program is undergoing fundamental change. To maintain its record of excellence and to be better able to meet the research challenges in a rapidly changing policy environment of the 1980s we make the following principal recommendations:

1 Research related to the human aspects of communications technology should be given a high priority. The Department of Communications should continue to support creative initiative across Canada and ensure that appropriate equipment is placed in the social context of application.

2 The Department of Communications should be in the forefront exercising its responsibility to recognize the jurisdictional problems in Canada related to telecommunications and propose effective solutions to these problems, backed by relevant research.

3 The Department of Communications should continue its active cooperation with the FCC in the United States to establish a common North American set of rules for mobile radio allocation in North America keeping in mind the export potential of key Canadian innovations.

4 The concept of a Canadian Communications, Information and Satellite R&D Institute should be fully explored, keeping in mind the need for a regional presence.

5 An adequate level of financial resources needs to be dedicated to the re-establishment of a stable research base within CRC.

6 The Department of Communications five-year R&D plan should become an integral part of the overall planning process and be updated yearly.

7 The technological and economic feasibility of SHARP should be determined. The impact on other communications modes should also be explored.

Other recommendations that we also make at this time are:

1 The Department of Communications should consider becoming the lead agency to assess the possibility of a National Program that would give those coming into the labor force and the unemployed the new tools so that they themselves can learn to adapt to the new communications technologies.

2 The Department of Communications should strengthen its social research program related to the use and impact of new communication technologies.

3 The Department of Communications should enlarge the consultative process by which it obtains advice from various constituencies.

4 The regulation for licensing mobile radio channels should increasingly encourage efficient use of the channels themselves, as well as efficient channel spacing. Operators of mobile radio channels should be encouraged to introduce digital technology.

5 The Department of Communications should accelerate its work with the communications authorities in other jurisdictions to develop appropriate guidelines for implementation of radio based transit systems to provide common marketplace across Canada.

6 The research activities of the CRC should include more work in support of efficient spectrum use and common North American regulations. In undertaking this work, CRC should involve Canadian industry to ensure the industrial opportunities are recognized and developed.

7 Through its standards work the Department of Communications should promote spectrum management standards that advance Canadian industrial development within the C.C.I.R. and other appropriate standardization bodies.

8 Research related to the development of Telidon technology needs to be maintained.

9 Space research should focus on longer term opportunities such as those related to MSAT and earth-stations and other advanced technological areas, for example gallium-arsenide.

10 A priority should be given to exploring the potential of High Definition Television (HDTV). The directions set down on page 39 should guide the R&D effort. In particular, consideration should be given to the use of the Elie test bed for research in the applications related to HDTV.

We believe that by accepting and acting on these recommendations the Department of Communications will contribute significantly in encouraging Canadians to capture the emerging opportunities in the new information/communications economy.

Annex A

A National Informatics Institute

There is a need in Canada for an organization which:

- Can provide
  - Critical mass needed to make significant contributions
  - Needs of governments (federal and provincial)
  - Canadian companies (small and medium)
  - Canadian carriers (Teleglobe, Telesat, CBC, Cable TV)
- Can be flexible
- Can work on a confidential, non-conflict basis with all customers
- Can grow as required
  - Free from arbitrary manpower and budget limitations
- Can consolidate all government telecommunications and informatics resources within one organization
  - CRC, NRC, DND, EMR, F&O
- Should institute, manage large programs i.e. Telidon, OCS

Source: Assistant Deputy Minister Research, Department of Communications, adapted from a presentation given at the CRAB Meeting November 9-10, 1982.

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