SCIENCE COUNCIL CANADA

A Policy for Scientific and Technical Information Dissemination

September 1969

SCIENCE COUNCIL OF CANADA

Report No. 6

A Policy for Scientific and Technical Information Dissemination

SEPTEMBER 1969

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October 1969.

The Right Honourable PIERRE ELLIOTT TRUDEAU, P.C., M.P.,
Prime Minister of Canada,
House of Commons,
Ottawa 4, Ontario.

Dear Mr. Prime Minister,

In accordance with sections eleven and thirteen of the Science Council Act, I take pleasure in forwarding to you the views and recommendations of the Council as they concern policies for scientific and technical information, in the form of a report entitled

"Science Council Report No. 6—A Policy for Scientific and Technical Information Dissemination."

Yours sincerely,

O. M. SOLANDT,
Chairman,
Science Council of Canada.

CONTENTS

SYNOPSIS

In this its Sixth Report, the Science Council has set out to propose a national policy for the dissemination of scientific and technical information with the ultimate aim of ensuring the provision of information and information services which will be relevant to the present and future needs of the generators, processors, disseminators and users of information in Canada. The basic principle followed in the development of the policy is that the building of any information service should be based on existing expertise and that the aim should be to link such services into a network of systems, operated under decentralized control.

The Report discusses the federal role in such an information network and proposes the creation of a "Scientific and Technical Information Board" within the framework of the National Research Council, to become responsible for the implementation of that federal role and to provide the co-ordinating focus for national development.

Brief mention is also made of the problems of information dissemination for the social sciences and humanities.

Three key recommendations made by the Science Council to the Federal Government are

(1) that the Federal Government formally adopt an information policy based on the principles set out in this Report (p. 12);

(2) that the Federal Government designate the National Research Council as the agency responsible for promoting federal participation in the development of a national network of scientific and technical information services (p. 18);

and

(3) that the National Research Council be empowered by Cabinet to create a Board of Directors to be responsible for directing the activity of the National Research Council in the field of scientific and technical information dissemination (p. 19).

Subsidiary recommendations (p. 19) deal with the composition of the Board, the provision of staff assistance to the Board, the amalgamation of certain activities of the National Research Council under the Board's direction, and the provision of a separate parliamentary vote to cover activities of the National Research Council in scientific and technical information.

Other recommendations deal with the status and responsibilities of the National Science Library (p. 21), the publication of abstracts of technical papers in both official languages (p. 26), and matters which should be investigated by the National Library Advisory Board (p. 33).

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Chapter I

INTRODUCTION

As the social and technical organization of man becomes more and more complex, communication plays an increasingly more important role. While the total exchange of information in such a process includes cultural, economic, scientific and technical components, this report concentrates on that part which involves the organization and flow of scientific and technical information (STI). Though no attempt is made to deal with information relating to the humanities and social sciences, the Science Council is fully aware of, and deeply concerned with, the needs for action in these fields and is hopeful that its recommendations will have a favourable influence.

The technical means for the transmission of information, whether in written form, or by broadband cable, relay towers or satellite, have far outstripped our methods for gathering, storing and retrieving it. The generators of information, be they government departments, industrial laboratories, universities or private sources, are producing a veritable flood of technical data, engineering know-how and scientific facts. Our report deals with the important policy problems relating to assembling, storing and making this information readily available to the Canadian user.

In science and technology there is truly an "information explosion", and the rate at which information is generated has become so great that it has been argued that "any young scientist, starting now and looking back at the end of his career upon a normal life span will find that 80 to 90 per cent of all the scientific work achieved by the end of the period will have taken place before his very eyes, and that only 10 to 20 per cent will antedate his experience".[1]

In a world where information is being generated so rapidly, and in which national economies are dependent to an ever-increasing extent on the application of scientific and technical knowledge, nations must place themselves in a position in which scientific and technical information can rapidly be supplied to those who need it. The system by which a nation disseminates its information begins to play a significant role in the national economy.

Given this dynamic environment, a nation such as Canada must face up to the necessity of formulating a national policy for information dissemination and must then seek means to implement this policy.

In recent years a number of studies have been conducted in Canada, all treating various aspects of information dissemination. The final report of

[1] *See* D. J. DeSolla Price. Little science, big science. Columbia University Press, 1963, p. 2.

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the latest of these, prepared by a group headed by J. P. I. Tyas, has been published by the Science Council as Special Study No. 8, *Scientific and Technical Information in Canada.* The earlier reports (e.g. by Bonn[1], Downs[2], etc.) are conveniently summarized in a chapter on Libraries in the report, Special Study No. 7, *The Role of the Federal Government in Support of Research in Canadian Universities* by J. B. Macdonald *et al.*

In early 1968 the Science Council of Canada created a Committee on Scientific and Technical Information[3] to draft recommendations concerning a policy for the co-ordination of scientific and technical information activities in Canada. The present report, based on the work of the Council's Committee, presents recommendations by the Science Council of Canada which would establish an information policy for Canada and would lead progressively towards the creation of a national information network. The information presented in Special Study No. 8, referred to above, has been especially useful to the Committee in its deliberations.

Information

For the purposes of this document, information is taken to mean any idea or statement of thought expressed in words, symbols, or pictures. Such "information" has two important characteristics which determine its "quality". These characteristics are validity and relevance.

There exist degrees of validity which can be thought of as a spectrum ranging from truth to falsehood. Information may be false, it may occupy a speculative middle range, or it may constitute a body of knowledge either provisionally or totally accepted on the basis of scientific or other criteria. In science the validity of information is also affected by the limits of error which are ascribed to it. Relevance is determined by the application for which the information is required. It also contains an element of timeliness, especially where information is required for decision-making. Information which arrives too late for use is irrelevant.

It should be the aim of any information system to provide the user as rapidly as possible with the information which is pertinent to his problem, screening out that which is not relevant. This latter requirement is the most difficult, and perfection can be approached but not reached.

This definition is loose and all encompassing, but will be sufficient for the purposes of the report. Given this concept, one can then define scientific and technical information, in its widest sense, to mean "information on the status, progress and results of research, development and other scientific activity, and on the application of such results, together with any other information of potential use in any scientific or technological activity."

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[1] Bonn, G. S., Science-technology literature resources in Canada: Report of a survey for the Associate Committee on Scientific Information of the National Research Council. Ottawa, National Research Council, 1966.

[2] Downs, R. B., Resources of Canadian academic and research libraries. Ottawa, Association of Universities and Colleges of Canada, 1967.

[3] See Appendix for a list of members.

Chapter II

INFORMATION POLICY

Information policy is concerned with the major and strategic decisions on the use of information and information systems in the attainment of our scientific, economic, social and human objectives by government, industry, universities, schools or other organizations. Past decisions, whether they have been in the context of an explicit policy or not, have resulted in the haphazard development and growth of libraries and information systems in Canada so that today they do not compare favourably with the best examples elsewhere. The time has now arrived for Canada to have an explicit information policy, since the investment of resources in information handling will be so great and the effects of decisions on information policy will be so far-reaching that the consequences of not having a proper policy would be severe. The development of an information policy is particularly important in that it is increasingly evident that no one agency or organization within a country or, for that matter, among a group of countries, can attain a solution alone.

Some universities have begun to approach a solution by working together on exchange of information; professional associations have had to act with vigour to meet the needs of their members; industries have become increasingly concerned with maintaining and improving their services; governments have become involved nationally and internationally in trying to promote solutions which will give focus to the efforts of all concerned with information.

In this chapter the Science Council will seek to identify some of the major objectives of an information policy and to examine the implications of these objectives. In a subsequent chapter the Council will then consider the possible means available for the implementation of the policy.

Major Objectives

The *principal objective* of a national scientific and technical information policy should be

—the provision of information and information services relevant to the present needs (and which will evolve to meet the future needs) of the generators, processors, disseminators and users of information in Canada.

This objective is necessarily broad and must immediately be refined by dividing it into a number of components which the Science Council believes to be

—the optimum utilization of existing information services and systems and the development of new ones;

—the promotion of international co-operation and liaison for the exchange of information;

—the support of (and development of facilities for) education and training in information science and technology, to provide the qualified manpower which will render possible the implementation of a national information policy;

—the support of research, development and innovation in information science and technology to increase both the efficiency of information services and the quality of the information which these services provide.

Two significant constraints, imposed by considerations of language and geography, must be imposed on the objectives of a *Canadian* information policy, and give rise to the need for

—the creation of an information system that can be queried in English or French with equal facility;

—the creation of an information system that will ensure that the effect of distance from a source of relevant information on a user will be minimized.

These, then, are proposed as the prime objectives of a national information policy for Canada. At this point, two observations should be made. First, these objectives are valid for a total information policy, and are not simply restricted to a scientific and technical information policy; although the recommendations made in this report refer to scientific and technical information, some comments will be added on information dissemination in the area of the social sciences and humanities. Second, these objectives are still so general that it would be virtually impossible to take immediate action towards reaching them without defining them further. The next step in articulating an information policy is therefore the examination of the implications of these objectives.

Implications

1. *"The Optimum Utilization of Existing Information Services and the Development of New Ones"*

In Canada, information systems and services are provided by every sector of the economy:[1]

—the Federal Government has major departmental systems and nationally oriented libraries (e.g. the National Library, the National Science Library);

—the provincial governments, particularly through the provincial research councils, provide important information services;

[1] For detailed notes on many of these systems, *see* Science Council of Canada, Special Study No. 8, Scientific and technical information in Canada, Part II, Chapters 1, 3, 2.

—municipal governments support public libraries;

—the universities not only have their own libraries and information systems, but are also beginning in several parts of the country, to link up their services (e.g. in Ontario, in the Atlantic Provinces, in B.C.);

—the private sector has information systems and libraries operated by companies, by industrial associations, by professional agencies, etc.

All of these form part of the "information community"; the Science Council believes that it is essential that all parts of this community participate as partners in the implementation of a national information policy, and that the growth of a national information system be based on existing strength. To encourage this to happen, suitable mechanisms must be developed to co-ordinate the activities of this heterogeneous group, in seeking the attainment of the common goals of an accepted national information policy.

The Council further emphasizes that a scientific and technical information service, no matter how well-organized, comprehensive, or fast, is of limited use unless it is fully exploited by those who could and should use it. It is essential that the availability of an STI service be *advertised* to potential users and followed through by *instruction* in its use. Those are necessary ingredients of any STI policy formulation.

It is the opinion of the Science Council that the concept of "optimum utilization of information systems" will involve:

—Encouragement of the initiatives of individuals, institutions and organizations in the development and operation of scientific and technical information services which they consider to be in their best interests.

—The support and integration of established and emerging centres of specialization in important areas of science and technology as key points within the national information community. Specialized collections of information, developed by the leading groups in a particular field or discipline, have much more value than centralized collections put together in a location remote from the principal activity which they are to support.

—The adoption of a national acquisitions policy which would have as its principal objective the development of a national collection of information which would be as comprehensive as is economically possible, by means of the development of complementary collections.

—The provision of adequate and well-maintained catalogues, bibliographic tools and data on information to aid the user in his search for information, and supporting services to retrieve the information required. (An important aspect of this objective is the maintenance of an up-to-date union catalogue of all library holdings in Canada.)

—The provision and maintenance of an efficient referral or reference system to direct the user to the source of information which he seeks.

—The development and adoption of efficient dissemination techniques and services to draw the attention of the user to new and relevant information in his stated and precisely delineated fields of interest.

—The promotion and development of existing and new technical information services for industry.

—The development of existing and, where necessary, new scientific and technical journals and other publications, as a means of disseminating information relevant to Canadian interests and needs. In this context, two urgent problems should be considered: the need for both faster reviewing and publication of papers and faster abstracting. The present time lags are unacceptable.

—Substantial improvements of systems for storing, retrieving, and disseminating information contained in maps, plans and pictures such as aerial photographs; conventional libraries barely touch this problem.

2. *The Promotion of International Co-operation and Liaison for the Exchange of Information*

Since no single country is self-sufficient in information resources[1], strong efforts must be made to remove impediments to the flow of information across national boundaries. Information is now truly a *world* resource to which all countries must have access. The most advanced and sophisticated systems of national networks will realize only a small fraction of their potential if suitable mechanisms for international co-operation are not created and utilized in the very near future.

Throughout this report the Science Council will emphasize the principle that the systems devised to provide Canada with scientific and technical information should be firmly founded on existing strengths wherever possible. This principle is fully applicable to existing strengths *outside Canada.* Every system developed, for example in the United States, which can be used to fulfil a Canadian need should be fully utilized. It would be folly to divert scarce Canadian resources from providing some extra service to duplicate the vast expenditures involved in preparing *Chemical Abstracts.* The aim of all countries is to build systems which are reasonably interchangeable and which will provide the ability to transfer information between systems with minimum inconvenience. Canada should enter wholeheartedly into the international exchange of information by offering access to Canadian systems and by obtaining connections to many others being developed elsewhere.

[1] The rate of generation of information by countries is extremely difficult, if not impossible, to measure. Intuitively one feels that a *qualitative* impression (but not necessarily a quantitative one) of the rates of generation can be obtained from a comparison of research and development expenditures. The fact that Canada spends annually about 2 or 3 per cent of the world total expenditure on research and development gives some idea of the proportion of all scientific and technical information generated outside Canada.

The Science Council urges that Canada co-ordinate and strengthen our participation in international bodies such as the Organisation for Economic Co-operation and Development (OECD), the International Federation for Documentation and the International Council of Scientific Unions. No possible avenues of co-operation should be closed. For example, the participation in OECD activities does not preclude other arrangements or agreements with individual members or groups of members of OECD, or with countries outside that organization. Canada's unique relationship with the United States requires the closest collaboration in approaching problems of information transfer.

If Canada is to approach the problem of international exchange of information efficiently, it is evident that many groups inside and outside government will be involved. However, three particular problem areas must be borne in mind.

(1) Many groups at present exchange information on an international basis[1] but no evidence exists to indicate that this is well-known in Canada beyond the confines of special-interest groups. These groups should be brought together to discuss their activities and to have them publicized. The information community as a whole must be aware of all the avenues for international information exchange which have already been developed.

(2) In international relations it is necessary for Canada to draw upon the talents of the most qualified people to act as representatives and participants in any formal meetings—especially when the agenda covers technical matters. Such representatives should be drawn from government, universities or the private sector as appropriate. The National Research Council's practice of drawing its delegates to meetings of the International Union of Pure and Applied Physics from all sectors of the physics community is a step in the right direction and could profitably be adopted as routine practice in all international meetings on information for which the Federal Government selects the Canadian delegates.

(3) Government-generated information poses a special problem. In many cases governments will supply only limited numbers of copies of the information which they exchange (e.g. the United States Atomic Energy Commission provides Canada with only two copies of its documentation). Canada must designate some group to be responsible for maintaining an overview of the dissemination of scientific and technical information obtained from foreign governmental, or intergovernmental sources, and of the distribution of Canadian-generated information in exchange. This role has been described as that of a "clearing-house" and is mentioned later.

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[1] *See* Science Council of Canada. Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 4, International organizations and foreign countries. Ottawa, Queen's Printer, 1969.

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3. *The Support of Education and Training in Information Science and Technology*

The implementation of a national information policy is not possible without a supply of qualified manpower. With the rapid changes in information-handling techniques, the manpower requirements will not be limited to the so-called "classical" services but will cut across a variety of disciplines. Training will be required for administrators, systems planners, librarians, library technicians, information scientists, subject specialists, and information specialists.[1] Provision must be made for

(*a*) the expansion and redirection of existing schools of library and information science to meet the demands for specialists in the handling of scientific and technical information. Funds should be used to build on existing strengths and not scattered thinly among numerous new schools;

(*b*) the provision of adequate facilities, which Canada lacks today, for the training of information technologists who would occupy positions comparable to those filled by graduates of the Institutes of Technology in other fields of science. This will entail the creation of new facilities in some Institutes of Technology;

(*c*) scholarships, bursaries, grants and other methods of support for trainees.

Nor must the users of information be forgotten in the education cycle. Training in the preparation of information and in its proper utilization must form an integral part of the educational system at all levels from secondary school, through college and university, to adult education and in-service programs. Our educational institutions must meet this challenge in new and enterprising ways.

4. *The Support of Research and Development in Information Science and Technology*

The efficiency of information services and the quality of the information which these services provide can only be increased by a vigorous program of research and development (R and D) in information science and technology. Rapid changes are occurring in methods of information storage, retrieval, and dissemination, sparked by the development of large-scale electronic computers, electro-optical and electro-mechanical devices, display systems, etc. The spectrum of tasks to be undertaken is of sufficient breadth to warrant, indeed to necessitate, the participation by industry, the universities, and governments. The Federal Government should actively promote, co-ordinate and support research and development programs in the universities and in industry.

[1] Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 3, Universities, and Chapter 6, Libraries.

Research in the universities can be fostered in the rapidly emerging departments or centers of information science or computer science;[1] an exciting range of opportunities opens up for industrial entrepreneurship with all its attendant risks but sizeable rewards. The fruits of this labour will be reaped not only in the improvement of national information services but in the enhancement of Canada's role in the world community.

5. *The Creation of an Information System which can be Queried in English or French with Equal Facility*

It must be emphasized that the objective is a system which can be queried[2] in both languages. This objective must not be confused with the problem of providing translation services. Since a Canadian information system should provide the user with access to information generated in many languages, in many parts of the world, the system should offer to provide the information in the original language, leaving the user to obtain such translations as may be necessary. In this connection, the STI Service, recommended later in this report, will, as a federal entity, follow the precepts of the Official Languages Act and offer access to its services in both languages.[3]

6. *The Creation of an Information System that will Ensure that the Effect of Distance on a User from a Source of Relevant Information will be Minimized*

"Distance", in the present context, goes beyond the usual physical connotation. Difficulties for the user of information can arise from geographic location, or from location within an economic, social, or organizational framework. The systems to be developed must be designed to minimize these difficulties.

An attractive solution to the problem of providing an efficient national information system for Canada is the concept of an information network. The Science Council's view of a network is that of a set of independent information sources developed to meet particular needs (and evolving in response to these needs) which are linked by an efficient communications system. This communications system could initially be as simple as a telex system, backed up by the rapid mailing of microfiche or hardcopy of the information, and ultimately as complex as a totally computerized system with the user having his personal terminal from which to interrogate a series of distant computerized information sources, with the desired information being

[1] Consideration could also be given to the creation of one or two interdisciplinary institutes of information science sponsored, separately or jointly, by universities, government and industry.

[2] In this context a query could equally well be a question asked verbally of a person or an interrogation of a computer through an input device.

[3] Remarks on translation services and on the distribution of scientific and technical literature by language of publication are given later, pp. 25-26.

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transmitted by broadband system.[1] Participation in such a network should depend on co-operation, not compulsion; those electing to join should agree to supply the mutually selected services.

Information networks to satisfy their particular interests would be required by the universities, by scientific and technical societies, by industry associations, and by special interest groups which cut across a number of traditional organizations. Provision for the effective co-ordination and collaboration of the separate entities must be made by a properly constituted body operating at the national level.

There does exist a major constraint on a Canadian information system, which serves to accentuate the need to cope with the problem of distance. Because of the vast costs involved, Canada cannot and should not aspire to assemble in many locations, complete collections of information on any one subject, let alone across the gamut of subjects. As suggested earlier, Canada should seek to develop complementary collections, which together cover as wide a range of subject areas as possible; development of international ties should be used to ensure that Canadians have access to all available information. This constraint underscores the need for networks to link the user to the information. It must also be emphasized that whatever networks are set up must be administratively and operationally simple.

The Science Council has argued that Canada needs a national information policy and has discussed what, in its opinion, the objectives of such a policy should be. The Council would now hope to see this policy accepted by all sectors of the economy as outlining the common goals which they will all strive to realize.

As an immediate step, the Science Council recommends that the Federal Government set an example by formally adopting an information policy which would include among its objectives those set out above.

In concluding this chapter, reference must be made to several important problems which should be covered by an information policy, but which have not yet been investigated by the Science Council. First there is the problem of the dissemination of confidential information, particularly where private interests are involved. This is of such complexity and importance that it will require much more elaborate study; it is made pressing by the advent and increasing use of large-scale data banks in government and the private sector.

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[1] An interesting example of a computerized network presently under formation, is the recently announced system which will link 15 computer research centres in the United States (*Spectrum*, August 1969, p. 12). The first stage, which will link UCLA, Stanford Research Institute, UCSB, and the University of Utah, is expected to be in operation in the fall of 1969, with the complete system operational in late 1970. Compatibility will be achieved by equipping each computer in the network with its own interface message processor. The network will in effect provide a pooling of the separate resources in computer hardware, programs, and specialized knowledge.

The Science Council is conscious also of the close relationship which must exist between information services and the communications industry, a relationship which will be strongly influenced by the final outcome of the current debates on matters such as:

—the ownership of means of communications;

—the licensing of communications companies and common carriers for operations in different modes (telephone, telegraph, data transmission, etc.);

—the degree of government regulation appropriate to the communications industry;

—the desirable relationships between the common carriers and such other industries as computer utilities, data banks, communications hardware manufacturing.

Resolution of these important questions will influence the future of both the communications and the information industries. However these matters are not touched on in this particular report which concentrates on the provision of information services rather than on the communications aspects of the problem.

Chapter III

THE IMPLEMENTATION OF A NATIONAL INFORMATION POLICY

When considering the dissemination of scientific and technical information, it must always be remembered that it is generated in hundreds of places, by thousands of individuals; it is disseminated through hundreds of systems, in thousands of journals, books, and papers, and it is used by governments, universities, industries, and myriads of individual researchers.

In short, information is, and must remain, all pervasive; without active participation and initiative by all of these individuals and groups, no total information system can operate. It is of the utmost importance that this pervasiveness be maintained and that any "national system" aimed at facilitating the flow of information be in the nature of a network, built up to link together the sources and users of information; what is to be strenuously avoided is the imposition of a rigid and monolithic system to which all must conform. The success of any nation-wide network of information systems will be dependent on the extent to which all of the groups involved can be brought together in harmony.

There are examples already in existence of the kind of co-operative activities which could build a national network, if extended far enough. The universities in Ontario have their libraries linked by telex and rapid delivery systems. By an enlightened approach to interlibrary lending, they have merged their resources in a real sense (without the unnecessary expense and inconvenience of trying to house their collections under a common roof), and have thereby increased the service that they provide to their public. In Nova Scotia a co-operative system encompassing university, provincial and federal organizations is evolving,[1] which, by tackling the problem of linking different organizations in different sectors of the economy, is even more ambitious and far-sighted.

There is one fundamental prerequisite which must be satisfied if a decentralized information network such as envisaged in this report is to have any hope of operating successfully, and that is a comprehensive and accurate national union catalogue of the holdings of all of the individual components of the system. Given both the large number of such components and the vast number of documents which any national system will contain, the only feasible approach would be to have such a catalogue in machine-readable form. The production of a machine-readable national union catalogue for scientific and technical information must, therefore, rank as an immediate item of first priority in the establishment of any national network.

[1] Both of these systems are discussed in Special Study No. 8, Scientific and technical information in Canada, Part II, Chapters 3 and 6.

The Federal Role in STI Dissemination

Although the Science Council argues that no single highly centralized system could or should be created as a step towards implementation of the recommended policy, the Council can identify a significant, central role for the Federal Government as a catalyst for the many separate actions which will be needed to bring into being an active information network.

The report of the Glassco Royal Commission on Government Organization states that:

> "The dissemination of information as a service to the Canadian public is either the sole or principal reason for the existence of some departments and agencies and is an explicit or essential corollary to the operations of others."[1]

The extent to which federal departments and agencies are involved in the propagation of scientific and technical information has been discussed at length by Tyas and his co-workers.[2] While all of these bodies will continue to play an important role in any future national STI network, the Science Council will now review briefly the duties and responsibilities of two agencies which by virtue of their mandates, can claim to play a central role in such a system.

The National Library

The National Library is responsible for matters relating to books[3] in Canada, and for the development of a national union catalogue of the holdings of all libraries. Under its new act[4], and with its new board, the National Library will be expected to play a more important role in the future than it has in the past. However, scientific and technical information is considered peripheral to its interests and objectives. Under an agreement in 1953 between the National Research Council (NRC) and the National Library, the NRC library (later to become the National Science Library) formally assumed responsibility for national library services in science and technology.[5] Although close co-operation and co-ordination with the National Library remain essential, the development of a national scientific and technical information system cannot wait upon the development of a more ambitious total information system. For this reason the Science Council does not believe that the National Library can be charged with the development of a scientific and technical information system. An appropriate role for the National Library is briefly mentioned in a later chapter of this report.

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[1] Royal Commission on Government Organization. The organization of the Government of Canada. Ottawa, Queen's Printer, 1963, Vol. 3, p. 63, *quoted in* Special Study No. 8, Part I, p. 21.

[2] Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 1, Government departments and agencies.

[3] The National Library Act, Section 2(*b*) defines "book" to mean: "Library matter of every kind, nature and description and includes any document, paper, record, tape or other thing published by a publisher on or in which information is written, recorded, stored or reproduced".

[4] S.C. 1968/69, C. 47.

[5] Dominion Bureau of Statistics, Canada Year Book Division. Canada Year Book 1968. Ottawa, Queen's Printer, p. 397; see also Special Study No. 7, p. 221; and p. 21 of the present report.

National Research Council

The National Research Council Act[1] empowers the National Research Council, *inter alia* "to establish, operate and maintain a national science library and, subject to the approval of the Minister, to publish and sell or otherwise distribute such scientific and technical information as the Council deems necessary". In its pursuit of these objectives the National Research Council has become a leader in this field and has developed some key policy-oriented committees and operating bodies.

The NRC Associate Committee on Scientific Information, first established in 1957, is concerned with problems relating to the collection, organization and dissemination of scientific and technical information in Canada. To date, it has undertaken studies on matters of national concern in its field and has given scholarships for training in library science and documentation. On the negative side, it meets only once a year (but now plans to meet twice a year); it does not have a full-time secretariat devoted to formulating policy and servicing the needs of the Committee; its members express some frustration about its limited accomplishments although these are commensurate with the inadequate resources and narrow responsibilities allocated to it.

The National Science Library states that it is

> "responsible for ensuring that Canadian scientists, engineers and industrialists have direct and immediate access to publications and information required in their day to day work".[2]

The Library is already expanding its role beyond the traditional confines of library services into the broader field of information dissemination, and has a pilot-project scale service in operation which provides for the "Selective Dissemination of Information"[3] to a list of subscribers who have identified their general areas of interest.

The Technical Information Service of NRC, established in 1945 to aid small- and medium-size industrial firms in keeping up with research and technological advances, has considerably broadened its scope. At present it consists of three major sections: Technical Inquiries, Industrial Engineering, and Technological Developments. The Technical Inquiries Section (TIS) provides an enquiry and answer service for industry, which is of value not only to small firms with limited technical staff, but also to large companies unable to cover fully their own specialized fields or relevant associated fields. Since this service is essentially a passive mechanism, the service on industrial engineering was introduced in 1962 to provide information on managerial functions, office administration and production operations. A further step in taking an active role in the provision of information was the creation of the Technological Developments Section in 1964. This Section provides such services as state-of-the-art reviews or reports, lists of literature

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[1] National Research Council Act, Section 13 (*fb*) and 13 (*g*).

[2] National Science Library. Annual Report, 1967-68. National Research Council of Canada, Ottawa, 1968. p. *v*.

[3] For brief notes on this service, see National Science Library, Annual Report, 1967-68, pp. 7-8.

references in specific fields, a film loan service, and checklists of titles of technical articles chosen for and directed to separate fields of industry. It should be noted that the majority of the liaison officers, located in 11 field offices across Canada, are employed in the field services of provincial research councils, which receive TIS grants to cover the technical information part of their activities.

One of the outstanding contributions made by the National Research Council to the fostering of scientific research is through the publication of the Canadian Journals of Research, consisting of eight scientific journals in the fields of biochemistry, botany, chemistry, earth sciences, microbiology, physics, physiology and pharmacology, and zoology. The Journals provide a major outlet for Canadian scientists (of the papers published in 1967, 69 per cent came from Canadian sources). The National Research Council covers the administration, editorial and publication costs, a portion of which is recovered through sales. The Journals incidentally play an important role in bringing foreign publications to Canada by means of library exchange agreements.

As well as having these specific groups within its framework devoted to different aspects of the dissemination of scientific and technical information, the National Research Council has a long history of involvements with universities, industry, and other institutions; for example, it fulfils an important function by supporting the National Science Film Library of the Canadian Film Institute and by providing grants to assist in the production of technical journals published by some of the major professional societies. Moreover it has among its staff a wide variety of technical skills and abilities which could be applied to the problems of information dissemination.

The Science Council therefore recommends that the Federal Government designate the National Research Council as the agency responsible for promoting federal participation in the development of a national network of scientific and technical information services, and for the implementation of the federal components of a national scientific and technical information policy. This task should immediately be made one of the major missions of the National Research Council.

The objectives of the mission proposed for the National Research Council are those specified earlier as the objectives of a national information policy. As work progresses these objectives will need further refinement and more precise goals will have to be set.

The role foreseen for the National Research Council does not abrogate the responsibilities of other federal departments and agencies for the provision of information and information services *closely related to their specified missions.*

Organizational Requirements

Having stated the objectives of an information policy and having identified an appropriate group to become responsible for meeting them, the

Science Council would add some comments on the organizational requirements which should be satisfied.

The Science Council recommends:

(1) that the National Research Council be empowered by Cabinet to create a Board of Directors to be charged on behalf of the President and Council of the National Research Council with the responsibility for directing the NRC activity in the field of scientific and technical information dissemination and for undertaking the continuing task of refining and articulating the objectives of the national information policy. The membership of this Board, which should not exceed twenty in number, should encompass representatives of the users of scientific and technical information as well as of the disseminators; it should have representatives from federal, provincial and municipal governments, from universities and professional societies and from industrial corporations, both large and small; and it should have adequate representation of the information and communications sciences. Members should be appointed for specific terms with provision being made for an adequate annual turnover of the membership.

(2) that the National Research Council provide this new Board with a small but competent staff or secretariat. No part-time policy-oriented body can be completely effective without some measure of staff support. Members of such a secretariat should be employed full-time on that task, but should not be permanently employed by the secretariat. If some staff members are appointed for one- or two-year terms this would bring about a constant influx of ideas to the work of the secretariat and its parent Board; at the end of their appointment they would carry back to their home institution valuable experience and insight into the problems of a national information system.

(3) that the National Research Council amalgamate the important elements within its structure already engaged in aspects of scientific and technical information dissemination—the National Science Library, the Technical Information Service and the Canadian Journals of Research—and place them under the direction of the proposed Board.

(4) that the Treasury Board and the National Research Council enter into discussions with a view to providing future appropriations to the National Research Council for its activities in scientific and technical information dissemination in a discrete Parliamentary Vote, separate from the others which the National Research Council already receives.

For the purposes of the remainder of this report, the proposed Board and operating elements of the National Research Council mentioned above, when taken together will be referred to as the Scientific and Technical Information Service (or STI Service). The major responsibility of this Service would be the performance of those tasks which can most appropriately be undertaken by the Federal Government in establishing a national network of information services.

In making these recommendations the Science Council is fully aware that it is proposing the establishment of a Board which will be responsible both for the operation of its own facilities and for the co-ordination and support of the activities of groups in the private and university sectors. Such bodies have been questioned and criticized of late, principally over the fear that the judgment by the Board of the relative priorities for funds, particularly in times of financial stringency, will be unduly biased in favour of its own operations. The Science Council believes the system proposed can prove these fears to be unjustified provided that the Board follows the principles of the information policy suggested by the Council, and provided that the Board is strong enough to avoid becoming the captive of the operations which it directs.

Some Practices and Problems

The Science Council proposes that the STI Service, which will be an important and integral part of the National Research Council, should undertake two classes of tasks in order to carry out the central role in implementing a national information policy. These are: (*a*) the provision of those centralized services which only the Federal Government is in a position to provide, and (*b*) the encouragement, support and co-ordination of the wide range of decentralized activities (training, research, development, innovation, and implementation) which must take place together throughout the sectors of the economy, if a national network of efficient and responsive information systems is to evolve.

(*a*) *Centralized Services*

There are a small number of services and facilities required by a national information system which are central to the system and which should not be duplicated. It should be the responsibility of the STI Service to see that these are provided. These are:

(1) *A National Science Library*

In a decentralized national network of information systems, in which participating libraries will be encouraged to develop specialized collections to serve particular needs, there will exist a requirement for one central library whose policy should be to ensure that, when taken together, the libraries involved in the network have collections which cover the range of Canadian needs. It is not necessary, and would in fact be wasteful, to have a single centralized collection of all available scientific and tech-

nical information in Canada; it is imperative, however, that the sum of Canadian collections provide as complete a coverage as possible and that links with other countries be forged which will give access to any other information which may be sought.

This central role should be filled by the existing National Science Library in NRC, as part of the proposed STI Service. The policy suggested is in general agreement with the principles recommended by Macdonald and his co-workers in their recent review of acquisition policies for Canadian research libraries.[1]

Some confusion surrounds the legal status of the National Science Library and its responsibilities in the fields of scientific and technical information.[2, 3, 4] The sole statement appearing in an Act of Parliament occurs in the National Research Council Act which empowers that Council to "establish, operate and maintain a national science library".[5]

> **The Science Council recommends that the status and responsibilities of the National Science Library be clarified by appropriate legislative change, order-in-council, or other means to indicate that it is the principal federal library operating in the fields of science, technology and medicine.[6]**

This confusion has pervaded the relationships of the National Science Library with other important federal libraries and information services and was not conclusively dispelled by the report published by the National Librarian and National Science Librarian in 1968.[7]

Information services such as those of the Canada Department of Agriculture, library collections such as that in nuclear science maintained by Atomic Energy of Canada, Limited, or geological data banks such as the one being studied in the Department of Energy, Mines and Resources, have

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[1] Special Study No. 7, The role of the Federal Government in support of research in Canadian universities, Chapter 11.

[2] Canada Year Book (1968), p. 397: "...in 1953, under an agreement with the more recently established National Library, the National Research Council Library formally assumed responsibility for national library services in the fields of science and technology."

[3] National Science Library, Annual Report 1967-68, p. 17: "The first formal step transforming this special library [the NRC library] with limited responsibilities to one having national responsibilities was taken in 1957 when a statement of mutual responsibility was signed by the President of the NRC and the National Librarian".

[4] Letter from the Secretary of State to the President of NRC, June 5, 1964, as given in the 1965 Report of the National Librarian, pp. 8-9: "For some years this division of interests [between the National Library and the NRC Library] has been a matter of informal agreement between the two libraries, but Dr. Lamb [the National Librarian] feels that the time has come when some more formal acknowledgment and approvement of the arrangement is desirable. As the Minister responsible for the administration of the National Library, I am therefore sending this letter to express my approval of what is surely a very sensible arrangement."

[5] R.S.C., 1952, c. 239, Section 13 (*f*b).

[6] The National Science Library, Annual Report, 1967-68, p. 3: "In November 1966, upon recommendation to the federal government by a committee representing the Association of Canadian Medical Colleges, the Medical Research Council and the Committee of Medical Science Libraries, the N.S.L. was assigned the additional responsibility of serving as the national bibliographic centre for the medical and health sciences".

[7] Lamb, W. Kaye, and Jack E. Brown. Federal Government libraries in Ottawa. *In* Report of the National Librarian, 1968.

immense continuing value: they should be effectively integrated into the national information network and be co-ordinated with the activities of the National Science Library.[1]

The National Science Library should immediately initiate discussions with other federal libraries with a view to reaching agreement on the areas to be covered by each library and on the adoption of common standards. It is anomalous to discover, for example, that the National Science Library and the nationally important library of the Geological Survey still use totally different indexing systems.[2]

(2) *A National Referral Centre*

If a national acquisitions policy is to be adopted with the aim of establishing a set of complementary collections located across Canada (and this is a policy which the Science Council believes to be necessary), then the national information system must have an efficient referral centre to provide a comprehensive directory of the major information sources in Canada.

(3) *A "Clearing-house" Service*

Canada's dependence on information generated abroad has been mentioned earlier. Since Canada performs only about 3 per cent of the world's research and development and since research and development is a major generator of scientific and technical information, it is obvious that Canada must seek to promote international exchanges of information. However a practice which is occurring with growing frequency in international exchanges is that of providing only a very limited number of copies of the information being exchanged. There exists the need for Canada to make best use of such information and it is recommended that the STI Service take the initiative in devising means for its dissemination. As a start, the STI Service should bring together those groups across Canada, who already participate in international exchanges, to seek a means of establishing a clearing-house service which will meet the needs of all parts of the national information system.

(4) *Central Assistance to the Publication of Canadian Journals*

The STI Service has an important role to play in ensuring the continuing health of Canadian scientific and technical publications. Such a concern would not necessarily inhibit implementation of the currently suggested transfer of editorial responsibility for the Canadian Journals of Research from the National Research Council to the appropriate learned societies. The present practice of supporting journals published by professional societies should continue as an important activity.

(*b*) *Decentralized Activities*

In developing a decentralized network, the STI Board must consciously ensure that all regions of Canada receive the services which they need. Re-

[1] A more comprehensive discussion of the information resources of federal departments and agencies is given in Special Study No. 8, Part II, Chapter 1, Government departments and agencies, Appendix A.

[2] Private communication from Dr. J. M. Harrison to Science Council of Canada.

search and development programs, for example in the computer and communications sciences, will have much to contribute to the development of a national information network provided that the results produced by successful programs are carried through to implementation across the country.

The development of a national information network, if actively pursued along the lines outlined in this report, should provide a wide range of opportunities for Canadian companies specializing both in "hardware" and "software" to make important contributions. The role of the STI Service in this area should primarily be that of an initiator, and it should seek to contract out specific projects to appropriate groups.

Moreover, the research needed for a scientific and technical information system is not restricted to the natural sciences, but must encompass areas of the social sciences such as economics, law, and administration.

Some of the key areas in which programs must be started are:

—*the evolution of standards:* The success of any network will depend on the setting of standards which must be derived and accepted. In addressing a Select Committee of the U.S. House of Representatives, the President of the Special Libraries Association testified that "The most significant problem . . . involves the investigation, determination and implementation of programs of standardization, cooperation and shared utilization of materials and analysis. With the critical shortage of funds which all libraries and information centres face, much money is inefficiently allocated at the local level to redundant and overlapping efforts in ordering and processing because of lack of standard approaches of universal acceptance. . . . One user's information requirements should be equally well served if his library does not have a specific item, but another library does and he can have access to it quickly and simply".[1]

—*R and D on hardware and software* which will make the system an efficient and practical reality. Technology has much to contribute and computers particularly make many operations feasible on a large scale for the first time, e.g. computerized techniques for the selected dissemination of information make possible the matching of stated user-interests with current literature, etc.

—*the economics of information systems* present a real challenge; users of efficient systems would gladly pay for relevant information produced on time. But how can costs be allocated? Information tends to be regarded as a "free-good" but this is far from being the case. The large costs involved in setting up a national network have been discussed in Special Study No. 8[2] (and even those figures may be substantially underestimated) but no realistic system of charging the user a fair price for services rendered has yet been devised.

[1] Testimony before the Select Subcommittee on Education, Committee on Education and Labour, U.S. House of Representatives, April 1969—Special Libraries Vol. 60, No. 5, p. 305, May-June 1969.

[2] Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 7, Economics.

—*legal studies* of the problems of copyright are needed urgently. The advent of relatively inexpensive and simple processes for large-volume reproduction of printed matter (e.g. xerography) has proved to be a boon to libraries and information systems, but the question of the effect of copyright on such operations has yet to be resolved.

The Science Council foresees an important role for private enterprises and for university research groups in these areas. It is particularly suggested that the STI Service consider

—entering into contracts with appropriate industrial and consultant groups to commence a planned R and D program aimed at developing the technology of mechanized information transfer

—giving one, or at most two, substantial negotiated development grants to an appropriate university (or pair of universities) to strengthen their existing schools of library and information science where some of the research programs mentioned above can be carried out and, most importantly, where sufficient numbers of information specialists can be trained (see page 10, item 3*a*).

(*c*) *Other Support Programs*

With the flood of papers appearing in scientific and technical journals each year mounting inexorably, the value of concise review articles and well-researched textbooks is enhanced immensely. The STI Service should give serious consideration to providing support to scientists of acknowledged stature to permit them to engage in the preparation of such documents. Comparatively modest investments in the form of grants or contracts to carefully chosen individuals could pay handsome dividends.

Special Services for Industry

The Technical Information Service (TIS) of the National Research Council has made significant progress in developing federal-provincial co-operation in the provision of assistance to industry, and particularly to those small industries which do not themselves maintain a large technical staff. These services are extremely valuable and should be expanded where possible.

The STI Service should also develop close collaboration with industry-supported information services and should offer them every assistance in their activities. The Science Council reiterates again its belief that information services developed in response to a specific need have a vital role to play in any national information system.

Other departments of government, both federal and provincial, have well-developed specialized services which they offer to particular industries, e.g. the Extension Services of the Departments of Agriculture across Canada. Such services must be maintained and extended as justified and all should benefit from close collaboration and discussions with the STI Service.

It may be pointed out, in the present context, that an important role of liaison and field services is simply to have "someone at the end of the telephone". Many requests may be trivial, but an effective service must be able to reply to all requests—trivial or otherwise.

A word of caution must be expressed on the funding of the Technical Information Service, either in its present or in an expanded form. These services are funded partly by the National Research Council and partly by the provincial research councils. It has been pointed out[1] that the federal component of funding varies from province to province; in some cases it meets half the costs, in others only one-third. This uneven approach could well be a source of future difficulty if the Technical Information Service is to be expanded.

Language and Information Transfer

In Canada, the question of language in relation to information transfer has two dimensions, the first shared with many nations, the second particular to Canada as a nation with two official languages.

The first question relates to published scientific and technical information: in a typical year it is estimated[2] that some 2 million documents and articles, 26 000 journals and over 30 000 books are published on scientific and technical topics in a wide range of languages. An insight into the distribution of this literature by language of publication is provided by the analysis of the contents of six major abstracting publications shown in Table 1.[3]

Table 1.—Language Breakdown of Literature Indexed in Six Major English-language Abstracting and Indexing Publications

Language	Journals					
	Chemical Abstracts	*Biological Abstracts*	*Physics Abstracts*	*Engineering Index*	*Index Medicus*	*Mathematical Reviews*
	%	%	%	%	%	%
English	50.3	75.0	73.0	82.3	51.2	54.8
Russian	23.4	10.0	17.0	3.9	5.6	21.4
German	6.4	3.0	4.0	8.6	17.2	8.7
French	7.3	3.0	4.0	2.4	8.6	7.8
Japanese	3.6	1.0	0.5	0.1	0.9	0.7
Chinese	0.5	1.0	0.1	0.0	0.4	0.2
Other	8.5	7.0	1.4	2.7	16.1	6.4

A national information system in Canada should provide the literature to the user in the language of publication, leaving it to user groups to provide local translation services. However, to avoid unnecessary duplication

[1] Private communication during discussion between Prairie Research Council Directors and Science Council staff.

[2] Special Study No. 8, Scientific and technical information in Canada, Part I, p. 2.

[3] Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 5, Techniques and sources, adapted from Wood, D.N., Journal of Documentation, 23(2):119 (1967).

of work, it is important that any such translations be deposited with the information system and recorded in some master index or catalogue. The work already undertaken by the National Science Library in maintaining the *Canadian Index of Scientific Translations*[1] is a valuable activity which should be extended to cope with the indexing of any translations done by local groups across the country.

The other problem involves that of provision of access to the information system in both English and French. The Science Council has already recommended (p. 11) that users should be able to query Canada's national information system in either official language.

There remains one important aspect of language as it affects information transfer. The Federal Government alone produces vast numbers of documents dealing with science and technology each year, most of which are produced in English only. Even in the journals supported by the Federal Government, e.g. the Canadian Journals of Research, the proportion of articles published in French is small. In the five-year period from 1964 to 1968 the eight Canadian Journals of Research published 12 295 articles, of which 142 (less than 0.9 per cent) were in the French language. The question as to whether or not all of this material should automatically be published in both English and French is covered by the Official Languages Act. It should be noted that it is an internationally accepted practice for scientific and technical journals to publish articles in the language in which they are submitted only, while in an increasing number of journals, abstracts are provided in a series of languages.

> **The Science Council recommends that all scientific and technical journals in Canada, and particularly the Canadian Journals of Research, adopt a policy of requiring that all articles submitted for publication be accompanied by abstracts in both English and French.**

This should not preclude the publication of abstracts in other languages, provided that the author involved supplies the appropriately translated text.

[1] National Science Library, Annual Report, 1967-68, p. 12.

Chapter IV

A SUMMARY OF ALTERNATIVES

During the preparation of this report various alternative courses of action were considered before the final recommendations were drafted. In essence a series of questions had to be answered in order, the first being "Does anything have to be done, or can the status quo be maintained without adverse effects?"

It appeared completely evident to the Council that Canada could not expect to continue to operate with a plethora of underfunded, unconnected libraries and technical information systems with an almost complete lack of forward planning on a national scale and simultaneously avoid losing ground in the race for technological and hence economic advance in which the other developed nations of the world are competing. With world-wide concern over the growing economic gaps which are at least in part attributable to different rates of adopting and applying new technology, it appeared obvious that Canada, like other nations, must take positive steps to improve her system of disseminating and utilizing scientific and technological knowledge and information, by co-ordinating activities and moving progressively towards a greater utilization of modern computer and communications technology. (However, the Science Council does not believe that a comprehensive national system, based on a single, central computerized facility, is feasible at this time.)

Having decided that action is necessary, the Science Council had then to choose between proposing:

(*a*) a decentralized system, with its components operated under a variety of ownerships and jurisdictions but collaborating together, under the guidance of some co-ordinating body to constitute a network of services or

(*b*) a centralized system, operated by a single owner (inevitably the Federal Government) which would seek to provide all services to all users.

The Council recommended the creation of a decentralized system, as defined above, for a number of important reasons:

—The users of STI themselves are highly decentralized in every respect—in organization, jurisdiction, geographic location, discipline, interests and objectives. To meet the needs of this varied clientele an information system must be diverse and, above all, responsive.

—The size of Canada itself discourages centralization. It appears to make much more sense to the Science Council to have the essential decision-making centres within a total information system located close to the needs which must be fulfilled.

—At present information services and libraries involved in the dissemination of STI are operated by federal, provincial and municipal governments, by universities, private companies, industrial associations and by professional societies, which are largely autonomous. This fact militates strongly against a decision to attempt to supersede them by a centralized system, with all the concomitant jurisdictional problems. In addition, the costs would be unjustifiably greater than those of promoting collaboration. (It should be remembered that existing investments, inadequate as they may seem in many cases, represent in aggregate many millions of dollars.)

For these general reasons the decision was made in favour of a decentralized system of participating services.

Within a decentralized system some central services have to exist, to provide the essential linkages between the components of the network, some of which exist today, others which will have to be developed in the near future. The provision of these centralized services leads to the next question—who should provide them? The Council recommended that these services (outlined in Chapter III of this report) should be operated by the Federal Government as part of its efforts to stimulate the national economy and to encourage economic and social development.

In many of its discussions the Science Council has been faced with choosing between recommending that a new or altered service or activity be undertaken by an existing agency of government or proposing the formation of a new body to be created specifically for the purpose. In the case of STI dissemination the Science Council has not recommended the creation of a new agency but has proposed that those tasks appropriate to the Federal Government in this field be given to the National Reseach Council, a body eminently suited to this function and one which is making strenuous efforts to improve the efficacy of the assistance which it is offering to the Canadian scientific community. Such action should avoid the stresses and strains inherent in creating a totally new federal agency and could be more easily implemented. In this particular case the National Research Council Act is sufficiently broad to empower that body to undertake the tasks proposed for it.

The Council also gave consideration to according these responsibilities to an existing, but very young department—the Department of Communications—but decided against such a course on the grounds that the functions to be fulfilled were inappropriate to what will be primarily a regulatory body.

One system, which has more centralized elements, and which received long and careful consideration by the Science Council is that proposed by

Tyas and his co-workers in their report to the Science Council.[1] While that particular system might seem to present a long-term goal for a national STI system in Canada (and the STI Board proposed in this document might well discuss the merits of that system in this light) it appeared to the Science Council that it would not be acceptable at present for the following reasons.

(*a*) It proposed a new agency for STI (which raises unnecessary legal problems), rather than seeking to adapt an existing body.

(*b*) It proposed the immediate application of computer technology on a large scale in areas where there are serious doubts as to whether adequate technology exists.[2] The Science Council's view on this matter is that Canada should set out to generate the necessary technology as a matter of priority, and to implement computerized systems within a decentralized network once they are both technically feasible and economically justified.

(*c*) The proposals seemed to contain an element of over-organization. The Science Council remains unconvinced of the immediate need for (and feasibility of) regional information centres of the kind recommended.

(*d*) Accepting the realities of Canada's present financial position, and noting that the Federal Government has decided to maintain a regime of austerity in government spending for some time to come, it appeared wise to the Science Council to recommend a system which could be implemented by making better use of whatever additional resources may be allocated to STI dissemination rather than to make proposals for large additional expenditures which might not be implemented for purely financial reasons.

It should be noted that in general terms the proposals in this report and in Special Study No. 8 are not incompatible—for example the new agency proposed in Special Study No. 8 could be formed by "spinning-off" the STI Board, discussed in this document, from the National Research Council. The scheme set forth by the Science Council should not be regarded as immutable but should be continually undergoing evolutionary change under the guidance of the STI Board.

[1] Special Study No. 8, Scientific and technical information in Canada, Part I.

[2] *See* Science Forum, June 1969, pp. 16-17, article by T. E. Hull.

Chapter V

ECONOMICS AND COSTS

The task of estimating both the cost of scientific and technical information services and their impact on innovation, and hence on the national economy, is complex in the extreme. An approximate measure of the implied importance of such expenditures can be derived from an examination of federal expenditures as published by the Dominion Bureau of Statistics. To those must be added the costs of specialized information services maintained and operated by industries, universities and other institutes.

Current expenditures by the Federal Government as reported by the Dominion Bureau of Statistics are separated into the categories: R & D, scientific data collection, scientific information, testing and standardization, scholarships and fellowships. Those on scientific information have increased from $13.6 million in 1963-64 to $25.1 million in 1968-69.[1] It should be noted that the costs of scientific data collection are listed separately and that it is not clear precisely which activities are covered by the term "scientific information".

More detailed cost figures are given in Special Study No. 8, where the total cost of Federal Government STI activities was estimated to be $75 million in 1968-69, and the projected cost for 1972-73 at $100 million.[2] These figures represent only those departments and agencies which reported to the study. There is a considerable variation in costs from one department to another, notably in the relative costs of library operations and of information services, as exemplified by the following (1967-68 figures):

Department of Agriculture: $2 033 000 on information services, $693 000 on library operations;

Department of National Health and Welfare: $1 882 000 on information services, $156 000 on library operations;

National Research Council: $754 000 for technical information services, $1 395 000 for library operations.

A useful first step towards understanding the economics of information dissemination would be the regular provision of expenditure data collected on the basis of some uniformly accepted definitions. To bring this about the Science Council would suggest that the STI Board, once created, should enter into discussions with the Dominion Bureau of Statistics and with the

[1] DBS Daily Bulletin, May 7, 1969, Table 1.

[2] Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 1, Government departments and agencies.

departments and agencies of the Federal Government, perhaps through the Advisory Panel on Science and Technology.[1]

The direct costs of information dissemination may be difficult to assess, but a much more complex problem is presented by the evaluation of indirect costs. What is the cost to the economy of producing goods or services by outmoded techniques, for lack of information which is available in other parts of the country, or even in the open literature? Attempts have been made to assess some indirect costs by the authors of Special Study No. 8,[2] who conclude that Canadian expenditures on library and information services are of the order of $100–$150 million annually. They further calculate minimum costs for the large-scale application of computers within a national information system which they suggest could exceed $50 million annually within a decade if their recommendations were implemented. While one may disagree with the accuracy of any set of estimates or projections, such as those mentioned, there is no evidence available to show that the quoted figures are totally unreasonable or grossly inaccurate. The principal conclusion which can be drawn from them is that Canada already does spend large sums annually on scientific and technical information dissemination, and this reinforces the need to improve the system to make better use of this investment.

There is no question that Canada should implement an information service at the lowest cost compatible with generally accepted norms of efficiency. The apportionment of costs among the participants of the system is, however, a complex problem which requires more intensive study. The Council suggests that the recommended STI Board address itself to this problem as one of high priority. Some alternatives worth considering are:

—the provision of a free service by government to industry, as an equivalent of the present industrial incentive schemes, since the ultimate objective is the encouragement of innovation.

—the provision of substantial contributions by government to the start-up costs of the system, but routine operations to be thereafter on a self-sustaining basis.

—payment by users for special services rendered, beyond those normally offered.

—recovery of some portion of the system's operating costs by a suitable charge structure.

At present, the Science Council does not believe that sufficient knowledge of the problem of costing information systems has been developed to permit a valid choice to be made from among these and other possible options. In coming to any decision on such charges the STI Board should bear in mind their impact on the operations of commercial information systems.

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[1] A committee of deputy ministers, roughly parallel in membership to Privy Council Committee on Scientific and Industrial Research, and representing the principal departments and agencies involved in scientific activities.

[2] *See* Special Study No. 8, Scientific and technical information in Canada, Part II, Chapter 7, Economics.

Chapter VI

THE NATIONAL LIBRARY AND INFORMATION FOR THE SOCIAL SCIENCES AND HUMANITIES

The problems faced by researchers in the social sciences and humanities, in so far as information sources and, particularly, adequate library facilities are concerned, have been the subject of a long series of reports over the years, the principal ones of which have been conveniently summarized in a recent report to the Science Council and the Canada Council.[1] That document (Special Study No. 7) identified some serious problem areas and put forward some suggested solutions; parts of it have been challenged by the National Library as not reflecting the present situation in Canada. In the opinion of the Science Council, the fact that such opposed views do exist in itself highlights the existence of an acute communications problem.

The National Library Act,[2] which received Royal Assent on June 27, 1969, empowers the Governor-in-Council to appoint a National Library Advisory Board[3] but makes no provision for regular meetings or for any staff to assist the board in its deliberations, both of which are necessary.

The Science Council recommends that such a Board be appointed, with some representation of the social sciences and humanities communities on its membership, and that as a first order of business the Board review the commentary provided in Special Study No. 7[1], consider the problem areas identified in that report, and seek to ensure that any necessary action on the part of the National Library is taken.

It would appear to the Science Council that it is essential that the National Library maintain an accurate, efficient and (as soon as possible) machine-readable National Union Catalogue of the holdings of all Canadian libraries. Many libraries across Canada are already taking steps to computerize the listings of their holdings. The National Library should be a leader, not a follower in this field.

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[1] Special Study No. 7, The role of the Federal Government in support of research in Canadian universities, by John B. Macdonald *et al.* Chapter II, Proposed policy in respect of libraries for research, pp. 213-248.

[2] S.C. 1968/69, C. 47.

[3] National Library Act, Clause 9 (1).

Appendix

MEMBERSHIP LIST OF THE SCIENCE COUNCIL COMMITTEE ON SCIENTIFIC AND TECHNICAL INFORMATION

Chairman

Dr. Leon Katz,*
Head, Physics Department,
and Director, Linear Accelerator Laboratory,
University of Saskatchewan,
Saskatoon, Saskatchewan.

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Chief Librarian,
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