STI POLICY: THE INTERNATIONAL STEP
BACKGROUND PAPER

B.E. COX
RESEARCH & INFORMATION SERVICES DIVISION
MOSST

STI POLICY: THE INTERNATIONAL STEP
BACKGROUND PAPER

B.E. COX
RESEARCH & INFORMATION SERVICES DIVISION
MOSST

N

IN limited

31531

STI POLICY:

THE INTERNATIONAL STEP

BACKGROUND PAPER

PROJECT C.P. 9/45

B.E. Cox
Research & Information
Services Division
MOSST

International Scientific & Technical Information

Dissemination of scientific and technical information (STI), which for purposes of this paper also includes the social sciences and humanities, is an important link in the chain of transfer of technology between nations. STI exists not only in printed form, such as books, journals, documents, etc., but also as audio-visual and machine readable material, organizational and individual expertise transferred by the interaction of people in seminars, conferences and meetings. It is found in all countries of the world and has become a world resource.

Internally, Canada has developed a reasonably efficient infrastructure for STI and is developing national networks to improve its dissemination. However since we produce only a fraction of the worlds STI it is important that we also have access to the worlds STI resources. Our systems and services should be developed so that they are reasonably interchangeable with those of other countries. We must be involved with, and aware of, developments in international organizations which seek to minimize the difficulty of STI interchange.

Many Federal Departments and Agencies, and organizations from the private sector, are involved in bilateral or multilateral agreements with their counterparts in other countries or within the forum of intergovernmental organizations.

When such agreements are reached, they often have an effect on other members of the Canadian STI community. Presently there is little effective coordination of Canadian participation, let alone establishment, of a Canadian position vis à vis international STI Policy. As well, there is no effective means of publicizing agreements that have been reached for the handling of information.

It would therefore seem logical to bring together the Canadian participants in international organizations to discuss, publicize, and coordinate their present and future activities. This is not a new idea. It was suggested by among others, the Science Council of Canada in its Report #6.

The first step in the process is to identify the players, both Canadian and International and their interactions. We have chosen to do this by dividing STI into two functions.

I   Management of Information - systems and services associated with the processing, storage, and retrieval of information.

II   Information transfer - systems and services associated with the physical transfer of information from one person to another.

I. Management of Information

A. International and Intergovernmental Players

1. The United Nations

The United Nations and its various agencies have probably expended more resources in efforts to develop and provide international scientific and technological information than any other organization. As with most recent UN activities, the primary impetus for this work is to assist the developing countries. The primary objective therefore centers on improving technology transfer to the developing countries. Thus, the work of some UN agencies has little direct benefit to Canada except in our role as a providor of foreign aid. Other agencies, however, are undertaking projects that will be of great importance to Canadian STI activities and this paper will discuss these activities.

The UN STI activities can be divided into two areas:

- Programs of a general nature designed to provide a conceptual framework for the establishment of national and international STI systems and services which will facilitate access to the worlds information resources and to create the necessary conditions for system interconnection and compatibility.

- Discipline or mission orientated systems concerned with development of information tools, training of information specialists, and establishment of infrastructures at national, regional, and international levels.

a) The UN program likely to have the greatest effect on global STI dissemination is UNESCO/UNISIST (UN program of International Cooperation in STI). UNISIST was formally established in January of 1973, after a feasibility study carried out by UNESCO and the

International Council of Scientific Unions (ICSU). They recommended that a body be established to coordinate international action to facilitate transfer of scientific and technical information. Thus UNISIST objectives are:

- To advance and co-ordinate the world trends towards information-sharing and co-operative agreements among governments, international organizations and operating information services;

- To provide guidance and catalytic action for the necessary developments in the field of scientific and technological information;

- To facilitate the access to published information by scientists, engineers and technologists;

- To help the developing countries meet their needs for scientific and technological information;

- To take the necessary actions for the establishment of a flexible world network of information systems and services based on voluntary co-operation.

Although the programme objectives emphasize the priority action required in science and technology, it is intended that the framework to be created in the context of UNISIST will ultimately benefit the transfer of all types of rational information at the national and international levels. Just recently, UNISIST has been expanded to include the social sciences.

UNISIST activities include the following:

- Development of tools for information systems and services.

    i)   world register of information services
    ii) world register of periodicals
    iii) guidelines and proposals for unified bibliographic
         standards
    iv) standardization of scientific and technological
         terminologies

v)   improvement of the quality of scientific publications.

- Development of specialized information manpower.

    i)   training courses
    ii)   guidelines and manuals for training
    iii) fellowships.

- Promotion of national and international policies.

    i)   identification of objectives and priorities
    ii)   development of national focal points for STI.

- Development of national, regional and international infrastructure.

    i)   surveys of needs
    ii)   planning and design of infrastructure
    iii) development of international referal systems.

UNISIST cooperates with virtually every other international organization that is interested in some specialized aspect of information management in designing and planning its programs and activities or those of the other organization involved.

b)   UNESCO/NATIS. National Information System -- a prerequisite to the establishment of any global information system would be the establishment of a National Information System (NATIS) in each country. Thus, in September 1974 an Intergovernmental Conference on the Planning of National Documentation, Library and Archives Infrastructures met. It was co-sponsored by UNESCO, the International Federation for Library Associations (IFLA), International Federation for Documentation (FID) and the International Council on Archives (ICA).

The NATIS program is based on the recommendations made by this conference and its activities include:

- the promotion of policies and plans and the undertaking of research on national information systems.

- exchange of information and publications.

- improvement of National Bibliographic Control.

- improvement of the training of professional manpower.

- improvement of national services and infrastructures.

UNISIST and NATIS are both programs of UNESCO. UNISIST was part of the Division of Scientific and Technical Documentation and Information, NATIS was part of the Bureau of Documentation Libraries and Archives. A number of member countries complained about the overlap of UNISIST and NATIS activities and as a result, the Director General of UNESCO has now established a single advisory Committee for information, documentation, libraries, and archives. This Committee replaces the UNISIST ADVISORY COMMITTEE and the International Advisory Committee on Documentation, Libraries and Archives. The responsibility for coordination of all these activities has been placed in the Bureau of Studies and Programming.

c) Specialized Systems.

Many UN agencies have their own specialized information services and systems. Some of the systems will be mentioned in section II. Some of the services provided that have international utility are:

- UNIDO

    - a Thesauris of Industrial Development Terms
    - Industrial Development abstracts
    - specialized publications

- training courses in industrial information
- Clearing House of Industrial Information

- International Labor Office

  - International Appropriate Technology Unit - one main
    purpose is to remove the barriers to dissemination of
    information on technological alternatives.

  - promotion of technological information policies to
    develop information exchange and evoluation of
    technological choice.

- WHO

  - specialized publications on health
  - development of thesauri & indexing methods

- WIPO (World Intellectual Property Organization)

  - organizes patent documents & information
  - International Patent Documentation Center produces
    bibliographic data relating to patent documents
  - International Patent Classification - provides access
    to patent information
  - provides secretariat for Committee for International
    Cooperation in Information Retrieval Among Patent
    Office which promotes what its title implies. Their
    work includes abstracting, indexing, translation, and
    standardization of documents, bibliographic data, and
    indexes.

Recently, (Dec'75) the General Assembly adopted Resolution 3507 (xxx) on institutional arrangements in the field of transfer of technology. The resolution reaffirmed the importance of scientific and technical information and the need to enable the developing countries to have access to such information. The resolution requested the United Nations Industrial Development Organization to proceed with the development of an industrial technological development bank, requested other organizations in the UN system to undertake feasibility studies on the establishment of sectoral and regional information banks and other information systems, requested UNCTAD and UNIDO to assist in the establishment of centers for the transfer and development of technology and requested the establishment of an interagency task force to undertake a comprehensive analysis with a view to establishing a network for the exchange of technological information.

This resolution is indicative of the importance the UN gives to STI but points out its continuing problem of lack of coordination of its own programs. It was left to the Committee on Science & Technology for Development to pass a resolution at its meeting in February 1976 calling for better harmonization of the relevant information activities of the UN family and calling on the interagency task force to take account of the ongoing activities in the field of information and information systems conducted by UNESCO and particularly by UNISIST.

The Interagency Task Force has presented its preliminary recommendations which advocate the establishment of a network for the exchange of technological information but pays only passing attention to coordination of UN activities or development of a focal point for these activities within the UN. This has led Dr. L.C. Burchinal, the US delegate to the expert committee of the Committee on Science & Technology for Development to remark "If conditions do not change, efforts by the UN and its specialized agencies to respond to the STI needs of developing countries will likely add to the problems of international information transfer rather than to their solution."

2. Organization for Economic Cooperation and Development (OECD)

Under the auspices of the Committee for Science and Technical Policy (CSTP) of OECD, two groups have been set up to examine policy questions of STI:

(a) The Information Policy Group (IPG) created in 1965 to assist OECD members in defining policy and machinery to administer and disseminate the output of the research system and to examine the potential impact of computer technology on information handling from a users point of view. Their mandate includes the following:

- to examine information management methodology and stimulate national and international activities which will contribute to its improvement.

- to stimulate development of national scientific and technical information policy and planning and

infrastructures, and act as a forum for information exchange on advances in policy and planning.

-    to promote the improvement of the application of information technology to governmental and industrial activities, the service sectors and other fields of economic and social activities.

b)   The Computer Utilization Group (CUG) was created in 1969 to consider policy issues arising from the large scale use of computers. Since its inception their policy interests have shifted away from purely scientific issues to regulation of services and social implications (protection of privacy, computer/telecommunication services). Therefore its work is of less interest in this section dealing with STI management.

However the IPG has been involved in several projects of interest.

-    identification of the governmental responsibility for national information activities.
-    identification of the bases for government decisions relating to information.
-    studies of the functions of "national foci for information" and descriptions of arrangements needed in different member countries for government policy action.
-    identification of areas of need for standardization to interconnect information systems.
-    cooperation with other international bodies in development of international systems and services.

During the last year, budget restrictions, national government interests and a report of a CSTP task force on Information, Computers and Telecommunications have forced the IPG and CUG to think about reorganization of their activities. Alternatives range from a merger of the two groups still under

CSTP to the development of a new Committee which would report to OECD Council directly. This latter proposal seems to be favored.

The work of the proposed program for Information, Computers and Telecommunications (ICT) falls into 3 categories.

1.   International Agreements - Privacy, copyright, etc.

2.   Coordination and Exchange of Views on International Issues - tariffs, network design, electronic mail.

3.   Coordination and Exchange of Views on National Issues - definition and implementation assistance for national STI Policies; economic studies; application of information to urban affairs, industry, environment, etc.

The CSTP has given a high priority to this work. As well, the CSTP combined the work of the Scientific and Technical Information Systems actively with the ICT program.

The work of the ICT program for the next year will include.

1.   Transborder Data Flows, Protection of Privacy and Right of Access to Information.

2.   Economic Analysis of Information Activities.

3.   Government and Information Policy.

4.   Information for Industry.

5.   Relations between Developed and Developing Countries in the ICT field.

6.   Industrial Aspects of the Information Sector.

It would appear that the OECD work plan is of peripheral interest to international STI interchange. However, the program is designed to strengthen STI policy and improve the economics of STI in the OECD member nations. This should allow for improved international STI transfer as it is a prerequisite to have a

strong national STI systems and services before international transfer can take place.

III. Non Governmental Organizations (NGO's)

NGO's are most often professional organizations that have been established to advance the particular profession that they represent. In the field of international STI there are many but this paper will restrict itself to those few major ones who have had or will have the greatest impact on the field:

1. The International Standards Organization (ISO).
2. International Federation of Library Ass. (IFLA).
3. International Federation for Documentation (FID).
4. International Council of Scientific Unions (ICSU).

NGO's play an important role in advancing their own professional interests on the international scene but they are also very useful to the Intergovernmental Organizations (IGO's) as contractors to undertake research or investigative work, or to implement resolutions of the IGO's.

NGO's have many advantages over IGO's. Primarily, they are apolitical, that is, they are less likely to be swayed by political considerations of a certain bloc of countries in carrying out their technical work; they do not have to employ international civil servants who are expensive, and they can draw on the expertise of a wider variety of expertise for their Committees and working groups because they do not have to depend on national government appointees. However, sometimes the political aims of IGO's have clashed with the professional aims

of the NGO's. This has led to some tension and perhaps a risk to future funding of the NGO's.

(a) The International Organization for Standardization (ISO)

At the international level, the recognized authority for standardization is the ISO. Through its better than 80 Member bodies, 160 Technical Committees, 500 Sub-committees and 900 Working groups, the ISO seeks to "promote the development of international standardization in order to facilitate the exchange of goods and services and to develop mutual cooperation in the sphere of intellectual, scientific, technological and economic activity." By bringing together the interests of manufacturers, consumers, governments, and the scientific community, ISO covers almost every area of technology except electrotechnical.

ISO membership is provided to the national body most representative of standardization in each country. There is therefore only one member from each country.

The technical work of ISO is carried out by experts working through Technical Committees (TC). Each Member Body has the right to be represented on any TC of interest to them either as a participating member or as an observer. TCs may establish Sub-committees (SC) to study a particular aspect of their program of work and SCs may establish Working Groups (WG's) to deal with particular points or problems. The work is usually carried out by correspondence, meetings being held only when absolutely necessary.

An International Standard is the product of consensus among the member bodies. It begins as a draft proposal that is usually submitted by a member body but may be submitted through a member body by other organizations (e.g. UNISIST). The draft proposal is circulated to the members of the TC concerned. When agreement is reached within the TC, it is registered as a Draft International Standard (DIS) and circulated to all ISO member bodies. If 75% or more of them accept the DIS, it is referred to ISO Council for final acceptance as an International Standard.

There are three Technical Committees of ISO that are relevant to STI:

1. TC37   -   Terminology
2. TC46   -   Documentation
3. TC97   -   Computers & Information Processing

These three TC's cooperate with other NGOs such as IFLA and FID and work very closely with UN organizations such as UNESCO in the development or implementation of standards. Nevertheless, a great deal of coordination in the field of standards is still required. It often happens that two or more organization will develop unilaterally, standards that overlap and which are incompatable. ISO/TC46 has taken a step in the right direction to eleminate the problem by establishing a steering committee composed of six of its members plus observers from IFLA, UNESOC, and FID. In cooperation with UNESCO/UNISIST, ISO has created an International Centre for Standards in Information and Documentation (ISODOC) and an International Information Centre for Terminology (INFOTERM).

However, there are still a number of organizations "competing" with ISO. The Library of Congress in the U.S. has had a significant influence on the development and pseudo-standardization of library procedures and services. As well, the Anglo-American Cataloguing Rules (AACR) remains the recognized source for cataloging rules in the US, Canada, and Britain. UNISIST has established an International Serials Data System to record the International Standard Serial Numbers (ISSN). IFLAs Committee on Cataloguing has created an International Standard Bibliographic Description (ISBD) for standardizing bibliographic records.

Often, ISO will retrospectively recognize these so called international standards and accord them International Standard status. Thus ISO has accepted the ISSN, and the ISBD's for monographs and serials have been sent to ISO for consideration. However, there still exists a large body of overlapping standards which must be unified into a no conflict situation if national and international networks are to be established. The best interests of everyone would be served if only one body would determine national and international standards. Other organizations might submit proposals, but these would not achieve national or international status until approved by the designated standard organization.

(b) The International Federation of Library Associations (IFLA)

IFLA sees its role as "promotion of planned cooperative and coordinated action in all fields of librarianship and bibliography. It works cooperatively with UNESCO, FID and ISO

A major program relevant to STI is the establishment of Universal Bibliographic Control (UBC), a project supported by UNESCO. Its objective is to make universally and promptly available, in a form which is internationally acceptable, basic bibliographic data on all publications issued in all countries. The concept of UBC presupposes the creation of a network of component national parts, covering a wide range of publishing and library activities, integrated at the international level to form the total system. Each country would follow international standards in the preparation of its national bibliography, retaining if it wished its traditional practices but not as a part of UBC IFLA plans an international meeting in September of 1977 which will serve as the implementation of UBC by hopefully reaching agreement on the minimum standards, the guidelines for presentation, and the arrangement and frequency of publication.

A second program of IFLA undertaken by its Committees on Mechanization and its Committee on Cataloging and consistent with UBC is the development of an international MARC format for provision of an efficient method of transferring bibliographic records. MARC is a machine readable cataloging system which can be used for communicating cataloging information from one library to another via magnetic tape. Originally developed by the Library of Congress, the concept has been accepted by many other

national libraries and forms the basis for ISO's standard for structure of magnetic tape formats for interchange of bibliographic data - ISO 2709. Unfortunately, many libraries have modified the format considerably to suit there own national needs and their tapes are not transferable to other systems without considerable interpretation. Consequently IFLA has established a working group to design an international format based on the ISBD which will standardize the descriptive bloc of the record but leave the data bloc to the national library for its own purposes.

Fortunately, the Library of Congress (LC) has been working cooperatively with IFLA on UBC and on international MARC. LC has adopted ISBD and has agreed to rewrite the appropriate sections of the AACR so it will conform to ISBD. This should facilitate the introduction of an international MARC. A number of librarians have raised objections to this as they were not consulted on the adoption of the ISBD and because they will face some expense in altering their records and software. Nevertheless it appears that ISBD and the international MARC will be accepted.

IFLA is also involved with UNESCO (where it has consultative status) and other NGOs in promoting an integrated approach to the organization of libraries, archives and documentation services. With FID, International Council on Archives, and UNESCO, it co-sponsored the recent International Conference to establish NATIS.

IFLA also sponsors training courses and provides expert advice to countries that request assistance.

(c) The International Federation for Documentation (FID)

The FID describes itself as the leading non-governmental organization in the field of documentation and technical information. Its aims are "to coordinate the efforts of organizations and individuals interested in documentation, to carry out classification research studies, and promote the training of documentalists. A major project of FID is the supervision, revision, and development of the Universal Decimal Classification, a shelving classification principally used in Europe. In cooperation with UNISIST and the National Science Foundation it has developed the world register of abstracting and indexing services.

FID also undertakes research and development projects in the area of classification, linguistics, and on the theory, methods, and operation in information systems and networks. It carries on an extensive publication activity, producing directories, guides, and bibliographies, as well as publishing its own proceedings, monographs, and reports.

The technical work of FID is carried out by working groups of which there are 9, each with a subject area to consider. Contract work (from UNESCO for example) is done by a central secretariat of about 10 people. Working group members are

experts and do not represent their country although consideration is given to ensure that one country is not over represented.

The FID appears to be a source of expertise rather than an organization to carry out operational activities in the area of STI, but as such plays a useful consultative role in other programs.

(d) International Council of Scientific Unions (ICSU)

ICSU has a much broader mandate than STI as indicated by its objective "to facilitate and coordinate the activities of the international scientific unions in the field of the exact and natural sciences." However, through various divisions, it has concerned itself with information and documentation activities in order to improve international STI dissemination. Of particular importance are the activities of the ICSU Abstracting Board (ICSU/AB) and the Committee on Data for Science and Technology (CODATA) as well as its activities in developing and promoting UNESCO's/UNISIST.

i)   ICSU/AB - its objective is to organize and promote on an international scale, the exchange and publication of primary and secondary STI and to deal with related matters directed towards a better dissemination of such information.

Its aims include:

-    to provide a mechanism for collecting, compiling and exchanging information pertaining to scientific and technological activities, including studies on sources of primary information.

-    to assist in the ultimate development of a world wide information network in Science and Technology.

- to promote liaison with sources of primary information and with other organizations which are concerned with STI.

The work of the Board is carried out through Working Groups or Ad Hoc Task Groups which study various problems. One example is the joint UNISIST/ICSU/AB Reference Manual for machine readable bibliographic descriptions whose purpose is to define a minimum set of data elements to facilitate information exchange between abstracting and indexing services. The British Library has just concluded a contract to set up a UNISIST Centre for Bibliographic Descriptions to distribute and maintain the Manual.

ii) CODATA seeks to improve the quality, reliability, and accessibility of data of importance to science and technology. It deals with numerical data in the field of physical, geological and biological science. Its work includes activities such as: developing an inventory of programs and capabilities for the collection evaluation publication and dissemination of critically evaluated numerical data for science and technology and, studying current methodology for use of computers in generating and processing of numerical scientific data and of means to assure compatibility of such methods.

The work of CODATA is carried out by Task Groups of 8-10 experts chosen by the Executive Committee. The Executive Committee is advised on policy issues by discipline orientated advisory committees.

Recent work of CODATA has resulted in publications in the areas of man-machine communication in scientific data handling, accessibility and dissemination of data, ker values for thermodynamics. They have undertaken a

feasibility study for a World Data Referral Centre.   Some of
this work is supported by UNESCO/UNISIST contracts.

II INFORMATION TRANSFER

In the previous section we have discussed those organizations which are attempting to create international systems and services which will facilitate the transfer of information by establishing the basic infrastructures, processes, and tools required for such transfer. In this section we will examine those organizations that are attempting to improve the actual transfer of information internationally - to establish an international information network. Such a network will likely consist of a coordinated series of smaller networks (communication, library, computer etc.) which will transfer information from one point to another irregardless of country. An analogy can be drawn to the world telephone system which consists of local networks which are connected to national and then international networks.

A wide variety of activities are being undertaken to build such a system, from bilateral and multilateral agreements for the exchange of documents, data bases, and personnel, to international studies and meetings sponsored by international organizations. However, simply because the mass of information is so great, any global information network will have to be based on automated computer systems. As is the case for management of information, most system development for the transfer of information is based on this principle. Just as Bibliographic descriptions, thesauri, abstracts, etc, are all being designed to be machine readable; network development is based on computer

communication. The technology to establish an international network already exists; new developments will simply make the system more efficient. The major stumbling blocs are political, economic, and the lack of coordination to insure that networks are capable of being interconnected.

The development of an international computerized information network will be dependent upon developments in the field of international computer communication which in turn is dependent (at least for the present) upon the use of the world's telecommunications facilities. It is this area that provides one of the main hurdles to a global network. A national governments policies towards the use to which the telecommunication systems in its country may be put, the jungle of tariff and excise regulations, accounting problems, and the reluctance of large common carriers to alter their systems to accomodate international traffic are problems that inhibit development of an international network.

The work of several organizations in the field of standardization has made network interconnection less of a problem. Future work in this area in terms of standard protocols, programs, and interfaces will further simplify the process.

Computer communication is expensive. The capital investment for hardware and software as well as the personnel to operate the systems mitigate against widespread use at the moment. However, new technology is decreasing the capital cost significantly and often requires less expensive personnel to operate the system. At
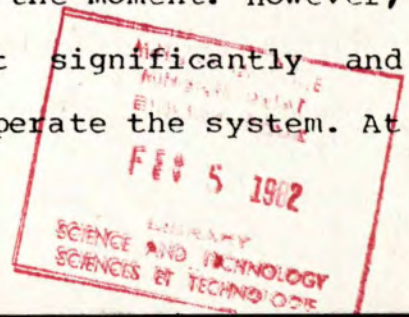
the same time, the cost of publishing and travel are increasing. This has led some observers to predict that in the near future, a great deal more intellectual work will be done ""on line" through an electronic information network.

Any future large scale international network will likely be based on a highly decentralized system of coordinated sources and users of information. To solve all the problems mentioned above, a great deal of effort will have to be expended, especially in the sociopolitical area. A number of organizations are working on various aspects, but how coordinated their efforts are is a matter for debate. However, the work of these groups and the current development of regional networks which are resolving these problems locally, will lay the groundwork for future global networks. It has been said that the periods 1968-72 was for definition of requirements, 1972-76 for design of specifications and the period 1976-80 will see the implementation and interconnection.

A.   INTERNATIONAL ORGANIZATIONS

1)   International Telecommunications Union (ITU)

The objectives of ITU are to encourage world cooperation in the use of telecommunications, to promote the development of technical facilities and their efficient operation, and to harmonize the actions of nations in the attainment of these common ends. The work of ITU is done through a number of

committees or boards of which the International Telegraph and Telephone Consultative Committee (CCITT) has the major impact on computer communication. Its study groups are involved in several projects in areas such as, transmission problems, operation and tariffs, vocabulary and symbols, switching, equipment specification, and planning the development of an international network.

Through the ITU, the CCITT produces recommendations on such subjects as international tariffs, network parameters, and network and terminal interfaces. These recommendations are often sent to ISO for ratification as International Standards. A recent example is Recommendation X.25 which deals with packet switching standardization.* It was originally assumed that each country or even each system would develop its own packet specifications. However X.25 has constrained not only packet specifications, but also network access protocol and the entire range of network services. This will cause a considerable degree of similarity to be effected in both network structure and services between packet networks evolving throughout the world. Technical limitations to network interconnection will be significantly decreased. Any terminal will be capable of being connected to any other and will be able to transfer data as fast as the slower of the two will operate.

As mentioned previously, bilateral agreements are easier to effect than multilateral. The possibility for global internetting will therefore be increased by X.25 for any global

network could be built on a series of bilateral agreements. Direct channels could be established between pairs of countries where traffic was sufficient to justify the link. Packet switching will allow traffic between countries which are not directly interconnected by routing through intermediate countries thus also increasing the economies of scale.

*Packet switching is a process whereby discreet "packets" of information, (about 1000 bits) each individually addressed, are transferred from one point to another via the most readily available telecommunication channel. Thus dedicated lines are not required which makes better use of transmission facilities and is therefore less costly.

2)   International Standards Organization (ISO)

ISOs aims and objectives were considered in section 1. Their working group which has a major impact on coordination in the field of computer communication in TC97 – Computers and Information Processing. Sub-committees of this Committee study standardization of vocabulary, character sets, programming languages, data communication, control procedures, magnetic tape and disks, etc.

3)   United Nations (UN)

The UNs activities are centered more in the area of information management however, UNISIST does promote the acceptance of CCITT & ISO standards for network interconnection. The UN agencies which are developing information networks are conforming to UNISIST recommendations and will form part of any international network.

The UN has also established a program on informatics (information processing) called the Intergovernmental Bureau for Informatics (IBI). Its objective is to promote research, education and utilization of informatics at government level. Inasmuch as the improvement of computer sciences improves information transfer, IBI plays a role in implementing an information network, especially in the developing countries.

IBI together with UNESCO has established a Corresponding Institution Network for the purpose of exchanging information and

software and assists in the creation of Twinning Systems between
similar institutions belonging to the network.

4)   Organization for Economic Cooperation and Development
        (OECD)

The OECD has already been mentioned in Section 1. Its
Computer Utilization Group (CUG) is responsible for its interest
in computer communication. Its mandate includes:

-       assisting members in formulation of computer
        utilization policies.

-       facilitating the exchange of information on usage
        concepts and experience of computerized information
        systems.

To the degree that the CUG helps strengthen national
computer use policies and helps to develop international
consistency in those policies, it does have an effect on
international transfer of information.

B.   INTERNATIONAL SYSTEMS

The problems that would be faced in trying to create one
large global information network would likely be insurmountable.
However the possibility of interconnecting smaller regional or
sectional systems into a coordinated network is quite likely.
There are a wide variety of these either available now or in the
advanced planning stages. A selection is given below to
illustrate the types that will likely form the basis of any
future global network.

1)   International Nuclear Information System (INIS) of the
International Atomic Energy Agency (IAEA)

INIS is a cooperative, world-wide system for collecting and disseminating nuclear science information. Information is distributed via a monthly printed bibliography, magnetic tapes, and microfiche.

By any definition INIS is an international information system. The literature covered is internationally published; it is reported to the system by forty-four member states where information is produced; it is input according to standards and formats established by an international body; the output is distributed internationally. It is the first fully decentralized, computer based, mission-oriented information system and as such has and will serve as a model for future systems.

The concept behind the development of INIS was, from the start, to be compatible with existing and planned large scale systems. Its rules were written so as to be compatible with UNISIST and ISO standards

One of INIS's major innovations was its "territorial" formula whereby each participant has a clearly defined territory for which he is responsible, usually a country. Each participant bears the cost of finding and reporting the relevant information from his territory which apportions the costs fairly to the major users and reduces the central costs to a minimum.

INIS has been very successful both because of this decentralized formula and because of the political support of the major world powers. Its success can also be attributed to the sharp definition of its subject scope, the fact that one agency in each country is responsible for nuclear science, and the fact that many countries had already developed basic systems which INIS was able to take over and adapt.

Other systems that are currently in place or under development that use the INIS model are AGRIS (International Information System for the Agricultural Sciences) and DEVSIS (Development Sciences Information System).

2) The Space Documentation Service (SDS) of the (European Space Research Organization)

The SDS is another example of an international information system. However it is based on existing information available from commercially available magnetic tape services such as Chemical Abstracts and INIS. Input is centralized but output is decentralized to terminals in member states. SDS was the first such international, time shared documentation retrieval network.

3) Medline

Medline is an international bibliographic information network which allows interactive searching of more than 400,000 citations of the medical literature. It is not a true international system as control is national (U.S. National

Library of Medicine). However its service is provided to several countries, some of which now play a part in policy formulation through an International Policy Advisory Group.

4)   Chemical Abstracts Service (CAS)

CAS is another national system with international scope. U.S. based, Chemical Abstracts have for many years abstracted the chemical literature. This has finally been computerized and tapes are made available to many centers around the world who modify or manipulate the data and also add to it. In fact, more than 70 percent of the material it possesses originates outside the United States. CAS forms one of the basic data bases for most multiple data base networks.

5)   Integrated Scientific Information System (ISIS) of the ILO

This is a computerized library management and information storage and retrieval system operated by the UNs International Labor Office. It is used by ILO to store and retrieve abstracts of documents in order to provide on-line literature searches as well as SDI processing. The software developed for ISIS is presently used in over fifty other institutions in a dozen countries. For example, ISIS forms the basis for the Swedish national computerized library network.

6)   United Nations

The UN and its specialized agencies operate or have under development a number of sectoral or mission orientated data basis, referal systems, clearing houses, and bibliographic information systems. The UN is particularly interested in improving the transfer of technology to the developing nations. A number of resolutions have been adopted to this effect.

The Economic and Social Council in resolution 1902 requested the Secretary General to undertake a feasibility study on the progressive establishment of an international information exchange system for the transfer and assessment of technology. The study concluded that a rationalization and systemization of present initiatives was required rather than the creation of a single international system. The Secretary General therefore recommended:

1. a study of user needs

2. a review of present mechanisms for collection and dissemination of technological information

3. additional support to technological information systems

4. increased coordination cf ongoing and developing systems

5. establishment of an interagency task force charged with carrying out the recommendations.

The General Assembly in its 30th session adopted resolution 3507 concerning institutional arrangements in the field of the

transfer of technology. Among other things it requested the Secretary General to establish an interagency task force to undertake a comprehensive analysis, with a view to the preparation of a plan for the establishment of a network for the exchange of technological information. The task force submitted a report in June '76 which concluded that the establishment of a network would be advantageous and should be a cooperative effort of existing systems composed of a large number of individual nodes linked into one network. Efforts are presently underway to prepare a direction of information services available from the UN and to obtain support from those "capable of making a constructive contribution".

C. Regional Systems

As mentioned, the major problems in establishing an international information network stem from sociopolitical reasons. Transborder flow of information is often restricted by incompatible telecommunication services and tariff policies, problems which are difficult enough in bilateral agreements and may be insurmountable on an international scale.

One solution appears to be the development of smaller regional networks between nations who are already members of organizations for political and economic cooperation. The eventual consolidation of regional networks would present fewer problems than trying to join several national networks. Besides reducing the number of agreements that have to be reached,

regional networks will have gained experience that will make global interconnection that much simpler.

Regional network development is already well underway especially in Europe.

1.   Euronet/EIN

The Commission of European Communities has established a Working Party on Scientific and Technical Information and Documentation whose mission is to propose the content and form of cooperation required to set up a system to process and disseminate technical information. They recommended that the Community undertake the building of a European network of STI services and that it develop a concerted policy related to such aspects as interconnection, pricing policy, technical standards and language and legal issues.

Subsequently the CEC approved a resolution proposing the creation of a European network and established the Committee for Information and Documentation in Science and Technology to assist in its planning and implementation. The result of their deliberations has led to the implementation of a joint data transmission network - Euronet. The Euronet plan includes the establishment of a communications facility which the European's Postal Telephone and Telegraph Systems (PTTS) are to provide.

During the same period, the Ministers of eight European nations and Euratom signed an agreement to cooperate in design

and subsequent construction of a European Informatics Network (EIN). Its purpose was to facilitate research into methods of exchanging information and to share data processing facilities. Its function was to serve more as a model for future networks. The designers of EIN saw it as providing knowledge suitable for determining the feasibility and viability of a permanent international network while the hardware and software developed could be the basis of such a network. Work began in early 1973 and today there are five network switching centers connected to form the initial network. They are Euratom, France, Italy, Switzerland, and the U.K. The EIN seems to have overcome most of the problems encountered by an international network. So much so in fact that except for a few technical differences it will form the basis for Euronet which will go into operation in 1977 and eventually serve some 700 industrial and research centers.

2. The Nordic Public Data Network

The Nordic countries (Sweden, Denmark, Finland, Norway) are presently establishing a data network planned to satisfy data requirements to 1990. Planned start up will be in 1978. The period from 1978 to 1980 will be for development of the basic system with full service to be achieved by expanding existing services and facilities. The network will use existing transmission services although the system will be constructed to use digital transmission systems in the future. The system is being constructed in accordance with most of the CCITT regulations but is using circuit switching technology as opposed

to packet switching which may limit its future interconnection with other networks.

3. Commercial Networks

Both Euronet and the Nordic Public Data Network are government sponsored projects. They are probably best suited to Europe where the PTTs are all government owned and controlled. However there exist a number of national commercial communication networks, principly in the US, which are starting to make international inroads. One of them, Infonet, has a substantial network in the U.S. and has recently established centers in Canada, Germany, France, Britain, Belgium and Australia. They have recently incorporated satellite communications services into their network. Infonet claims to have established the cooperation of European PTTs for use of their transmission facilities.

Western Union International has also established links between the U.S. and Europe but has run into problems with the regulatory bodies for expansion of their networks.

III CANADIAN PLAYERS

A number of Canadian organizations, both governmental and non-governmental are involved with international organizations. It would be impossible to list every organization, who, through their own specific interest or discipline, are attempting to improve international communication. Therefore, we have restricted ourselves to those groups that deal with the more general problems or have a broader base of activities to improve the international management and/or transfer of information.

a) The National Research Council (NRC)

The National Research Council Act empowers the NRC, inter alia, "to establish, operate, and maintain a national science library and, subject to the approval of the Minister, to publish and sell or distribute such scientific and technical information as the Council deem necessary." In 1969 Cabinet agreed that:

(a) pursuant to subsection 2 of Section 7 of the National Library Act, the Governor in Council direct that the National Research Council, under the general direction of the National Librarian, develop in concert with existing information organizations, a national sceintific and technical information system, to encompass the natural sciences and engineering;

(b) the National Research Council be given approval to appoint for the above purposes an advisory Board of

Directors responsible for formulating general policies for scientific and technical information services in Canada and for guidance toward their implementation and that the National Library be given adequate representation on the Board;

(c) subject to the approval of Treasury Board, the STI operations of the National Research Council be funded through a separate parliamentary vote.

In October 1974, the two national information disseminating centers of NRC, the National Science Library and Technical Information Service were brought together to form the Canadian Institute for Scientific and Technical Information (CISTI).

CISTI is responsible for NRC's activities in STI and sees its role as:

1. serving as the major node in the evolving network of STI services,

2. providing leadership and know how in developing STI systems and services,

3. performing the functions of a national science library,

4. serving as a link between the Canadian STI network and similar foreign and international services,

5. being a referral source of STI.

CISTI also operates CAN/OLE, a data-base system providing access to over 3 million citations and CAN/SDI, a computer based selective dissemination of information service.

ABSTI is composed primarily of experts in information from the academic, and government sectors with limited representation from the private sector and its purpose is to advise NRC/CISTI on STI matters including participation in the activities of international organizations and on arrangement for international collaboration.

There is general agreement that ABSTI has not yet fulfilled its primary role let alone its international one. Different approaches have been experimented with in order to make ABSTI more effective, such as workshop-type meetings which examine a problem or topic of interest. The findings and recommendations are then reported to NRC. It has served more as a forum to keep leaders of the Canadian information community aware of NRC activities. It has stated that coordination is required in respect to Canada's involvement in international STI activities to insure our continued access to STI from abroad and to ensure that Canada speak with one voice. Recently ABSTI established an ad hoc committee to examine the international interface with respect to Canada's STI efforts. The ad hoc committee is composed of representatives from National Library, NRC, MOSST, and the International Development Research Centre.

NRC/CISTI is certainly the leader in STI activities in Canada and as such is recognized internationally as a source of

expertise. It is often requested to participate in and support the activities of international and non-governmental organizations. Various members of its staff serve on working groups of ISO, OECD, FID, and CODATA among others and the CAN/OLE system has been exported to many other countries through either bilateral agreements or under UN sponsorship.

NRC/CISTI also supports the Canadian National Committees (CNC) for several international organizations, the roles and activity of which vary significantly.

ABSTI, for example, acts as the CNC/UNISIST, but the National Library is the UNISIST focal point in Canada. It is probably just as well that CNC/UNISIST is inactive in light of this confusing arrangement, which will be further confused now that UNISIST has decided to expand its terms of reference to include the social sciences, something ABSTI is not really equipped to deal with.

The CNC/FID is relatively active however. It is composed of 10 members from across Canada and from various private, academic, and public organizations. It performs a liaison function between FID and Canadian interests, distributes FID literature and publications in Canada, and ratifys the selection of Canadian experts to FID working groups.

The CNC/CODATA was formed in 1970 and also acts as a liaison between CODATA and Canadian interests, mostly in the geosciences. It has no internal links or formal structure and no control of

input or output of data but does distribute CODATA Bulletins and
Newsletters. Its Chairman, Dr. R.N. Jones is very active in the
international organization being a member of the Executive
Committee as well as various Task Groups.

B) National Library of Canada

The National Library (NL) has been given the overall
responsibility for the development of library services within the
government of Canada which includes the coordination of the
government library services such as:

a)   acquisition and cataloguing,
b)   professional advice,
c)   provision of modern information storage and
     retrieval services, including photocopying and
     microfilming, electronic and other ADP services.

As the national library, the NL has a significant influence
on developments in library services for all of Canada and
therefore in the management of information in Canada.

NL also plays a key role in the international exchange of
information. Members of its staff serve on committees and
working groups of major international organizations, and most of
NL's projects for improving library services take into account
international standards and procedures.

For example, Canadiana, the national bibliography, is being
produced in accord with the UBC of IFLA The national
bibliographic data base will therefore be in accord with other

national data bases. A component of Canadiana will be CONSER (Conversion of Serials) an international cooperative project to build a serial data base of 200,000 titles.

NL is responsible for administration and implementation of two international bibliographic numbering systems in Canada the ISBN and the ISSN. The ISSN is essential for CONSER and they are included in all listings for new serial titles in Canadiana.

The ISDS (International Serial Data System), a registration system requiring the identification, formatting, and input of certain data elements including key-title, is also handled by NL in the ISDS Canada division and ISDS records are sent to the International ISDS Centre in Paris.

NL is responsible for the Canadian MARC program which tends to shape bibliographic information into a common standard of communication. As well Canadian MARC tapes are being exchanged for French, Australian and U.S. MARC tapes and British MARC tapes are being purchased.

NL staff also serve on the Working Group on Content Designators for an International MARC being designed by IFLA. The purpose being to facilitate the international transfer of MARC tapes.

The office of Library Standards is involved in the revision of the Anglo-American Cataloguing Rules so they will conform to international standards. This office is also involved in the creation and evaluation of the ISBD standards. The Chief of the

Office of Library Standards is Chairman of the Canadian Advisory Committee for ISO/TC46.

The National Library is also actively involved in establishing a Canadian Bibliographic Network which will involve a review of the international interface of the emerging network. The NL and CISTI are evaluating the DOBIS system - a bibliographic data base software package, for the purpose of establishing an integrated library system capable of operating in a network mode.

The Canadian Library Documentation Centre acts as a clearing house on new developments in librarianship in areas such as automation, technical services, and library standards. It also acts as the Canadian Depository for the conference papers of IFLA and the Canadian National Information Transfer Centre for UNESCO's ISORID.

C)   International Development Research Centre (IDRC)

IDRC was established in 1970 by an Act of Parliament "to initiate, encourage, support, and conduct research into the problems of the developing regions of the world and with the means for applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions." The Centre is governed by an international Board of Governors from 10 countries, six of whom are from developing nations. The Centre awards grants to the developing nations to undertake research in their countries. By this method they hope

to build up the research capabilities, the innovative skills, and the institutions which will allow these nations to solve their own problems.

IDRC is divided into four administrative divisions; Agriculture, Food & Nutrition Sciences; Information Sciences; Population & Health Sciences; and Social Sciences & Human Resources. A fifth division, Publications, has recently been created.

It is largely within their Information Sciences Division that IRDC promotes international STI. Grants are awarded for development of national information systems, thesauri, data bases and for the development of DEVSIS - Development Sciences Information System. DEVSIS is a major project of IDRC in cooperation with UNESCO, OECD, UNDP, ILO, UN/ESA to establish a global information system for the development sciences. Work is presently underway to develop a thesaurus, to prepare draft versions of an operations manual and a study to determine the scope of DEVSIS. The UN has been asked to incorporate DEVSIS into one of its agencies after which UNDP will be asked to fund it.

IDRC has recently purchased a minicomputer on which it will operate an interactive bibliographic information system based on ISIS (Integrated Set of Information System) which will also be compatable with AGRIS and DEVSIS.

IDRC is extremely important to development of Canada's international STI activities not only because of the projects it supports, but because of its influence and expertise in the area of international STI.

D)   Standards Council of Canada (SCC)

The Canadian member body in ISO for all standardization concerns is the SCC It works cooperatively with the Canadian Standards Association (CSA) who provides the secretariat for the SCC and is responsible for national standardization.

In the field of STI three technical committees of ISO are of interest:

1.   TC37 Terminology
2.   TC46 Documentation
3.   TC97 Computers and Information Processing

The SCC has participant status in all three committees and is advised by a Canadian Advisory Committee (CAC) in each subject area. The advisory committees are composed of a broad representation from government, industry and universities.

The CAC for Terminology includes representatives from Secretary of State and CBC An officer of National Library is Chairman of the CAC on Documentation which also has representation from NRC/CISTI and Public Archives.

The Department of Communications, NRC, and D.S.S. has representatives on the Computers, Information Processing, and Office Machines (CIPOM) committee which is the CAC for TC97. The

Government EDP Standards Committee is responsible for coordinating federal government involvement in CIPOM, its subcommittees and working groups.

SCC also nominates experts to ISO sub-committees and working groups. These may or may not be members of the CAC's.

Recommendations of ISO/TCs are publicized in Canada by the SCC and are sometimes ratified by the C.S.A. which gives them some legal status. However, especially in the fields of Terminology and Documentation, the standards are purely voluntary and cannot be enforced. For a variety of reasons, such as the cost of conversion of systems to new standards, the operating groups to whom these standards apply might not accept them. This then, naturally leads to confusion as in the case of country abbreviation lists. ISO, Library of Congress, and the CCITT have all established and are using lists which are not compatible. Generally such inconsistencies are eventually recognized and resolved however. CISTI and SCC are cooperating in the development of a natural standards information system which should assist in the dissemination of standards.

E)   External Affairs

The role of External Affairs in STI is primarily one of political liaison between foreign governments or intergovernmental organizations and Canadian departments and agencies. It does not have an administrative section responsible for STI, its activities in this area being handled (along with a

variety of other tasks) by the Scientific Relations and Environmental Problem Division, the Cultural Affairs Division, and by the United Nations Economic and Social Affairs Division each of which reports to a different Bureau.

External Affairs does have a mandate to coordinate or direct official delegations but they seldom exercise this mandate in the scientific or technical areas primarily because they lack the resources to do so. However it does seek the advice of other departments in determining its position at meetings where it is acting as the Canadian representative, such as UNESCO/UNISIST.

F) Department of Communications (DOC)

DOC is responsible for communications policy and regulation of telecommunications systems and services and thus has a profound effect on the transfer of information and development of network between Canada and other countries.

In 1970 DOC led a study on telecommunications in Canada. The resulting Telecommission report, made reference to the complexity of issues raised by the interconnection of computer and communication networks. As a result, Cabinet established a Task Force on Computer/Communications which produced a report "Branching Out" containing an important series of recommendations. The government took a detailed look at these recommendations and produced a Green Paper on Computer/Communications Policy.

One result of these studies was the establishment of an Interdepartmental Committee on Computer Communications with a permanent secretariat in DOC. The Chairman of the Committee is also Director of the Secretariat. This IDC has dealt mostly with policy issues related to the computer industry, the economics of computer/communications, and its social impacts. Recently, the continued utility of the IDC, and therefore the Secretariat, have been questioned by some of its members. They believe that many of the issues could be handled more efficiently by one or two departments working together. The Chairmen has recently asked all working groups to make a final report on their activities, "to clear the way for whatever future arrangements, if any, Cabinet may wish to initiate".

If the IDC and its secretariat is disbanded, its work and staff will likely be absorbed by the Department.

DOC is the focal point for the international aspects of telecommunications and participates in some 20 international organizations with a view to establishing compatible policies and regulations for international communications. The International Telecommunications Branch is responsible for the liaison with most international organization such as the I.T.U.

Staff of DOC are also involved on various committees of OECD and ISO and serve on subcommittees of the Standards Council of Canada.

G) Canadian Library Association (CLA)

The CLA has membership in six library-related international organizations: the Commonwealth Library Association, the International Association of School Librarianship, International Federation of Library Associations (IFLA), the Special Libraries Association (IDRC), and the Canadian Commission for UNESCO. Its Committee on International Relations seeks to collect information for CLA members about the activities of international organizations in the field of libraries and information. It distributes this information through the CLA newsletter. It is a volunteer committee which usually meets only at the General Meetings of the CLA.

The CLA sends a delegate to IFLA meetings and votes on IFLA resolutions, however it does not nominate members to IFLA working groups. They are usually sponsored by the experts own organization.