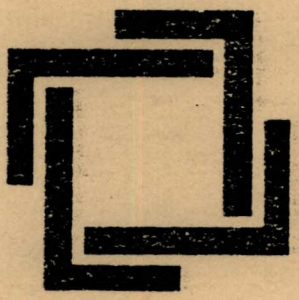
A STUDY OF THE ROLE OF THE DEPARTMENT OF COMMUNICATIONS IN TELECOMMUNICATIONS STANDARDIZATION



Philip A. Lapp Limited

(2)

A STUDY OF THE ROLE OF THE DEPARTMENT OF COMMUNICATIONS IN TELECOMMUNICATIONS STANDARDIZATION

carried out for the National Telecommunications Branch
of the Department of Communications, Ottawa
under DSS Contract No. OST81-00-228

"This report presents the views of the author(s). Publication of this report does not constitute DOC approval of the report's findings or conclusions. This report is available outside the Department by special arrangement."

Philip A. Lapp Limited
CONSULTANTS TO INDUSTRY AND GOVERNMENTS

REVISION ONE
June 1982

work carried out by: Dr. J.R. Whitehead (1), K.E. Hancock, C. Balko

Approved by
K.E. Hancock
Vice President
Telecommunications

HEAD OFFICE: SUITE 302, 14A HAZELTON AVENUE, TORONTO, ONTARIO, CANADA M5R 2E2
Phone (416) 920-1994

OTTAWA OFFICE: SUITE 904, 280 ALBERT STREET, OTTAWA, ONTARIO, CANADA K1P 5G8
Phone (613) 238-2452, Telex 053-3314

EXECUTIVE SUMMARY

Over the last decade or so, there has arisen in Canada a need for National telecommunications standards. This need has come about partly due to the range of technological advances that can be grouped under the term "Information Technology", and partly due to the socio-economic changes in the telecommunications industry typified by the need for the interconnection of subscriber owned terminal equipment to the National, and International telecommunications networks.

To meet Canada's specific telecommunications needs, a number of standards-setting mechanisms outside of the National Standards system evolved. The Department of Communications concluded that a definitive and independent statement of current activities, and recommendations for the future development, approval and implementation of National standards in the field of telecommunications and information technology was needed. This study is a result of that requirement.

This study commences with a detailed review of the standards mechanisms in place in Canada, particularly those of the National Standards System under the Standards Council of Canada. This section also reviews in detail the International standards writing organizations which are of particular interest to telecommunications and information technology in Canada. The role of standards in law, including International trade agreements, is also reviewed.

The next section of this report identifies and reviews the current telecommunications standards mechanisms and activities. These include those of the various committees such as TAPAC that have recently been set up by the Department of Communications, the Canadian Videotex Consultative Committee, the Government EDP Standards Committee, the Canadian Standards Association and various International telecommunications standards activities. This section concludes with an outline of the current limitations of telecommunications standards actvities, highlighting the need for a planned and properly organized mechanism to co-ordinate all current activities, to ensure that all relevant International standards are reviewed for possible use in Canada, to monitor information technology developments and to plan

for standards-setting activities as required and finally to ensure that such activities are performed in a manner acceptable to the Federal Government, the provincial governments, the Canadian telecommunications common carriers industry, the Canadian telecommunications manufacturing industry and finally the Canadian consumer The next section of this report analyses the inputs received from the Federal Government, the majority of the provincial governments and the industry regarding the requirements and needs for a national telecommunications standardization mechanism.

There was a surprising degree of unanimity for a single, non-partisan, expeditious organization within the Standards Council mechanism to set standards for the whole range of information technology diciplines. This organization should draw from all interested sectors, and have no unreasonable restriction to membership. The Federal Government, supported by the provincial governments, should act as a catalyst for its implementation, and for new work where this is required, but should not have a controlling role. One of its key functions of the organization would be the liaison with the Canadian National Committees and the Canadian National Organizations of the International standards writing bodies, and an expeditious and routine review of all international telecommunications standards for possible incorporation with National Standards of Canada.

The study continued by attempting to ascertain the current financial and human resources allocated to existing standards telecommunications activities. Although it has not been possible to obtain precise figures, it is estimated that currently three to four million dollars are being spent annually on telecommunications and information technology standards activities in Canada. The largest spender in the area is the Canadian telecommunications common carriers, followed by the Federal Government.

The key recommendations that are made as a result of the information gained during this study are:

- That the Canadian Standards Association be requested to set up an information technology steering committee, and that all current telecommunications and information technology standardization

activities be transferred to sub-committees to be set up by the CSA Information Technology Steering Committee.

- That a joint CSA/DOC task force be set up to investigate methods of expeditiously setting up such a steering committee and of transferring current standardization activities to it.

- That all interested parties be actively encouraged to participate in the information technology steering committee activities.

- That methods are found to ensure expeditious but effective action on the part of the steering committee which would have as one of its key guidelines the incorporation of telecommunication standards in the National Standards System.

- That the steering committee form a planning committee to ensure that new sub-committees are set up at the appropriate time to deal with the needs of advancing technology.

- That a sub-committee of the steering committee be conserned with the routine review of all International telecommunications and information technology standards, with a view to the use or modification, as National Standards of Canada.

- That the Department of Communications organize the setting up of a computerized list of National and International telecommunications and information technology standardization activities, and that this list be updated on a routine basis.

- That the Department of Communications consider the setting up of seminars for the education of all interested parties in the current telecommunications and National Standards mechanisms, and on the new mechanisms when they are set up.

* * *

CONTENTS SHEET

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

BNQ - Bureau de normalisation de Quebec

CAB - Canadian Association of Broadcasters

CAC - Canadian Advisory Committee (of ISO)

CBC - Canadian Broadcasting Corporation

CCI - International Consultative Committee

CCIR - International Radio Consultative Committee

CCITT - International Telegraph and Telephone Consultative Committee

CGA - Canadian Gas Association

CGSB - Canadian General Standards Board

CIPOM - Committee on Information Processing and Office Machines

CNC - Canadian National Committee (of ISO or IEC)

CNO - Canadian National Organization (of CCIR or CCITT)

CRTC - Canadian Radio-television and Telecommunications Commission

CSA - Canadian Standards Assocation

CSC - Canadian Sub-Committee (of IEC)

CTCA - Canadian Telecommunication Carriers Association

CVCC - Canadian Videotex Consultative Committee

DCWG - Data Communications Working Group (of GESC)

DOC - Department of Communications

EDP - Electronic Data Processing

EEMAC - Electrical and Electronic Manufacturers Association of Canada

EIA - Electrical Industries Association

GATT - General Agreement on Tariffs and Trade

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (Cont'd)

GESC	-	Government E.D.P. Standards Committee
IEC	-	International Electrotechnical Commission
IFRB	-	International Frequency Registration Board
ISO	-	International Organization for Standardization
ITU	-	International Telecomms Union
NSC	-	National Standards of Canada
NSG	-	National Study Group (of CNO/CCIR or CNO/CCITT)
NSS	-	National Standards System
SCC	-	Standards Council of Canada
RPOA	-	Recognized Private Operating Agency
SIO	-	Scientific or Industrial Organization
SWO	-	Standards Writing Organization
TAPAC	-	Terminal Attachment Program Advisory Committee
TCTS	-	Trans-Canada Telephone System
TTF	-	Telecommunications Technical Forum of TCTS
ULC	-	Underwriters' Laboratories of Canada.
WARC	-	World Administrative Radio Conference

A STUDY OF THE ROLE OF THE DEPARTMENT OF COMMUNICATIONS IN TELECOMMUNICATIONS STANDARIZATION

1. STUDY BACKGROUND

Over the past several years, with the development of new policies and technology, there has arisen a need for national telecommunication standards to permit the orderly development of these services. Typical examples are terminal attachment standards for subscriber provided equipment, and standards for Telidon.

To fill the vacuum created by the lack of these standards, the Department of Communications has set up mechanisms to develop them, and for their recognition both nationally and internationally. This work has been carried out essentially on an ad hoc basis, although action has been taken to link the Telidon standards to the National Standards System (NSS) via the Canadian Standards Association (CSA). It is recognized that further standards will be required in the near future, particularly in the rapidly developing field of information technology. It also recognized that it is of major importance that the development of such standards should take place in an orderly and effective manner specifically taking into account the Federal, Provincial, industrial and international needs. It was also recognized that it was essential that future standards be nationally and internationally acceptable.

It was concluded that a definitive, independent and current statement on the activities required, and the scope and nature of the activities currently taking place for the development, approval and implementation of national standards in the field of telecommunications and information technology was needed. This study is the result of that requirement.

2. REQUIREMENTS

It is required to investigate, analyze and report on the effective development and implementation of national standards to allow for the orderly development of Canadian telecommunications, including office automation and computer communications aspects. This will require:

- an investigation of the requirements for national standards in these areas of telecommunications and the recommendation of appropriate and effective means to achieve these requirements.

- reporting on the nature and significance of the various existing Canadian, foreign and international standards processes and recommending appropriate measures for the development of national standards in Canada.

- reviewing the factors affecting federal and provincial authorization, promulgation and enforcement of approved standards and recommending appropriate measures to facilitate the achievement of domestic and international objectives.

3. APPROACH

The approach taken in this study was to divide the work into three major tasks, namely:

- the investigation of national telecommunication standards requirements;

- the review of current Canadian, foreign and international standards processes;

- the analysis and review of the factors affecting Federal and Provincial authorization, promulgation and enforcement of standards, together with the drawing of conclusions and presentation of recommendations for future approaches.

Each task commenced with a detailed review of literature currently available and an analysis of existing organizational structures. From this a list of key personnel was developed and interviews took place to ascertain the needs and concerns of the many groups concerned with telecommunications standards in Canada.

An initial analysis was then made from the information received with particular emphasis on identifying what further information was needed to fully meet the

requirements of this study. These gaps were then filled by the analysis of additional documentation and by further interviews when required.

Finally a detailed analysis was made permitting the drawing of conclusions, and the making of recommendations.

An activity schedule of this work is given in Appendix A.

Numeric references relate to the bibliography given as Appendix B, while alphabetic references relate to the index of interview and meeting reports given in Appendix C.

4. STANDARDS IN CANADA

(Refs: 2; 3; 4; 12; 13; 14; 15; 16; 17; 20; 22; 24; i; k;)

Most industries and commercial operations use standards of one form or another. These are often internal standards developed and used by a single company or manufacturer, or industry standards developed by an industry association for use by members. In Canada, the standards are frequently developed by foreign manufacturers and imposed on Canadians by the simple fact that the products or goods are sold within Canada.

As it developed, this fragmented and ad hoc structure of standardization militated against the root objective of standards, that is to provide a widely acceptable norm for goods and services to facilitate trading on a national and international basis.

4.1 The Standards Council of Canada and the National Standards System

To overcome the standardization problems identified above, the Standards Council of Canada (SCC) was created by Act of Parliament in October 1970, as the National Coordinating Institution for voluntary standardization in Canada. It operates a National Standards System (NSS) which is made up of organizations concerned with voluntary standardization in Canada. The System was created to provide a medium through which Canadian organizations involved in such activities may operate and cooperate to recognize, establish and improve standardization in Canada. It was designed to provide a comprehensive Canadian standardization capability to meet both national and international requirements and responsibilities.

The System now consists of the Council, five accredited standards-writing organizations (SWO's), two Canadian National Committee structures concerned with international standardization, one certification organization, and several advisory and coordinating committees. A limited program of accreditation of testing organizations is underway.

The accredited standards-writing organizations of the National Standards System are:

- the Canadian Gas Association (CGA)
- the Canadian General Standards Board (CGSB)
- the Canadian Standards Association (CSA)
- Underwriters' Laboratories of Canada (ULC)
- Bureau de normalisation du Quebec (BNQ).

Of these, the SWO most concerned with telecommunications standards is the CSA.

Within its overall standards-writing programme, each organization, with the exception for the moment of BNQ, operates in an agreed group of designated subject areas from which it may submit its standards to the Standards Council for approval as National Standards of Canada (NSCs).

The one accredited certification organization is Warnock Hersey Professional Services Limited.

National Standards of Canada (NSCs) are the prime output of the National Standards System.

The description of standards as National Standards of Canada is essential for international recognition and for effective Canadian participation in the development of international standards. Ability to trade beyond a local market is thus greatly enhanced.

It is anticipated that eventually there will be several thousand NSCs satisfying a major part of the Canadian requirements for standards. Progress towards this objective has to date been slow, but is expected to improve now that the accredited standards-writing organizations have adopted policies to process the bulk of their standards as NSCs.

A time frame is being developed; however, it takes time for policy decisions and internal eductional processes not only to reach the working levels in the committee structure but to be accepted there. In addition, SCC policy requires that NSCs be available in both official languages. The vast majority of NSCs are developed and written in English. Translation into French is a two-stage process: the act of translation itself, followed by technical editing of the translation to ensure that it faithfully reflects the English original. Delays are experienced, and one of the slower areas is that of telecommuncations.

The SWOs follow procedures associated with the process of submission (by the SWOs) and approval (by the SCC) outlined in - "Criteria and Procedure for the Preparation and Approval of National Standards of Canada". It is questioned by the SCC if the requirements of this process could not be regarded as an integral part of the SWO accreditation, with a resultant saving in time and increase in flexibility.

The SCC is conducting a thorough review, in conjunction with the SWOs, of the whole process of development and approval of NSCs with the aim of streamlining the process.

The SCC also believes that it is important that there be a target to work towards in processing SWO standards to NSC status. Those carrying out the review will be asked to suggest a target to be achieved over the 1982/1985 time frame, perhaps in the 50-70% range of published SWO standards.

A study will also be carried out by the SCC on methods of adopting non - SWO standards as NSCs. Consumer requirements for standards will be identified. Expansion of the consumer advisory panel concept and alternatives will also be considered.

4.2 Other Standards-Writing Bodies Concerned with Telecommunications

There are a number of major organizations not recognized by the SCC as accredited SWOs that produce standards used throughout the Canadian telecommunications industry.

Typical of these are the TransCanada Telephone System (TCTS) and the Electrical and Electronic Manufacturers Association of Canada (EEMAC). While both of these organizations, and several others, provide inputs to CSA and Federal and Provincial government standards, they also produce their own standards which are widely recognized. In addition, EEMAC is associated with the Electrical Industries Assocation (EIA) and uses many of their standards.

4.3 International Standards

As by its very definition, telecommunications is concerned with distant communication, it is to be expected that international operation, and standards for such operation, are fundamental to the industry. The two major organizations whereby Canada participates in international telecommunications standards are the International Standardization Branch of the SCC and the International Telecommunications Union (ITU).

The International Standardization Branch of the SCC is responsible for the general administration of the Canadian National Committees of two major international standards-writing organizations, the International Organization For Standardization (ISO) and the International Electrotechnical Commission (IEC).

4.3.1 The International Organization for Standardization (ISO)

ISO is a specialized agency for standardization which was created in 1946 in London at a meeting of the United Nations Standardization Coordination Committee and 25 national standardization organizations. Its head office is located in Geneva. At present ISO is made up of the national standards bodies of 86 countries.

The object of the ISO is to promote the development of standards with a view to facilitating international exchange in goods and services, and to develop cooperation between nations in the sphere of intellectual, scientific, technological and economic activity. National standardization organizations may belong to ISO, but a country may be represented by one organization only.

On 1st April 1972, the Standards Council of Canada took over these responsibilities for CSA. ISO carries out its wide ranging activities through specialized Technical Committees, one of which, TC97 - Data Processing, is of specific interest to this study.

The Canadian National Committee on the ISO (CNC/ISO) is responsible, through the Standards Council of Canada, for the general supervision and direction of Canada's participation in the work of the ISO. Accredited standards-writing organizations are encouraged to use recognized international standards as a basis for national standards whenever Canadian practices and conditions permit.

4.3.2 The International Electrotechnical Commission (IEC)

The International Electrotechnical Commission, which was created in 1906, does similar work to that performed by the ISO, but confines its activities to the electrotechnical field. Some 42 nations are represented in the Commission. Like ISO, it has its head office in Geneva.

Since April 1972, Canada has been represented on the IEC by the Standards Council of Canada.

Again the work of the IEC is carried out by a number of technical committees of which TC12, Radio Communication: TC46, Cables, Wires and Waveguides for Telecommunication equipment, and TC74, Safety of Data Processing Equipment and Office machines, are of significant interest to this study.

The Canadian National Committee of the IEC (CNC/IEC), which is similar in structure to the Canadian National Committee on the ISO, is responsible to the Council for the general supervision and direction of Canada's participation in the work on the IEC.

4.3.3 SCC's Management of Canadian Participation in ISO and IEC

The International Standardization Branch of the SCC is responsible for the general administration of the IEC and ISO standardization work in Canada and provides the secretariat for the CNC/ISO and CNC/IEC.

The work of international standardization is carried out by the two organizations through ISO and IEC technical committees and their subordinate sub-committees and working groups.

Canadian participation in this work is done by Canadian Advisory Committees (CACs) in the case of ISO work and by Canadian Sub-committees (CSCs) in the case of IEC work.

There is a CAC or a CSC, for every international technical committee whose work is of interest to Canada. The Canadian National Committee on the ISO is responsible for all the Advisory Committees, while the Canadian National Committee of the IEC assumes the responsibility for all the Sub-committees.

The members of the CACs and CSCs participate directly in the work of international standardization carried on by the associated technical committee, and consist of individuals, producers, users and others according to the subject under consideration.

It should be noted that all ISO/CAC and IEC/CSC members are volunteers and receive no SCC remuneration for their efforts. Accredited delegates to international technical meetings, however, are eligible to receive SCC travel subsidies in support of their attendance.

For some years, the SCC has been endeavouring to reduce duplication or overlap of national and international standardization work. This effort has been two-fold: improving communication between

the organizations responsible for writing standards in Canada and those individuals participating in international standards work - thereby permitting Canadian organizations to take into account the results of international standardization work; and promoting Canadian standards as international standards, where appropriate.

The members of some technical committees of Canadian standards-writing organizations accredited to the National Standards System are also members of the corresponding ISO/CAC or IEC/CSC. In such cases, the standards-writing organization concerned is responsible for appointing the members of the relevant CAC or CSC.

In 1977, the SCC set up an Advisory Committee on International Standardization. This committee, formed of members of the Executive Committees or other persons of appropriate background and interests, provides a forum for discussion of problems common to both national committees.

While the CNC/ISO and the CNC/IEC are responsible to the Council for the direction and administration of Canadian participation in the ISO and IEC, the Advisory Committee on International Standardization provides the Council with advice and recommendations on policy matters concerning Canada's participation in the general sphere of international standardization.

One point of principle which arises from considerations of harmonization is what to do in those situations where Canada is involved in international work in an area where there is no related national work. It has been argued that Canada should only be involved internationally when national work is going on. On the other hand, given the rising importance of international standards, particularly in the context of the GATT Agreement, one could argue equally well that in Canada's own interests, there must be involvement in international work whether or not there is an equivalent national activity.

The SCC considers that this point of principle requires study in depth. The resources that are committed to international standardization represent a considerable portion of the SCC budget and there is a need to be sure that these monies are being well and appropriately spent. This study will probably involve the two national committees concerned with international standardization work and the Advisory Committee on International Standardization.

4.3.4 The International Telecommunication Union (ITU)

The ITU is a body created in 1932 by a merger of organizations previously concerned with international telephone, telegraph and radio regulations. A single convention, signed by 80 countries, was drawn up with three sets of regulations attached: one for radio, one for telegraph and one for telephone.

It is perhaps useful to note at this time that telecommunications conventions are agreements of the nature of a treaty between governments. Their objective is to facilitate relations and co-operation between peoples by means of efficient telecommunications services while fully recognizing the sovereign right of each country to regulate its telecommunication. The International Telecommunications Convention, which is in effect at this time, is a sort of constitution of the Union, which specifies the internal organization of the ITU and sets forth general principles governing telecommunication. It is drawn up and revised at Plenipotentiary Conferences of the member countries of the Union.

The ITU can perhaps be most succinctly described by tabulating its purposes:

- to maintain and extend international co-operation for the improvement and rational use of telecommunications of all kinds;

- to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public;

- to harmonize the actions of nations in the attainment of those ends.

To this end, the Union shall in particular:

. effect allocations of the radio frequency spectrum and registration of radio frequency assignments in order to avoid harmful interference between radio stations of different countries;

. co-ordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio frequency spectrum;

. co-ordinate efforts with a view to harmonizing the development of telecommunications facilities, notably those using space techniques, with a view to full advantage being taken of their possibilities;

. foster collaboration among its Members with a view to the establishment of rates at levels as low as possible consistent with an efficient service and taking into account the necessity for maintaining independent financial administration of telecommunications on a sound basis;

. foster the creation, development and improvement of telecommunication equipment and networks in developing countries by every means at its disposal, especially its participation in the appropriate programs of the United Nations;

. promote the adoption of measures for ensuring the safety of life through the co-operation of telecommunication services;

- undertake studies, make regulations, adopt Resolutions, formulate Recommendations and Opinions, and collect and publish information concerning telecommunications matters.

The ITU supports four permanent organizations: the General Secretariat; the International Frequency Registration Board (IFRB); the International Radio Consultative Committe (CCIR) and the International Telegraph and Telephone Consultative Committee (CCITT). Of these, the latter two are of particular interest to this study and will be enlarged upon below.

These two organizations, commonly called CCIs, permit four types of participants: administrations, recognized private operating agencies (RPOAs), scientific or industrial organizations (SIOs), and international and regional operations.

Member administrations, in this case the Canadian Government as represented by the Department of Communications, of the ITU, are members of the CCIs. Recognized private agencies, subject to the appropriate procedure and approval of the administration, may become members of the CCITT or CCIR or both. As a result of the organization memberships, they have a seat on the executive committee of the Canadian National Organization of CCIR (CNO/CCIR), if they are members of the CCIR, or a seat on the Steering Committee of the Canadian National Organization of CCITT (CNO/CCITT), if members of CCITT.

SIOs which are engaged in the study of telecommunications problems, or in the design or manufacture of equipment intended for telecommunications services, may similarly be admitted in an advisory capacity to participate in the work of the CCIs study groups.

International and regional organizations, which co-ordinate their work with the ITU and which have related interests, may be admitted to participate in the work of either or both of the CCIs.

4.3.5 International Radio Consultative Committee CCIR

The ITU radio regulations provide the basis for orderly development and interlocation of the radio frequency spectrum throughout the world. Canada, represented by the Department of Communications, has an interest in the making of radio regulations because of the extensive use Canada makes of the facilities that utilize the spectrum. The Department therefore participates in the development of these regulations by its work in the CCIR. It should be noted that the CCIR itself does not produce standards or regulations, the prime product being recommendations which the CCIR considers to be sufficiently complete to serve as the basis for international co-operation. These recommendations usually form the technical basis for world administrative radio conferences (WARC) where ITU radio regulations are prepared and approved. These regulations being covered by the telecommunications convention are therefore of the nature of a treaty between governments.

In 1968 the Canadian National Organization of the CCIR (CNO/CCIR) was established. The Executive Committee of the CNO/CCIR brings together senior engineering and management representatives from government departments and industry to provide the direction and co-ordination of the work of national study groups and to give approval of Canadian proposals and positions put forward by these study groups. The submissions are then presented to the Deputy Minister of DOC as part of a brief on the occasion of every International meeting of the CCIR.

Although the Department of Communications plays the prime Canadian Government role in CCIR work, the Department of National Defence, the Department of Transport, the National Research Council and the Canadian Radio-television and Telecommunications Commission also engage directly in this work. In addition the Canadian

Broadcasting Corporation (CBC), Teleglobe Canada, Telesat Canada, the Canadian Association of Broadcasters (CAB), CNCP Telecomm and the TransCanada Telephone System (TCTS) all participate in CCIR as Canadian RPOAs. Finally Spar Aerospace Limited and Bell Northern Research participate as Canadian SIOs.

4.3.6 International Telephone and Telegraph Consultative Committee (CCITT)

The duties of this, the other CCI of the ITU, are to study technical, operating and tariff questions relating to telephony and telegraphy, and to issue recommendations on them.

In somewhat similar fashion to the CCIR, the CCITT works through study groups and receives inputs from national organizations. Once more recommendations provide guidance on the best operational methods and techniques are developed and submitted, in this case to a Plenary Assembly. If the Plenary Assembly adopts these recommendations, they are published by the CCITT and disseminated by the ITU. Again, these recommendations are regarded as voluntary adjuncts to the Telephone and Telegraph Regulations, which have the power of the telecommunications convention behind them and are once more of a nature of a treaty between governments when international telephony and telegraphy operation is undertaken. It should be noted that these recommendations are adopted for national use in some countries.

With support from the then new CTCA, the Canadian national organization of the CCITT was established in 1973. It consists of a steering committee, national study committees (NSCs) and national study groups (NCGs). These latter two organizations are subdivided in the same way as the study groups of the CCITT. In the previous twenty-five years, fewer experts were involved and preparations were less formal.

A contribution from the NSGs is passed to the NSCs for approval. The NSC coordinates the other NSCs to ensure the position taken by the NSG does not conflict with the interests of other NSCs. A concensus of a single Canadian position on a subject must be achieved by the time the final draft recommendation has been formulated by the appropriate CCITT body. This position may be to approve, not approve or abstain. Whichever is the case, all Canadian participants at the meetings must support the agreed Canadian position.

The CNO/CCITT is made up of representatives from the Department of Communications, other government departments concerned with CCITT work, CN/CP Telecomm, TCTS and Teleglobe Canada as RPOs and Bell/Northern Research as an SIO. Canadian experts in the telecommunications field representing user groups, consultants, manufacturers, universities or other organizations may also be invited to participate from time to time.

4.4 The Role of Standards in Law

All standards issued by the SCC through the National Standards system together with other standards issued by SWOs and other standards writing bodies are purely voluntary from a legal view-point. Individual trade associations may require their members to follow their own standards as a condition of membership, but this is an internal matter. ITU regulations do have the force of an international treaty but these refer solely to telecommunications traffic between Canada and other countries and are not mandatory within Canada.

With this situation the question arises as to the usefulness of voluntary standards if they cannot be enforced. The answer to this is that firstly there are considerable trade and other pressures to comply with a standard and secondly when necessary, the standards are referred to in laws, regulations and by-laws at various levels. For example, the electrical code series of standards issued by the CSA are referred to in many building by-laws and other legal instruments.

The advantage of this approach of keeping standards setting and standards implementation mechanisms separate is that the standards setting organizations can set and modify technical standards as the technological and other needs arise without recourse to the legislative mechanisms. At the same time, a law or regulation can be written to ensure that the "latest issue" of a particular standard is used in a specific situation, thus allowing the laws, by-laws or regulations to take advantage of the latest technological standards.

There is an exception to this situation. When a government department, such as the Department of Communications, has the right to set regulations or standards under a specific act, such as the Radio Act, the regulations or standards it sets do have the force of law on department licencees to whom such standards, regulations and procedures apply. The Department of Communications' broadcast standards and broadcast procedures are examples of these, and licencees not meeting these standards may lose their licences.

4.5 International Implications

Canada is a member of the General Agreement on Tariffs and Trade (GATT). One of the multilateral agreements within GATT is the "Agreement on Technical Barriers to Trade" (also known as the "Standards Code"), which came into force on the 1st of January 1980.

In broad terms the objective of this agreement is to ensure that technical standards and regulations are not set up with a view to creating obstacles to international trade. As such, this agreement (4) is of specific interest to this study, and certain key extracts from it are given below. It is strongly recommended that the complete document is studied in detail by persons significantly concerned with the objectives of this study.

However, for the completeness of this study, and for the more casual reader, key clauses are as follows:

- Parties shall ensure that technical regulations and standards are not prepared, adopted or applied with a view

to creating obstacles to international trade. Furthermore products imported from the territory of any party shall be accorded treatment no less favourable than that accorded to the products of national origin and to like products originating in any country in relation to such technical regulations and standards. They shall likewise ensure that neither technical regulations or standards themselves nor their application shall have the effect of creating unnecessary obstacles to international trade.

- Their technical regulations or standards are required and relevant international standards exist, or their completion is imminent, parties shall use them, or the relevant parts of them, as a basis for the technical regulations or standards except where --- such international standards or relevant parts are inappropriate for the parties concerned ---.

- With a view to harmonizing technical regulations or standards --- parties shall play a full part --- in the preparation by appropriate international standardization bodies of international standards for products for which they either have adopted, or expect to adopt, technical regulations or standards.

- Where appropriate, parties shall specify technical regulations and standards in terms of performance rather than design or descriptive characteristics.

- Where a relevant international standard does not exist or the technical content of a proposed technical regulation or standard is not substantially the same as the technical content of relevant international standards, and if the technical regulation or standard may have a significant effect on trade of other parties, parties shall: publish a notice in a publication at an appropriate stage in a manner as to enable interested parties to become acquainted with it, that they propose to introduce a particular technical regulation or standard.

- Parties shall ensure that all technical regulations and standards which have been adopted are published promptly in a manner to enable interested parties to become acquainted with them.

- Parties shall take such reasonable measures as may be available to them to ensure that local government bodies within their territories comply with the provisions (of the agreement) (i).

- Parties shall take such reasonable measures as may be available to them to ensure that non-governmental bodies within their territories comply with the provisions --- (of the agreement) (i).

- --- Parties shall ensure, wherever possible that their central government bodies: accept test results, certificates or marks of conformity issued by relevant bodies in the territories of other parties; or rely upon self-certification by producers in the territories of other parties; even when the test methods differ from their own, provided they are satisfied that the methods employed in the territory of the exporting party provide a sufficient means of determining conformity with the relevant technical regulations or standards. ---

- Parties shall ensure that certification systems are not formulated or applied with a view to creating obstacles to international trade. They shall likewise ensure that neither certification systems themselves nor their application shall have the effect of creating unnecessary obstacles to international trade.

The implications of this agreement will be expanded upon in later sections of this study, and conclusions and recommendations.

(i) Qualifier (added)

5. A BRIEF REVIEW OF CURRENT TELECOMMUNICATIONS STANDARDS MECHANISMS AND ACTIVITIES

(ref. 1; 2; 5; 6; 7; 8; 9; 10; 11; 12; 18; 19; 20; 21; 25; 26; 27; 28; 29; 30; 31; 32; a; c; d; e; f; h; i; v; y; z; ee.)

In the past there has perhaps been little real need for national telecommunications standards. While this statement may seem surprising it should be recognized that traditionally the telephone companies and telegraph companies have been the only organizations, other than the consumer, on which such standards had a significant impact. As "natural monopolies" the telephone and telegraph companies had the need, resources and capabilities to develop their own standards and to be very active in the relevant international standards organizations, in particular in CCITT and CCIR. The various telephone and telegraph companies, together with their trade organizations such as CCTA and TCTS, developed their own excellent internal standards. The Department of Communications was of course active in the International Standards Organizations but prior to the 1970s had no significant national telecommunications standard activities, nor was there a perceived need for such activities.

Under the Radio Act, the Minister makes regulations concerning use of the radio spectrum including, when necessary, specification of certain technical characteristics of apparatus transmitting on authorized frequencies.

There is, at present, no equivalent Telecommunications Act, under which technical specifications for telecommunications equipment in general can be made or enforced.

In October 1970 the Standards Council of Canada was created by the Standards Council of Canada Act with the mandate providing co-ordination for voluntary standardization in Canada through a national standards system. Although both the CSA and CGSB have worked on various telecommunications related activities, these tended to be specialized (such as CSA standards for pole lines) and uncoordinated. Nor was there any need for them to be otherwise.

The 1970s saw rapid change in two areas, one social-economic and one technical, which would have a significant impact upon this somewhat halcyon state of telecommunications standards.

The first of these changes was the growing demand for telecommunications interconnection. The background and development of telecommunications interconnection has been dealt with very extensively in the literature, so will not be repeated here.

The second area of change was that of the technical nature of telecommunications. Where in the past telecommunications equipment and networks could readily be defined as those pertaining specifically to telephone and telegraph activities, the growing significance in the 1970s of such things as computer communications, broad-band distribution networks carrying all types of traffic, the almost ubiquitous use of microprocessors, the growing number of information services, and the trend towards communications between various types of office machinery have all tended to blur the distinction between telecommunications, computer technology, office machines and a number of other technologies. For ease of discussion these technologies can be lumped together under the heading of "Information Technology". The growth of Information Technology has not only brought about an urgent and growing need for national standards for the equipment and networks making up the component parts of this technology, but has brought with it a requirement for co-ordination and rationalization of such standards to meet the overall needs of Information Technology.

The setting of voluntary standards is traditionally a long drawn out process. The main reason for this is that if such standards are to be long lived and successful they must be the result of hard won concensus and agreement from all potential users of such standards. The pressures of the 70s for new telecommuncations standards has brought about a number of ad hoc telecommunications standard setting mechanisms which have not always met this need and which have not provided the broad co-ordinating mechanism required to draw together standards for the various disciplines making up information technology. The following subsections describe the various mechanisms by which telecommunications standards are currently formulated, and the section concludes with an outline of the current limitations of these mechanisms.

5.1 Terminal Attachment Program Advisory Committee (TAPAC)

Subsequent to the identification by DOC of the requirement for the interconnection of subscriber owned equipment to telecommunications networks as part of its 1970 telecommunications studies, discussions were set up between the Department and the Federally regulated carriers on this matter. In the absence of any suitable existing "non-partisan" body and as a result of these discussions, a program was implemented in 1976 to facilitate the direct attachment of certain customer provided equipment to carrier networks. Under this program the carriers' tariffs permitting the direct electrical connection of specific network non-addressing devices to carriers' facilities are certified by the Department in accordance with technical network interface standards issued by the department. The program covered predominantly voice type devices. In 1977 a terminal attachment program advisory committee (TAPAC) was formed to assure manufacturers, suppliers, common carriers and users of representation in terminal attachment program standards development. It is to be noted that these standards are for domestic use and generally are not of concern to international bodies. In spring 1979 TAPAC commenced the formulation of interface standards for network addressing devices. At the time of writing (March 1982) a total of four certification standards have been issued. In addition certification procedures, a quarterly terminal equipment list of certified equipment and other support documents have been published. There is continuing demand from its participants for further work covering newer types of terminals and networks.

Although headed and organized by the Department of Communications, membership of TAPAC includes federally-regulated telecommunication carriers, manufacturer organizations, user groups and some provincial governments. Observers include some provincial carriers, TCTS, a provincial government, CRTC, and some media correspondants. The position of TCTS and the majority of the provincial common carriers has been to avoid direct membership of TAPAC but to maintain the position of permanent observers. Manitoba Telephone System and Saskatchewan Telephones do not involve themselves with TAPAC.

A key CRTC decision in 1981 (CRTC 81-23) permits, on an interim basis, the use of either TAPAC standards, FCC standards or Bell standards for interconnection.

The following quotation from the Alberta Public Utilities Board decision illustrates the Alberta attitude to TAPAC:

> "AGT had proposed that all customers' terminals would have to meet AGT's technical standards based upon the DOC/TAPAC certification standards and that the technical specifications would include performance parameters. The Board, in noting that AGT chose not to participate in TAPAC, stated its position that there were no grounds for unique Alberta standards and that "uniform and consistent Canada-wide technical standards (voice) determined by an independent body should apply"."

Also, in its recent Terminal Attachment Application to the PEI Public Utilities Commission, Island Tel proposed the adoption of TAPAC standards.

It is generally conceded that TAPAC has been very effective in producing, in an expeditious manner, standards of a very high quality for terminal attachment. There is, however, currently no mechanism for the consideration of TAPAC standards via the National Standards System as National Standards of Canada.

5.2 Canadian Videotex Consultative Committee (CVCC) Standards Subcommittee

In 1979, mainly as a result of the DOC developing and promoting the Telidon Teletext/Videotex system, the Department set up the Canadian Videotex Consultative Committee. This committee, headed by the Department, consisted of interested industry and user representatives and has as its mandate the advising of the Deputy Minister of DOC on all matters concerned with teletext/videotex in Canada.

One of the immediate needs for the development of Telidon in Canada and world wide is for standardization. One of the first sub-committees to be set up by the CVCC was therefore a standards subcommittee chaired by Mr. Robert Bennett, a Director of the National Telecommunications Branch of the Department.

This sub-committee was most active and has published a number of provisional Telidon standards. The CVCC perceived the need for a more formal and established standardization mechanism, and the standards sub-committee has transferred much of its work to the CSA Technical Committee on Teletex and Telematics standards. The future of the CVCC standards sub-committee is currently unclear.

5.3 Government EDP Standards Committee (GESC)

The Government Electronic Data Processing Standards Committee is an organization vested with the overall responsibility for electronic data processing standards in the Federal Government. While as such it has no mandate for national or other generally used standards, it does provide secretarial facilities for the CSA Committee on Data Communications and has a vote in that committee. For that reason it is identified in this section.

5.4 Canadian Standards Association Telecommunications Standards Activities (CSA)

The CSA, one of the major SWOs credited to the NSS develops its standards through a formal structure consisting of:

- A Standards Policy Board
- Standards Steering Committees
- Technical Committees

CSA's current activities in information technology are carried out under the auspices of three separate steering committees as follows:

- Steering Committee on Computers, Information Processing and Office Machines (CIPOM)
- Steering Committee on Canadian Electrical Code, Part 2
- Steering Committee on Electromagnetic Compatibility

The Steering Committee on Canadian Electrical Code, Part 2, currently has two standards under development. These are a standard to cover equipment electrically connected to a network, and a standard to cover communication cable installed within a building.

The Steering Committee on the Electromagnetic compatibility develops standards for methods of development, limits of interference from various sources, suppression of interference and immunity of electrical and electronic equipment to interference. By the very nature of the work it interrelates very closely to a number of facets of telecommunications.

The Steering Committee on Computers, Information Processing and Office Machines perhaps has the greatest current activity in the information technology field. Under this Steering Committee the following technical committees exist:

- Data Communications
- Videotex
- Character Recognition
- Character Sets
- Credit Cards and Identification Cards
- Key Boards
- Open System Connection
- Problem Definition and System Analysis
- Programming Languages
- Representation of Data Elements
- Vocabulary

All of these sub-committees are currently active in setting standards each within the scope of its own work. This Steering Committee, through its sub-committees, is working on standards for Telidon as transferred to it from the Standards Sub-commitee of the Canadian Videotex Consultative Committee, and on standards on text preparation and interchange projects emanating from the ISO subcommittee on these matters, ISO/TC97/SC18. This latter work, which has already resulted in some CSA standards, is apparently the only area in which currently CSA is systematically reviewing international standards with a view to integrating them into the national standards system.

5.5 International Telecommunications Standards Activities

The majority of the "traditional" telecommunications network performance, protocol, coding and interconnection standards used by Canadian telecommunications common carriers have their genesis in CCITT or CCIR recommendations. Notwithstanding this there is currently no mechanism for reviewing such standards or recommendations for possible use as national standards of Canada.

There are however, procedures in place but not fully operating at this time, for the National Standards System to review all ISO and IEC standards for possible use as Canadian Standards. The only area in which this has occurred is the review of ISO TC 97 standards by the CSA CIPOM Steering Committee as mentioned Section 5.4 above.

The International Electrotechnical Commission (IEC) is also significantly involved in information technology standardization. In particular, sub-committee 12H is involved in Videography Terminals for the End User. In addition Sub-Committees 12A: Radio Receivers; and 12G: Cabled Communications, are also involved in standards that have some relation to information technology. In addition TC 46: Cables, Wires and Wave Guides for Telecommunications Equipment, and TC 74: Safety of Data Processing Equipment and Office Machines produce standards related to information technology.

That information technology is of significant interest to the IEC may be shown by the fact that it has set up an Information Technology Co-ordinating Group to co-ordinate all information technology activities within the IEC, and also to co-ordinate the IEC activities with the other international standards organizations. At a recent (Geneva - March 1982) meeting the Information Technology Co-ordinating Group made a recommendation to the Committee of Action of the IEC that Sub-Committee 12H mentioned above should be upgraded to a full technical committee on information technology.

It should be noted that Canada is extremely active in the information technology fields of the four international standards organizations mentioned in this sub-section.

5.6 Industry Standards

It should be mentioned that both the Canadian Telecommunications common carrier industry and the Canadian electronic manufacturers industry devise their own telecommunications related standards for use within the industry. While by no means national standards, the fact that work has been done in these fields by Canadian organizations should be noted and these organizations given the opportunity of participating in any future Canadian telecommunications standards organization.

5.7 Outline of Current Limitations of Telecommunications Standards Activities

As shown above, the current need for telecommunications standards has been met, at least to an acceptable standard, by various ad hoc and other mechanisms of the Canadian Government, the Canadian Standards Association and various international standards organizations. What is lacking at this time is a planned and properly organized mechanisms to co-ordinate these activities, to ensure that all relevant international standards activities are reviewed for possible use as national standards of Canada, to monitor information technology activities and to plan for standards setting activities as required by developing technology and finally to

ensure that such activities are performed in a manner acceptable to the Federal Government, the provincial governments, the Canadian telecommunications common carriers industry, the Canadian telecommunications manufacturing industry and finally the Canadian consumer.

6. THE PERCEIVED REQUIREMENT FOR NATIONAL TELECOMMUNICATIONS STANDARDS

(Refs. 14; 15; 19; 21; 26; a; f; g; i; j; k; l; m; n; o; p; q; r; s; v; w; x; y; z; aa; bb; cc; dd; ee;)

The preceding sections of this study have been almost wholly the result of the combination of a detailed literature study with the knowledge and experience of the consultants carrying out this study. However, to gain the information and opinions required in the remaining three sections, to permit valid conclusions to be drawn and recommendations made, an extensive series of interviews were carried out with representatives of the Federal Government, the majority of provincial governments, the Canadian communications common carriers industry and the Canadian telecommunications manufacturing industry.

In this section the perceived requirements for National telecommunications standards are presented according to the positions taken by the various groups indicated above. Comments on the relationship to international standards are made throughout.

6.1 The Federal Position

Although a wide range of Federal Government officials were interviewed from the regions as well as from Ottawa, and from organizations in addition to the Department of Communications, no conflicting opinions were received on the matter of the requirement for national telecommunications standards.

It was strongly felt that there should be a focal point for such standardization rather than having it spread over a number of organizations; also that the standards writing body should be a non partisan one (e.g. one of the SCC SWOs, such as CSA), but that DOC should maintain a role of catalyst, and if necessary co-ordinator.

Several interviewees noted that current non-government standards writing organizations had considerable inertia and that mechanisms should be investigated for ensuring expeditious but effective action.

Several respondees made the point that is now virtually impossible to separate telecommunications from computers, from office automation equipment within the broad domain of information technology, and that the approach for the future was to consider them all under one heading for the purpose of standardization.

It was also pointed out that the prime objective of standardization should be defined, as related to interconnection, safety, hardware, or other areas. Standardization should also be timely, neither too early nor too late. A number of interviewees pointed out the real need for national telecommunications standards mechanisms to consider the work done by the international standards organizations.

A further point made was that standards setting and standards implementation should be recognized as quite separate activities.

A final point made was that there appeared to be a definite need for the education of interested parties in the current Canadian standards organizations and their activities, thus preventing overlapping when the need arises for new information technology standards. After this phase there was a further need for continuing communication to keep developers of new technology informed as to the status of relevant standards writing activities.

The Government of Canada has published a statement that it believes that it is essential to work towards the adoption of Canadian standards which would be acceptable on a nationwide scale (see Ref 21).

6.2 The Provincial Position

With the sole exception of Ontario, the positions taken by the provinces, while not necessarily identical, were compatible with each other. The Ontario and Quebec positions are presented in some detail at the end of this section, the first because it differs from the others, the second because of the substantive nature of the Quebec response.

The general position of the majority of the provinces on the requirement for national telecommunications standards was that these were necessary, that generally they should be developed initially by industry and the user, and a national standard developed by a non-partisan body only when the technology was sufficiently developed to be stabilized.

It was felt that the role of governments, provincial and federal, should be as a catalyst for standards rather than assuming the position of setting the standards themselves.

It was generally accepted that the SCC SWO mechanism was a suitable one, with CSA being recognized as probably the most suitable SWO.

There was a general consensus (apart from Ontario) that the standards setting process should be separate from the standards implementation process. There was also consensus that international standards should be reviewed for possible use as Canadian standards.

An interesting concept brought up by the Maritime provinces was the need for maintenance standards. This was based on the concept that with interconnection a telecommunications system now consisted of three separate parts, the transmitting party, the network and the receiving party. Any user of the system, particularly an interactive system, had the right to expect that the network owner and the receiver equipment owner would maintain their portions of the system in such a manner that the system as a whole would always be used satisfactorily. In the most basic consideration of this, the owner of a telephone would have wasted his investment if the network or the telephone he wished to interconnect with had not been maintained in a manner permitting his call to go through.

It was felt that the matter was one of considerable urgency considering the situation regarding the competing carrier situation and the decision of the FCC in the AT & T case in the United States. In the future a call to the United States would be made through any one of a number of competing U.S. carriers. A major question was how could this be handled with regards to interconnection standards and would this varying

service impact negatively on the service provided to Canada, and upon the implementation of any Canadian national standard for services permitted to cross the border.

The Ontario position was that the Federal Department of Communications had a definite role to play in standardization and should take the lead. National standards were required and the DOC was the preferable leader and focal point in telecommunications standards. It was felt that the CSA, being a large and diffuse organization, did not have the focal point required for telecommunications standards both currently and in the future. It was also felt that standardization should not be left to the common carriers as these normally had a strong vested interest.

With regard to international standards, Ontario had some 65% of Canada's electronics industry and wished to keep it that way. It was felt that perhaps strong international standards could help to overcome some of the non-tariff barriers to international telecommunications trade that had been erected.

In summary, Ontario felt that information technology standardization would play a key role in the future, and it should be left to the federal government to orchestrate and direct such standardization, using its power both nationally and internationally.

En ce qui concerne le Québec, la seule normalisation qui se fasse actuellement dans le domaine des télécommunicatins est faite par le Bureau de Normalisation du Québec, et ne couvre que les besoins internes du gouvernement. Elle vise à la coordination des achats de matériel et à la comptabilité des systèmes utilisés par le gouvernement.

Le Bureau de Normalisation ne touche aucunement ce qu'ils ont appelé 'le domaine extérieur', c'est-à-dire tout ce qui est en dehors du gouvernement lui-même.

Les manufacturiers de matériel de télécommunications, les entreprises de télécommunications au Québec et le gouvernement provincial semblent assez satisfaits du cadre actuel dans lequel se déroulent les activités de normalisation (ACNOR, DOC) et des résultats obtenus.

On affirme qu'il est souhaitable qu'il y ait une distinction entre les organismes chargés de la définition des normes et ceux chargés de les faire appliquer, ceci pour assurer que les normes soient choisies selon des critères techniques et non politiques. On affirme egalement qu'il serait utile d'avoir une liste, constamment tenue à jour, des activités nationales et internationales de normalisation.

L'ACNOR pourrait être le forum idéal, mais il faudrait qu'elle augmente ses activités dans le domaine des télécommunications.

Du pointe de vue du Québec il existe aussi un probléme dans le cadre actuel: les normes émises sont généralement d'application volontaire, et ne deviennent obligatoires que lorsqu'elles sont reprises par des organismes de réglementation comme le CRTC par exemple, ce qui permet un certain flottement entre le volontaire et l'obligatoire, et dans l'application des normes.

Les normes actuelles ont surtout été établies en vue de la protection de réseaux de télécommunications.

Avec la libéralisation récente, on ressent un besoin de s'attaquer au problème des normes de qualité des équipements rattachables aux réseaux.

La priorité devrait aller

- aux terminaux
- aux 'nouveaux services' (interconnect, videotext, traitement de texte etc.)

La Régie des Services Publics, qui commence à reglementer certains secteurs des télécommunications dans la province, pourrait éventuellement vouloir s'interesser à la normalisation.

En somme le message du Québec parait d'être le suivant: que le cadre actuel est assez satisfaisant, qu'il fonctionne raisonnablement bien, mais qu'il y a deux on trois domaines ou il faudrait augmenter les activités; que l'ACNOR est l'organisme qui peut le mieux constituer le forum où les normes peuvent être définies selon les critères techniques.

6.3 The Industry's Position

Members of the telecommunications industry interviewed were in general agreement as to the need for effective telecommunications standards. With one exception, CNCP Telecommunications, there was agreement that standardization should be carried out by a non-partisan organization, such as CSA, that the standards setting body should be within the framework of that currently established, and that it was essential that this body review all relevant international standards for possible use as Canadian national standards. Again, there was general agreement that the standards setting organization should have full industry participation.

The manufacturing industry and the telecommunications carriers, with the exception of CNCP, have felt that the CSA was the most appropriate "non-partisan" organization to be accorded the standard setting function.

The general trend of opinion obtained from these interviews is that the standards writing body should take over the TAPAC functions, however the industry has published support for the work carried out by TAPAC (refs 34 & 35).

CNCP's position was that they are primarily in the business of public message carriers, principally telex, with their entire tariff being message-based. As such, they had a major interest in ensuring maximum usage of the system, as any uncompleted message meant a direct loss of revenue. Therefore CNCP wish to retain full control over standards. In essence, they were looking for a continuation of status quo with standardization being required for all subscriber-owned equipment to be connected to the system. There was also concern that building wiring codes should be standardized and that equipment be connected by hard wiring rather than jacks. Disconnected jacks showed merely as an open circuit and equipment could be disconnected by clumsy cleaners, etc. CNCP felt thatmaintenance standards should be mandatory. CNCP would offer maintenance service and suspend service to customers who do not maintain their terminal equipment. CNCP accepts the current TAPAC concepts and are currently writing TAPAC standards for their equipment. They felt that minimum standards for subscriber-owned terminal equipment should be equivalent to those written for their own equipments. Again, it was emphasized that CNCP were very concerned about end-to-end system integrity as their revenues were based on individual

message use. The point was made that equipment coming onto the market is not so "forgiving" as more traditional telex equipment CNCP felt that international standards should be monitored on a routine basis for possible use as Canadian standards, but they did not feel that CSA should be involved in CCITT work as this might result in non-equivalent standards.

6.4 Brief Summary of the Key Requirements for an Effective National Telecommunications Standards Setting and Implementation Mechanism

Despite the varied opinions of the province of Ontario and CNCP Telecommunications, perhaps the most important result of this portion of the study is the degree of unanimity for the need for a:

- single
- non-partisan
- expeditious

organization within the Standards Council of Canada mechanism to set standards within the whole range of information technology. This organization should draw from all interested sectors, and should have no unreasonable restriction to membership. The federal government, supported by the provincial governments, should act as a catalyst for its implementation, and for new work where this is required, but should not have a controlling role. One of its key functions would be liaison with the Canadian national committees and Canadian national organizations of the international standards writing bodies, and expeditious and routine review of all international telecommunications standards for possible incorporation as a national standard of Canada.

There is a considerable body of opinion that a new CSA steering committee should be set up to provide this mechanism. Such a steering committee would incorporate, through its working groups, all of the current work being undertaken by CSA in telecommunications, the work being carried out by TAPAC, the remainder currently being carried out by the CVCC standards committee, and it would liaise closely with industry organizations to ensure transfer and incorporation of industry standards where appropriate.

The steering committee should have a firm mandate to incorporate such mechanisms as required to ensure expeditious action on the part of its technical committees, and should itself act as a planning body to review technical advances in the information technology field to ensure that standards setting is undertaken at an appropriate time. This appropriate time should bear in mind the fact that the technology should be reasonably stabilized before standards setting is undertaken, but at the same time ensure that standards are ready when needed for national and international trade purposes.

Standards should primarily be of the type to allow interconnection and competition, but should consider the maintenance and other requirements of a homogenous interactive telecommunications system with its three main component parts, initiator, network and responder, under separate control and ownership.

7. THE PRIORITIES GIVEN AND THE FINANCIAL AND HUMAN RESOURCES ALLOCATED TO EXISTING TELECOMMUNICATIONS STANDARDS ACTIVITIES

(Refs. 33; c; d; e; f; g; h; i; k; l; n; o; q; r; cc; ee)

In investigating the most effective way of fulfilling this portion of the study requirement, it became apparent that there were five groups within Canada that currently contributed financial and human resources to the development of telecommunications standards. These were:

- the federal government
- the provincial governments
- the telecommunications common carriers
- the telecommunications industry
- the Standards Council of Canada
- the Canadian Standards Association.

These are not necessarily in order of importance or contribution. In virtually all cases these groups consider both national and international standards.

To facilitate the study of the current priorities and financial and human resources allocated to telecommunications standards, each of these groups will be considered in turn from the viewpoint of both national and international telecommunications standards.

It should be noted that the vast majority of standards writing activity is carried out through voluntary concensus type committees of one form or another. While this is an efficient and cost-effective way of writing standards, it militates against accurate calculation of either the financial or human resources allocated. Almost without exception, the work is carried out by individuals as a adjunct to their main tasks, and as such is seldom allocated individual costs. In addition, whilst the time spent at meetings can fairly easily be determined, again this is seldom accounted for separately from other tasks, and indeed, frequently represents only a minor portion of the total standardization work carried out. In many cases the major portion of the work is carried out by correspondence and standardization activities are perhaps characterized by the large amount of routine paperwork that passes over the desks of participants. These matters should be borne in mind when assessing the figures given below, which in general represent "best estimates" on the part of the interviewees.

7.1 Federal Government Priorities and Inputs

The Federal Government represented primarily, but by no means exclusively, by the Department of Communications, places a reasonably high priority on the establishment of effective and efficient telecommunications standards. It sees a major need for such standards, both nationally and internationally to facilitate the maintenance and growth of Canada's highly effective telecommunications networks.

As such, it has placed itself in the role of instigator and catalyst for such things as TAPAC and the CVCC Standards Committee, areas in which it might be argued that it has no specific mandate. In addition, it is very active in the ITU, maintaining a directorate dedicated to these matters. It is also active in ISO and IEC international standards setting. Nor does the DOC neglect internal government telecommunications standards, being very active on the government EDP Standards Committee.

Although it is difficult to give accurate figures for the resources the DOC applies to telecommunications standards, an overall estimate for non-radio specifications work, would be in the order of $750,000 to $1,000,000 spread over the

National Telecommunications Branch, the International Telecommunications Branch and the Regulatory Branch.

A rough breakdown of these figures between the three branches are as follows:

- National Telecommunications - between $150,000 and $250,000.
- International Branch - no specific figure could be obtained from this branch; however there is a directorate with several staff, dedicated to CCITT and CCIR work. It should be noted, however, that a fair proportion, perhaps the majority, of the work in this directorate, pertains to CCIR activities that are not telecommunications related. However, the directorate has current approval for 40 person trips to CCITT conferences and meetings in 1982, and a significant overrun on this allocation is expected.
- The Regulatory Branch estimates an annual expenditure of some $330,000 on telecommunications standards activities, primarily in relation to TAPAC.

The government telecommunications agency (GTA) allocates the equivalent of one person year or approximately $50,000 to telecommunications standards activities. GTA gave a high priority to telecommunications standards, particularly those for Terminal Attachment and for compatibility between equipment and telecommunications systems.

The CRTC also had a significant interest in telecommunications standards, it seeing its role as being that of ensuring that telecommunications standards were written in a form that did not give undue discrimination to any segment of the Canadian economy. CRTC's resources for standardization are comparatively limited and are normally applied to the analysis of technical standards programs. One engineer has specific responsibility for keeping abreast of telecommunications standards in a monitoring role and answering questions from the CRTC executive and from the public at large. Although no specific figure was given, an interpolation yields an annual expenditure in telecommunications standards of $50,000 to $75,000.

Other Federal Government organizations that have an interest in telecommunications standards, including internal government standards, are the Department of Supply and Services, the Department of Transport and the Royal Canadian Mounted Police. No specific figures were available from these departments, but total input from them might be estimated at one to two person years per annum.

7.2 Provincial Government Priorities and Input

Generally speaking, the provincial governments saw their role as being a monitoring one in relation to telecommunications standards. Typically, prime participation was in TAPAC with monitoring by correspondence of other national and international standards activities. The provincial representatives interviewed saw this general position being maintained, with perhaps minor additional resources being allocated, as telecommunications and information technology standards activities increased in the future.

Typically, the provinces had one to two persons working full-time on telecommunications matters as a whole. Out of these resources, work on telecommunications standards was allocated on an as-required basis.

The Government of Ontario provided the greatest input with the current involvement of the equivalent of two person years per annum on telecommunications and radio standardization matters. In addition, the ministry called upon the assistance of TV Ontario to represent the province in ISO activities. Ontario's policy was to match resources with the needs of standardization and as these needs develop in the future, resources will be expanded to meet them.

7.3 The Common Carrier Priorities and Input

The telecommunications common carriers give a high priority to telecommunications standards activities. Operating primarily, but not exclusively, through TCTS, very considerable resources are allocated to both international standardization activities of the ITU and national standardization activities, particularly in TAPAC and CSA. In addition, the telephone companies

have their own internal standards and TCTS has interconnection standards for interconnection between the major Canadian telephone companies.

TCTS carried out considerable research into the costing of its standardization activities to permit an estimate to be given for this study. Notwithstanding this, it was not possible to give any figure that could be substantiated for national telecommunications work, although very considerable resources are applied to TAPAC and CSA activities.

In the international field, TCTS and its member telephone companies budget approximately $1.5 million per year to ITU and other international standard forums. While a proportion of this relates to CCIR non-telecommunications activities, the major portion is in fact related to telecommunications. Some 80 persons are involved in these activities, a fair proportion full-time although some part-time.

As a body, the common carriers can be said to contribute the major proportion of telecommunications standards activities within Canada. Within TCTS, perhaps the lion's share is provided by Bell Canada with some 30 to 40 persons working on standardization, essentially on a full-time basis. This of course includes international as well as national (CSA) activities, and while most of it is devoted to telecommunications standards, does include CSA standards acitivites on pole lines and their hardware and similar low-technology standardization activities. Although the funding of the common carriers to telecommunications activities is high, the interviewees were unanimous in their opinion that it was money well spent.

7.4 Industry Priorities and Input

The resources allocated by the telecommunications industry to standardization are diverse and fragmented. While EEMAC monitors TAPAC and CSA activities, and of course has input to their own industry standards, it has been impossible to arrive at even a rough estimate of total resources applied to standardization. Certain companies, such as IBM, invest considerable resources in

standards relating to their own activities, but generally industry activity appears to be on an ad hoc basis, in relation to both national and international standards.

7.5 Standards Council of Canada Priorities and Input

The SCC has been considered under a separate heading, as it is a non-partisan coordinating body and is generally perceived as such.

Its input into telecommunications standards can be considered to be in two major areas. The first is its coordination of voluntary standardization in Canada and the operation of the national standards system. From the viewpoint of this study, this means the coordination and acceptance of CSA and CGSB as accredited standards writing organizations. The second area of input to telecommunication standardization is the provision and support of ISO and IEC by the running of Canadian national committees of these organizations. SCC subsidizes travel of experts providing their time on a voluntary basis to IEC and ISO meetings overseas.

The only financial information available from Standards Council of Canada is that contained in the financial portions of its annual report. This shows in 1981 an annual cost of operations of a little over $4.5 million. Of this, $1.7 million is in salaries and benefits, $700,000 in financial assistance to standards writing organizations and $540,000 in travel, $446,000 in membership to international organizations and $113,000 in international secretariat costs.

It is, of course, not possible to give anything but an educated estimate as to the proportion of these costs attributable to telecommunications standardization activities. Such an estimate, based on an estimated proportion of SCC activities relating to telecommunications, would be in the order of 7% or $327,000.

7.6 Canadian Standards Association

CSA can perhaps be defined as Canada's foremost standards development organization. It is a non-profit, independent, voluntary organization, engaged in developing standards in 35 major areas. The details of these activities relating to information technology is contained in previous sections of this report.

Once more, it has not been possible to break out the cost of these telecommunications-related activities from other work of CSA. They are, however, considerable and in any consideration of the overall resources allocated by Canada to telecommunications standards, they should be included.

It should be emphasized that CSA is putting a high priority on its telecommunications activities and is prepared to consider significantly increasing these activities, should it be so justified.

8. CONCLUSIONS AND RECOMMENDATIONS FOR THE ACHIEVEMENT OF MORE EFFECTIVE NATIONAL TELECOMMUNICATIONS MECHANISMS

(Refs: 20; a; c; e; g; bb; cc)

In this, the final section of the report, conclusions are drawn from the wide range of inputs gathered during the study, and recommendations are made for methods of setting up more effective telecommunications standards mechanisms to meet the stated needs of the Federal Government, the Provincial Governments and all concerned sectors of the telecommunications and information technology industries. These recommended mechanisms are designed to strengthen Canada's ability to take advantage of the rapid technological advances taking place in information technology, to the benefit of the Canadian economy, the Canadian consumer and international trade.

8.1 Conclusions

Given below are the main conclusions drawn from the analysis of the work carried out during this study. For the sake of completeness and continuity, some conclusions that might appear obvious to readers with wide experience of standardization in Canada have been included.

- Over the last decade or so there has arisen in Canada a need for National telecommunications standards.

- This need has come about partly due to the range of technological advances that can be grouped under the term "Information Technology", and partly due to socio-economic changes in the telecommunications industry as typified by the need for the interconnection of subscriber owned terminal equipment.

- To meet this need a number of uncoordinated ad hoc standard setting mechanisms have been set up.

- The current and future needs of the Canadian economy will be better served if a co-ordinated mechanism is set up to plan and set all Canadian information technology standards within the National Standards System.

- Such a mechanism should be "non partisan" and not run by either the Federal Government or the provincial governments.

- Such a mechanism should be within the National Standards System of the Standards Council of Canada.

- Membership of this organization for Information Technology Standardization should be open on an equal basis to interested parties within the Federal Government, provincial governments, the common carriers, the manufacturing industry and any group with a valid interest.

- In the past the National Standards System of the Standards Council of Canada has been slow in developing but the Standards Council of Canada is now dedicated to increasing the efficiency of the system.

- International standards are extremely important in the field of telecommunications and information technology, and international standardization work in this area should be monitored as a matter of routine for possible use as National Standards of Canada.

- A very high proportion of the current information technology standardization work in Canada is supported by the telecommunications common carriers.

- The Canadian Standards Association (CSA) has in place an organization which would meet many of the needs for an information technology standardization mechanism.

- The CSA mechanism is perceived by many to be effective but slow and cumbersome.

- There is a need for effective but expeditious standards setting for information technology standards.

- Any standards setting mechanism should function on a voluntary, consensus basis.

- The mechanisms for standards setting and standards implementation should be quite separate, with the latter being the mandate of the appropriate jurisdictional bodies.

- Any new information technology standards setting mechanism should take account of the key requirments of the "Agreement on Technical Barriers to Trade", a part of the General Agreement on Tariffs and Trade.

- Although it has not been possible to obtain precise figures, it is estimated that currently three to four million dollars are being spent annually on telecommunications and information technology standards activities in Canada.

  The largest spender in the area are the Canadian telecommunications common carriers, followed by the Federal Government.

- There are a large number of National and International committees working on standardization and similar procedures in the telecommunications and information technology fields, but there is currently no organization responsible for listing, updating or co-ordinating such work.

- There is, throughout both the public and private sectors of the telecommunications industry, a lack of knowledge of the National Standards System and appropriate standards mechanisms for new technologies.

8.2 Recommendations

As a result of the conclusions drawn above the following recommendations are made:

- That the Canadian Standards Association be requested to set up an Information Technology Steering Committee.

- That all current telecommunications and information technology standardization activities be transferred to sub-committees to be set up by the CSA Information Technology Steering Committee.

- That all interested parties be actively encouraged to participate in the Information Technology Steering Committee activities.

- That a joint CSA/DOC Task Force be set up to investigate methods of expeditiously setting up such a steering committee and of transferring current standardization activities to it.

- That the Task Force include in its mandate an investigation of methods of ensuring expeditious but effective action on the part of the Steering Committee in setting up future telecommunications standards.

- That part of the mandate of the Steering Committee be to ensure that all standards set up are considered as candidates for National Standards of Canada.

- That there be included in the mandate of the Steering Committee the formation of a planning committee to ensure that new sub-committees are set up at the appropriate time to deal with the needs of advancing technology.

- That within the mandate of the Steering Committee, there be the formation of a sub-committee concerned with the routine review of all International telecommunications and information technology standards with a view of their use or modification as National Standards of Canada.

- That the Telecommunications common carriers and the Canadian manufacturing industry be encouraged to carry out their own standardization work through the Information Technology Steering Committee, thus allowing Canada as a whole to have the advantage of the wide experience and expertise of these bodies in telecommunication standardization.

- That the Department of Communications organize the setting up of a computerized list of National and International telecommunications and information technology standardization activities, and that this list be updated on a routine basis.

- That the Department of Communications consider the setting up of seminars for the education of all interested parties in both the current telecommunications and National Standards Mechanisms, and on the new mechanisms when they are set up.

* * *

ROLE OF DOC IN STANDARDIZATION: ACTIVITY SCHEDULE

APPENDIX A

TASK	SUMMARY OF TASK DESCRIPTION	STAFF AND PERSON DAYS FOR EACH TASK	TIME
TASK 1 INVESTIGATION OF NATIONAL TELECOMMS STANDARDS REQUIREMENTS	.REVIEW LITERATURE .INTERVIEW KEY FEDERAL, PROVINCIAL AND INDUSTRY PERSONNEL .ANALYSE POSITIONS .DRAW CONCLUSIONS .MAKE RECOMMENDATIONS	KEH - 4 JRW - 5 CB - 3	13 JAN — (3 WEEKS) — 15 FEB 12 PERSON DAYS
TASK 2 REVIEW CURRENT CANADIAN, FOREIGN AND INTERNATIONAL STANDARDS PROCESSES	.INVESTIGATE CURRENT FEDERAL, PROVINCIAL, INTERNATIONAL, FOREIGN AND INDUSTRY STANDARDS PROCESSES .ANALYSE PROCESSES .REPORT ON NEEDS AND PRIORITIES	KEH - 4 JRW - 2 CB - 2	13 JAN — (6.4 WEEKS) — 15 FEB 8 PERSON DAYS
TASK 3 REVIEW FACTORS AFFECTING FEDERAL & PROVINCIAL AUTHORIZATION, PROMULGATION AND ENFORCEMENT OF STANDARDS	.INTERVIEW KEY FEDERAL, PROVINCIAL AND INDUSTRY PERSONNEL TO GAIN OPINIONS ON JOINTLY ACCEPTABLE METHODS OF ACHIEVING DOMESTIC AND INTERNATIONAL STANDARDS OBJECTIVES .ANALYSE INPUTS .MAKE RECOMMENDATIONS	KEH - 6 JRW - 3 CB - 3	13 JAN — (10.6 WEEKS) — 31 MAR 12 PERSON DAYS
PROJECT CONTROL ACTIVITIES	.CONTRACT REVIEW MEETING .INFORMAL PROGRESS MEETINGS .FINAL REPORT (15 COPIES)	KEH - 1, JRW - 1 KEH - 1 KEH-4, JRW-1, CB-2	10 PERSON DAYS REPORT WRITING 7 PERSON DAYS 13 JAN — 15 FEB — 31 MAR CONTRACT REVIEW MEETING INFORMAL PROGRESS MEETING DELIVER REPORTS

APPENDIX B

BIBLIOGRAPHY OF MAIN DOCUMENTS USED IN THIS STUDY

1. Protocol for Nation-wide Bibliographic Network to be Developed. National Library of Canada News Release Communiqué, December 10, 1980.

2. ISO/TC97/SC6N Data Communication Standardization of the X25 DTE Link Layer Procedure, July, 1981.

3. Lawson, F. Facing up to Competition. British Telecom Journal, Volume 2, Number 3, Autumn 1981, pp. 17-19.

4. Agreement of Technical Barriers to Trade. General Agreement on Tariffs and Trade, Geneva, 1979.

5. Downey, Blaise. Forming an Attachment for Interconnection. Enterpriser, Vol. 4, No. 8, pp. 25-33.

6. Benson, Robert J. Have I Gotta Phone For You! Businessbeat, July/August 1981, pp. 24-38.

7. Discussion Paper for the Future Implementation of the Terminal Attachment Program - Telecommunications Regulatory Service DOC. March, 1977.

8. G.F. May, P. Eng. Canadian Terminal Attachment Standards Development Process. Paper presented at the International Electrical, Electronics Conference and Exposition (IEEE) Toronto, Oct. 1981.

9. Telecom Desision CRTC 80-13. Bell Canada - Interim Requirements Regarding the Attachment of Subscriber Provided Terminal Equipment, CRTC. August 5, 1980.

10. The Terminal Attachment Program Description. TRC-35-Telecommunications Regulatory Service, DOC April 30, 1976.

11. M. Melnyk, M. Mar, The Canadian Terminal Attachment Program. Paper presented at NTC'81, New Orleans, 1981.

12. Report on activities. 1981 Edition. International Electrotechnical Commission.

13. The Canadian Contribution to International Standards. Standards Council of Canada.

14. ISO/IEC Code of Principles on "Reference to Standards". ISO/IEC Guide IS-1977E. ISO/IEC Standards and the consumer 1981.

15. Adoption of International Standards in National Standards. - ISO/IEC Guide 21-1981(E).

16. Assessment of Draft ISO & IEC Standards for Implementation as Canadian Standards - Standards Council of Canada - July, 1979.

17. Extracts from ITU Telegraph and Telephone Regulations.

18. Alberta PUB decision No. E81235 Section 8 - Technical Standards.

19. Letter A.T. Tateishi, Director Government EDP. Standards Committee Secretariat, DSS, to chairman of CSA Committee on Data Communications.

20. Into the Second Decade, the National Standards System of Canada - CAN-P-5A, Standards Council of Canada - October, 1980.

21. Joint Statement in Respect to Petitions to the Governor in Council to Vary or Rescind CRTC Telecom Decision 80-13. May 7, 1981.

22. Criteria and Procedures for the Preparation and Approval of National Standards in Canada. - CAN-P-2G - Standards Council of Canada, June, 1981.

23. CSA 1981 Standards Catalogue.

24. CNO/CCI.

25. Waller, F.M., Interconnection in Perspective, Internal Memo, Maritime Telegraph & Telephone Company Ltd., February 15, 1972.

26. ATT News Release on Bell System Divesting Decree.

27. Report - V.C. MacDonald, "Observations and Recommendations - standards: Office Communications" March 5, 1982.

28. Current Projects and Published Standards in Communications Technology Including Telecommunications and Related Fields - Canadian Standards Association.

29. Equipment Electrically Connected to a Telecommunication Network - Canadian Standards Association, February, 1982.

30. Packet Assembly/Disassembly (PAD) Facility in a Public Data Network - CSA Standard Z2443.43.2, 1981 Canadian Standards Association.

31. Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on Public Data Networks - CSA Standard Z243.38, 1980, Canadian Standards Association.

32. Working with Vidoe Display Terminals, Information for Employers and Employees - Ministry of Labour, Occupational Environment Branch, Province of British Columbia.

33. Standards Council of Canada - Annual Report, 1980-1981.

34. Report of the Communications Research Advisory Board 1980-81 - Department of Communications.

35. Telecommunications in Canada - Phase 1 Interconnection - Restrictive Trade Practices Commission - Consumer and Corporate Affairs, Canada.

APPENDIX C

STANDARDS PROJECT

INDEX OF INTERVIEW AND MEETING REPORTS

a) Mr. John Gilbert, Director, International Telecommunications Branch, DOC, January 15, 1982.

b) Mr. Ben Watson, Manager, International Secretaries, Standards Council of Canada, January 22, 1982.

c) Mr. Max E. Melnyk, Chairman, Terminal Attachment Program Advisory Committee and Chief Interference and Interconnection Division, Engineering Programs Branch, DOC, January 29, 1982.

d) Jacques Lyrette, DOC Regional Director, Quebec, February 1, 1982.

e) Vince Hill, Director General, National Telecommunications Branch, DOC, February 2, 1982.

f) Bob Bennett, Director of Network Development, DOC, February 2, 1982.

g) Ken Hepburn, Assistant Deputy Minister, Spectrum Management and Government Telecommunications, DOC, February 2, 1982.

h) Guido Henter, Director General, Government Telecommunications Agency, February 2, 1982.

i) Des Dymond, Vice-President, Standards, Canadian Standards Association, February 3, 1982.

j) Tom Mimee, Manager, Government Relations, Electrical and Electronics Manufacturers Association of Canada (EEMAC), February 4, 1982.

k) A.R. Bastikar, Director, C.C.I. Activities, International Telecomms Branch, DOC, February 5, 1982.

l) F.M. Waller, Chairman, Atlantic Committee on Communications, Council of Maritime Premiers, February 9, 1982.

m) Dave Colville, Director of Communication Policy, Department of Communications, Government of Nova Scotia, February 9, 1982.

STANDARDS PROJECT

INDEX OF INTERVIEW AND MEETING REPORTS

n) R.W. Wilson, Assistant Director, Standards, TransCanada Telephone System, February 11, 1982.

o) Jim Barry, Director, Network Development and Standards and Carl Strahlendorf, Assistant Director, International Standards both from Headquarters, Technical Development, Bell Canada, February 15, 1982.

p) Mr. J. Patry, Director, Tariffs and Rates Marketing, CNCP Telecommunications, February 16, 1982.

q) Mr. Tom G. Moore, P.Eng., Data Terminals and Facsimile Engineer, CNCP Telecommunications, February 16, 1982.

r) Mr. Bob P. Bulger, Director, Communications Operations Branch, Communications Division, Ontario Ministry of Transportation and Communications, February 16, 1982.

s) John C. Howard, Manager, Engineering Pacific Region, Department of Communications, February 17, 1982.

t) Mr. Phil Riddolls, Telecommunications Consultant, Pacific Region, Government Telecommunications Agency, February 17, 1982.

u) Mr. Hal Halladay, Regional Director - Pacific, Department of Communications, February 17, 1982.

v) Meeting between Dr. J.R. Whitehead (P.A. Lapp) and V.C. MacDonald (DOC), February 17, 1982.

w) Meeting of the Government EDP Standards Committee - Data Communications Workers Group - Attended by Dr. J.R. Whitehead (P.A. Lapp), February 18, 1982.

x) Terry Prentice, P.Eng., Director - Communications Development Branch, Government of British Columbia, February 19, 1982.

y) Mr. Harold Page, Assistant Deputy Minister (Communications), Government of British Columbia, February 19, 1982.

STANDARDS PROJECT

INDEX OF INTERVIEW AND MEETING REPORTS

z) Mr. Don MacMillan, Deputy Minister of Communications Government of Saskatchewan and Mr. Richard Simpson, Director, Communications Secretariat Government of Saskatchewan, February 25, 1982.

aa) Mr. Fraser Lee, Vice President Network Services, Saskatchewan Telecommunications, and Mr. Bruno Petschulat, Saskatchewan Telecommunications, February 25, 1982.

bb) Mr. Peter Noden, Senior Policy Adviser, Department of Utilities and Telephones; Government of Alberta, February 25, 1982

cc) Mr. Doug Smith, Deputy Minister of Telecommunications, Government of Manitoba, February 26, 1982.

dd) Mr. Fred Kaita, Manager: General Staff Engineering Group, Manitoba Telephones, February 26, 1982.

ee) Mr. Stu C. MacPherson, Director General, Operations, Telecommunications, CRTC, February 25, 1982

WHITEHEAD, J.R.
A study of the role of the Dept. of Communications in telecommunications standardization