A Study of the Issues in Canadian Information Technology and Telecommunications Standards

December 1992

TECH TEAM
MANAGEMENT INC.

TECH TEAM
MANAGEMENT INC.

Tel. 416-237-9177
Fax. 416-237-9178
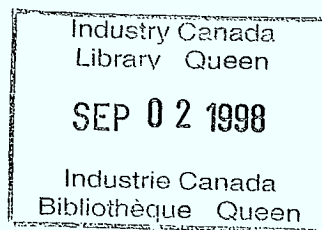
November 30, 1992.

Mr. Michael Binder,
Senior Assistant Deputy Minister,
Research and Spectrum,
Communications Canada,
300 Slater Street,
Ottawa, Ont.,
K1A 0C8.

Dear Mr. Binder:

We are pleased to provide you with our final report entitled,
"A Study of the Issues in Canadian Information Technology and
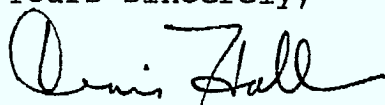Telecommunications (IT&T) Standards".

This report analyses the key strategic issues discussed at
the IT&T Standards Seminars organized by Communications
Canada across the country during June 1992.

The analysis and recommendations reflect the judgement of
TECH TEAM Management Inc. who conducted this assignment. We
accept sole responsibility for our recommendations.

We received excellent cooperation from our many government
and private sector contacts. Discussions were always frank
and open. Dr. Bob Olley and I would like to express our
thanks publicly for this. In particular, we are grateful for
the assistance provided by Ben Ho of Communications Canada in
basic research and data organization.

Our recommendations are presented in the same spirit of
openness which we found within government and the private
sector during our extensive discussions. We would expect that
Communications Canada could accept its opportunity to
spearhead the action needed without encroaching upon the
mandates of other departments of government and without
dictating to the private sector. Progress will be made only
through the coordinated actions of many people, but somebody
has to take the lead.

Yours sincerely,

C. Denis Hall

7 Darlingbrook Crescent, Etobicoke, Ontario, Canada, M9A 3H4
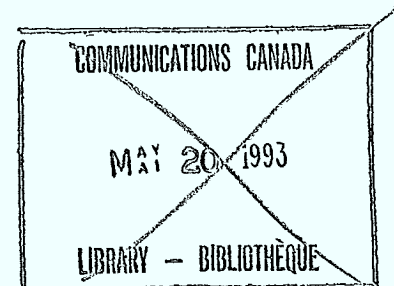
TECH TEAM Management Inc.

Project Report

2. A STUDY OF THE ISSUES IN CANADIAN INFORMATION TECHNOLOGY AND TELECOMUNICATIONS STANDARDS

Prepared for

Communications Canada
Contract Number 36100-2-6410

Benedict H. Ho, P. Eng.
Scientific Authority

Prepared by

Dr. C. Denis Hall
Dr. R. E. Olley

December 1992

PREFACE

I have the pleasure to provide you with a copy of the report entitled "A Study of the Issues in Canadian Information Technology and Telecommunications (IT&T) Standards".

This report presents the analysis of the key findings resulting from the national and regional seminars in IT&T standards conducted by Communications Canada in the 1991/92 time frame. It includes recommendations from TECH TEAM Management Inc., who both participated in the seminars and prepared this report. The recommendations and conclusions are those of the consultants.

I have requested that an action plan be developed by the first quarter of 1993 through the Telecommunications Standards Advisory Council of Canada (TSACC) to address the key findings and recommendations. Communications Canada is prepared to play its part in this work which will contribute to the strengthening of the IT&T standards process in Canada and improved exploitation of standards in the public and private sectors.

I am grateful to all who contributed to this activity and look forward to working with you in this important area.

Michael Binder
Senior Assistant Deputy Minister, Research and Spectrum
Communications Canada

December 1992

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

The Department of Communications had been concerned for some time about several aspects of IT&T standards in Canada. In 1990 the Department established the Standards Program Office (SPO) which in turn conducted a set of workshops across Canada to determine the issues. While these seminars were still running, TECH TEAM Management Inc. was contracted to consolidate the issues thus identified and to propose a set of actionable recommendations.

We have determined that changes to both the technologies and to the business modalities of the Canadian and worldwide IT&T industries over recent years have simultaneously increased the demand for IT&T standards and decreased the availability of resources to manage and execute the standards processes.

This Report lists the issues, provides actionable recommendations and the rational for those recommendations. Our recommendations have been reasonably tested by selected technical contributors to the standards process and then by a group of senior managers who are aware of the issues but who are not involved in the day to day process.

The thrust of our recommendations is that the Department of Communications, within the bounds of its mandate, take upon itself a proactive and leadership role in the evolutionary resolution of the complex set of IT&T standards issues in Canada. This does not imply that the Department unilaterally take over the tasks which others in government or the private sector are already performing. This Report lists specific action items.

The Department of Communications is in a position to make a substantial contribution to the effective management of the IT&T standards in Canada at a time when industrial and technical conditions are such as to warrant this contribution. The investment needed to make a contribution recognizable to both the private and public sector in the near term is no more than the dedicated involvement of three well chosen individuals on a full time basis.

1. BACKGROUND in IT&T STANDARDS

The Department of Communications had been concerned for some time about several aspects of IT&T standards in Canada. An early report on the subject ("The Lapp Report") in 1982[1], states the situation at that time. "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 technology advances which 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 interconnection of subscriber owned terminal equipment to the National, and International telecommunications networks."

The Lapp Report concluded with eleven recommendations, the essence of which were:

- The Canadian Standards Association set up an Information Technology Steering Committee. This implies that the activity comes under the eventual purview of the Standards Council of Canada [then twelve years old] and thus be part of the National Standards System.

- Current standardization activities be transferred to this committee.

- Canadian standards should be based upon international standards.

- Standardization work done by the Canadian common carriers and the Canadian manufacturing industry should be done through the committee.

- The Department of Communications should organize a computerized list of National and International telecommunications and information technology standardization activities.

Since the Lapp Report was written, there has been significant further movement in IT&T technologies and in the socio-economic structure of the telecommunications industry worldwide in the general direction anticipated by that report. It is generally agreed that standardization has taken on increased importance during the past decade.

In 1990 the Department of Communications set up the Standards Program Office (SPO) to address some of these issues. The SPO was staffed with standards professionals who were themselves actively involved in standards committees around the world.

The Department of Communications commissioned a study of the IT&T standards environment in 1990, known as the Salter Report[2]. This report describes the complexities of the national and international IT&T standards situation and at several points lists "Options for a Canadian Response". The report does not recommend among the options. The report does make the following important observations about the environment of 1990. This environment differs from today's only in detail and thus the report remains very relevant.

. Profiles, reference standards and base standards represent new approaches to specifying interfaces while avoiding the over specification of equipment or software. These approaches can be used in conjunction with developing technologies and standards can be generated early in the life of a technology. (p. 28)

. Increasingly, it is the manufacturers who are pushing standardization forward. (p. 42)

. To some extent, government sponsored standardization activity (CCITT) and industry sponsored activity (JTC1) are rivals. (p. 45, 122)

. The British Standards Institute (BSI) has a mandate to coordinate all of the standards related activities in the UK. It has close links to the Department of Trade and Industry. It is highly visible in certification and testing. It represents the UK at European and International Standards organizations, CEN/CENELEC and ISO/IEC. Representation to the ITU and ETSI are through the Department of Trade and Industry to satisfy the formal need for government representation to these bodies, but we note the close links which are maintained between that department and the BSI. (p. 47)

. In Europe, ETSI is able to assign full time staff to an issue which requires quick resolution. This, at least potentially, avoids many of the problems often associated with reliance upon volunteer man power in standards generation. (p. 56)

. The U.S.A. was forced to rethink the telecommunications standards issues with divestiture in 1982. The *de facto* standardization performed by the AT&T could no longer continue and industry (not government) took the initiative to restructure the standards organization. (p. 64)

. There is a need to strengthen the mechanism for interdepartmental co-operation in a Canadian national standards strategy. (p. 125)

The overall message of the report is clear. The issues are complicated by technology, rapidly changing commercial considerations and the involvement of governments. Heavy industry involvement is a new factor in the U.S.A. Heavy government involvement in Europe in the generation of European Community standards is a new factor there. Canada has many options which interact among themselves. Canada is not particularly well organized to generate a strategy on standards for IT&T.

In 1991, the SPO organized the first Canadian Seminar on Information Technology and Telecommunications Standards in Ottawa. In a letter to the participants, The Honourable Marcel Masse stated, "This seminar is designed to help all of us work towards a better understanding of the key strategic issues affecting IT&T standards activities in Canada." In 1992, similar seminars were held in several locations across the country.

The conclusions of the Ottawa seminar were reported by Dr. R.E. Olley[3]. The combined conclusions of the five regional seminars held in 1992 can be found in a report by B. Ho and J.D. Kelley[4]. Neither report tried to settle the issues, but rather identified the important issues across the country.

2.   MANDATE and METHODOLOGY of THIS ASSIGNMENT

The present assignment was designed within the bounds of available resources to define the main issues put forward by the seminars as reported by Olley[3] and Ho and Kelley[4] and to then propose actionable recommendations for resolving the issues.

Our methodology has been straight forward. We first attended two of the regional seminars and then reviewed the reports on those seminars and the report on the National Seminar carefully. This produced a short list of issues which are important to Canada. We then conducted a number of interviews with knowledgeable workers in the IT&T Standards community in Canada. These interviews were aimed at detailing the needs for standards activity and then discovering how these needs could be met more effectively or efficiently than has been the case heretofore. Two small workshops with this same focus were held - one each in Toronto and Ottawa.

Thirdly, we held a set of telephone interviews with active Canadian members of standards working committees. This set of interviews tried to determine the extent of involvement of sample large and small Canadian companies in the standards arena. We wanted to know the size of their annual investment and how they were organized to make use of the information. Who controlled the standards budget? Who made the strategic decisions on standards issues in Canadian companies?

We then met for a full day with Department of Communications management to discuss the implications of our finding and to flesh out our tentative conclusions. With this in hand, we presented the tentative solutions to a group of very senior government and industrial management which has responsibility for Canadian IT&T standardization work, but which is not heavily involved in the daily technical or administrative activity. We hoped that this group would help us make our recommendations acceptable to senior management and thus render them practical.

Finally, we produced this Report for presentation to senior management at the Department of Communications as our analysis of the situation and our recommendations for action.

3. NEW DEMANDS for IT&T STANDARDS WORLDWIDE

The factors which drive the demand for increased standards activity are not well known. However, it seems that increased demand is linked to a combination of the rate of change of technology and the commercial stability of the producers of equipment. The standardization demand is usually triggered by equipment users who want interface standards set so that they are not locked into hardware and software from a single supplier. The users are thereby forcing competing suppliers to stop differentiating themselves at the interfaces. The suppliers are thus forced to stop competing on some aspects and to produce identical functionality in areas which are standardized.

The difficulty experienced in reaching agreement on the wording and content of standards is very dependent upon the sacrifices in commercial advantage which a specific standardization implies. First, competing suppliers have to agree that they mutually have more to gain than to lose through giving up some degrees of freedom to standardization. Agreement is then easily reached when there is little or no equipment in the field and is even easier when the designs are still in their early stages. In this latter case, interface decisions are almost arbitrary and the task of the standardizers is simply to be thorough and to publish their decisions.

When technology is changing very rapidly, standardization processes in the past have had a difficult time keeping up to the changes. Suppliers have seen commercial advantage in being first to the market with new technology. The first requirement for consensus standards - a willingness to give up some degrees of freedom to standards - was thus missing. Additionally, the process has not been seen as responsive and it has sometimes been by passed by the government and the private sector when they wanted to have standards put into place. When a producer has been dominant or an industrial sector has been heavily regulated, *de facto* standards have taken the place of negotiated standards.

It is clear that the technology of IT&T has changed rapidly over the past several years. Now in Information Technology, we see a heavy demand from the user community to have their suppliers standardize interfaces in both hardware and software. The hardware has recently become largely a commodity and the software is rapidly moving toward that status.

In the Telecommunications sector around the world, we currently face commercial instability due to both deregulation and reregulation of the service suppliers[5]. The postal and telecommunications functions in the PT&Ts are being separated. Mergers, joint ventures and alliances within the equipment producer organizations are the order of the day. Telecommunications equipment has yet to reach the commodity status of Information Technology equipment, but it is clearly headed in that direction.

In the face of commoditization of both the Information Technology and the Telecommunications industries combined with commercial instability, the user communities are demanding interface standardization. The providers who want to hold their market shares are thus willing to cooperate with their customers and their competitors to take the production of consensus standards ever more seriously, and they become the active standards setters.

Everything is further complicated by the fact that the computing world is emerging as a large user of telecommunications. End user software is increasingly the "user" of the communications network. The end user wants transparent operation and is pushing for functional standards and interfaces which require interactive simultaneous agreements between computing equipment suppliers, telecommunications equipment suppliers, network providers and a multitude of software suppliers. Telecommunications suppliers tend to be regulated. Telecommunications standardization mechanisms have evolved through government channels[2] p122. Computing standards have evolved primarily in the private domain.

We observe that rapidly changing technology in the architecture of communications networks may simplify the tasks of standardization in this strategically central field of endeavour just when we much need this help.

We see the emergence of large new communications subsystems such as ISDN (Integrated Switched Digital Network), SONET (Synchronous Optical NETwork) and ATM (Asynchronous Transfer Mode). For the first time, the providers of the equipment were willing to settle the major standards issues at the system interfaces before they made equipment available. These systems are complex enough that the suppliers know that they will have minimal sales unless they can give some considerable comfort to prospective users that the interface problems had been settled.

Because of the complexity of the systems issues, problems in getting agreed standards have become less over time! Suppliers have many degrees of freedom left with which to differentiate themselves commercially after they have given up some degrees of freedom through standardization at the interfaces. And their customers insist on the standards at the interface prior to purchasing these major new systems anyway. The risk of functional obsolescence to the purchaser would be too great otherwise.

If we go back to the days of standardization attempts on PCM (Pulse Code Modulation) in the early 1970's when operating equipment was already in widespread use, the world had to settle for two standards on rate and companding laws[5]. Agreement on ISDN was reached only after a considerable struggle and there are still several options which are "acceptable". The agreement on SONET was reached relatively easily. The agreements on ATM were reached quickly and published by an adhoc group calling itself The ATM Forum which had no formal linkages to standards bodies. This Forum had been formed by four interested parties to set consensus protocol standards for this emerging multi media high bit rate digital switch, but its membership now numbers about one hundred.

In summary, the end users of IT&T equipment are demanding standardization at equipment interfaces. The user is unwilling to make an investment in large system proprietary technology without an interface standard in place to protect his investment. The suppliers are forced by commercial necessity to cooperate on standards generation. The users sit on the sidelines as largely uninformed guards insisting that their hostage suppliers agree among themselves quickly. Almost any water tight agreement will be good enough, but QUICKLY. A list of the IT&T standards committees of greatest interest to the Canadian community are listed in Appendix I of this Report.

This atmosphere may place the small supplier in an awkward position. He is often not in a position to donate his prime technical expertise to the standardization meetings - much less contribute to the management of the process. At the same time, the major contributors do not take kindly to helping out their smaller competitors by keeping them up to date on strategic issues.

4.   CURRENT CANADIAN IT&T STANDARDS ISSUES

We take our base of current Canadian IT&T standards issues from the two reports which record the conclusions of the National Seminar held in Ottawa in May 1991[3] and the regional seminars held in mid 1992[4].

The Olley Report[3] on the National Seminar declares that the participants at that seminar wanted the Department of Communication to "take the lead in a number of undertakings, acting as the leader, the facilitator, or the promoter, as the case may require." (p. 19) Accordingly, it should act under the following board strategic considerations:

. Canada should support the ITU and ISO/IEC as truly international organizations

. Canada should lead in international standards work when it has an advantage in technology, but otherwise it should largely adopt resulting standards

. Canada needs a national industrial strategy in IT&T before it can proceed very far toward having a national standards strategy. [TECH TEAM Management views this as impractical. An operational strategy for IT&T standards can be generated without formally resolving the issue of a national strategy for the IT&T industry.]

. User emphasis is on interoperability

. The requirement to streamline the Canadian IT&T standards system stems from a demand that standards be produced more quickly

. We should be reluctant to create new standards institutions or more elaborate bureaucracies

The report goes on to list nine recommendations. Those recommendations not already clearly implied in the foregoing are as follows:

. Evaluate the differences between the methods used to develop Information Technology (IT) standards versus those used to develop Telecommunications (T) standards. Will the SCIT model work in the telecommunications sector?

. Evaluate the possible effectiveness of an award system to encourage participation by individuals and firms in the standards process

. Promote the use of IT&T standards in all government procurement

. Develop a series of seminars to promote the strategic importance of standards at the senior management level in Canadian industry

. Develop a clearly understood advisory mandate for TSACC

. Immediately promote the international acceptance of test results

. Immediately lead the exploration of new ways to obtain financial and human resources for standards development

The thrust of the Olley Report[3] is thus that the Department of Communications should provide leadership in any form which might be needed to develop a standards strategy in IT&T. The framework for this strategy should be the promotion of international standardization and the involvement of Canadian industry as strategic partners.

The Ho and Kelley Report[4], on the regional seminars, is rich in a diversity of local issues as one might expect from the series of regional seminars. Many of these local issues will quite naturally be addressed as the more national issues are attended to. At the end of this report (p. 31), Ho and Kelley[4] list the eleven key common issues presented by the regional seminars. Of these, four cover ground beyond that addressed by the participants in the Ottawa seminar and reported by Olley[3]. These are:

. The body of IT&T standards and knowledge of the current activity on these standards is not easily accessible to Canadian industry in general

. Canadian IT&T standardization activity seems to be centred in the Ottawa/Montreal/Toronto triangle. Can we generate regional focus points?

. Canada should become more involved with the strategic issues of standardization bodies in the U.S.A. and Europe

. Certification/test centres should be established regionally across the country [We believe that the CSA testing modality under which as much testing as possible is done in the client's facility under CSA supervision is more appropriate.]

Thus, we see that the additional plea from the regional seminars is for additional two way information flow on IT&T standards to those Canadians who are outside the Ottawa/Montreal/Toronto triangle.

Although many issues were identified in the Olley[3] and the Ho and Kelley[4] reports, an examination of highlights listed in this report indicates that the re are really four major issues as follows:

1.   Can we reduce the manpower required to manage IT&T Standards? If so, how?

2.   How can small companies get better access to early information on developing standards?

3.   How can we get senior management in Canadian industry to treat standards as a strategic issue?

4.   What is the appropriate role for government?

To these four issues, we add the related issue from the Olley recommendations[3] as to how the Federal government might best use its purchasing power to reinforce the use of IT&T standards in Canada.

5.   CORPORATE PARTICIPATION in IT&T STANDARDS ACTIVITY

We conducted a set of telephone interviews with Canadian individuals who participate actively in Canadian IT&T standards activities. Appendix II contains a copy of the interview guide. Candidates for these interviews were chosen from standards committee membership lists which we gathered from the CSA and the SCC. We made an effort to include in our selection a good range of product types (computing hardware, telecommunications hardware, software) and company sizes.

From these interviews we can conclude that:

.   The vast majority of funding provided by the private sector for IT&T standards work is controlled by individual product primes who have responsibility to their corporations for the eventual commercial success of specific products. The funding is accounted for as part of the expense of supporting a specific product or a product line. It is thus difficult to get support for generic standards work or for the administrative functions such as Steering Committees or in some cases even for committee chairmanships.

.   The direct participants in working committees tend to be technically oriented individuals who now occupy staff positions in their home organizations and who have little or no staff reporting to them.

.   The direct participants are usually involved in several committees each, nationally and internationally.

.   Within established budgets, the direct participants have the effective final signing authority for significant discretionary funds ie. most have the final effective authority at the $5,000 level.

.   Although the annual expenditure of time per year varies considerably, participants from the smaller companies indicate that they typically spend one third to half of their time in preparing for and attending standards meetings. In most cases, the remaining time is spent internally with product development and marketing people on standards related issues.

.   In the very large companies, there are a few people who spend full time on standards issues. In the same companies there are five times as many people who are involved marginally in the formulation and analysis of standards positions (usually relative to a specific product).

.   A surprising number of the committee chairmanships are held by individuals from government or from the very large companies.

Our general conclusion is that the standards process is limited financially by people with accountability for product line profitability and who thus take a relatively short term view in their funding decisions. The direct participants are highly regarded as very intelligent technologists. They are entrusted to make important decisions on the spot, but in general they are not in a particularly strong position to influence the level of standards activity in their companies.

6. LOOKING FOR SOLUTIONS

We conducted several in person interviews and two small workshops. The one-on-one interviews and the workshops involved only senior participants in the Canadian IT&T standards community who have had many years experience nationally and internationally. Our approach was to present our four issues and to then stimulate a wide ranging discussion on the solutions. Such a discussion was necessary because the solutions themselves interact in ways in which it becomes essential to address the issues in groups or as a whole. We came away from these meetings with the following points:

. **Overlaps in IT&T standards activities in Canada and worldwide are due to history.** Standards activities are for the most part set up in good faith to solve real problems. The committees can then take on lives of their own and may sustain themselves for almost social reasons. There are very few forces in place to force disbandment. Two meetings per year can become perquisites to the attenders given the loose control which their home organizations hold over them. This is not to say that the majority of committees find themselves in this mode of operation.

Standardization problems know few natural boundaries. The activities of committees from differing administrative organizations expand independently to meet new needs and overlaps occur. Senior standards administrators are aware of this tendency and they do try to guard against it. However, they face major tasks of moral persuasion in their efforts to rationalize activities. After all, they are dealing primarily with volunteers in both camps who may not know those in the other committees well enough to simply hand over control of an issue without considerable negotiation. We have to remember that the volunteers are funded primarily by product primes in their home organizations. They feel rightly responsible to those funders in assuring that the home organization is not blind sided!

. **It seems to us that industrial associations can play a larger role in IT&T standardization activity in Canada.** These associations have the requisite industrial contacts. Their management is motivated to be seen to be doing things in the interest of their memberships. The associations might be in a good position to arrange for the sharing of representational duties among members and thereby reduce the overall cost of access to current information. The Government of Canada could consider assisting the associations financially in this effort. The government could also consider subcontracting some standards activities to the associations.

. **Industrial retirees might perform some standardization activities very cost effectively, if their activities were actively coordinated and managed.** In many cases, the appropriate activity might be more of a reporting function - including reports from international meetings - than an input function. The important input functions are most likely to be driven directly by industrial product primes.

. **Government can be accepted as a major strategist in standardization activity.**

. **There is a general willingness worldwide to eliminate duplicate effort in standardization work, but the initiative to spot the duplication and then to invest the time in negotiations to eliminate it must come from individuals.** Those who have the overview knowledge necessary to execute these tasks successfully are usually very busy with other tasks ie. this task is not at the top of their list of priorities.

. **It is in Canada's interest to promote multinational standards committees as the existence of these committees will minimize the man hours for Canadians.**

. **Canadian companies should be easily convinced that an aggressive stance in producing technical input to standardization committees internationally is an important route to enlarged international sales.**

. **The benefits and costs of an electronic infrastructure which supported standards work in Canada is worthy of serious investigation.**

In summary, these workshops and interviews tell us that there is a role for government in IT&T standards strategy and infrastructure support. In general, there is not a role for government in standards content. There are probably opportunities to improve the efficiency and effectiveness of Canadian IT&T standards activity, but there is little likelihood that the direct participants will be very motivated to take on the tasks given the short term focus of their funding sources and their home company agendas. For the overall good, this effort must come from government.

7.   THE FINAL WORKSHOP

On October 5, 1992 we held a four hour workshop during which we presented our factual findings and then our tentative conclusions and suggested action items. The workshop was very well attended with representatives from the DOC; Industry, Science and Technology, Canada; Treasury Board; Bell-Northern Research; Canadian Standards Association; Unitel; Stentor; Standards Council of Canada and The Canadian General Standards Board. Attendance totalled 18 persons.

The workshop was asked to interactively comment upon the facts which had been gathered by this study as those facts were presented. There was very good participation. Comments were short and to the point. Participation was broadly based.

With that as a background, we then presented our tentative conclusions and suggested action items. There was general agreement on both fronts and several points of view were offered to better focus the material.

Key new points made during the presentation and discussion of the facts were:

. For the benefit of both our suppliers and users, Canadian standards should be operationally compatible with international standards.

. The key objective of standards work is to negotiate the acceptance of common standards globally. Commercially, this is an order of magnitude more important than is the acquisition of technical knowledge which may occur in the process of negotiation.

. There is an increasingly important component of standards ie. the standardization of services as seen by the end user. The services are becoming more complex and the standardization of the services and the human interfaces to them is important to the widespread marketing and use of these services.

. Company downsizing has removed people who were in the past available to support the standards infrastructure. Company focus is becoming increasingly short term. Participation in the standards process draws on scarce knowledgeable people. If the infrastructure faces attrition, we will see the generation of more informal committees which always operate to the disadvantage of the smaller companies and countries.

. The smaller firms can make valuable contributions to standards work, but they often lack the human and cash resources to participate fully.

. Standards are becoming increasingly complex. Standards have to address both the system interface definition and issues such as physical design, physical appearance and electrical safety. These latter issues today may represent 20% of the effort required while the interface definitional work is the other 80%.

. There is a danger that standards professionals take the external part of their jobs so seriously that they fail to impart their knowledge effectively internally in their own companies. This part of the process has to be better managed.

. There may not be much "political" will to change the standards infrastructure. We can easily get out of step with the world standards community when the needed rate of change in organization is high.

. There is worldwide criticism of standards bodies for their perceived slowness in performing their tasks. As a result, various standards consortia have sprung up which claim that they can do the job more quickly. The Canadian standards community has to keep an eye on these consortia because important decisions are being made there.

. The interface of the standards community to senior management cannot be the same as its interface to the technical participants. Senior management has neither the time nor the interest to deal on the detailed technical level. Today, the vast majority of our material in the standards community is structured for the technical part of that community. We have very little material in the IT&T standards world which deals appropriately at senior management levels.

. We do not do a very good job of communicating existing standards. Standards have to be communicated before they are used in procurement documents. We are missing the point if we think that the end purpose of standards management is to get a standard produced. The end purpose is to get the standard widely understood, used and accepted in application. The developers of standards will naturally take their knowledge back to their own organizations. They do not naturally provide information to purchasers - let alone the universities, technical schools and to the general public.

. In seeking solutions to the organizational fragmentation at the Department of Communications, we must remember that to some extent this fragmentation has been driven by and somewhat reflects the same entrenched functional fragmentation in the private sector. The larger private sector firms often have different people dealing with TAPAC, CNO, spectrum and product issues while the smaller firms seldom deal with the full set of issues.

. It is important to emphasize electronic means of distributing standards material and electronic means of managing the standardization function.

. We are faced with the dilemma that the volunteer standards community is asking for man hours to provide the leadership functions for the volunteers. There are many organizations in our society which have a full time director, full time management and infrastructure support, but which rely on volunteers to provide the bulk of the working hours.

. We cannot jump to the conclusion that the situation in IT (information technology) standards management is the same as for T (telecommunications) in Canada today. The situations are different due both to commercial and technical considerations. It is important no to try to make one solution fit both circumstances without clearly understanding the differences which probably exist.

We found all of this input most useful. Some of it restates points which we have recorded previously and therefore shows congruency between the views of the standards professionals and the more senior management cadre. Other points come directly from a management prospective rather than from a technical prospective. We feel that these comments will remain very useful guides to the implementers of the action items listed in the next section of this Report.

8.   RECOMMENDATIONS

The terms of reference under which the work reported here was undertaken, included a request that we make specific recommendations for action by the Department of Communications.

The thrust of our recommendations is that the Department of Communications take upon itself, within the bounds of its mandate, a proactive and leadership role in the evolutionary resolution of the complex set of IT&T standards issues in Canada. This does not imply that the Department unilaterally take over the tasks which others in government or the private sector are already performing.

Previous sections of this Report have made it clear that there are five reasonably well defined generic issues to be resolved in the area of IT&T standards, as they affect telecommunications or touch upon the use of telecommunications systems.

The first of these is the role of government. This is potentially a very broad question because there are several federal departments beyond the Department of Communications, and there are several provincial governments which have more-or-less well developed interests in IT&T standards. The present Report focuses upon the Department of Communications in its direct roles, and as a facilitator or prime mover to stimulate broader government action.

The second issue is the question of how to involve smaller companies in the standards development processes. This involves participation in the writing/adaption/endorsing of standards, the acquisition of technical knowledge, the integration of smaller companies into the network of contacts which develop during standards development, the ongoing information as to what standards require of products when they are marketed both at home and abroad.

The third issue is senior management awareness of the requirements of the overall standards management systems in Canada, and, perhaps more importantly, understanding of the strategic implications of standards and the infrastructure required for their orderly management.

The fourth issue is Federal Government procurement processes. This is not directly a responsibility of the Department of Communications. There is no implication created by raising the matter that the Department of Communications should attempt to expand its authority in this direction. Rather the point is that if standards are good in some relevant sense, then the quite consistent reference to standards in the Federal Government procurement documents will greatly reinforce Canadian commercial interest in supporting the standards processes.

The fifth issue is the broad and somewhat nebulous question of how to streamline the standards development and management processes in Canada. There are several complex dimensions to this issue. One is simply the provision of a focus so that users can quickly determine which agency to approach to obtain full information. Another dimension is to reduce the overlap and duplication of resource demands from both the technical committees and the infrastructure. A third dimension is to reduce the development interval for standards. A fourth element of the issue is to increase the degree to which international standards are adopted, or at least the degree of full technical harmonization of Canadian standards with international standards. Finally, there is the question of coordinating standards in different IT&T areas so that they are compatible with one another as technology develops. These dimensions are all interrelated and yet sufficiently separable that there are strong tendencies to solve the issues independently and thus suboptimally.

In respect of all these areas the Department of Communications can play a most useful role in two ways. Sometimes it would act directly as a leader in a partnership in getting a solution accepted. At other times, it would act as a prime mover to perform as the agency responsible and with acknowledged prime interest to get barriers to its proposed actions removed from within a diverse network of government departments, other governments, standards bodies, industry associations and private interests. Either way, the Department of Communications would accept the responsibility to promote actively the efficiency and effectiveness of the Canadian standards system for IT&T standards. Accordingly, the findings of this Report, presented above, lead to a number of recommendations.

8.1 The Active Role of the Department of Communications

Our findings indicate that the Department of Communications is a welcome partner in the standards writing and management process. At the same time, in a well functioning consensus standards environment, neither it nor any other agency should dictate standards. To the extent that the consensus standards process is perceived as being unresponsive to government and/or industry needs, this issue should be addressed. In short, the multi-partite consensus process for developing standards is widely recognized to be capable of leading to the production of very good standards with a built-in mechanism for keeping them current. All interest groups - or stakeholders - should have ample opportunity to have their points of view heard and to influence the standards outcome. The consensus process requires manpower and leadership.

In these regards, we recommend that the Department of Communications make a start by undertaking the following actions:

a. The Department of Communications should declare that, within the bounds of its mandate, it accepts responsibility to be the leader in promoting efficiency in the working of the standards system for Canadian IT&T standards. The Department should specifically recognize the coordinating role of the Standards Council of Canada, the responsibilities of other Federal Government Departments (the Treasury Board in particular) and the interests of the provincial governments. Nevertheless, the Department would declare its willingness to assist all parties and its active desire to promote an efficient and effective standards management system.

b. The Department of Communications should visibly coordinate its own standards work and quite specifically the work of TAPAC, the Standards Program Office (SPO), CNO/CCITT and TSACC. Those outside of the Department must perceive a strong and coordinated strategy on IT&T standardization from within the Department if the Department is to creditably take on a leadership role for Canadian IT&T standardization activity.

c. The Department of Communications should become visible and clearly active in proposing and promoting improvements to the IT&T standards management processes. The Department would both originate proposals and actively promote those proposals originating with other groups which it deems to be constructive. It would continuously meet with interested and affected stakeholders to seek consensus in making changes to processes which will improve efficiency.

d.   In order to implement the previous recommendation, the Department of Communications should add two or three full time people of senior positions and strategic capabilities. These people would consult frequently and regularly with groups in the area of IT&T standards in order to synthesize ways to improve the IT&T standards processes. Their work would include the moulding of formal and informal proposals which might come from any source. Accordingly, the work would be interactive and recursive until the desire for change had been crafted into formal or informal agreements among the stakeholders to undertake a coordinated and self-consistent set of changes.

e.   There are actual and incipient shortages of people to carry out the operational functions in some technical and managerial areas, both domestically and internationally. The shortages are being generated as the margins available to IT&T laboratories and manufacturers of IT&T equipment shrink. This, coupled with the lack of understanding at the senior management level in these companies in Canada of the need for the long term support of standards work, will act most quickly to the detriment of the smaller firms. The larger firms will shorten their standards horizons. The Department of Communications should identify specific manpower shortages and investigate resource strategies to address this shortfall. Suitable low cost resources could be obtained from industrial associations and/or through the part time employment of retirees.

It is very important that such contracts be managed in detail by the Department. Standards management produces two important by-product benefits for those who participate. The first is the technical information and the second is a very valuable network of personal contacts. It is therefore important that those who carry out these government sponsored contracts impart their knowledge and that they couple other Canadians to their personal contacts.

Management of the contracts would thus include a very strong emphasis on the effective distribution of the technical information and its associated commercial implications to those Canadian firms with a need to know. New contacts would have to be made and passed on effectively and sensitively. Contractor performance in these regards would have to determine their level of on going participation.

8.2   Involvement of the Smaller Companies

As we have made clear earlier in this Report, it is difficult for smaller Canadian companies to become involved in the standards development and management processes on an on going basis. This is partly because of the cash outlays involved, but most importantly because the smaller company cannot afford to have relevantly qualified personnel away from their operational activities for the time required to make important contributions and thus to gather the available intelligence effectively.

Moreover, there are wide differences among the interests of small companies. Many wish only to receive advanced warning about probable changes to relevant standards. Others want to actually influence the standards so that their particular products will qualify as compliant. Still others want to simply insure that their products are not rendered non compliant through ignorance or omission. In other words, the smaller companies have a wide range of the degree of involvement which they would find to be cost effective. Unfortunately for these smaller companies with partial interests, there is little room for or tolerance of "partial" involvement in the standards processes today.

We recommend that the Department of Communications begin to respond to these various needs in the following ways.

a.   The Department of Communications should provide a regional focus for IT&T standards information through its regional offices. By this we mean that the Department should make the provision of such information a regular part of the duties of its regional offices and that it should publicize to local industry the availability of this information service.

Just how this should be done in practice is beyond the scope of this Report. The Department might consider everything from using locally knowledgeable access to Standards Council of Canada databases to the active building of profiles of the needs of local companies for specific standards information.

b.   The Department of Communications should encourage its regional officers and the members of the proposed standards unit at headquarters to visit the smaller companies with offers of assistance on standards issues. To act on this recommendation, the Department will have to define its service offerings. These might run the range from promoting awareness of the availability of assistance in the search for standards information to running regional workshops or arranging for quite direct connection between the companies and selected standards work nationally and internationally.

While we recommend that the Department initiate and promote these activities, it could well be that some other government department, industrial association or combination of these and its own staff, could actually provide the services.

c. The Department of Communications should make standards a regular agenda item at its regional management meetings. The intent of this recommendation is to keep standards activity and knowledge of this activity before the management group and thus at the forefront of its thought as it deals with its public.

d. Financing the participation in standards development is perceived as a serious problem in many small companies although the actual sums involved are not large by most measures. We recommend that the Department of Communications initiate exploratory discussions, first with Industry, Science and Technology, Canada, and if warranted then with the Department of Finance and with Revenue Canada, Taxation, to determine whether it might be effective to develop a tax based incentive to company involvement in standards. If it is deemed to be an effective incentive, the mechanism for its delivery might be as simple as instituting an administrative practice in Revenue Canada, Taxation, to accept as Scientific Research and Exploratory Development (SR&ED) any time and expenses which were put into standards work associated with product SR&ED. This simple move would have the effect of making small companies eligible for refundable tax credits in this regard.

8.3   Senior Management Awareness

The nature and level of interest in IT&T standards is changing today in Canada because of changes to technology and business practices. To a large extent, senior management in Canadian firms does not yet understand the new demands which these changes make on private sector support for standards management.

Standards management in IT&T in Canada has worked reasonably well in the past and only now are signs of distress emerging as the new pressures of technology and changing business modalities are brought to bear. Members of the technical committees have generally speaking come from specific product areas within companies, while participants in the standards management infrastructure have come from the larger industries and from government. Monetary support has come largely from the larger companies, governments and industry associations.

With reducing IT&T industry margins, support in both cash and man hours is becoming increasingly scarce - particularly for the longer term infrastructure support. There is little explicit awareness that without the infrastructure, the technical committees cannot function indefinitely with perceived legitimacy. The need for perceived legitimacy is proven dramatically by the observation that successful adhoc standardization groups soon make moves to get themselves integrated into the more formal standardization community.

Although it may have been perfectly valid for senior management to leave standards issues to their technical experts and the middle management cadre of their marketing organizations in times of a stable business environment, it is not valid today in the IT&T world. The infrastructure now requires senior management endorsement and support. It is now important to make a concerted effort to raise the awareness of senior management to the longer term strategic significance of IT&T standards, and the associated importance of keeping the infrastructure functional. Accordingly, we recommend as follows:

a. The Department of Communications, working with bodies such as TSACC and industry associations, should take the lead in developing a centrally organized three year campaign to senior marketing people throughout the IT&T industries in Canada. The objective of the campaign will be to sensitize senior management to the importance of standards management and to portray the standards infrastructure as a key long term need for the successful national and worldwide marketing of their products.

The Department might wisely choose to implement this recommendation through industrial associations - with or without contractual support to those associations.

8.4   Federal Government Procurement to Standards

As a very large purchaser of IT&T products and services, the Federal Government can both reinforce the importance of standards and contribute to their management. To fully mobilize these two forces in aid of an efficient standards system, we recommend that:

a. The Department of Communications provide all the support feasible to assist Treasury Board in setting and enforcing IT&T standards within government. In parallel, the Department should see what it can do to encourage provincial and municipal levels of government to follow the lead of the Treasury Board.

8.5   Streamlining Standards Development

Pursuit of efficiency in the standards management process involves streamlining it wherever possible. We have already noted in this Report that there appear to be areas where overlaps between parts of the standard process in Canadian IT&T standards management. These overlaps occur at both the technical levels and within the management infrastructure. As we have also noted, these overlaps arise innocently, but their eliminations cannot be ordered - they have to be negotiated.

Committees individually define their functions in order to meet their own mandates which legitimately evolve with changes in both technology and business modalities. Overlaps develop over time because the technologies know no natural boundaries and competition produces overlapping spheres of business. Thus, the task of restructuring will be complex and time consuming. Many people will have to be convinced that any changes sought will not unduly expose them and their enterprises to extra risks in standardization management. Rationalization will therefore be very difficult to achieve unless it is under the aegis of knowledgeable, trusted senior people who have the time to negotiate and renegotiate until satisfactory restructuring is agreed. We therefore recommend that:

a. The Department of Communications recognize that streamlining will be the result of delicate and intricate negotiations, and it therefore commit strategically oriented people from its full time staff to this task.

We regard these recommendations as the most effective starting point for a visible and effective contribution by the Department to the management of IT&T standards for the benefit of Canadian industry in worldwide markets. We expect that the personal interactions fostered by these initiatives will lead to additional commercial successes. We would expect to see the nature of the Department's involvement to change over time as the real needs of the IT&T industrial and user communities change.

9.   CONCLUSIONS

The Department of Communications is in a position to make a substantial contribution to the effective management of the IT&T standards in Canada at a time when industrial and technical conditions are such as to warrant this contribution. The investment needed to make a contribution recognizable to both the private and public sector in the near term is no more than the dedicated involvement of three well chosen individuals on a full time basis.

REFERENCES

1.   Philip A. Lapp Limited, "A Study of the Role of the Department of Communications in Telecommunications Standardization", Department of Communications, June 1982.

2.   L. Salter and R. Hawkins, "The Standards Environment for Communications and Information Technology", Vol. 1, Communications Canada, March 1990.

3.   Dr. R.E. Olley, "Rapporteur's Report on Canadian Seminar on Information Technology and Telecommunications Standards", Department of Communications, May 9-10, 1991.

4.   B. Ho and J.D. Kelley, "Report of the Five Regional IT&T Seminars Organized by Communications Canada SPO and Regional Offices - June 1992", Department of Communications, Aug. 4, 1992.

5.   M.H. Sherif and D.K. Sparrell, "Standards and Innovation in Telecommunications", IEEE Communications Magazine, July 1992.

APPENDICES

APPENDIX I

KEY CANADIAN IT&T STANDARDS COMMITTEES OF INTEREST

TSACC   Telecommunications Standards Advisory Council of Canada

CSA/SCOT   Steering Committee on Telecom

CSA/SCIT   Steering Committee on Information Technology

CNO/CCITT   Canadian National Organization for the CCITT

CNO/CCIR   Canadian National Organization for the CCIR

TAPAC   Terminal Attachment Program Advisory Committee

CSA/CAC/JTC1   Joint ISO/IEC Technical Committee

CSA/SCIT SUB COMMITTEES

CSA/CAC/SC1   Vocabulary

Standardization of terminology for information technology and related fields in order to develop a user-oriented vocabulary in coordination with the sub-committees of JTC 1 and other appropriate committees.

CSA/CAC/SC2   Coded Character Sets

Standardization of graphic character sets and their characteristics, associated control functions, and their coded representation for information interchange; excluding audio and picture coding.

CSA/CAC/SC6   Telecommunication and Information Exchange Between Systems

Standardization, in the field of telecommunications and Open Systems Interconnection, of system functions, procedures and parameters, as well as the conditions for their use, for the four OSI layers that support the Transport Service. A vital aspect of this work is done in effective cooperation with CCITT.

CSA/CAC/SC7   Software Engineering

Development of guidelines for management techniques, and standardization of supporting methods and tools necessary for the development and testing of software.

CSA/CAC/SC11   Flexible Magnetic Media for Digital Data Interchange

Standardization for the purpose of digital data interchange of: flexible magnetic media, the recording of data on these media, and algorithms for the lossless compression of data.

CSA/CAC/SC14   Data Element Principles

Standardization of data elements that are interchanged among information processing systems, and the syntax by which these data elements are associated.

CSA/CAC/SC15   Labelling and File Structure

Standardization of structure and format of data files and of labels recorded on media for interchange.

CSA/CAC/SC17   Identification Cards and Related Devices

Standardization in the area of identification cards and related devices for use in inter-industry applications and international interchange.

CSA/CAC/SC18   Document Processing and Related Communication

Standardization of document processing, related communication and the user-system interface as applied to the fields of publishing and office systems.

CSA/CAC/SC21   Open Systems Interconnection, Data Management and Open Distributed Processing

Standardization of protocols, services, interfaces and information objects, and of related reference models.

CSA/CAC/SC22   Languages

Standardization of programming languages, their environments and systems software interfaces.

CSA/CAC/SC23   Optical Disk Cartridges for Information Interchange

Standardization of optical disk cartridges for media and information interchange between information processing systems.

CSA/CAC/SC24   Computer Graphics and Image Processing

Standardization of interfaces, in windowed and nonwindowed environment.

CSA/CAC/SC25   Interconnection of Information Technology Equipment

Standardization of interfaces, protocols and associated interconnecting media for information technology equipment, generally for commercial and residential environments.

CSA/CAC/SC26   Microprocessor Systems

To prepare international standards for microprocessor systems, where the term "microprocessor systems" includes but is not limited to microprocessor assemblies, and the related hardware and software for controlling the flow of signals at the terminals of microprocessor assemblies.

CSA/CAC/SC27   IT Security Techniques

Standardization of generic methods and techniques for IT security.

CSA/CAC/SC28   Office Equipment

Standardization of basic characteristics, test methods and other related items, excluding such interfaces as user system interfaces, communication interfaces and protocols, of office equipment and products such as printers, copying equipment, electronic typewriters, facsimile equipment.

CSA/CAC/SC29   Coded Representation of Audio, Picture, Multimedia and Hypermedia Information

Standardization of coded representation of audio, picture, multimedia and hypermedia information and control functions for use with audio and video information.

E.D.I.   Electronic Data Interchange

TC68   Banking and Related Financial Services

TELEPHONE INTERVIEW GUIDE

QUESTIONNAIRE #1

Company Involvement in Standards Work

Date:_____ Time:_____ Interviewer:_____
Company Name: _____
Interviewee: Name:_____
             Address:_____
             Telephone:_____

THE OBJECTIVE OF THIS SHORT INTERVIEW IS TO DETERMINE THE LEVELS
WITHIN THE ADMINISTRATIVE HIERARCHY WHERE VARIOUS STANDARDS
ACTIVITIES ARE CONTROLLED IN YOUR COMPANY. WE WILL BE ASKING YOU
TO NAME INDIVIDUALS, IDENTIFY THEIR TITLES AND THE APPROXIMATE SIZE
OF THEIR ORGANIZATIONS.

CAN YOU GIVE ME 10 MINUTES OF YOUR TIME NOW?

Question 1.   Who in your company:

a)   **Is a member of a standards technical committee?**
     What committee(s)?
     **(If several people and several committees, record all
     information available.)**

Answer

     Named individual: _____

     Title: _____

     City where office is located: _____

     Is this individual in a <u>line</u> or a <u>staff</u> position? _____

     Span of Control: _____
     (Total number of people reporting to this position.)

     Committee named   _____

     Is it a national or international committee: _____

     Number of days spent: _____

Question

**b)   Is a member of a standards administrative committee?
What committee(s)?
(If several people and several committees, record all
information available.)**

Answer

Named individual: _____

Title: _____

City where office is located: _____

Is this individual in a <u>line</u> or a <u>staff</u> position? _____

Span of Control: _____
(Total number of people reporting to this position.)

National or international: _____

Days per year: _____

Question

**c)   Is the most senior person who <u>actively</u> addresses standards
policy issues for the company?**

Answer

Named individual: _____

Title: _____

City where office is located: _____

Is this individual in a <u>line</u> or a <u>staff</u> position? _____

Span of Control: _____
(Total number of people reporting to this position.)

Question

d)   Is the most senior person who has been involved in a standards discussion or knowledgably involved in a standards decision during the past 12 months?

Answer

Named individual: _____

Title: _____

City where office is located: _____

Is this individual in a <u>line</u> or a <u>staff</u> position? _____

Span of Control: _____
(Total number of people reporting to this position.)

Question

2.   What is the company's budget this year (in man-years) for

standards work. _____

What is the expense budget in Canadian dollars excluding

manpower cost. _____

Answer

Named individual: _____

Title: _____

City where office is located: _____

Is this individual in a <u>line</u> or a <u>staff</u> position? _____

Span of Control: _____
(Total number of people reporting to this position.)

Question

3.   Who would effectively approve an increase of expenditures in
        cash and man hours for standards activities by 50%?
     (A more senior person might officially approve this on the
     recommendation of the person names here).

Answer

    Named individual: _____

    Title: _____

    City where office is located: _____

    Is this individual in a <u>line</u> or a <u>staff</u> position? _____

    Span of Control: _____
    (Total number of people reporting to this position).

Question

4.   Who would effectively approve a one time cash expenditure on
     budgeted standards activities of:

     (Examples of these expenditures might be the procurement of a
     standards document, outside advice, or subscription to a
     standards issues warning system focused for a specific
     business.)

     a) $100?

Answer

    Named individual: _____

    Title: _____

    City where office is located: _____

    Is this individual in a <u>line</u> or a <u>staff</u> position? _____

    Span of Control: _____
    (Total number of people reporting to this position.)

b) $1,000?

<u>Answer</u>

    Named individual: _____

    Title: _____

    City where office is located: _____

    Is this individual in a <u>line</u> or a <u>staff</u> position? _____

    Span of Control: _____
    (Total number of people reporting to this position.)

c) $5,000?

<u>Answer</u>

    Named individual: _____

    Title: _____

    City where office is located: _____

    Is this individual in a <u>line</u> or a <u>staff</u> position? _____

    Span of Control: _____
    (Total number of people reporting to this position.)

QUESTIONNAIRE #2

Reorganization Possibilities in IT&T Standards Activities

Date:_____ Time:_____ Interviewer:_____

Company Name: _____
Interviewee: Name:_____
                Address:_____
                Telephone:_____

1. In what IT&T areas do you perceive that commercial
    considerations are often the source of strong impediments to
    standards activity in Canada?

    _____

    _____

    _____

    _____

2. Should Canadians be producing more IT&T standards on a
    consensus basis, or are we already moving as quickly as
    consensus will permit?

    _____

    _____

    _____

    _____

3. Describe your participation in each of your IT&T standards
    activities. (A list is available on an interviewee basis.)

    _____

    _____

    _____

    _____

4. What activities outside your sphere of direct influence impact the standards activities which you have just described?

_____

_____

_____

_____

5. How are the principle factors which add cash costs, person hours and elapsed time to IT&T standards development in Canada?

_____

_____

_____

_____

6. How would you propose to reduce the number of IT&T meetings which you attend without reducing the useful output of these activities?

_____

_____

_____

_____

7. Conduct an open discussion aimed at collecting pragmatic ideas as to how IT&T standards efforts in total could be reduced or redirected in Canada while still achieving what the community really needs for growth of wealth.

_____

_____

_____

_____