

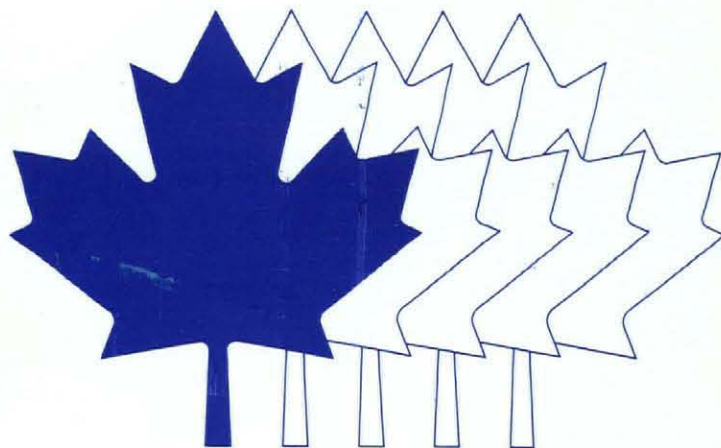


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Technology Centre
Review Project:
Policy Team Report

July 26, 1985



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Government of Canada

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MEMORANDUM

NOTE DE SERVICE

TO
A

Des Loftus
Director
Assessment Branch
MOSST

FROM
DE

Doug Hull
Senior Analyst
MOSST

SUBJECT
OBJET

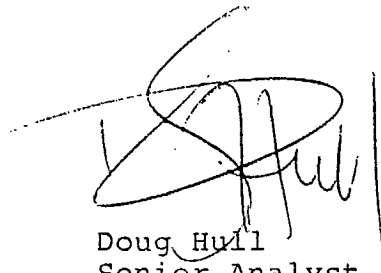
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| OUR FILE - N / RÉFÉRENCE |
| YOUR FILE - V / RÉFÉRENCE |
| DATE July 26, 1985 |

The final report of the Policy Team, attached, recommends, inter alia, that cost recovery and performance funding be used to improve the cost effectiveness and client responsiveness of the proprietary and non-proprietary technology centres supported by the federal government. In effect, the proposed management framework will:

- (a) rationalize and redeploy federal resources by increasing federal support to external centres which are heavily engaged in providing diffusion support to industry clients, while reducing the cost to the federal government of establishing new centres and maintaining internal technology centre operations, and
- (b) lay the basis for a more integrated national system of technology centres by providing a single point management focus in the federal government charged with developing relevant plans and strategies and by encouraging closer federal/provincial cooperation in providing start-up and sustaining assistance, possibly leading to the joint management of grant funding.

The report represents a consensus among the members of the team and closely reflects the views expressed by most of the experts interviewed in the course of our work. As you know this included senior federal and provincial officials, industry associations, university administrations, managers of technology centres and other experts including Messrs. Light, Wright, Doyle and Blais.

I would also like to draw your attention to the high degree of support we received from all the agencies participating in this work, but most especially, from NRC (Bill Coderre), NSERC (Wolf Illing), DRIE (Tom Hopwood, Elizabeth Payne and Steve Montague), DOC (John Sifton and Jim Taylor) and Agriculture Canada (Ian de la Roche and Ron Halstead). Within MOSST, Roger Heath, Paul Dufour and Lise Gotell contributed heavily to the Team's efforts. I owe them all a debt of thanks.

A handwritten signature in black ink, appearing to read 'Doug Hull', with a large, stylized flourish above the name.

Doug Hull
Senior Analyst

attachment

cc. Policy Team Members
Evaluation Team Members

Executive Summary

Mandate

In May 1985, MOSST was directed to undertake a study on the ways and means to rationalize the federal government's investment in technology centres. MOSST was to bring forward, by August 19, 1985:

- a) a plan for a national system of technology centres,
- b) a strategy for the redeployment of existing resources that will rationalize and consolidate the existing centres.

This report is a consequence of those instructions.

Definition

Technology centres that fall within the ambit of the above-mentioned plan and strategy were defined as "organizations sustained (through grants, contributions or contracts) or operated by the federal government and which were designed or now function predominantly in support of industry need for new technology or specific technical skills." The review covered approximately 250 industrially-oriented centres in the federal and provincial governments and the industry and university sectors which receive a substantial level of federal financial support.

Policy Proposals

Primary Emphasis

The overriding message to the Policy Team from the 82 people interviewed was that primary emphasis should be placed on improving the utilization of existing facilities, ensuring a more effective response to client needs and fostering greater coordination and networking among centres. These objectives require both a more stringent control on the creation of new centres and better management of the federal resources devoted to the portfolio of the technology centres which are receiving federal support.

New Centres

New technology centres should be funded by the federal government only when there is a clearly

identified private sector need, as demonstrated by a detailed market analysis and business plan developed in consultation with the potential clients. Furthermore potential clients should be heavily involved in new centre financing. A maximum 50% federal contribution is proposed.

Management and Control

A primary consideration in improving the management and control of technology centres will be to ensure some focused administration, either within a single agency like MOSST or by means of an interdepartmental committee including all relevant agencies.

In light of the increased interest of non-federal governmental sectors in the creation and evaluation of technology centres, and the need for a more integrated national policy on technology diffusion, a permanent advisory committee of industry, university and provincial representatives should be created in support of the lead federal agency or interdepartmental committee.

Since the federal government controls only a limited number of the 250-odd technology centres being reviewed, an attempt to rationalize and integrate technology centres activities must be based primarily on a redirection of federal financing. The preferred way of handling this is that the federal government could continue to provide assistance to centres but relate it directly to contributions made by industry and the contractual revenues received from clients. This would assist centres in achieving a self-sufficiency position which is dependent on the degree of customer support they receive. In other words, the government should adopt performance funding.

Implementation Plan

The technology centres being reviewed fall into two distinct categories, i.e., those which are within the federal government (proprietary) and those which receive federal start-up or sustaining assistance but are not owned by the federal government (non-proprietary).

Non-Proprietary Centres

The basic objective respecting non-proprietary centres, which are located mainly in universities and provincial research organizations, is to foster more

effective use of these facilities. This can be done by encouraging stronger linkages with industry users and ensuring small and medium-sized business has increased access to technology centre services, even if it cannot afford to pay the full cost of these services.

From the expert interviews, written submissions and literature review, the Policy Team has a strong preference for the variable funding system.

This system could be implemented to replace existing federal grants and contributions to technology centres, excluding start-up assistance, where federal contributions would be capped at 50% and be phased out after 3 to 5 years. Thereafter, additional federal grants would be directly related to revenues earned by centres under contract with clients. While all qualified technology centres would be eligible to receive this matching assistance, the level of funding provided could be varied according to the technology involved, the type of services being offered, the clientele being served and/or the region and industry sector within which the centre operates.

To ensure that costs are contained within available federal resources, payments by the federal government would be made only against contract revenues actually earned. Moreover, they would not exceed the target projected in a centre's plan, an amount that had been previously accepted by the government.

Provincial governments could be encouraged to opt into this program in order to establish a more integrated national system. This could be done by inviting provinces to pool their grant assistance into the matching funds program and then managing this on a joint basis under a sub-agreement, with either federal or provincial administration.

Proprietary Centres

The primary goals respecting these centres is to make them more responsive to client needs, increase the level of technology transfer to industry and to reduce total operational costs to government. There are four means of accomplishing this: each centre should have a board of directors; cost recovery should be implemented by all technology centres with provisions for meaningful financial and person-year incentives; contracting-out on a sub-contract basis should be pursued by each centre; finally, increased flexibility should be provided to technology centre managers to manage their resources in line with the evolving needs of their clients.

1.0 INTRODUCTION

1.1 BACKGROUND

In May 1985 the Ministry of State for Science and Technology (MOSST) was directed to undertake a study on ways and means to rationalize the federal government's investment in technology centres. Duplication of services was identified as one of the key problems with federal support for these centres, and self-sufficiency was recognized as a desirable component of future federal involvement. As a result, MOSST was directed to bring forward, by August 19, 1985:

- a) a plan for a national system of technology centres;
- b) a strategy to redeploy existing resources that will rationalize and consolidate the existing centres.

1.2 STUDY ADMINISTRATION

The review project was directed by a Steering Committee at the Assistant Deputy Minister level with representation from MOSST (Chair), the Department of Regional Industrial Expansion (DRIE), the National Research Council (NRC), the Natural Sciences and Engineering Research Council (NSERC) and Statistics Canada. The Committee approved the workplan, provided resources and reviewed progress and final reports.

To ensure full interdepartmental liaison, an Advisory Group was also formed. The Group included officials from MOSST, NRC, DRIE, NSERC, Statistics Canada, the Department of Communications (DOC), Energy, Mines and Resources (EMR), Agriculture Canada (AC), Transport Canada (DOT), Health and Welfare Canada (HWC), Environment Canada (DOE), the Department of National Defence (DND), the Department of Fisheries and Oceans (DFO), Secretary of State, and the Treasury Board Secretariat (TBS). As part of the workplan, two teams were established:

- ° The Resource Review Team, which was led by DRIE, involved DRIE, MOSST, NRC, NSERC and

private consultants. This team, using the technology centre data base that it developed, analyzed the questions of technology centre overlap or duplication, proliferation and fragmentation, coordination, self-sufficiency, and the impact of technology centres on the availability of skilled human resources.

- ° The Policy Team, which was led by MOSST, involved participants from MOSST, DRIE, NRC, NSERC, DOC, AC and the Bureau of Management Consulting/Supply & Services Canada. This team determined the main policy issues, conducted consultations, and developed options and a plan for a national system of technology centres. This report will deal only with the activities and findings of the Policy Team.

1.3 STUDY TASK

The task of the Technology Centre Policy Team was to prepare a draft plan for a national system of technology centres:

- ° to identify broad objectives and a policy framework for the federal government's continuing support of technology centres;
- ° to identify or make provision for the development of criteria for federal support of centres and implementation guidelines to insure:
 - responsiveness to industry's needs;
 - mission-orientation;
 - harmonization with provincial initiatives;
 - effective and efficient operation;
 - overall coordination of effort.

1.3.1 DEFINITION OF A CENTRE

Subsequent to the confirmation by the Privy Council Office, the Steering Committee agreed to the following definition of technology centres for the purposes of the MOSST study:

"Organizations sustained (through grants, contributions or contracts) or operated by the

federal government and which were designed or now function predominantly in support of industry need for new technology or specific technical skills."

This definition, which was agreed upon interdepartmentally, excluded departmental laboratories which are intended primarily to support mission-oriented R&D, (e.g., DND laboratories), while including those with direct industry support objectives. Where it was unclear whether a federal government centre activity should be included or not, the decision was left up to the responsible department.

Non-government centres were identified by examining lists and data from many sources and determining, through extensive follow-up, if they met the criteria of the definition. Over 600 centres were examined and of these, 256 government and non-government centres were identified.

1.3.2 Issues

The specific issues that were examined by the team were placed under the following six headings:

a) Diffusion:

Is the slow pace of technology diffusion in Canada a serious obstacle to the improved productivity and competitiveness of Canadian industry, especially small business? What are the main factors behind the problem? Should technology diffusion become a more important priority in economic development policies?

b) Federal Role:

What are the main options for promoting diffusion? What criteria justify further direct federal operation as opposed to indirect funding support for industry, province or university-operated centres? What options exist respecting a national system, networking, associations, distributed delivery, etc.?

c) Proliferation

Has the proliferation of centres created major difficulties for industry (skills shortage), unproductive competition or intergovernmental tensions? How can approval of new centres and management of the existing establishment be better coordinated? Can an overall strategy be developed and by what means could it be implemented?

d) Effectiveness:

What factors/activities contribute most to the success and failure of technology centres in terms of their survival and their effect on the rate of diffusion? What unique Canadian industrial and regional factors need to be taken into account? Can a basic set of core functions be identified?

e) Financing:

Would greater emphasis on cost recovery have a positive or negative effect on centre effectiveness? Would a matching funding arrangement reduce potential problems while promoting user service and self-sufficiency? How would this approach work?

f) University/Industry Initiatives:

How can the federal government promote increased cooperation between university and industry in technology transfer and critical skills development? What approaches are most conducive to encouraging industry interest and investment without jeopardizing the longer term research and training objectives of universities?

2.0 POLICY PROPOSALS

2.1 OVERVIEW

The review covered approximately 300 industrially-oriented centres in the federal and provincial governments and the industry and university sectors which receive a substantial level of federal financial support.

In the course of our initial work we interviewed 82 leading experts on science and technology policy and technology centre operations. The recapitulation of the Policy Team's survey results comprises Appendix A of this Report. Along with information from other sources, the guidance received led us to a number of preliminary observations. These were referred to a second group of about 25 experts, including many of those initially contacted including all provincial government representatives. The guidance received during this second round of consultations provided the basis for developing the detailed proposals outlined below.

2.2 DRAFT PROPOSALS

2.2.1 General

Accelerating the rate of technology diffusion in Canada is crucial to improving the productivity and international competitiveness of Canadian industry. Greater emphasis on technology diffusion is warranted in industrial, regional and technological development planning.

Because technology diffusion is a distinctly person-to-person process, technology centres can be one of the most effective program instruments available to government. Centres have the greatest success in promoting technology diffusion when they operate directly in response to needs identified by clients. A close buyer-seller relationship is best ensured when centres obtain a substantial financial contribution from their customers.

There has been a rapid increase in the number of technology centres in recent years. While concerns about a significant duplication of effort and resource shortages may be overstated, there is considerable room for improved effectiveness and efficiency. Primary emphasis should be placed on improving the utilization of existing facilities, ensuring a more effective response to client needs and on fostering greater coordination and networking among centres. These objectives require both a more stringent control on the creation of new centres and better management of the federal resources devoted to the portfolio of technology centres which are receiving federal support.

2.2.2 New Centres

New technology centres should be funded by the federal government only when there is a clearly identified private sector need, as demonstrated by a detailed market analysis and business plan. Clients should be heavily involved in the financing, planning and management of all new centres, wherever these are situated. Wherever federal contributions are provided, a thorough and regular cost-effectiveness evaluation of these expenditures should be undertaken in consultation with major centre clients.

New federally sponsored technology centres should be operated by and located in the private sector wherever possible. Where this is not feasible, full consideration should be given to contracting-out centre management to existing industry centres, PROs, or universities. Less reliance should be placed on establishing or expanding technology centres, as laboratories, within government departments. To encourage departments to rely on external technology centres, the existing federal policy on contracting-out R&D requirements should be considerably strengthened and modified to allow PROs and universities to compete more fully.

2.2.3 Management and Control

At present there is no coherent federal strategy for promoting the more rapid diffusion

of new technologies in Canadian industry despite its importance for industrial productivity and competitiveness, and regional development. Worse still, there is no comprehensive data base upon which to develop such a strategy. Accordingly, a primary consideration for improving the management of technology centres will be to ensure some focused administration. This could occur either within a single agency like MOSST or by means of an interdepartmental committee including all relevant agencies. The basic elements of this improved administration should be: (a) implementing a system to monitor the impact of technology diffusion services on the productivity and sales performance of client firms; (b) developing diffusion strategies related to critical technologies and regional and sectoral development; (c) identifying ways to foster the use of networks and joint ventures through technology centres; (d) maintaining an inventory of technology centres and services and (e) preparing an multi-year investment plan concerning the provision of start-up and sustaining funding. This plan would be aimed at raising the overall level of industry contribution and fostering increased centre self-sufficiency.

Our study indicates that there is an increasing interest within industry, provinces and universities about the need for a more integrated national policy on technology diffusion. As industry, provinces and universities operate and control the majority of technology centres, there must be some forum for consultation during the emergence of a federal strategy. Therefore a permanent advisory committee of industry, university and provincial representatives should be created in support of the lead federal agency or interdepartmental committee. It should have a direct input into each of the tasks identified in the preceding paragraph.

Since the federal government controls only a limited number of the approximately 250 technology centres being reviewed, an attempt to rationalize and integrate centre activities must be based primarily on a redirection of federal financing. Three main alternatives were identified in the course of our interviews.

The options were:

- (1) The federal government could require detailed business plans of all technology centres which receive or request federal support. Also an attempt could be made to achieve operational improvements and cost-savings through an annual review and negotiation process.
- (2) The federal government could decide to phase-out or discontinue all forms of financial assistance and force centres to become self-sufficient.
- (3) The federal government could continue to provide assistance to centres but relate it directly to contributions made by industry and the contractual revenues received from clients. This would assist centres in achieving a self-sufficiency position which is dependent on the degree of client support.

The third option, termed performance funding, appeared to be the preference of those interviewed. This was confirmed by a second round of consultations. The following paragraphs focus on how this approach can be implemented, including its financial implications, the way the funding would be provided and how the system would be coordinated with provincial governments.

2.3

AN IMPLEMENTATION PLAN

The approximately 250 technology centres being reviewed fall into two distinct categories, those which are within the federal government (proprietary) and those which receive federal start-up or sustaining assistance but are not owned by the federal government (non-proprietary). Different approaches are required to implement performance funding in these two categories.

2.3.1 Non-Proprietary Centres

The basic objective respecting non-proprietary centres, which are located mainly in universities and provincial research organizations, is to foster more effective use of these facilities. This can be done by encouraging stronger linkages with industry users and ensuring small and medium-size business has increased access to technology centre services, even if it cannot afford to pay the full cost of these services. There are several performance funding options which could accomplish this end:

2.3.1.1 A Voucher System

A voucher system could be implemented to replace all existing grants. Vouchers would be distributed to various groups of firms and would provide free or subsidized services at eligible technology centres. This approach would be highly user-driven and competitive and would therefore foster strong linkages between successful centres and their clients. However many centres might not survive.

The main difficulties with a voucher system is that it would diffuse federal support over a wide user base, possibly resulting in insufficient support to most firms. Moreover, firms which were already planning to acquire technology centre services would now be provided with unnecessary assistance, reducing the overall cost-effectiveness of federal funds. These problems, combined with the immature development of the technology services sector, make the voucher option a poor choice at the present time.

2.3.1.2 A Service Contract System

A service contract system could be implemented to replace federal grant support to centres. This system would exclude start-up assistance which would continue to be provided from existing funds but with more stringent terms and conditions applied. For example, federal start-up contributions could be linked

directly to funding from industry and provincial governments, with a ceiling of 50% in most cases. Start-up assistance would last for a period of 3 to 5 years after which all federal derived revenues would have to be obtained through service contracts.

Service contracting would require all federal agencies to deal with technology centres only through contracts for specified services. Basically, a centre could submit an unsolicited proposal to provide services to a client at partial cost recovery rates. After verifying the usefulness of this service and the willingness of industry to pay the minimum fee, the department concerned could contract with the centre, at a cost equal to the difference between user revenues and total costs, plus a reasonable profit. Of course, it would also be possible for departments to solicit competitive tenders for the provision of certain services. This would follow consultation with potential users, and would result in contract with the most suitable supplier. In either case, payments by government would be made in line with revenues received from clients. In order to ensure the financial involvement of industry, back-to-back contracts between government, industry and technology centres could be used in place of a single, two party agreement.

This system would ensure a high degree of cost control and a focus in the use of federal technology centre assistance. It would also encourage centres to establish direct links with clients and would foster higher levels of cost-recovery from users. Service contracting could be implemented in such a way as to avoid severe disruptions within the current establishment of non-proprietary technology centres, while promoting higher levels of effectiveness and efficiency overall. Moreover, it avoids any discrimination between technology centres and consulting engineering firms, since these could also compete for service contracts.

The main disadvantage of this approach is that its initial implementation could be

complex due to the amount of specification, development and contracting work required. This could, however, be reduced greatly in future years by the use of multi-year contracts. Also, while the system would require extensive government consultations with industry and user groups, it would remain bureaucratically-driven.

The service contracting option can be administered in a decentralized manner within the federal government. Nevertheless, it would be necessary to have an interdepartmental committee and a small permanent secretariat to develop the overall strategy focus and maintain a comprehensive data base, as discussed in section 2.2.3. An industry, university and provincial advisory committee should also be established to ensure broad-based input to this work. This option could be implemented in conjunction with the provinces by inviting them to co-sponsor various contracts. While there would undoubtedly be a number of joint projects, provincial governments may not be interested in substituting this approach for their current and planned grants programs for technology centres.

2.3.1.3 A Variable Funding System

This system could be implemented to replace existing federal grants and contributions to technology centres, excluding start-up assistance where federal contributions would be capped at 50% and be phased out after 3 to 5 years. Thereafter, additional federal grants would be directly related to revenues earned by centres under contracts with clients. While all qualified technology centres would be eligible to receive this matching assistance, the level of funding provided could be varied according to the technology involved, the type of services being offered, the clientele being served and/or the region and industry sector within which the centre operates.

To ensure costs are contained within available federal resources, eligible centres would be required to submit business plans with future levels of contract revenues projected 12 to 18 months in advance. In order to provide

a variable funding formula it is necessary to factor aggregate contract revenues into expected resources. This formula would form the basis of an overall contribution agreement with centres for the following year. However, payments by the federal government would be made only against contract revenues actually earned and would not exceed the target projected in a centre's plan. As a result, total federal spending would be limited.

This option would promote increased technology transfer and strengthen industry linkages to centres. It would also encourage most centres to raise the level of contract revenue earned as a consequence supporting industry. Further, it would allow some centres which are already near to self-sufficiency to work more closely with potential clients who cannot afford to pay. It would be relatively simple to implement and administer. It would also be market-driven.

With cost containment assured by the methods noted above, it is necessary to determine which centres should be eligible for assistance and also, to ensure that competition between centres is not undermined by grants from other governments. There are two approaches here. First, accreditation regulations for centres could be limited to ensuring that basic financial and accounting standards are observed, that the government has the right to audit the accounts of centres requesting assistance, etc. Total grant assistance from all governments could be capped, to ensure that public support for a centre does not rise above a certain level. This approach would allow consulting firms and others to compete with established technology centres, thereby fostering a high degree of competition. However, it would diffuse the level of government support across a very large number of centres and firms. It would be very complex to administer since it mixes non-for-profit centres with profitable firms which could take advantage of tax breaks to gain an additional competitive edge.

Alternately, following the current DRIE method, only non-profit centres could be eligible for assistance. A cap on total public sector grants and contributions would also be instituted. By excluding profit-based firms from the program, federal funding would be more highly focused and program administration would be kept simple. For these reasons this latter approach is preferred at least during any initial application of the variable funding option.

Because of the need for focused management of funds under this option, its implementation will require that all federal grant and contribution assistance to non-proprietary centres be amalgamated into a single appropriation in NRC or DRIE. This fund could be managed by a dedicated Program Office reporting to an interdepartmental management board including NRC, DRIE, NSERC, MOSST, Treasury Board, etc. In addition to financial administration activities the Program Office should also be made responsible for all those points outlined in section 2.2.3. An Advisory Panel to the Board should also be created to reflect university, industry and provincial interests in the management of the fund.

In terms of fostering a more integrated national system, provincial governments could be encouraged to opt into the Program. This could be done by inviting provinces to pool their grant assistance with the federal funding program. Assistance could be managed on a joint basis under a sub-agreement, with either federal or provincial administration.

2.3.1.4 Assessment of Proposed Systems

Both the service contracting and variable funding approaches are administratively practical and financially feasible. From our expert interviews, written submissions and literature review, the Policy Team has a strong preference for the variable funding option. Short of this perhaps the most suitable option, at least initially, is to mix the two methods as follows: variable funds up to a maximum of 50%; but where this is insufficient to ensure the provision of a public service, then competitive service contracts with selected technology centres.

2.3.2 Proprietary Centres

The primary goals respecting these centres is to make them more responsive to client needs, increase the level of technology transfer to industry and to reduce total operational costs to government. There appears to be four key means which, if used in conjunction, could accomplish these objectives:

- (i) A Board of Directors should be established for each technology centre or program which is intended to service industry's need for new technology. The Board should be in addition to or in lieu of the existing structure of advisory committees and panels. The Board should reflect the user community but be dominated by non-government representatives. The chairman should be non-governmental. The Board should meet at least four times a year to review and decide on various plans and issues. Its advice should be provided to the Minister and Deputy Minister of the appropriate department and to TBS and MOSST.

To ensure the Boards further the gradual commercialization of technology centres and industry related laboratories, these organizations should prepare annual business plans which, besides basic financial data, cover:

- the research program being undertaken in support of identified clients needs, with projected costs and outputs and associated personnel;
- a subcontracting-out plan identifying which activities will be subcontracted to industry and the impact this is expected to have on costs, timeliness and quality;
- cost-recovery projections showing the rates to be charged for various services and the expected revenues against costs, along with the marketing plan including sources of additional revenues;

- peer reviews scheduled to be undertaken on on-going and planned research programs.

The plans should be submitted to the Board prior to final program and resource decisions within the department. Unless overall resource requirements are increased by the Board, the plans they approve should normally be accepted by the departments concerned. In addition, the Board should meet to review progress toward plans, evaluation reports, etc.

It is recognized here that it may not be practical to provide the Boards of Directors for technology centres with powers equivalent to those exercised in the private sector. The intent, however, is to raise significantly the degree of influence and control which clients and non-departmental advisors currently have in the management of these centres. Where a government centre gradually evolves into a more commercial enterprise it may be possible to transfer it to an existing Crown corporation or privatize it. This would have the effect of submitting it to a real business management regime. This, however, is not a viable objective for more than a few proprietary centres.

- (ii) Cost Recovery should be implemented by all technology centres, with annual revenue generation targets and rate structures being included in business plans for Board of Directors and departmental approval. Besides justifying the rate structure, business plans should describe the expected impact on the client groups and on the overall demand for the services being provided.

There are two other points of particular importance. First, to ensure a logical basis for cost recovery, technology centre's operations must be fully costed. While the details of full costing have to be worked out with TBS, it will require inclusion of overhead and all operating costs, including facility and equipment maintenance, with fixed capital expenditures being amortized over a realistic time frame. Rate schedules should be developed

in reference to these full costs, although fees would not generally be set at this level in recognition of the public goods portion of the service.

Second, to encourage technology centres to gradually commercialize their activities, they should be credited with a reasonable portion of the revenues received as a result of their service charges. While the NRC is already able to retain revenues directly, formal agreements will need to be worked out between Finance, TBS and the various departments responsible for technology centres. These will focus on the terms and conditions for crediting earned revenues back to votes without causing a corresponding reduction in the proposed appropriations for the department as a whole. This will ensure that both technology centre managers and senior departmental officials are given a reasonable incentive to increase cost-recovery and productivity in future years.

As a general principle it is proposed that where earned revenues are less than or equal to the full cost of offering the service, minus amortized capital costs, they should be totally credited to the department and the technology centre. Revenues in excess of, say 10% of this amount, should be retained in the Centre Revolving Fund. This will ensure that major capital equipment purchases for all technology centres will have to be justified by a separate Treasury Board Submission. Funding so provided should be in the form of repayable loans or advances to the department concerned. Additional rules need to be worked out to cover earnings from licensing and royalties, revenues from disposal and contributions in kind.

A greater degree of person-year flexibility should also be provided to technology centres operating on cost-recovery. Preliminary discussions with TBS officials indicate that the Treasury Board might be amenable to decontrolling cost-recoverable technology centre person-years, possibly on a pilot project basis. Special consideration

could also be given to cases where a person-year investment in industrially-related research could produce a marketable and cost-recoverable product within a reasonable time frame, (say five years). Of course, departments would have to reduce their future person-year complement accordingly, if the research failed to achieve the expected benefits. These and other details would have to be worked out between TBS, MOSST and the departments and agencies directly concerned, once the principle of cost-recovery for technology centres is endorsed by the government.

- (iii) Subcontracting will be an important technology centre management tool from two viewpoints. From the perspective of the centre manager and the Board of Directors, contracting-out is a means of implementing a long-term strategy of specialization. Contracting-out basically allows personnel resources to be focussed on areas of special advantage, while subcontracting other remaining services to outside sources.

From the perspective of the program-level managers, who may have one or more technology centres reporting to them, the contracting option is also an important cost control instrument whose potential application is enhanced by the gradual commercialization of the technology centres within the department. Accordingly, these officials should be encouraged to submit an increasing amount of any program-related requirement to the "make-or-buy" test. This would entail developing the specifications for needed service support and submitting it to competitive tender, with all fully costed suppliers eligible to bid whether these are proprietary or non-proprietary centres or a private firms. As an initial approach to simulating greater "make-or-buy" decision-making departments, the technology centres could be asked to commit to progressively higher levels of competitive tendering.

- (iv) Increased Flexibility should be provided to technology centre managers to manage their resources in line with the evolving needs of their clients. This will involve reducing departmental and central agency reporting and evaluation requirements, especially in view of the strengthened role of the Board of Directors. Managers should also be allowed greater latitude respecting expenditures on staff training, conferences and travel provided incremental costs are covered by reduced operating costs or incentive revenues. Some consideration might be given, as well, to allowing performance bonuses, greater flexibility in hiring and higher salary levels in the case of exceptionally qualified individuals.

APPENDIX A: Recapitulation of Survey Results

The findings of the Team A survey of experts is set-out below without any analysis. These findings are based on the responses to the questions listed in Appendix B by the persons listed in Appendix C. The total number of people approached with regard to this survey was 82. The following information is presented in accordance with the format of the questionnaire in order to facilitate comparisons.

1. a) The current pace of technology diffusion in Canada is unsatisfactory according to 44 respondents while 6 respondents felt the pace was satisfactory. The former group of respondents were composed of:

- . 17 Federal respondents
- . 11 Provincial respondents
- . 9 Industry Association/Firm respondents
- . 2 University respondents
- . 5 Centre/Other respondents

The reasons given for the unsatisfactory diffusion rate and the number of respondents who noted these reasons were:

- . lack of industry receptivity and/or industry conservatism (12 respondents)
- . large numbers of small firms (6 respondents)
- . small disaggregated market (6 respondents)
- . lack of focus upon delivery mechanisms (5 respondents)
- . lack of industry relevant research and development (5 respondents)
- . geographical barriers (4 respondents)
- . lack of critical mass (4 respondents)
- . preponderance of foreign-owned subsidiaries (3 respondents)
- . lack of government resources (2 respondents)
- . poor investment climate (2 respondents)
- . poor federal-provincial coordination (2 respondents)
- . linkage firms missing (1 respondent)

b) Areas where the opportunities for technological diffusion are the greatest were cited as being:

- . small companies (28 respondents)
- . large companies (10 respondents)
- . manufacturing industries (13 respondents)
- . resource industries (15 respondents)
- . disadvantaged regions (9 respondents)
- . developed regions (10 respondents)
- . technology development (9 respondents)
- . skills training (6 respondents)
- . basic research and development (3 respondents)
- . commercial innovation (13 respondents)
- . leading firms (13 respondents)
- . lagging firms (4 respondents)

Some respondents suggested that a diffusion strategy should be developed before deciding upon targeted sectors (5 respondents).

3. Views on the effectiveness of certain diffusion mechanisms were as follows:

- . Tariff policy is an important structural mechanism for promoting diffusion (8 respondents). Some respondents felt that tariff policy was too broad an instrument to be effective (8 respondents).
- . Tax incentives are an effective diffusion mechanism (18 respondents). Those respondents that disagreed with this statement cited this mechanism's ineffectiveness for small, low profit firms (11 respondents).
- . Direct assistance mechanisms create a dependency on government (2 respondents).
- . Grants are an effective mechanism, especially for small firms that do not benefit from tax incentives (28 respondents agree, 7 disagree).
- . Contracting-out could be effective in promoting technology transfer (23 respondents agree, 6 disagree).

- . Direct assistance in the form of basic research is vital to industry (10 respondents agree, 7 disagree).
 - . Technology centres can be an effective diffusion mechanism (20 respondents agree, 1 disagrees). Some respondents expressed concern that technology centres lack a focus on diffusion (5 respondents).
 - . Technology information systems can be useful in promoting transfer (12 respondents agree, 7 disagree).
 - . The Canadian Patent Development Limited has been ineffective in promoting technology transfer (11 respondents).
4. The rationale for the existence of technology centres was felt to be:
- . the strategic significance of technology (17 respondents agree, 2 disagree)
 - . the high degree of technical risk (18 respondents agree, 2 disagree)
 - . technology centres' importance in technology transfer (28 respondents agree, 3 disagree)
 - . critical skills training (15 respondents agree, 4 disagree)
 - . fostering basic research (9 respondents agree, 9 disagree)
 - . problems in industry organization, i.e. the preponderance of small firms (20 respondents agree, 2 disagree)
 - . encouraging international exchange of technology (8 respondents)
 - . fostering applied, industry oriented research (7 respondents)
 - . to provide a technical liaison with industry (8 respondents)

- . fostering generic research (2 respondents)
 - . there is little rationale for technology centres (2 respondents)
5. a) There has been an undue proliferation of technology centres according to 38 respondents. 16 respondents felt that undue proliferation does not exist. 8 respondents stated that they had no opinion in this issue. The first group of respondents was composed of:
- . 11 Federal respondents
 - . 3 Provincial respondents
 - . 14 Industry Association/Firm respondents
 - . 2 University respondents
 - . 5 Centre/Other respondents
- b) Specific problems arising from duplication consist of the following:
- . serious duplication in micro-electronics sector (11 respondents)
 - . the existence of too many centres overall (7 respondents)
 - . a lack of networking between centres (7 respondents)
 - . the lack of an overall national approach (3 respondents)
 - . insufficient federal coordination (2 respondents)
 - . duplication in delivery (1 respondent)
 - . a lack of coordination between industry and university centres (1 respondent)

Many respondents felt that duplication had not caused serious problems. Reasons cited were the following.

- . competition among centres may be healthy (4 respondents)

- . the level of duplication depends upon region and sector (9 respondents)
- . duplication is necessary in Canada because of geography (9 respondents; 2/3 of these respondents were from the Western and Maritime provinces)

c) Greater coordination between centres could improve inefficiencies (13 respondents agree, 4 disagree). Some respondents argued that there should exist more centralized management of technology centres (4 respondents).

6. Technology Centres restrict the availability of scientific and technical personnel and represent an inefficient means of using this resource (9 respondents agree, 40 respondents disagree, 13 had no opinion).

Of those respondents who disagreed with this statement there were:

- . 17 Federal respondents
- . 8 Provincial respondents
- . 7 Industry Association/Firm respondents
- . 1 University respondents
- . 7 Centre/Others respondents

Most of these also expressed the view that technology centres are an effective means of training and skill gathering (33 respondents).

7. Views on the effectiveness of technology centres by specific function were as follows:

- . centres are effective at building awareness (33 respondents agree, 4 disagree)
- at providing information (37 respondents agree, 1 disagrees)
- at representing clients with government (10 respondents agree, 24 disagree)

- at providing advice and assistance (35 respondents agree, 5 disagree)
- at scouting (24 respondents agree, 10 disagree)
- at cooperative approaches (20 respondents agree, 8 disagree)
- at adapting technology to Canadian conditions (26 respondents agree, 10 disagree)
- at long term research (10 respondents agree, 27 disagree)
- at skills development (19 respondents agree, 11 disagree)
- at fulfilling a brokerage role (2 respondents agree)
- at stimulating new industrial activity (3 respondents agree, 1 disagrees)
- at penetrating their potential marketing base (1 respondent disagrees)

Other comments on effectiveness were as follows:

- . centres should be more effective in all of the above functions (6 respondents)
- . there is a need for centralization of the international scouting function (4 respondents)
- . centres should be more pro-active (3 respondents agree, 1 disagree)
- . university centres lack motivation to be effective in these areas (2 respondents agree, 1 disagree)

8. Factors cited as being the most important determinants of success were:

- . internal (management) factors (45 respondents)

- . external factors such as industry structure, international conditions, type of technology (15 respondents)
 - . linkages to the sources of technology and potential clients (22 respondents)
 - . clearly defined market demand for centre services (28 respondents)
 - . responsiveness to industry needs (20 respondents)
 - . adequate funding; sustaining funding for non-remunerative services (18 respondents)
 - . marketing the centre (4 respondents)
 - . shared funding with industry (2 respondents)
9. a) Sources of technology which are currently well exploited by technology centres are as follows:
- . international (8 respondents agree, 2 disagree)
 - . university (8 respondents agree, 3 disagree)
 - . industry (4 respondents agree)
 - . self-generated (4 respondents agree)
 - . government labs (2 respondents agree, 2 disagree)
 - . some respondents felt that all of these sources could be tapped effectively if centre were familiar with the needs of the sector (6 respondents).
- b) Universities must orient their activities towards industry to be more effective in exploiting technology (6 respondents).

10. Opinions of respondents on the location of technology centres are as follows:
- . centres should be university based (12 agree, 15 disagree)
 - . centres should be federally based because of the federal government's ability to act as a bridge between research and application (2 agree, 6 disagree)
 - . centres should be industry based because of a greater market orientation in industry centres (22 agree)
 - . centres should be provincially based (9 agree, 4 disagree)
 - . location depends on the function of the centre (13 agree)
 - . centres should be located close to the sources of technology (10 agree)
 - . centres should be located in proximity to clients (7 agree)
 - . there should be no technology centres (3 agree)
 - . centres should be municipally based (1 agrees)
11. Views on enhancing the link between technology centres and industry needs were as follows:
- . industry participation in technology centre boards would encourage industry predominance (34 respondents)
 - . proper market analysis is required to ensure industry relevance (11 respondents)
 - . there should be stronger communication between generators and users of technology (11 respondents)

- . clear mandates for technology centres are needed to design activities to industry needs (9 respondents)
 - . adequate funding and critical mass are required (9 respondents)
 - . personnel exchanges with industry should be encouraged (8 respondents)
 - . there should be a monitoring of centre output against industry needs (8 respondents)
 - . the culture and philosophy of labs should be altered to reflect responsiveness to the market (6 respondents)
 - . the federal government should sponsor communications mechanisms to encourage awareness of technology centres (5 respondents)
 - . mechanisms are needed to ensure university - industry discussions, e.g. liaison people, personnel exchanges (4 respondents)
 - . the mandates of various government agencies should be coordinated to enhance industry relevance (4 respondents)
 - . venture assistance type centres should be emphasized to promote local commercialization (1 respondent)
 - . centres should not compete with the private sector (1 respondent)
12. The rationale for federal government support of technology centres was expressed as being:
- . the strategic significance of technology (27 respondents)
 - . the high degree of technical risk (22 respondents agree, 2 respondents disagree)

- . transferring technology from its laboratories (20 respondents agree, 2 disagree)
- . encouraging industry innovation (17 respondents agree, 1 disagrees)
- . critical skills training (13 respondents agree, 1 disagrees)
- . fostering basic research (10 respondents agree, 9 disagree)
- . encouraging links with foreign technology (24 respondents)
- . battling regional underdevelopment (14 respondents)
- . industry fragmentation (9 respondents)
- . protecting and encouraging trade competitiveness (6 respondents)
- . there is no rationale/little rationale (5 respondents)
- . fostering long term research (3 respondents)

13. Respondent's views on how the federal government can best support technology centres are as follows:

- . the federal government should technology centres through:
 - funding (51 respondents agree, 1 disagrees)
 - operating (4 respondents agree, 14 disagree)
 - coordinating (18 respondents)
 - ongoing program review (3 respondents)
 - operating only long term labs (1 respondent)

It was also stressed that, in addition to government support, there should exist a high degree of industry/client support for technology centres (11 respondents).

14. Few respondents expressed the opinion that technology centres should be self-sufficient in all areas of operation. Only 12 respondents agreed with this statement. Of these there were:

- . 5 Federal respondents
- . 1 Provincial respondent
- . 5 Industry Associations/Firm respondents
- . 1 Centre/Other respondent

47 respondents disagreed; these consisted of:

- . 19 Federal respondents
- . 8 Provincial respondents
- . 10 Industry Association/Firm respondents
- . 3 University respondents
- . 7 Centre/Other respondents

Of the latter group, many expressed the view that partial self-sufficiency should be a target (27 respondents).

Opinions on self-sufficiency were as follows:

- . technology centres do a certain amount of public interest work that should be subsidized (21 respondents)
- . self-sufficiency is not a realistic goal (17 respondents)
- . the level of self-sufficiency should depend on region and sector (9 respondents)
- . total self-sufficiency would harm small firms who would be unable to pay for centre services (5 respondents)
- . self-sufficiency would mean a pre-occupation with short term revenues at the expense of long term goals (4 respondents)

- . self-sufficiency is not feasible in underdeveloped regions where industry is not profitable (4 respondents)
 - . industry alone could not afford to support technology centres (3 respondents)
 - . total self-sufficiency would result in a concentration of resources in areas where rate of return is highest and not necessarily where need is greatest (2 respondents)
15. To ensure greater industry relevance respondents stated that funding should be arranged through:
- . matching (19 respondents agree, 5 disagree)
 - . core funding (10 respondents agree, 4 disagree)
 - . service funding (7 respondents agree, 2 disagree)
 - . start up (13 respondents agree, 2 disagree)
 - . voucher (2 respondents agree, 3 disagree)
 - . start up and then matching (13 agree, 1 disagrees)
 - . start up, then matched funding, with additional support for core activities (6 respondents agree)
 - . a mix of matching and voucher (2 respondents agree)
 - . through a technology "OHIP" plan; firms bill the government for technology consultants (1 respondents agree)
- Other opinions on funding were as follows:
- . funding method should depend on centre mandate (4 respondents)

- . matched funding discourages diffusion and does not benefit disadvantaged regions or smaller firms (3 respondents)
 - . centres should be made more accountable through program review (1 respondent)
16. Views on the establishment of an effective national approach to technology centres were as follows:
- . technology centres should be more responsive to industry needs (10 respondents)
 - . greater federal coordination of technology centres is required (10 respondents, 1 disagrees)
 - . a federal-provincial sub-agreement to include technology centres should be negotiated (9 respondents)
 - . there should be a reduction in the number of technology centres (7 respondents)
 - . greater federal-provincial cooperation is needed (8 respondents)
 - . there should be more cooperation between industry, government, and universities (5 respondents)
 - . any national system should let all centres bid for contracts on equal footing (5 respondents)
 - . technology centres should be funded only through the tax system (5 respondents)
 - . there should be regional specialization in technology (3 respondents)
 - . there should be regular program evaluation (3 respondents)

- . all government sponsored technology centres should be abolished (2 respondents)
- . IRAP and PILP should be maintained (2 respondents)
- . the articulation of an industrial strategy is needed before a national approach is possible (1 respondent)
- . there should be greater networking between centres (1 respondent)
- . there should be regional representation on boards of national centres (1 respondent).

APPENDIX B: POLICY TEAM TECHNOLOGY CENTRE STUDY
QUESTIONNAIRE

Date: _____

Name: _____

Title: _____

Org.: _____

Address: _____

Telephone: _____

Interviewed by: _____

INTRODUCTORY COMMENTS

Purpose of this study.

MOSST mandate.

Definition of a technology centre.

Importance of technology diffusion.

1. a) Is the current pace of technology diffusion in Canada Satisfactory?
- b) What are the weaknesses?
- c) How does the pace of Canadian technology diffusion compare to that of other countries?
2. Where are the opportunities for technology diffusion the greatest?

List of potential opportunity areas:

- . small or large companies
 - . manufacturing or resources industries
 - . economically disadvantaged or developed regions
 - . technology development or skills training
 - . basic R&D or commercial innovation
 - . leading or lagging firms
 - . other
3. How effective are the following mechanisms in promoting technology transfer?
 - a) Structural
 - . Tariff policy
 - . Tax incentives to industry
 - b) Direct assistance
 - . Industrial innovation grants
 - . Contracting out of government R&D
 - . Support for basic research
 - . Technology centres
 - c) Government delivery
 - . Technology information systems
 - . Canada Patent Development Limited
 4. Given this range of mechanisms, what is the rationale for technology centres?

List of potential rationales:

- . strategic significance of the technology
- . high degree of technical risk
- . transferring technology from their laboratories
- . encouraging industry interest
- . critical skills training
- . fostering of basic research
- . industry organization, i.e. small firms

5. a) Do you feel there has been undue proliferation of technology centres?
 - b) Has there been duplication? Specify.
 - c) Are you aware of specific inefficiencies arising from this duplication? Specify.
 - d) Could this be improved by greater coordination and communication among centres?
6. a) What has been the impact of technology centres on the supply or availability of scientific and technical people?
 - b) Are the centres an effective way of using this scarce resource?
 - c) Are there short or long-term problems?
7. How effective are technology centres in performing the following activities?
 - . promotion of technological awareness
 - . provision of information
 - . representing client needs with government
 - . provision of advice and assistance
 - . scouting for new technologies
 - . promoting cooperative approaches to problems
 - . adapting technology to Canadian conditions
 - . undertaking long-term research
 - . skills development
8. What factors are most important to the success of technology centres in promoting technology diffusion?
 - . internal factors
 - i.e. management aspects
 - . external factors
 - i.e. industry, structure, international conditions, technology
 - . linkages to the sources of technology and potential clients
 - i.e. contacts with foreign scientists
9. a) What sources of technology do the centres exploit well?
 - b) What sources could they try harder to develop?

10. Technology centres may be university-based, based in federal laboratories, industry-based, or provincial-based. Are there any significant advantages or disadvantages to these orientations?
11. a) What are the special opportunities and difficulties for enhancing the link between technology centres and industry needs?
b) How can the federal government help?
12. a) What is the main rationale for federal government support for technology centres?
b) How different is it from the provinces?

List of potential rationales:

- . strategic significance of the technology
- . high degree of technical risk
- . transferring technology from their laboratories
- . encouraging industry innovation
- . critical skills training
- . fostering basic research
- . opportunities with the industries' innovation support infrastructure
- . links to foreign technology

13. How can the federal government best support technology centres?

Potential forms of federal support:

- . funding
 - . operating
 - . coordinating
 - . different from provinces
14. a) Is self-sufficiency for technology centres desirable?
b) What are the limits, effects and functions of self-sufficiency?
 15. How can ongoing funding be arranged in a way that encourages greater industry relevance or private sector leadership?

List of potential forms of ongoing funding:

- . matching
- . core
- . service
- . start-up
- . voucher

16. What would you recommend to promote a more effective national approach to technology centres?

Appendix C: List of Contacts

These individuals' opinions were solicited concerning the six issues noted in the introduction (i.e. diffusion, proliferation, university-industry) and/or concerning the policy options set-out in the Policy Option Section. Those persons whose name is preceded by an asterik (*) were contacted as part of the interview process mentioned in Appendix A.

- Mrs. N. Adams
Privy Council Office
Ottawa, Ontario
- * Dr. Dan Archer
Industry, Trade and Technology
Government of Manitoba
- * Dr. David E.P. Armour,
President
Electrical and Electronic Manufacturers Association
of Canada
- * Mr. Peter Barnes
Assistant Deputy Minister, Technology
Ministry of Industry and Trade
Government of Ontario
- * Mr. P.G. Bates
Director
Office for Regional Development
St. John's, Newfoundland
- * M. Guy Bertrand,
President
Centre de recherche industrielle du Quebec
- * Mr. N. Bhungara
Director General, Science Center
Supply and Services Canada
- * Mr. Roger Blais
Ecole Polytechnique
- Mr. B.C. Blevis,
Assistant Deputy Minister
Department of Communications
Ottawa, Ontario

* Mr. R.S. Boorman,
Executive Director
New Brunswick Research and Productivity Council

* Dr. A.N. Bourns
Brantford, Ontario

* Mr. K.H.G. Broadfoot,
Assistant Deputy Minister
Department of Economic Development
Edmonton, Alberta

Mr. R. Brown
Assistant Deputy Minister
Department of Regional Industrial Expansion
Ottawa, Ontario

* Mr. John Bulloch
President
Canadian Federation of Independent Business

* Mr. B.W. Burgess
Pulp and Paper Research Institute of Canada

Mr. Tom Burnett, Manager
Process Sales
INCO
Mississauga, Ontario

Dr. Alan Cairnie
Science Advisor's Office
Environment Canada
Ottawa, Ontario

Dr. N. Campbell
Director General
Marine Science and Information Directorate
Department of Fisheries and Oceans
Ottawa, Ontario

Mr. Gerry Capello,
Deputy Secretary
Administrative Policy Branch
Treasury Board
Ottawa, Ontario

Mr. N. Chippendale,
Director
Policy and Analysis
Post-Secondary Education
Secretary of State
Ottawa, Ontario

Mr. L.H. Chow,
Manager
Government Contracting
Pratt & Whitney Canada Inc.,
Montreal, Quebec

* Mr. Clark,
President
Motor Vehicle Manufacturers Association

* M. Gilles Cloutier,
Recteur
Universite de Montreal

Mr. B. Corcoran
Program Branch
Treasury Board Secretariat
Ottawa, Ontario

* Dr. Alan Cornford
Assistant Deputy Minister
Ministry of Universities
Science and Communications
Victoria, B.C.

* M. Pierre Coulombe
Directeur, Direction de
l'Innovation Technologique
Ministère de l'Enseignement
supérieur, de la Science
et de la Technologie

* Dr. J.C. Davis,
Director General
Department of Fisheries and Oceans
Ottawa, Ontario

* Mr. Denis De Melto
Director General, Industrial Development Policy Branch
Department of Regional Industrial Expansion
Ottawa, Ontario

* Mr. A.G. De Wolf
Office of Senior Advisor
Federal Economic Development Coordinator
Halifax, Nova Scotia

* Mr. Denzel Doyle,
President
Doyle Tech Corporation

- * Mr. Robin M. Dodson
Regional Executive Director
Office for Regional Development
Vancouver, B.C.
- * Mr. E.H. Dungeon
Director, Division of Mechanical Engineering
National Research Council
Ottawa, Ontario
- * Mr. Jerry Dyer
Dupont Corporation
- * Dr. N.R. Eaton,
President
Canadian Welding Institute
- * Mr. H. Eliasson,
Assistant Deputy Minister
Department of Industry, Trade and Technology
Winnipeg, Manitoba
- * Mr. E.R. Evason,
President
The Society of the Plastics Industry of Canada
- * Dr. A.C. Frosst
Assistant Vice President, Research Services
McMaster University
- * Mr. Keith Glegg
Vice President Technology
National Research Council
Ottawa, Ontario
- * Mr. Clyde Granter
Assistant Deputy Minister, Industry
Department of Development and Tourism
St. John's, Newfoundland
- * Dr. Alex Guy
Deputy Minister
Department of Science and Technology
Regina, Sasaktchewan
- * Mr. Robert Haack
Office for Regional Development
Montreal, Quebec

- * Dr. J.E. Halliwell,
Director
Natural Sciences and Engineering Research Council
Ottawa, Ontario

- * Mr. John Hansen
Federal Economic Development Coordinator
Office for Regional Development
Vancouver, B.C.

- Dr. D.D. Hedley,
Director
Strategic Planning Division
Agriculture Canada
Ottawa, Ontario

- * Mr. R.J. Herring
Assistant Deputy Minister
Agriculture Canada
Ottawa, Ontario

- * Dr. E. Holmes
Director of Research Administration
University of Waterloo

- * Dr. Terry Howard,
President
B.C. Research Council

- * Mr. Jim Hutch,
President
Saskatchewan Research Council

- * Mr. F.T. Jackman
Regional Executive Director
Office for Regional Development
Edmonton, Alberta

- * Mr. H. Douglas Johnston
Federal Economic Development Coordinator
Office for Regional Development
Charlottetown, P.E.I.

- * M. Maurice L'Abbé,
Président
Conseil de la science et de la technologie
Québec, Québec

- * Dr. C. Lajeunesse,
Director
Natural Sciences and Engineering Research Council
Ottawa, Ontario

- * Mr. H. LaPier,
Chairman
Canadian Advanced Technology Association
Ottawa, Ontario
- * Mr. P. Lavellé,
President
Auto Parts Manufacturers' Association
Toronto, Ontario
- * Mr. Paul E. Leblanc
Director of Centres of Specialization
Secretary of State
Ottawa, Ontario
- * Mr. Walter Light
Northern Telecom Limited
Toronto, Ontario
- * Dr. G.M. Lindberg
Director, National Aeronautical Establishment
National Research Council
Ottawa, Ontario
- * Mr. Robert S. Long,
Executive Director
Canadian Advanced Technology Association
- * Mr. Douglas Lyle,
Executive Vice-President
Canadian Food Processors Association
Ottawa, Ontario
- * Mr. James D. MacNiven,
Deputy Minister
Council of Maritime Premiers
- * Mr. I. McCauley
Federal-Provincial Relations Office
Ottawa, Ontario
- * Mr. E. McMullan,
Associate Professor
Faculty of Management
University of Calgary
- * Mr. Frank Maine
Chairman of Board of Directors
Waterloo Industrial Innovation Centre

Dr. C. Mann,
Director
Oceans Sciences Laboratory
Fisheries and Oceans Canada
Vancouver, British Columbia

* Dr. E.G. Manning,
Director
Institute for Computer Research
University of Waterloo

* Mr. R.R. Mayes,
Director General
Transport Canada
Ottawa, Ontario

* Mr. Paul Midghall,
President
Ontario Research Federation
Mississauga, Ontario

Mr. D. Millar
Federal Economic Development Coordinator
Office for Regional Development
Winnipeg, Manitoba

* Dr. D.R. Muir,
President
Sulphur Development Institute of Canada (SUDIC)
Calgary, Alberta

* Mr. D. Muir,
Director General
Department of Fisheries and Oceans
Ottawa, Ontario

* Mr. B.T. Ness,
President
Canada Wire and Cable Company Limited
Toronto, Ontario

* Mr. T.B. Nickerson,
President
Nova Scotia Research Foundation

* Mr. R.E. Nuth,
President
Canadian Construction Association
Ottawa, Ontario

- * Mr. Pierre Perron
Assistant Deputy Minister
Energy, Mines and Resources
- * Mr. Normand Plante
Federal Economic Development Coordinator
Office for Regional Development
Montreal, Quebec
- * Dr. Ross Pottie,
Vice President
Physical Sciences and Engineering
National Research Council
- * Mr. William, A. Reid,
Executive Director
Office for Regional Development
Saskatoon, Saskatchewan
- * Mr. R.M. Renfrew,
Executive Director
Canadian Institute for Guided Ground Transport
Queen's University
- * Mr. H.A. Reynolds
Regional Executive Director
Office for Regional Development
Winnipeg, Manitoba
- Mr. R. Robillard,
Assistant Director
Department of Finance
Ottawa, Ontario
- Mr. David B. Sampson,
President
Canadian Association of Consulting Engineers
Toronto, Ontario
- * Mr. B. Savin and L. Pammett
Office for Regional Development
Halifax, Nova Scotia
- * Mr. Frank Smith,
President
Nordco Limited
St. Johns, Newfoundland

- * Mr. Stuart Smith,
Chairman
Science Council of Canada
Ottawa, Ontario
- * Mr. Barry Stevenson
Ministry of Universities, Science and Communications
Province of British Columbia
- * Mr. Robert Stewart,
President
Alberta Research Council
- * Mr. Max Street,
Major Projects Officer
Federal Economic Development Coordinator
Office for Regional Development
St. John's, Newfoundland
- Mr. H. Swain,
Assistant Secretary to Cabinet
Privy Council Office
Ottawa, Ontario
- * Mr. M. Thibault,
President
Canadian Manufacturers Association
Toronto, Ontario
- * Mr. Dale Turner,
Executive Director
Planning Division
Prince Edward Island Development Agency
- * Dr. M. Vaisey-Genser
Associate Vice-President (Research)
University of Manitoba
- * Dr. Alan Vanterpool,
Director
Office of Science and Technology
Alberta Research Council
- * Mr. Arthur Wakabayashi
Federal Economic Development Coordinator
Department of Regional and Industrial Expansion,
Saskatchewan
- * Mr. Henry M. Walsh,
President
Canadian Shipbuilding and Ship Repair Association

- * Mr. Stephenson Wheatley,
Executive Director
Department of Commerce and Development
New Brunswick

- * Mr. Roy Woodbridge,
Managing Director
Mining Association of Canada

- * Mr. Peter Woolford
Federal Economic Development Coordinator
Office for Regional Development
Toronto, Ontario

- Dr. Douglas Wright
President
University of Waterloo

- * Mr. Jim Wright,
General Manager
Delro Industries
Winnipeg, Manitoba

- * Mr. Marvin Zulman,
Consultant
Industrial Performance
Canadian Manufacturers' Association
Toronto, Ontario

