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CANADA

Report of the
National Advisory Board
on Science and Technology

COMMITTEE ON THE DEPARTMENT OF INDUSTRY, SCIENCE AND TECHNOLOGY

Presented to the
Prime Minister of Canada



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**Department of Industry, Science and Technology
Committee Report**

February 1988

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1.0 MANDATE FOR THE DEPARTMENT OF INDUSTRY, SCIENCE AND TECHNOLOGY

This report advises the Prime Minister on a mandate for the newly created Department of Industry, Science and Technology (DIST).

1.1 Objective of DIST

The purpose of the Department should be to foster the economic growth and development of Canada by promoting an internationally competitive commercial sector, encompassing firms of all sizes. The development and application of S&T are particularly important means to this end, and so the Department should have a special responsibility to promote them.

Capital, information and technology can now be transferred around the globe almost instantaneously. Patterns of world production are therefore determined increasingly by human creativity, education and training, management ability and capacity to adapt. In broadest terms, these are the challenges which must lie at the heart of the mandate of DIST and constitute its *raison d'être*.

The Department will have many clients, both in the goods-producing and service-producing industries. The focus of the Department should not be blurred by competing objectives, such as regional development, income support or job creation. (There is a significant complicating factor in that the Department will have continuing responsibility for regional development in Quebec and Ontario. This explicit responsibility should be clearly differentiated from the Department's main purpose.)

1.2 Role of Government

Governments, regardless of their ideological orientation, intervene massively in both economic and social policy. The direct economic activities of government make up a significant portion of the GNP. More and more, governments around the world have become directly involved in the commercial competition among nations. This trend will continue, and governments will inevitably play important roles in promoting their commercial sectors.

In Canada there is a deeply imbedded - though not unqualified - belief in private enterprise. The responsibility of government in promoting the commercial sector is to foster those things that are in the national interest but which industry is unable or unwilling to provide. The responsibilities that belong uniquely to government include, for example:

- a) setting the right macroeconomic policy;
- b) offsetting the advantages conferred by governments in other countries;
- c) helping private enterprises to function more efficiently; and

- d) assisting in areas where short-sighted market forces or structural impediments (e.g., branch-plant industry) stymie strategically important advances for the nation.

1.3 Principal Activities of DIST

The Department will be the principal advocate of the commercial sector in the councils of government. It will advise on and formulate policies, and deliver programs. In carrying out these activities, the following considerations should be paramount.

- a) **Framework Policies:** The effect of government on the commercial sector is overwhelmingly felt through fiscal and monetary policy, and through framework policies, such as those dealing with tax, labour, education, trade, regulation and procurement. The principal responsibility of DIST should therefore be to ensure that these policies promote an internationally competitive and flexible commercial sector.
- b) **Fostering Innovation:** The new challenge facing DIST, and the principal rationale for its creation, is to encourage much higher rates of successful technological innovation of both products and processes. Training in technology management skills needs to be widely accessible. The spectrum of activities - from basic research through applied research to design, demonstration, and engineering - needs to be understood, explained and made generally available. Financial and marketing considerations must take into account the entire chain of these activities, not just individual links within the chain. There is a large literature on these subjects, but Canadian experience is limited and concentrated in a few companies. The Department will, therefore, have to break a great deal of new ground. The success of DIST will be determined by how well it captures the available expertise, interprets it, and fosters appropriate organizational responses in business and education.
- c) **Understanding Needs of Business:** The Department must understand deeply the needs of business and the ways in which government policy affects business. One of the principal mandates of the Department must be to consult continually with the private sector to be able to translate its concerns into advice for the government and, conversely, to explain government policy to business.
- d) **Focusing Programs:** DIST programs should be targeted primarily on small- to medium-sized enterprises. Very small and very large firms are more feasibly and appropriately assisted by the right set of framework policies. There is great risk that programs will have adverse unintended consequences and that, over time, their effectiveness will be degraded by 'political entropy'; i.e., the tendency to spread spending uniformly in response to political pressures.

Forerunners of DIST have long experience in program delivery. Their hard-won lessons must not be forgotten; they must be applied to new program design.

- e) **Principles of Program Design:** Program design should be based on principles such as the following:
- i) **Back winners.** Don't create programs for which only the incompetent need apply.
 - ii) **Beware of programs that support activities that companies ought to be motivated to undertake themselves (e.g., modernization).** This is wasteful and forces *all* firms to request assistance under the program for competitive reasons. Such programs are typically designed to correct structural problems that reflect apparent market failure - e.g., companies may not be able to justify the risk of heavy R&D investments. Direct government assistance may be needed for individual firms, but efforts should first be made to understand and correct the structural impediments. These are often best addressed by framework policies, e.g., tax relief.
 - iii) **Avoid programs that are subject to political discretion.** Programs should be within the purview of the professional public service and subject to criteria which are as transparent as possible. On the other hand, there is the risk that criteria will be applied too strictly 'by the book'. There should be sufficient scope for flexibility to permit program administrators to apply common sense judgment.
 - iv) **Consult extensively with the groups to whom programs are delivered.** Their practical advice is essential in the design of appropriate criteria and implementation strategies.
 - v) **Do not adopt an explicit job creation criterion.** This tends to both politicize the program and diminish productivity.
 - vi) **Test every program idea against market criteria to obtain a clear understanding why the market does not already provide the service.** Careful attention must also be paid to the incentives, unintended and otherwise, that the program will create.
 - vii) **Ensure that every program has a built-in evaluation procedure that periodically forces an assessment of its effectiveness.** Clients' views must be a central part of the evaluation.

1.4 Specific Areas of Focus

The Department should also undertake other, more specific activities. They include:

- a) **Foreign Intelligence:** Strongly emphasize the gathering and subsequent dissemination of intelligence from foreign sources concerning industrial, technological, scientific and marketing matters. Forge close links with the Department of External Affairs. Knowledgeable persons from the private

sector should also be retained to gather information on behalf of the government for subsequent broad dissemination.

- b) **Information Dissemination:** Make a major commitment to establish the technology for, and methods of, information dissemination to the commercial sector. This is integral to the theme of DIST as a department whose value and influence should depend on possession of superior information rather than on sheer spending clout. The NRC has had extensive experience in disseminating information on technological matters. Examine how this model, appropriately modified, could be transferred to other areas. The Bureau of Intellectual Property would also act as a source of information on foreign and domestic technology and its protection.
- c) **Strategic S&T:** Focus support for basic and applied science in areas having commercial potential for Canadian firms. This implies a degree of targeting in fields where this country has comparative advantage or a particular need. The risk is that such targeting will be at the expense of support for science that lacks any apparent commercial potential. This would be tragically short-sighted. To avoid the risk that greater emphasis in certain areas would be at the expense of basic science, overall spending on S&T must be increased substantially in real terms.
- d) **Procurement as a Development Tool:** Maximize the procurement leverage of government to give firms the market base needed to support greater R&D and the development of production facilities of efficient size. The use of procurement to encourage domestic firms is a delicate matter in view of fair trade principles and the heavy costs that can be incurred when the most efficient suppliers are not used. Nevertheless, all governments use procurement preferences to develop their domestic firms; Canada cannot afford to miss this opportunity. Government involvement can have substantial leverage when used to support new types of ventures.

Firms must have an incentive to continue R&D in the same field once government support has ceased. This suggests that ownership of intellectual property in government-funded technology development should vest in companies (though government would have right of use free of royalties).

In the past, the key missing ingredient in unsuccessful efforts by government to support technological initiatives has been in marketing, not on the technical side. DIST must learn to overcome this inherent weakness of government involvement in commercial technology support. Assessments of proposals must focus heavily on marketing factors.

- e) **Executive Interchange:** Ensure continuous interchange of personnel (temporary assignment) between the Department and the private sector. This would be a constant source of revitalization.
- f) **Bureau of Intellectual Property:** The Bureau of Intellectual Property should be moved from the Department of Consumer and Corporate Affairs to DIST.

This is consistent with the new Department's mandate to promote technical innovation for the benefit of industry. (See Appendix A for detailed rationale.)

1.5 Further Observations

- a) **Senior Minister:** The new Department must always be headed by a senior minister who is a member of the Priorities and Planning Committee of Cabinet.
- b) **National Presence:** Although the department will not have a mandate to promote regional development *directly* (beyond Ontario and Quebec), it is essential that it be strongly represented from coast to coast. DIST must have solid political support from all parts of the country for it to be an effective advocate of the commercial sector within the councils of government (e.g., to promote the right framework policies). To achieve this without spending a great deal of money in the regions, it must forge firm ties with the business sector across Canada.
- c) **Image:** The Department's predecessor, DRIE, had a fuzzy and contradictory image with the private sector. Consequently, DIST will be greeted with skepticism, especially if its role and objectives are not seen to be practical, useful and clear. It is essential that the demarcation between DIST and the new regional agencies (WDO and ACOA) is well spelled out and respected. The residual role of DIST as a regional agency in Ontario and Quebec should be clearly segregated. Inevitably, DIST will be called upon to assist in industrial rescues; the economic rationale in such cases must be compelling and credible. If social objectives (e.g., preserving jobs) substantially underlie the bail-out, it should be undertaken by an agency other than DIST.
- d) **S&T Culture:** The Department will be continuously challenged to overcome the lack of awareness in Canada of the importance of S&T for future prosperity. One of the Department's immediate responsibilities will be to convey the message forcefully to industry. Indirectly, DIST will be relied upon to champion increased emphasis on science in the education system and to promote, over the long term, all reasonable measures to foster an S&T dimension in Canadian culture.
- e) **Trade Function:** It is unfortunate that DIST will not be responsible for international trade. At the very least, there must be an extremely close working relationship between the trade function of External Affairs and the Department. The collection and dissemination of international commercial and technological information is one of the most important services that the new Department could provide. Similarly, the Department's credibility in the business sector will depend on its ability to exercise strong influence in trade-related matters.
- f) **Top-Flight Staff:** The Department must be particularly careful to build a first-class staff. It is better to start understaffed rather than overstaffed. Without the best people, DIST will earn the respect of neither the business

sector nor of academic scientists and engineers. The consultation process will be far less effective, and the interchange program with the private sector will attract castoffs rather than comers.

1.6 The Science Mandate

The most difficult issue to settle in designing the mandate of DIST is to define the Department's responsibility in science. It is undeniable - and proper - that DIST will strongly favour business, and therefore will preferentially support science that is *perceived* within the Department to be the most commercially beneficial. But science is an activity that has value and importance beyond its commercial implications. Moreover, the responsibility for science within government policy goes well beyond the natural mandate of a department of industry. In particular, this will make it extremely difficult, though perhaps not impossible, for DIST as one operating department among many with important scientific activities, to play a coordinating role of the sort originally envisaged for MOSST.

To address the issue of how best to allocate responsibility for S&T within government, consider first the following major elements of federal science activity together with the existing centres of responsibility.

Activity	Current Responsibility
1) Promote S&T to foster internationally competitive industry.	DIST, NRC, some departments (e.g., Communications)
2) S&T related directly to the mandates of government departments and agencies.	NRC, various departments (e.g., Agriculture, F&O, EMR, Environment, NHW, Communications, Defence)
3) Direct support of advancement of knowledge.	Granting councils, NRC
4) Co-ordinate government spending on S&T generally to: (a) eliminate waste and duplication; and (b) steer priorities to support broad public objectives.	Not clear
5) Promote an S&T perspective on all government policy.	Not clear; some from PM, NABST and Science Council.

This table points up the difficulty of housing all responsibility for science policy inside DIST. The second activity, the fourth, and to a considerable extent the fifth, do not fit easily under the wing of any operating department. On the other hand, as the experience of MOSST has shown, a pure policy department is

unlikely to be taken seriously unless it has a 'gate-keeper' function (like Treasury Board and Finance).

Beyond question, there must be a strong champion of S&T within DIST because a vital part of its *raison d'être* is to foster innovation and scientific technology in the economy. This role requires a separate minister within the Department to assume principal responsibility to promote S&T. Furthermore, this minister - and the Minister of DIST - must be the principal advocates in Cabinet of the science community for its economic, academic and cultural aspects. Given the identification of the science minister with DIST, he or she will have to be at pains to assure those scientists whose work has no apparent commercial prospect that their interests will be promoted vigorously. This will be a never-ending task; the minister will always be suspected of being biased in favour of promoting technology.

There remains the question of responsibility for the coordination of government S&T activities. It is unlikely that this can be accomplished through DIST because:

- a) the Department is itself a participant in the competition for resources and thus faces an inherent conflict of interest as coordinator;
- b) the Department's industry perspective will inevitably be seen to compromise its objectivity; and
- c) DIST will have no way to directly impose its advice on other departments (i.e., it is not a gate-keeper), and the attempted coordinating function would eventually not be taken seriously.

If the government considers the coordination of federal science policy and related resource allocation as vitally important, it has no alternative in the long run but to assign this responsibility to a central agency. Logically, this would be directed by a small secretariat in the Prime Minister's own department, the PCO. A science advisory capacity in the chief executive's office is found in the United States, U.K., Japan and many other developed countries. In these countries, this has *not* replaced other centres of S&T policy advice in departments of industry, trade and commerce. Thus, a general science policy and coordination function in the PCO is not incompatible with a major S&T responsibility resting with DIST and a minister dedicated to the purpose.

2.0 NABST

2.1 The Future of NABST

The long-term role of NABST raises a dilemma: It is extremely important for issues of S&T policy to remain at the forefront of the Prime Minister's attention; it follows that NABST should continue to report *directly* to the Prime Minister. Yet to maintain this essential link, the Board must not come to be seen to be an agent of one particular operating department, in this case, DIST.

Several suggestions have been advanced to address this problem though none has been discussed in sufficient depth by NABST to warrant a recommendation now. Some options for possible consideration follow:

- a) **Outside Ministers:** NABST would continue essentially as at present with secretariat support from DIST. But other ministers with S&T responsibilities (e.g., Communications, Defence) would be invited to attend NABST whenever issues affecting their departments are on the agenda. The advice of other ministers should also be solicited in defining these agendas. This would dispel the belief that NABST was an instrument of DIST.
- b) **SAGIT Model:** Reorganize NABST after the model of the Sector Advisory Groups on International Trade. There would be an eminent outside chairman. The group might report through the Minister of DIST, but it would meet the Prime Minister directly, say, three times a year. The agenda of the group would be defined partly at the government's initiative, but partly at its own initiative in response to issues which it believed were too important to wait to be asked. The working practice of NABST under this model would be more informal and less paper-driven than at present. Issues would be discussed in plenary at greater length and recommendations would be transmitted in concise letters. Secretariat services and outside consulting as required would be more at the direction of NABST than at present.
- c) **PCO Secretariat:** If a science policy coordinating function were located in the PCO, it would be logical to have the same body act as a support group for NABST. This would ensure the legitimacy and credibility of NABST among departments. It would also support a continuing direct reporting relationship to the Prime Minister.

3.0 RECOMMENDATIONS

3.1 Purpose

DIST should foster an internationally competitive commercial sector. S&T are particularly important means to this end and thus DIST will have a special responsibility to promote their development and application in the economy.

3.2 Regional Responsibility

A residual responsibility for regional development in Ontario and Quebec confuses the image of the Department, identifies DIST as the 'Department of Ontario and Quebec' and risks diverting the minister's attention from the central mission of DIST toward political fire fighting. Therefore, regional development responsibility should be vested separately, probably in a counterpart of ACOA and WDO.

3.3 Trade

International trade matters are inherent in the purpose of DIST. Maintaining a separate trade department serves no apparent purpose and runs the risk of

inefficient communication with DIST, or worse, of outright turf battles. The trade function should be united with DIST.

3.4 Human Resources

The new Department must have top-flight people to do its job and to regain the respect of its client groups. Overstaffed offices will send the wrong signal. A flexible executive interchange program with the private sector should be a priority.

3.5 Bureau of Intellectual Property

The Bureau is potentially a potent instrument to foster the promotion and commercialization of innovation. It can fulfil this role more effectively in a department of industry than in a department where consumer interests are paramount. The functions of the Bureau are located in departments of industry and commerce in many other countries - e.g., United States, U.K. and Japan. The Bureau should be moved from Consumer and Corporate Affairs to DIST.

3.6 Minister of Science

There should be a separate minister in DIST with specific responsibilities for S&T. The minister will have to represent *all* scientists and research institutions, not only those perceived to be working in areas most directly relevant to industry. It will be a long, uphill battle to maintain an adequate profile for S&T within DIST.

3.7 Coordination of Government S&T Activity

If the government believes it is essential to coordinate science policy and related resource allocation *across* departments, it will eventually have to establish a central agency responsibility to do the job. DIST, as an important competitor for S&T resources, cannot be expected to direct evaluations that would affect resource allocation among departments.

Appendix A

BUREAU OF INTELLECTUAL PROPERTY

The Bureau of Intellectual Property has jurisdiction over patents, copyright, industrial design and trade marks. It is currently responsible for the operations of the Patent Office, the Copyright Office, the Industrial Design Office and the Trade Mark Office.

The patent, trade mark, industrial design and copyright legislation would be effectively used as instruments for the development and implementation of a national S&T policy in DIST. In the Department of Consumer and Corporate Affairs (CCA), the goal of lower consumer prices has become paramount. The recent pharmaceutical legislation is one of the rare instances within CCA where investment considerations and the development of S&T took precedence over consumer prices. (CCA's consumer-oriented policies on compulsory licensing of pharmaceutical patents in 1969 first led to the introduction of a policy designed to keep consumer prices down at the expense of investment in science, research and technology in the pharmaceutical industry in Canada.)

The concern of CCA with consumer matters has reduced its emphasis on the goal of stimulating technology, research and production in Canada through the use of intellectual property. Consequently, the development of S&T in Canada would be better served if the Bureau were transferred to DIST, which has no inherent conflict in its jurisdiction and whose activities embrace all those of the Bureau.

The Patent Act provides an example of how policy on intellectual property can increase the level of the application of S&T in Canada. The act ensures not only that patents are granted to encourage invention, but also that the new inventions are worked on a commercial scale in Canada without undue delay. More than 95 per cent of Canadian patents are owned by foreigners. However, if patented technology is not used within Canada by a foreign patentee within three years of the issuance of a patent, a Canadian company may obtain a compulsory license to produce the patented item. In their R&D, private industry and Canadian universities could access this foreign technology, which could be exploited by Canadian industry, obtaining compulsory licenses if necessary. There are procedural matters within the Patent Act that could be addressed so that compulsory licenses would be issued more rapidly. This matter is more likely to be effectively addressed by DIST than by CCA, which has contradictory goals of representing the interests of both consumers and the owners of legal monopolies, such as patents.

The resources of the Canadian Patent Office, which include a mass of technical information about inventions made in Canada and elsewhere in the world, could be more effectively made available to Canadian industry and universities for study and research. Integration of the Bureau of Intellectual Property with DIST could foster a coordinated effort for the exploitation of intellectual property in Canada, involving cooperation among Canadian industries, universities and governments. The Japanese Ministry of International Trade and Industry

coordinates the resources of the Japanese Patent Office with research carried out by industry and universities. In the U.K., intellectual property matters fall under the jurisdiction of the Department of Trade and Industry, and in the United States under the Commerce Department.

The U.S. Patent Office has recently launched a program to promote U.S. technological leadership through encouraging analytical thinking by U.S. school children. A comparable Canadian program is more likely to be developed by DIST than CCA.