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National policy-making

Development of Canadian science and technology policy

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In March 1987 the federal, provincial and territorial governments of Canada signed the first National Science and Technology Policy. This marked the culmination of a period of cooperation in contrast to the previous diversity of interests; there is a new economic imperative in the formation of S&T policy.

Canada's experiments in nation-building through S&T are heavily dependent on the ability to pool the R&D resources within the constituent elements. Both federal and provincial efforts will serve to harness Canada's vast potential for meeting the challenges of international competitiveness.

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MARCH 12, 1987 MARKED an historic occasion in the annals of Canadian science and technology policy. It was the date of the signing by federal, provincial and territorial governments of the first ever National Science and Technology Policy (Council of Science and Technology Ministers, 1987).

The event was not lost on those who are familiar with the evolution of the national science policy debate in Canada; a debate that dates back more than two decades (Lakoff, 1973; Wilson, 1974). It is a story punctuated by extensive consultation with the major stakeholders of the scientific, technological and entrepreneurial community; detailed negotiation with provincial governments that, constitutionally, have exclusive jurisdiction in a number of critical areas impacting on science and technology policy (such as education and natural resources), and continuous assessment of international developments in the technological arena.

Two major factors are posited for the creation of this national policy. First, over the past two decades, the base of broad involvement in science and technology (S&T) decisions has expanded significantly since the 'golden age' of science policy in the late 60s and early 70s. Canada's S&T community has matured and has gone up the learning curve in its understanding of the technological system. Much of this has come about via a regular 'diet' of technology policy studies conducted in Canada and abroad (Science Council of Canada, 1971).

Second, the nature of Canadian federalism has had a much more significant impact on the development of national science policy than it has had in most other federal states. In fact, it could be argued that province-building through science and technology has been the determinant factor in progress towards national science and technology policy (Gilpin, 1971; Belovic, 1972).

This experience may have some important lessons for Europe's science policy developments. As a recent commentary in *Science* noted, "achieving closer ties between . . . scientific programs and research groups in Europe is not easy. Cultural, linguistic, and regional diversity, coupled with traditional political and economic rivalries, all

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present obstacles to successful cooperation" (Dickson and Norman, 1987).

This assessment could not be more true of the relationship between Canada's federal government and provincial and territorial governments. In a recent paper, Hochstrasser suggests that a European science policy should be defined and gain political weight through the establishment of a regular meeting of the ministers responsible for science and technology in the participating states (Hochstrasser, 1986).

An appeal to the "political will of the European nations to act in a concerted manner" is certainly necessary, but cannot be viewed as a sufficient force in itself to counter-balance the inevitable obstacles constituted by the autonomy of each state and their desire to defend their own interests.

The discussion of a European science policy could profit from the experience of a confederation like Canada that has been trying to define a national science and technology policy since the mid-1960s, and which has only now been able to sign a first statement of policy defining the broad objectives to be pursued in a coordinated manner.

The issue of collaboration between the provinces and the federal government, which often have different priorities, is present in most domains where a national policy is required. In this paper, however, we would like to demonstrate that, in the case of the science and technology policy, a working agreement was reached after extensive negotiations between one federal and ten provincial (and two territorial) governments in such a manner that the national policy would respect the autonomy of action of each province. If it had not, no national policy could possibly have been signed by all parties.

Moreover, the fact that the federal government controlled significant S&T funding allocations in different regions of the country served as a major inducement in bringing the provincial governments to come to the table to discuss national S&T issues.

This last aspect is probably the most important difference between the process of national policy-making in a federal state like Canada, and the international policy process of autonomous states envisaged by Hochstrasser. Furthermore, the European situation has been characterized by fiscal constraint in the funding of projects amongst community members (and less so at the individual state level). But the Canadian situation has largely been characterized by a significant debate over traditional roles and responsibilities in science and technology whereby the federal government's funding of science and technology far and away outpaces that of other governments but is politically affected by strong interventionist forces of regional governments in science and technology.

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At the organizational level, however, the different committees created to monitor the implementation of the policies and programs in the domain of science and technology in Canada are similar to the ones suggested by Hochstrasser for the establishment of a European science policy.

Antecedents of national policy

The content of the National Science and Technology Policy is largely familiar. It contains the usual references to the international competitive challenge brought about by the currency of knowledge and research; the development of strategic technologies; improved technology diffusion; the strengthening of the basic research infrastructure; adequate attention to social adjustment brought about by the rapid rate of technical change; and proper consideration for an improved 'science culture' or public awareness of science and technology.

The science and technology policy domain in Canada is littered with extensive studies on these issues, the symptoms for which are well-known. In fact, the exhaustive nature of these studies has prompted one observer to remark cynically: "Never was so much written by so few with so little impact as the burgeoning literature on science and technology planning" (Jarrell, 1985).

However, the major new element to the development of this national policy is the importance attached to the regional development aspects across the country.

A thumbnail sketch of the national science and technology policy debate that has evolved over the past two decades, particularly from an institutional standpoint, follows, as it will serve to provide a better basis from which to view the present context.

Potted history

The 1960s, as in most other OECD nations, were without question, the golden age of science policy in Canada. In 1963, the Royal Commission on Government Organization (known as the Glassco Commission), published the first major report on the organization of federal scientific activities since the creation of the National Research Council in 1916, and proposed a new organizational structure for the coordination of these activities (Royal Commission on Government Organization, 1963).

This report, combined with the recommendations from another report on Canada's science policy machinery prepared by the former President of the National Research Council, led, in 1964, to the creation, within the Privy Council Office, of the Science Secretariat to advise the federal government on short-term scientific matters and implementation of policies. Two years later, another important recommendation of the Commission was implemented with the creation of the Science Council of Canada. An arm's length body, the Council's mandate is to produce independent advice for the government on science and technology matters of importance for the country.

The last element of the structure policy reinforced by the workings of another commission of inquiry

established in 1969 – the Senate Special Committee on Science Policy (known as the Lamontagne Committee) – was the Ministry of State for Science and Technology (MOSST), created in 1971. Ultimately a replacement for the Science Secretariat, the Ministry deals with advising and coordinating the scientific and technological activities of the federal government, and has taken the responsibility of establishing the federal input to the National Science and Technology Policy.

Recently, the federal structure for science, technology and industry has undergone further re-appraisal, and the ministries responsible for regional industrial expansion and science and technology are to be merged into a new flagship Department of Industry, Science and Technology.

In addition to these institutional advancements, and to the Lamontagne Committee which published four volumes with extensive recommendations on the science apparatus, the OECD and the Science Council each conducted a study of Canada's national science policy. (Senate Special Committee, 1970; OECD, 1969; Science Council, 1968).

Paralleling these developments, provincial governments began to institutionalize their respective science policy machinery, often in response to federal initiatives, and to assist in regaining control over their own local economies. Provincial governments had been active in science and technology as early as 1921 when Alberta instituted its Scientific and Industrial Research Council (now the Alberta Research Council); and other provinces followed suit.

At the institutional level, the province of Quebec was the first to establish a science policy structure in the early 70s; a structure that was the functional equivalent of the Science Council of Canada. This development eventually led to the formation of Quebec's science policy, and later, its technological development strategy (Quebec, 1979, 1983).

The rise of interest in science and technology policy by provincial governments was as much an attempt to strengthen and diversify the local economic base, as it was a deliberate, focused response to the central, federal government's thrusts in the science and technology sphere. Much of this provincial activity has been described as province-building or economic provincialism; efforts to establish greater local control, and enhanced power over regional economies through the establishment of goals for rapid economic development.

The necessity of building strong, regional economies through the effective use of science and technology has led to some clever slogans behind which could be mobilized the respective research and entrepreneurial capacities of the provinces. For example, Ontario instituted its BILD (Board of Industrial Leadership and Development) Program in the early 1980s, an initiative that focused on creating six technology centres in that province. In Quebec, *Bâtir le Québec* (Building Quebec) and *le Virage Technologique* (The Technological Transition), have become the titles of major economic policy statements which concentrated on promoting that province's technological strengths.

Global industrial re-structuring through science, technology and innovation provided the stimulus for Canada to pool her resources to meet the technological challenge

Achieving national consensus

One would think that with all of this movement in new S&T initiatives, extensive studies of the making of S&T policies, and widespread experimentation with new institutions, that the governments in Canada were equipped with the modern tools necessary to use science and technology in a concerted manner for the future development of the country. This was not the case, and it took nearly 20 years after the seminal Science Council report *Towards a Science Policy for Canada* (Science Council, 1968) to arrive at a national consensus on the priorities of a nation-wide policy on science and technology.

Like the European situation, the global industrial re-structuring through science, technology and innovation provided much of the stimulus that Canada required to pool its national skills and natural resources in a manner that could meet the international technology challenge.

There are many reasons why Canada's science and technology renaissance did not occur until the early 1980s. Walsh, in a review of the special problems of small countries in adopting the technology trajectory of larger nations, (Walsh, 1986) has argued that:

> "There is a minimum threshold of resources needed for serious investment in R&D, below which no national effort is likely to reach the critical mass or level of efficiency necessary for an indigenous contribution to innovating."

While Canada's situation is still somewhat deficient regarding resources devoted to R&D, the increased funding of R&D has been particularly marked over the past five years, especially from the corporate sector which has benefited from a series of fiscal incentives designed to encourage investment in knowledge-based activities.

Besides the apparent lack of an 'external threat' to catalyze increased government attention on matters scientific and technological, the domestic situation in Canada had, until the installation of the present government, been characterized by an inability to conceive what constituted the 'national interest'. Much of the debate in science and technology policy, revolved around tensions between the two levels of government in identifying their respective spheres of interest and influence. (Brown and Eastman, 1981). As an early Science Council of Canada report (Science Council of Canada, 1973) correctly noted:

> "Effective 'national' science policy may in fact consist of a multiplicity of science policies each responding to the specific needs of the regions or sectors of this country, framed within some broader national perspective."

Difficult challenge

This national perspective was long in coming. With a federal government that, in the 70s, had given a very low priority to science and technology, and with the rise of such provincial movements as the separatist Parti Québécois that espoused a *'maître chez nous'* (master at home) ideology, it is no small wonder that nation-building through science and technology was a difficult challenge.

One of the more perceptive comments made on the situation was highlighted by a Quebec economist, who argued:

> "In the past, science was outside the main preoccupations of political leaders because it was not perceived to involve the question of national unity. Lately, however, it has become a source of possible tensions between federal and provincial governments because it is involved in the distribution of political decision-making" (Garigue, 1972).

The vision of Canada as a unified country, with little attention to the provinces with their respective interests and constitutional rights, had gradually become anachronistic. With the installation of the new federal Conservative government in 1984, a major re-ordering of the national perspective was in order.

Not only did this federal government adopt national reconciliation as the order of the day, but it also quickly recognized that science and technology would have to occupy a much more central position within the federal (and by definition, provincial) corridors of power. To borrow from Neil Kinnock's Labour electoral platform, science and technology would have to move from the periphery to the centre of the decision-making apparatus.

The combination of national reconciliation (with provincial governments), political will regarding science and technology, and consensus-building among the country's social partners (industry, labor, academics) meant that conditions for national science and technology policy planning were ripe. As the French would say, the 'conjuncture' was propitious.

Making the policy

Consequently, in 1984, the federal government, through the Ministry of State for Science and Technology, began a concerted process along with other governments, to develop a national policy for science and technology. The process here was extremely critical in helping to deliver a product. As Steed (Steed, 1987) has noted:

> "In S&T policy-making, where norms are uncertain and problems and goals are frequently not clearly defined, the process of policy research is often as important as the product."

When the national science and technology policy exercise began, the collective corporate memory of previous science policy initiatives was somewhat weak. One had to learn from the past, while keeping an eye on present trends within the context of future implementation.

This was made particularly difficult because the client base and policy issues for S&T are relatively unstable. People change positions, governments reorganize structures, and program and policy measures are in a continuous state of flux. Keeping track of this moving target poses an immense challenge for decision-makers.

Having established a major dialogue between the federal, provincial and territorial governments in developing a national science and technology policy, it became important to establish a consensus-building exercise that would seek out, in the most effective manner, the input of Canada's major stakeholders in the science, technology and entrepreneurial community. The sensitive aspect of this consultative approach, as one would expect, was how to capture and weigh the necessary views of these diverse interest groups. From the outset, the exercise had a science community's view as well as those of business and labour.

The federal Minister for Science and Technology in February 1985, tabled a working paper, *Science, Technology and Economic Development* for a meeting of S&T ministers (Ministry of State for Science and Technology, 1985). This was published and views were solicited.

At a subsequent meeting of S&T ministers in September 1985, the federal minister stated that he would convene a national forum on science and technology policy in the summer of 1986. Like the previous Australian and French consultative processes, the forum would serve to mobilize the S&T community in setting out their views on the development of a national S&T policy. Leading up to the forum, the federal minister held a series of regional roundtables across Canada with selected representatives of the business, entrepreneurial and academic sectors in an attempt to sensitize both himself, and the participants, to some of the common themes that, by then, had already begun to emerge.

The federal government prepared a background paper, *Building on our Strengths* (Ministry of State for Science and Technology, 1986), for the forum, and the Science Council of Canada was asked to assist in managing and chairing the forum. In these preparations, a series of specific questions were prepared so as to focus debate, and the federal minister wrote to a host of interest groups asking them to prepare their respective briefs on a national science and technology policy.

These briefs were gathered, and along with the background paper, were tabled at the forum. At the end of the forum, governments had a list of consensual issues that could serve as the basis for developing the national S&T policy.

Intensive negotiations followed between both levels of government and, by December 1986, ministers had agreed to the broad outlines of a national

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policy, and in fact, to the establishment of a Council of Science and Technology Ministers, a mechanism that would serve to formalize a consultative and collaborative forum between the two orders of government in the area of science policy.

Cooperation in diversity

At the centre of the national policy is the recognition that "there is a necessity to take account of federal, provincial and territorial priorities". The governments also recognize that "Canada's provinces and territories have differing scientific and technological capacities in different sectors" (Council of Science and Technology Ministers, 1987).

The Policy defines six major objectives which can be attained through cooperation between governments, business, universities and labour. These are to:

- improve industrial innovation and technology diffusion through public and private mechanisms;
- develop strategic technologies for manufacturing, service and resource-based sectors;
- assure the necessary pool of highly qualified people;
- support basic and applied research and development;
- control the impact of technological change on society; and
- promote a more science-oriented culture.

The process, of course, is far from over. The March meeting confirmed that seven working groups would study specific areas of the national policy and will make recommendations to the Council of Science and Technology Ministers on specific courses of action that could improve the health of S&T in Canada.

The National Science and Technology Policy that was signed by ministers responsible for science and technology demonstrates clearly that partnership is in, paternalism is out. There has been some concern that the Policy implies a drift in responsibility at the federal level in the face of increased provincial activity in S&T, and that new arrangements are in the offing concerning national cost-shared S&T programs.

The federal government set forth its own strategy, InnovAction, with a number of courses of action on March 24 (Ministry of State for Science and Technology, 1987). This complemented another initiative. In February, the Prime Minister signaled his commitment to the importance of science and technology by nominating a National Advisory Board for Science and Technology that would advise him directly on national directions that must be taken on issues of pressing concern. The Prime Minister, in fact, chairs the Board.

These actions are all guided by three major goals: economic and regional development; the support of government missions; and the advancement of knowledge and supply of highly qualified people.

The process of negotiating with provincial and territorial governments, and consultation with business, labour and higher education, has had a remarkable learning effect within the Canadian S&T infra-structure. Provincial governments have become

Up to the mid-70s science policy in Canada was often dissociated from economic growth; now it is more pragmatic and economically-oriented

much more adept at understanding, and making a case for, the introduction of S&T policy within their respective cabinets, as is demonstrated by Premiers and Ministers in a number of provinces through their appointment of consultative mechanisms in science and technology.

The federal government has learned to appreciate much better the regional development dimension associated with science and technology, and government departments are increasingly involved in extensive bilateral (and multilateral) consultations with provincial counterparts. Business, labour and educational interest groups have substantially increased their voice in the S&T arena, though more still needs to be done in this area.

Indeed, following the discussion of a major report on Canada's R&D effort to the First Ministers' Annual Conference in November, 1987, a National Conference on Technology and Innovation was recently held that sought a major commitment to investment in science and technology from the corporate and academic leaders in Canada. At this conference, the Prime Minister announced an infusion by the federal government of C$1.3 billion over the next five years in science and technology. He also announced that five regional conferences to continue the momentum of the debate will shortly be set up.

Conclusions

Whereas during the late 60s and the first half of the 70s, science policy in Canada was geared more towards helping the growth of science in a general way, and was often disassociated from the policies of economic growth, the 1980s have been characterized by a more pragmatic and economically-oriented conception of science policy as a science and technology/innovation strategy (OECD, 1987). This new focus is also reflected in the new names given to ministries responsible for science and technology, with a good number of them incorporating a mandate to promote the development of industry, science and technology under one umbrella.

This thrust towards an 'economic imperative' has also led to a series of bilateral agreements between the federal and provincial governments, each of which recognizes and promotes the existing R&D infra-structure of a particular region.

These Economic and Regional Development Subsidiary Agreements (ERDAs) have been negotiated typically for a period of five yeas (1984/85-1989/90), and involve significant sums of money both from the federal and provincial governments.

They, along with a number of Memoranda of Understanding that have also been signed between both orders of government, are designed to jointly

identify priority areas in science and technology for economic development. In fact, by subsuming science and technology under regional and economic development, the federal government put these actions in a light that facilitated the signature of a national agreement, and provided a definite framework to allow the implementation of concrete projects.

While there are a considerable number of subsidiary bilateral agreements that deal with economic areas touching on science and technology such as mineral processing technology, and forestry related scientific activities, five agreements deal specifically with S&T or advanced technology. These are sub-agreements negotiated between the federal government, and the provinces of Quebec, Saskatchewan, British Columbia, Nova Scotia and New Brunswick. These amount to C$215 million, and support for technological development is along a number of areas.

The Quebec agreement, for example, provides C$60 million in capital and operating funds for the construction of a National Optics Institute and an Electrochemical Institute. The Nova Scotia Technology Transfer and Industrial Innovation agreement focuses on new technologies and technology transfer. The Saskatchewan Advanced Technology Agreement addresses various technology needs through university-industry collaboration, marketing support, and assistance in technological procurement.

All of these agreements involve the mobilization of private sector firms and associations, university researchers, provincial research organizations and entrepreneurs, and have been viewed favourably by the country's major stakeholders in science and technology.

The creation and implementation of these agreements has been rendered more responsive to the needs of provincial governments. This is because, as one observer has noted (Jenkins, 1979):

> "The provinces are often more geographically and economically homogeneous than Canada as a whole, and therefore, the provincial governments frequently have a greater capacity than the federal government to evolve coherent economic and industrial policies for economic factors operating within their boundaries."

Much like the European experience, however, Canada's experiments in nation-building through science and technology are heavily dependent on the ability to pool the resources of the considerable R&D infra-structure that exists within its constituent elements. The various efforts, through the National Science and Technology Policy, the federal science and technology strategy, provincial technology strategies, and consultative science and technology mechanisms, collectively, will serve to harness Canada's vast potential for meeting the challenges of international competitiveness, and social adjustment to change brought about by the new technological trajectory.

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