The Mining Supply and Service Sector: Innovation Policies and the Delivery Gap

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Introduction

Canada’s innovation strategy has taken shape slowly over the 17 years since the Free trade pact was enacted. The broad outlines of Canada’s current policy were widely discussed by 1990. This chapter examines a specific opportunity that was explicitly identified by 1991 and is still awaiting federal action. The history of the Mining Supply and Service (MS&S) cluster in Sudbury provides a remarkably straightforward test of whether the Canadian innovation strategy as practiced will support “changing horses” – becoming an economy less dependent on natural resources, and more reliant on innovation and skills. The example reveals a troubling inability at both the federal and the provincial level to act on an obvious opportunity.

Sudbury is Canada’s leading mining community. With a GDP that is much larger than the GDP of Prince Edward Island, (5.6 vs. 3.4 billion in 2002) and a population greater than the combined populations of the Yukon, the Northwest Territories and Nunavut, Sudbury has been called “one of the world’s four great "mining city-states". It sits on one of the ten largest producing mineral deposits in the world (the largest in North America. It is the only city in the world with fourteen producing mines and two major smelters within the city limits. It is the only mining community in Canada with a research university.

Sudbury is also home to Canada’s densest concentration of specialized mining supply and service firms, with over three hundred within city limits and more in nearby North Bay. A 2000 report by Natural Resources Canada found that 45% of Canada’s MS&S firms were in just three communities: Toronto, Vancouver, and Sudbury. The Sudbury firms draw, on average, half of their revenue from outside the immediate region and 11% from outside of Canada.

For the last 15 years the Sudbury MS&S cluster has presented federal and provincial policy-makers with an opportunity to develop a high-tech, innovation-based export sector based on existing strengths in the resource sector. Industrialization based on Canadian resource wealth has been the goal of Canadian economic strategy since confederation. The Sudbury cluster also has the potential to drive economic development in one of Canada’s most economically depressed regions. It provides us as policy analysts with a natural experiment that tests the capacity of the current policy regime to achieve the goals that were set for it in the early 1990’s.

Section one therefore describes the MS&S sector and its evolution in Sudbury. We need to establish that the MS&S sector really did present a significant opportunity for Canadian policy-makers.
Section two describes the 15-year evolution of Canadian policy with respect to innovation since the implementation of the Free Trade agreement in 1989. It also sketches two recent strands in economic theory that lay behind that evolution, and describes how they have gradually been incorporated into the conventional wisdom of policy makers. To explain why progress has been so slow in one of the few sectors specifically identified by the key policy analysis of 1991 it is also useful to follow the convoluted process through which theory has gradually been translated into programs.

Section three then describes the very limited support for the development of the Sudbury cluster provided by federal and provincial governments in the fifteen years since the cluster was first described. Section 4 attempts to account for the very limited progress and draw lessons of that apply more generally.

Section 1: Promise- The MS&S sector

The MS&SD sector now employs more Canadians than mining does. The labour-saving technological change that is driving mining employment down around the world is increasing demand for capital equipment and technology. The supply industries now compete internationally and are becoming a significant export sector for advanced technology and services.

Table 1: Selected Canadian Mining-supply and Service Providers

<table>
<thead>
<tr>
<th>Exploration financing</th>
<th>Engineering</th>
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<tr>
<td>Investment analysis</td>
<td>Project management</td>
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<td>Due diligence</td>
<td>Mine construction</td>
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<td>Legal services</td>
<td>Parts and equipment</td>
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<tr>
<td>Geophysics</td>
<td>Materials handling</td>
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<td>Geology</td>
<td>Mineral processing</td>
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<td>Geochemistry</td>
<td>Smelting</td>
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<tr>
<td>Analytical laboratories</td>
<td>Refining</td>
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<tr>
<td>Mapping</td>
<td>Ventilation</td>
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<tr>
<td>Remote sensing</td>
<td>Explosives</td>
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<tr>
<td>Drilling</td>
<td>Safety supplies</td>
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<tr>
<td>Communications</td>
<td>Automation and software</td>
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<tr>
<td>Community relations</td>
<td>Environmental management</td>
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<tr>
<td>Feasibility studies</td>
<td>Transportation</td>
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Mining supplies and services are provided by firms in many different industries, as Table 1 suggests. Firms are connected through their customers and their need for specialized knowledge of the mining industry, but the diversity of products and services has made it difficult for analysts to see them as a coherent entity.


Until the development in the 1980s of the Ontario Mining Equipment and Service Exporters, which later became the Canadian Mining Equipment and Service Exporters (CAMESE), no organization represented the MS&S sector.

A crucial element was added to the Sudbury cluster in the 1990s. David Peterson’s provincial government announced in 1998 it would transfer of the Ontario Geological Survey and offices of the Ministry of Northern Development and Mines from Toronto to the campus of Laurentian University in Sudbury. Peterson hoped to create a critical mass capable of attracting additional industry by concentrating government assets related to the northern economy in northern Ontario. The presence of the OGS did make Sudbury a centre for exploration, and it stimulated mining-related research. There are now thirteen mining-related research institutes or centres at Laurentian, including the mining branch of the Canadian Mining Industry Research Organization. Active participation of the OGS and MNDM also made possible Laurentian’s PhD program in Precambrian Geology.

Section 2: Economic Theory and the Evolution of Canadian Policy

With the implementation of the Free Trade Agreement in 1989, industrial policy became a crucial issue for Canada. By 1989 at least 45 federal agencies were engaged in adjustment programs. In 1992 Industry, Science and Technology Canada reviewed 44 studies conducted between 1988 and 1991. One of the studies, Canada at the Crossroads by Michael Porter and the Monitor Company of Boston, brought to bear the largest collection of new data, was the only study to seriously examine the theory of trade and competitiveness, and was the only one to offer a synthesis that pointed to a consistent set of policy recommendation.

Canada at the Crossroads was commissioned by the Business Council on National Issues and the Government of Canada (represented by four ministries: Industry, Science & Technology, Employment & Immigration, Trade, and Consumer & Corporate Affairs. Although undertaken for Brian Mulroney’s Conservative government, it became the basis of the economic policy of the Liberals in the 1994 election. The innovation strategy of both the current federal government and the Ontario government in 2005 are direct descendents of the recommendations in Canada at the Crossroads.

Prescriptions

Porter’s report was based on an analysis of the pattern of Canadian trade, a detailed study of 25 industries accounting for more than 37% of Canadian exports, and an audit of the institutional and public policy environment in Canada and its impact on the way Canadian firms compete. It also drew on the principle conclusion of Porter’s most influential book, the Competitive Advantage of Nations. In that work, Porter argued for policies based on an extension of the standard theory of comparative advantage.
The most significant and sustainable competitive advantage results, he argued, when a country possesses factors which are both advanced and specialized in a particular industry. Sustained international competitive advantage results from innovation and that “the factors most important to modern industrial competition and to national prosperity are created, not inherited\(^\text{10}\).” Human capital, infrastructure, the institutional system, infrastructure and patterns of industrial organization and attitudes are all factors of production created over time at great expense.

Porter emphasized that Canada’s wealth was still precariously based on natural resources, which are inherited factors. In 1991 exports were concentrated in only five of the sixteen broad sectors. Four of these were minimally processed, natural resource-based products: metal and materials, forest products, petroleum and chemicals, and food and beverages\(^\text{11}\). In 1982 the four “clusters” provided more than 62% of Canadian export revenues. The only other large exporter was the auto industry, protected by national policy and international treaty.

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<th>Stage</th>
<th>Employment</th>
<th>Description</th>
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| 1 | 47 000 | mining and quarrying  
This sector comprises establishments primarily engaged in extracting naturally occurring minerals. These can be solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas. |
| 2 | 87 000 | smelting and refining,  
Primary metal manufacturing (manufacturing metal products by rolling, drawing, extruding, alloying or casting (NAICS 331 includes smelting and refining ferrous and non-ferrous metals from ore, pig or scrap in blast or electric furnaces.).) |
| 3 | 255 000 | in non-metal semi-fabricated parts,  
This sub sector comprises establishments primarily engaged in forging, stamping, forming, turning and joining processes to produce ferrous and non-ferrous metal products, such as cutlery and hand tools, architectural and structural metal products, boilers, tanks and shipping containers, hardware, spring and wire products, turned products, and bolts, nuts and screws.) |
| 4 | Fabricated parts and simple products, and fabricated metal manufacturing.  
and These establishments cut, grind, shape and finish granite, marble, limestone, slate and other stone; mix non-metallic minerals with chemicals and other additives; and heat non-metallic mineral preparations to make products, such as bricks, refractories, ceramic products, cement and glass. |
| 5 | Product assembly | |

Source: Natural Resources Canada. Key Facts 2002

Table 2 : Stages of mining
Commodity prices have fallen relative to the prices of manufactures by an average of about 1% annually over the last 140 years\(^\text{12}\). Between 1971 and 2000 commodity prices dropped over 50% in real $US. Not only have prices fallen but Canada’s competitive advantage has been undermined. Low-cost southern-hemisphere eucalyptus hardwood, for example, now competes with higher-cost Canadian softwood in producing pulp and paper, and fast-growing US plantation pine competes with slower-growing Ontario species in the lumber market. In 1950 Canada produced 95% of the “free world’s” nickel, enjoying monopoly rents. By 1976, when employment in the Canadian industry peaked, Canada share had fallen to 43% and by 2002 Canada produced only 15% of the world’s nickel. Ores of nickel are now mined in about 20 countries on all continents, and are smelted or refined in about 25 countries.

Canada at the Crossroads also found that Canada had largely failed to develop sophisticated suppliers for its resource industries. “Few Canadian industries have obtained significant competitive advantage from healthy indigenous related and supporting industries\(^\text{13}\).” The failure put the resource sectors at further risk in international competition. Of special concern for Porter was that Canada has few internationally competitive machinery industries\(^\text{14}\). Since the middle of the 20\(^\text{th}\) century Canada has been increasing the share of manufactures in its bundle of exports. In 2005, however, Jim Stanford, chief economist for the Canadian Auto Workers began to call attention to the fact that Canada exports have become more resource intensive since 1998, with falling investment in the manufacturing sector and increasing dependence on natural resource exports. A now increasing part of our export sector is producing commodities that are steadily falling in value. In contrast to the Canadian economy, the US, Swiss, Danish and Japanese economies are increasingly weighted towards firms producing unique products using unique processes and the assets of these firms are increasing in value\(^\text{15}\).

**Program: innovation, clusters, advanced and specialized factors**

The barriers to upgrading\(^\text{16}\) for Porter were in “essential areas such as science, technology, education and training” that were in the public domain. Like many analysts he was highly critical of Canadian management, but his emphasis was on public policy. Key problems included the fact that Canada’s R&D infrastructure was not well aligned with requirements for upgrading, supporting industries were weak, and clusters were inadequately developed. To improve the productiveness of R&D, Porter recommended that governments improve coordination, foster better linkages between public research institutions and industry, shift government research funding from government labs to universities and the private sector, encourage greater specialization among universities, both in research and in training programs, and stimulate the adoption of technology. In addition, governments should revise regional development strategies and other policies to foster the development of stronger industry clusters by encouraging existing clusters and focusing on developing specialized factors\(^\text{17}\). With varying degrees of commitment and success, the Canadian government has acted on all of these recommendations.
Clusters

The concept of clusters is one of the key ideas in Porter’s work and perhaps the most contentious and difficult. The concept initially described industries at the national level that succeed in international competition.

Figure 1 uses Canada’s mining cluster and its relationship to the MS&S sector to illustrate what Porter meant by a cluster. In 2003, Canada’s minerals and metals sector employed about 389,000 in the first three of five stages of production (Table 2). The fourth and fifth stages occur to a large extent in other countries.

Shading in Figure 1 indicates industries in which Canadian firms supply a relatively large share of industry demand. In some areas Canadian-based companies are world leaders. Canadian firms have captured a significant share of the world market for airborne geophysical equipment and related software, Canadian data companies have a strong international presence. The Canadian consulting engineering industry, which developed to service large government-funded infrastructure projects, markets project development services worldwide. Challenging mining conditions have helped to make the geophysical contracting industry competitive, and “stringent safety regulations contributed to the emergence of an internationally competitive explosives industry”.

Employment and the variety of products increase rapidly in the later stages of production. Error! Reference source not found. suggests the relative absence of value added production after smelting, and the weakness of Canadian, machinery suppliers. Despite its size and potential, the Canadian metal sector has limited depth and breadth. The distinctive feature of Canada at the Crossroads was the emphasis on reinforcing and completing clusters of industries that produced traded goods.
Figure 1: Schematic of the stages of the mining industry and the associated mining supply and service sector

Sudbury was singled out for special attention in Canada at the Crossroads. Although Porter observed that “few of Canada’s resource-based industries have upgraded or widened their source of advantage.\(^{21}\)” the nickel industry was one of the very few exceptions. It had been “successful in developing advantage in advanced factors\(^{22}\),” and furthermore, “the nickel industry has benefited from the clustering of certain research and development activities, educational institutions and the Ontario Government’s Ministry of Northern Development.

Over the course of the 1990’s the concept of a cluster increasingly came to mean a geographically group of companies and other institutions located close enough to each other for to allow extensive interpersonal contact and for firms to benefit from a variety of externalities generated by the grouping. Growing clusters were thought to attract skilled people through offering greater opportunities particularly where the cluster is concentrated geographically\(^{23}\). Entrepreneurs or individuals with ideas might migrate to the cluster from other locations, because a growing cluster signals opportunities. In Canada at the Crossroads Porter argued that innovation tends to be facilitated by the presence of a cluster, and Mines, in the Sudbury area\(^{24}\).

Although it is not without serious critics\(^{25}\) the cluster-based strategy has become enormously popular - “Clusters have become recognized as a potentially effective mechanism for enhancing competitive advantage, and governments around the world have sought to develop mechanisms to identify actual and
potential clusters and to promote their formation and operation. Clusters enhance economic performance through increases in the productivity of member organizations, driving the pace and direction of innovation, stimulation of the formation of new businesses, and access to new knowledge and learning. The cluster approach “promised a seemingly easy answer to the challenges created by increased international competition and the growing importance of innovation in the knowledge economy – particularly for smaller regions tied to traditional industries.”

The cluster approach was adopted by the federal government in 1994 and has guided the activities of several federal agencies, including industry Canada, (providing funds for communities to identify their clusters), the National Research Council (investing in cluster building) and the SSHRC, (funding a major research project on clusters), and the Ontario Provincial government, (funding biotech cluster in each region of Ontario, supporting research on clusters). Because the cluster approach has been adopted and has become part of the mental machinery of policymakers at all levels, a basic understanding of the approach is crucial for understanding the evolution of competitiveness policy and innovation policy since 1990.

There is no definition accepted by all the agencies, researchers and consultants who use the term. Robinson has pointed out that if cluster theory directs public resources, we should expect that the struggle for control of resources will lead to a struggle for control of the definition. The simplest definition comes from Swann and Prevezer: “groups of firms within one industry based on geographical area.” Porter, whose several definitions tend to dominate discussion, has increasingly emphasizes geographical concentration: “Clusters are critical masses - in one place - of unusual competitive success in particular fields” but he also extends the notion beyond a single industry: a cluster is “an array of interrelated industries and organizations sharing common technology, skills, information, customers and clients and sharing ideas of common concern to increase productivity and competition.” Clusters may also be characterized functionally as networks that provide advantages to the member firms. The OECD has a working definition that places greater emphasis on the knowledge dimension.
The key element in all definitions is a collection of related firms. Figure 2 reproduces the cluster model used by Cassidy et all\textsuperscript{33} to explore the success of the National Research Council’s cluster-building program. The figure places the group of firms in a setting that includes customers and competitors. The success of the firms rests on local factor conditions and may be enhanced by a wide variety of supporting institutions, including government and industry organizations. The narrowest definition includes only the firms.

The collection of over 300 mining supply and service firms in Sudbury is automatically a cluster by this definition. Wider definitions require that the cluster include an array of supporting institutions such as research facilities, standards association, government offices, universities and colleges with specialized training and research programs. Senior policy makers and consultants sometimes look for softer indicators such as signs of self-consciousness, the presence of a cluster organization, or a reputation or brand\textsuperscript{34}. Porter’s 1990 conception of a cluster as a grouping of firms at the national level that succeeds in international competition makes performance integral to his definition.

**Growing political support**

The new liberal government did move quickly when it came to power to increase research funding for universities and to shift resources from government labs, but active promotion of innovation and of clusters did not take hold until almost ten years after the recommendations were published and seven years after they became Liberal Party policy. Liberal policy documents for 1997\textsuperscript{35} and 2002 repeated key ideas from the 1994 Redbook, (and Porter’s 1991
report), providing evidence that the ideas were persisting among Liberal policy-makers. Interestingly, sections of the Redbooks based on the Porter analysis were being quoted in departmental discussion papers by 1998, suggesting that Redbook policies were also insinuating themselves into the culture in the federal bureaucracy.

In 1998, for example, the National Research Council (NRC) and the Natural Sciences and Engineering Research Council (NSERC) funded the Innovations Systems Research Network (ISRN), a multi-year multi-researcher study of innovation systems and clusters. The Social Sciences and Humanities Research Council (SSHRC) funded a second round beginning in 2001. It is significant that the second round shifted the emphasis from innovation networks to the cluster model. When the second round wound up in 2005, ISRN researchers had examined 27 clusters or potential clusters across the country. Over the course of the project researchers met regularly with senior people from HRDC, Industry Canada, Statistics Canada, and, in the Ontario government with the Ministry of economic development and technology. Links with the relevant departments in other provincial were also established.

For the researchers the ISRN was clearly an exciting project, but its role in the evolution of economic policy is particularly interesting. It helped established a national network of senior bureaucrats with a more or less common understanding of innovation and cluster development. The ISRN contributed directly to a process of cultural change within the federal and to a lesser extent within some provincial bureaucracies. It was understood in this light by some of the senior bureaucrats and by some of the senior researchers involved.

A turning point may have been reached in 2002 when the federal government conducted a 10-month cross-country consultation ending in November with a “National Summit on Innovation”. The summit was attended by the Prime Minister and over 500 influential Canadians. The stated objective of this time-consuming and costly process was to “engage partners from the private sector, non-government organizations, academia and government in shaping the priorities for Canada’s Innovation Strategy, and to seek commitment from all sectors for a Canadian innovation and learning action plan.” An unstated objective was to engage a still largely uncomprehending public service and local political representatives in a set of policies that had originated outside of the bureaucracy. It had taken over a decade for policies that had been articulated by academics, supported by a large part of the business community, and adopted by a political party out of power to be grafted onto the federal program machinery.

A key element of the National Innovation Strategy was the National Research Council’s new responsibility to contribute to the development of at least 10 internationally recognized clusters by 2010. Between 2000 and the present, the NRC has received over $300 million in four rounds of funding to establish and reinforce cluster initiatives across the country. In 2005 the NRC published a report on its cluster-building activities called Building Technology Clusters across Canada. The report states that “Stimulating the growth of community-based technology clusters across Canada is an important part of NRC’s business” and that “NRC has played a critical role in the development of emerging and mature clusters across Canada such as Ottawa (IT), Montréal (biopharmaceuticals) and Saskatoon (plant biotechnology).”
Some of the clusters supported by the NRC are very large – the Montreal life-
sciences and aerospace clusters employ 37,000 and 35,000 respectively. Others
are quite small and speculative. The NRC is investing heavily in the Saskatoon
biotech, nutraceutical and bio-products cluster. According to the NRC report,
Saskatoon is home to 35 companies involved in agricultural biotech and another
30 “nutraceutical and functional food companies” which, with the related public
sector employs some 1,100 staff. The NRC will attempt anchor a PEI bio-
resources technology cluster by investing in a $31.5 million institute for
Nutriscience and Health and it is providing $8.45 million to help Halifax
develop a life-sciences cluster that now has “over 60 core companies”. The NRC
claims to have initiated the cluster-building process for a Newfoundland ocean
technology cluster in 2001 and directed $20 million in federal funds to the
cluster in 2002. As of October 2004 there were more than 40 ocean technology
firms in St. John’s, with 11 housed in a $6.5 million facility largely funded by
the NRC. The NRC has been working on the New Brunswick “information
technology/e-business cluster” since it first received ACOA funding in 2000. In
2005 the cluster had grown to 200 firms, 75% of which employ fewer than 20
people. The NRC has also made its mark in advancing Cape Breton’s “nascent
wireless systems cluster”, helping to secure a $7.8 million project.

Surprisingly, the Sudbury cluster – with over 300 MS&S firms in 2005, with
estimates of MS&S employment that range upwards from 8,000, and
approximately 6000 more working in mining, has received no attention from the
NRC. The oversight was not because the cluster was invisible. It had been
identified by Porter in 1991, and in fact even earlier under Ontario premier
David Peterson. It was not because the cluster did not fit the mandate of the
NRC. The Sudbury cluster is clearly more promising than several that the NRC
has committed resources to. Senior NRC officials have explained that the NRC
could not act in an area that was the responsibility of Natural Resources Canada.
A more convincing reason for the neglect was almost the lack of champions at
the provincial level through the 1990’s.

The Ontario provincial government’s views of innovation have shifted toward
Porter’s strategy very slowly over the last ten years. The 1997 (Conservative)
budget papers, for example, expressed a commitment to not investing in
innovation: “The Government's plan is to create a positive business climate to
unleash the power of private-sector job creation – by cutting taxes” and went on
“The Province's plan – cut taxes, invest wisely, and rely on the private sector for
job creation and economic growth – will work for R&D just as it is working in
other areas. Supporting R&D through tax cuts is one important way of creating
good, long-lasting jobs.”

The difference between provincial and federal approaches persisted through the
1990s. The Ontario Competitive City Regions (OCCR) Partnership begun in
1999, for example, brought together Human Resources Development Canada,
Industry Canada and its Federal Economic Development Initiative in Northern
Ontario (FedNor) ), the Government of Ontario (represented by the Ministry of
Economic Development and Trade), and other agencies. The Partnership funded
a series of local symposia for communities with populations greater than
100,000, at least one university, and at least one college. The symposia in
North Bay and Sudbury in 2100-2001 were actively encouraged by Fednor staff
to identify the economic clusters that could serve as the basis for growth. Direction from the province was virtually non-existent. In 2000, Industry Canada was actively promoting the cluster approach at the community level through its regional development staff. The province had no strategy to offer.

In 2001 the province began taking a more activist stance, responding at least in part to pressure from the business community. The Speech from the Throne announced a Task Force on Competitiveness, Productivity and Economic Progress, to be led by Roger L. Martin, Dean of the Joseph L. Rotman School of Management at the University of Toronto. The Task Force was to measure and monitor Ontario’s productivity, competitiveness and economic progress compared to other provinces and the U.S. states and to report to the public on a regular basis. The task force was supported by an independent, not-for-profit Institute for Competitiveness and Prosperity headed by Martin and funded by the Government of Ontario.

Martin’s appointment was evidence of the growing influence of Porter’s 1991 study. Before becoming Dean of the Rotman School in 1998 Martin was a director the company that produced Canada at the Crossroads. In 2000 he co-authored, with Porter, Canadian Competitiveness: Nine Years after the Crossroads, a review of progress in implementing the recommendations in Canada at the Crossroads. The Institute’s first working paper A View of Ontario: Ontario’s Clusters of Innovation. It was a “comprehensive view of Ontario's industry clusters” and “the result of collaboration with Porter's Institute for Strategy and Competitiveness.”

A change of government in 2003 returned the province to a more interventionist stance. The Budget Speech in 2005 promised to create a Research Council of Ontario to coordinate and align research and commercialization investments. The language is eerily similar to that of the early 1990s. The Budget also projected over 500 million dollars of spending for a new Ontario Research Fund (ORF) to support scientific, technological and medical research in Ontario universities, colleges, research hospitals and institutions. The fund replaced a 1997 Ontario Research and Development Challenge which required matching funds from industry. Then in June of 2005 the Premier appointed himself minister of Research and Innovation. Overall, the new government has signaled that it sees innovation leadership coming from public sector institutions rather than primarily from industry.

Although the decade after Canada at the Crossroads was one of growing political momentum for both an innovation strategy and the cluster approach, practical progress was much more limited. In Canadian Competitiveness: Nine Years after the Crossroads Porter and Roger Martin concluded that Canada was “most definitely slipping in competitiveness”. Moreover, many of the weaknesses relate to innovation in one form or another” and that “There is room for governments to show greater entrepreneurial acumen and zeal in providing support to clusters.”
**Section 3: Progress for the MS&S Cluster**

The thrust of the preceding sections has been first, that developing industrial clusters has become Canadian policy and second, that there is an MS&S cluster in Sudbury that fits all the criteria for active promotion. The cluster was well established and showed significant growth potential even in 1991 when it was identified by Porter in one of the key documents in developing Canada’s innovation strategy. The cluster presented an opportunity to build on Canada’s existing strength in resource production to develop industries based on advanced technologies. It offered an existing concentration of “advanced and specialized factors.” It promised to reinforce the dangerously weak Canadian machinery sector. It presented a unique opportunity to promote economic development in northern Ontario, one of Canada’s most economically depressed regions. Decisions already made in the 1980’s by the provincial government had laid the foundations for a research-intensive cluster.

The two most significant public initiatives associated with the MS&S sector after 1991 were, first, the development, by the Ministry of Northern Development and Mines (MNDM), of the Ontario Mining Industry Cluster Council (OMICC) in 2004, and second, progress toward creation of a Center for Excellence in Mining (CEMI - pronounced semi).

OMICC was created in 2004, by MNDM Minister Bartolucci, building on an initiative begun under the previous government. OMICC consists of “representatives of the mineral industry, academia, government and communities.” Although it is called a “cluster” council it is in fact a mineral sector council. Representatives of MS&S firms, specifically the Canadian Association of Mining Equipment and Services for Export (CAMESE) at the national level and The Sudbury Area Mining Supply and Service Association (SMASSA) in Northern Ontario are grouped with “other key stakeholders” and not identified as central players. The evolution of OMICC makes it clear that the provincial government was prepared to listen carefully to the mining companies and saw the MS&S firms as a secondary issue. MNDN staff worked to ensure that the council represented the whole province and to make sure that Sudbury was not identified as “the cluster.”

Nonetheless, the mandate OMICC is to “Lever the current mineral industry assets to create a larger and more globally competitive cluster of mineral and related industries and organizations”. The method is by bringing together the cluster of mineral-related industries and organizations. The boundaries of the so-called cluster are those of the province of Ontario, but within the council it is increasingly recognized that assets will have to be concentrated in the existing cluster.

The only recommendations by the OMICC Co-Chairs in February 2005 that were among the key items identified in Canada at the Crossroads were support for mining education and for R&D. Progress on the first was underway before the OMICC Chair’s reported. Porter had noted that provincial funding policies for post-secondary education discouraged specialization by universities and inhibited the development of the relatively costly but necessary programs in science, engineering and technology fields. These policies prevented smaller universities from launching PhD programs that were industry-specific.
Throughout the 1990s they prevented Laurentian University from developing programs around the mining industry. The effect was to inhibit the development of the research base for the mining industry in Sudbury. Research funding necessarily went to southern universities, inhibiting both the growth of the cluster and the economic development of the region. The problem has been addressed since 2002 and Laurentian has gone on to create programs in Precambrian Geology and Natural Resource Engineering. The Rae report on postsecondary education also supported differentiation, making room for linking post-secondary education to local clusters, a policy that can only be pursued by the provincial government.

The Center of Excellence in Mining Innovation has been presented as an initiative of OMICC although it was initiated and has been driven by FedNor, the federal agency for economic development in Northern Ontario. CEMI is intended to deal with the fact that “much of Canada’s mining related R&D is being undertaken in an uncoordinated manner.” It is significant that FedNor has been the driving force and that the Federal government is expected to be the most significant source of funds through the National Research Council. Fourteen years after Canada at the Crossroads, a branch of Industry Canada is pursuing a cluster-based innovation strategy for northern Ontario and for the mining industry.

CEMI is still at the proposal stage. A business plan was released in May 2005. The plan calls for a national center of excellence in mining and exploration to be located in Sudbury. The rationale for locating CEMI in Sudbury has four parts: 1, the largest concentration of Canadian mining is in Northern Ontario, 2, Sudbury is the largest mining district in the world, 3, Sudbury has a concentration of supply and service firms, and 4, Sudbury has a concentration of internationally renowned research. The CEMI business plan shows that the Sudbury Cluster has finally been accepted in key parts of the federal and provincial bureaucracies. It is striking, however, that the NRC is still not participating directly.

An additional sign of progress is that the MS&S cluster is explicitly mentioned in the plan. While most of the proposed $100 million in funding for R&D is to be directed toward short-term initiatives identified by the mining industry, provision has been made for telerobotics and automation, projects not currently of interest to the Canadian mining industry. It is hoped that these initiatives will open markets for Canadian suppliers. In line with the current federal emphasis on commercialization, (a theme strongly present in the studies at the beginning of the 1990s) the CEMI plan emphasizes commercialization and spin-off companies. Existing SMEs however, are largely ignored and the local MS&S cluster has no explicit role in CEMI.

**Conclusions**

Although the case for promoting the Sudbury cluster is easily made in retrospect, it took the two senior levels of government 14 years to recognize the opportunity flagged in Canada at the Crossroads. At the time this essay was written in mid 2005 neither of the senior levels of government had committed significant resources to the project. The failure is puzzling when the NRC has
already committed significant efforts to developing clusters that were arguably less promising in Nova Scotia and Prince Edward Island.

Jurisdictional issues certainly contributed to the problem. The strategic analysis was developed for the federal government, but the key responsibilities, natural resources and education are provincial domains. Within the federal government agencies for regional development, science, and industry are within Industry Canada, but mining falls under Natural Resources Canada. Within the provincial government responsibility is distributed as well, although the pattern differs. Mining and regional development are under the same Ministry, MNDM, but Industrial development is the responsibility of the Ministry of Economic Development and Technology (roughly equivalent to Industry Canada). It is as though Fednor were transferred to the minerals branch of NRCan.

Lack of capacity at the provincial level was also a barrier. MNDM had no staff economists as a result of cutbacks in the 1990s. Arguably the ministry had neither the capacity to recognize the opportunity nor the resources to campaign for federal support. It is unlikely that the ministry had the staff to develop the suggestions in Canada at the Crossroads into an economically coherent plan. In 2003, when the cluster process was begun in Ontario, the Minister and the Deputy Minister of Northern development and Mines virtually begged the mining industry representatives to provide leadership. (Industry leaders responded that they wanted the ministry to continue to provide coordination.) It is a feature of the Canadian confederation that “although the provincial governments collectively constitute a major factor in the Canadian economy, individually they are relatively minor when compared to the significance of the central government.” Even mighty Ontario relies on the federal government for data and analysis.

Part of the explanation lies in the very long time needed to make a new strategy part of the political culture. It may take a decade to harness the machinery of government. Although the ideas that were to become Canada’s innovation strategy were described fairly completely by 1991 it is possible that building consensus and collecting information cannot be done much faster.

Even when both federal and provincial governments began to support clusters with funds and institutional changes, they had great difficulty identifying clusters to support. The practical solution adopted by the NRC appears to have been to deal with the clusters that organized themselves and were effectively championed by the province and/or municipality. This approach probably resulted in imperfect and somewhat politicized selection, but may produce relatively efficient interventions because it ensures that the resources of the community and the cluster are mobilized at the beginning of the NRC’s participation.

Another partial explanation is that the Sudbury cluster lacked the governance machinery needed to represent it when the senior levels were looking for horses to back. The PEI cluster supported by the NRC, for example, was objectively less promising than the Sudbury MS&S cluster, but PEI has a provincial government with a premier and ten cabinet ministers serving a population smaller than that of the City of Sudbury. Northern Ontario was represented by a
single minister with no direct say in industrial development, education, research, trade or any of the other issues central to the innovation strategies. Wolfe46 and Creutzberg47 among others have argued that the ability of the national; and even provincial governments to influence local economic development is declining and that local governance is becoming more important. The argument supplies the increasingly local cluster approach with the beginning of a political theory. The implicit theory is that growth increasingly depends on local governance, local intelligence, mobilizing local resources – in short on political development and autonomy.

There are signs that the Sudbury cluster was slow to be recognized simply because it was a resource extraction area. Over a century of generating resource rents that flowed to metropolitan regions and supported metropolitan commercial growth has established a vision of how the economy should work. In 2002 many public officials believed it was neither possible nor desirable to promote the MS&S in Northern Ontario. Even MNDM staff argued that the MS&S sector in southern Ontario deserved to be promoted by MNDN at least as much as the Sudbury sector, a remarkable view given that the MS&S sector in the south falls in neither of the Ministry’s two areas of responsibility. The national organization of exporting MS&S firms, CAMESE, which continues to receive MNDM funding, actively opposed the formation of a local supplier organization. Northern Ontario suffered silently the kind of economic colonialism that Western Canada has struggled against.

Writing about New Brunswick, Donald Savoie concluded that “Economic Development in New Brunswick requires a constant pulling against gravity. Gravity does not come solely from the market forces or from the province’s inherent inability to compete. It also comes from a federal government incapable or unwilling to accommodate regional interests in its policies other than those of vote rich Ontario and southern Quebec48.” Savoie distinguishes northern and southern Quebec in this passage, but not Northern and southern Ontario. Northern Ontario in fact faces the double disadvantage of having two senior governments that tend to align with outside metropolitan interests.

The main lesson in the history of the Sudbury MS&S cluster are easy to extract if we try to imagine what might have happened if there had been an independent regional authority with its own economic analysis capacity, if there had been a Northern Ontario Economic think tank, or a PhD Program in regional economic development at Laurentian University. The implication for northern Ontario of Canada at the Crossroads would certainly have been recognized and elaborated. The strategy that is emerging with such difficulty in 2005 would clearly have developed earlier and would have been kept in front of decision-makers at all levels throughout the 1990’s. At the end of the 1990s, when federal and provincial governments were prepared to act, deepening the Sudbury MS&S Cluster would have seemed both obvious and easy. This thought experiment suggests that a major barrier was the lack of brainpower committed to the problems of Northern Ontario.

Promoting the Sudbury MS&S cluster is perhaps the most direct possible response to the problem of Canadian underdevelopment. Ultimately the delay in promoting the Sudbury MS&S cluster may be precisely because shifting the
focus from extraction to the MS&S sector required attacking the most basic
distortion in the economy. Clusters in new industries are easier to identify and
promote precisely because they are not embedded in an institutional structure
and a configuration of interests committed to industrial strategies that have
failed. As Canada at the Crossroads put it, “resource abundance contributes to a
set of policies that reduce the incentives to upgrade and make it difficult to move
beyond the factor-driven stage of development.” It also contributes to a set of
attitudes that make it very difficult to imagine a different approach.

If resource dependency is the old horse and innovation-based supply industries
are the new horse, Canada is not even trying to change horses yet. Federal and
provincial governments have still to understand the need, they still have to make
key decisions, and they still have to commit resources. So far the innovation
strategy has failed to accomplish its goals in northern Ontario.
Endnotes

1 The term is usually ascribed to John Baird, Executive Director of the Canadian Association of Mining Equipment and Service Exporters.


4 The most striking example occurred in April 2002 when the Institute for Competitiveness & Prosperity published its first working paper, A View of Ontario: Ontario's Clusters of Innovation. The paper listed the clusters that the Institute had identified in each Ontario city. Neither mining nor the MS&S sector appeared on the list for Sudbury. The large number of MS&S employees were scattered across 17 NAIC codes, none of which alone had more employees than the metropolitan average.


10 Porter, Crossroads, p.46.

11 Porter classifies food and beverages as production for final consumption, but points out that most of Canada’s exports were relatively unprocessed products such as fish and wheat.

12 See for example

13 Porter, op. cit. p. 43.
14 Porter, op. cit. p. 15.
16 Porter Crossroads. p. 5, proposed an analogue of Adam Smith’s “progressive state”, the “upgrading economy” – one that “relentlessly pursues greater productivity in existing products, using more efficient production processes, and migrating into more sophisticated and higher value industries.”
17 Porter, pp. 93-96
19 Porter, op. cit. p. 44
21 Porter, op. cit. p. 43.
22 Porter, op. cit. p. 34, 41.
23 Porter, op. cit. p.27.
24 Porter, loc. cit..
28 Robinson, op. cit. p. .


33 Cassidy, op. cit. p.7.

34 Robinson, op. cit. p.


36 A very high percentage of Redbook commitments have been carried out according to an assessment on CBC.ca, which tracked every promise in that pamphlet to see what action has been taken since November 2000.


39 Cassidy, op. cit. p. 5

40 Cassidy, loc. cit..


42 Institute for Competitiveness & Prosperity. A View of Ontario: Ontario’s Clusters of Innovation. WP No.1. April 2002. Ironically, the methodology used to identify clusters at the CMA level actually drew attention away from the Sudbury cluster that Porter had pointed to in 1991 on the basis of national data and interviews.

43 Porter and Martin, op. cit. presented new evidence that the Canadian economy was at risk. Data from the 1999 Global Competitiveness Report rated Canadian company operations and strategy as 12th in the world, far below Canada’s standing in the microeconomic environment for business. Canadian ratings on Capacity for Innovation (20th), Product Designs (19th), Value Chain Presence (17th), Control of International Distribution (15th) and Extent of Branding (14th) are all similarly disappointing. In 2002, the last recorded OECD figure, our annual expenditure of GDP on R&D was 1.8 per cent, which is far below the U.S., France and Germany, and below the 2.33 per cent average of the total OECD.

44 Porter, Crossroads, p. 50, 93.


49 Porter, op. cit., p. 29.