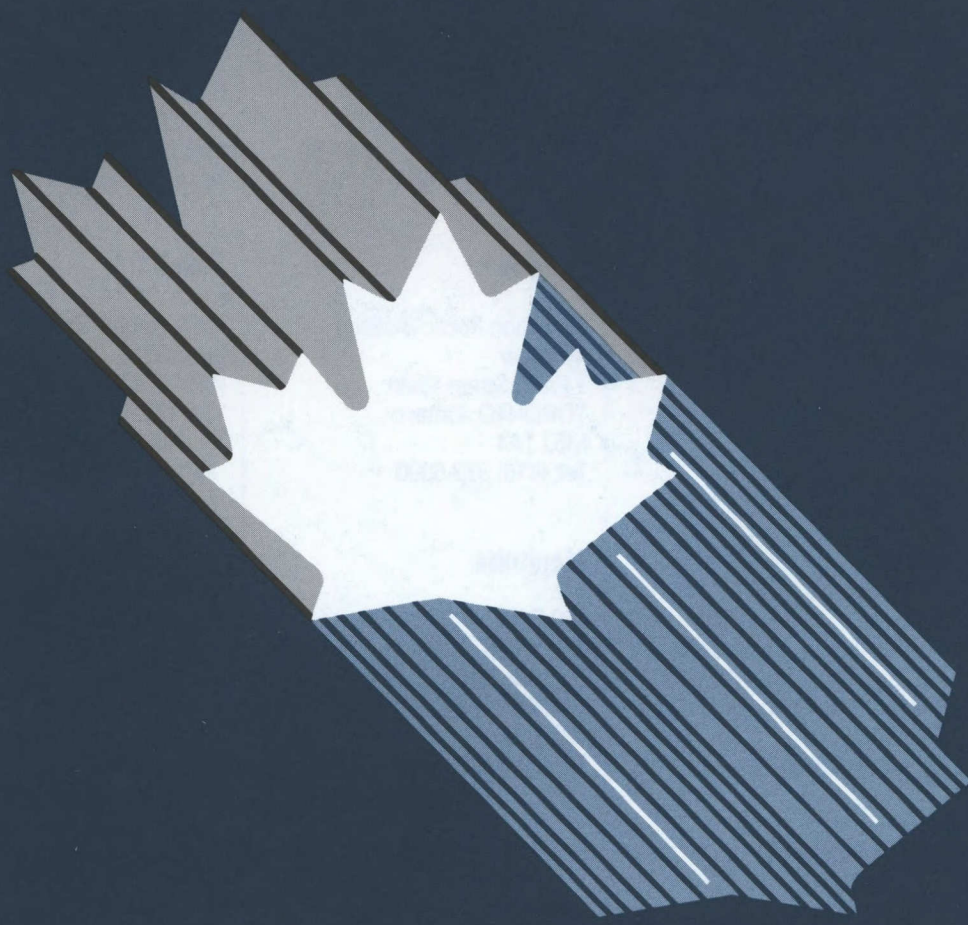



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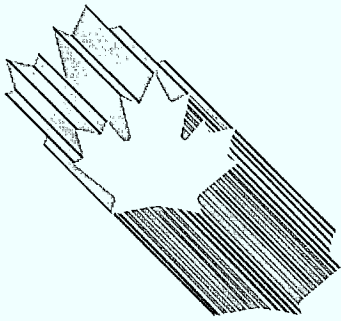
I N D U S T R Y
P R O F I L E



 Industry, Science and
Technology Canada Industrie, Sciences et
Technologie Canada

**Computers
and Office Equipment**

Canada



I N D U S T R Y P R O F I L E

COMPUTERS AND OFFICE EQUIPMENT

1988

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FOREWORD

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In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to survival and growth. This Industry Profile is one of a series of papers which assess, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological and other key factors, and changes anticipated under the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the papers.

The series is being published as steps are being taken to create the new Department of Industry, Science and Technology from the consolidation of the Department of Regional Industrial Expansion and the Ministry of State for Science and Technology. It is my intention that the series will be updated on a regular basis and continue to be a product of the new department. I sincerely hope that these profiles will be informative to those interested in Canadian industrial development and serve as a basis for discussion of industrial trends, prospects and strategic directions.

Minister

1. Structure and Performance

Structure

The companies in this industry manufacture computers, data communications equipment, terminals, storage devices, printers, photocopiers, word processors and typewriters. More than 80 percent of its revenues are from the sale of computers or computer peripherals. Photocopiers are the largest non-computer product, accounting for 16 percent of revenues. Many of these companies are also major producers of computer software and integrated circuits.

The major material inputs are micro-electronic components, printed circuit boards, metal or plastic enclosures, keyboards and monitors. Another major input is computer software. In most cases, manufacturers provide system and application software with their equipment.

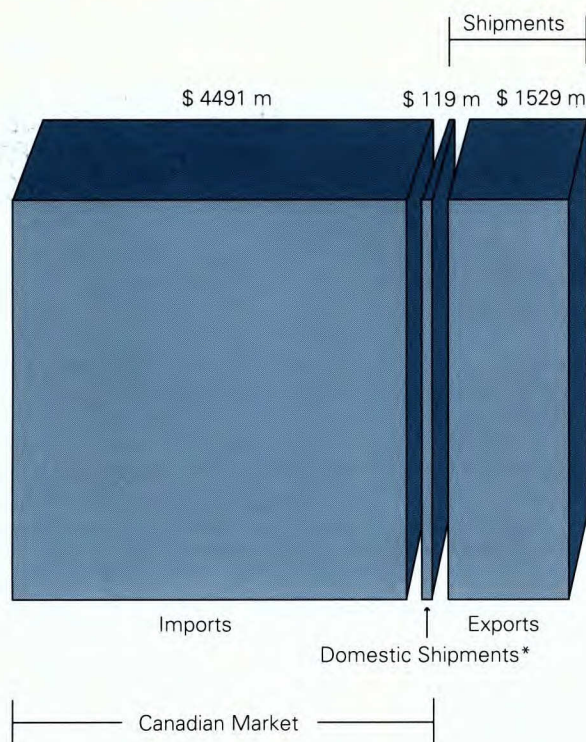
The Canadian industry comprises about 150 manufacturing establishments. In 1986, it shipped goods worth \$1.6 billion, more than 90 percent of which were exported. Imports totalled \$4.9 billion, creating a trade deficit of \$3.4 billion. This deficit largely reflects the lack of Canadian production in several product areas, such as printers and copiers, and the fact that Canada's computer industry does not encompass the full range of user requirements. Employment in manufacturing was estimated at 19 800.

The Canadian industry consists predominantly of the subsidiaries of U.S.-based multinational companies. The largest, IBM Canada Ltd., accounts for 41 percent of computer hardware and software sales in Canada. Seven large multinational subsidiary companies account for 64 percent of Canadian equipment and software revenues.* They are Digital Equipment of Canada Ltd.; Unisys Canada Inc.; NCR Canada Limited.; Honeywell Limited.; Honeywell Bull Limited; Control Data Canada Limited.; and IBM Canada Ltd.

Small companies follow one of two product strategies: they either manufacture a specialized and unique product, or produce a mass-market product like a video terminal. Canadian-owned firms are small and manufacture a small number of products. They accounted for 11.5 percent of total Canadian hardware and software revenues in 1986.

This company size, ownership and market concentration pattern exists in most western countries, with the actual production mix differing, based on the product mandate structures of the major multinationals. For example, in 1986 IBM accounted for 41.5 percent of world sales in large and medium-sized systems, Digital Equipment Corporation 6.3 percent, and Unisys 6.1 percent. Japan is something of an exception. Its electronics companies have strength in micro-electronics, components and consumer electronics, as well as a strong presence in computer markets throughout the world.

* Combined hardware and software revenue data were obtained from Evans Research Corporation. While software activities are not part of the sector definition, revenue data are only available in this form. All other statistics are from Statistics Canada and cover only hardware activities.



**Imports, Exports and Domestic Shipments
1986**

* ISTC estimate

In recent years, multinationals have moved part of their production to newly industrialized countries (NICs) such as the Republic of Korea and Taiwan. Firms indigenous to these NICs have emerged both as suppliers to the multinationals and as producers in their own right.

Companies in this industry represent the leading edge of new technology development. They operate in an environment characterized by high levels of research and development (R&D) and short product cycles. Their products contribute to the productivity of all other sectors of the economy. The Canadian market is substantial, ranking sixth in the world. The public sector accounts for about 40 percent of demand.

Geographically, the Canadian industry is located mostly in Ontario and Quebec, with some activity in British Columbia. Ontario accounted for 80 percent of shipments in 1986. Quebec followed with 12 percent and British Columbia with two percent.

Trade flows are largely the result of the multinationals' international pattern of production. These firms establish plants on the basis of differing labour rates, capital costs and governmental pressures.

Most of Canada's exports go to the United States. Trade flows are mostly between subsidiaries and the parent company in its home country. Imported sub-assemblies are integrated into finished systems and then exported. Conversely, a significant amount of Canadian subsidiary output consists of components or sub-assemblies exported to the United States for integration into finished systems.

Performance

In the early 1970s, the development of integrated circuits led to the microprocessor and to high-density semiconductor memory chips. This technology has improved the performance of large and mid-sized computers substantially. It has also made new products such as the microcomputer and the word processor possible. The introduction of the personal computer has brought about mass-market computers and software. The inexpensive processing power provided by these components has brought substantial automation to the "desktop". This power is now also used in appliances, machine tools, automobiles and many other products. As well, the pattern of equipment ownership has changed. Initially, equipment was mostly leased because of a combination of high costs and intensive maintenance requirements. Now, outright purchase is the dominant ownership pattern.

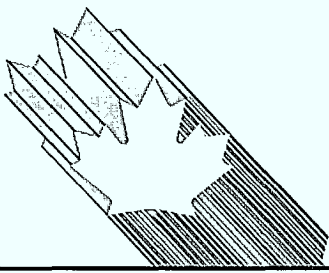
Revenues from equipment sales between 1980 and 1986 have grown at an average annual rate of 22 percent. The market share of large systems has declined, while the share of mid-sized and small systems has increased. Most current growth of installed capacity is in small systems at low unit prices.

Indigenous Canadian companies have had considerable success selling abroad because of their technical competence and price competitiveness. They have successfully penetrated markets such as the People's Republic of China, the Middle East and Europe as well as the United States. Successful export products include multilingual and point-of-sale terminals.

2. Strengths and Weaknesses

Structural Factors

The strongest companies can set market and technical standards independently. They are large, with a substantial degree of vertical integration, an efficient production operation and an effective sales force. Most develop a substantial amount of original technology. A second group of firms has been successful by being fast followers. They use technology developed by others in products which are often the most popular in a particular market niche.



Because of the key role of the multinationals, Canada's ability to attract their investment is a major determinant of the structure of the industry in this country. Important factors for the multinationals include proximity to major markets and the cost, quality and availability of labour, land, energy and transportation. All are areas in which Canada offers many competitive advantages.

Canada's particular advantage is location. Because of its proximity to the United States, the industry's largest market, transportation costs on the bulkier items are reduced, while communications between headquarters and subsidiaries are not a problem. Related to this are cultural and language similarities as well as business practices. Land and energy costs are lower in Canada than in the United States, Japan and most of Europe. In addition, labour costs are lower than those in the United States and some parts of Europe, and there is a plentiful supply of engineers and computer science graduates to support R&D. All of these factors support locating assembly plants in Canada.

Multinational enterprises have invested in Canada for a number of reasons. Tariff barriers were a factor prior to 1970. Now location, as discussed above, is more influential. Policy measures, such as investment promotion initiatives by federal and provincial governments, also have an effect. The net result has been the establishment of multinational subsidiaries in this country, which today constitute the largest segment of the industry in Canada.

Most Canadian manufacturing capacity produces goods for parent multinationals, using current technology on a product-mandate basis for world markets. More than 90 percent of all manufactured shipments are exported. The choice and extent of product mandates result from the global strategies of the parent firms. Mandates vary in extent, and can include related R&D. For example, Digital Equipment of Canada (DEC) Ltd. manufactures backplanes for the entire Digital product line.

Companies such as DEC also perform product R&D, but most of the industry's R&D takes place in the home country of the larger corporations. On a corporate basis, the large multinationals invest an average of about 10 percent of revenues in R&D, whereas their Canadian subsidiaries typically invest about one-half of this rate. Smaller firms normally invest between four and six percent of sales. Their research and development does not often involve the fabrication of new devices or custom components. Rather, it consists of the development of new circuitry using commercially available components. This is a labour-intensive activity with low capital requirements.

Indigenous Canadian companies have performed about as well as their counterparts in Europe and the United States. There have been notable successes in particular product niches such as word processors and terminals. Canadian companies have also faced some difficulties in gaining access to capital. At the same time, they have had some advantages in accessing new technology because of their proximity and links to U.S. companies and universities.

Trade-related Factors

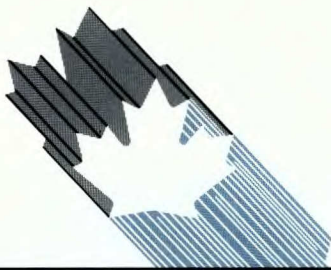
Tariffs on complete computer systems have always been low, typically in the four to six percent range. Canada, the United States and Japan currently have no tariffs on large and mid-sized computers. The United States has a tariff of 3.9 percent on sub-assemblies. The European Community (E.C.) charges the Most Favoured Nation (MFN) rate of 4.9 percent. Japan's tariffs range from 4.6 to 8.4 percent depending on the specific product. Duties are remitted on computer parts imported into Canada which are to be incorporated into products for foreign markets.

Non-tariff barriers (NTBs) have focused on encouraging national firms or attracting investments by multinationals. The General Agreement on Tariffs and Trade (GATT) Procurement Code requires most government tenders higher than US\$171 000 to be subject to international competition. Tenders in the areas of public safety, communications, health and transportation are exempt. Many countries also impose restrictions on defence procurement and set-aside portions for small business. Because of the global scope of the operations of the dominant firms, standards and technical requirements are not major barriers to international trade.

Under the Canada-U.S. Free Trade Agreement (FTA), all remaining tariffs, including those on sub-assemblies, will be eliminated immediately. In addition, the threshold amount for procurement will decline to US\$25 000 for trade between Canada and the United States. Temporary entry restrictions on personnel between the two countries will also be eased. The FTA will be accompanied by a set of rules of origin. Their effect on the Canadian industry may be wide ranging, because components are sourced from a large number of countries.

Technological Factors

The development of products in this industry requires close co-operation between equipment and component manufacturers. All Canadian manufacturers rely heavily on U.S.-designed semiconductors and other parts. Firms based in the United States often exploit new developments before anyone else, because they are close to suppliers and often own them. Japan is in a similar position because of its strength in components.



Indigenous Canadian companies often exploit new developments quickly. Being next to the United States has led to a large body of shared experience through university and company relationships as well as defence ties. Canada has a number of world-class universities in mathematics, computer science and engineering. Their graduates are a major reason for multinationals to locate in Canada.

Other Factors

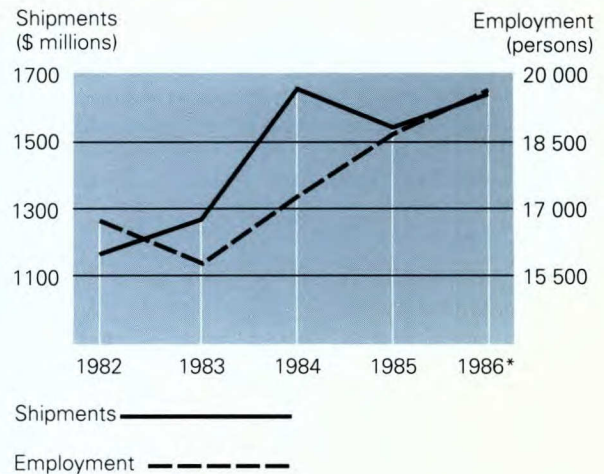
The federal government's rationalization policy for the procurement of computers and office equipment encourages further investment by indigenous companies and multinationals. If a multinational can meet certain trade and investment criteria, for example, its products may be treated as Canadian for the purposes of federal government procurement. Some provincial governments also have procurement-based policies. Quebec, for example, has an Economic Partnership Program which uses procurement to encourage companies to operate in that province. Many provinces also offer assistance to firms in the industry as part of their general industrial promotion efforts.

3. Evolving Environment

This industry will continue to have large numbers of new entrants. The increased importance of data communications and computer networking has resulted in a convergence between computing and telecommunications. Telecommunications companies have also adapted the digital technology on which computers are based to conventional voice functions as well as data uses. The distinctions between telecommunications and computer companies have blurred as computer firms have entered the telecommunications field, and vice versa.

Historically, the industry was dominated by a few full-line, vertically integrated suppliers. The current tendency to less vertical integration among computer firms and their suppliers will continue. With the expansion of markets, it has become possible for companies to specialize in certain market niches. Specialized suppliers of minicomputers, microcomputers and super computers have emerged.

Companies from NICs such as Taiwan and the Republic of Korea are increasing their market presence. Firms with low labour costs can profitably assemble products such as personal computers and photocopiers. The next steps to improved quality controls, internal design and automation often follow. Becoming a supplier to a multinational is often the first step which leads to becoming a substantial, independent player. This step has been taken by both South Korean and Taiwanese companies. Canadian subsidiaries and indigenous companies now face increased competition from these sources.



Total Shipments and Employment

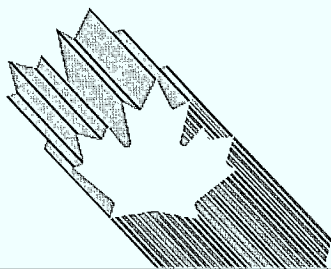
* ISTE estimate

Increasing levels of circuit integration and faster switching speeds in components will continue to improve the price/performance ratio of computers. A major trend today is the shift to distributed computing, involving a network of computers which share both the computing load and software. Distributed computing makes the most of integrated-circuit-based processors and is expected to be a major area of growth over the next few years. Regulatory standards and market competition (e.g., between equipment suppliers and network or value-added service suppliers) will influence the future structure of this industry significantly.

Many office equipment items are adopting computer technology. For example, photocopiers are now using laser printers to produce their images. As well as improving image quality, this development allows photocopiers to be part of an office network, a major objective of office automation.

Software availability and standards impose the greatest limits on growth. In many areas, application software is not available or is just developing. System software standards are a combination of proprietary products and institutional decisions. In the past, this was acceptable because of the limited numbers of suppliers and applications. Now, a lack of standards is acting as a brake on the growth of applications.

Several developments are taking place in response to the need for more uniform standards. Some suppliers are developing the UNIX operating system as a standard for computing. Telecommunications companies are making a similar effort with the Integrated Services Digital Network (ISDN). General Motors is using its market power to develop a software environment for manufacturing, termed Manufacturing Automation Protocol (MAP).



The FTA provides for the immediate removal of current tariffs for products covered by this profile. This may improve Canada's attractiveness because of its proximity to the United States. The agreement also allows for the freer movement of personnel across the border and creates opportunities for Canadian service firms and Canadians working for multinational firms.

4. Competitiveness Assessment

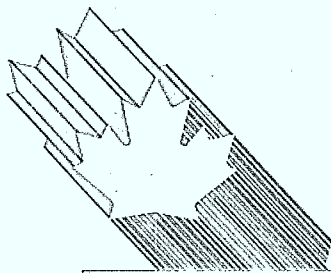
Canadian production is mostly determined by the responses of multinational enterprises to world markets rather than to the domestic Canadian market. Canada is competitive as a location for multinational investment because of its proximity to the U.S. market and the cost, quality and availability of labour, land, energy and transportation.

The FTA may enhance Canada's competitiveness because of its location. Opportunities for Canadian companies will continue to lie primarily in finding market niches and developing specialized systems or technology. The reduction of tariffs under the FTA will expand their market. When compared with small firms in other countries, Canadian computer and office equipment manufacturers are competitive.

For further information concerning the subject matter contained in this profile, contact:

Information Technologies Industry Branch
Industry, Science and Technology Canada
Attention: Computers and Office Equipment
235 Queen Street
Ottawa, Ontario
K1A 0H5

(613) 954-3320



PRINCIPAL STATISTICS

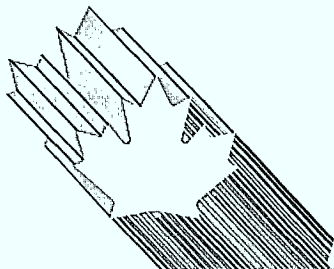
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	1982	1983	1984	1985	1986
Establishments	92	106	135	140	150 ^e
Employment	16 856	15 883	17 155	18 582	19 800 ^e
Shipments (\$ millions)	1 178	1 283	1 662	1 540	1 648 ^e
Investment (\$ millions)	121.3	138.6	157.0	176.9	196.5

TRADE STATISTICS

	1982	1983	1984	1985	1986
Domestic exports (\$ millions)	969	1 115	1 431	1 428	1 529
Re-exports (\$ millions)	265	315	434	525	438
Domestic shipments (\$ millions)	209	168	231	112	119 ^e
Imports (\$ millions)	3 215	3 450	4 947	4 600	4 929
Canadian market (\$ millions)	3 159	3 303	4 744	4 187	4 610 ^e
Exports as % of shipments	82.3	86.9	86.1	92.7	92.8
Net imports* as % of domestic market	93.4	94.9	95.1	97.3	97.4 ^e
Source of imports (% of total value)	U.S.	E.C.	Japan	Asia	Others
1982	86	2	4	5	2
1983	79	3	6	9	3
1984	81	3	6	8	2
1985	79	5	6	8	2
1986	76	5	7	10	2
Destination of exports (% of total value)	U.S.	E.C.	Japan	Asia	Others
1982	72	16	1	3	8
1983	72	16	2	3	7
1984	73	17	1	2	6
1985	75	16	1	3	5
1986	75	16	1	3	5

(continued)

**REGIONAL DISTRIBUTION — 1984**

	Atlantic	Quebec	Ontario	Prairies	B.C.
Establishments — % of total	—	19	64	8	9
Employment — % of total	—	19	64	12	5
Shipments — % of total	—	12	80	6	2

MAJOR FIRMS

Name	Ownership	Location of Major Plants
Control Data Canada Limited	American	Toronto, Ontario
Digital Equipment of Canada Ltd.	American	Kanata, Ontario
IBM Canada Ltd.	American	Toronto, Ontario and Bromont, Quebec
NCR Canada Limited	American	Kitchener, Ontario
Philips Information Systems Ltd.	Dutch	Montréal, Quebec
Unisys Canada Inc.	American	Winnipeg, Manitoba
XIOS Systems Corporation	Canadian	Montréal, Quebec

e ISTC estimate

* Net imports equal imports minus re-exports.

Note: Statistics Canada data have been used in the preparation of this profile.

Regional Offices

Newfoundland

Parsons Building
90 O'Leary Avenue
P.O. Box 8950
ST. JOHN'S, Newfoundland
A1B 3R9
Tel: (709) 772-4053

Prince Edward Island

Confederation Court Mall
Suite 400
134 Kent Street
P.O. Box 1115
CHARLOTTETOWN
Prince Edward Island
C1A 7M8
Tel: (902) 566-7400

Nova Scotia

1496 Lower Water Street
P.O. Box 940, Station M
HALIFAX, Nova Scotia
B3J 2V9
Tel: (902) 426-2018

New Brunswick

770 Main Street
P.O. Box 1210
MONCTON
New Brunswick
E1C 8P9
Tel: (506) 857-6400

Quebec

Tour de la Bourse
P.O. Box 247
800, place Victoria
Suite 3800
MONTRÉAL, Quebec
H4Z 1E8
Tel: (514) 283-8185

Ontario

Dominion Public Building
4th Floor
1 Front Street West
TORONTO, Ontario
M5J 1A4
Tel: (416) 973-5000

Manitoba

330 Portage Avenue
Room 608
P.O. Box 981
WINNIPEG, Manitoba
R3C 2V2
Tel: (204) 983-4090

Saskatchewan

105 - 21st Street East
6th Floor
SASKATOON, Saskatchewan
S7K 0B3
Tel: (306) 975-4400

Alberta

Cornerpoint Building
Suite 505
10179 - 105th Street
EDMONTON, Alberta
T5J 3S3
Tel: (403) 420-2944

British Columbia

Scotia Tower
9th Floor, Suite 900
P.O. Box 11610
650 West Georgia St.
VANCOUVER, British Columbia
V6B 5H8
Tel: (604) 666-0434

Yukon

108 Lambert Street
Suite 301
WHITEHORSE, Yukon
Y1A 1Z2
Tel: (403) 668-4655

Northwest Territories

Precambrian Building
P.O. Bag 6100
YELLOWKNIFE
Northwest Territories
X1A 1C0
Tel: (403) 920-8568

*For additional copies of this
profile contact:*

*Business Centre
Communications Branch
Industry, Science and
Technology Canada
235 Queen Street
Ottawa, Ontario
K1A 0H5*

Tel: (613) 995-5771