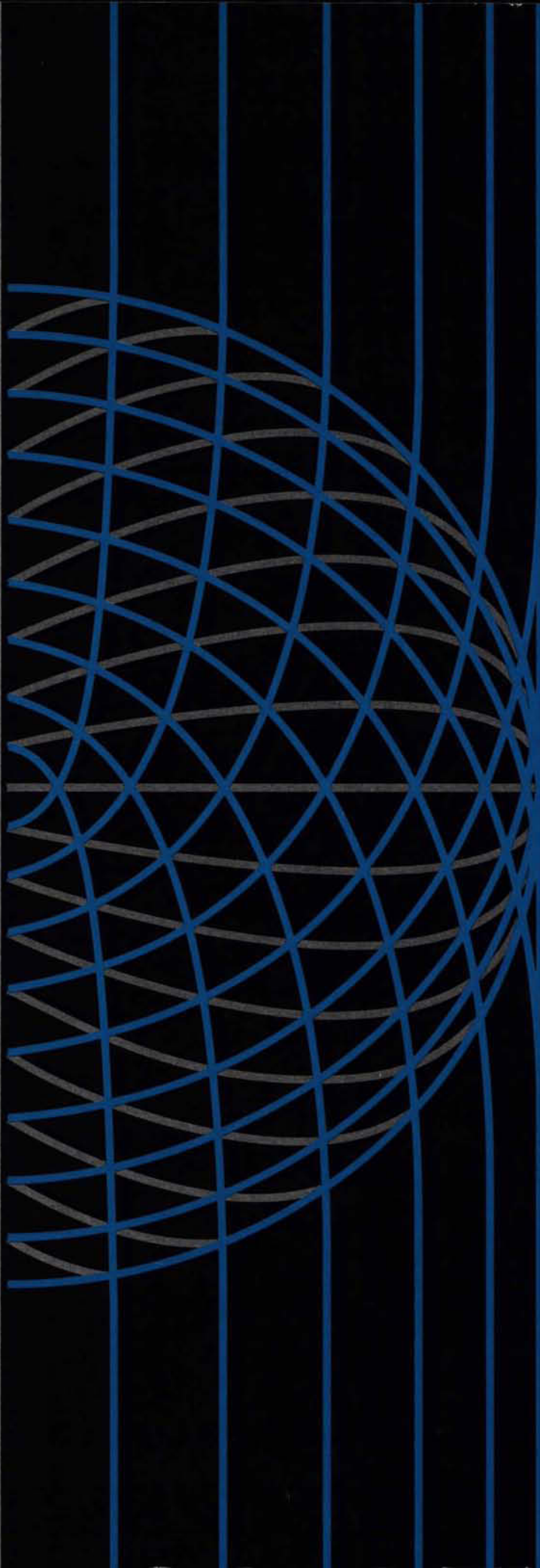


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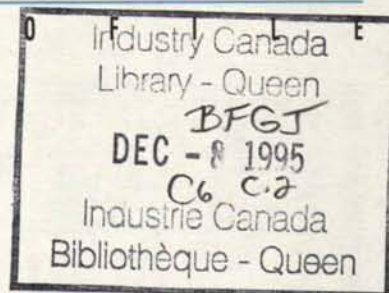
Canada



I N D U S T R Y P R

1990-1991

CONSULTING ENGINEERING



FOREWORD

In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to growth and prosperity. Promoting improved performance by Canadian firms in the global marketplace is a central element of the mandates of Industry, Science and Technology Canada and International Trade Canada. This Industry Profile is one of a series of papers in which Industry, Science and Technology Canada assesses, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological, human resource and other critical factors. Industry, Science and Technology Canada and International Trade Canada assess the most recent changes in access to markets, including the implications of the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the profiles.

Ensuring that Canada remains prosperous over the next decade and into the next century is a challenge that affects us all. These profiles are intended to be informative and to serve as a basis for discussion of industrial prospects, strategic directions and the need for new approaches. This 1990-1991 series represents an updating and revision of the series published in 1988-1989. The Government will continue to update the series on a regular basis.

Michael H. Wilson
Minister of Industry, Science and Technology
and Minister for International Trade

Structure and Performance

Structure

The consulting engineering industry comprises firms engaged primarily in providing services normally associated with the development and construction of capital projects. These services include preparing feasibility studies, planning and making detailed designs. Related activities are project and construction management as well as operational management. Capital projects in construction cover many categories, from infrastructural facilities and buildings to industrial and resource projects. In addition, consulting engineers provide a variety of services in other fields, such as traffic flow analyses as well as telecommunications and environmental assessments. Industry profiles in this series have also been prepared on

- Architectural Services
- Construction Contracting
- Real Estate Development

Capital projects are usually undertaken in one of two ways: on a consulting or project management basis for a professional services fee, or on a turnkey construction basis for a fixed overall construction price. Project management normally involves consulting services only. Turnkey operations, also called engineer-procure-construct (EPC) projects, consist of a package of engineering services as well as procurement, equipment supply and construction activities. EPC operations involve substantial financial involvement on the part of the contractor and are normally undertaken by large integrated multinational firms. Another method of implementing capital projects is through the build-own-operate-transfer (BOOT)

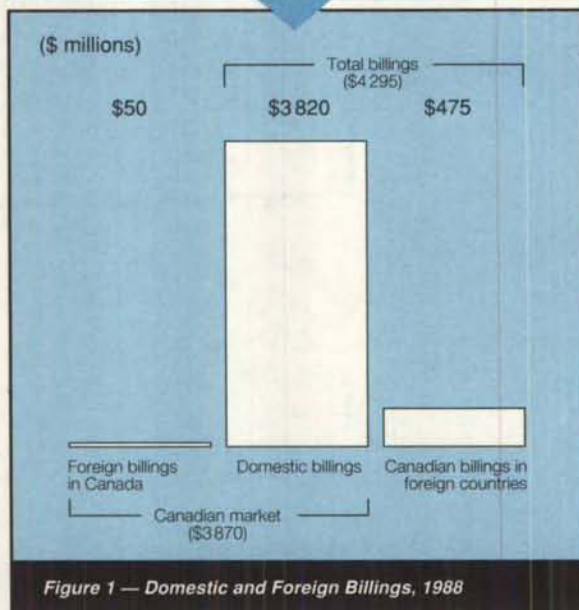


Figure 1 — Domestic and Foreign Billings, 1988

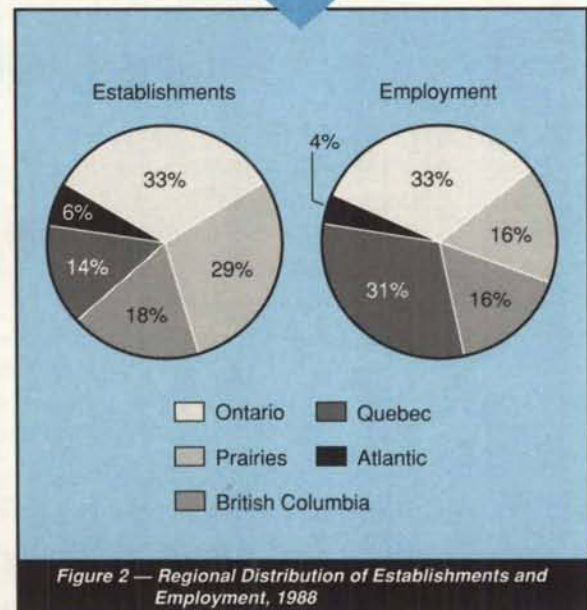


Figure 2 — Regional Distribution of Establishments and Employment, 1988

process. Under this type of arrangement, the project bidder agrees to finance, build, own and operate the facility, usually in a foreign country, for a number of years until the project cost is recovered. At this time, the facility is transferred to the operators in the host country.

The Canadian industry is aggressive and dynamic, ranking among the most developed in the world. Most firms are domestic and privately owned, but a growing number of firms active in Canada are internationally integrated. Three Canadian firms are listed among the world's largest in terms of total billings. Some of the larger Canadian firms have developed or are developing the capacity to provide the complete range of EPC services and are responding to the requests of international clients to assume broader responsibility in procurement and construction, including turnkey contracts. Because BOOT projects are higher-risk activities, only a few Canadian firms are in a position to enter into such arrangements.

The most important revenue fields for consulting engineers in the domestic market are power projects, 20 percent; building construction, 16 percent; primary industries, 15 percent; municipal services, 13 percent; process industries, 10 percent; transportation systems, 7 percent; and other services, 19 percent. In the export market, the same fields are also the principal revenue earners, except for building construction and municipal services, which do not command the same kind of priority in developing countries as in Canada.

In 1988, the Canadian consulting engineering industry employed an estimated 62 000 people in 4 500 firms, with total billings of almost \$4.3 billion. An amount of \$475 million was earned on projects in foreign countries, while foreign billings in Canada amounted to \$50 million (Figure 1).

Consulting engineering companies range in size from one-person operations to large corporations with more than 1 000 employees. One firm exceeds 7 000 employees. Firms with more than 200 people account for about 40 percent of the industry's employment, while those with between 50 and 200 people account for about 30 percent. However, most employ fewer than 50 people, accounting for about 30 percent of the industry's employment.

The regional distribution of firms and their employment reflect fairly closely the location of Canada's resources, industry and population (Figure 2). A major consulting engineering base has developed in the Ontario-Quebec industrial heartland, and accounts for about two-thirds of the industry's fee income. In Quebec, the industry's development can be traced to the contracting-out policies of government agencies and Crown corporations such as Hydro-Québec. As a result, a number of Quebec firms have developed a strong, internationally recognized capability, particularly in hydro-electric power generation and transmission. On the other hand, some firms in Western Canada have developed a capability in serving resource-based industries or producing electrical energy from fossil fuels.

Canada has a positive balance of trade in consulting engineering services. Canadian consulting engineers are



active in the international field, with more than 100 firms working in most regions of the world. The leading markets are in Africa, Asia and Europe. While all sizes of firms serve the export market, the larger ones account for the greater share of Canadian foreign billings.

Consulting engineering companies account for roughly one-half of the engineering services in demand in Canada. The other half is primarily performed in-house; that is, through an organization's own engineering staff in government departments, public utilities, Crown corporations and private sector companies.

The client base of consulting engineers fluctuates over time with the general state of the economy, investor confidence and public sector spending. The split between private sector and public sector work is approximately 50:50. The major share of public sector work comes from provincial and municipal governments.

Consulting engineering represents a major technology base in Canada. The industry is linked to other sectors through the skills it provides for the rationalization, design and management of facilities expansion and technology development. By writing the specifications for materials and equipment, the industry also can have a direct effect on manufacturing and supply industries. For export projects, the engineering assignment often provides opportunities for follow-on sales. Moreover, the technological and managerial expertise of consulting engineers can facilitate the transfer of technology among government organizations, universities, research centres and the private sector.

Performance

The consulting engineering industry is cyclical because activity is influenced by the level of capital investment. Spurred by significant investment in Canadian industry, resource and energy development beginning in the early 1950s, the consulting engineering industry grew steadily. The industry's real average annual growth rate between 1974 and 1982 was about 8 percent. Following the 1981-1982 recession, however, it suffered a considerable reduction in fees and employment. New operations were established by laid-off engineers, and branch offices of large firms were established in response to provincial and municipal government policies favouring locally based firms. The increase in price competition, which is still prevalent, forced companies to operate at lower margins, thus reducing the quality of service and curtailing the research and training budgets of firms. Many firms had to rationalize and retrench their operations.

A few larger companies diversified and made acquisitions or mergers. Diversification into non-engineering areas has not always been successful in generating the financial

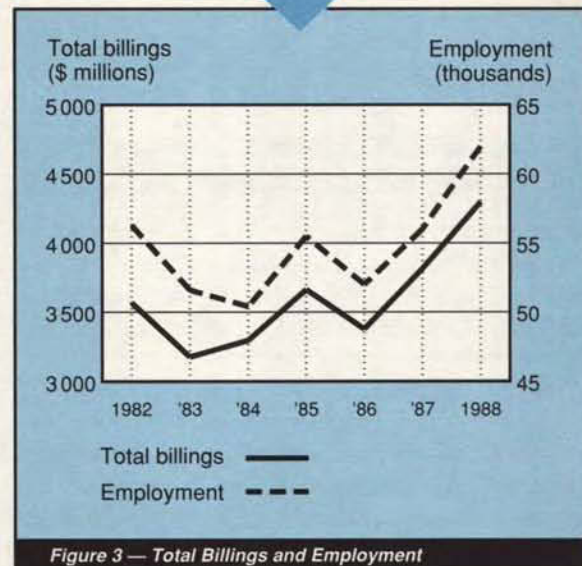
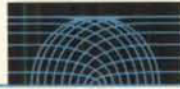


Figure 3 — Total Billings and Employment

stability to offset the cyclical nature of the capital projects. In a recent case, diversification created a situation where a large Canadian consulting engineering company, Lavalin, was forced to restructure as a result of poor performance in the non-consulting portion of the firm. The consulting engineering portion was bought out by another large Canadian consulting engineering company, SNC, to form SNC-Lavalin. This union has created the largest Canadian, and the fifth largest international consulting engineering company. Except for 1985, no real growth occurred between 1983 and 1986 (Figure 3). Business picked up in 1987 and again in 1988, mainly in Ontario and Quebec. While downsizing since the 1981-1982 recession has made companies more efficient and productive, profit margins continue to be low, largely because of strong competitive forces. They still lagged behind those of the U.S. engineering industry, however, which uses a different fee structure and which benefits from the U.S. practice of selection by technical competence rather than by price.

Industry billings abroad grew from \$80 million in 1974 to \$400 million in 1982. From 1982 to 1986, there was some fluctuation in Canadian billings in foreign countries; the growth then continued, rising to \$500 million in 1987 and to almost as much in 1988.

The main asset of a consulting firm is its labour force. While labour costs are the major expense of a firm, investments in computers and, to some extent, laboratory equipment have increased in recent years. Profit margins have fallen steadily since the 1970s. While some increase in profits has occurred since 1986, profit margins for the whole



industry amount to an average of about 8 percent of revenue before taxes. However, those of the larger firms have been much lower than the industry average.

Strengths and Weaknesses

Structural Factors

The key factors contributing to the competitiveness of Canadian consulting engineering firms are their technical, managerial and marketing skills, the strength of their domestic base, the level of their technological capability, the extent of their participation in international consortia, and government export assistance.

The Canadian consulting engineering industry is highly competitive in providing design and project management services in the international capital project market. The total international market (the market gained by foreign firms in other countries) is worth \$5 billion for design firms and over \$100 billion for contractors, including design-build contractors. Although Canadian consulting engineers have not competed significantly in the design-build market, they regularly secure about 8 percent of the international design market. This is about the same market share attained by French and German firms but lower than the share of U.S. and British firms. However, in 1987 and 1988, the market share of Canadian firms was surpassed only by U.S. firms, which remained in the top position.

Canadian capabilities in developing capital projects at remote, environmentally hostile sites are probably unparalleled in the world. The industry's key strength, however, is its reputation for offering independent professional advice. The demonstrated strength of Canadian firms has been in providing independent and impartial services to clients through consulting services and project management. These are services provided without direct links to manufacturers, contractors and suppliers. Through a competitive bidding process, they assist clients in the selection of contractors and suppliers for the various components of the capital project. The firms also offer clients the high level of North American technology and project management services. Quebec firms have a natural advantage in Francophone countries. All of these factors help Canadian engineers gain work in less developed countries (LDCs), from which about 70 percent of their foreign billings are derived.

An August 1990 report prepared for the Canadian Engineering Manpower Board and the Employment and Immigration Commission indicates that the demand for engineers in Canada is expected to rise significantly by the year 2000, whereas the supply of engineers will grow more slowly.

Officials in the industry and government are closely examining this report and other information pertaining to this matter to ensure that any emerging shortfall is quickly and accurately assessed.

The Canadian consulting engineering industry accounts for about 15 percent of the engineers in the work force. Any shortage of engineers in Canada will affect the consulting engineering industry. While the standard of engineering education in Canada is considered high, enrolment in engineering courses has declined relative to that in other disciplines. In the past, Canada has relied on immigrants for its engineering population. The extent to which Canada can continue to do that in the future is unclear, because of the possibility of competition for skilled engineers with the United States, Europe and other countries. Aggressive promotional efforts will likely be required at both the pre-university and engineering graduate levels to encourage more people to move into engineering occupations. The Association of Consulting Engineers of Canada (ACEC) and the Canadian Council of Professional Engineers (CCPE) and its constituent associations are working together with government and educational institutions on measures, such as attracting more women to the engineering profession, to avert any shortfall that may occur. The government's Canada Scholarships Program, National Science and Technology Week and Science Culture Canada Program are examples of initiatives to attract more students to the engineering profession.

Consulting engineers mainly apply existing technologies to meet the needs of their clients. The expertise of a consulting engineering firm is based not only on the methods used in operating a consulting practice, but also on the qualifications of its people, the techniques used, the extent of its knowledge base and previous experience. Also used are proprietary processes, either developed by the consulting engineering firm or purchased under licence.

In today's diversified market, many projects require a combination of skills and experience that is difficult to find in a single organization. As a consequence, firms must group together in joint ventures or consortia to provide the required services. An added factor, particularly in the case of multi-industry consortia formation for larger projects, is sharing the contractual risks, even though this, and the compounding of contingency factors, may adversely affect competitiveness. Nevertheless, this need to form consortia remains particularly important in Canada because of the lack of integrated firms. Moreover, on international projects, consortia are also an attractive way of sharing the export financing with firms of other countries.

In the international capital project market, Canadians must compete with foreign integrated firms offering EPC services on a turnkey construction basis for a total price, fixed in



advance and bearing the risk of cost overruns. Canadian consulting engineers offer an alternative approach; that is, they offer EPC services on a consulting or project management fee basis, but without guaranteeing the actual cost of project construction. When Canadian firms do compete directly on contracts with foreign turnkey construction contractors, they form consortia with contractors and equipment suppliers. In the industrial plant field, some foreign firms have their own proprietary process technologies, which are used in the plants they build. Canadian-owned firms have not yet developed the same depth of capability as integrated U.S.-owned and European-owned firms, and often do not have comparable financial resources.

The industry's domestic and export activities are mutually supportive. A strong domestic practice provides the base from which to export, and a strong export practice provides the additional experience and employment that will strengthen the domestic base.

One effect of Canada's relatively successful consulting engineering industry internationally is that access to export markets is also facilitated for other Canadian industries. By undertaking feasibility studies and detailed designs, consulting engineers are a lead-in to capital projects. In the typical capital project, 10 percent of the cost is for engineering and 90 percent is for construction and equipment. Consequently, consulting engineers, by being effective technology exporters, create opportunities for exports of Canadian goods and other services. Estimates place these opportunities at between two and five times the actual value of the consulting services.

In the past, government support to match the aid provided to foreign competitors has helped Canadian consulting engineering firms secure contracts abroad. Both federal and provincial governments have provided front-end marketing support. Federal initiatives such as the Program for Export Market Development (PEMD) and project identification through the Canadian International Development Agency's (CIDA) Canadian Project Preparation Fund (CPPF) have been beneficial to Canadian firms in securing overseas contracts. Project financing through the Export Development Corporation (EDC) has significantly helped consulting engineers develop capital projects abroad. However, constraints on Canadian government financing, particularly concessional financing, for export projects have added to the challenge of remaining competitive internationally, as not all competing countries have reduced this type of project support to the same degree.

Trade-Related Factors

Although there are no major barriers to international trade in consulting engineering services, a number of irritants can detract significantly from efficient operations. These include discriminatory taxation, requirements to employ local nationals,

the need to form a joint venture arrangement locally, currency restrictions, professional licensing restrictions, and countertrade (trade that is conditional upon a reciprocal purchase).

In addition, when competing for projects in developing countries, Canadians face stiff competition from companies in developed countries that receive significant government aid.

In developed countries, because of the mature nature of local consulting industries and client preferences, the normal practice for foreign companies is either to establish or acquire a local company or to enter into a joint venture with a local firm on a project-by-project basis.

Under the Canada-U.S. Free Trade Agreement (FTA), which was implemented on 1 January 1989, both governments have facilitated the temporary cross-border access for professional and business people. Also, tariffs on drawings and plans have been removed. As part of the FTA, the professional licensing bodies in each country are working towards harmonization and reciprocity of their accreditation and licensing requirements. Difficulties do remain in the area of state licensing regulations.

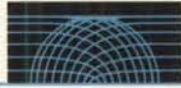
Technological Factors

Consulting engineers are agents of technology transfer, basically converting available technology, or knowledge, into practical solutions to problems through the use of innovative engineering.

Firms in the industry also perform research and development (R&D) both on their own account and under contract to clients. While most own-account R&D is directed to the management and efficiency of the consulting practice itself — management information systems and computerization — the research work can also include improved designs, processes and systems. Because of the nature of their business, firms are constrained in this type of R&D by funding limitations.

R&D performed under contract is mostly project-specific research or development to find solutions to a client's particular problem. This type of endeavor is an important area for consulting engineers because, by applying their technical and management skills to new and emerging technologies, their competitiveness is enhanced. Furthermore, as agents of technology transfer, consulting engineers also bring together the different technologies of engineering design, industrial processes, construction and manufacturing required in capital projects. As such, they also contribute a technical synergism.

Consulting engineering involves a spectrum of expertise. In general, Canadian firms match the capabilities of equivalent U.S.-owned and European-owned firms. However, as they do not have an integrated manufacturing or contracting capability, they often do not have manufacturing and processing technologies of their own. Because manufacturing firms are not heavy



users of consulting engineering services, firms have not yet developed an in-depth capability in certain areas of secondary manufacturing, robotics and other advanced manufacturing technologies. Improvements in these areas are needed to allow the industry to compete more effectively in future markets of developed countries as well as to offset import competition.

Technology change in the Canadian consulting engineering industry is by no means uniform. Several firms have adopted sophisticated computer-based technologies, such as computer-aided design and drafting (CADD), but others have not. Some with sophisticated CADD systems had difficulty sustaining them during the 1981–1982 recession. The development of large-capacity microcomputers has now made computer technology more affordable to most firms. Many clients are requiring firms to use computer technology in their design work.

Other Factors

Agencies at all levels of government in Canada regularly decide whether to contract out for the engineering services they require or, alternatively, to provide the services in-house. The latter decision can mean lost opportunities to develop private sector capabilities and export potential. Over the years, Quebec has contracted out for most of its highway work as well as for the development of its hydro-electric sites; this practice has contributed to the competitive strength of Quebec-based engineering firms. Consequently, some of Canada's most successful exporting consulting engineering firms are headquartered in Quebec.

One reason for the lack of development of integrated firms in Canada is that, despite the country's large size, the market is segregated by provincial trade barriers such as local preferences, which prevent companies from operating nationally with a large, integrated pool of resources. In Canada, federal government departments request a quote as part of engineering proposals submitted to them. Firms in the industry, however, feel this practice inhibits innovative solutions to engineering problems. In the United States, the federal government and more than one-half of the state governments instead require contracts to be negotiated on the basis of demonstrated competence and qualifications to perform the services required; subsequently, fees are negotiated with the firm having the best technical proposal. This practice strengthens the capacities of U.S. firms by permitting them to fully develop their capabilities. As a consequence, they have a comparative advantage over Canadian firms in bidding for the same projects in the United States.

The practice of provincial governments to give preference to local firms bidding on a given project creates barriers to interprovincial trade. This denies firms from other regions

the opportunity to show whether they could perform the work more efficiently and prevents Canadian firms from building a "critical mass" of staff in one location in order to compete better with foreign firms, especially U.S. firms having freer access to Canadian markets under the terms of the FTA.

Evolving Environment

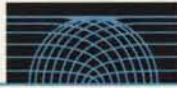
The industry is in transition, requiring firms to adapt their operations to new technologies and to new expectations of clients. In the future, three types of consultancy operations are expected to predominate in order to meet market requirements:

- the large multidisciplinary consulting practice capable of initiating major project proposals and offering a complete range of services, such as financial services (including taking equity as part of compensation), project management, and operation and maintenance;
- the small to medium-sized traditional firms, which essentially serve the domestic market, particularly the public sector; and
- the specialized firm concentrating in particular fields, which are sometimes involved as part of joint ventures or consortia.

At the time of writing, the Canadian and U.S. economies were showing signs of recovering from a recessionary period. During the recession, companies in the industry generally experienced reduced demand for their services, in addition to longer-term underlying pressures to adjust. In some cases, the cyclical pressures may have accelerated adjustments and restructuring. With the signs of recovery, though still uneven, the medium-term outlook will correspondingly improve. The overall impact on the industry will depend on the pace of the recovery.

Internationally, the market for conventional consulting engineering services is diminishing because of the increasing capability of developing countries to handle these services themselves. However, specialized capabilities and project management skills will still be in demand. In addition, turnkey construction projects and those requiring equity participation are expected to offer increasing opportunities. The larger Canadian firms are moving in this direction and are positioning themselves to handle these higher-risk projects by teaming with other firms to provide financial strength and to share the risks.

At the same time, there continue to be market opportunities to sell technical expertise in global market niches — either on their own or in consortia — for small or medium-sized firms



with specialized world-class capabilities. To be successful, these smaller firms will have to make a commitment on a long-term basis to export their services and will have to devote the necessary resources to market their capabilities.

The record of Canadian consulting engineers with the World Bank and other international lending agency projects is good. Canadian firms are facing stronger competition from local firms in the country of the project. It is estimated that 50 percent of the value of all the consulting contracts awarded by these agencies go to local firms. A positive aspect is that loan allocations for projects have been increasing recently, after years of relatively low activity.

While it is difficult in overall terms to forecast how economic and other factors will affect specific fields for consulting engineering services, present indications suggest that activity in Canada will continue to grow in the energy, transportation and environmental fields, while softening in the pulp and paper, mining and manufacturing markets. Internationally, stronger activity is expected in energy, transportation and environment, particularly from increased loan allocations of the international lending agencies. Also, as developing countries improve their industrial base, opportunities should emerge correspondingly in these fields.

Because the Canadian market is considered to have fewer barriers to entry than other countries in the world, the thrust towards more liberalized trade in services in the global market can lead only to benefits to Canadian firms in the long term.

The Canadian share of the European Community (EC) market in consulting engineering is small. Firms have penetrated this market mainly by establishing or acquiring European operations or by associating with European firms. Of particular importance is how the trend towards economic integration of the EC will affect the right of establishment or the right of acquisition, temporary access of professionals and the licensing of engineers of firms from outside the EC. In addition, stronger international competition is anticipated from larger firms as a result of the planned EC economic integration after 1992.

The activity of Canadian consulting engineering firms in Eastern Europe has been slight. One reason is that the region apparently favours turnkey contracts over consulting services contracts. There is no indication that this approach will change as a result of liberalization in those countries. While the potential for business appears good in such fields as infrastructure rehabilitation, resource development and the environment, progress will be slow without significant foreign investment and resolution of problems arising from shortages of hard currency.

In Canada, the rapid growth of consulting engineering work in the 1960s and 1970s, driven by economic expansion and major projects, has declined in recent years. Although a number of energy-related mega-projects are anticipated,

most future domestic public sector projects will likely be smaller ones that focus on upgrading existing infrastructure. In government, there may be additional scope for more contracting out from departments and agencies, particularly at the provincial and municipal levels. In the private sector, there will be generally less emphasis on expansion of capacity and more concentration on upgrading of existing facilities and on improving production methods.

The degree of success in the domestic market will depend largely on the willingness and flexibility of the industry to adjust its operations from the traditional area of design of capital projects (which has been diminishing) to new opportunities for maintaining or upgrading existing facilities and improving production methods, with attention given to environmental considerations.

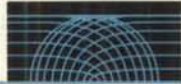
The environment is a rapidly growing field for consulting engineers. Environmental consulting now accounts for about 15 percent of total industry revenues. With the growing emphasis on achieving sustainable economic development and with the introduction of more stringent environmental regulations, projects will require more detailed up-front assessments and will be subjected to greater controls on how they are planned, designed, constructed, operated and decommissioned. This growing market will provide significant opportunities for consulting engineers, as their skills can be used to develop, apply and integrate the new technologies required to resolve the technical problems of improving the environment.

Competitiveness Assessment

Consulting engineering is an example of a world-class Canadian service industry. Canadian exports of consulting engineering services are ranked second in the world. Canadian firms are competitive in most fields and have achieved international recognition in power, pulp and paper, mining and metallurgy, and transportation projects.

While Canada exports to many countries around the world, the largest market for its design engineering services is the United States, which is considered to be the most competitive market in the world. Canadian billings in the United States in 1988 amounted to about \$100 million. Growth is expected over the long term. Since the implementation of the FTA, there have been no signs of increased competition from U.S. firms in the Canadian market, but this competition may emerge in the future, particularly through EPC firms.

The likelihood is high that the industry will successfully adapt to the more difficult and competitive global market for engineering services. Leaner operating methods and downsizing induced by the 1981–1982 recession, plus movement



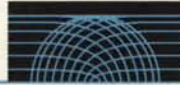
towards greater use of computerization and strategic alliances, augur well for improved competitiveness. The industry's flexibility means that Canadian firms are well positioned to capture a proportionate share of emerging international opportunities, provided that they can continue to obtain competitive export financing for services and capital projects. There would appear to be scope, nationally and particularly at the provincial and municipal levels, to make further gains in the industry's development through more contracting out of engineering services. Diversification of larger consulting engineering firms has improved their financial strength, and should also permit them to pursue future higher-risk projects in the EPC and BOOT fields.

Future success of the industry will depend, in large part, upon closer attention to human resources training, development of new skills, acquisition and adoption of new technologies, development of new markets such as industrial engineering consulting for the secondary manufacturing sector and factory automation, computerization, marketing, joint ventures or consortia with Canadian and international firms, associations with firms in the country of the project including the training of local engineers, and the ability to arrange innovative project financing.

The industry has a record of strong and proven performance in domestic and international markets. Its capacity for flexibility, competitiveness and innovation positions it to successfully meet the anticipated new challenges of the future, both at home and abroad.

For further information concerning the subject matter contained in this profile or ISTC initiatives listed on page 11, contact

Service and Construction Industries Branch
Industry, Science and Technology Canada
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PRINCIPAL STATISTICS^a

	1974	1982	1983	1984	1985	1986	1987	1988
Establishments	1 591	3 200	N/A	N/A	N/A	4 000	4 300	4 500
Employment	36 926	56 300	51 600	50 400	55 500	52 000	56 000	62 000
Payroll (\$ millions)	458	1 861	1 656	1 719	1 912	1 758	1 986	2 237
Total billings (\$ millions)	984	3 568	3 174	3 294	3 664	3 375	3 815	4 295

^aAll data are ISTC estimates derived from a number of sources, including Statistics Canada surveys of engineering and scientific services as well as consulting engineers, McGraw-Hill's *Engineering News-Record* survey of the top 500 design firms of 8 April 1991, and an ISTC mini-survey.

N/A: not available

TRADE STATISTICS^a

	1974	1982	1983	1984	1985	1986	1987	1988
Canadian billings in foreign countries (\$ millions)	80	400	380	410	380	400	500	475
Domestic billings (\$ millions)	904	3 168	2 794	2 884	3 284	2 975	3 315	3 820
Foreign billings in Canada (\$ millions)	N/A	N/A	30	30	30	25	25	50
Canadian market (\$ millions)	N/A	N/A	2 824	2 914	3 314	3 000	3 340	3 870
Canadian billings in foreign countries (% of total billings)	8.1	11.2	12.0	12.4	10.4	11.9	13.1	11.1
Foreign billings in Canada (% of Canadian market)	N/A	N/A	1.1	1.0	0.9	0.8	0.7	1.3
Canadian share of international market (% of billings)	N/A	8	8	9	8	9	10	9

^aISTC estimates.

N/A: not available

CANADIAN BILLINGS IN FOREIGN COUNTRIES^a (% of total value)

	1982	1983	1984	1985	1986	1987	1988
Africa	21	28	26	30	29	20	24
Asia	15	17	25	27	24	26	22
Europe	5	5	6	1	11	26	20
Latin America	14	12	8	11	14	17	17
Middle East	18	18	9	6	4	3	4
United States	27	20	26	25	18	8	13

^aISTC estimates.



REGIONAL DISTRIBUTION^a (1988)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Establishments (% of total)	6	14	33	29	18
Employment (% of total)	4	31	33	16	16
Billings (% of total)	4	30	37	15	14

^aISTC estimates.

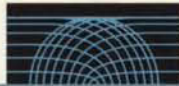
MAJOR FIRMS

Name	Country of ownership	Location of head office
Acres International Limited	Canada	Toronto, Ontario
Hatch Associates Inc.	Canada	Mississauga, Ontario
Kilborn Engineering & Construction Limited	Canada	Toronto, Ontario
Monenco Limited	Canada	Montreal, Quebec
Sandwell Inc.	Switzerland	Vancouver, British Columbia
H.A. Simons Ltd.	Canada	Vancouver, British Columbia
SNC-Lavalin	Canada	Montreal, Quebec
Stanley Technology Group Inc.	Canada	Edmonton, Alberta
UMA Group Ltd.	Canada	Vancouver, British Columbia

INDUSTRY ASSOCIATIONS

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SECTORAL STUDIES AND INITIATIVES

The following initiatives have recently been supported by Industry, Science and Technology Canada.

The ACEC and ISTC signed a Memorandum of Understanding (MOU) in May 1989 aimed at strengthening the global competitiveness of the Canadian consulting engineering industry.

ISTC believes that consulting engineers can contribute more to the international competitiveness of Canadian manufacturers. In accordance with the MOU, ISTC is working with the ACEC to encourage more firms to focus on the needs of secondary manufacturers for industrial engineering and factory automation. ISTC also believes that this market has not received adequate attention from the consulting engineering industry.

ISTC has contracted to provide funds to ACEC to undertake a study on the attitudes of manufacturing and process companies towards using consulting engineers.

The Science Council of Canada is currently engaged in an ISTC funded study on the R&D performance of selected industry sectors (including consulting engineers) with a view to understanding the relationship between R&D and global competitiveness.

As part of the ISTC activities of the Environmental Industries Sector Campaign, a survey is being conducted to identify the depth of capability in this field of service firms, including consulting engineers.

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