

Consulting Engineering in Canada

An Update

A REPORT PREPARED FOR
DEPARTMENT OF INDUSTRY, TRADE AND
COMMERCE
CONSTRUCTION AND CONSULTING SERVICES
BRANCH
IN COOPERATION WITH
ASSOCIATION OF CONSULTING ENGINEERS OF
CANADA

BY

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TORONTO, ONTARIO
MARCH, 1981

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Cat. No. C 2-70/1981E

ISBN 0-662-11611-9

EXPLANATORY NOTES

1. Derived from Statistics Canada, "Consulting Engineering Services", 1974, 1978.

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March 1981

Mr. R. D. Gladu
Chief - Consulting Services Division
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Dept. of Industry, Trade and Commerce
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K1A OH5

Dear Mr. Gladu;

We are pleased to submit the results of our update study on the consulting engineering industry in Canada, completed over the past two months. Before beginning, we would like to review the background of the study and our approach, present an outline of the report, and review the major conclusions.

**BACKGROUND OF
THE STUDY**

In April 1978, our firm completed a study of the consulting engineering sector in Canada for your Branch and the ACEC. This was the first "in-depth" study of this diverse sector and was based partly on the 1974 Statistics Canada survey of the industry. The recent publication of the 1978 Statistics Canada survey made this an appropriate time to update our earlier study.

Our first report, based partly on 80 personal interviews, presented both an analytical profile and a qualitative assessment of the industry and its problems. The main focus of the present study has been to update the information on the sector and revise, where necessary, any projections of future trends.

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OUR APPROACH

We first reviewed all information pertaining to the sector published since our last report, as well as available forecasts related to the industry. In particular, we conducted a preliminary analysis of the 1978 Statistics Canada survey results and reviewed our findings with Statistics Canada and ACEC personnel. These results suggested in what areas certain data had to be clarified or added to. We then proceeded with the assistance of the Branch to prepare a survey form for use in gathering supplementary information during our field interviews.

We carried out interviews with about 20 of the largest firms across Canada, collectively accounting for about approximately 60% of industry billings and employment. The survey form was sent to each of the firms in advance with a covering letter from your Branch. The interviews were carried out in Montreal, Toronto, Vancouver and Calgary and information was also obtained from firms in Edmonton. The purpose of the interviews was to meet with the senior executives of the firms and to talk with them about their perspective on the business. Budget limitations did not allow visits to other cities nor more extensive visits within the cities chosen.

With the background of our previous work, we were able to quickly update our knowledge and understanding of the industry. Although much remained the same as our previous study, significant changes in trends were noted. As previously, our objective was to provide an overview of a complex and dynamic industry.

OUTLINE OF THE REPORT

The following report contains three chapters and an appendix.

1. Updating the Perspective on the Industry describes the important changes which have taken place in the industry since our previous report. Details of the performance of the domestic and export markets are provided and compared with similar figures in our first study.

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2. Future Prospects updates our estimates for both the domestic and international markets for the next five years.
3. Challenges Ahead describes the efforts of the industry and government to come to grips with problems during the period and discusses their concerns for the future.

In the Appendix, we list the names of the representatives of the firms interviewed during the course of the study, and the names of all firms responding to our survey.

**MAJOR
CONCLUSIONS**

1. Industry continues to grow. 1980 fees are estimated to be \$1.7 billion overall; approximately 42,000 employees are engaged in 1700 active firms. The last three years marked the beginning of a slower growth period for the industry which has averaged about 6% for the past 20 to 30 years. However there are differences between domestic and export areas:
 - Domestic slowdown shows signs of turnaround. Despite growth rates of close to zero for the past six years, the Canadian market is showing signs of reviving. A strong performance in 1980 was led by the power and plant processing sectors which each realized growth in excess of 10%. Petroleum, natural gas, and telecommunications experienced modest growth while all other sectors were negative.
 - Export activities have expanded. The export sector, relative to domestic, has increased in importance: only 5% of overall fees in 1964, it attained 17% in 1977 and is now estimated at 20% of the total. Expansion has led to a more evenly spread market in regions of the world than in the early 70's. The generation of follow-on sales from consulting exports is very significant. This multiplier effect is very difficult to quantify; however, estimates have ranged from 1:2 to 1:10 in some sectors.

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2. Future prospects good but changing. Future prospects are good, with an overall growth rate of 4%-5% predicted for the next five years. This represents slightly slower growth than the last 20 years and signifies a shift in sectors of importance:
 - Domestic/Export growing at different rates. The foreign market will grow at between 10% and 15% annually, while domestic will average only 4%. Export is expected to peak at 25% of total billings for the industry.
 - Markets will continue to shift. Power and energy will be the leading sectors domestically while building and municipal decline in importance. Power will continue to be one of the major sectors in the export market as well. No single region of the world is expected to be dominant; market share and prospects will constantly shift among several areas.
3. Many challenges ahead. The industry will have to overcome substantial problems in order to capitalize on opportunities. New concerns with manpower and profitability will have to be addressed. New management skills and techniques will have to be mobilized. In particular, strategic planning will become a more important management tool for larger firms dealing with complex business options and priorities.

* * * * *

To conclude, we would like to thank Ray Gladu and Max Smith of the Branch for their assistance and encouragement. Both Ken McLennan and Colin Smallridge of ACEC provided ideas and insights. Special thanks to Mrs. R. Bennett of Statistics Canada for providing us with additional data and to Roger Pinault and Derek Holloway of ACEC for their assistance in compiling and analyzing additional data on the industry.

This has been a most challenging and interesting assignment for us. We have appreciated the opportunity to continue our close involvement with the consulting engineering industry. We hope that our work will be of assistance in providing a better understanding of the industry, and will allow those interested in the industry to better overcome constraints.

Respectfully submitted,

Peter Barnard Associates

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THE 12 SECTORS OF CONSULTING ENGINEERS SERVICES

Fields Covered*

- | | |
|--|---|
| 1. MUNICIPAL | Water supply, sewage disposal, waste disposal roads and streets, traffic engineering, urban and regional planning |
| 2. BUILDINGS | Acoustics, communications, electrical, elevators, escalators and moving sidewalks, heating, ventilating and air conditioning, illumination, mechanical, piping systems, refrigeration, structural |
| 3. PETROLEUM & NATURAL GAS | Exploration, extraction and separation, pipelines, gas process plants, oil refineries |
| 4. POWER
(Power Generation, Transmission and Distribution) | Systems planning and operation, hydro power, thermal power, nuclear, transmission and distribution |
| 5. MINING & METALLURGY | Exploration, mine planning and production, mineral beneficiation, smelting, refining |
| 6. PLANT PROCESS | Alum. fabricating, alum. smelting, automotive plants, breweries, cement plants, chemical plants, distilleries, feed and flour mills, fertilizer plants, food processing, foundries, glass and ceramics, industrial environmental control facilities, industrial power houses, metal working, misc. manufacturing plants, petrochemical plants, steel mills, textile mills, wood working |
| 7. TRANSPORTATION
(Bridges, Tunnels, Highways and Railways) | Bridges, tunnels, highways and expressways, railways, public transit, transportation studies |
| 8. FORESTRY, ETC.
(Agriculture, Fisheries, Forestry, Forest Products) | Agricultural engineering, fisheries, forestry, logging, sawmills, veneer and plywood, particle-board and waferboard mills, hard and soft board mills, pulp mills, paper mills |
| 9. DAMS & IRRIGATION | Dams, irrigation, flood control |
| 10. AIR & SEAPORTS | Airports, harbours, docks and jetties, dredging river and coastal works, terminals and warehouses, transportation studies, oceanography and hydrography |
| 11. TELECOMMUNICATIONS | Microwave, broadcasting, wire line transmission, telephone systems, supervisory control and data transmission |
| 12. MISCELLANEOUS | Air and noise pollution control, arbitration and litigation, computer science and data processing, environmental impact studies, interior design, naval architecture, remote sensing and photogrammetric soil mechanics |

*Categories used in Statistics Canada, "Consulting Engineering Services", 1978.

1 **UPDATING THE PERSPECTIVE ON THE INDUSTRY**

The consulting engineering sector continues to be a large and important industry. It provides a wide range of services to virtually every major segment of the Canadian economy. (Exhibit 1.1 defines the 12 service sectors used in this report). It supplies both industry and government clients with services which are most commonly associated with the construction of capital projects.

Although many aspects of the industry remain unchanged since our last report, its dynamic nature continues to manifest itself in a number of ways. The international market has maintained its substantial growth of recent years. Domestically, the market is beginning to turn upward after experiencing a downturn in the late seventies. Overall, some significant changes in traditional patterns have occurred.

REMAINS LARGE AND IMPORTANT SERVICE INDUSTRY

The consulting engineering sector still plays a dominant role in the Canadian economy. It contributes directly and indirectly to the growth of the economy and is one of the largest and most influential parts of the service sector.

Fees Of \$1.7 Million; Employs Over 42,000 People

Our estimate of total industry fees¹ for 1980 is approximately \$1.7 billion.² Employment across the industry is about 42,000³, including both professional and non-professional

personnel. We reported in 1977 that the consulting engineering sector was the second largest service industry, accounting for 17% of total service trade services. The legal profession was the largest with 23% of fees. Although there has been no official documentation since the 1971 census, it is generally believed that the consulting engineering profession is now close to the legal profession in volume of fees earned.

Basic Structure Unchanged

Our 1977 report highlighted certain organizational aspects of the industry. While no major structural changes have occurred in the short interval since then, we have reviewed our previous findings and present some updated adjustments:

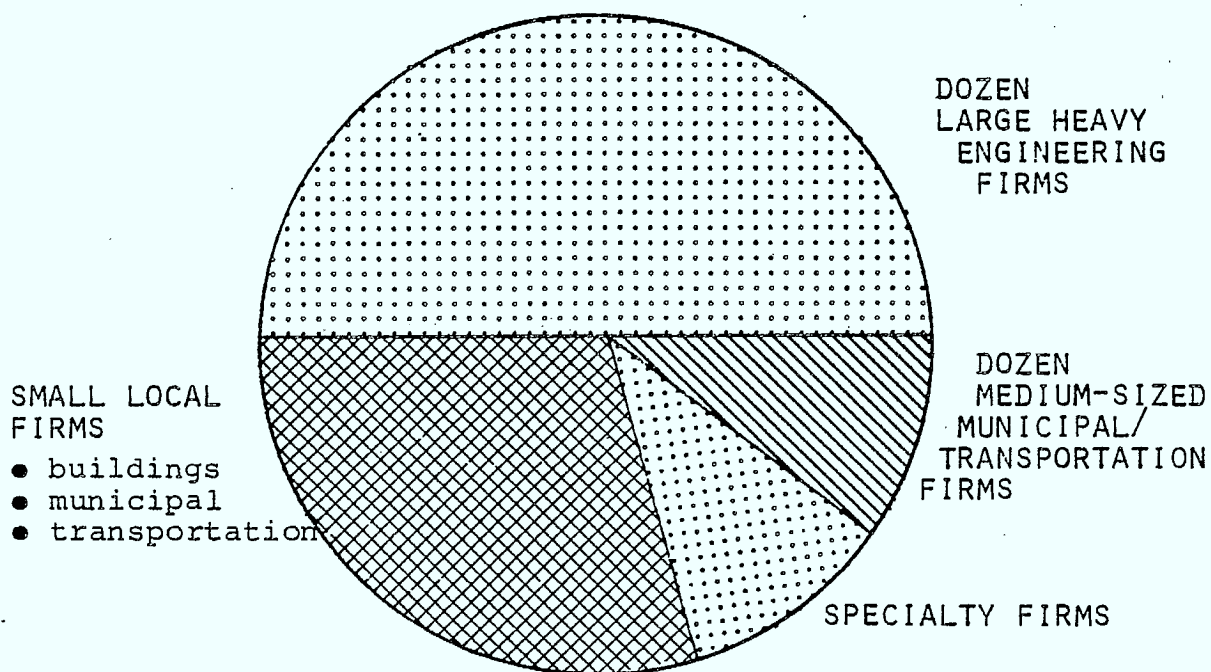
- Industry structured into 4 main types of firms.

These include:

- large heavy engineering firms
- medium-sized municipal/transportation firms
- local engineering firms
- specialty firms

Firms within specific categories offer similar services, are of similar size, and have many traits in common. Although our field work for this study allowed us to come into contact only with the first two types, we believe that little has changed structurally within the industry. The increased formation of consortia, high activity in mergers and acquisitions, emerging EPC activity, and increased subsidiaries in foreign countries have not contributed significantly to changing the face of the industry.

LARGE HEAVY ENGINEERING FIRMS STILL ACCOUNT FOR
HALF INDUSTRY BILLINGS & EMPLOYMENT



Source: Peter Barnard Associates estimates

- Few firms account for bulk of employment/fees.
Twenty-five major firms still account for about 60% of industry revenue and employment⁴. (Exhibit 1.2). These firms are situated across Canada with heavy concentrations in Montreal, Toronto, and Vancouver. The average employment across the industry is still about twenty-five people per firm, with the majority of staffs less than fifteen.⁵

Our estimated total of 42,000 employees in the industry are spread over approximately 1,700 firms. This represents annual increases of about 3% for both number of employees and number of firms since our last report. While there are considerably more firms registered in the industry, 1600-1800 firms consistently participate in information surveys and are known to be active. These figures mask a fair amount of activity in terms of personnel interchange among firms, mergers, acquisitions, and closings, for which little data is available at this time.

- Professionals constitute one-third of employment. The breakdown among the four basic categories of employment remains practically the same.

	<u>1977</u> ⁶	<u>1980</u> ⁷
Professional Engineers	29%	30%
Non-Engineering Professionals	4%	6%
Technician/Drafting	46%	43%
Admin./Clerical	21%	20%

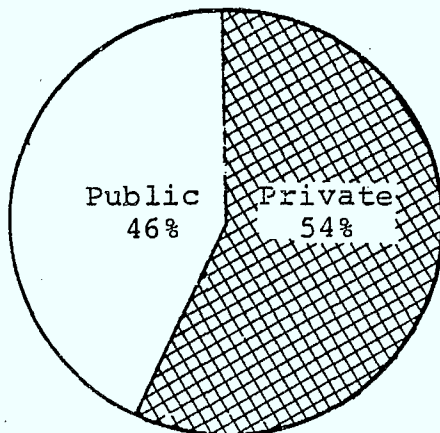
The slight increase in professionals coupled with the slight decrease in technical/clerical could be the result of more employment dollars being spent on the conceptual portions of projects. A number of

PROPORTION OF CONSULTING FEES

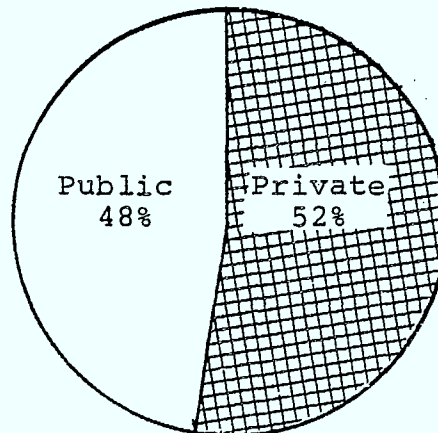
PRIVATE CLIENTS STILL MORE IMPORTANT

Total Fees

1977



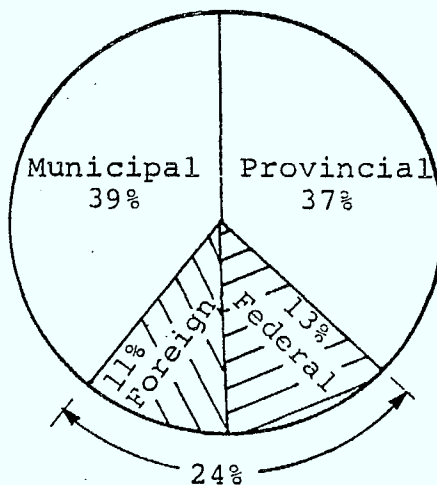
1980



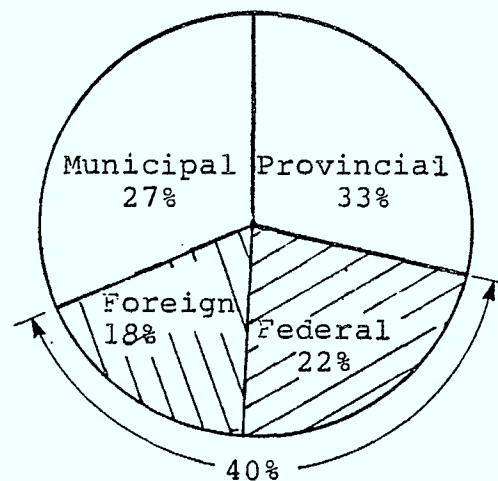
Source: Statistics Canada, "Consulting Engineering Services," 1974, 78

WHILE WITHIN PUBLIC SECTOR, FEDERAL/FOREIGN COMPONENT INCREASINGLY IMPORTANT

1977



1980



Source: Statistics Canada, "Consulting Engineering Services," 1974, 78

factors have contributed to this phenomena: more complex studies, more projects being studied and less executed due in part to the complex approval process, and more efficient methods for repetitive tasks.

- Some confirmations/changes in Private/Public.

Overall, fees continue to be divided about evenly between the public and private sector clients.⁸

(Exhibit 3.1). A closer look at public sector fees reveals increased importance of the Federal sector and decreased level of importance of the municipal sector during the period. Most industry spokespersons interpreted this phenomenon as a reallocation of spending rather than an actual shift in type of project or level of government served. Many Municipal projects were financially assisted in areas which would traditionally be funded from local sources. Industry officials believe that this is a temporary situation which will normalize in the near future. The increase in foreign fees generally will be touched on later.

Contributes To Economy In A Variety of Ways

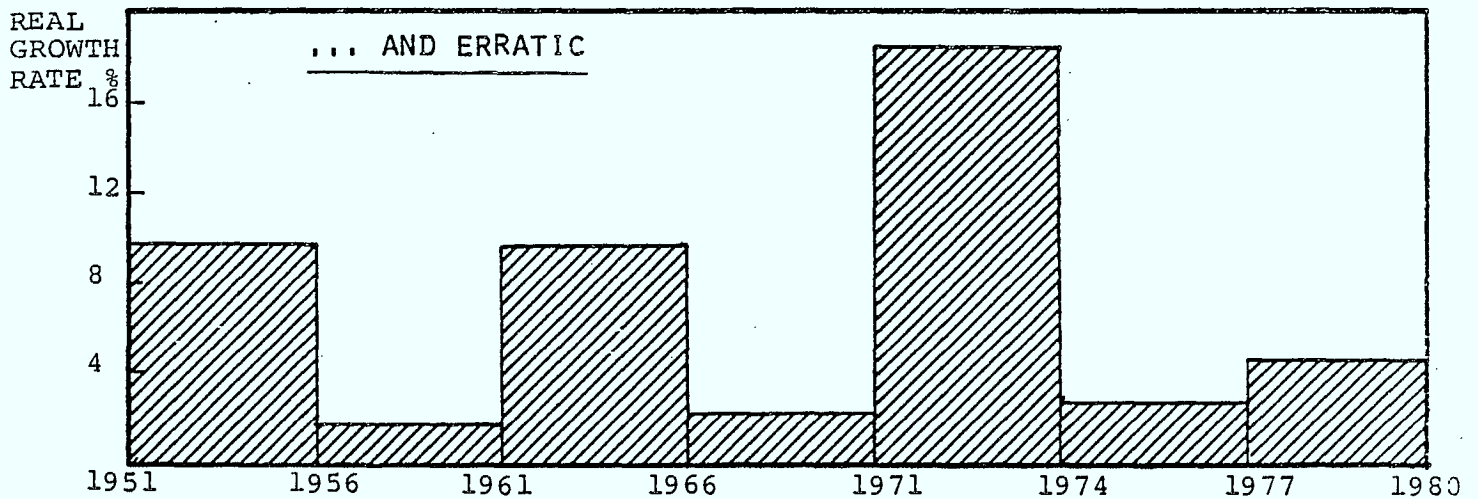
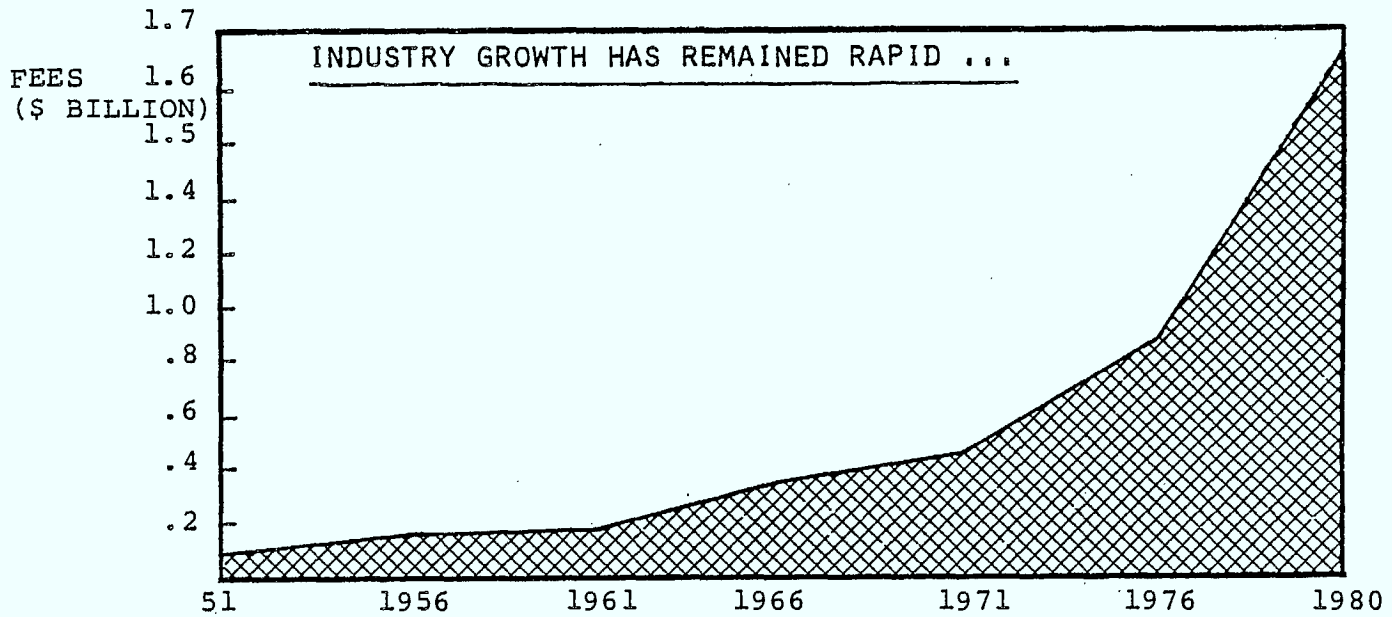
The potential of the consulting engineering industry to contribute to the overall economy has been documented in our previous report and in other government publications. Its unique characteristics provide a direct link to other industry sectors. As a major facilitator of economic expansion, it contributes to the skills of production rationalization and expansion, and to technological development and transfer.

In the last few years, the major discussions about the economic effects of consulting engineering have been in the area of possible follow-on sales from consulting exports. One of the key issues is the definition of an acceptable and accurate multiplier to define the relationship between the variables. Discussions to date have demonstrated the complexity of the multiplier which should be used: should it pertain to actual or potential exports? How direct is the link? A range of between 1:2 and 1:10 has been used as a guideline in some sectors. Search for a more specific indicator of actual or potential exports based on consulting engineering activity will vary according to several factors.

1. Source of funding. Obviously, certain Canadian bilateral funding, such as CIDA and EDC, is designed to encourage manufacturing exports. On the other hand, projects funded by private clients, foreign governments and multi-lateral sources hold less potential because equipment and supply requirements are more open to broader international competition.
2. Project location can affect the degree of opportunity for Canadian manufacturers. The level of economic development in the particular location will influence the degree of manufacturing competition presented by the client country. Second, local content requirements can severely limit the export of Canadian goods. Third, the relative distance of the project from Canada will obviously affect transportation costs. Finally, historic trading patterns and political relationships will have a bearing on the Canadian manufacturing export opportunity.

3. Canadian capability to manufacture the equipment and materials required or to provide necessary installation and maintenance will also be a strong influence in any client decision to select Canadian manufacturing firms for their requirements.
4. Difficulty of measurement. Tracing the relationships between consulting engineering activity and follow-on sales presents some difficulties, two of which are timing and type of effect. Since the export sales are seldom realized in the year that the consulting activity actually takes place, a major problem is to determine how sales of one year can be related to consulting fees of another. Also, especially with a lapse of some time, it becomes difficult to determine whether a particular export sale can be directly or indirectly attributed to a particular consulting project.

Therefore, it is generally acknowledged that the multiplier effect is quite significant and in some sectors has the potential to increase substantially. Attempts to define more specifically a numerical value for it will require extensive efforts, chief of which would be an attempt to gain greater in-depth understanding of the relationships among the relevant variables as discussed above.



SEVERAL GROWTH
TRENDS SIGNIFICANT

The industry continued to grow strongly throughout the last three years although it experienced moderate to negative growth in the 77-78 period. Many of our previous findings continue to prevail. However, subtle shifts in some trends signal potential major changes in certain aspects of the industry.

Total Growth Continues To Be Erratic

As predicted in our previous study, the period of 1977-81 signalled the beginning of a period of slower growth for the industry. The average annual growth for the period is 2%, significantly below the 6% average which the industry has enjoyed since the early 1950's. The average is masked by erratic shifts during the period: strong downturns in '78 and '79 followed by a major upsurge in 1980.

	Estimated Industry ⁹ Fees	Average Annual Rate Of Growth	
		<u>Actual</u>	<u>Real</u>
1951	\$100	10%	9%
1956	160	3%	1%
1961	188	11%	10%
1966	318	6%	2%
1971	417	25%	17%
1974	985	3%	-4%
1978	1220	6%	-2%
1979	1294	28%	+12%
1980	1660		

We see the strong positive performance of the past year as a correcting of the previous negative cycle and not as a permanent trend. Industry sources attribute the 1980 results to an industry wide phenomenon which saw many projects finally "coming to life", projects which had been held in abeyance for a number of reasons. Although this was more true of domestic projects as Canada began to emerge from a climate of economic and political uncertainty, a similar pattern of activity was also documented on the export market. Traditionally a more steady market, the international sector too experienced fluctuations during the period, reacting to poor domestic markets, excess capacity in many depressed areas of the world, and a variety of political, financial, and economic pressures.

A Few Sectors Still Account For Bulk Of Fees

Six of the twelve sectors listed in Exhibit 1.1 still account for about two-thirds of industry fees. Three of these, municipal, building, and power, together are responsible for over 40% of total industry output.

<u>Sector</u>	<u>% Of Fees</u> ¹⁰		<u>Annual Real Growth During Period</u>
	<u>1977</u>	<u>1980</u>	
Municipal	17%	16%	3%
Building	17	14	3%
Pet/NG	10	9	-8%
Power	9	15	26%
Mining	9	5	-16%
Plant Processes	<u>8</u>	<u>10</u>	20%
	70%	69%	

It is clear that the dominance of these major sectors has diminished somewhat, as projects are being shared out over more sectors. In fact, both transportation and forestry, 8% and 6% respectively of overall fees in 1980, could be substituted for petroleum and mining in the "top six". The modest declines in importance of municipal and building have been counterbalanced by small increases in plant processing and by a major jump in power projects.

It is likely that power, plant processes, municipal and building will continue to be dominant sectors in the near future. The latter two, while diminishing in overall importance, have experienced some positive growth. While only modest growth and gradual decline had been predicted for both, their sheer size and importance will keep them "in the spotlight" for some time. Also, municipal has a close relationship to certain power and energy projects, providing the infrastructure related services.

Both power and plant process have been strong sectors domestically and internationally, while mining and petroleum projects experienced more difficult periods. The severe drop-off in importance of mining consulting fees is attributed to an international oversupply of minerals as well as the high cost of domestic expansion in this sector and the high tax burden on the industry by some provincial governments. Petroleum and natural gas projects, touted as the leading sector of the eighties, experienced a period of slight decline. Many key projects have been delayed through lack of financing, manpower, depressed markets, and a complex approval process. Federal/Provincial political considerations over resource ownership and pricing have also caused slowdowns. Plant processing,

while remaining reasonably stable at home, has increased in importance internationally as foreign economies mature.

Two Shifts Considered Important

Although different shifts have been noted in the overall organization and direction of the industry, two trends in particular should be highlighted.

1. Increasing importance of export sector. The export sector has continued to grow strongly during the period, and, relative to domestic, is taking on greater importance.

	<u>International % Of Total Billings</u> ¹¹
1964	5%
1974	9%
1977	17%
1980	20%

The reasons for this continued development were reviewed in our previous study. Previously, the domestic slowdown caused many firms to look outside the country in order to maintain staff and expertise. Also, the need to grow and expand was limited by the size of the domestic market and the extent of competition. Finally, the capabilities of Canadian firms have been in sectors of greatest foreign need.

Our recent field work revealed that for the 20 major firms in the industry, their involvement in international projects is significantly higher than the average while for most smaller firms, it is significantly lower. Obviously, smaller firms often find the financial risk of the export sector more difficult and are not able to "stretch" their personnel and

management. Also, this average figure does not include the subsidiary operations of major firms in other countries. If these were included, the "export" sector would be higher. The successful launching of an export effort will often be followed by the establishment of a subsidiary company.

2. Shifting market share towards Ontario based firms.

Our earlier report showed the consulting engineering industry to be oriented toward the regions of economic development, principally Quebec, Ontario and the West. Although over 50% of the firms and 60% of the billings still originate in Quebec and Ontario, some recent variations have occurred as shown in the following table.

<u>Head Office Location</u>	<u>% Of Firms</u> ¹²			<u>% Of Fees</u> ¹²		
	<u>74</u>	<u>78</u>	<u>Avg. Real Growth Rate</u>	<u>74</u>	<u>78</u>	<u>Avg. Real Growth Rate</u>
Atlantic	7%	7%	0%	3%	3%	5%
Quebec	17%	14%	-19%	32%	26%	8%
Ontario	35%	36%	-.3%	30%	42%	80%
Man./Sask.	5%	4%	0%	4%	3%	-11%
Alberta	20%	23%	11%	16%	13%	10%
B.C.	17%	16%	-12%	15%	13%	14%

Both Quebec and Alberta based firms have diminished in market share of fees, the former by 6%, the latter by 3%. Both however, realized modest increases in fees during the period, between 8 and 10%. This occurrence in Quebec was accompanied by a loss in actual number of firms, an almost 20% actual decrease

and 3% in level of importance. Interestingly, Alberta increased absolutely the number of firms with head offices there, while still losing market share. The most positive situation occurred in Ontario who with relatively the same number of firms increased market share by 12% and in actual growth experienced an 80% increase during the period. It should be noted in this analysis that the major portion of the increase for Quebec and Ontario firms can be attributed to export activities. The combined share of export fees for Quebec and Ontario firms increased from 65% in 1974 to 87% in 1978.

THE MARKET IN CANADA

The domestic market for consulting engineering services continues to provide the major portion of fees overall, although growth is much slower than in the international market. Growth trends continue to show a highly cyclical nature while the strength of certain sectors vary across regions.

Recent Period Shows Continuing Domestic Turndown

The trend of the local market to demonstrate no real growth since 1974 has continued throughout the period. As discussed in our 1977 report, there are four basic reasons for this phenomenon:

- excess capacity in many key sectors of the economy
- declining population rates and rates of household formation thus lowering municipal and building investment

- government restraint toward capital projects
- severe decline in nuclear and some energy projects

Although the net growth for the period was 0%, this result should not be overshadowed by the strong performance of the industry in 1980.

	<u>Estimated Domestic Billings</u>	<u>Average Annual Real Growth Rate</u>
1951	\$ 96	
1956	152	9%
1961	179	3%
1966	288	6%
1971	367	1%
1974	770	25%
1977	990	0%
1978	1000	-6%
1979	1004	-7%
1980	1320	+13%

There is a good possibility that the domestic picture is beginning to improve, although the situation should be approached cautiously; a cyclical pattern of fast and slow growth has long been identified as a normal trend in this market. While the strong '80 performance reflected the ability of the industry to "bounce back", it was also caused in part by an outflow of projects which had been planned for sometime. The nature and size of consulting engineering projects together with the fact that the early part of the period was generally down worldwide, has caused this "upturn" to be somewhat exaggerated.

SECTORS CONTINUE TO BE HIGHLY CYCLICAL

AVERAGE ANNUAL REAL RATE OF GROWTH	THE 1960's 1961-71	EARLY 1970's 1971-74	MID 1970's 1974-77	LATE 1970's 1978-80
Substantial Growth (Over 10%)	Mining & Metallurgy	Power Dams & Irrigation	Power Petroleum & Natural Gas	Power Plant Process
Good Growth (5 to 10%)	Power Plant Process Municipal Petroleum & Natural Gas Buildings	Municipal Forestry, etc. Air and Sea Ports Petroleum & Natural Gas Communication		
Modest Growth (0 to 5%)	Communications Transportation Forestry, etc.	Buildings Plant Process Transportation	Transportation Telecomm	Telecomm Petroleum & Natural Gas
Negative Growth	Air and Sea Ports Dams & Irrigation	Mining & Metallurgy	Buildings Municipal Mining & Metallurgy Plant Process Forestry Dams & Irr. Air & Seaports	Buildings Municipal Mining/Metallurgy Transportation Forestry Dams/Irrigation Air/Seaports

Sectors Still Highly Cyclical

Certain sectors have grown at different rates. The power sector has been the strongest performer throughout the past twenty years and particularly in the last decade. Major utilities have continued to upgrade and add to existing facilities. Also, the sector has received impetus from technological changes in hydro, thermal and nuclear and the fact that the capital cost of projects has increased. Major development projects, such as James Bay in Quebec, have also been major contributors to this result.

Petroleum and natural gas projects survived a low period characterized by cancelled projects, delays, and problems with the general economic climate. The two major private sectors - plant processing and mining-experienced quite different results. Mining remained in the negative position it has found itself throughout the 70's while plant processing showed a cyclical high during the period after showing modest movement in the 70's. Transportation and municipal - associated with public sector decisions - continued to remain steady throughout the recent period although growth was fairly negative. Long term trends in real growth rates are illustrated in Exhibit 1.5.

Exhibit 1.6

<u>CERTAIN REGIONS STRONG IN CERTAIN SECTORS*</u>												
	<u>Forest</u>	<u>Air/ Sea</u>	<u>Transp</u>	<u>Build</u>	<u>Irr/Dam</u>	<u>Plant/P</u>	<u>M/M</u>	<u>Mun</u>	<u>P/G</u>	<u>Pow</u>	<u>Tel</u>	<u>Misc.</u>
Atlantic NA**												
Quebec	6	2	6	16	3	9	3	11	3	30	2	10
Ontario	1	3	7	19	2	19	7	19	NA	8	NA	8
Man/Sask NA												
Alberta NA**		1	8	24	1	3	3	27	25	1	NA	6
B.C.	28	2	6	16	2	11	4	18	1	3	1	7

**% Total Billing by sector. Statistics Canada "Consulting Engineering Services", 1978*

***Incomplete data did not allow Statistics Canada to publish these results.*

Certain Sectors Strong In Different Regions

Not surprisingly, certain sectors show strengths in various regions of the country. Building and municipal remain highly important in every region of the country. Although continuing to diminish in overall importance, they are being assisted through infrastructure upgrading programs in most parts of the country and by activities in the energy sector, particularly in Alberta. Single sectors show strength in particular parts of the country (Exhibit 1.6):

- Forestry remains strong in British Columbia due to the pressure of major firms and forestry related operations
- Power, always a strength in Quebec, has increased several times in importance during the period in this region
- Petroleum and Natural Gas projects are highly important to Alberta, where most of the key clients in that sector are found

THE EXPORT MARKET

International work continues to be the dominant growth segment of the consulting engineering industry. As the industry responds to new challenges in the export market, important shifts are being perceived both among key sectors and different regions of the world. The manner in which projects have been funded demonstrate a certain pattern.

International Market Continues To Grow

Growth in the international sector continues to be strong although performance throughout the period was slightly below the average of the last twenty-five years. Nevertheless, the long term real growth rate is still at least twice that of domestic, while the short term growth rate for the period was many times that of domestic.

	<u>International Fee Income¹⁴</u>		<u>Real Growth Rates</u>
1951	\$ 4 million		14%
1961	9		
1964	10		
1966	30		
1971	50		
1974	80		
1977	200		12%
1978	220	3%	
1979	290	21%	
1980	340	10%	

These results underline the ability of the industry to adapt to adverse conditions, in the case of the slowdown in the domestic market referred to earlier. The industry has been able, in a relatively short period of time, to adapt expertise acquired domestically to diverse and risky international situations.

Strength Among Certain Sectors Has Shifted

Reviewing the last 15 years of activity in the export sector reveals that there have been some shifts in the importance of several sectors, while others have remained

reasonably constant. Power has always been an important export market and, during the last few years, has become the leading sector, much as it is domestically.

Those sectors associated with early stages of economic development - forestry/agriculture, municipal and transportation - have diminished in importance as export markets have already obtained much of the needed services in these areas or are now in a position to call upon native expertise. However, a recent exception has been the water portion of municipal which has experienced strong growth during the period. As economies progress, the need for more sophisticated water systems has increased. Similarly, the sector most associated with industrializing economies - plant processing - has taken on greater importance. Mining/Metallurgy seem to show the greatest cyclical fluctuation, as it is highly dependent on unstable world prices and supplies. Finally, the petroleum and natural gas sector has decreased in importance during the period. Industry spokesmen attribute this to the general poor showing of the sector worldwide during this period as well as much uncertainty in this sector on the home front. More certainty about the Canadian situation would place more firms in a position of making further foreign commitments.

	<u>Percentage of Export Fees¹⁵</u>			<u>Average Annual Real Growth</u>
	<u>1964</u>	<u>1977</u>	<u>1980</u>	<u>77-80</u>
Plant Process	10%	17%	19%	18%
Power	20%	15%	33%	80%
Forestry	40%	17%	11%	9%
Mining	10%	17%	5%	-15%
Transportation	16%	8%	6%	18%
Municipal	10%	5%	7%	13%
Petroleum/N.Gas	7%	3%	4%	16%

Relative level of importance in the export market should not hide the fact that most sectors have experienced positive real growth in an ever expanding market. Not surprisingly, power has had a strong growth picture. Plant processing, transportation, petroleum/natural gas and municipal have demonstrated very respectable annual growth during the period, even though the last three no longer enjoy the overall importance they once did. Likewise, Canadian expertise in forestry and municipal projects have allowed these sectors to realize modest growth while becoming less in demand relative to others. Mining is really the only sector that experienced real negative growth during the period; however, this is an industry susceptible to major peaks and cycles where such drops are not unusual.

Market Share More Evenly Spread Among Regions

It is very difficult to draw conclusions about regional dominance in export billings. Obviously, one or two major projects can paint a positive picture for a region at a given period. Thus, our findings can only illustrate that major fees are being earned in certain regions during a particular period. Once a project or projects are terminated, that particular region may show a major drop in importance.

The needs of any given economy are cyclical: thus, a firm currently offering engineering services in a particular sector may not be needed again for some time in that region and sector and will probably find itself in some other part of the world. Therefore, the following analysis of regional trends should be approached with some caution.

	<u>% International Fees</u> ¹⁶		
	<u>1964</u>	<u>1977</u>	<u>1980</u>
U.S.	20%	32%	15%
Europe	8%	10%	4%
Latin America	30%	18%	16%
Caribbean	2%	3%	3%
Middle East	25%	18%	41%
Far East			
Africa	12%	24%	18%
Australasia	3%	3%	3%

} 20%
} 21%

Thus, the only obvious trend which emerges from a review of results for the past fifteen years is a more evenly spread market share among the respective regions. While certain regions have tended to dominate over the years, the most recent period shows the U.S., Latin America, Middle East, Far East, and Africa to be virtually even. The United States is playing a less dominant role than previously while the Middle and Far East have increased significantly in importance. The recent decline in U.S. results can be attributed to several factors: local U.S. firms, having some difficulties on the export market, are intensifying efforts at home; power projects on which Canadian firms could be engaged are being stalled for a variety of reasons; and some Canadian firms have set up American subsidiaries. This latter phenomenon, which effectively removes projects from the export listing, is a positive action as it expresses confidence in the American market. If fees earned by Canadian subsidiaries in the U.S. were added to the export figures, the U.S. region market share would rise by between 5% and 7%. This still represents an overall decline from 1977 levels.

Power continues to be the most important sector throughout the 70's in the export market. Also, some shift from public sector early stage type of development to private sector more mature development can also be perceived.

Key Sectors - Export Market¹⁷

	<u>1974</u>	<u>1978</u>
U.S.	Plant Process, Forestry	Mining, Petroleum
Latin America	Power, Mining	Plant Process/Power
Europe	Mining/Petroleum	Mining, Petroleum
Caribbean	Transportation/ Power	Power
Middle East	Municipal/ Transportation	Power
Far East	Power, Mining Transportation	Power, Plant Process
Africa	Power, Transportation	Power, Municipal Plant Process
Australasia	Forestry/Mining	Power

Some Sources Of Funding More Important Than Others

All major sources of funding have grown significantly during the last three years. However, on a worldwide basis international financial institutions and public and private foreign sources have consistently provided about two-thirds of the funding, with CIDA and EDC assuming the balance. These two Canadian agencies have performed well during the period, demonstrating the ability to adjust to feed-back from the industry.

	<u>% of Total Funding</u> ¹⁸		
	<u>1977</u>	<u>1980</u>	<u>Average Annual Real Growth Rate</u>
CIDA	19%	18%	16%
EDC	20%	19%	15%
International Financial Institutions	11%	16%	41%
Private Canadian Source	2%	6%	15%
Private Foreign Source	31%	21%	
Government Foreign Source	16%	28%	
Miscellaneous	1%	1%	
	*	*	*

The last three years have witnessed some significant changes within the consulting engineering sector although overall many organizational patterns and sales trends have remained constant. Chapter 2 will examine the future prospects for the industry.

EXPLANATORY NOTES

1. "Fees" will be used throughout this report to denote total consulting revenues less reimbursed expenses. Although many in the industry use "fees" and "billings" interchangeably, the latter - according to Statistics Canada - includes expenses as well.
2. Figures estimated were derived from a variety of data sources. The base was:
Statistics Canada, "Consulting Engineering Services, 1978", Catalogue: 63-537.
These figures were revised and updated after a review of several other sources:
 - Statistics Canada "Construction in Canada, 1979-80" catalogue 64-201
 - Salary surveys, 1977, 1979 conducted by "Canadian Consulting Engineer"
 - An analysis of the Statistics Canada data by ACEC
 - Interviews with industry executives
 - Survey conducted during the study
3. Similar sources as in 2
4. Peter Barnard Associates "Consulting Engineering in Canada - Overview and Prospects", 1977. This information was updated through reference to the publications and sources mentioned in footnote 2
5. Figures derived from our survey, ACEC estimates, and the salary surveys of "Canadian Consulting Engineer"
6. Peter Barnard Associates report
7. Derived from "Consulting Engineering Services", 1978
8. Estimated based on "Consulting Engineering Services" and interviews with industry executives
9. Fee estimates to 1974 reproduced from previous Peter Barnard Associates report. 1978, 79, 80 derived from survey, industry interviews, and ACEC estimates.

10. 1977 figures from previous Peter Barnard Associates report. 1980 estimates arrived at through updating "Consulting Engineering Services, 1978", by reference to industry survey and interviews.
11. Previous Peter Barnard Associates report for 64-77 and similar sources to footnote 10 for 1980.
12. Analysis and updating of data provided in "Consulting Engineering Services" 74, 78.
13. Figures based on a variety of sources. Estimates to 1977 from previous Peter Barnard Associates report. 1977-80 estimated from a review of following sources:
 - Statistics Canada "Private and Public Investment in Canada Outlook", catalogue 61-205
 - Industry Trade and Commerce, "Business Capital Investment Intentions Survey", 1979
 - Interviews and survey of industry
 - ACEC estimates
14. Previous Peter Barnard Associates Report, "Consulting Engineering Services 1978", industry survey and interviews.
15. Same sources as in footnote 14
16. Same sources as in footnote 14
17. Same sources as in footnote 14
18. Although a number of sources were consulted, the greatest weight was placed on information gained through the industry survey and interviews.

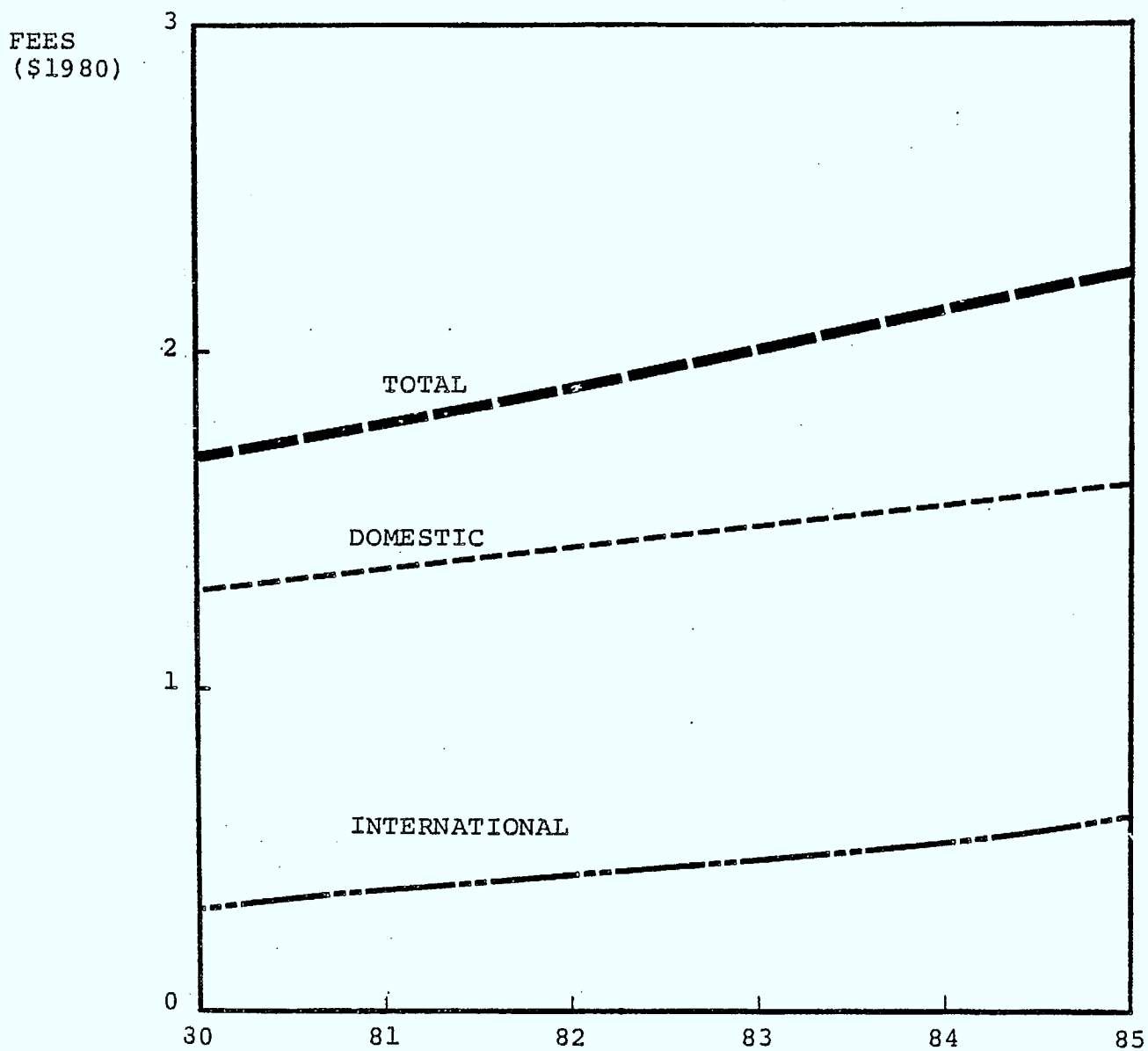
2 FUTURE PROSPECTS

Our previous report on the consulting engineering industry contained general and sectoral forecasts for the decade ending in 1988. This update report will focus on the next five years to 1985 highlighting where necessary any major adjustments to our predictions for the first half of the 80's. Naturally, a large number of variables must be taken into consideration when analyzing an industry as diverse as consulting engineering. We have attempted to touch upon the major ones but caution that in a broad report it is impossible to cover them all.

We continue to estimate a real growth rate increasing to 4% by 1985 for the Canadian economy; thus, neither the slowdown witnessed in the late 70's nor the sudden upsurge noted at the end of the decade should prevail. Our major background for the forecasts has been historic growth patterns, reviews of existing forecasts and expenditure surveys, interviews with industry executives and, of course, our previous research.¹

The current outlook for the industry overall is optimistic; however, this positive note must be sounded in the context of a number of uncertainties in order to present a true analysis. Positive growth is predicted for both the domestic and export sector with obviously many different variations within each.

BY 1985: FEES OF \$2 BILLION+



Source: Synthesis of data sources listed in explanatory notes.

OVERALL OUTLOOK
CONTINUED SLOWER GROWTH

The overall growth for the next five years will be slower than its historic performance of the past ten to fifteen years. The strong potential of certain key sectors could be overshadowed by a number of major problems. Many firms are expressing some uncertainty about the medium to long term.

4 to 5% Overall Growth Predicted for Next Five Years

Our previous report revealed that the consulting engineering industry has grown at an average annual rate of 6% since the early 1950's. We continue to predict that it will experience annual growth of about 4-5% during the next half decade. Performance at or above the historic industry average is possible depending on events in the energy and international sectors.

- Domestic will average 4%. The domestic slowdown experienced during the 77-80 period is beginning to turn around; we have already seen evidence of this in the 1980 domestic results. Most economic predictions² foresee a 4% real growth rate within the next few years. The major forces behind the turnaround are many and include the following:
 - the U.S. economy is beginning to turn around; the results should be felt in Canada within 2 to 3 years
 - a cyclical upturn in non-residential construction is also predicted to take hold around 82 to 83

- despite a continued prediction of lower billings in the municipal sector, the industry will be more than balanced off by high growth in energy projects which should be coming into force in the early 80's providing current political difficulties can be overcome
- Export closer to 10% to 15% real growth rate. As discussed in Chapter 1, the export sector has been growing at a rate of at least 20% since 1964. From 5% of overall fees, it has risen to 20% in 1980. Several factors favor continued growth in this sector. The most important is the strong reputation enjoyed by many Canadian firms in foreign markets. Another is the various aid programs being offered by the Canadian government to developing countries. Finally, the exchange rate on Canadian funds which is predicted to remain at current levels for some time obviously gives Canadian proposals an additional advantage.

Despite these positive points, growth will be below historical averages. The international market is perceived as more risky by some Canadian firms. With an upturn in domestic business predicted and with a chronic shortage of manpower, it is doubtful that even the major firms will be able to stretch sufficiently to meet the demands of both markets. The major domestic sector should be energy; signifying major projects, with heavy tie ups of personnel and capital. We also see the percentage share of export compared to overall fees for the industry reaching an upper limit of 25%,³ although individually many of the larger firms have already surpassed this;⁴ this is not seen as a desirable situation from many firms' perspectives. Also with renewed activity in the domestic sector energy projects, larger firms are likely to lower their priorities in the export market.

Uncertainties Exist At Home and Abroad

There is little question that energy will be the sector of most intense interest during the next five years and probably throughout the decade. However, it is facing a number of problems which - given its keystone importance - could affect the whole industry. As mentioned in Chapter 1, the sector has recently been beset by project delays, due chiefly to financing and/or manpower problems. Added to these is the sheer complexity of some of these major projects. Canadian firms, despite their worldwide reputations in many sectors must overcome the resistance of some clients and a lack of awareness of Canadian capability. Energy related projects are of course highly dependent on government policy with regard to energy prices and resource ownership. At this time the industry is in a holding pattern until those questions are resolved. Finally, further extension of nuclear technology in the energy sphere is meeting with stiff political and environmental opposition. This part of the industry is currently suffering from a poor image chiefly as a result of nuclear scares elsewhere and public uneasiness about this form of energy.

In general, our field work revealed some uncertainty about the future among the firms contacted. Few were forecasting beyond a twelve month period in any in-depth way. Many of the issues raised have been at least alluded to already in this report. How much effort and monies to put toward developing export sales is of major concern. Firms do not wish to overextend themselves internationally only to be caught short at home. The heavy dependence of most sectors on energy has made the uncertainties in that sector an industry wide concern. Provincial purchasing

policies which dictate the establishment of at least a branch office are making decisions about proposals in other provinces more agonizing and costly. In summary, government social and enviromental concerns are as serious factors as are many of the business and economic considerations.

CONSIDERABLE VARIANCE AMONG DOMESTIC SECTORS

The domestic sector should average about 4% growth throughout the period, rising to that level from its depressed showing in the late seventies. This will be below historic levels of about 6% due to the diminishing in importance of two major sectors - building and municipal. Every sector of course will vary in performance; each will be discussed below separately. When fee income estimates are discussed, all are in constant \$ 1980.

1. Buildings: Slow but Steady

In 1980, this sector accounted for \$221 million in fees and 17% of overall revenue. After strong growth from 1961-74, the sector has declined over the past six years. The components which contributed to its significant growth in the 60's and 70's have slowed considerably: non-residential construction, industrial expansion and lower household formation. Moderate growth of 2-3% is however forecast for the next five years. Some commercial developments, institutional buildings, and retrofit and renovation projects will contribute to a moderate turnaround. Also energy projects are expected to assist this sector in the medium to long term. Estimated fees for 1985 are \$250 million or about 15% of the total.

2. Municipal: Moderate Growth

This is a mature sector as basic infrastructure is established across the country. However, some growth possibilities exist in Quebec, the Prairies and the Atlantic Provinces where some basic work is still to be done. Also, the success of certain resource projects, particularly in the West, will create new demands for water and sewage programs. Many industry spokesmen also believed in the likelihood of Government upgrading programs in infrastructure particularly in the West. 1980 fees were 18% of total or \$242 million. 1985 estimates are approximately \$274 million or 17% of total fees.

3. Petroleum and Natural Gas: Strong Growth

Despite the fact that performance was below expectations during the last three years, this sector is expected to generate strong growth during the 80's. Approximately \$20-30 billion worth of projects are presently being proposed; although many are in the West, centered in Alberta, several large projects are in the works for Quebec and the Maritimes. These include the LNG plant and pipeline for the Maritimes or Quebec and the pipeline from Montreal to the Maritimes. As mentioned earlier, success will be dependent on the ability of Canadian firms to compete against American capability and to come to grips with problems of financing and manpower. 1980 fees are \$135 million, or 10% of total. A steady growth rate of 10% is predicted for the next five years. 1985 fees should be approximately \$240 million.

4. Power: Also Strong Growth

The fastest growing and most consistent sector in the past 20 years domestically, power should continue to expand at an annual rate of at least 10%. 1985 billings will be in the area of \$255 million. Together with petroleum and natural gas, it will be the leading sector of the decade.

This promising outlook is based in part on major expansion or redesign plans for almost every important utility in Canada. As stated in our 1977 report, developments in the next five years should add 50% to Canadian generating capacity. As with the petroleum sector, at least \$25 billion worth of projects are either underway or proposed. A major problem in the sector is the uncertainty about nuclear and its doubtful acceptance by the public. Political and environmental questions will have to be worked out before the industry can really flourish.

5. Mining/Metallurgy: Continued Decline

This sector which has experienced considerable cyclical movement in the past 20 years, has been in decline recently. Continued negative growth is foreseen for the 80's, as the worldwide oversupply adjusts itself. 1985 fees expected to be about \$64 million.

6. Plant Processing: Remaining Stable

This sector accounted for about \$100 million in fees in 1980 or 8% of total. Moderate growth of about 2% is predicted for the next five years. This should result in 1985 billings of about \$110 million or 7% of total. A somewhat pessimistic outlook toward the economy by manufacturers, identified in our previous report, should be counter-

balanced by some positive forces. Upgrading and expansion of pulp and paper facilities are planned for Quebec, Ontario and British Columbia. Michelin is proposing major additional facilities for Nova Scotia while expansion of several plants in Ontario is nearing the final planning stage. Energy projects in Alberta are being counted on to overflow into the industrial sector.

7. Transportation: Slow but Steady

Historically a sector of moderate, steady growth, transportation should be able to maintain a 2% to 3% rate of growth. 1985 billings should be about \$122 million.

The obvious decline in highway building should be somewhat offset by the demand for resource roads as related to projects in power, petroleum and natural gas. Also, the development of sophisticated mass transit systems, in the West and in Ontario should provide additional impetus for growth. Finally, marine terminals, especially in British Columbia, will be an important segment of transportation activity over the next five years.

8. Forestry: Continued Downturn

No growth in the 60's, strong in the early 70's this sector has declined domestically since 1974. Chief causes are the low operating levels and excess capacity in the pulp and paper industry and dwindling forest supplies. Increased U.S. demand for newsprint should allow industry to attain very modest growth of 1%-2%. 1985 fees are estimated at \$83 million or 5% of total.

9. Dams and Irrigation: No Growth

Decline of past six years should continue. As reported previously, fees should stabilize at current level of \$30-\$35 million.

10. Air and Sea Ports: Negative Growth

None of our interviews revealed a significant status from our previous report. Most key projects, particularly in the area of airports, are performed by government agencies. Few upgrading programs are proposed nor does the industry foresee significant increase in government spending for outside consultants. Potential programs for new, smaller regional airports would be a positive factor. 1985 fees should be about \$17million or 1% of total.

11. Telecommunications: Modest Growth

Presently \$13 million in fees, this small sector is expected to grow slightly. Most projects are "spillovers" from projects performed internally. Most firms have significant in-house expertise.

12. Miscellaneous: New Challenges

The need for new approaches to traditional and new problems should create respectable growth in the area of 5% annually. Environmental projects should head the list of those with strong potential. This sector, currently at 10% of total should be able to hold its position in 1985.

DOMESTIC CONSULTING FEES
(\$ MILLIONS 1980)

	<u>1980</u>		<u>1985</u>	
	<u>\$</u>	<u>%</u>	<u>\$</u>	<u>%</u>
Buildings	221	17	250	15
Municipal	242	18	274	17
Petroleum/N.Gas	135	10	240	15
Power	144	11	255	16
Mining/Metallurgy	76	6	64	4
Plant Process	101	8	111	7
Transportation	111	8	122	8
Forestry	79	6	83	5
Dams/Irrigation	32	2	32	2
Air/Seaports	30	2	17	1
Telecomm	13	1	14	1
Misc.	136	10	174	11
Total	<u>1320</u>	<u>100%</u>	<u>1636</u>	<u>100%*</u>

**Does not add to 100% because of rounding*

In conclusion, by 1985 power and energy should be the leading sectors. Although buildings and municipal will be on the decline, they will hold strong positions well through the end of the period under study. Most other sectors will have maintained their respective positions, although mining will have experienced the most serious decline.

EXPORT MARKET STILL STRONG

The strong growth experienced in the international sector in recent years should continue throughout the 80's. Certain features of the Canadian consulting engineering industry will allow it to compete well in the export market. Long term success will be based on an ability to recognize and adapt to the everchanging environment of international work and on the ability of government to provide and maintain a favourable policy framework.

Signs Point To Continued Growth

The Canadian consulting engineering industry has a strong track record internationally. Its dynamic growth over the past fifteen years has been alluded to already. It has demonstrated its ability to compete successfully, especially in the power and natural resources fields. Canadian branch offices and subsidiaries are firmly established around the world; Canadian engineers have completed projects internationally in every sector. As reported previously, Canadian firms are obtaining a reasonable share of World Bank contracts. Our interviews confirmed a continued interest in the export market by most firms.

Key To Future Will Be Ability To Adapt

Success in the coming years will depend on the ability of Canadian firms to adapt to certain conditions.

- Internal/external competition. The next few years will be crucial to the industry, both domestically and outside the country. Firms will be called upon to make difficult decisions, especially with regard to the allocation of efforts and resources. They will have to decide the level of participation they expect to reach in the Canadian market and foreign markets and allocate the appropriate marketing efforts. Inability to correctly understand and adapt to changing business conditions could result in missed local opportunities or pursuing a more risky, less secure foreign market. Internationally, competition is growing with many foreign competitors receiving substantially more support and assistance than Canadian ones.
- Changing international roles. As countries develop, they naturally develop engineering capability, particularly in those sectors requiring the lowest levels of technological expertise. As this condition continues to be found throughout the world, Canadian Consulting engineers will have to be ready to meet a number of diverse needs. They will, first and foremost, attempt to keep abreast technically in order to be able to constantly provide knowledge and techniques not available on a local level. They will be called upon to provide varied services somewhat different from those related to traditional expertise. Firms are being expected to effect transfer of technology in developing countries. Specification and procurement, already a part of large projects, will be increasingly in demand. Project management and the transfer of management expertise to local firms will

increasingly needed as local engineers master the technical detail of projects. Handling logistics detail for major projects will be an important area in which Canadian firms will be asked to contribute.

MOST SECTORS, REGIONS HAVE GOOD POTENTIAL

Our study reaffirmed the presence of Canadian firms in projects worldwide. Most regions were perceived as offering some potential to firms. Although proven ability exists in many sectors, certain tend to be more dominant.

Present Regional Trend To Continue

Attempting to ascertain the most likely regions for future projects was a very difficult part of the study. Few firms were able to articulate with any certainty a commitment to one or more export regions. Obviously many firms have experience in certain parts of the world and, in many cases, have established offices locally. Most expected existing trends to prevail, which would suggest a continuing division of projects among three or four key regions. Most firms are committed to expertise in certain sectors and are more prone to make a decision based on the technical nature of a project rather than its location, except where financial risks are involved. Obviously, the priorities of Canadian government funding will be a key issue.

- U.S. an uncertain opportunity. Despite the fact that many Canadian firms have American offices and the country is still an important export market, it appears to have lost some of its dominance. Even when Canadian subsidiary figures are included, the "export" fees for

the U.S. market are proportionately less than several years ago. Several causes have been suggested: many American firms are intensifying their efforts at home because of problems in the export market; the nuclear market is meeting a great deal of resistance; many firms reportedly are experiencing greater obstacles in registration and practice procedures as well as immigration regulations.

Certain Sectors Dominant

Although opportunities exist in all sectors, with the possible exception of building, we continue to propose that five sectors have particularly strong potential for export:

- Plant processes. Identified as a strong performer recently in export, the demand for this type of project should continue to be strong. Developing countries look to this sector for assistance as they grow and develop in manufacturing. Canadian expertise in plant processes is well regarded, particularly in steel.
- Power. Canadian expertise in hydro, thermal, and nuclear is well known and respected throughout the world. It is a sector which has been dominant in the domestic market and allowed Canadian firms to develop in-depth knowledge and expertise.
- Mining and metallurgy. Although the short term prospects for this market are poor for reasons discussed earlier, Canadian firms have completed sufficiently prestigious projects to have earned a good reputation with regard to certain minerals.

- Forestry. This is a key sector in terms of Canadian pre-eminence. Although the market is not strong at this time, the Canadian industry is usually able to win its share of contracts internationally.
- Municipal. Although a sector which is fast being taken over by local engineers and technicians or firms from developing nations, Canadian consultants are still being called upon to participate directly or in advisory capacities. The importance of this sector for so many years domestically has obviously created skills in many firms, skills which could be marketed on the international scene. Canadian firms should be presented with many opportunities in the \$120 billion worth of projects identified by the World Health Organization for the next decade.

* * * *

The strong market growth potential of the international market will continue to be realized by the industry while the domestic sector rebounds from a period of little growth. Prospects for both parts of the industry are optimistic. The last chapter touches upon recent developments in the industry and discusses the various ways it has overcome obstacles.

EXPLANATORY NOTES

1. The forecasts for each sector are based upon a synthesis of a number of data sources including:
 - Informetrica, "Provincial Construction Outlook to 1990," (July 1980, Revised)
 - Statistics Canada, "Private and Public Investment in Canada Outlook," Catalogue 61-205
 - Industry, Trade & Commerce, "New Capital Expenditure Projects," August 1980
 - Industry, Trade & Commerce, "Capital Investment Intentions Survey," (June 1980)
 - Peter Barnard Associates, "Consulting Engineering In Canada," 1978
 - Interviews and survey of the largest 25 firms in the industry
2. Sources listed in explanatory note 1, particularly Informetrica.
3. Estimated from industry interviews.
4. Some firms have recorded as much as 60% in export fees in certain years although they stated this was unusual. The more usual upper limit has been almost 40%.

3 CHALLENGES AHEAD

Many of the problem areas identified in our 1977 report have been dealt with by the industry and government, while others remain and new concerns have arisen. Given the market prospects discussed in the last chapter, the future holds many challenges for firms of all sizes.

PROGRESS IN OVERCOMING CONSTRAINTS

Our first study identified and discussed the major problems found by the industry, as perceived by firm executives, government officials and various client groups. At that time the key issues were:

- competition from foreign firms, (mainly U.S.-based in the EPC sector of the industry)
- in-house engineering by clients, that could be contracted out to consulting engineers
- the costs and risks associated with bidding on government contracts, including unrealistic contract terms
- rising costs of liability insurance
- "buy provincial" politics which were restricting access to several important markets

The proposed strategy concluded with recommendations for a variety of actions by the industry (largely through ACEC), and government to deal with those problems and to prepare an on-going program for the development of consulting engineering in Canada.

Our contact with executives of the biggest firms during this assignment has clearly revealed progress in many areas, including action on a number of the items mentioned in our earlier report. For example;

- ACEC has developed a Strategic Plan formulating the industry's position on all major issues. Annual action programs prioritize activities and focus on particular actions for any given year. In addition to specific briefs to cabinet and ongoing liaison with various ministries, ACEC has increased its output of publications to government in the last few years.
- The Federal Government, through I.T. and C., continues to be aware of problems facing the industry and has been sympathetic to many of the issues. Currently being examined are: federal contracting - out policies, the taxation system as it affects the competitive positions of Canadian firms and the salaries of offshore personnel; and the funding of research and development programs for consulting engineers. Specific changes have been implemented, particularly in the area of funding of feasibility studies.
- Several Provincial governments have carried out studies on their consulting engineering sector or compiled lists of firms and their capabilities for use in export promotion efforts.

Altogether, both the industry and government have made progress in dealing with common concerns over the past three years. Increased industry/government understanding and cooperation is particularly evident.

NEW CONCERNS HAVE ARISEN

During this assignment, our discussions with senior executives of the 20 or 30 largest firms in the country revealed preoccupations with a new set of problems which were not identified as major concerns the time of our first report. While continuing to grapple with the problems described earlier, the industry is becoming more concerned with a different kind of problem. Our first study detected a high degree of interest in the potential role the government could play in assisting the industry to maintain and improve revenues. While this is still a concern, the focus has shifted to the operations of the individual firm. Three particular problems have been highlighted:

1. Falling profitability. While recognized as a problem in our previous report, it is only in the last three years that it has become a major concern. Our study indicates a falling off in profitability during the 74-78 period: from 16% to 8%.¹ Profitability refers to net earnings before tax. Although several firms spoke of a strong profit picture, most identified with the general trend and confirmed it will remain a problem in 1981. Many causes have been suggested. The changing nature of the industry does not allow firms time to properly adjust. Overcapacity in some sectors has forced some firms to carry excess overhead. Price competition and foreign competition aggravate an already risky market place. The establishment of regional offices - to satisfy "buy provincial" criteria - are often not cost effective. Finally, contract

estimates must be more accurate than previously, leaving little margin for error. It was interesting to note that most solutions proposed revolved around private sector initiatives. It is generally believed that individual firms must constantly rationalize their operations and work as efficiently as possible.

Many of the problems identified in our previous report aggravate the problem of falling profitability. Over-regulation at different levels of government and the approvals process result in project delays, uncertainties, and inefficiencies. A higher number of firms competing creates increased costs for business development, greater overhead costs overall, and less chances of individual firms acquiring projects.

2. Shortages of experienced manpower. This issue was identified in every interview, although its source was attributed to a variety of causes. West coast firms believed that the high cost of housing in B.C. was one of the major causes of manpower shortages. Quebec firms believe that language is a limitation there, while generally across the industry, there is a frustration at being unable to move people easily - that is, into the country or out of the country. Several firms reported difficulty in attracting strong people to work internationally without a more attractive taxation package. The exchange rates inhibit Canadian firms from being able to offer a competitive wage to people presently in other parts of the world. Immigration regulations, while easily negotiated by some, are a major barrier to many firms wishing to employ outsiders in Canada or wishing to send employees into export markets. Many of the proposed mega projects are seen

as having the potential to aggravate this shortage considerably.

Most proposed solutions are expensive and of a long term nature. Some firms have opted to maintain staff during low cycles in order not to lose experienced people. Others have undertaken major national and international recruiting programs with some success. At the same time, the larger multi-disciplinary firms are being encouraged to make expanded use of smaller specialized and/or local firms.

Some of the major firms also have attempted to automate parts of their operation, such as drafting. While the results have been mixed for all these actions, few overall solutions have been found to solve the problem profitably.

Inability to manage and control this problem could have obvious repercussions. Foreign firms, particularly U.S., seem to be able to find sufficient number of personnel. Thus, the risk of losing out to those firms because of manpower shortage is very real. Also, shortage of personnel can also impede growth in areas where all other ingredients are positive. Long term such a situation can strain existing staff, causing turnover and morale problems.

3. Need for greater management orientation. A strong theme enunciated throughout the industry is the need for firms to become more management oriented. It is felt that the discipline of the "bottom line" is not as strongly imbedded as it should be in many firms. To survive, firms must innovate, not only technically, but in organization and administrative matters as well. Only efficient and highly organized firms will be able to compete successfully against increasing challenges at home and abroad, challenges which are characterized by greater competition and ever increasing sophistication.

As stated often in this report, the environment of the consulting engineer will continue to be a rapidly changing one. The key to success will be an ability to make decisions within that environment. Such a skill must include an understanding of political and environmental considerations, and the various roles played by consulting engineers in the domestic and international market.

FUTURE HOLDS CHALLENGES

Industry and government face important challenges in the short to medium term. Capitalizing on growth opportunities will be achieved only if firms can successfully overcome major obstacles. Strategic planning will have to be increasingly utilized especially by the larger firms.

- Overcoming new concerns. Solutions to the key problems identified earlier are vital to the survival and smooth functioning of consulting engineering firms. The manpower shortage can only be improved through continuous efforts, both individual and collective, while avoiding ad hoc remedies. Declining profitability is a complex issue which must be carefully analyzed both in the context of individual firms and industry wide trends. Insights and solutions applicable in other industries should be considered and modified to apply to the particular needs of the industry. Management techniques should be of concern not only to present executives but should be an integral part of training programs for future managers.

- Capitalizing on opportunities. There are clearly identified business opportunities for the industry in both the domestic and international sectors. But uncertainties must be overcome if these opportunities are to be realized. Energy - potentially the most significant sector in the 80's - is highly dependent on government policies. Project delays, major foreign competition, and public doubts about the safety of nuclear are major current concerns. The international role of the industry is changing and firms will have to be able to adapt. Canadian engineers must keep ahead technically vis-à-vis professionals in other countries if they expect to be awarded contracts on a continuing or expanding basis. They must be prepared to offer a number of diverse services; project management, logistics for large projects, training personnel in project implementation and operations management will be key areas for Canadian firms in developing countries.

The government will have to continue to play an important role by providing support to private industry in a number of areas and a favourable environment for growth. It can assist the industry to define sectors of importance and problems related to each, share the financial risk especially in new large projects and generally provide assistance comparable to that received by competing foreign firms from their governments.

- Need for strategic planning in larger firms. The decisions facing firms in the industry of the 80's will be many and complex. Strategic planning should be undertaken as a means of identifying, categorizing, and dealing effectively with important interrelated problems and issues such as:
 - choices among sectors. Crucial decisions must be made as to which sector of the domestic or foreign economy will show the best growth patterns and provide the greatest return to the firm.
 - pursuing new opportunities. New directions for the firm can be successfully pursued only if effectively planned. Strategic preparation will ensure that a firm is entering a new market at the best time and has a solid grasp of what to expect.
 - conglomerate management. Larger firms are becoming increasingly involved in a wide range of consulting sectors, types of service, geographical areas and, for some, non-consulting businesses. This type of diversity will require management techniques more similar to those used by conglomerates than traditional, single business companies.
 - mergers and acquisitions. This phenomenon is increasingly prevalent and will continue to be a characteristic of the industry of the 80's.

- Continuing role for smaller firms. This report was prepared through consultation only with the largest firms. The vast majority of firms in the industry, however are smaller and continue to play an important role. Although we were unable through constraints of time and budget to update our knowledge extensively of this part of the industry, we were aware of their continuing presence in all sectors of the domestic sector and a growing interest internationally. Although they individually represent a large cross section of interests and problems, collectively they reflect many of the trends and patterns identified in the report.

* * * *

In conclusion, despite some uncertainties and changes, the future is promising for the industry. Both domestic and foreign markets are predicted to grow provided that obstacles can be overcome. As in the past, the industry will undoubtedly prove capable of meeting new challenges and taking advantage of the new opportunities of the years ahead.

APPENDIX

Individuals and Firms Interviewed During Study
(in alphabetical order of the firms)

<u>Firm</u>	<u>Executive</u>	<u>Location</u>
Acres	Hugh Rynard President Peter Brown Vice-President J.S. Baker Mgr. International Marketing	Toronto
Bechtel Canada	John A. Connor Vice-President & Mgr. of Operations Ron Holmes Mgr. of Business Development	Toronto
Canatom	P.J. McDonough Vice-President - Marketing	Montreal
Cansult	R.A. Frigon President	Toronto
Delcan	James Main President	Toronto
Fluor	Lyman Calkin President L.S. Heaton General Mgr. Engineering	Calgary
Kilborn	John Dew President Art Foster Senior Vice-President M.S. El Guindi Mgr. - International Business Development	Toronto

<u>Firm</u>	<u>Executive</u>	<u>Location</u>
Lavalin	Tom Shaw Vice-President Finance	Montreal
Lummus	H. Sonnenberg Vice-President Marketing	Toronto
Marshall Macklin Monaghan	K. McLennan Executive Vice President	Toronto
Montreal Engineering	Jim Leslie Vice-President Planning	Montreal
Proctor & Redfern	Peter Hertzberg President	Toronto
Sandwell	Owen Dalley Executive Vice- President	Vancouver
H.A. Simons (International)	Tom Simons President Allan Smith Resource Industry Analyst	Vancouver
Swan Wooster	Wilfred Pegusch President	Vancouver
Tecsult	Luc Benoit Vice-President	Montreal
UMA Group	Warren McIntyre Vice-President International Operations	Vancouver
Wright Engineering	Harold Wright President	Vancouver

Firms Who Participated in the Survey (in alphabetical order)

Acres
Associated Engineering Services
Bechtel Canada
Canatom
Cansult
Delcan
Fluor
Kilborn
Lavalin
Lummus
Marshall Macklin Monaghan
Montreal Engineering
Proctor & Redfern
Reid Crowther
SNC
Sandwell
Shawinigan Engineering
H.A. Simons (International)
Stanley Associates Engineering
Swan Wooster
Tecsult International
UMA Group
Wright Engineering