# Engineering and Technology Labour Market Study

## The Results So Far: **An Interim Report**

Engineers Canada
and
Canadian Council of Technicians and Technologists

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Canada

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## About Engineers Canada

Established in 1936, Engineers Canada is the national organization of the 12 provincial and territorial associations and ordre that regulate the practice of engineering in Canada and license the country's more than 160,000 professional engineers. Engineers Canada serves the associations and ordre, which are its constituent and sole members, by delivering national programs that ensure the highest standards of engineering education, professional qualifications and professional practice.

## About the Canadian Council of Technicians and Technologists

The Canadian Council of Technicians and Technologists (CCTT) establishes and maintains national competency standards for certifying members with a 'quality seal of approval' in 14 applied science and engineering technology disciplines: bioscience, industrial, building, instrumentation, chemical, mechanical, civil, mining, electrical, petroleum, electronics, geomatics, forestry, and information technology.  CCTT's provincial associations are responsible for issuing these highly regarded credentials, which are recognized by provincial statute in many Canadian provinces.

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# Executive Summary

The Engineering and Technology Labour Market Study, a joint project of Engineers Canada and the Canadian Council of Technicians and Technologists (CCTT), is a five-part research project whose objective is to collect and analyse labour market information related to licensed and unlicensed engineers and certified and uncertified technologists and technicians. The resulting information will provide a better understanding of the current and future employment picture within the engineering and technology sectors of the Canadian economy by analysing trends affecting the engineering and technology occupations. Ultimately, findings will be used to formulate recommendations with respect to policies and strategic initiatives related to skills and labour development.

The five parts of the research project assess: employer labour requirements; the available workforce; attitudes and practices related to certification and licensing; the role of diversity groups; and globalization. The reports on diversity and globalization will be ready in the coming months. Key results from the other three areas of study are summarized here:

## Snapshot of the Engineering and Technology Labour Market (2006 *Census*)

- Two-thirds of persons with a Canadian university degree in engineering were employed *outside* engineering occupations. For those who obtained their degree outside of Canada, the proportion was over 80%.
- Individuals who obtained their engineering degrees outside Canada accounted for approximately 20% of all employment in engineering occupations. For technicians and technologists, the proportion was 6.6%, although this excludes persons in technology occupations who have non-Canadian educational qualifications in a field other than engineering or technology (*e.g.*, general science).
- Approximately 30% of persons classified by the *Census* as working in engineering occupations were *not* university engineering graduates. The proportion is high and warrants consideration by regulatory bodies.
- The employment of technology graduates was more dispersed across occupational categories. Only 15.5% of technology graduates were actually employed in technology occupations (as defined by Statistics Canada).

## Short-Term Outlook, 2008-2010

*Demand:*

- Overall employment demand for engineers, technologists and technicians was projected to increase by approximately 3.6% per year between now and 2010. The downturn in the U.S. and its spill-over effects into Ontario and Quebec will bring this projection down.[1]
- Survey data suggest that hiring will be weighted to technologists/technicians.

*Supply:*

- Graduates: since 2002, new enrolments in engineering and technology have declined.
- Immigration: immigration of engineers peaked in 2001. *In 2001 and 2002, more than two-thirds of increases to supply in Ontario were derived from immigration and less than one-third*

[1] The demand forecast is currently being revised to take into account recent economic developments.

*from new graduates.* Since 2001, owing to crowding in the Ontario engineering labour market, there has been a decline of almost 70% in immigration of qualified engineers.

*Outlook:*

- Labour markets in western Canada will be characterized by significant excess demand for all engineering and technology occupations in 2008 and 2009. In 2010, these demand pressures will moderate somewhat.
- Labour markets in Ontario are currently characterized by excess supply and will continue to be so characterized in 2009, but are expected to see moderate skill shortages, but *not* labour shortages, in 2010.
- In Quebec, current labour market conditions are better than in Ontario, but will drift into excess supply for engineers in 2010. Demand for technologists/technicians will remain strong.
- In the Atlantic region, excess demand conditions will abate by 2010 when there will be moderate skill shortages, but not labour shortages.

### Changing Roles

- There is significant occupational overlap in two technical functions: process control (especially in mid-sized manufacturing establishments) and project management (especially in construction and IT). Occupational overlap is more evident in civil, mechanical and electrical engineering and less evident in chemical, mining, aerospace, and environmental engineering.
- There is no consistency between how industry uses the terms 'technologist' and 'technician' and how the post-secondary system or professional bodies use these designations.

### Skill Requirements and the Nature of Shortages

- The term 'shortages' conflates two distinct phenomena: labour shortages and skills shortages. A labour shortage is an absolute insufficiency in the number of people with the formal educational qualifications to fill employers' hiring requirements. A skills shortage is a shortage of persons with the *right* mix of technical and non-technical skills or the *right* industry or technology skills. A serious skills shortage can, and often does, co-exist with serious unemployment.
- Only survey data based on consistent samples and questions over time would enable us to draw a definite conclusion that skill shortages are more troublesome today. We do not have such data, and must rely on interviews and focus groups. These suggest that the problem of skill shortages is serious, that it certainly is not getting less serious, and that it may be getting more serious.

### Licensure and Certification

- Diverging employment and licensure trends suggest, though do not definitively prove, that there are weaknesses in support for the systems of professional licensure and certification. This weakening support may already be a serious challenge. It certainly could become serious.
- At the same time, it is clear licensure and certification are seen as bulwarks for the ethic and culture of professionalism and that this is the major factor behind support for licensure and certification on the part of both professional employees and their employers.

# 1. Overview of Study

The Engineering and Technology Labour Market Study, a joint project of Engineers Canada and the Canadian Council of Technicians and Technologists (CCTT), is a five-part research project assessing:

- employer labour requirements
- the available workforce
- attitudes and practices related to certification and licensing
- the role of diversity groups
- globalization

The objective is to collect and analyse labour market information related to licensed and unlicensed engineers and certified and uncertified technologists and technicians[2] to: inform the planning and integration of international engineering and technology graduates; better understand the changing work and skill sets required by the engineering team today and in the future; depict a detailed picture of supply and demand; and identify labour force and skills implications from various economic realities.

The research will provide a better understanding of the current and future employment picture within the engineering and technology sectors of the Canadian economy by analysing trends affecting the engineering and technology occupations. Ultimately, findings will be used to formulate recommendations with respect to policies and strategic initiatives related to skills and labour development.

The Study was created thanks to a recommendation resulting from the *From Consideration to Integration (FC2I)* project. FC2I is a three-phase initiative[3] designed to integrate international engineering graduates into the Canadian profession and workforce without compromising public safety or lowering professional standards. Phase I looked at every aspect of their experience, from taking the first steps to immigrate to Canada, to licensing, finding a job and all the elements of culture and language that accompany that journey. Phase II involved sorting, analyzing, validating and prioritizing that information so that the project's Steering Committee could draw conclusions. One of those conclusions was that international engineering graduates need better labour market information to support their integration into the Canadian engineering profession and into the technology labour market. In addition, workshops hosted by HRSDC and attended by representatives from Engineers Canada, CCTT, and post-secondary and industry stakeholders identified additional labour market information needs.

The principal components of the Engineering and Technology Labour Market Study are:

- a detailed analysis of *Census* and *Labour Force Survey* data
- a customized survey of 700 engineering and technology employers
- a customized survey of engineers, technologists and technicians
- construction of a detailed supply and demand model
- executive interviews

[2] A total of 725,000 people

[3] Fully funded by Human Resources and Skills Development Canada (HRSDC).

- focus groups
- case studies of diversity programs
- case studies of factors affecting educational choice at the high school level

The Study is supported by a 32-person Steering Committee drawn from professional associations, universities and colleges, industry, and organizations that assist in the integration of international engineering and technology graduates. As the research reports from the Study are approved for release by the Steering Committee, they are published on the Study website at www.engineerscanada.ca/etlms.

The Study is funded by Human Resources and Skills Development Canada (HRSDC) and was launched in January, 2007. Research is being undertaken by Prism Economics and Analysis; all work is expected to be completed by February 2009.

The following table summarizes the planned publications and their expected release date.

| Publication | Current Status | Public Release |
|---|---|---|
| Final Report: 2007 Engineering and Technology Employer Survey | Steering Committee | November 2008 |
| Interim Report: Survey of Engineers, Technologists and Technicians (Survey still in the field) | Steering Committee | Final Report February 2009 |
| Labour Market Tracking System and Short-Term Forecast Version 1.0 | In Validation | |
| Labour Market Tracking System and Short-Term Forecast Version 2.0 | October 2008 | December 2008 |
| Report: Changing Roles in Engineering and Technology | Steering Committee and Associations | November 2008 |
| Report: Licensure and Certification | Steering Committee and Associations | November 2008 |
| Report: Continuing Professional Development | In preparation | November 2008 |
| Report: Case Studies in Diversity Programs | In preparation | November 2008 |
| Report: Factors Affecting Educational Choice among Young Women | In preparation | February 2009 |
| Report: Globalization Issues | In preparation | February 2009 |

# 2. A Snapshot of the Engineering and Technology Labour Market

It was important at the study's outset to have a clear picture of the current engineering and technology labour market. This chapter reports on the employment and underemployment of persons with engineering degrees, and presents data on the employment situation of international engineering and technology graduates[4] . Finally, the chapter looks at the distribution of employment for engineers, technicians and technologists by region and industry, and the diversity trends for each occupational group.

## Key Findings:

Seven important findings emerge from the 2006 *Census*:

1. Roughly two-thirds of persons a with university degree in engineering obtained in Canada were employed *outside* engineering occupations. For individuals who obtained their engineering degree outside Canada, the proportion was 83.0%.

2. There is evidence of significant under-employment of persons with university engineering degrees. This applies regardless of whether degrees were obtained in Canada or outside.

3. Approximately 30% of persons classified by the *Census* as working in engineering occupations were *not* university engineering graduates. The proportion is high and warrants consideration by regulatory bodies.

4. Individuals who obtained their engineering degrees outside Canada accounted for approximately 20% of employment in engineering occupations. For technicians and technologists, the proportion was 6.6%, although this excludes persons in technology occupations who have non-Canadian educational qualifications in a field other than engineering or technology (*e.g.*, general science).

5. The employment of technology graduates was more dispersed across occupational categories. Only 15.5% of technology graduates were actually employed in technology occupations (as defined by Statistics Canada).

6. A large proportion (60%) of technology jobs were filled by individuals whose educational qualification is other than a university degree in engineering or a college qualification in technology.

7. Women accounted for 12.3% of engineering employment and 19.1% of technology employment. However, there were marked divergences from these averages across different technical fields.

[4] All data are based on a special tabulation of 2006 *Census* data.

## Engineering Occupations and Qualifications:

When interpreting *Census* data it is important to bear in mind that occupational data is subject to coding errors. This is particularly relevant for engineering occupations. Individuals may identify themselves as engineers, even though they lack a university (or equivalent) qualification in engineering. An individual also may describe his or her job as an engineering job, even though it is actually working in a technology job. Statistics Canada cannot verify all *Census* returns. *Census* data should therefore be interpreted as estimates, rather than precise measures.

Figure No. 1 shows the distribution across occupational categories of persons who reported that they had a university degree in engineering.

**Figure No. 1**
Occupations of University Engineering Graduates, 2006
Statistics Canada, *2006 Census*

| | International Engineering Graduates | Domestic Engineering Graduates | Total Engineering Graduates |
|---|---|---|---|
| Engineering Occupations | **17.0%** | **32.5%** | **25.9%** |
| Management occupations | 12.7% | 17.1% | 15.2% |
| Natural and applied science excl Engineering and Technology | 12.1% | 12.7% | 12.4% |
| Trades, transport and equipment operators and related occupations | 12.4% | 8.2% | 10.0% |
| Occupations in social science, education, government service and religion | 5.2% | 6.7% | 6.1% |
| Business, finance and administrative occupations | 9.0% | 6.1% | 7.3% |
| Sales and service occupations | 12.5% | 6.1% | 8.8% |
| Technology Occupations | 7.2% | 5.3% | 6.1% |
| Occupations unique to processing, manufacturing and utilities | 8.7% | 2.4% | 5.1% |
| Occupations unique to primary industry | 0.7% | 1.2% | 1.0% |
| Occupations in art, culture, recreation and sport | 1.2% | 1.1% | 1.1% |
| Health occupations | 1.2% | 0.6% | 0.9% |
| Total | 100.0% | 100.0% | 100.0% |

As can be seen from Figure No. 1, *only 32.5% of persons who obtained their university degree in engineering in Canada were working in an engineering occupation*. Among international engineering graduates, this proportion was only 17.0%. Some university-trained engineers were in management (15.2%) or business, finance or administrative occupations (7.3%). Others worked in government (in non-engineering occupations), or in education (6.1%). Some of these occupations would require engineering qualifications, for example, engineering management occupations or teaching occupations in engineering. In other occupations, engineering training may be advantageous, though not a unique qualification. Still the picture that emerges is that a large number of persons with university degrees in engineering are working in fields where other educational qualifications might be equally suitable and where non-engineering skills are important. As will be discussed later in this report, this picture is confirmed by survey data.

The *Census* data also strongly suggest that a significant number of persons with a university degree in engineering were working in occupations for which they were over-qualified. That is to say, relative to their educational qualifications, these individuals were under-employed. It is impossible to

be precise about the rate of under-employment. A reasonable estimate would be that in *2006, around 11% of domestic engineering graduates, and 18% of international graduates, were employed in occupations for which they were over-qualified*.[5] Lower and higher estimates are plausible. However, by any reasonable estimate, the rate of under-employment was troublesome.

It is also evident from the *Census* that engineering occupations are not confined to persons with university degrees in engineering. Figure No. 2 shows that only 30.2% of persons who were in engineering occupations in 2006 did *not* have a university degree in engineering. Some of these individuals may have had other qualifications that were equivalent to a university degree in engineering. However, this is unlikely to account for the majority. The *Census* reports that 9.8% had a technician or technologist qualification, rather than an engineering degree.

**Figure No. 2**
Educational Qualifications of Persons in Engineering Occupations, 2006
Statistics Canada, *2006 Census*

| | Per Cent of all Persons in Engineering Occupations |
|---|---|
| International Engineering Graduates | 19.6% |
| Domestic Engineering Graduates | 50.2% |
| Sub-Total | 69.8% |
| International Engineering Technician/Technologist Qualification | 1.2% |
| Domestic Engineering Technician/Technologist Qualification | 8.6% |
| Other Professionals | 20.4% |
| Total | 100.0% |

Roughly half of the 'other professionals' engaged in engineering work were employed as computer engineers. Indeed, only 47.5% of persons employed as computer engineers were university engineering graduates.[6]

[5] This is based on the premise that all engineering graduates would be over-qualified for technical occupations and that approximately 30% would be overqualified for occupations in four other categories:

| | International Engineering Graduates | Domestic Engineering Graduates | Total Engineering Graduates |
|---|---|---|---|
| Trades, transport and equipment operators and related occupations | 12.4% | 8.2% | 10.0% |
| Sales and service occupations | 12.5% | 6.1% | 8.8% |
| Occupations unique to processing, manufacturing and utilities | 8.7% | 2.4% | 5.1% |
| Occupations unique to primary industry | 0.7% | 1.2% | 1.0% |
| Sub-Total | 34.36% | 17.91% | 24.94% |
| 30% | 10.31% | 5.37% | 7.48% |
| Technical occupations (i.e., technicians / technologists) | 7.2% | 5.3% | 6.1% |
| Total | 17.5% | 10.7% | 13.62% |

[6] Note that while the *Census* distinguishes between 'computer engineers' and 'software engineers', some misclassification is likely. Computer engineers are engaged in designing hardware and systems integration whereas software engineers are engaged in the high level design (sometimes termed 'architecture') of software applications.

## International Engineering Graduates (IEGs):

In 2006, international engineering graduates (IEGs) comprised 42.7% of all persons with university degrees in engineering and 28.1% of persons with university degrees in engineering who were employed in engineering occupations. Figure No. 3 summarizes the data for each province and territory.

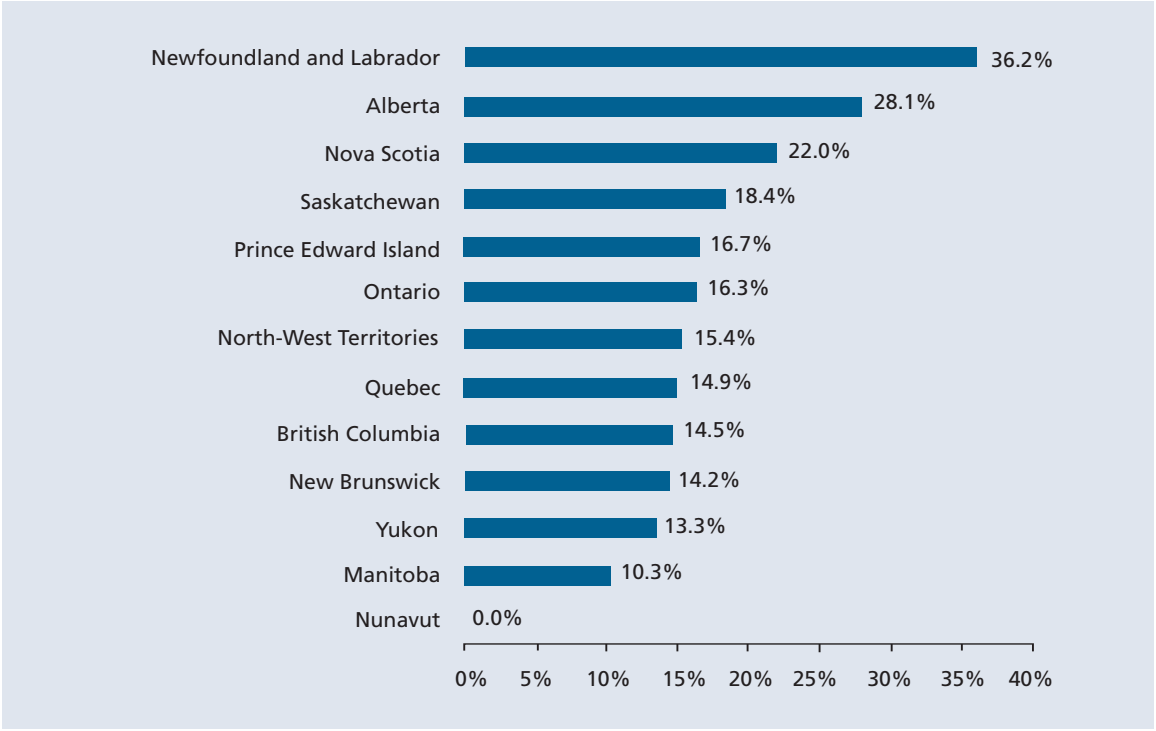
**Figure No. 3**
International Engineering Graduates (IEGs) Share
of All Persons with University Degrees in Engineering, 2006
Statistics Canada, 2006 *Census*

| | Engineering Occupations | All Occupations |
|---|---|---|
| Newfoundland and Labrador | 6.9% | 6.7% |
| Prince Edward Island | 4.5% | 7.2% |
| Nova Scotia | 10.3% | 12.0% |
| New Brunswick | 4.4% | 9.5% |
| Quebec | 14.4% | 28.1% |
| Ontario | **37.3%** | 51.8% |
| Manitoba | 15.1% | 35.5% |
| Saskatchewan | 7.9% | 14.2% |
| Alberta | **27.5%** | 36.0% |
| British Columbia | **36.2%** | 52.2% |
| Yukon | 8.3% | 22.7% |
| North-West Territories | 28.6% | 15.3% |
| Nunavut | 0.0% | 15.0% |
| Canada | 28.1% | 42.7% |

As can be from Figure No. 3 the share of international engineering graduates – and by inference, the significance of integration challenges – varies across jurisdictions. Ontario and British Columbia, international engineering graduates account for 37.3% and 36.2% respectively of all persons with university degrees in engineering who are employed in engineering occupations.

A proximate indicator of international engineering graduates' participation in the engineering and technology labour market is the proportion of international engineering graduates who were employed in engineering occupations. This is only a proximate indictor since there are jobs in other occupational categories which would be conventionally considered 'engineering jobs', e.g., engineering management, construction management, etc. However, the proportion of international engineering graduates who were employed in engineering occupations is an indicator of their rate of utilization. Figure No. 4 shows that this ranged from 36.2% in Newfoundland and Labrador to 10.3% in Manitoba (and zero in Nunavut).

**Figure No. 4**
Percent of International Engineering Graduates (IEGs) who were working in Engineering Occupations, 2006
Statistics Canada, *2006 Census*




On a national basis, only 17.0% of international engineering graduates were employed in engineering occupations. This compares with 32.5% of domestic engineering graduates.

Fewer than 2% of international engineering graduates were classified as lacking the ability to conduct a conversation in either official language. As will be discussed later, however, survey data indicate that, for professional employees, the language skills issue is more complex than basic fluency.

## Technicians and Technologists:

Figure No. 5 shows the occupational distribution of college-qualified engineering technologists and technicians.

**Figure No. 5**
Occupations of College Engineering Technologist/Technician Graduates, 2006
Statistics Canada, *2006 Census*

| | International Engineering Graduates | Domestic Engineering Graduates | Total Engineering Graduates |
|---|---|---|---|
| Trades, transport and equipment operators and related occupations | 25.5% | 22.1% | 22.4% |
| Technology Occupations | 8.1% | 16.3% | 15.5% |
| Sales and service occupations | 16.8% | 11.9% | 12.4% |
| Natural and applied science excl Engineering and Technology | 6.1% | 11.7% | 11.1% |
| Management occupations | 12.7% | 11.4% | 11.5% |
| Business, finance and administrative occupations | 8.7% | 8.2% | 8.2% |
| Occupations unique to processing, manufacturing and utilities | 11.0% | 7.5% | 7.9% |
| Engineering Occupations | 4.9% | 3.9% | 4.0% |
| Occupations unique to primary industry | 1.7% | 3.2% | 3.0% |
| Occupations in social science, education, government service and religion | 1.8% | 1.6% | 1.6% |
| Occupations in art, culture, recreation and sport | 1.6% | 1.5% | 1.5% |
| Health occupations | 1.1% | 0.8% | 0.8% |
| | 100.0% | 100.0% | 100.0% |

There are differences in the distribution across occupations between domestic and international technology graduates. International technology graduates were markedly *less* likely to work in purely technical occupations (technology, engineering, and other natural and applied science occupations). In 2006, 19.1% of international technology graduates took employment in these purely or predominantly occupations. For domestic technology graduates, the comparable proportion was 31.9%.

Jobs requiring college qualifications in technology occur across a broader range of industries than engineering jobs. Consequently, it is not feasible to estimate the proportion of college technology graduates that are employed outside a technology field. Nor do *Census* data enable us to estimate the incidence of under-employment.

The 2006 Census identified 271,995 persons working in technology occupations. Figure No. 6 shows the educational qualifications of these individuals.

**Figure No. 6**
Educational Qualification of Persons employed in Technology Occupation, 2006
Statistics Canada, *2006 Census*

| | Educational Qualification |
|---|---|
| International Engineering Graduates | 5.1% |
| Domestic Engineering Graduates | 5.3% |
| International Technologist/Technician Program Graduate | 1.5% |
| Domestic Technologist/Technician Program Graduate | 26.3% |
| Other Professional Qualifications (Canadian and International) | 61.8% |
| Total | 100.0% |

The technologist/technician programs tracked for purposes of Figure No. 6 were:

- 15.0000 Engineering Technology, General
- 15.0101 Architectural Engineering Technology/Technician
- 15.0201 Civil Engineering Technology/Technician
- 15.0399 Electrical and Electronic Engineering Technologies/Technicians, Other
- 15.0499 Electromechanical and Instrumentation and Maintenance Technologies/Technicians, Other
- 15.0599 Environmental Control Technologies/Technicians, Other
- 15.0699 Industrial Production Technologies/Technicians, Other
- 15.0799 Quality Control and Safety Technologies/Technicians, Other
- 15.0899 Mechanical Engineering Related Technologies/Technicians, Other
- 15.0999 Mining and Petroleum Technologies/Technicians, Other
- 15.1001 Construction Engineering Technology/Technician
- 15.1199 Engineering-related Technologies, Other
- 15.1201 Computer Engineering Technology/Technician, General
- 15.1399 Drafting/Design Engineering Technologies/Technicians, Other
- 15.1401 Nuclear Engineering Technology/Technician
- 15.1501 Engineering/Industrial Management
- 15.9999 Engineering Technologies/Technicians, Other

It is striking that 10.4% *of persons employed in technology occupations were engineering graduates and that these were equally divided between domestic and international engineering graduates*. It is also striking that over 60% of persons in technology occupations had an educational qualification other than, or in addition to a college certification in a technologist/technician program. There are a number of factors that could contribute to this high proportion. First, some individuals in technology occupations may have a trades background. Second, there also may be some individuals in these occupations that were trained in the military (either in Canada or elsewhere). Third, many individuals in technology occupations may have taken college training, but not completed that training. Fourth, individuals with university training who also take college training are classed by the Census as university, rather than college graduates.

## Employment by Province or Territory:

Figure No. 7 summarizes the provincial and territorial distribution of employment in engineering and technology occupations. It is interesting to note that the ratio of engineering occupations to technology occupations differs across jurisdictions. The highest ratio is Ontario at 47.0%.

**Figure No. 7**
Employment in Engineering and Technology Occupations by Province or Territory, 2006
Statistics Canada, *2006 Census*

| | Engineering and Technology Employment | | | Share of Engineering and Technology Employment within Province or Territory | |
|---|---|---|---|---|---|
| | Engineering Occupations | Technology Occupations | Total | Engineering Share | Technology Share |
| Canada | 199,755 | 271,910 | 471,665 | 42.4% | 57.6% |
| Newfoundland and Labrador | 2,450 | 3,780 | 6,230 | 39.3% | 60.7% |
| Prince Edward Island | 390 | 755 | 1,145 | 34.1% | 65.9% |
| Nova Scotia | 3,785 | 6,665 | 10,450 | 36.2% | 63.8% |
| New Brunswick | 2,720 | 5,055 | 7,775 | 35.0% | 65.0% |
| Quebec | 40,465 | 71,035 | 111,500 | 36.3% | 63.7% |
| Ontario | 85,350 | 96,345 | 181,695 | 47.0% | 53.0% |
| Manitoba | 4,080 | 7,770 | 11,850 | 34.4% | 65.6% |
| Saskatchewan | 3,270 | 6,345 | 9,615 | 34.0% | 66.0% |
| Alberta | 34,360 | 43,575 | 77,935 | 44.1% | 55.9% |
| British Columbia | 22,560 | 29,740 | 52,300 | 43.1% | 56.9% |
| Yukon | 155 | 330 | 485 | 32.0% | 68.0% |
| North West Territories | 140 | 405 | 545 | 25.7% | 74.3% |
| Nunavut | 30 | 110 | 140 | 21.4% | 78.6% |

Figure No. 8 summarizes the provincial and territorial shares of national employment in engineering and technology occupations.

**Figure No. 8**
Provincial and Territorial Share of National Employment in Engineering and Technology, 2006
Statistics Canada, *2006 Census*

| | Engineering Occupations | Technology Occupations | Both Engineering and Technology Occupations |
|---|---|---|---|
| Newfoundland and Labrador | 1.2% | 1.4% | 1.3% |
| Prince Edward Island | >1.0% | >1.0% | >1.0% |
| Nova Scotia | 1.9% | 2.5% | 2.2% |
| New Brunswick | 1.4% | 1.9% | 1.6% |
| Quebec | 20.3% | 26.1% | 23.6% |
| Ontario | 42.7% | 35.4% | 38.5% |
| Manitoba | 2.0% | 2.9% | 2.5% |
| Saskatchewan | 1.6% | 2.3% | 2.0% |
| Alberta | 17.2% | 16.0% | 16.5% |
| British Columbia | 11.3% | 10.9% | 11.1% |
| Yukon | >1.0% | >1.0% | >1.0% |
| North West Territories | >1.0% | >1.0% | >1.0% |
| Nunavut | >1.0% | >1.0% | >1.0% |
| Canada | 100.0% | 100.0% | 100.0% |

## Employment by Industry:

Figure No. 9 summarizes employment by industry. The consulting industry and the manufacturing sector are the major employing sectors for both engineers and technologists/technicians, accounting respectively for 63.2% and 54.0% of employment in 2006. The construction industry employed 4.7% of engineers and 8.9% of technologists/technicians. However, this underestimates the importance of construction as an employment driver, since a large share of employment in the consulting sector is tied to construction, including many environmental impact studies. Based on the industry distribution of employment, it is clear that capital spending is the major driver of both engineering and technology employment, but has a greater impact on engineering employment. Capital spending ultimately determines the demand for most engineering services, including feasibility analysis, environmental impact studies, design, and project management.

**Figure No. 9**
Employment in Engineering and Technology Occupations by Industry, 2006
Statistics Canada, *2006 Census*

| Industry (2-digit NAICS Code) | Engineering Occupations | Technology Occupations |
|---|---|---|
| 11 Agriculture, forestry, fishing and hunting | 0.2% | 0.4% |
| 21 Mining and oil and gas extraction | 5.8% | 4.6% |
| 22 Utilities | 5.0% | 4.4% |
| 23 Construction | 4.7% | 8.9% |
| 31-33 Manufacturing | **26.0%** | **27.0%** |
| 41, 44-45 Wholesale and Retail Trade | 4.0% | 5.0% |
| 48-49 Transportation and warehousing | 2.3% | 2.5% |
| 51 Information and cultural industries | 3.6% | 1.2% |
| 52,53 Finance and Real Estate | 1.1% | 0.9% |
| 54 Professional, scientific and technical services (consulting) | **37.2%** | **27.0%** |
| 55 Management of companies and enterprises | 0.1% | 0.1% |
| 56 Administrative and support, waste management and remediation services | 0.9% | 1.6% |
| 61 Educational services | 0.8% | 1.3% |
| 62 Health care and social assistance | 0.6% | 1.3% |
| 71,72, 81 Arts, Entertainment, Accommodation and Other Services | 1.0% | 2.1% |
| 91 Public administration (government) | 6.6% | 11.7% |
| Total - Industry - North American Industry Classification System 2002 | 100.0% | 100.0% |

## Diversity:

Figure No. 10 summarizes the female share of employment in engineering and technology occupations. It is significant that this share differs significantly across technical fields. The female share in chemical engineering and chemical technology is markedly higher than in other fields. By contrast the female share in mechanical engineering and mechanical technology is markedly lower.

In 2006, members of visible minorities accounted for 25.8% of engineering employment and 14.9% of technology employment. Self-identified aboriginal Canadians were 0.7% of engineering employment and 1.9% of technology employment.

**Figure No. 10**
Female Share of Employment in Engineering and Technology Occupations, 2006
Statistics Canada, *2006 Census*

| | Female Share |
|---|---|
| C031 Civil engineers | 12.4% |
| C032 Mechanical engineers | 8.9% |
| C033 Electrical and electronics engineers | 10.0% |
| C034 Chemical engineers | **22.4%** |
| C041 Industrial and manufacturing engineers | 15.5% |
| C042 Metallurgical and materials engineers | 12.7% |
| C043 Mining engineers | 7.2% |
| C044 Geological engineers | 13.1% |
| C045 Petroleum engineers | 15.2% |
| C046 Aerospace engineers | 11.1% |
| C047 Computer engineers (except software engineers) | 13.0% |
| C048 Other professional engineers, not elsewhere classified | 17.8% |
| Total Engineers | 12.3% |
| | |
| C111 Chemical technologists and technicians | **47.0%** |
| C112 Geological and mineral technologists and technicians | 24.7% |
| C113 Meteorological technicians | 22.7% |
| C131 Civil engineering technologists and technicians | 12.6% |
| C132 Mechanical engineering technologists and technicians | 7.2% |
| C133 Industrial engineering and manufacturing technologists and technicians | 19.8% |
| C134 Construction estimators | 10.5% |
| C141 Electrical and electronics engineering technologists and technicians | 9.8% |
| C143 Industrial instrument technicians and mechanics | 4.7% |
| C144 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors | 6.9% |
| C151 Architectural technologists and technicians | **31.6%** |
| C152 Industrial designers | 26.2% |
| C153 Drafting technologists and technicians | 25.8% |
| C154 Land survey technologists and technicians | 15.8% |
| C155 Mapping and related technologists and technicians | **33.6%** |
| C161 Non-destructive testers and inspectors | 8.0% |
| C162 Engineering inspectors and regulatory officers | 20.7% |
| C163 Inspectors in public and environmental health and occupational health and safety | **35.1%** |
| C164 Construction inspectors | 12.3% |
| Total Technologists/Technicians | 21.5% |

# 3. Short-Term Outlook, 2008-2010[7]

As noted earlier, the Study is a five part research project assessing:

- employer labour requirements
- the available workforce
- attitudes and practices related to certification and licensing
- the role of diversity groups
- globalization

Findings from all five of these study components have been combined into a Labour Market Tracking System that assesses conditions for engineers and engineering technicians and technologists (ETT) in Canada's provinces, territories and regions. This chapter describes the Labour Market Tracking System and:

- summarizes trends in engineering and technology graduations and immigration
- sets out provisional conclusions on labour market conditions for engineers by region and by technical field
- sets out similar conclusions for technicians and technologists
- presents survey findings on employers' expected recruitment difficulties for engineers and technologists

## Labour Market Tracking System:

The Labour Market Tracking System (LMTS) developed as part of the Study is a system for tracking and projecting labour market conditions by occupation and by region. The current version of the model (Version 1.0) covers 18 engineering and technology occupations at the national level. At the provincial level, occupations must be combined, owing to data limitations. Analyses have been developed for six provinces, plus the Atlantic region. At this time, the Atlantic region is combined owing to data availability issues.

On the demand side, the Labour Market Tracking System estimates demand by industry and by occupation, based on an employment co-efficient model and a medium-term forecast of output by industry and by region. On the supply side, the Labour Market Tracking System factors in graduation trends by discipline and by region, and immigration by intended occupation and intended destination. A demographic model is used to estimate the impact of aging on the engineering and technology labour force. Labour force participation rates in the model are age-sensitive.

The supply-demand balance is then evaluated and ranked according to five levels for the current year and each forecast year. The rankings reflect trend changes in employment, the excess supply rate, hiring requirements relative to retirements, and industry input. The provisional rankings are subject to a regional validation process. The Labour Market Tracking System is designed to allow regular updating and refinement of the regional and occupational analysis.

[7] This chapter presents a synopsis of the results that are set out in detail by region and by occupation in *Engineers and Engineering Technicians and Technologists (ETT) Labour Market Tracking System: Labour Market Conditions - 2008 to 2010* which is Version 1.0 of the Labour Market Tracking System.

Version 1.0 of the Labour Market Tracking System is complete. The provisional rankings are currently in the process of being reviewed and validated by regional groups. Version 2.0 will update and refine Version 1.0 using:

- a more current industry output forecast (taking account of recent economic changes)
- a calibration to 2006 Census data which has only recently become available
- updated and refined projections of graduates
- more recent immigration data
- industry input from the regional validation process

A description of the rankings used for each occupation and labour market is set out below. The rankings range from "significant excess supply" to "supply constraints" where economic growth is constrained by the inability to recruit needed engineering and technology professionals.

## Labour Market Rankings

**RANKING 1 – Significant excess of supply over demand**

… no difficulty in recruiting qualified ETT staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.

**RANKING 2 – Excess of supply over demand**

… no difficulty in recruiting qualified ETT staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. *The geographic range and extent of qualifications is broader than in #1*.

**RANKING 3 – Moderate supply pressures**

… difficulty in recruiting qualified ETT staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. However, these moderate supply pressures are generally not evident in recruiting ETT staff with 0-5 years of Canadian experience.

**RANKING 4 – Significant supply pressures**

… difficulty *across the board in recruiting qualified ETT staff* in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their outsourcing of engineering and technology work to consultancies or staff the assignment with ETT workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.

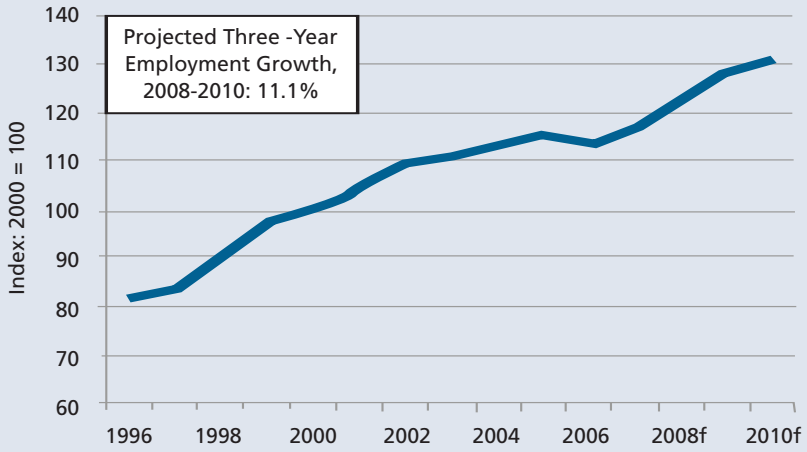
**RANKING 5 – Supply constraints**

… *systemic difficulty* in recruiting qualified ETT staff. International recruiting is common among large employers. There is a widespread perception that the consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource engineering and technology work to qualified consultancies with a known track record.

## Demand-Side Trends:

The demand for engineers, technologists and technicians is determined chiefly by trends in capital spending and trends in output by industry. The engineering intensiveness of industries varies significantly. For this reason, the forecasting model in the Labour Market Tracking System disaggregates projected economic growth by industry so as to estimate the implications of growth trends for engineering and technology occupations. Figure No. 11. shows the estimated trend in employment in all engineering and technology occupations. The Labour Market Tracking System breaks down this aggregate projection by region and by occupation, though, as noted earlier, data limitations restrict the ability to construct detailed occupational forecasts in some regions. Version 2.0 will update this forecast based on more recent assessments of economic trends.

**Figure No. 11**
Actual and Projected Trend in Employment for Engineering and Technology Occupations, Canada



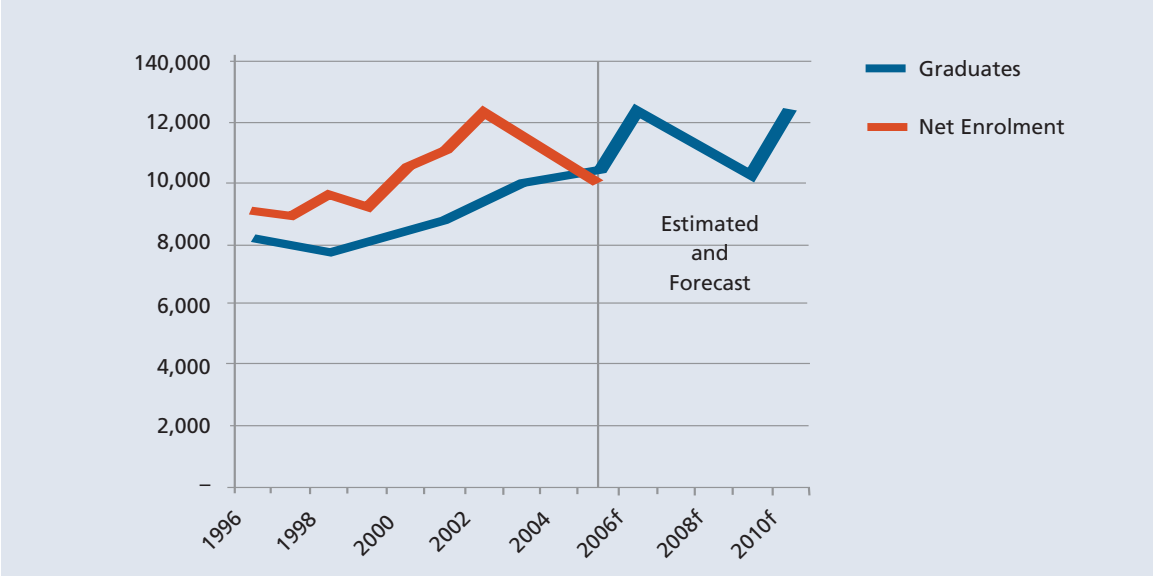

## Enrolment and Graduation Trends:

Projected graduations are a lagged function of enrolments. On an all-disciplines basis, engineering graduations are expected to average around 11,100 in 2008-1010.[8] (See Figure No. 12). We are still gathering enrolment data for 2007 and 2008. These data are particularly important in light of the downward trend in enrolments since 2002. Strengthening administrative data collection, so as to improve the currency of enrolment data and the graduate forecast, is an important priority.[9]

[8] Visa students account for approximately 6-7% of this total. Hence the net increment to supply will be closer to 10,400. Many of these visa students subsequently immigrate to Canada. They are reflected in the immigration data discussed later.

[9] Details by province and by discipline can be found in the spreadsheets that accompany Engineers and Engineering Technicians and Technologists (ETT) Labour Market Tracking System: Labour Market Conditions - 2008 to 2010. These are reproduced on the Study Website in the Members Only section: http://www.engineerscanada.ca/ etlms/index.cfm

**Figure No. 12**
Net Enrolments and Graduates in Engineering (All Disciplines)




In contrast with engineering, college and CEGEP programs for engineering technicians and technologists are not tracked at the national level. Constructing a data series is complicated by the fact that colleges and CEGEPs differ in how they label programs, the curriculum for those programs, and the duration of programs. The consulting team is currently mapping existing community college programs into the occupations in the ETT Labour Market Tracking system. We are also in the process of gathering enrolment and graduation data. Figure No. 13 reports the overall results of this effort.

**Figure No. 13**
Trends in College and CEGEP Graduations from Programs Mapped into Technologist and Technician Occupations

| | 2000 | 2002 | 2004 | 2006 | 2007 to 2010* (Avg) |
|---|---|---|---|---|---|
| British Columbia | n.a | n.a | 1,881 | 1,730 | 1,611 |
| Alberta | n.a | n.a | n.a | 1,304 | 1,417 |
| Saskatchewan | 180 | 260 | 325 | 364 | 316 |
| Manitoba | n.a | 381 | 394 | 360 | 353 |
| Ontario | 6,072 | 6,786 | 7,277 | 7,383 | 7,383** |
| Quebec | 1,003 | 955 | 1,151 | 1,660 | 1,743 |
| Atlantic | n.a | n.a | 680 | 696 | 696 |
| Total | 7,255 | 8,382 | 11,708 | 13,497 | 13,519 |

* Based on actual 2007 data for British Columbia and Saskatchewan
** Enrolment data unavailable for graduate projections
n.a. Not available

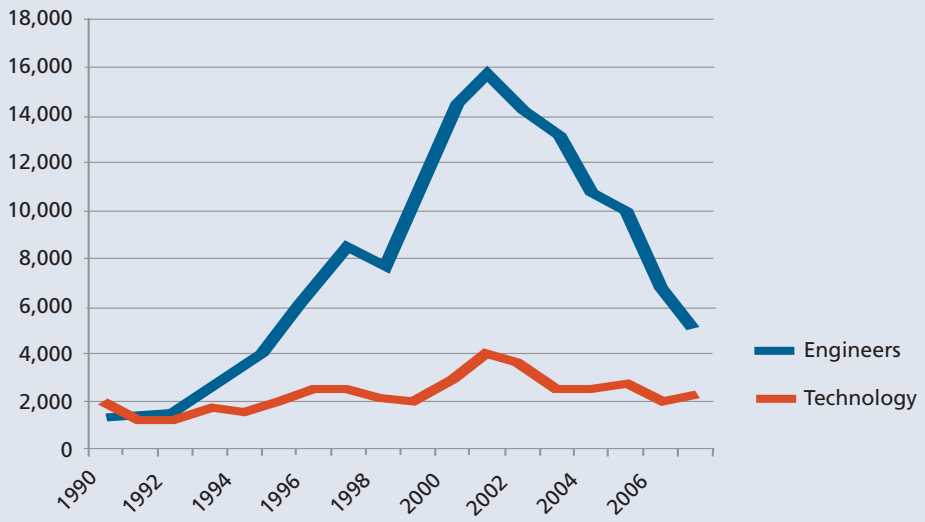
These findings are preliminary. However, the results do provide an indication of graduation trends sufficient to support an initial assessment of supply-side trends.

## Immigration:

Figure No. 14 shows annual immigration of persons in engineering and technology occupations under the skilled worker program. As can be seen from the graph, immigration peaked in 2001 at 19,772 persons. It is useful to compare this intake to graduations. In 2001, there were 15,863 international engineering graduates compared to 8,733 engineering graduates in the same year. The majority of international engineering graduates initially settled in Ontario. *In 2001 and 2002, more than two-thirds of increases to supply in Ontario were derived from immigration and less than one-third from new graduates*. It is not surprising that in these circumstances both recent immigrants and many recent graduates in Ontario experienced considerable difficulty in finding employment commensurate with their training. The decline in enrolments shown in Figure No. 11 reflects these conditions, as does the even more marked decline in immigration after 2001. As can be seen from Figure No. 12, immigration of engineers to Canada in 2007 is down to 5,066.[10]

We are currently analyzing administrative data to see if there are standard lag patterns between immigration trends and applications for licensure.

**Figure No. 14**
Immigration in Engineering and Technology Occupations
Citizenship and Immigration Canada




Immigration in technology occupations has been significantly less than immigration in engineering occupations, although this may reflect administrative errors in the classification of educational qualifications.[11] Relative to the size of the technology workforce and the number of new graduates, immigration is less significant a factor than in engineering occupations.

[10] Details by province and by discipline are reproduced on the Study Website in the Members Only section: http://www.engineerscanada.ca/etlms/index.cfm

[11] In some countries engineering is studied in technical institutes which sometimes makes it difficult for immigration authorities to classify educational qualifications. Jurisdictions also differ in how they define and regulate the practice of engineering or the use of the title 'engineer'.

## Assessment of Labour Market Conditions (v 1.0):

The following tables summarize the assessment of overall labour market conditions by region and by occupation. Detailed tables are available in the full report. These assessments are currently being reviewed and validated and updated, as described earlier. Version 2.0 will be released in October 2008.

### Engineers

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| **British Columbia** | 4 | 3 | 3 |

Comment; Strong employment slows after 2009. Immigration reaches a ten year low in 2008. Trends in post-secondary graduations decline after 2008. The engineering age profile is older than average and this adds to supply pressures.

| | | | |
|---|---|---|---|
| **Alberta** | 4 | 3 | 3 |

Comment; Recent strong employment growth slows after 2009. Immigration holds at ten year average levels after 2008. Post-secondary graduations reach and sustain record high levels. The engineering age profile is younger than average and this reduces supply pressures.

| | | | |
|---|---|---|---|
| **Saskatchewan** | 4 | 4 | 3 |

Comment; Employment growth accelerates after 2008. Immigration is limited. Graduations from post-secondary schools rise from past levels. The age profile is close to the national average.

| | | | |
|---|---|---|---|
| **Manitoba** | 4 | 4 | 3 |

Comments; Strong employment growth runs from 2007 to 2010. Immigration is rising but is not large relative to the workforce. Post-secondary graduations are low relative to the market. The age profiles for engineers is close to the national average.

| | | | |
|---|---|---|---|
| **Ontario** | 2 | 2 | 3 |

Comments; Employment growth is limited from 2007 to 2010. Immigration has declined to a ten year low. Graduations from post-secondary programs are rising to historic high levels. The age profile for engineers is close to the national average creating modest supply constraints.

| | | | |
|---|---|---|---|
| **Quebec** | 4 | 4 | 2 |

Comments; Most Quebec occupations experienced some weakness between 2004 and 2007. Strong growth resumes in 2008 and 2009. Immigration is below ten year averages and graduations from post-secondary programs will be sustained at relatively high levels. The age profile of engineers in Quebec is younger than average and this limits supply constraints especially later in the period.

| | | | |
|---|---|---|---|
| **Atlantic** | 4 | 3 | 4 |

Comments; A drop in employment in 2005 weakened markets in 2005 and 2006. Employment is growing steadily and will peak with major resource projects in 2010. Immigration is limited and is stalled at ten year average levels. Post-secondary graduations will peak in 2007 and fall back to ten year levels. The engineering age profile is older than average and will contribute to tighter labour markets later in the projection period.

| | | | |
|---|---|---|---|
| **Canada** | 3 | 3 | 3 |

Comments; National trends may conceal regional conditions. Employment growth is moderately strong. Immigration has declined to levels well below ten year averages. Graduations from post-secondary programs are strong; rising to record levels in most years. The national age profile is average and this corresponds to an additional 1.5% increase in employment each year.

| | | | | |
|---|---|---|---|---|
| **1** – Significant excess of supply over demand | **2** – Excess of supply over demand | **3** – Moderate supply pressure | **4** – Significant supply pressures | **5** – Supply constraints |

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| **Civil** | 3 | 3 | 3 |

Comments; Employment dropped in Quebec and Alberta in 2005 and 2006 but was more than offset by gains in Ontario. Steady and regular growth in employment resumes in 2007. Graduations from post-secondary programs have expanded well beyond past trends offsetting a significant drop in immigration. The national age profile for civil engineers is above average. On balance, supply expands slightly faster than demand.

| | | | |
|---|---|---|---|
| **Mechanical** | 3 | 3 | 3 |

Comments; Employment dropped in 2005 in some markets but has been rising since that time. Employment growth is weak in Ontario. Immigration has dropped below ten year average levels, but post-secondary graduations are rising. The age profile for mechanical is average. Overall supply expands slightly faster than demand.

| | | | |
|---|---|---|---|
| **Electrical & electronic** | 3 | 3 | 3 |

Comments; Employment growth in Ontario is weak from 2005 to 2009 with a big recovery in 2010. Employment growth in Quebec accelerates rapidly in 2008. Graduations from post-secondary programs rose in 2006 and 2007 and continue at high levels in Quebec from 2008 to 2010. Graduations in Ontario decline. Immigration is well below ten year averages in all provinces. The age profile for electrical engineers is average. This national assessment assumes that strong demands in Quebec can be met from other provinces.

| | | | |
|---|---|---|---|
| **Chemical** | 2 | 2 | 2 |

Comments; Employment cycles up and down from 2005 to 2007 but the trend from 2008 to 2010 is weak. Graduations from post-secondary programs will be strong and this more than offsets declining immigration. The age profile is average. Supply expands faster than demand. Graduates from chemical engineering programs may migrate to work in other areas.

| | | | |
|---|---|---|---|
| **Industrial & manufacturing** | 3 | 3 | 3 |

Comments; Strong variations in employment measures and in tracking of graduates may signal data weaknesses in this smaller group. Immigration is down but remains larger than the projected number of graduates from Canadian schools. The age profile is average.

| | | | |
|---|---|---|---|
| **Computer** | 4 | 3/4 | 3 |

Comments; Very large declines in employment in 2001 and 2002 are followed by big gains that build to a peak in 2006 and the employment gains gradually ease by 2010. Immigration peaked in 2000 and has declined by over 50%. Graduations peaked in 2003 and 2004 and are declining. The age profile for computer engineers is well below average. The strong cycle in employment and slow response by immigration and post-secondary programs creates shortages until 2010.

| | | | |
|---|---|---|---|
| **Petroleum** | 4 | 4 | 4 |

Comments; After a drop in 2002 and 2003 employment has been growing rapidly for this group. Employment in Alberta is prominent but does not dominate. There are only a limited number of immigrants and post-secondary graduates identified for this group so that excess supply is generally negative from 2008 to 2010. The age profile is average. Supply for this group may come from other disciplines.

| | | | |
|---|---|---|---|
| **Aerospace** | 4 | 3 | 3 |

Comments; Employment has been variable and is currently on an up trend. Measurements may be unreliable. There are few post-secondary programs and very limited immigration. Expected employment gains cannot be met from these sources and shortages may be an issue. The age profile for this group is just below average.

| | | | |
|---|---|---|---|
| **Total Engineers** | 3 | 3 | 3 |

Comments; Employment trends have been generally stronger than the overall economy. Immigration has fallen by 50% from peaks in 2000 and is projected to remain at this level. Graduations from post-secondary programs are running in line with expected gains in employment. Retirements will grow to average just under 2.0% of the workforce by 2010. These national trends imply that supply will track demand but this conceals imbalances in individual markets.

| | | | | |
|---|---|---|---|---|
| **1** – Significant excess of supply over demand | **2** – Excess of supply over demand | **3** – Moderate supply pressure | **4** – Significant supply pressures | **5** – Supply constraints |

## Technologists and Technicians

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| **British Columbia** | 4 | 3 | 3 |

Comments; Employment growth is currently strong and expected to continue until 2010. Immigration is low in this group of occupations but post secondary programs will graduate close to the needed number of new recruits. The age profile is older that average and this contributes to labour market tightness in some years. Shortages are a more persistent issues in some occupations.

| | | | |
|---|---|---|---|
| **Alberta** | 4 | 3 | 3 |

Comments; Employment declined in 2003 and 2004 but has been recovering since. Gains are notable in 2007 and 2008 but level off in 2009 and 2010. Immigration is low relative to the workforce, but post-secondary programs are set to produce most of the needed graduates. The age profile is below average and this holds the ranking down. Excess supply measures signal tight markets when the impact of the age profile is removed.

| | | | |
|---|---|---|---|
| **Saskatchewan** | 4 | 4 | 4 |

Comments; Strong employment growth is expected from 2007 to 2010. Immigration is very limited in these occupations, Post graduate programs increase in size but are not able to meet expected demand. Saskatchewan may benefit as residents working outside the province return. The age profile is well below average and this holds down the overall ranking. There are shortages in these occupations at the present time.

| | | | |
|---|---|---|---|
| **Manitoba** | 4 | 4 | 3 |

Comments; A brief but steep drop in employment in 2003 and 2004 weakened markets. Rapid employment growth from 2007 to 2010 will tighten markets. Immigration has fallen to record low levels and graduations are not sufficient to meet all demand. The age profile is young and this holds down the current overall ranking. There are important shortages in some skilled technical occupations.

| | | | |
|---|---|---|---|
| **Ontario** | 3 | 3 | 3 |

Comments; Average employment growth has been weak and improves only modestly. This conceals weakness among electronic service technicians and some industrial occupations. Markets are tight for some groups including inspectors and regulators. Immigration is down by over 50% from a 2000 peak and gains in post-secondary programs have partly made up the differences. The age profile is below average and replacement demand becomes significant later in the period.

| | | | |
|---|---|---|---|
| **Quebec** | 4 | 4 | 4 |

Comment; Weak employment growth in 2006 and 2007 is concentrated among electronic service technicians, other technical occupations face stronger markets. Immigration has fallen below ten year average levels. Graduations from post-secondary programs are holding ten year trend levels. Age profile is young and this acts to ease supply constraints. Ranking underestimates market tightness for all technicians and technologists except electronic service technicians.

| | | | |
|---|---|---|---|
| **Atlantic** | 4 | 3 | 3 |

Comments; There is a big employment cycle with employment down from 2005 to 2007 and a current revival. Major projects will add to employment starting in 2008. Immigration has been limited and this is assumed to continue. Graduations remain at historical levels but this is not sufficient to meet demand. The age profile is older than average and this added to market tightness.

| | | | |
|---|---|---|---|
| **Canada** | 3 | 3 | 3 |

Comments; Employment growth for technical occupations falls just slightly below growth for engineering. But this trend conceals the stronger growth for most technical occupations and the weaker prospects for electronic service technicians and other technicians working in manufacturing and processing. Immigration is low and has declined by over 50% from the peak in 2000. Graduations are generally high and may meet demand. Measures of post-secondary programs are weak and it is not clear that skills taught match employer needs. Overall evidence of balanced markets will conceal many imbalances in individual markets.

**1** – Significant excess of supply over demand

**2** – Excess of supply over demand

**3** – Moderate supply pressure

**4** – Significant supply pressures

**5** – Supply constraints

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| **Applied chemical technicians & technologists** | 4 | 3 | 3 |

Comment; Immigration peaked in 2004 and market weakness began to reduce employment from 2005 to 2007. Immigration declined in 2006 and left a brief gap in supply in 2008. The age profile is younger than average. Weak manufacturing conditions will leave an excess of supply over demand.

| | | | |
|---|---|---|---|
| **Geological, mineral & meteorological technicians & technologists** | 3 | 3 | 3 |

Comments; Employment declined in several years from 2000 to 2005 but has been growing steadily in this occupation since then. The excess of supply over demand has been gradually absorbed into the workforce. Immigration is low but graduations are high enough to match demand. The age profile is younger than average.

| | | | |
|---|---|---|---|
| **Other technical inspectors & regulatory officers** | 4 | 4 | 4 |

Comments; This is a large occupation and strong growth began in 2004. Steady employment growth is projected. The age profile is older than average. Few training programs target this work and immigration is limited. Tight markets will draw experienced technicians and technologists from other areas.

| | | | |
|---|---|---|---|
| **Civil engineering technicians & technologists** | 3 | 3 | 3 |

Comments; Strong to moderate employment growth is matched by equal parts of immigration and post-secondary programs. The age profile is younger that average and this limited demand helps to balance markets.

| | | | |
|---|---|---|---|
| **Mechanical engineering technicians & technologists** | 2 | 2 | 2 |

Comments; Volatile demand left an excess supply of mechanical technicians and technologists in 2006. Steady growth since then has been meet by high levels of graduations from post-secondary programs. Immigration is limited and down from a peak in 2000. The age profile is average.

| | | | |
|---|---|---|---|
| **Industrial engineering & manufacturing technicians & technologists** | 3 | 3 | 3 |

Comments; Labour markets for this group were tight in 2004 and 2005 but employment growth has been moderate since that time. Graduations from post-secondary programs and immigration provide roughly equal parts of the supply. The age profile is young and markets should remain in balance as long as the manufacturing sector is weak.

| | | | |
|---|---|---|---|
| **Technical occupations in electronic & electrical engineering** | 3 | 3 | 3 |

Comments; This is a large group that contains several distinct occupations. The largest is electronic service technicians. This group has traditionally been trained in apprenticeship by manufacturers and on the job. Perhaps one quarter have college training. Employment in this large group began to fall dramatically in 2002 and 2003 as manufacturers of appliances and electronics shifted to production of consumer goods that do not need service or repair. The employment projections shows a rebound in employment but this may be optimistic for the service technicians. Markets will be weak and displaced technicians may seek employment in related occupations.

| | | | |
|---|---|---|---|
| **Technical occupations in architecture, drafting, surveying & mapping** | 3 | 3 | 3 |

Comments; Employment trends reported in the Statistics Canada Labour Force Survey show big drops in employment from 2003 to 2006. This weakens markets and leaves an excess of supply over demand. Projected improvements in employment are related to resource projects. Data for graduations and immigration will likely match the expected growth.

| | | | |
|---|---|---|---|
| **Total Technical Occupations** | 3 | 3 | 3 |

Comments; Trends in the rankings are skewed by the impact of manufacturing and production conditions on the larger technical occupations. Weak markets and excess supply in these areas conceal shortages and tight markets in resource based work in the west. Immigration is limited for these occupations. Matching post-secondary graduates to occupations is difficult and may overstate the available supply. The market assessments may overstate supply and miss some labour markets where shortages exist.

| | | | | |
|---|---|---|---|---|
| **1** – Significant excess of supply over demand | **2** – Excess of supply over demand | **3** – Moderate supply pressure | **4** – Significant supply pressures | **5** – Supply constraints |

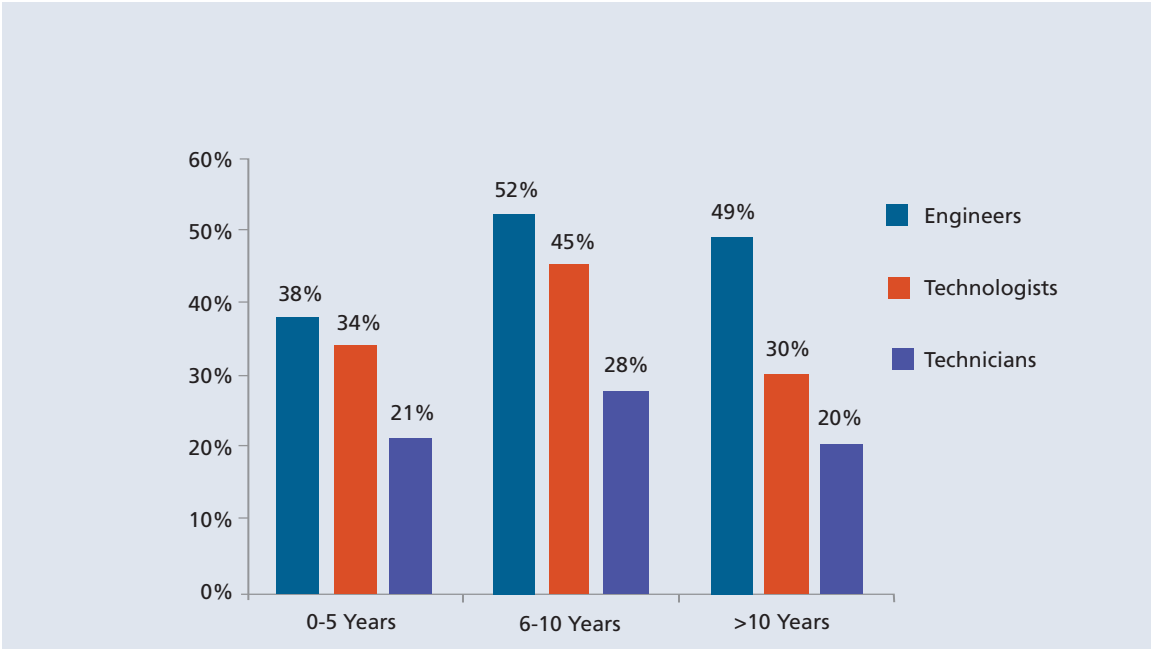
## Survey Results:

The 2007 Engineering and Technology Employer Survey was a web-based survey on engineering and technology intensive employers. The goals of the survey, which was operational from July 2007 to January 2008, were to identify: employment patterns by technical field and by function; hiring intentions; recruitment channels and related issues; and policies regarding licensure and certification, continuing professional development, and the promotion of diversity in the engineering and technology labour force.

The survey results support the conclusions from the Labour Market Tracking System:

- 56% of survey respondents reported an intention to hire in the next 12 months,
- the intention to hire rate was highest in the consulting sector – 62% and lowest in the telecom sector – 43%
- the expected hiring rate for technologists (9.1%) and technicians (8.7%) was more than three times greater than the expected hiring rate for engineers (2.6%). This suggests that, in many industries, employers were hiring technologists or technicians into positions for which they previously recruited engineers. (It should be noted that industry often uses the terms technologist and technician interchangeably, making it difficult to discern differences between these two occupation groups.)
- a significant proportion of employers anticipate recruitment difficulties. These expected difficulties are greater for engineers than for technologists and technicians and most evident for the 6-10 years of experience cohort. (See Figure No. 15).

**Figure No. 15**
Percent of Engineering and Technology Employers that Expect to Hire in the Next Twelve Months and Anticipate Recruitment Difficulty
*2007 Engineering and Technology Employer Survey*



# 4. Changing Roles

The roles of engineers and technologists are changing, and in particular they are overlapping in some functions and technical fields. This chapter summarizes findings from surveys, focus groups, and executive interviews on these issues, and explores the factors that both impede occupational overlap and either enable or encourage overlap. The chapter also discusses issues specific to the designations 'technician' and 'technologist'.

## Key Findings:

1. While technical competencies are central to engineering and technology occupations, necessary career skills go well beyond purely technical skills. This conclusion is strongly supported for engineers, but is also true for technologists, and to some degree, for technicians, as well.
2. Although all engineering and technology professionals are trained in a particular field, it is common for individuals to work in other technical fields over the course of their careers.
3. There do not appear to be any trends in technology, in the organization of engineering and technology work, or in the system of post-secondary education that will eliminate or fundamentally alter the distinction between engineers and technologists/technicians. However, there are two functions in which occupational overlap blurs the distinction between engineers and technologists/technicians. These are 'process control' (especially in mid-sized manufacturing establishments) and 'project management' (especially in construction and IT).
4. Occupational overlap is more evident in civil, mechanical and electrical engineering and less evident in chemical, mining, aerospace, and environmental engineering.
5. Occupational overlap will somewhat reduce the long-run demand for engineers while marginally increasing the long-run demand for technicians and technologists. However, the implications of occupational overlap for the regulation of engineering practice are likely to be of greater importance than the impact on the structure of demand.

The findings in this chapter are based on:

- *2007 Engineering and Technology Employer Survey*
- *the Survey of Engineers and Engineering Technicians and Technologists*
- regional focus groups
- interviews with engineering and human resource executives

The Employer survey is complete; a full report on the results is available on the study website. The Survey of Engineers and Engineering Technicians and Technologists is currently in the field. Results presented in this chapter are preliminary and are based on approximately 11,700 returns. A report on the results of the regional focus groups and executive interviews will be available shortly on the study website.

## Job Functions and Related Skill Requirements:

Figure No. 16 summarizes results from the *Engineering and Technology Employer Survey* on the predominant function of their engineering and technology employees. As would be expected, technical and related functions predominate. By inference, technical competencies are at the heart of engineering and technology occupations. However, *for engineers, but also for technologists, and to a degree, also technicians, requisite career skills go well beyond purely technical skills*. Figure No. 16 shows that for a large minority of engineers (29%) and technologists (20%), employers report that managerial functions are not only important – they are the *predominant* function of the engineers and technologists they employed.

**Figure No. 16**
Predominant Function of Engineers, Technologists and Technicians
*2007 Engineering and Technology Employer Survey*

| | Engineers | Technologists | Technicians |
|---|---|---|---|
| Managerial: General Management, Planning and Project Management | **29%** | **20%** | 10% |
| Technical: Consulting and Design and/or R&D | 47% | 49% | 33% |
| Production Control: Production/ Process/ Quality Control | 14% | 8% | 27% |
| Service: Service and Support, Supply and Install, Technical Sales | 7% | 19% | 25% |
| Inspection | 3% | 4% | 5% |

Similar conclusions emerge from the *Survey of Engineers and Engineering Technicians and Technologists*. Respondents were asked to identify up to four of their most important job functions from a list of technical and non-technical functions. Figure No. 17 lists the functions that were cited by 10% or more of the survey respondents. The same pattern as is evident from the *Engineering and Technology Employer Survey* also emerges from the *Survey of Engineers and Engineering Technicians and Technologists*. Technical competences are central to engineering and technology occupations, but non-technical functions are important for large numbers of engineers and technologists/technicians. In particular, project management is a key occupational skill which 45% of engineers and 37% of technologists/technicians identify as among their most important job functions.

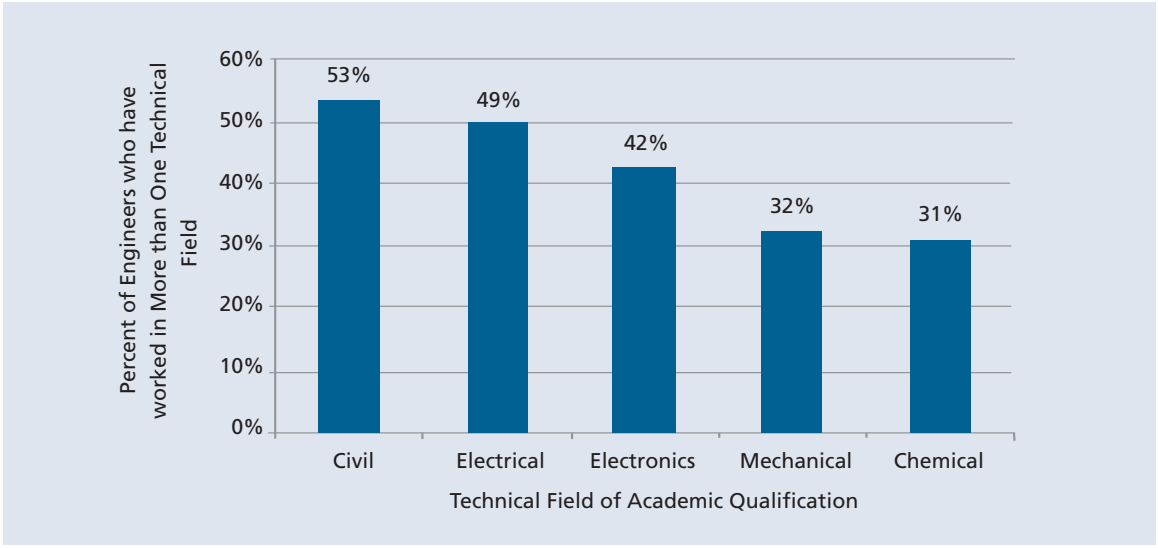
**Figure No. 17**
Most Important Job Functions (Potential to Identify Four)
*Survey of Engineers and Engineering Technicians and Technologists*

| | Engineers | Technologists/ Technicians |
|---|---|---|
| Technical Functions | | |
| • Design | 37% | 33% |
| • Specification/Technical Writing | 18% | 17% |
| • Operations/Production | 14% | 16% |
| • Quality Assurance/Control | 11% | 16% |
| • Inspection | 11% | 21% |
| • Installation/Maintenance | 10% | 18% |
| • Health & Safety/Environment | 9% | 10% |
| • Testing | 8% | 13% |
| • Computer Operations | 4% | 11% |
| | | |
| Non-Technical Functions | | |
| • Project Management | **45%** | **37%** |
| • Consulting | 27% | 18% |
| • Management/Administration | **25%** | **21%** |
| • Planning | **18%** | **18%** |
| • Contract Administration | 13% | 15% |
| • Program Management | 11% | 7% |

## Technical Fields:

Engineering students specialize in a particular technical field of engineering after completion of their first year of studies. The majority of engineering graduates work only in the field in which they were academically qualified. However, *a significant minority of engineers have worked in a technical field, other than that for which they were formally prepared by their undergraduate studies.* Among civil engineers and electrical engineers, our survey data indicate that approximately half of graduates in these fields have worked outside the field for which they are academically qualified. Among graduates in other technical fields, the proportion is lower, but still significant. These data are illustrated in Figure No. 18.

**Figure No. 18**
Percent of Engineers who have worked outside
the Technical Field in which they Qualified Academically
*Engineers and Engineering Technicians and Technologists Survey*




The data in Figure No. 18 do *not* imply that engineers who work outside the field for which they were academically qualified lack technical competence. Rather, the data suggest that an undergraduate engineering degree should be interpreted as a 'foundation degree' that prepares an individual to work in a potentially broad range of technical fields. As a result of this academic preparation, there is significant mobility across technical fields among engineering graduates. By way of example, Figure No. 19 shows the proportion of academically qualified mechanical engineering graduates who reported working in various technical fields. Of those qualified in mechanical engineering, only 72% reported working in this field.

**Figure No. 19**
Percent of Academically Qualified Mechanical Engineering Graduates
who have worked various Technical Fields
*Engineers and Engineering Technicians and Technologists Survey*

| Technical Field | Percent of Mechanical Engineering Graduates who worked in this Field |
|---|---|
| Manufacturing/industrial engineering | **72%** |
| Other engineering specialties | 35% |
| Aerospace engineering | 13% |
| Electrical and electronics engineering | 9% |
| Petroleum engineering | 9% |
| Metallurgical and materials engineering | 8% |
| Civil engineering | 7% |
| Environmental engineering | 6% |
| Mining engineering | 6% |
| Chemical engineering | 6% |
| Computer engineering | 5% |

## Occupational Overlap between Engineers and Technologists/Technicians:

*Occupational overlap is now an important and incontrovertible phenomenon in certain types of engineering and technology functions.* Based on focus group discussions and executive interviews, we estimate that the *overlapping of occupational roles affects perhaps 10% of technologists/ technicians*, though no precise and indisputable estimate is feasible.

Figure No. 20 summarizes findings from focus groups and executive interviews on the degree of overlap or differentiation in various technical and related functions between engineers and technologists/ technicians. The assessment of the degree of overlap portrayed in Figure No. 20, and also in Figure No. 21, are a distillation of input from focus groups and executive interviews. In individual workplaces, the degree of overlap may be greater or less than suggested in Figures Nos. 20 and 21.

*The overlap is most evident in 'project management' and in 'process control'*. These findings are consistent with survey results. (See Figure Nos. 14 and 15 above.) Occupational overlap is less evident, but still noteworthy, in 'engineering design'. This occurs principally at intermediate levels of complexity. As well, there is evidence that a greater number of technologists/technicians have advanced into 'engineering management' positions that were previously held almost exclusively by engineers. Regulatory changes in some jurisdictions have also allowed technologists/technicians to approve certain types of designs or 'technical evaluations'. However, these functions are predominantly carried out or overseen by engineers.

**Figure No. 20**
Trends in Occupational Overlap between Engineers and Technologists/Technicians
Summary of Executive Interviews and Focus Groups

| | Predominantly Carried out by Engineers | Predominantly Carried out by Engineers but Limited Overlap | Predominantly Carried out by Engineers but Moderate Overlap | Significant Overlap between Engineers and Technologists/ Technicians | Predominantly Carried out by Technologists/ Technicians |
|---|---|---|---|---|---|
| Engineering Design | | • | | | |
| Engineering Management | | • | | | |
| Project Management | | | | • | |
| Technical Specification | | | • | | |
| Technical Approvals | • | | | | |
| On-Site Technical Inspection | | | | | • |
| Technical Testing | | | | | • |
| Technical Evaluation | | • | | | |
| Feasibility Analysis | • | | | | |
| Process Control | | | | • | |
| Quality Control | | | | | • |
| Cost and Quantity Estimating | | | | | • |
| Technical Procurement | | | | | • |
| Installation and Repair | | | | | • |
| Service and Support | | | | | • |
| Technical Sales | | | | | • |

Figure No. 21 summarizes views on occupational overlap by engineering field. As can be seen, overlap is more important in civil, mechanical and electrical/electronic engineering, and less important in other fields.

**Figure No. 21**
Occupational Overlap between Engineers and Technologists/Technicians by Technical Field
Summary of Executive Interviews and Focus Groups

| | High Incidence | Moderate Incidence | Very Little Incidence | Virtually No Incidence |
|---|---|---|---|---|
| Civil | | • | | |
| Mechanical | | • | | |
| Chemical | | | | • |
| Aeronautical | | | | • |
| Environmental | | | • | |
| Electrical & Electronic | | • | | |
| Mining | | | | • |

The distinction between engineers and technologists/technicians rests ultimately on real differences in the training and experience required to carry out different types of technical functions. While the regulatory system inhibits occupational overlap in some fields, in the main, the regulatory system reflects, rather than creates occupational distinctions. The most important factor inhibiting occupational overlap is the ethic and culture of professionalism that is associated with engineers. Concerns over liability are also an important factor in determining who performs and takes responsibility for engineering work, separate and apart from the regulatory system.

Occupational overlap is enabled or encouraged by a number of factors. These include:

- Differences in remuneration
- Difficulties recruiting engineers in regions characterized by skill shortages.
- Engineering graduates who take technology jobs in regions where there are too few employment opportunities for engineers. *Census* data suggest that around 5.3% of technologists and technicians are domestic university engineering graduates.
- International engineering graduates who are hired into technologist positions, but whose qualifications and experience enable employers to assign them tasks that would previously have been assigned to professional engineers.
- College co-op and internship programs which have given college graduates a competitive advantage for entry level positions.
- University science graduates who subsequently obtain a college qualification in technology and are viewed by some employers as substitutes for engineers. Data from the *Survey of Engineers and Engineering Technicians and Technologists* suggest that approximately 6% of technologists also have a Bachelor of Science degree.

Occupational overall has a number of potential implications. In the first place, occupational overlap increases the demand for technologists and technicians relative to engineers. This is reflected in

survey results reporting expected hiring intentions.[12] Second, occupational overlap poses challenges for the system of regulating the practice of engineering. In particular, occupational overlap could weaken employer support for professional licensure. Engineering regulators, therefore, may have an interest in devising strategies to capture occupational overlap within the system of professional licensure, rather than viewing this phenomenon as fundamentally antithetical. The potential implications of occupational overlap for professional licensure will likely be greater than the implications for employment trends.

## Technologists and Technicians:

*There is no consistency between how industry uses the terms 'technologist' and 'technician' and how the post-secondary system or professional bodies use these designations*. In the post-secondary system, the distinction between 'technologists' and 'technicians', where it applies, usually pertains to the duration of training (three years versus two years) and to the weight of science and mathematics in the curriculum. It should be noted, however, that there are two-year technologist programs in some jurisdictions. Professional bodies distinguish between 'technologists' and 'technicians' based on education and responsibilities. The qualifying examinations for the respective designations are also different. In Quebec, only the technologist occupation is eligible for certification.

In industry, there is no consistent or standard nomenclature. Some employers distinguish between 'technologists' and 'technicians' in much the same way as the post-secondary system or professional bodies. Other employers utilize the terms, but only in relation to responsibilities, not educational qualifications. In some workplaces, persons who are professionally qualified as technicians may be employed as technologists, and conversely, persons who are qualified as technologists may be working as technicians. Still other employers make no distinction between 'technologists' and 'technicians' and use the terms interchangeably.

Participants in our focus groups and executive interviews did not dispute that there are differences in technology work based on such factors as: the amount of theoretical knowledge or experience required to carry out certain functions, the degree of autonomy with which an individual carries out those functions, and the consequences of errors in performing the functions. However, *the manner in which professional associations reflect these differences in their certification systems does not correspond, in any consistent manner, with the way in which industry defines technology jobs and selects individuals for those jobs*. The asymmetry between industry practice and the certification system begs the question whether it is practical to certify two different levels of technology occupations.

[12] It would be an error to significantly discount expected future demand for engineers solely on the basis of substitution of technologists for engineers. Other economic factors are far more important in shaping the demand trajectories for both engineers and for technologists.

# 5. Skill Requirements and the Nature of Skill Shortages

This chapter examines the nature of skill requirements in engineering and technology occupations and introduces the important distinction between a labour shortage and a skill shortage.

## Labour Shortages and Skills Shortages:

In professional labour markets, the term 'shortage' conflates two distinct phenomena. Disentangling this confusion is fundamental to understanding how to deal with shortages.

In any labour market, a shortage can arise from a **labour shortage** *per se*, that is to say, relative to demand, an absolute insufficiency in the number of people with the formal educational qualifications to fill employers' hiring requirements. However, labour shortage is not the only cause of shortage. A shortage can also arise from a **skills shortage**, that is to say, from a shortage of persons with the *righ*t mix of technical and non-technical skills or the *right* industry or technology skills. While a skills shortage can arise in any occupational labour market, professional labour markets are especially vulnerable to skill shortages. This is because, in professional labour markets, there is much more granularity and specificity in employers' skills requirements. Employers rarely seek to hire an engineering or technology professional *per se*. Rather, they endeavour to recruit a professional who has a particular type of industry experience, is familiar with particular types of technology, also has significant non-technical skills acquired through experience.

*A labour shortage will exacerbate a skills shortage, but a labour shortage is not a necessary condition for a skills shortage*. Indeed, a serious skills shortage can, and often does, co-exist with serious unemployment.

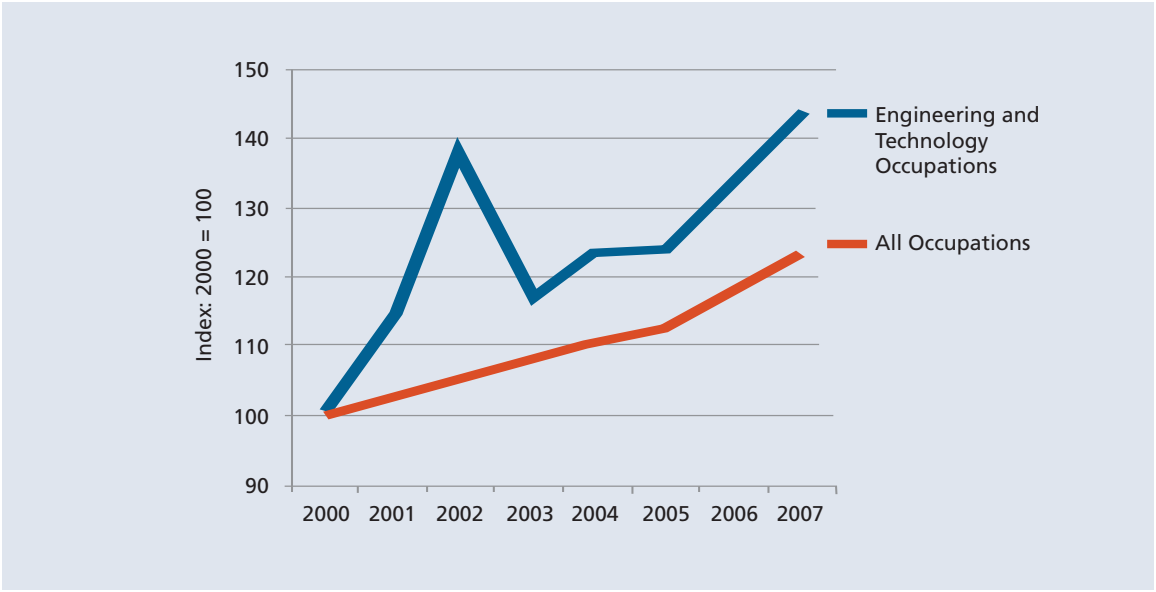
For the perspective of an employer trying to fill a job, it may be difficult to distinguish between a labour shortage and a skills shortage. Indeed, to an individual employer, the difference may not be material. However, strategies to address a shortage require a clear understanding of the degree to which a employers' hiring difficulties stem from a labour shortage or a skills shortage.

## Labour Shortages:

A labour shortage arises when the demand for engineering and technology professionals outstrips their availability. These conditions clearly apply, at the present time, in western Canada, and especially in Alberta.

Alberta's growth is being driven by capital spending and this, in turn, implies that employment growth is strongly biased to engineering and technology occupations. This is evident in Figure No. 22 which shows the growth of employment in 'engineering and technology occupations' in Alberta, relative to the overall growth of employment in that province.

**Figure No. 22**
Employment in 'Engineering and Technology Occupations' and 'All Occupations' in Alberta, 2000 – 2007 (Index: 2000=100)
Statistics Canada, CANSIM, *Labour Force Survey*
(Labour Market Tracking System Source Files – Alberta)




As can be seen in Figure No. 22, employment in engineering and technology occupations in Alberta increased by 44% since 2000. During the period 2000 to 2007, Alberta accounted for approximately 32% of the increase in engineering jobs in Canada. By 2007, 17% of Canada's total engineering employment was found in Alberta. This compares to under 12% in 2000.

On the supply side, since 2000 Alberta has attracted fewer than 10% of immigrants with engineering qualifications, although this share did rise over the period. As well, Alberta's share of domestic engineering graduates averaged just over 10%. It is not surprising that, given these supply and demand trends, demand has outstripped supply and labour conditions predominate across-the-board in all engineering and technology occupations.

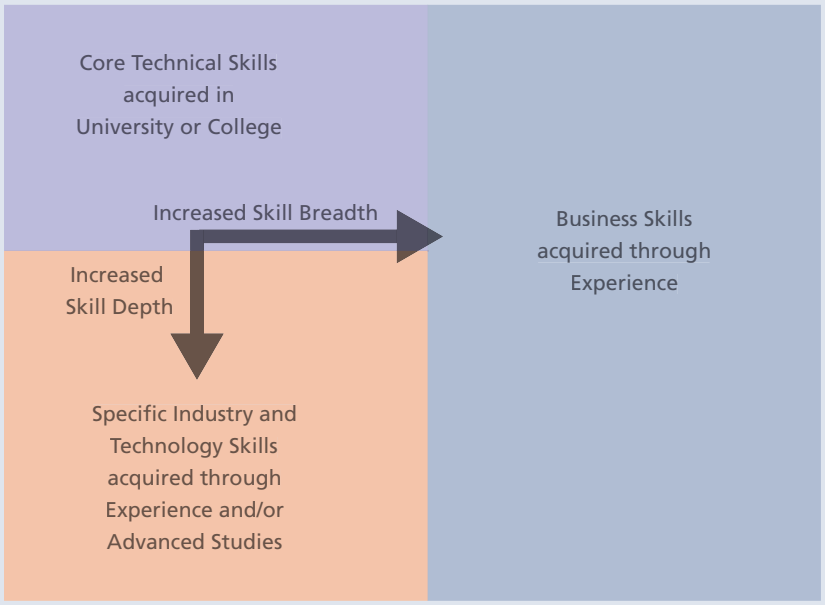
The Labour Market Tracking System suggests that labour shortages are also emerging in some technical fields in Quebec and Atlantic Canada. In Ontario, by contrast, there is no evidence whatsoever of a labour shortage. Indeed, in Ontario there is an excess of supply, at least for 2008 and 2009.

A labour shortage can only be remedied by an increase in supply. In the short-run, the means for achieving this increase are (1) an increase in inter-regional migration, (2) an increased utilization of out-of-province resources supplied by the consulting sector, and (3) an increase in temporary foreign workers. Increased immigration is a two-edged sword. If new immigrants settle in regions of high demand, increased immigration can relieve some of the labour shortage. However, if new immigrants continue to settle predominantly in Ontario, their increased numbers will only exacerbate excess supply conditions in that province. Increased graduations, of course, provide long-term increases in supply, but few benefits in the short-term.

## Skills Shortages:

Figure No. 23 illustrates the nature of skill requirements in the engineering and technology labour market.

**Figure No. 23**
Schematic Representation of Professional Skills
in Engineering and Technology Occupations




Recent university graduates in engineering or college graduates in technology come to the labour market with core technical skills. These are shown in the upper-left quadrant in Figure No. 23. It is reassuring that the *2007 Engineering and Technology Employer Survey* shows a high level of employer satisfaction with these skills.[13] However, *only a small minority of engineering and technology jobs have a skill profile that is limited to the core technical skills acquired in university or college*. By far the preponderance of jobs require specific industry and technology skills and business skills. Business skills are variously termed 'non-technical skills' or 'soft skills'. They include written and oral communications skills, contract administration skills, project management skills, team-working skills, and business case analysis skills, among others. In the skill model portrayed in Figure No. 23, we describe an increase in specific industry and technology skills as an increase in 'skill depth'. An increase in business skills is termed an increase in 'skill breadth'.

[13] In the *2007 Engineering and Technology Employer Survey*, 87% of respondents expressed satisfaction with the science-based skills of recent engineering graduates, while for technologists and technicians the satisfaction levels were respectively 89% and 84%.

Skill depth and skill breadth are acquired through experience, although advanced studies and continuing professional development can partially substitute for experience. When employers speak of shortages, they often do *not* mean that there is a shortage of job applicants with the formal educational qualifications needed. Rather, employers mean that they are unable to recruit employees with the requisite skill depth and skill breadth.

## Is the Skills Shortage Problem Greater Today?

There is no reliable methodology for measuring the extent of a skills shortage or employers' perceptions of a skills shortage. Consequently, we cannot say definitively whether the skills shortage problem is more acute today than previously. However, the evidence suggests that there may have been a ratcheting up of skills shortage conditions. *The 2007 Engineering and Technology Employer Survey* indicates the following:

- More than one-fifth of employers are dissatisfied with the non-technical skills of experienced engineers and technologists. For recent graduates, the proportion is one-third. By contrast, dissatisfaction with technical skills is much lower - 5% or less for experienced engineers and technologists.

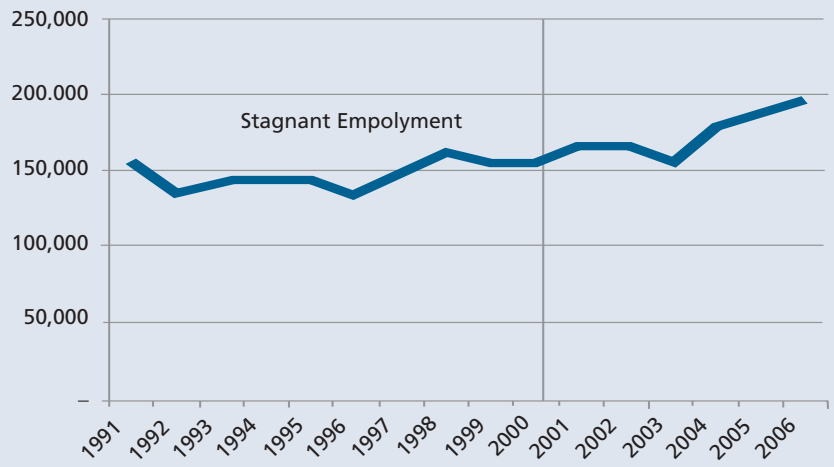
- Asked to rank a range of non-technical skills, by far the majority of employers ranked most of these skills between 'essential' and 'very important'.

- More than 50% of employers identified serious weakness in the *non-technical* skills of internationally educated professionals as the greatest obstacle to hiring them into engineering jobs.

Only survey data based on consistent samples and questions over time would enable us to draw a definite conclusion that skill shortages are more troublesome today. We do not have such data, and must rely, therefore, on interviews and focus groups. These suggest that the problem of skill shortages is serious, that it certainly is not getting less serious, and that it may be getting more serious.

Two reasons may explain why skill shortages could be worse today. The first, as noted, is the influx in immigration. Between 2000 and 2006, immigration accounted for more than 60% of the increase in the supply of engineers. Internationally educated professionals are widely perceived by employers as lacking the relevant skill depth and skill breadth. Second, there is evidence of a 'cohort problem'. Many employers report that their greatest difficulty is in recruiting engineers with 6-10 years of professional experience. This is an 'echo effect' from the 1990s. During that decade the Labour Market Tracking Model estimates that employment was essentially static. (See Figure No. 24). Many graduates were compelled to take employment outside engineering and technology or to take jobs for which they were over-qualified. The result is that, in recent years, there has been a shortage of persons with 6-10 years of experience.

**Figure No. 24**
Estimated Employment in 'Engineering Occupations' – Canada, 1991-2006
Statistics Canada, *Labour Force Survey*
(Labour Market Tracking System Source Files – Canada)




Other trends may also be important. Some have suggested that, as a result of increased competitive pressures stemming from globalization and de-regulation, companies may be less able to hire junior engineers and technologists and invest in their training.

## Addressing a Skills Shortage:

Addressing a skills shortage is significantly more complex than tackling a labour shortage. Increasing overall supply may reduce employers' recruitment difficulties for a period of time. However, the benefits are not sustainable. The essential characteristic of a skill shortage is that it co-exists with significant levels of under-employment. Evidence of this under-employment was discussed earlier in this report. Widespread under-employment leads to a decline in immigration, and ultimately to a decline in enrolments.

Responding to a skills shortage with measures to increase overall supply will provide only limited short-term benefits to employers. In the long run, these measures will exacerbate imbalances in the labour market. A skills shortage requires focused interventions that target recent graduates and international engineering and technology graduates. A comprehensive strategy to reduce the severity of a skills shortage will also include measures to promote and facilitate continuing professional development.

# 6. Licensure and Certification

This chapter compares trends in engineering employment with licensure data. Owing to data limitations on certification, this analysis is not yet available for technologists and technicians. The chapter then reports survey findings on factors that affect the support for licensure and certification on the part of both employers and employees.

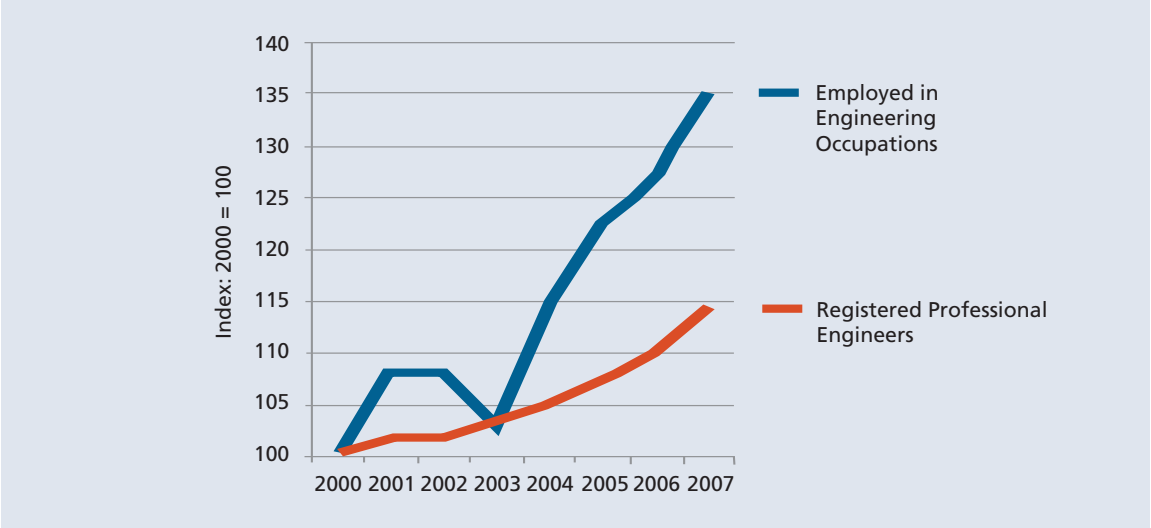
## Key Findings:

1. Diverging employment and licensure trends suggest, though do not definitively prove, that there are weaknesses in support for the systems of professional licensure and certification which may already be serious and which certainly could become serious.
2. The inferences that may be drawn from divergent employment and licensure trends are supported by other survey findings which suggest, in particular, that employer support for professional licensure and certification may be weaker than expected.
3. At the same time, it is clear licensure and certification are seen as bulwarks for the ethic and culture of professionalism and that this is the major factor behind support for licensure and certification on the part of both professional employees and their employers.

## Overall Trends:

Figure No. 25 compares recent trends in engineering employment with trends in professional licensure. As can be seen, since 2000 the registration total has increased by approximately 14.5% while employment in engineering occupations has increased by 35.1%. How should this divergence be interpreted?

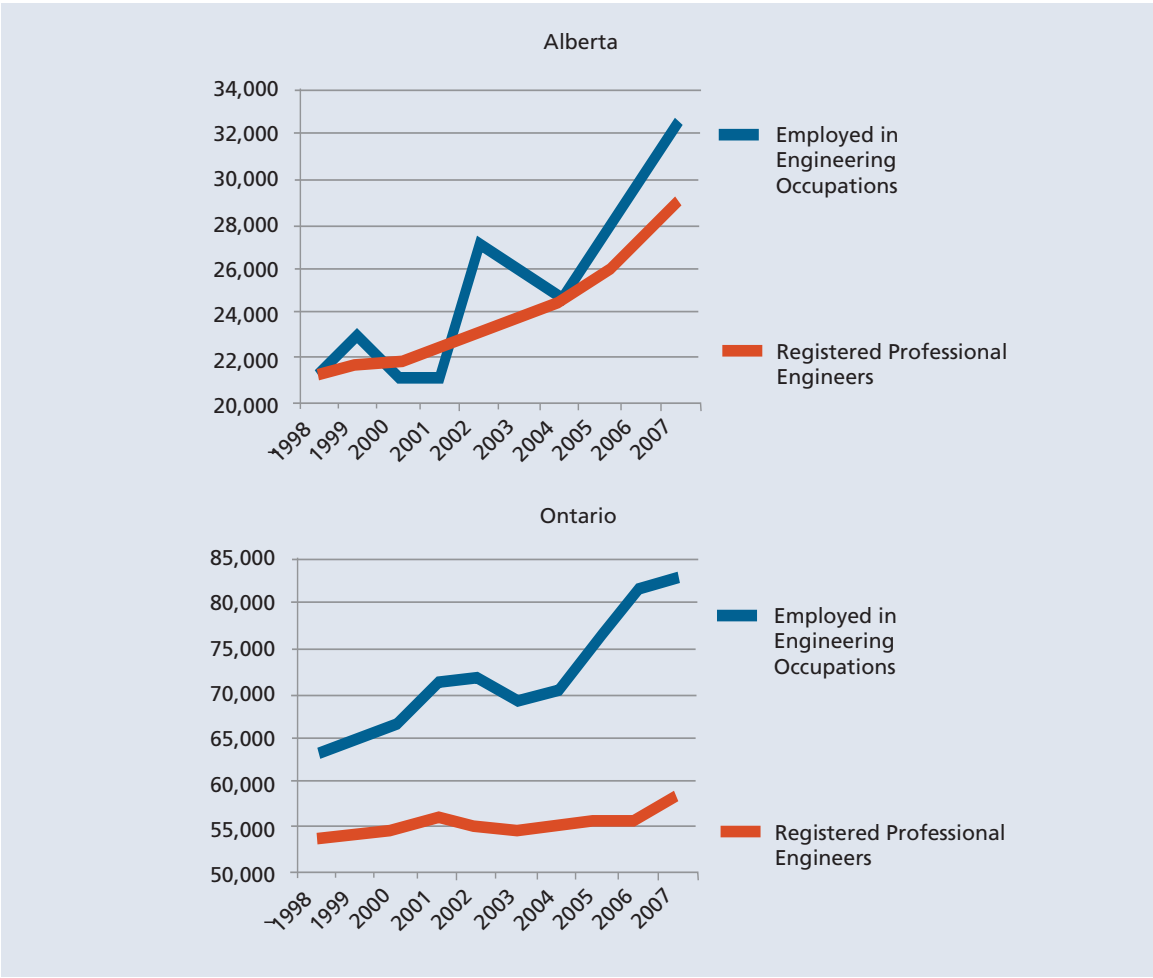
**Figure No. 25**
Estimated Employment in 'Engineering Occupations' and Total Number of Registered Professional Engineers (excluding Retirees), Canada, 2000-2007 Index: 2000 = 100)
Statistics Canada, *Labour Force Survey* and Association Administrative Data
(Labour Market Tracking System Source Files – Canada)



There is no one-to-one relationship between licensure trends and employment. The statistical definition of persons in engineering occupations includes anyone who is doing engineering work, as defined by the National Occupational Classification (NOC) system. This definition is similar, but not identical to engineering as it is defined in provincial statutes. The statistical definition therefore counts individuals as 'engineers', regardless of whether they are licensed, unlicensed, exempted from a licensing requirement, or in the process of qualifying for a license. By contrast, many university engineering graduates maintain their professional registration, even when they are no longer doing work that falls within the scope of provincial engineering statutes. Hence, the total number of registered professional engineers includes persons who would not be counted in the statistical definition as being employed in 'engineering occupations'.

At the provincial level, registration and employment trends may differ, but the divergence pattern continues to be apparent. Figure No. 26 compares employment and registration trends in Alberta and Ontario. In both cases, the data suggest that sometime around 2004 the trends in registration and engineering employment began to diverge more sharply.

**Figure No. 26**
Estimated Employment in 'Engineering Occupations' and Total Number of Registered Professional Engineers (excluding Retirees), Alberta and Ontario
Statistics Canada, *Labour Force Survey*
Association Administrative Data
(Labour Market Tracking System Source Files – Canada)



We cannot determine from the data whether the divergence between registration trends and employment trends arises from an increase in the number of persons in engineering occupations who are unlicensed or an increase in the number of engineering graduates who are not doing engineering work, as defined in provincial legislation, and who have elected not to be registered as professional engineers. The first interpretation would suggest a regulatory challenge. The second suggests a market share challenge with respect to the broader role of professional associations.

## Employer Policies:

In the 2007 *Engineering and Technology Employer Survey*, only 55% of employers answered questions on their policies regarding licensure, while only 38% answered questions on certification policy. Figure No. 27 shows that *only a minority of employers have a policy of generally requiring licensure for engineers and that this proportion falls dramatically for certification of technologists and technicians*. Even if non-respondents were omitted, which could be methodologically misleading, the proportion of employers that require licensure for engineers would still be a minority.

**Figure No. 27**
Employer Policies on Licensure and Certification
(Non-Responding Employers included in Total, but not Reported)
*2007 Engineering and Technology Employer Survey*

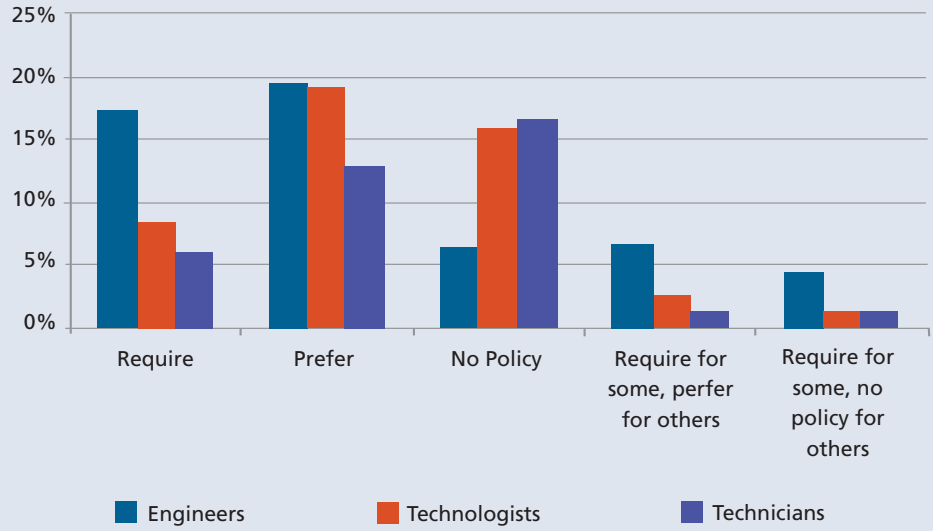



Figure No. 28 summarizes employers' reasons for requiring or preferring licensure and certification or for not having such policies in place. As can be seen, support for the ethic and culture of professionalism is far and away the most import factor leading employers to support the systems of licensure and certification. These survey findings are confirmed by our executive interviews.

Restricting hiring ability is the most important reason for not having policies that would require or prefer licensure or certification.

**Figure No. 28**
Employers Reasons for Policies on Licensure and Certification
*2007 Engineering and Technology Employer Survey*

| | Engineers | Technologists and Technicians |
|---|---|---|
| Reasons for Requiring or Preferring Licensure/Certification: | | |
| • Encourages professionalism | 61% | 71% |
| • Meet legal obligations | 55% | |
| • Competitive advantage | 44% | 47% |
| • Other reasons | 10% | 17% |
| | | |
| Reasons for not Requiring or Preferring Licensure/Certification: | | |
| • Would restrict ability to hire Canadians who elect not to be licensed/certified | 52% | 57% |
| • Would restrict ability to hire internationally educated persons who do not qualify for a Canadian license/certification | 26% | 22% |
| • Wish to avoid legal liabilities associated with licensure | 5% | |
| • Philosophically opposed to licensure | 1% | 2% |
| • See no advantage | 22% | 37% |
| • Other reasons | 22% | 13% |

The survey also suggests considerable stability in employer policies. Approximately 90% of those employers that responded to questions on licensure and certification reported that they had not changed their policy in the past five years.

Figure No. 29 summarizes data from the *Survey of Engineers and Engineering Technicians and Technologists*. It should be noted that 88.9% of respondents to this survey are either licensed, certified or in the process of making an application for licensure or certification. Even with this sampling bias, it is significant that *only a minority of employers are described as requiring licensure or certification*.

**Figure No. 29**
Employee Description of Employer Policy on Licensure or Certification
*Survey of Engineers and Engineering Technicians and Technologists*

| | Engineers | Technologists | Technicians |
|---|---|---|---|
| Employer Policy: | | | |
| • Licensure/Certification Required by Employer | 45.1% | 26.6% | 25.1% |
| • Licensure/Certification Preferred by Employer | 35.3% | 66.9% | 55.9% |
| • No Employer Policy | 19.6% | 6.5% | 19.0% |

The primary reason given by individuals for taking up professional licensure or certification is professional recognition – a motivation that is consistent with the principal reason cited by employers for supporting licensure and certification. Figure No. 30 shows that other factors are also important, but that the expectation of increased earnings ranks lowest among these factors.

**Figure No. 30**
Significance of Licensure or Certification to Individual Engineers, Technologists and Technicians
*Survey of Engineers and Engineering Technicians and Technologists*

| | Engineers | Technologists | Technicians |
|---|---|---|---|
| Significance of Licensure Certification: | | | |
| • Professional Recognition | 87.4% | 79.4% | 66.6% |
| • Meet Client Expectations | 69.7% | 57.2% | 50.8% |
| • Broader Career Options | 81.5% | 74.1% | 65.4% |
| • Increase Employability | 84.8% | 77.5% | 67.9% |
| • Increase Earnings | 31.1% | 53.2% | 48.6% |

The survey findings underscore the continuing value of licensure and certification as bulwarks supporting an ethic and culture of professionalism. Commitment to the ethic and culture of professionalism is the main source of both employer and individual support for licensure and certification. On the other hand, the survey data confirm what is also suggested by a comparison of trends in engineering employment and registration, namely that there are weaknesses in this support which may already be serious and certainly could become serious, in the future.

# Appendix A
# Members of Steering Committee

Kim Allen
Professional Engineers Ontario

Jean Luc Archambault
Order des Technologues Professionels du Quebec

Michelle Branigan
Electricity Sector Council

David Chalcroft
Association of Professional Engineers, Geologists, and Geophysicists of Alberta

Samantha Colasante
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Brian George
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Stephen Gould
Canadian Council of Technicians and Technologists

Kevin Hodgins
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Cheryl Jensen
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The Association of Science and Engineering Technology Professionals of Alberta

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