Engineering and Technology Labour Market Study

Trends in Licensure and Certification

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

Engineers:

- Around 70% of the persons in engineering occupations are either professional engineers or interns.
- Only 31% of engineering graduates are licensed professional engineers or registered as interns.
- Depending on how 'engineering jobs' are defined, the proportion of graduates working in these jobs is between 25% and 45%. In other words, the majority of engineering graduates are *not* working in engineering jobs.
- Six sectors account for 85% of engineering employment in Canada. The manufacturing sector stands out as having a comparatively low incidence of employer policies requiring engineers to be licensed (29.2%).
- Fewer than 20% of organizations that employ 5 or fewer engineers require their engineers to be licensed. By contrast, approximately 36% of organizations that employ more than 50 engineers require licensure.
- Encouraging professionalism and complying with legal requirements are the leading reasons for employers to require or prefer licensure. Philosophical opposition to licensure on the part of employers is negligible.
- The most important factor influencing employers that do not require or prefer a licence is concern about restricting their ability to recruit graduates who are not licensed.
- Attitudes towards licensure among engineering graduates are strongly favourable. Age has almost no effect on attitudes towards licensure. However, graduates under age 35 are less likely to work in organizations that require a licence.
- Civil (and related) engineers assign the greatest importance to licensure. Electronics engineers and other engineers working in IT assign lower importance to licensure. Aerospace engineers also assign generally lower importance to licensure.

Technicians and Technologists:

- Between 17% and 20% of persons working as engineering technicians or technologists are certified.
- There may have been a modest strengthening of employer support for certification over the past five years. Of 367 employers that provided information, 6 reported weakening their policy on certification in the past five years, while 30 reported strengthening their policy. Fewer than 2% of employers reported that they were philosophically opposed to certification.
- There is a strong correlation between employers' policies on licensure for professional engineers and their policies on certification for technicians and technologists. Governments and the consulting sector show greater support for certification than other sectors.
- 'Encouraging sound professional attitudes and conduct' is by far the most important factor cited by employers that support certification.

- Large employers are significantly more likely to support certification.
- Among employers that do not support certification, the most important consideration is the desire to avoid restrictions on their ability to hire.
- On all criteria, regardless of age group, technologists attach greater importance to certification than technicians. Age does not affect technologists' attitudes toward certification. By contrast, technicians under the age of 35 are less likely to have positive attitudes toward certification than technicians over the age of 35.
- Support for certification is notably weaker among technologists working in bio-systems, geo-science, computer, and chemical technology. By contrast, certification is more strongly supported by technologists in the geological, metallurgical, civil and environmental fields.
- Two important policy issues need to be addressed by professional associations: the viability of continuing to certify two distinct levels of professional competence (i.e., technicians and technologists) and the need to establish a simplified, national system of professional designations.

Introduction

This report examines trends in licensure for engineers and in certification for engineering technicians and technologists.

This study is part of the *Engineering and Technology Labour Market Study* commissioned by Engineers Canada and the Canadian Council of Technicians and Technologists, with support from Human Resources and Skills Development Canada. Additional information on the Engineering and Technology Labour Market Study is available from the study's website: www.engineerscanada.ca/etlms/index.cfm

The findings presented in this study are based on a national survey of engineering and technology employers (701 respondents), a national survey of engineers, and engineering technicians and technologists (15,585 respondents) and interviews with 41 senior engineering executives. A more detailed description of the methodology is set out in Appendix A.

Trends in Licensure for Engineers

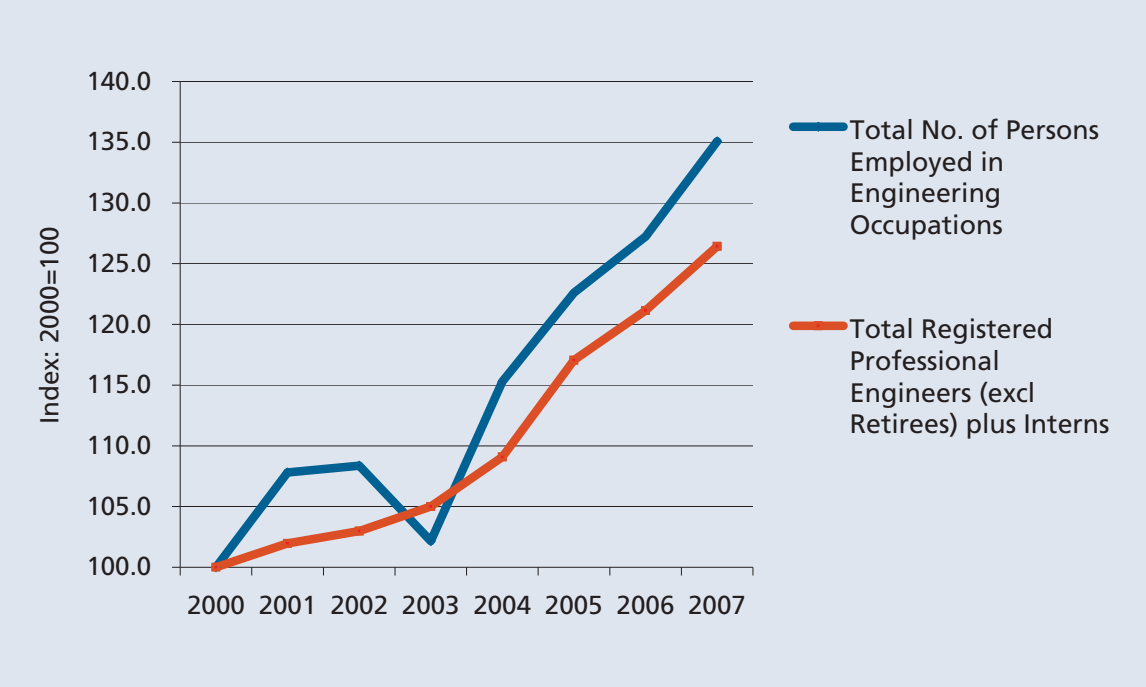
Comparing Employment Trends to Registration Trends:

The 2006 *Census* identified 184,540 persons as employed in engineering occupations. In principle, all of these jobs would fall within the ambit of regulatory statutes, except in Ontario, where the 'industrial exemption' allows employers to hire unregistered persons in certain circumstances.[1] Administrative data provided by the provincial and territorial associations indicate that in 2006 there were around 159,000 registered professional engineers (excluding retirees) and interns. This overestimates the actual total, since it includes some persons who were registered in more than one province. Some of these registered professional engineers were in management positions. Others were in teaching positions or in jobs that were not directly related to engineering. Survey data suggest that about 17% of registered professional engineers were not working in an engineering occupation. *In approximate terms, therefore, the effective coverage of the licensure system (including interns) would appear to be around 70%. That is to say, around 70% of the persons in engineering occupations are registered professional engineers or interns, while around 30% of persons in those occupations are neither registered professional engineers nor interns*.

1. Section 12(3) of Ontario's *Professional Engineers Act* lists the allowed exceptions to the requirement for professional engineering to be done solely by licensed professional engineers. The first of these exempts "doing an act that is within the practice of professional engineering in relation to machinery or equipment, other than equipment of a structural nature, *for use in the facilities of the person's employer in the production of products by the person's employer."* [emphasis added.] Professional Engineers Ontario (PEO) explains that, an industrial facility does not need to employ or retain a professional engineer for the purpose of designing or evaluating production equipment and processes or for supervising its use. However, the exemption is not a permit for non-licensed persons to assume total control over design of production equipment and process. Other legislation imposes requirements for a professional engineer to be involved in aspects of the work. For instance, the *Occupational Health and Safety Act*, Regulation for Industrial Facilities requires all new or modified production equipment to be reviewed by a professional engineer to confirm its compliance with all health and safety standards prior to use. Non-engineers can design the equipment or process but a P. Eng. must attest that it is safe to use. There is similar legislation specifying that professional engineers design electrical systems, buildings or other structures, and pressure vessels. The exemption does not pertain to persons designing, evaluating, commissioning or otherwise practising engineering in relation to production equipment and facilities for someone other than their employer. Custom equipment builders and others must have the design done by professional engineers.

Figure No. 1 compares the growth of employment engineering occupations, as measured by Statistics Canada's *Labour Force Survey* and the estimated number of registered professional engineers (plus interns), based on administrative data provided by the provincial and territorial regulators. Between 2000 and 2007, the number of persons employed in engineering occupations increased by approximately 35.1%. Over this same period, the total number of registered professional engineers (excluding retirees, but including interns) increased by around 26.4%. *The gap between the employment trend and the registration trend is not large. However, the gap has widened in recent years*.

Figure No. 1
Estimated Employment in 'Engineering Occupations' and Total Number of Registered Professional Engineers (excluding Retirees, but including Interns), Canada, 2000-2007, Index: 2000 = 100
Statistics Canada, Labour Force Survey and Association Administrative Data
(Labour Market Tracking System Source Files–Canada)



Registration trends can also be compared to the total number of persons with undergraduate engineering degrees. The 2006 *Census* identified 308,595 domestic university engineering graduates and 230,170 international graduates. These numbers should be reduced by around 5-6% to account for persons who are not in the active labour force. This lowers the count to around 290,000 domestic engineering graduates and 216,000 international graduates. As noted earlier, in 2006, there were approximately 159,000 registered professional engineers (excluding retirees) and interns. If both domestic and international graduates are considered the appropriate comparator, then around 31% of university engineering graduates are licensed or registered as interns. Using only domestic graduates as a comparator yields a higher estimate – 55%. However, this is clearly an over-estimate, since a growing number of international graduates have qualified for Canadian licensure.

Who are the unregistered graduates? The unregistered graduates fall chiefly into four categories. The first are engineering graduates who are working in engineering jobs, but who are either non-compliant with licensure requirements or are working under an exemption permitted by the relevant engineering statute, such as the 'industrial exemption' in Ontario. The second group comprises international graduates whose qualifications are not commensurate with Canadian standards. These individuals would not be eligible for full licensure, although some may be eligible for restricted licenses. The third group is graduates who took their bachelor's degree in engineering, but who subsequently pursued career interests that are not directly related to engineering. Interviews suggest that for domestic graduates, this constitutes about 10% of each graduating class. And finally, the fourth group comprises engineering graduates who are not working in engineering jobs. *Census* data suggests that the latter three groups account for somewhere between 55% and 75% of all graduates, depending on how 'engineering jobs' are defined. [2]

These coverage ratios suggest that the profession may wish to consider alternative modes of registration that allow graduates who wish to retain an association with the profession to register under different terms from those graduates who intend to practice engineering. Establishing this alternative mode of registration could facilitate the return to the profession of graduates who moved from engineering into other types of employment.

Employers' Policies:

Six sectors account for 85% of engineering employment in Canada. Figure No. 2 shows that, based on employee survey responses, the *manufacturing sector stands out as having a comparatively low incidence of employer policies that require engineers to be licensed* (29.2%). This poses a challenge for professional associations in all provinces, but especially in Ontario which has both the greatest number of employers in the manufacturing sector, and an 'industrial exemption' provision in its regulatory statute.

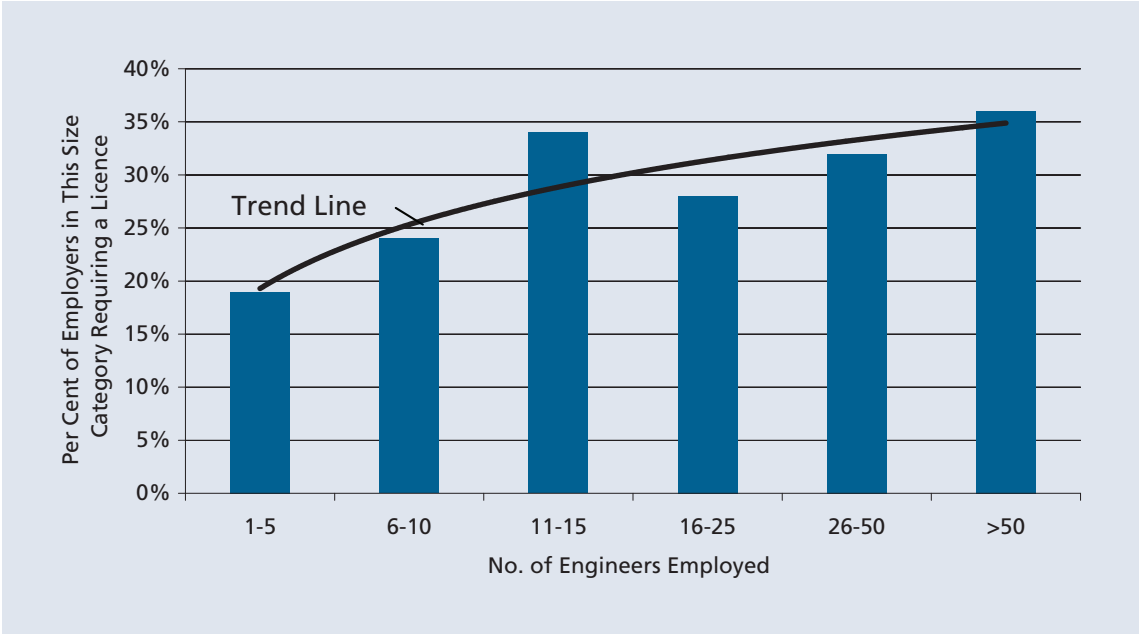
Figure No. 2
Percent of Survey Respondents who reported that their Employer Requires Engineers to be Licensed
Survey of Engineers and Engineering Technicians and Technologists, 2008

Sector	Share of Total Engineering Employment (2006 Census)	Percent of Survey Respondents Employed in this Sector who Reported that their Employer Requires Engineers to be Licensed
Consulting	37.2%	62.1%
Manufacturing	26.0%	**29.2%**
Government	6.6%	61.3%
Utilities	5.0%	58.8%
Construction	4.7%	49.5%
Oil and Gas, Mining	5.8%	51.9%
Total	85.3%	n/a

2 See Figure No. 1 and the related discussion in *The Results So Far: An Interim Report*, pp 6-7

Figure No. 3 shows that *there is a correlation between the number of engineers employed and the likelihood of an employer requiring professional licensure*. In the *2007 Engineering and Technology Employers Survey*, fewer that 20% of organizations that employ 5 or fewer engineers reported that they required a licence. This proportion increased with the number of engineers employed. Approximately 36% of organizations that employed more than 50 engineers had a policy requiring licensure.

Figure No. 3
Percent of Employers, based on Number of Engineers they employ, that require Engineers to be Licensed
2007 Survey of Engineering and Technology Employers



Survey data also indicate that a sizeable majority of engineers are employed in organizations with 50 or more engineers. Thirty-six percent of employers in these large organizations reported that they have a policy to require licensure, 26% described themselves as preferring licensure, and 22% had a policy that requires licensure for some engineers, but not for others. (Sixteen percent declined to answer the survey question). Maintaining support for licensure among large engineering and technology employers, therefore, is critical to the long-term role of the system of professional licensure.

Companies that participate in co-op programs are more likely to require licensure. The likelihood of participating in a co-op (or internship) program increases significantly with the number of engineers an organization employs. If it is feasible, strengthening the links between employers' policies on licensure and their participation in the co-op programs would be of considerable benefit to the licensure system. [3]

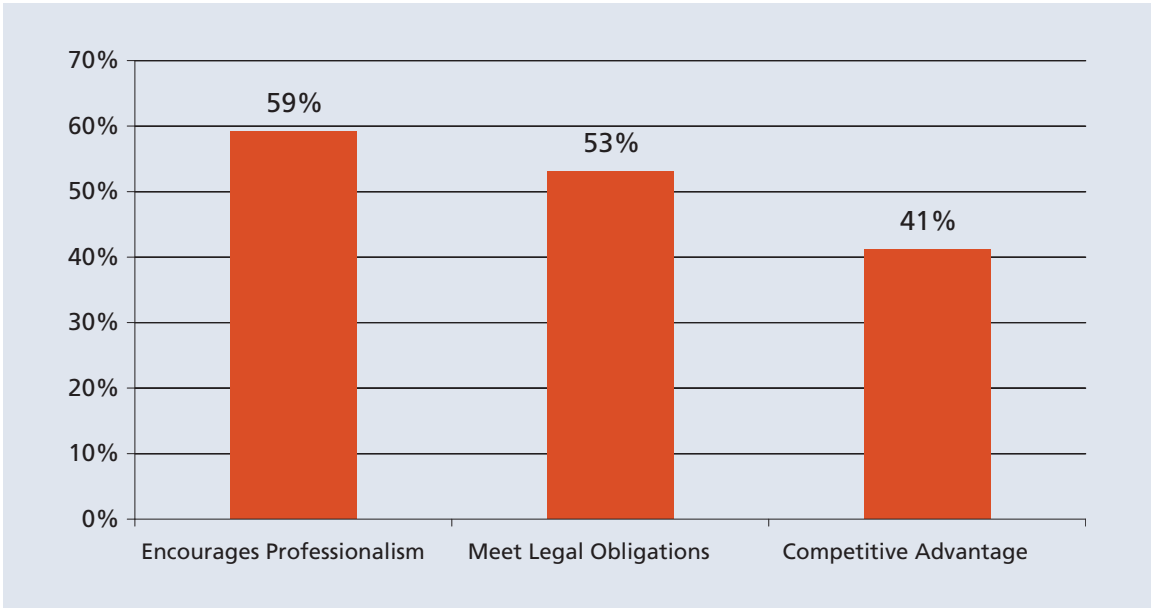
3 The following table, based on data from the *2007 Engineering and Technology Employers Survey* shows the percentage of employers within each size category that reported formally participating in co-op or internship programs.

No. of Engineers Employed	Participate in Co-op Programs	
	Yes	No
1-5	28%	72%
6-10	56%	44%
11-15	72%	28%
16-25	80%	20%
26-50	88%	12%
>50	95%	5%

Survey data suggest a high degree of stability in policy towards licensure. Ten percent of employers in the *2007 Survey of Engineering and Technology Employers* reported that they had changed their policy in the past five years. About half of these indicated that they moved from a policy of 'no requirements or preferences for licensure' to a policy of preference.

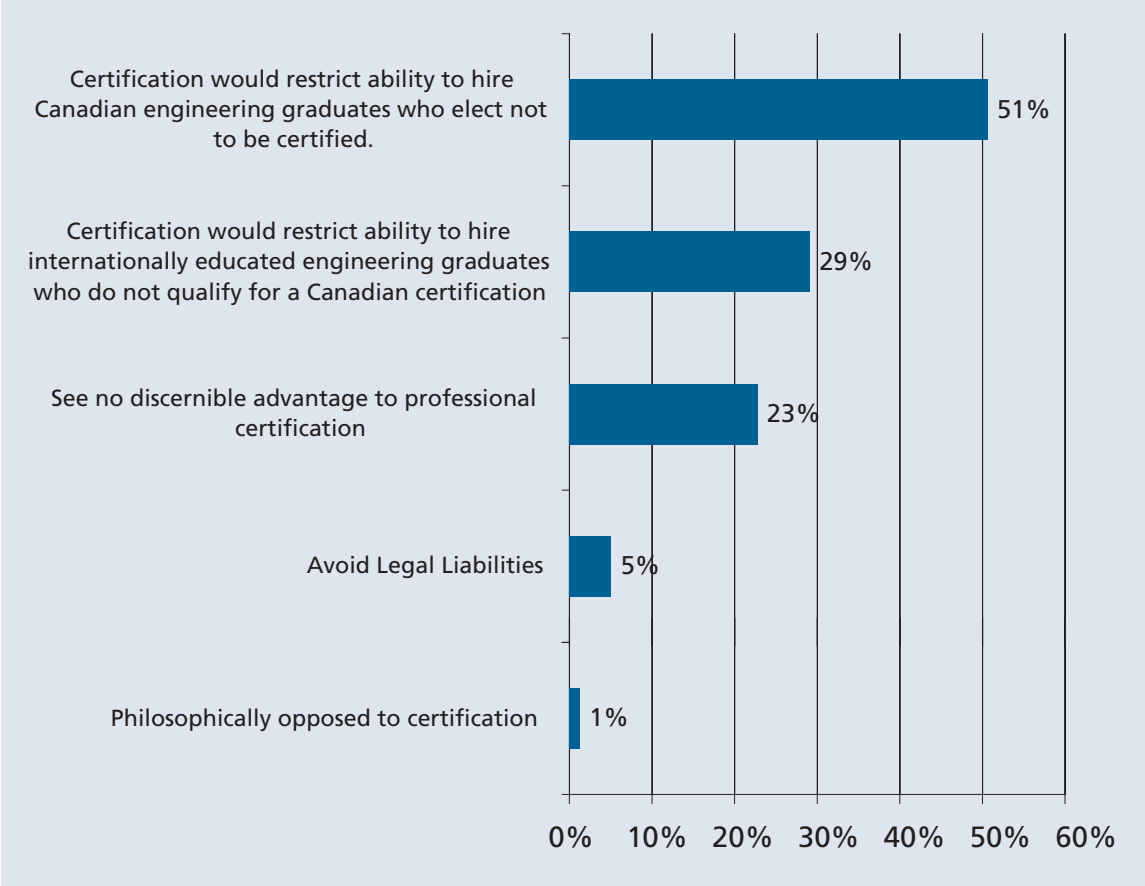
Figure No. 4 shows that encouraging professionalism and complying with legal requirements were the leading reasons that employers have policies requiring or preferring a licence for their university engineering graduates.

Figure No. 4
Reasons cited for Requiring or Preferring a Licence for University Engineering Graduates by Employers with Requirement or Preference Policies
2007 Survey of Engineering and Technology Employers



It is significant that philosophical opposition to licensure is negligible as a consideration reported by employers that have no requirement or preference policy for licensure. Fewer than 1% of responding employers cited philosophical opposition to licensure as a factor behind their organization's policy, although 23% see no advantage to licensure. Figure No. 5 shows that the most important factor for these employers is the desire not to restrict their ability to recruit persons who have elected not be licensed.

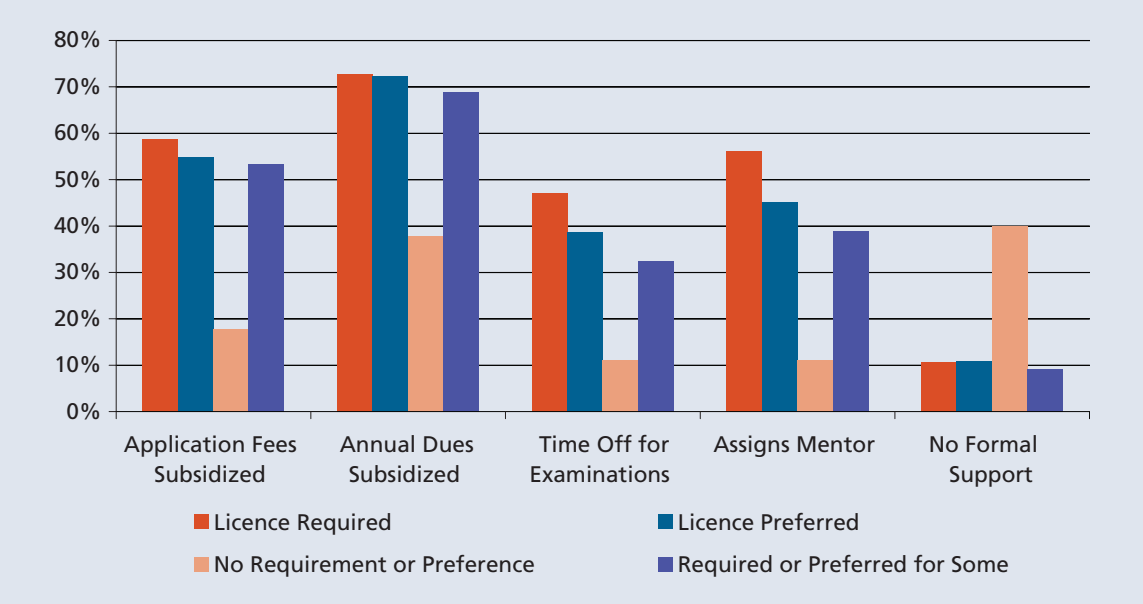
Figure No. 5
Reasons cited for Neither Requiring nor Preferring a Licence for University Engineering Graduates by Employers with a 'No Requirement / No Preference' Policy
2007 Survey of Engineering and Technology Employers



The survey data suggest a 'chicken and egg' phenomenon. Some university graduates in engineering elect not to be licensed because they perceive that there are employers who are indifferent to the system of licensure. In turn, the existence of this pool of graduates leads some employers (predominantly small employers according to our survey) to maintain a policy of 'no requirements / no preferences' vis à vis the system of licensure, despite having no *a priori* philosophical opposition to the licensure system. Strategically, therefore, it may be important for professional associations to communicate to engineering students during their graduating year the importance that large employers attach to licensure and the career limitations that are implicit in a decision not to pursue licensure.

Figure No. 6 shows that, except for employers that explicitly have no policy requirements or preferences, a large majority (approximately 70%) subsidize annual fees for professional associations. A smaller majority, but still a majority, subsidize application fees. Support for mentorship is also strong. It may be useful to communicate the extent of employer support to students in their graduating year and to encourage students to inquire about employer support for professional qualification.

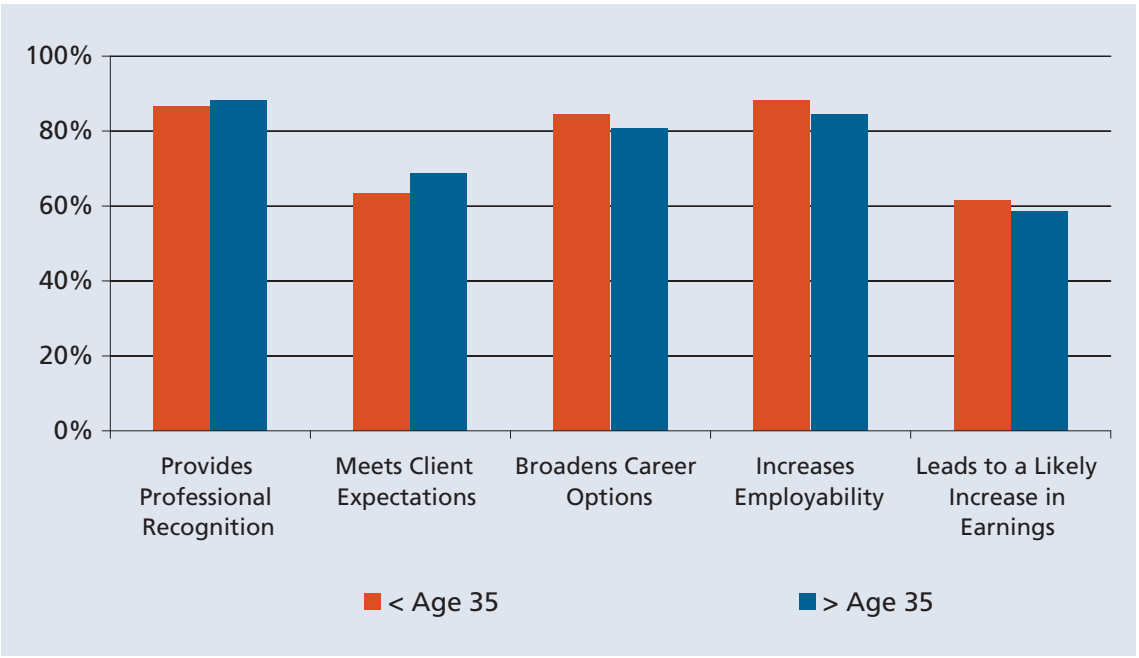
Figure No. 6
Types of Support Provided for Licensure
2007 Survey of Engineering and Technology Employers



Attitudes of Engineering Graduates:

Age has virtually no influence on attitudes towards licensure. Figure No. 7 shows that on all attitudinal factors measured in the *Survey of Engineers and Engineering Technicians and Technologists*, there was only an inconsequential difference between respondents age 35 or under and those over age 35.

Figure No. 7
Attitudes towards Licensure among Engineering Graduates, based on Age
Survey of Engineers and Engineering Technicians and Technologists, 2008



Graduates under age 35 were, however, somewhat less likely to be employed by organizations that require a licence. Forty-three percent of survey respondents age 35 or under were employed by an organization without a mandatory licensure policy, compared to 52% of those over age 35.

Figure No. 8 compares attitudes toward licensure, based on technical field.

Figure No. 8
Attitudes towards Licensure among Engineering Graduates, based on Technical Field
Survey of Engineers and Engineering Technicians and Technologists, 2008

	Provides Professional Recognition	Meets Client Expectations	Broadens Career Opportunities	Increases Employability	Leads to a Likely Increase in Earnings
Aerospace / Aeronautical	**74%**	**39%**	74%	78%	**39%**
Agricultural / Bio-resource	91%	78%	96%	96%	63%
Architectural / Building / Structural	96%	85%	92%	93%	77%
Bio-Sci. / Bio-Med. / Bio-Chem.	87%	63%	74%	79%	**47%**
Chemical	89%	61%	81%	86%	51%
Civil	95%	86%	90%	94%	75%
Electrical	82%	60%	78%	81%	52%
Electronics	83%	**50%**	**72%**	**74%**	**47%**
Engineering Sci. / Engineering Physics	86%	64%	79%	81%	49%
Environmental	93%	78%	89%	91%	66%
Geological and Related	93%	78%	87%	92%	71%
Industrial / Manufacturing	86%	**52%**	80%	86%	56%
IT / Computer / Software	**77%**	**43%**	**69%**	**70%**	**39%**
Instrumentation / Control Systems	88%	67%	80%	82%	57%
Marine / Naval	83%	64%	75%	81%	**48%**
Materials	86%	64%	76%	78%	51%
Mechanical	87%	63%	81%	86%	59%
Metallurgical	84%	62%	69%	**74%**	**42%**
Mineral Resources / Mining	89%	75%	83%	89%	62%
Nuclear	91%	63%	**66%**	83%	**36%**
Petroleum and Gas	83%	76%	83%	88%	64%
Systems	84%	**57%**	74%	**70%**	**38%**
Survey / Geomatics	90%	71%	85%	87%	66%
Average	87%	66%	81%	85%	58%

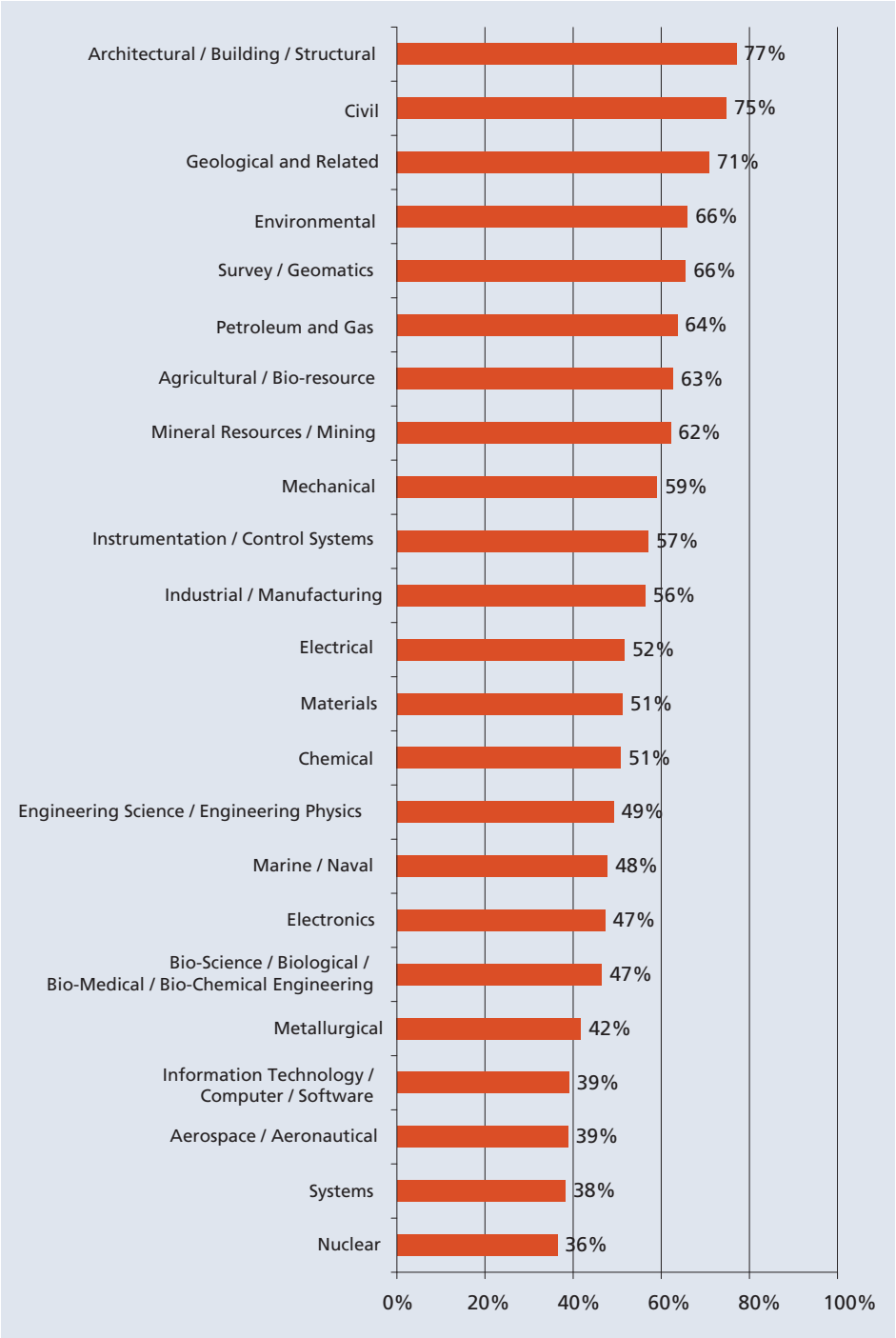
Underlined cells indicate significantly above the 'all fields' average
Bolded cells indicate significantly below the 'all fields' average

There are some divergences from the average trend which should be noted:

- Civil engineers and Architectural/Structural/Building engineers assign greater importance to licensure on most criteria.
- By contrast, Electronics engineers and IT/Computer/Software engineers assign lower importance to licensure on most criteria.
- Aerospace/Aeronautical engineers also assign generally lower importance to licensure.
- Attitudes are close to the mean (as measured by the standard deviation) for all disciplines on three criteria:
    - providing professional recognition,
    - broadening career options, and
    - increases employability.
- By contrast, there is greater dispersion of attitudes across disciplines for two criteria:
    - meets clients' expectations, and
    - leads to a likely increase in earnings.

Figure No. 9 illustrates the significant dispersion of attitudes across technical fields on attitudes towards whether licensure 'leads to a likely increase in earnings'. The lowest association of licensure with a likely increase in earnings is among nuclear engineers (36%). The highest is among architectural/building/ structural engineers (77%).

Figure No. 9
Percent of Engineering Graduates by Technical Field
responding that Licensure Leads to a Likely Increase in Earnings
Survey of Engineers and Engineering Technicians and Technologists, 2008



Trends in Certification for Engineering Technicians and Technologists

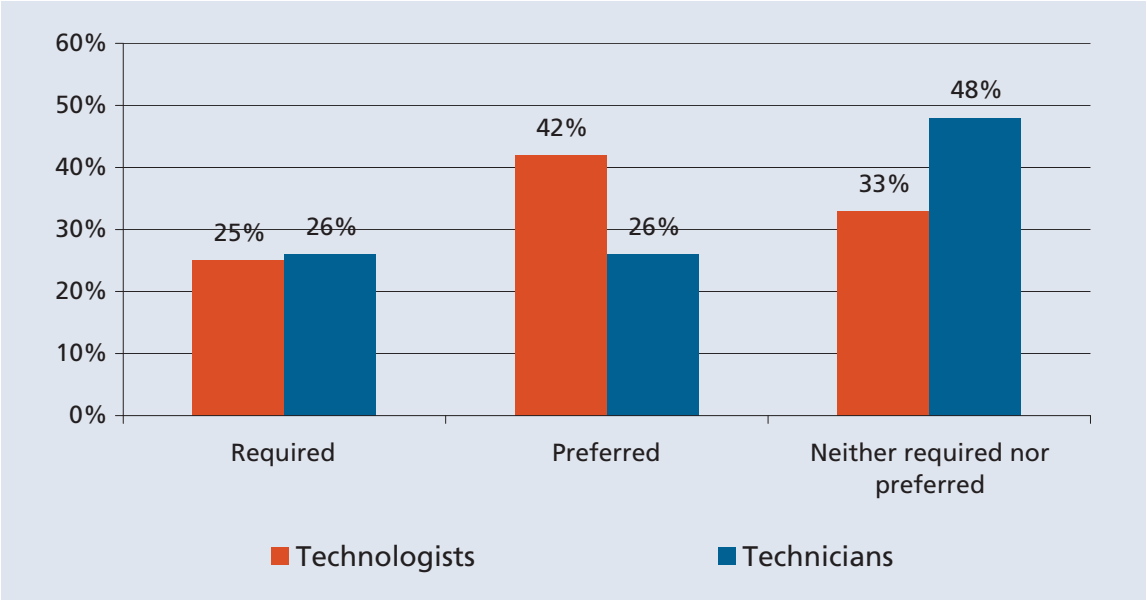
Comparing Employment Trends to Certification Trends:

The 2006 *Census* identified 245,510 persons as employed in engineering technician and technologist occupations. Data supplied by the Canadian Council of Technicians and Technologists show that there were approximately 52,000 certified technicians and technologists. All provinces, except Quebec certify both technologists and technicians. Quebec certifies only technologists. The 2006 *Census* identified 245,510 engineering technology jobs. Since 2006, this number has increased by about 6-7%. While most of the 52,000 certified technicians and technologists were employed in technician and technologist occupations, some were working in management, teaching, technical sales or other jobs. *A reasonable estimate of the coverage of certification with respect to the number of technician and technologist jobs is, therefore, around one in five or one in six.* That is to say, around 17-20% of engineering technicians and technologists are certified.

Employers' Policies:

Figure No. 10 shows that, while only a quarter of respondents in the *Survey of Engineers and Engineering Technicians and Technologists* reported that their employer required a technologist to be certified, somewhat more than 40% have a policy of preferring certification. For technicians the percentage is lower.

Figure No. 10
Percent of Technicians and Technologists who reported that their Employer Requires or Prefers Technicians and Technologists to be Certified
Survey of Engineers and Engineering Technicians and Technologists, 2008



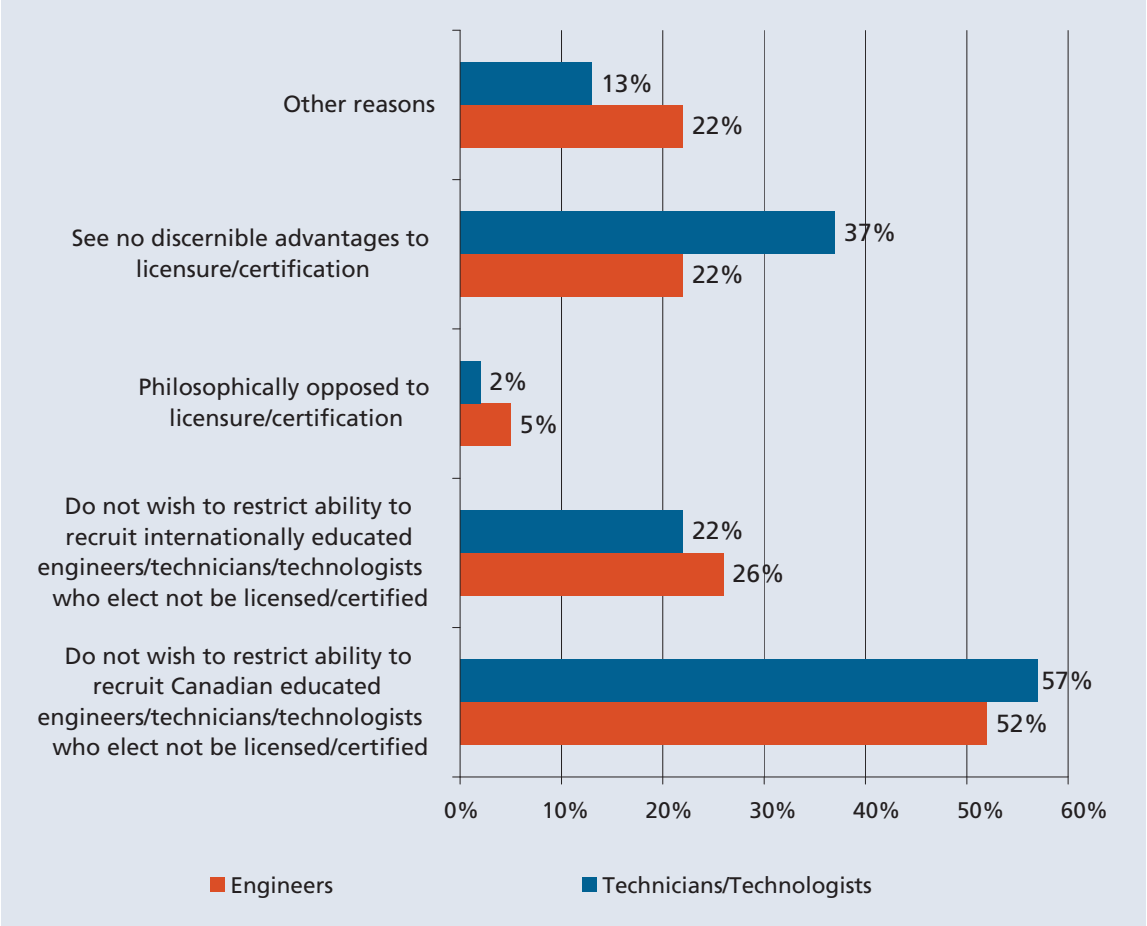
The *2007 Engineering and Technology Employers Survey* suggests that there may have been a strengthening of support for certification over the past five years. Of 701 respondents to the survey, 367 provided information on their certification policies. Of these, 6 reported a weakening of their policy in the previous five years, while 30 reported a strengthening of their policy. (Given the large proportion of non-respondents, care should be taken when interpreting these findings.) This trend is encouraging and suggests that the professional associations should consider a national strategy to promote certification in targeted sectors and to larger employers that are more likely to benchmark themselves against similar organizations.

As would be expected there is a strong correlation between an employer's policy on certification for technicians and technologists and its policy on licensure for professional engineers. Organizations that are weak supporters or non-supporters of licensure for engineers generally do not require or prefer certification for technicians and technologists. Governments and the consulting sector show a greater support for certification than other sectors. This is consistent with the advantages to certification cited by those organizations that require or prefer certification. Seventy-one per cent require or prefer certification because it 'encourages sound professional attitudes and conduct'. Forty-seven percent agree that 'certification is a competitive advantage in dealing with customers or clients, even when it is not required by law'. Other considerations account for only 17% of the reasons for requiring or supporting certification.[4] These findings are strongly aligned with the findings for licensure. They suggest professionalism is by far the strongest appeal of certification and that efforts to market certification to employers should focus on this appeal.

As with the engineering profession, employer size is also an important correlate with employer policy on requiring professional qualifications. Large employers are significantly more likely to support certification. This is important to bear in mind when developing marketing strategies.

Among those employers that do not support certification, the reasons cited are similar to the reasons for not supporting licensure for engineers. Figure No. 11 compares the survey data.

Figure No. 11
Reasons for not Requiring or Preferring Licensure/Certification among Employers with Policies of Not Requiring or Preferring Licensure/Certification
2007 Survey of Engineering and Technology Employers



4 Data based on *2007 Engineering and Technology Employer Survey*

As can be seen from Figure No. 11, there is a close alignment on all factors except the perception of 'no discernible advantage' which is greater in regard to certification of technicians/technologists than for licensure of engineers. This may also reflect the different legal environment, since one of the possible advantages of licensure is legal compliance. However, the data also suggest that professional associations representing technicians and technologists may need to highlight the distinguishing attributes of a certified technician/technologist in their marketing efforts. This highlighting may also suggest ways of introducing or strengthening distinguishing attributes in areas such as continuing professional development.

Particular note also should be given to the trivial number of employers (2%) that reported philosophical opposition to certification.

The *2007 Engineering and Technology Employers Survey* shows that the most important reason for not having a policy to support certification is concern over restricting the ability to hire persons who elect not to be certified. As discussed in the earlier section, this is a 'chicken and egg' problem. Many qualified technicians and technologists elect not to be certified because they perceive that there are many employers who are indifferent to the system of certification and that there is no reason to go through the process and incur the expense of becoming certified. In turn, the existence of this pool of uncertified persons leads some employers (predominantly small employers according to our survey) to neither require nor prefer certification because they fear that by doing so, they would cut themselves off from this labour pool.

Opinions of Technicians and Technologists on Certification

Figure Nos. 12a and 12b show opinions on certification among technicians and technologists based on age group.

Figure No. 12a
Technicians' Attitudes towards Certification, based on Age
Survey of Engineers and Engineering Technicians and Technologists, 2008

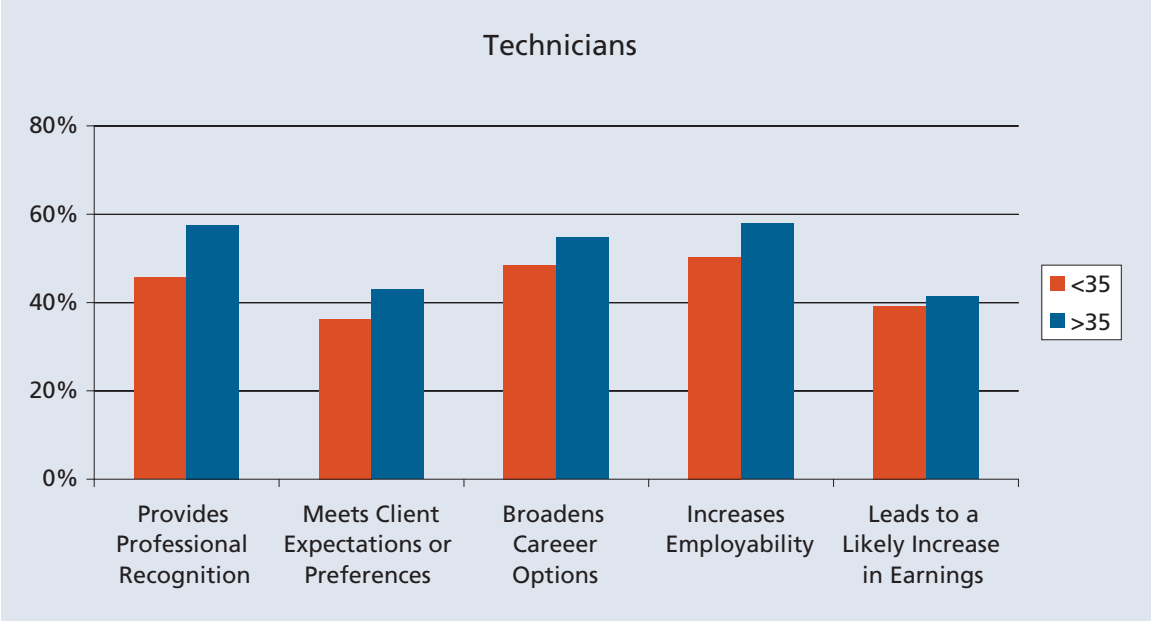
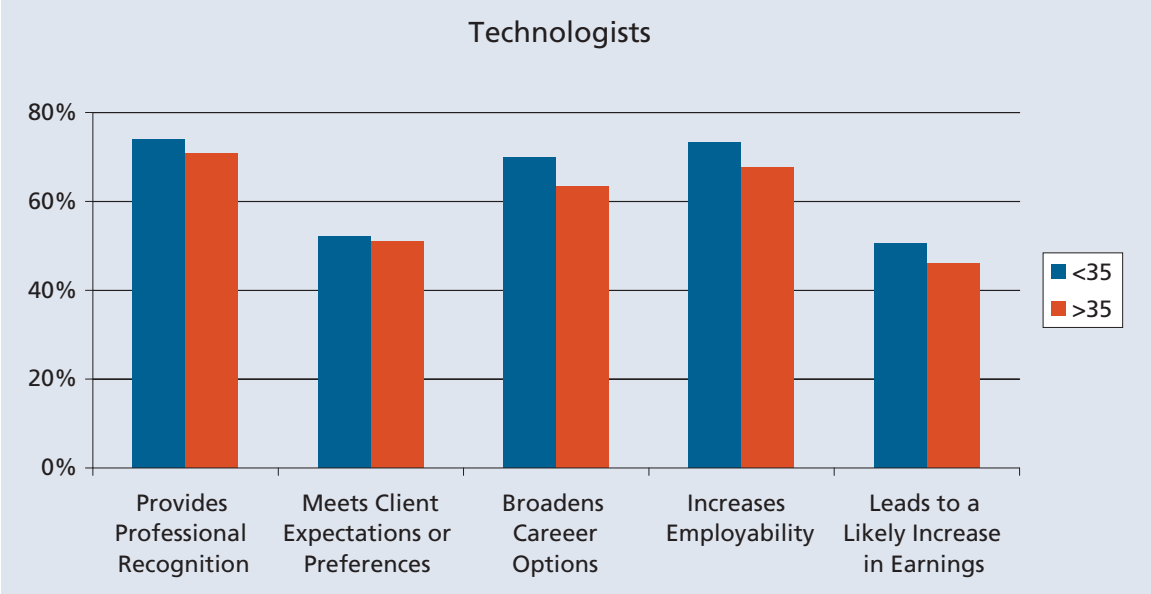


Figure No. 12b
Technologists' Attitudes towards Certification , based on Age
Survey of Engineers and Engineering Technicians and Technologists, 2008



Comparing the survey results suggests a number of comparisons and contrasts:

- on all criteria, regardless of age group, technologists attach greater importance to certification than technicians,
- among technologists, age has relatively little impact on attitudes toward certification, though younger technologists are marginally more likely to report positive opinions of certification,
- among technicians, age is somewhat more important as a determinant of attitudes towards certification and has the opposite influence as among technologists, that is to say, older technicians are marginally or moderately more likely to report positive opinions of certification,
- the differences in attitudes toward certification are more marked between younger technicians and younger technologists than between older technicians and older technologists.

Figure No. 13 compares attitudes towards certification across technical field for technologists. (For technicians, the survey sample was too small to allow this analysis .)

13 The correlation between the Canadian dollar and imports of engineering (and related) services is similarly weak.

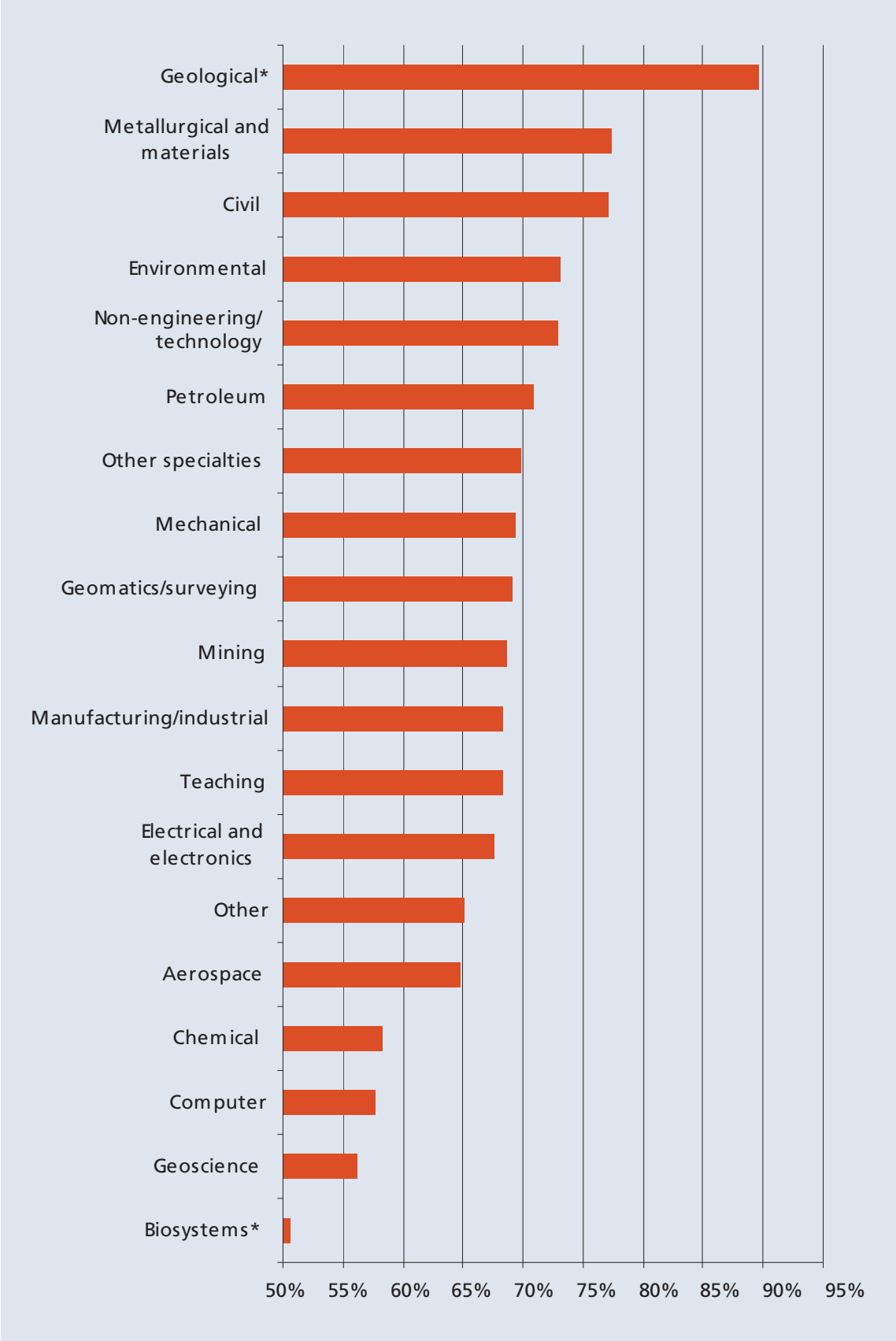
Figure No. 13
Technologists' Attitudes towards Certification, based on Technical Field
Survey of Engineers and Engineering Technicians and Technologists, 2008

	Provides Professional Recognition	Meets Client Expectations or Preferences	Broadens Career Options	Increases Employability	Leads to a Likely Increase in Earnings
Aerospace	**73%**	**46%**	73%	81%	50%
Chemical	81%	**33%**	76%	**68%**	**33%**
Civil	86%	71%	82%	86%	60%
Computer	77%	**39%**	**66%**	68%	**38%**
Electrical and electronics	79%	57%	72%	77%	53%
Environmental	88%	66%	79%	82%	51%
Geological*	92%	85%	100%	100%	71%
Geomatics/surveying	76%	**52%**	81%	81%	55%
Geo-science	76%	**40%**	**65%**	**58%**	**42%**
Manufacturing/industrial	82%	**49%**	78%	79%	54%
Mechanical	84%	57%	76%	78%	53%
Metallurgical and materials	91%	63%	89%	83%	61%
Mining	80%	64%	78%	**73%**	49%
Petroleum	79%	62%	75%	81%	58%
Bio-systems*	62%	**38%**	**57%**	59%	**36%**
Other specialties	80%	59%	73%	79%	57%
Non-engineering/technology occupations	85%	55%	77%	88%	59%
Teaching	86%	57%	72%	77%	50%
Other	**66%**	**51%**	74%	76%	58%

*Fewer than 25 in sample. Caution should be exercised in interpreting these data.
Underlined cells indicate significantly above the 'all fields' average
Bolded cells indicate significantly below the 'all fields' average

Figure No. 14 constructs a composite indicator based on the average of the five factors tracked in Figure No. 13. The composite indicator suggests that technical field has a significant influence on attitudes towards certification. As can be seen, a significantly lower proportion of technologists employed in bio-systems, geo-science, computer, and chemical technology jobs expressed positive attitudes towards certification. By contrast, certification was much more strongly supported by technologists in the geological, metallurgical, civil and environmental fields. These fields, it should be noted are also more strongly associated with the consulting sector.

Figure No. 14
Composite Indicator of Technologists' Attitudes towards Certification, based on Technical Field
(Percent expressing a Positive View of Certification – Average of Five Factors)
Survey of Engineers and Engineering Technicians and Technologists, 2008



Designations:

Increasing employer support for certification is one of the central challenges facing the professional associations that represent and certify technicians and technologists. Two policy challenges make achieving this goal more difficult. The first pertains to occupational terminology; the second, to the structure of professional designations.

As discussed in *Changing Roles*, the terms 'technician' and 'technologist' lack clarity. The distinctions in competence and qualifications that professional associations intend by these occupational terms does not conform to the way that industry uses the terms. Many employers use the terms 'technician' and 'technologist' interchangeably. In other words, for many employers the two terms are equivalent. Other employers use the terms to connote distinctions in job responsibilities, but these distinctions do not necessarily accord with the distinctions in competence and qualifications that the professional associations intend. In some provinces, the qualification norm is a two-year college program in technology. In other provinces, there are both two-year and three-year programs. And finally, to complicate matters, some provinces are debating whether to phase out their two-year program. All of the professional associations certify both technicians and technologists, except Quebec, which certifies only technologists.

Promoting adoption of voluntary certifications is itself a difficult challenge. The desire to certify two distinct levels of competence is understandable. The question that professional associations must ask themselves, however, is whether it is practical to promote two levels of voluntary certification when industry practice and industry nomenclature are so often inconsistent with certification standards.

The second policy issue which makes it more challenging to promote employer adoption of certification standards is the multiplicity of designations. For the *Survey of Engineers and Engineering Technicians and Technologists* we identified a veritable welter of designations – 7 for technologists and 3 for technicians. About 4% of certified respondents in the survey held more than one designation. The problem of simplifying the designation structure has been discussed by the Canadian Council of Technicians and Technologists. Recent amendments to the federal-provincial *Agreement on Internal Trade (AIT)* may make it more urgent to resolve this problem. The amendments to the *AIT* are intended to eliminate, or radically reduce, the remaining barriers to inter-provincial mobility in Canada. As voluntary certifications, the engineering technology certifications are not the primary focus of the *AIT* amendments. However, the *AIT* will increasingly bring all professional designations under scrutiny. Employers, as well as technicians and technologists, will rightly ask why there are no nationally accepted designations.

Engineers

A comparison of *Census* data with registration data indicates that around 30% of persons working in engineering occupations are neither licensed nor registered as interns. Some of these individuals may be working under the supervision of a qualified professional engineer. Others may be working under permitted exemptions, such as Ontario's 'industrial exemption'. Nevertheless, the 30% proportion is too high; it is inconsistent with the philosophy of professional regulation.

Over the coming years, all regions of Canada will see major investments in infrastructure. As well, globalization will make the maintenance of high professional standards even more important than it already is. These are appropriate circumstances for those jurisdictions that have not updated their regulatory statutes to consider doing so. Three issues are of central importance. The first of these is the definition of engineering, which should explicitly take account of the importance of IT systems and of emerging fields, like bio-engineering. The second issue of importance is the offshoring of engineering work and the implications for employer liability when that work is relied upon in Canada. Until recently, offshoring was a relatively modest phenomenon. That is changing rapidly. The regulatory system should not lag behind this important change in business practice. And finally, exemptions from compulsory licensing, whether of individuals or engineering practices, also should be re-examined to determine whether they are still appropriate. In particular, the continuing appropriateness of Ontario's 'industrial exemption' needs to be re-considered.

Recommendation No. 1

The engineering associations/ordre should consider whether the current circumstances make it timely to update their engineering statute particularly, but not solely, in regard to (1) expanding and making more current the scope of regulated practice, with particular reference to IT systems and bio-engineering, (2) clarifying employer responsibilities and liabilities, especially in regard to off-shored engineering work, and (3) eliminating or narrowing exemptions from compulsory licensure.

Data from the 2006 *Census* suggest that somewhere between 55% and 75% of university engineering graduates are *not* working in engineering jobs. The estimate depends on how 'engineering jobs' are defined. Even the most inclusive definition, however, implies that the majority of engineering graduates are working in non-engineering occupations. This trend poses two challenges. Many engineering graduates continue to identify with the engineering profession, notwithstanding that their current employment is not in an engineering field. Overall support for professional values would be enhanced if these individuals were able to maintain a formal link to the engineering profession. Addressing this gap would also contribute to meeting a second challenge. The demand for engineering professionals is strongly cyclical, owing to the importance of capital spending as a demand driver. Given this, it is inevitable that some individuals will move out of engineering jobs when capital spending turns down. When the cycle reverses, some of these individuals return to engineering work. This movement in and out of engineering work could weaken the system of licensure, if individuals drop their registration when they move out of engineering work and do not become re-licensed when they return to engineering work. It is much easier to ensure that individuals maintain their professional registration if it is never fully abandoned in the first place. A system which allowed qualified individuals to have non-practising

status when they are in non-engineering occupations would enable engineering graduates to retain their professional affiliation and also would make it more likely that these individuals would seek full licensure status when they return to engineering work.

Recommendation No. 2

The engineering associations/ordre should consider options for allowing qualified individuals who are not working in engineering to hold a non-practising registration which they could subsequently seek to have upgraded to full licensure when they are doing engineering work.

While the system of professional licensure is robust, there is evidence of weakness in some areas. As noted earlier, smaller employers and employers in the manufacturing sector evidence somewhat weaker support for licensure. As well, the immigration into Canada of international engineering graduates will continue to alter the composition of the engineering work force. While immigration numbers have come down from the peak in 2001 and 2002, they are still substantially higher than in the early 1990s. Both the *Census* and the *Survey of Engineers and Engineering Technicians and Technologists* also show that many of these individuals have graduate degrees in engineering. Both the evidence of some weakness in employer support for licensure and trends in immigration suggest that the profession might benefit from a rigorous marketing study that identifies the perceived strengths and weaknesses of the system of professional licensure. Such a study might also provide greater insight into how engineering careers are perceived.

Recommendation No. 3

Engineers Canada, in collaboration with the professional associations/ordre should consider undertaking a marketing study as part of a process to develop a strategy for promoting licensure to engineering employers and to all engineering graduates, including international graduates. This study might also consider how engineering careers are perceived.

Technicians and Technologists

In the previous section, it was estimated that, around 17-20% of engineering technicians and technologists are certified. Clearly the greatest challenges facing engineering technology professionals is to achieve increased employer support for the system of certification and to foster greater support for that system among persons currently employed in engineering technology jobs. Two policy obstacles impede the achievement of these goals.

The first policy issue that needs to be addressed is the ambiguity that surrounds the terms 'technician' and 'technologist'. It is always challenging to promote and maintain a system of voluntary certification. It is doubly challenging when the occupational terminology used by the certification system is 'out of sync' with industry practice. The Canadian Council of Technicians and Technologists and the provincial associations/ordre need to review the viability of two distinct levels of certification. In the long run, a system of voluntary certification cannot operate at odds with industry practice. Either industry practice will have to be brought into line with certification standards or certification standards will have to reflect industry practice.

Recommendation No. 4

The Canadian Council of Technicians and Technologists and the provincial associations/ ordre should systematically review the viability of continuing to certify two distinct levels of technical competence, namely 'technicians' and 'technologists'.

The second policy issue of importance is the system of designations. A system of voluntary certification requires simplicity. The current system of professional designations for engineering technicians and technologists is anything but simple. There are too many designations applicable to essentially the same competencies - 7 designations for technologists and 3 for technicians. Employers, as well as technicians and technologists, can rightly ask why there are no nationally accepted designations. The recent amendments to the federal-provincial *Agreement on Internal Trade (AIT)* should be an impetus to resolving this problem.

Recommendation No. 5

In light of recent amendments to the federal-provincial Agreement on Internal Trade, the Canadian Council of Technicians and Technologists and the associations/ordre certifying technicians and technologists should make it a priority to create a simplified, national structure for the certification of technology professionals. The engineering profession is a relevant comparator. In engineering, there is only one professional designation in English (P Eng) and an equivalent designation (ing.) in Quebec.

Any system of voluntary certification is vulnerable to changes in employer and individual sentiment. It is important, therefore, for the Canadian Council of Technicians and Technologists and the associations/ ordre to carefully monitor employer attitudes towards certification, especially among the large organizations that employ the preponderance of engineering technicians and technologists. A consistent methodology would flag changes in employer sentiment in a timely manner that would allow professional associations to respond. Marketing certification to individual technicians and technologists is also an important challenge. Survey data show considerably different attitudes towards certification based on technical field. Among technicians, the under-35 age group appears to be somewhat less supportive of certification.

Recommendation No. 6

After reviewing the viability of two levels of certification (i.e., for technicians and for technologists) and professional designations and addressing the need for a simplified national system of designations, Canadian Council of Technicians and Technologists (CCTT) and the associations/ordre that certify technicians and technologists should develop a consistent methodology to track employer attitudes toward certification. CCTT and the associations/ordre should also consider a marketing study as part of a process to develop a strategy for promoting professional standards and professional certification to employers and to qualified technology professionals.

Appendix A
Methodology

Employer Survey:

The *2007 Engineering and Technology Employer Survey* was a web-based survey of engineering and technology intensive employers. The survey was conducted in 2007 and early 2008. A total of 701 valid responses were received. Of these respondents, 339 (48%) conducted operations in more than one province, at the time of the survey. In total, the respondents reported that they employed 23,367 engineers, 10,285 technologists, and 8,276 technicians. Based on the 2006 *Census*, the respondents to the survey accounted for approximately 11.6% of the total estimated employment of engineers and 7.1% of technicians and technologists.

More detailed information on the survey sample is available in the report, *2007 Engineering and Technology Employer Survey*, which is available on the Engineering and Technology Labour Market Study website: http://www.engineerscanada.ca/etlms/index.cfm

Employee Survey:

The *Survey of Engineers and Engineering Technicians and Technologists* was conducted throughout 2008. A total of 15,585 persons participated in the survey. These comprised 8,700 respondents with an undergraduate degree in engineering (earned either in Canada or abroad), 5,809 persons with a Canadian or external college qualification (and no university qualification), 490 persons with a university science degree (and no other qualification), 547 persons with a graduate degree in engineering (but who did not report an undergraduate degree[5]), and 312 persons whose qualifications could not be determined. Approximately 85% of the survey respondents reported that they were working in engineering or technology when they completed the survey. The regional, gender and age distribution of respondents approximates the *Census* distribution. Among respondents with an undergraduate degree in engineering, 87.9% were either licensed or registered with their professional association as engineers-in-training. Among respondents with a college qualification in technology, 62% held a technologist or technician certification.

More detailed information on the survey sample is available in the report, *Survey of Engineers and Engineering Technicians and Technologists*, which is available on the Engineering and Technology Labour Market Study website: http://www.engineerscanada.ca/etlms/index.cfm

Executive Interviews:

Figure No. 15 summarizes the regional and industry distribution of the executive interviews. Persons interviewed were generally chief engineers, chief technology officers, CEO's or directors of human resources. The interviews were conducted in the spring and summer of 2008.

5 The respondents who reported a graduate qualification in engineering, but no undergraduate degree probably reported only their highest degree.

Figure No. 15
Regional and Industry Distribution of Executive Interviews

	Consulting	Manufacturing	Government	Oil & Gas	Other	Total
Atlantic	2		2		3	7
Quebec	5	2	1			8
Ontario	4	1	2		1	8
Manitoba – Saskatchewan	1	2	3			6
Alberta	2		1	3	1	7
British Columbia	2	1	1		1	5
Total	**16**	**6**	**10**	**3**	**6**	**41**

The interview protocol is reproduced at the end of this appendix.

Executive Interview Outline

1. What are your firm's policies regarding continuing professional development for engineers, technologists and technicians? Do you have a budget allocation for continuing professional development? Do you have a benchmark in terms of the number of days allowed for continuing professional development? Does your company maintain records on the continuing professional development of its engineering and technology employees? Do requirements by professional associations for continuing professional development affect your company/organization's policies or practices?

2. Do your engineers or technicians/technologists tend to belong to *professional* associations (i.e., the provincial and territorial associations that undertake licensure of engineers or certification of technicians/technologists)? Are there any advantages to you, as an employer, that you associate with your engineers or technicians/technologists having membership in professional associations (e.g., differences in professional attitudes, differences in involvement in continuing professional development, etc.)? Does your company subsidize membership fees, sponsor association activities, or subsidize attendance at association conferences, seminars, etc.?

3. Do your engineers or technologists tend to belong to *technical* associations? (e.g., Canadian Society for Civil Engineering, Canadian Society for Chemical Engineering, Institute of Electrical and Electronics Engineers – IEEE, etc.)? If so, does your company subsidize membership fees, sponsor association activities, or subsidize attendance at association conferences, seminars, etc.?

4. What channels does your company rely on for continuing professional development for engineering and technology employees? (e.g., University-based professional development centres, colleges, private seminars, technical associations, in-house seminars, etc.). Does your company/ organization have a preference for any particular channel?

5. Are there any broad trends that you observe in terms of the strengths or weaknesses of the skills of recent graduates? - technical skills, non-technical skills?

6. Should participation in continuing professional development be a requirement for renewal of an engineer's professional license? for renewal of a technologist's or technician's certification? (Note: this is a requirement in some provinces.)

7. In terms of supporting the cost of continuing professional development, where do you see the balance across individual responsibility, employer responsibility, and government support (through the tax system)?

8. In your experience, have there been any trends in shifting responsibilities between engineers and technologists? between technologists and technicians? between technologists and technicians, on the one hand, and tradespersons on the other? If so, what is behind these changes? (e.g., cost pressures, differences in training, internationally trained professionals who are educated as technologists, but employed as technicians)

9. Do you see any implications of these shifting responsibilities for the system licensing engineers or certifying technicians or technologists?

10. What is your company's policy towards professional licensure for engineers and professional certification for technologists and technicians? Do you provide financial support for annual registration or membership fees?

- If policy is to require licensure and certification: what are the main reasons that you require licensure and certification?
- If policy is to prefer licensure and certification: what are the main reasons that you encourage licensure and certification? Why do you opt for a policy of encouraging, rather than requiring?
- If policy is mixed, i.e., require for some employees, but not for all: what factors determine where you draw the line between requiring licensure or certification vs. not requiring?
- If policy is non-supportive: why does your company not see value in licensure or certification?
- Have there been any changes in your company's policy or attitude towards licensure or certification? If so, what was behind these changes?

Appendix B:
Steering Committee Members

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
Engineers Canada

Manjeet Dhiman
ACCES Employment Services

Brian George
Northwest Territories and Nunavut Association of Professional Engineers, Geoscientists

Stephen Gould
Canadian Council of Technicians and Technologists

Kevin Hodgins
Northwest Territories and Nunavut Association of Professional Engineers, Geoscientists

Cheryl Jensen
Mohawk College

Ellie Khaksar
Diversity Integration and Retention Services Inc.

Lise Lauzon
Réseau des ingénieurs du Québec

Edward Leslie
New Brunswick Society of Certified Engineering Technicians and Technologists

Andrew McLeod
Engineers and Geoscientists New Brunswick

Perry Nelson
The Association of Science and Engineering Technology Professionals of Alberta

Robert Okabe
City of Winnipeg

D'Arcy Phillips
Manitoba Aerospace

Pat Quinn
Professional Engineers Ontario

Colette Rivet
BioTalent Canada

Tom Roemer
Camosun College

Kyle Ruttan
Canadian Federation of Engineering Students

Deborah Shaman
Human Resources and Skills Development Canada

Len Shrimpton
Association of Professional Engineers, Geologists and Geophysicists of Alberta

Andrew Steeves
ADI Ltd.

Al Stewart
Royal Military College of Canada

Richard Tachuk
Electric Strategies Inc.

Jean-Pierre Trudeau
Ordre des ingénieurs du Québec

Gina van den Burg
Ontario Society of Professional Engineers

Deborah Wolfe
Engineers Canada

Bruce Wornell
Engineers Nova Scotia

Yaroslav Zajac
Canadian Council of Technicians and Technologists