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Engineering Education in New Zealand – Supply and Demand

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Demand

Engineering skills are vital in any economy. The primary and traditional role of engineers was to provide underpinning infrastructure for a nation – mainly by acting as the investment agents for large amounts of public sector capital in water, roads, waste, energy and communication systems. As an economy increases in sophistication the demand for engineers in secondary and service industries grows. Whereas developing countries might have one-third of their total tertiary graduates in engineering, with a high emphasis on infrastructural engineering, as an economy develops the proportion drops to a typical level of about 12 to 16 per cent across the OECD.

New Zealand has a particularly difficult geography for providing infrastructure, including long distances that separate a distributed population. It also faces unique geophysical and climatic hazards, has a growing elaborately-transformed manufacturing and professional services industry base, and has a highly mechanised primary sector. Therefore there is no reason to suggest that New Zealand's demand for engineering graduates would be lower than the OECD norm. However, as Figures 1 and 2 show, at all tertiary education levels we seem to produce too few graduates.

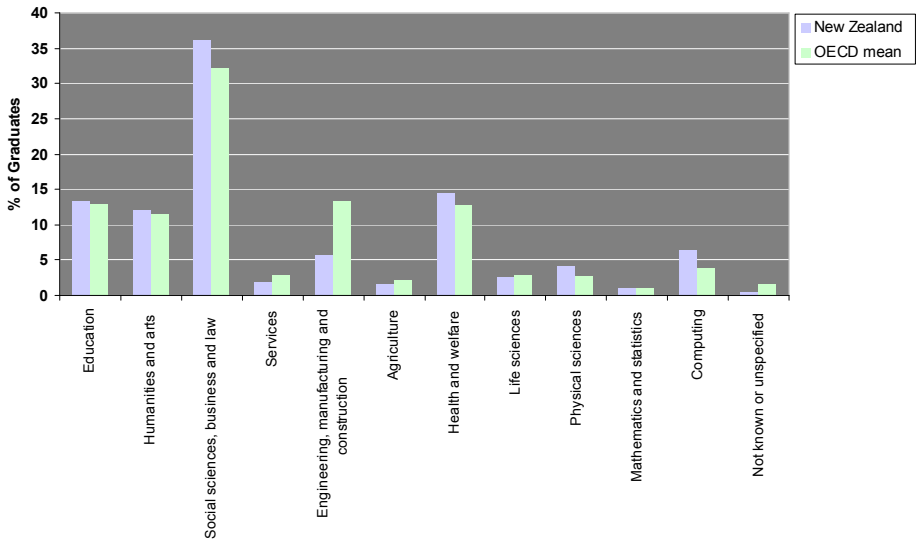

Figure 1: Comparison of graduates of Type A qualifications in New Zealand with the OCED mean by field of study (2002). (Type A qualifications are typically Bachelors degree or above.) *Source: OECD*

As participation in tertiary education as a whole grew over the last decade, the absolute numbers of engineering graduates remained relatively static at Bachelors level, and

declined at sub-degree level. By 2002 New Zealand dropped to less than half the OECD norm. Since 2002 participation in ICT tertiary education has dropped in New Zealand to well below the OECD norm, but for the engineering classification there has been little change except some improvement at trades level.

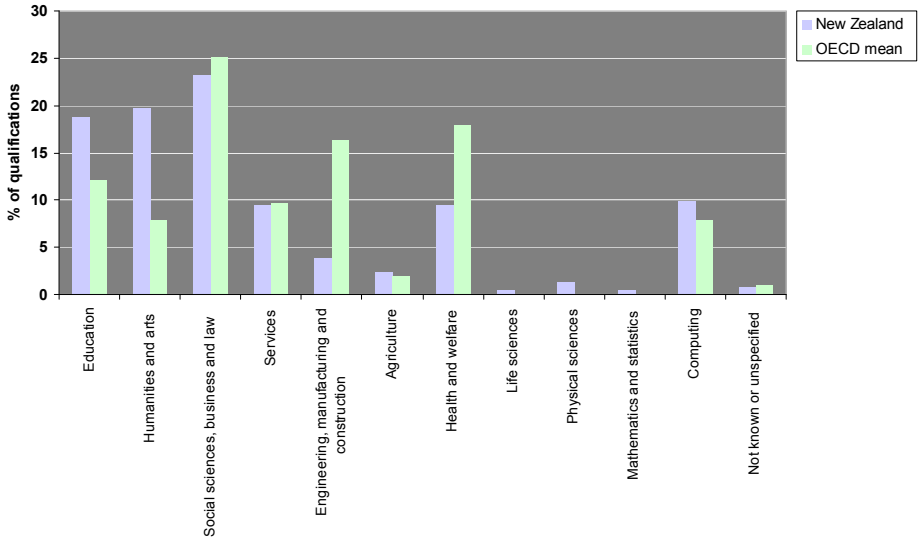

Figure 2: Comparison of graduates of Type B qualifications in New Zealand with the OECD mean by field of study (2002). (Type B qualifications are typically sub-degree.) *Source: OECD*

In 2007, the employment market for engineering graduates shows supply shortages, with rises in salaries, and far fewer engineers entering non-classical employment than is the norm elsewhere (as the supply of engineers grows, more enter diverse employment roles in which they apply an engineering mindset to other activities). Many New Zealand companies are actively recruiting in other countries because they cannot find the graduates they need locally. Graduate demand in higher-waged economies is going to continue international shortages for good quality engineers so reliance on inwards migration is dangerous. New Zealand has little choice but to produce more of its own.

In order to align with the OECD norm, IPENZ estimates that the reasonable annual needs for engineering graduates are approximately:

Professional level (four-year BE or higher)	1,500-2,500
Engineering technologist (three-year BEngTech)	500-1,000
Engineering technician (two-year Dip Eng)	500-1,000

These estimates are about double the present levels of graduation. In addition, there needs to be a considerable boost in ICT-related education, particularly in fields of study where engineering and information sciences converge.

Engineering Schools

As a long-standing accreditation agency, IPENZ has developed a view that, to reach a suitable critical mass, professional engineering schools must produce a minimum of 100 to 150 graduates per year from a set of inter-related disciplines, conventionally at a single physical location. This numerical guideline is derived from the Institution's

consideration of accreditation outcomes over the last decade, which show that meeting and maintaining the required standard is almost invariably difficult if student numbers are low. For wide-ranging disciplines the critical mass is even larger. For BEngTech degrees, a smaller scale is possible, particularly if the provider offers engineering trades, diplomas and degrees in a "pyramid" arrangement whereby the degree offered is supported by a substantial base of lower level qualifications. A distributed network of provision is needed for engineering diplomas.

Taking the population distribution of the country into account, and the need for engineers across a range of disciplines, IPENZ considers that three strands of engineering education will best achieve the required outcomes at Level 6 and above on the National Qualifications Framework.

1. A modest number of campuses (perhaps four to seven) delivering professional engineering programmes with student numbers well above the critical mass threshold. These campuses should cover the main population centres in the South Island, lower North Island, Waikato/Bay of Plenty and two or three Auckland locations. Of these, no more than two or possibly three need to consider large-scale infrastructural engineering (civil, heavy electrical), and the other campuses should focus on secondary and tertiary industry applications (mechanical, electrical, process). With less than 1,500 graduates per year, seven schools would mean that one or two do not have the critical mass to continue reliably high-quality provision. Professional engineering degrees require strong links to research so it should be the norm for such programmes to be provided by universities.
2. A modest number of providers of BEngTech degrees (perhaps four to seven), with most delivering programmes in disciplines focused towards secondary and tertiary industry (mechanical, electrical, process), and perhaps one or two providing infrastructural (civil) engineering programmes. These degrees do not require strong links to research so providers in the polytechnic sector are expected to be dominant. Providers would be most likely to be located in main centres, and heavily involved in engineering diplomas and trades as well.
3. A network of provision for engineering diplomas within the polytechnic sector whereby a range of narrow specialisations is available within broad discipline-based "National" diplomas in civil, mechanical, electrical, computer and perhaps process engineering. For each specialisation (for example, instrumentation might be seen as a specialisation within electrical), only one polytechnic would take the lead nationally in providing higher level courses, while contributing courses at lower levels could be studied at a number of polytechnics, including those outside the main centres. Thus, standardised courses in physics, maths, mechanical, electrical, civil and process engineering principles might be offered at a number of locations.

Background to IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national professional body representing the engineering profession in New Zealand. It has approximately 10,000 Members, including a cross-section from engineering students to practising engineers to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.