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Australia

Submission

The shortage of engineering and related employment skills

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INTRODUCTION

The Institute of Public Works Engineering Australia (IPWEA) is a not for profit, membership based, professional organisation representing engineers and others involved in the provision of public works and services predominantly in the local government sphere. It conducts a National office and State Divisions.

This submission is authored by the NSW Division.

Infrastructure provided by all levels of Governments plays a critical and fundamental role in ensuring economic activity is supported and growth can occur. Delaying infrastructure improvements (or even basic maintenance) impacts on economic sustainability (often seen as confidence in a location), transport (movement of people and freight) and impacts on the cost of living for our communities (electricity, water, sewerage, transport, etc).

Engineers, a part of a broader team, play key roles in infrastructure development, design, construction, operation and maintenance. These engineering roles underpin nearly every aspect of life nowadays (as the disciplines in engineering are broad and cover a very wide range of industries)

Engineers develop an understanding of systems, safety and performance requirements, and optimising delivery to meet service requirements. Without the safeguards inherent in an engineered solution, infrastructure performance would be haphazard, dangerous and much more costly.

To maintain the communities lifestyle's and sustain our standard of living, sufficient engineering skills need to be brought to bear - sufficient engineering knowledge is required to be part of decision making processes, so at least, the results of decision-making are understood and the ramifications planned for.

"That is why the Government has placed its support behind the important work of the Australian National Engineering Taskforce (ANET), which brings together industry, the education sector and engineering peak bodies to preserve and expand our nation's engineering skills base."
The Hon Julia Gillard, MP Prime Minister [i]

TERMS OF REFERENCE

This submission only addresses the following Terms of Reference

The nexus between the demand for infrastructure delivery and the shortage of appropriate engineering and related employment skills in Australia, with particular reference to:

(c) options to address the skill shortage for engineers and related trades, and the effectiveness and efficiency of relevant policies, both past and present;

(e) effective strategies to develop and retain engineering talent in the private and public sectors through industry training and development, at enterprise, project and whole-of sector levels;

(f) opportunities to provide incentives to the private sector through the procurement process to undertake skills development;

(i) other related matters.

BACKGROUND

Skills shortage in engineering is real

In 2010, skills shortages in engineering have been highlighted as a key constraint on a resources-led economic recovery, with the National Resources Sector Employment Taskforce hearing industry's concerns of a major labour market shortfall.

Skills Australia has also designated engineering as a skillset requiring structured workforce development interventions to ensure that community need is met, particularly around climate change infrastructure adaptation.

Engineers are globally in short supply, with Australian higher education providers producing only around half of the graduates needed to fill domestic demand, and in this environment systemic cultural issues, low numbers of women in education and in the workforce and an aging workforce have produced widespread issues with retention and sustainability.

The problem is not just qualified engineers but those generally involved in civil construction and infrastructure renewal.

The Skills DMC and Civil Contractors Federation Occupation Review Report March 2010[ii] clearly shows the huge deficit in semi qualified or qualified supervisors and operators.

The industry survey provides information that highlights the widespread recruitment difficulties facing employers in civil construction, with skill shortages for some occupations. In particular, the survey provides data on current (unfilled) vacancies, expected vacancies at end 2012 and the percentage of vacancies filled in recent recruiting.

Issues identified included

– difficulty in securing workers willing to work in remote areas
– lack of available skilled operators and supervisors

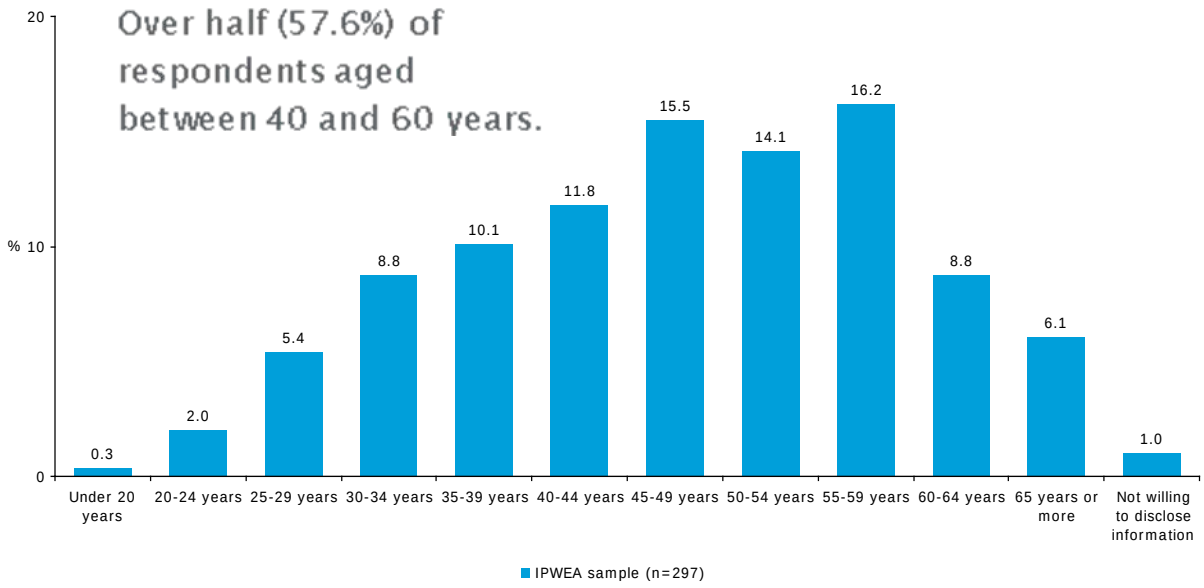
New and Additional Workers to 2012 in Priority Occupations

The table below provides an indication of the new and additional workers required in priority occupations to 2012

Priority Occupation	Total New and additional Workers required to 2012
Leaders & Supervisors	**8,478**
Bridge Constructors	**1,413**
Pipe Layers	**2,862**
Plant Operator	**8,080**
Road Constructor	**7,572**

WHAT IS THE PROBLEM

The annual Beaton Survey[iii] of our own membership shows clearly the age of engineers and the need to address the ever aging workforce.



This is backed up by the Clarius Skills Index September 2011 quarter[iv] which states "Engineering is another sector that will be hit by skills shortages, with 18 per cent of those employed now just a few years from retirement."

WHAT IS BEING DONE TO ADDRESS THE PROBLEM

There are a myriad of organisations, industry groups, individual employers all seeking short term and long term solutions.

Each have unique criteria, demands and objectives, not always complimentary.

The problem can be summarised by...

- Not enough students in years 10 to 12 studying subjects deemed suited towards engineering studies
- Engineering students not completing their tertiary studies.
- Students in hot demand and the two speed economy (resource sector very needy for graduates).
- A lack of cohesion between universities and TAFE's students can't articulate easily from one course to another.

- International graduates not necessarily trained to the same level of competency or aware of Australian Standards and lack real life experience in Australian Conditions
- Difficult to undertake part time or distance education
- Lack of uniform registration across states and differing regulations
- Lack of recognition by employers of the specialised skill set, training and importance of engineers. (some employers have simply given up employing engineers at huge risk to the community)

WHAT STILL NEEDS TO BE DONE

There needs to be considerable effort in three key areas to assist in addressing the problem long term.

1. Attracting students to study engineering.
    a. Encouragement of the study of high level Maths and Science in senior years at secondary school
    b. The IPWEA supported "Build a Bridge" program, is a great local initiative that encourages local students to consider engineering through a three day live in real life engineering challenge. Run successfully for 5 years in the Riverina NSW region, local government now has employed engineers who started through the build a bridge program. This is a program that could be expanded nationally especially in regional areas with financial support, offering exposure to year 10 and 11 students across all regions of Australia, metropolitan and regional, providing support material to school careers advisors, marketing and promotion in addition to running the program continually. Estimated cost $ 2.5 million per annum.

        A detailed presentation on this program can be made to the Senate.
    c. The IPWEA supported University of New England Women in Engineering promotion is another local initiative. UNE – in collaboration with the Roads & Maritime Services (formerly RTA), Institute of Public Works Engineering Australia (IPWEA), the Women in Engineering group within Engineers Australia, Armidale Dumaresq Council and local professional organisations and employers – is working to attract more women students into engineering. UNE is aiming to boost

the percentage of women in its Bachelor of Engineering Technology degree program from the current 8% to 20% by 2013. The Women in Engineering Weekend was designed to demonstrate to the participants the value and attractiveness of engineering as a career choice for women and the written feedback from the girls showed this worked. Again this is an initiative that should be encouraged across all universities.

d. A greater awareness by School Career advisors and teachers generally of the career path and opportunities in Engineering, and the need to select the right subjects at school, not simply aim for the soft easy to achieve a high score subjects. This would involve an industry specific approach highlighting both the areas of civil engineering and local government/ public infrastructure as long term attractive career opportunities, development of uniform resources, an education and communication strategy.

2. A review of current practises in Education and Training

a. A uniform and clear articulation between TAFE and University qualifications. Currently there are no clear or very restrictive pathways from diploma level to degree level for engineers to gain formal qualifications and recognition. A simple progression from Certificate, through Diploma through to Degree, Graduate Diploma and Masters, involving cooperation between the VET sector , TAFE , and University would greatly assist in training of potential engineers, especially those supervisors etc who already work in the industry.

The ANET Review "Pathways from VET Awards to Engineering Degrees: a higher education perspective" 7th April 2011 [v]concluded:

"This review of the provision and operation of pathways from VET qualifications into engineering degrees has reported from a higher education perspective. The engineering degree programs are taken to be the 'target' for articulating students. The prime VET qualifications programs of interest, as the source qualification for articulating students, are the Diplomas and Associate Diplomas, formulated as competency-based national Training Package qualifications or institutionally developed Accredited Courses.

The recent growth of Associate Degrees (as curriculum-based higher education qualifications that may be offered by both VET institutions and universities, and mostly aimed at supporting their graduates to articulate into degrees) has added a new dimension into the qualification and articulation picture for engineering. These programs appear to be displacing the provision (and take-up) of Advanced Diplomas and Diplomas that had a prime focus on occupational outcomes at the paraprofessional level.

The number of graduates from Advanced Diplomas across the engineering disciplines seems barely adequate to satisfy both occupational employment demands and a growing cohort of students that aspire to articulate into engineering degrees.

Incorporating the findings of prior work by the authors and others, the study has reported on examples of good practice in operating pathways between the sectors, and made recommendations to share best practice in key areas, including the assessment of credit transfer more efficiently. Not surprisingly, the dual-sector providers in Victoria provide most of the examples of effective pathway operation. Their key operational features could, however, be emulated in jurisdictions without dual-sector institutions.

The evidence is that the rate of progression and success of VET-qualified entrants in their degree studies is poor, and that the engineering schools in the higher education could take measures to improve both their programs and academic support to increase these students' graduation rates. Accordingly, recommendations to progress these measures are made, noting that such actions would be likely to benefit all degree students, and increase the overall graduation rates.

A possible mechanism for strengthening articulation pathways, and enhancing the attrition rates of articulating students, would be to develop some Level 5 and Level 6 qualifications to be a blend of VET competency-based course and HE curriculum based courses. RMIT uses this approach in its AQF Level 6 engineering programs.
The premise underlying this study is that the number of engineering degree graduates can be increased significantly by improving the provision of pathways from VET qualifications.

The conclusion from the data and evidence examined is that such growth is most likely to arise from Associate Degree pathways operated by both VET and HEd institutions, rather than from the competency-based Diplomas and Advanced Diplomas.

Assuming that the latter qualifications are well directed to industries' needs, every effort should be taken to increase their enrolments, along with those in Associate Degrees. Broad and informed industry, education and professional perspectives need to be developed on the focus and additional support of all such programs, if Australia is to provide the desired balance of engineering qualified professionals and paraprofessionals".

b. Tertiary education embracing the needs of regional students with attention to part time study, traineeships and mentoring. All evidence and testimony from Regional engineers highlights the challenges facing regional students.

   Taken from the IPWEA Discussion forum on Skills Shortage[vi]

   Distance education is a very flexible method of studying engineering and would certainly suit those regional Council's who are looking to put on Cadets/ Trainees and employ them full time. I completed my undergrad through the USQ distance education program and found it very rewarding.

   With regards to the increased duration of the course when studying part way a well structured course program can be completed in 5.5 - 6 years if taking 2

courses a semester including summer session. This would require a degree of negotiation with the uni to ensure they are running the correct courses over summer but if the demand is there I'm sure they will be accommodating.

Although this would not appeal to all people the point is there is flexibility to study who and when you want. The great benefit of studying this way is that the study you are doing relates to your work and you are gaining experience in the industry at the same time. Contrast the full time graduate with 2 years experience versus the distance education graduate with 6 years and tell me which one you'd rather employ.

I can accept of course that distance education doesn't suit everyone and I think that however people want to study the key is to make the university courses as flexible as possible.

In relation to addressing the skills shortage I agree with Wayne that we need to be targeting the high school students and trying to generate interest at that level. You really do need to make a memorable impression though and care should be taken not bore the kids otherwise you'll potentially have the opposite effect and deter rather than entice. It's also worth mentioning that we need to be targeting the kids in year 9 - 10 to get them thinking about subject choices for year 11. The hard thing is that at that age most kids don't know what they want to do (I know I certainly didn't).

Lastly something that has come to my attention and I've been working on over the last few months is that there is a surplus demand of graduates or near graduates from the city universities (specifically Sydney uni's) looking to complete their industry experience. I think there is a opportunity here for regional Council's to market themselves to these graduates, get them out, show them what regional Council's do and hopefully retain a few of them. We have had a number of students come through here who have gotten a lot out of this and hadn't previously considered careers outside of the city. What I would like to see is neighbouring Council's getting together and each taking on a number of students, not only does this foster a regional approach is also provides a support network for the students.

Joshua Devitt
Project Engineer
Forbes Shire Council
FORBES NSW

Programs such as the IPWEA/ REROC's Build-A-Bridge, I feel are very important in introducing engineering to school age kids at a time when there is still room for them to choose their HSC subjects to suit engineering (3-unit maths, physics, chemistry and - if available - engineering studies).

The greatest hurdle for the regional and rural stakeholders (both LG and private) is that nearly all the universities that offer engineering are located in the cities or major centres like Newcastle and Wollongong. I had to finish my last year via distance and it was a killer; there is no way I would have managed to get through an entire degree by distance!

William Barton
Assistant Engineer
Junee Shire Council
JUNEE NSW

c. Encouragement of flexible learning, the reinstatement University of Technology Sydney Sandwich Course for example is a way in which employers can attract trainees and assist with training and real work experience, especially in regional areas.

d. Sharing of resources between TAFE Colleges and Universities, rather than competing. Currently individual TAFE's are competing with each other and this includes teaching resources. The same could be said for individual universities competing for students.

e. Development and funding of technical industry learning resources as currently being developed by organisations on a shoe string budget such as IPWEA NSW Timber Bridge Maintenance training resource for example. This involves considerable investment of limited resources by Non for Profit organisations such as IPWEA utilising voluntary members funds to invest in the future of their industry. Access to Government funds should be made more accessible.

f. Streamlining and making accessible programs such the Critical Skills Investment Fund. IPWEA NSW was a recipient of the Critical Skills Investment Fund which was far more beneficial to meeting the needs of Local Government than the successor, National Workforce Development Fund. Both Programs are very restrictive in their delivery; not catering to any Diploma level training as an example; and work under impossible deadlines. For example the actual

application process, once the Expression of Interest was approved in the CSIF process was only open for 2.5 weeks. Imagine seeking the written agreements of eleven Local Government General Manages, contracts signed, workforce plans submitted in that time frame? The Critical Skills Investment Fund is a good model that will suit the needs of Local Government and Civil Engineering. It needs to be revisited and expanded to allow a wider range of qualifications.

g. Investigation of a federally funded scheme attracting trainee engineers and Apprenticeships in civil construction supervision in the specialised local Government sector with long term training and financial support to Local Government.

3. A uniform Statutory National Registration of Professional Engineers consistent across all states.

   The peak bodies representing Australian professional engineers - Engineers Australia, Consult Australia, APESMA and IPWEA - believe that Australia should have nationally consistent State registration systems for professional engineers.

   Unlike a number of other important professions, registration is largely voluntary for engineers in Australia, and there are different regulatory requirements for engineers in each Australian jurisdiction.

   This situation adds to compliance costs for the profession and hinders mobility of trade, adding to skills shortages, and poses serious risks in relation to consumer protection and public safety. Engineering failures can be devastating and are almost always attributed to a lack of competency. Under the current ad hoc and voluntary system of registration, competency standards cannot be enforced. In addition, engineers and others claiming engineering expertise cannot be prevented from providing services even where there is evidence of misconduct or incompetence.

   The engineering profession encourages your Government to work with it on developing a nationally consistent, State based registration system for professional engineers, using COAG as the vehicle to pursue these reforms.

IPWEA NSW would welcome the opportunity to address the Senate Committee at the proposed hearings.

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[ii] Skills DMC and Civil Contractors Federation Occupation Review Report March 2010

[iii] 2010 Annual Business and Professions Study Beaton's Research and Consulting

[iv] http://www.clarius.com.au/news_centre/clarius_skills_index.aspx

[v] "Pathways from VET Awards to Engineering Degrees: a higher education perspective" 7th April 2011 ANET

[vi] http://ww.ipwea.org.au