

Introduction

The Australian National Engineering Taskforce (ANET) Engineers Survey was conducted over two weeks in late December 2009. The target group was selected as APESMA and Engineers Australia engineering members, other than retired engineers and student members. Emails were sent out to members by APESMA and Engineers Australia providing some information about ANET and inviting members to participate in the survey. The survey was hosted on the ANET website.

There is a well-recognised shortage of professional engineers in Australia. This is part of a global problem, with Australian projects competing internationally for the best skilled labour. The engineering capacity shortfall has had a range of negative outcomes across sectors, with industry sources reporting financial and opportunity loss due to inability to attract and retain engineering professionals. Professional engineers work across a wide range of essential industries, with strong competition between vital sectors for the best professional engineering expertise. They are a highly skilled and educated workforce with an excellent understanding of the role and value of their profession in the broader community.

The survey questions focussed on gauging engineers' experience of the engineering skills shortage at their workplace, the local and broader effects of any capability shortage, and the utilisation of their skills as professional engineers. Engineers work at the coalface, sometimes quite literally, and the survey results reveal that respondents had a first-rate understanding of the local and broader quality, cost and productivity effects that skills and capacity shortages continue to have on industry and the profession. Respondents came from across all industries, both public and private sector, and the results are indicative of a broad national trend.

Overwhelmingly, the results reveal that engineers have strong concerns about the impact of the skills shortage and first-hand experience of its effects. **60.6%** of respondents identified an engineering skills shortage in their work section. More than half of comments identified that a specific discipline or area is in short supply. **40.2%** of respondents felt that their organisation did not have the right skills mix to meet current or future needs. **54.3%** of respondents identified a loss of capability in their workplace. Comments revealed a high level of dissatisfaction with the lack of investment in their profession and the detrimental impacts on quality and productivity.

ANET is a coalition of APESMA, Engineers Australia, Consult Australia, the Deans of Engineering and the Academy of Technological Sciences and Engineering. ANET has been formed to investigate the national shortfall in engineering capacity and to work with the Federal Government and industry to formulate actions and policy recommendations to solve the problem with industry support, and will officially launch in March 2010. ANET is undertaking a programme of work to investigate and address labour supply issues in professional engineering. More information can be found at the ANET website, www.anet.org.au.

HEADLINE RESULTS

- **60.6%** of respondents identified an engineering skills shortage in their work section. More than half of comments identified that a specific discipline or area is in short supply.
- **40.2%** of respondents felt that their organisation did not have the right skills mix to meet current or future needs.
- **54.3%** of respondents identified a loss of capability in their workplace.
- Engineers identified a range of broader impacts of the underutilisation of their skills and capabilities in the workplace and organisation.
 - **34.3%** of commenters identified an impact on efficiency and effectiveness
 - **25%** identified an impact on productivity
 - **17.1%** identified a loss of organisational capability
- The majority of engineers felt that their employer supported them to exercise their full range of skills and capabilities. However, **28%** felt that their job had moved away from core engineering duties.

DEMOGRAPHICS

In total, the survey received **2392** responses, which was a substantially higher than expected rate of response given the time of year and length of the survey. Of these:

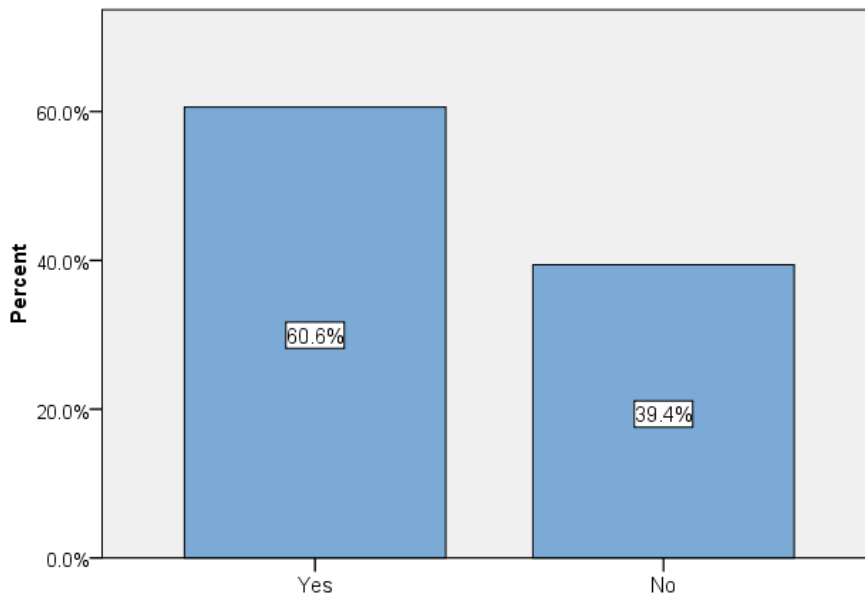
- 64.7% were private sector respondents
- More than half of responses came from the following industries¹:
 - Construction, Transport and Storage – 25.2%
 - Water, Gas and Electricity – 19.5%
 - Government administration and defence – 12.1%
- 80% of respondents had undertaken their engineering training in Australia; 65.6% held a bachelor degree as their highest qualification, 5.2% a graduate diploma, 16.8% a masters, and 4.4% a doctorate.
- The mean age of respondents was 44 years old, with a skew to older respondents (presumably mid and late career engineers); respondents had practiced as an engineer for an average of 20 years.
- Respondents had worked in their current role for a mean of 4 years.
- 20% of respondents had worked in a field outside of engineering in their career for an average of 5 and a half years, in a diverse range of roles and industries.
- 41.9% of respondents had worked overseas in their career;
- Almost half of respondents thought they may work overseas in the future.

¹ 18.6% of respondents identified as being in 'other' industries.

ENGINEERS COMMENTS: A SNAPSHOT

Engineers were asked a series of questions about their views on skills and capabilities at their workplace.

Q11 - IS THERE AN ENGINEERING SKILLS SHORTAGE IN YOUR WORK SECTION?



60.6% of respondents identified an engineering skills shortage in their work section. When asked about the impacts of this perceived skills shortage:

- More than half of commenters identified a specific discipline or area that was in short supply
- 17.3% identified a particular type of skill in shortage (project management, etc)
- 21.5% identified a particular skill level at their workplace in short supply (eg mid-level, senior engineer etc.)
- There were a range of identified effects around work delays, cost increases, productivity and staffing issues, work undertaken at higher levels, training and development.

In addition, **40.2%** of respondents felt that their organisation did not have the right skills mix to meet current or future needs. Engineers' comments revealed a level of dissatisfaction:

Respondent 249:

Over the last two years, our Engineering department has dropped from a peak of over 100 people to just 16. We have barely enough people to maintain existing product, without considering any new projects.

Respondent 34:

We have insufficient qualified people to make effective judgement calls regarding the expenditure of public money. We have a large number of partially qualified people doing the job of senior engineers.

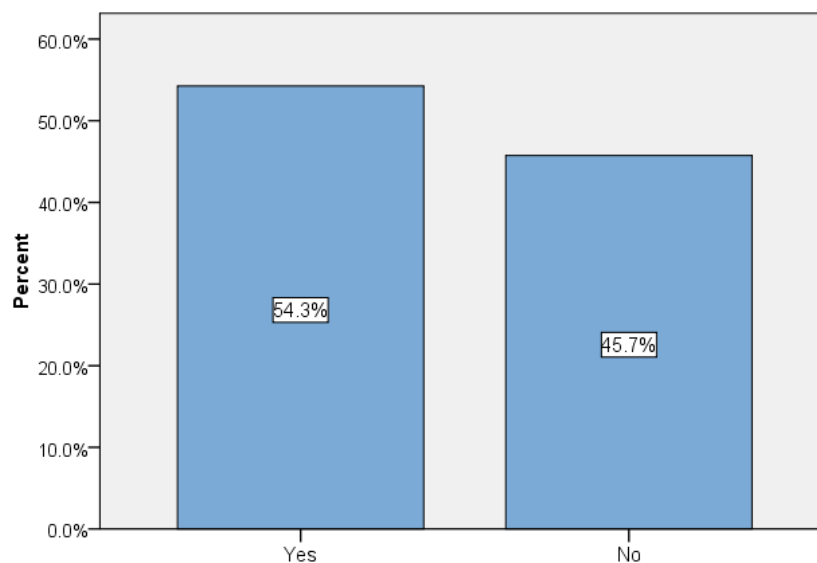
Respondent 2298:

There are a number of specialist vacancies that have been very difficult to fill, despite national and international searches - in some cases we have compromised by appointing relatively inexperienced engineers, with a view to an intensive skills development program. In the interim we have a greater reliance on consultants to fill the gap. Challenge will be to keep the employees once trained up, particularly given the market environment.

Respondent 610:

As a government department, we moved from having a large in-house engineering workforce, to outsourcing most functions. We are now largely an administrative/management agency. However with that outsourcing we lost a lot of institutional knowledge and capability. We struggle to remain an informed client and are desperately trying to build technical expertise in key areas that cannot be met through the private sector. The current situation is inadequate to meet current demands, let alone provide a sustainable model to meet future demands. The organisation has not successfully tackled the issue of attraction and retention of engineers and allied technical personnel.

Q12 - ARE YOU ABLE TO IDENTIFY A LOSS OF CAPABILITY IN YOUR WORKPLACE?



54.3% of respondents identified a loss of capability in their workplace.

- Half of commenters on this issue identified a particular area of lost capability or expertise.
- 30% indicated that they had experienced an increased workload or working hours.
- 17.4% indicated that this loss of capability had had an impact on project outcomes or the quality of work overall.
- Many commenters identified the ageing of their organisational workforce and a lack of skills transfer as a concern in loss of capability at their workplace.

Respondent 424:

My project has had many contract staff (PSPs) in the past and these contracts have not been renewed this year. As these staff were contracted to fill vacancies we couldn't fill with APS staff we are now having to find public servants again - but this is proving difficult. Recent co-ordinated government intervention in the Canberra labour market (Gershon Review) has improved the situation a bit but the level of skills and experience in new staff is still not high enough.

Respondent 510:

Technical expertise....the organisation is no longer an informed purchaser. My employer does not value my technical skills and capabilities. My employer (a State Government agency) is now an uninformed purchaser of engineering goods and services....this results in poor quality roads and bridges...which then impacts on road safety.

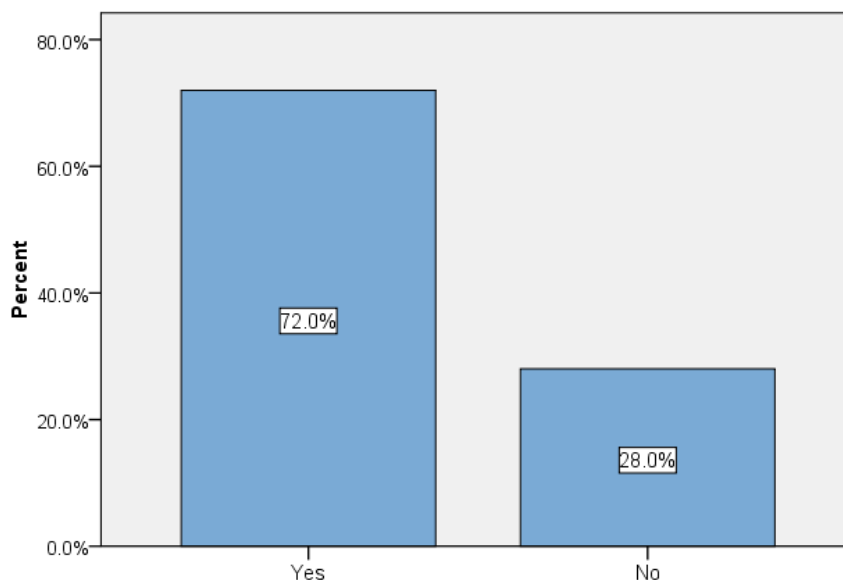
Respondent 1590:

The most highly skilled engineers in our organisation are all now in there 50s and will exit the workforce in the next 5 to 15 years. These are not being replaced due to a shortage of engineers in the market.

Respondent 68:

The few remaining knowledgeable and skilled engineers have to take on increasing responsibilities often resulting in single points of knowledge. No one to pass knowledge too as no succession planning exists. Severe loss of corporate knowledge is imminent as many engineers will retire in next 5 years.

13 - DOES YOUR CURRENT EMPLOYER SUPPORT YOU TO EXERCISE THE FULL RANGE OF SKILLS AND CAPABILITIES THAT YOU HAVE DEVELOPED AS A PROFESSIONAL ENGINEER?



The majority of engineers felt that their employer supported them to exercise their full range of skills and capabilities. However, **28%** felt that their job had moved away from core engineering duties. Of these:

- **34.4%** of comments identified general engineering and technical skills as being an area where they were least supported.
- **17.3%** identified management skills as being least supported
- **15.3%** identified design skills
- **14%** identified specialised areas of technical skill or expertise.

Sample comments included:

Respondent 226:

80% of my day would be nothing more than a trained clerk - paper shuffling - meetings about meetings etc. The technical input that I should be concentrating upon is deemed as secondary task - this does little in getting the metrics right.

Respondent 417:

Due to overall skill shortages and headcount imperatives, engineers are often required to undertake excessive administration/sub professional works duties.

Respondent 1049:

Each role is relatively specialised, and whilst you do utilise a wide range of skills, it is preferred that you build and maintain a particular capability, rather than having ten different capabilities. This is partly driven by clients, as they prefer engineers to be highly specialised (ie. experts) in one particular field/sector/capability, rather than continually jumping from one to another.

Respondent 859:

I have a feeling that some of the management at my current employer has little idea about what a professional engineer is.

Engineers identified a range of broader impacts of the underutilisation of their skills and capabilities in the workplace and organisation.

- **34.3%** identified an impact on efficiency and effectiveness
- **25%** identified an impact on productivity
- **17.1%** identified a loss of organisational capability
- **11%** identified an impact on cost and project delays
- **8.6%** identified a loss of morale or demotivation as a result.

Respondent 1263:

I think it impacts efficiency more so than anything because we are not able to produce the most efficient designs and concepts.

Respondent 2230:

Lack of experienced engineers with field (as opposed to design office) experience means a lot of designs tend to be impractical or blind to the difficulties of implementation. Too much emphasis is placed on academic excellence and not enough on common sense and the problems of implementation in the real world.

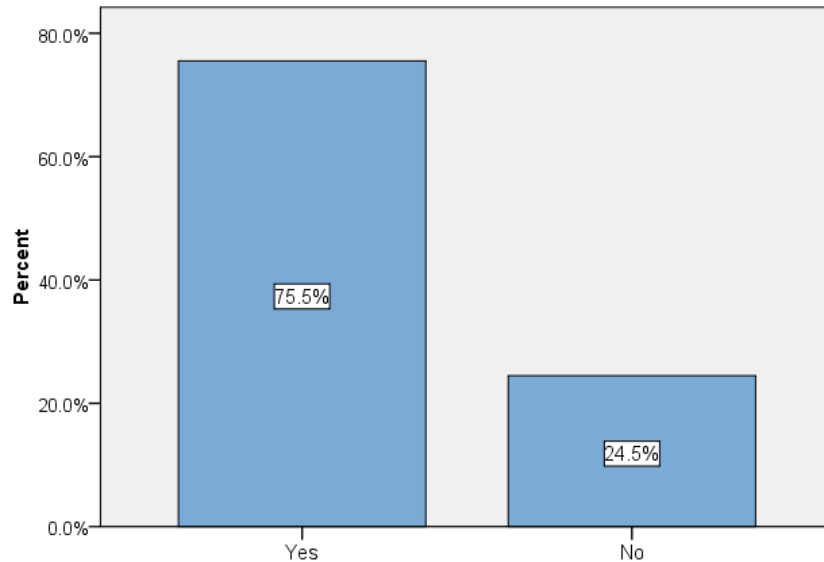
Respondent 377:

Once the remaining engineers with past design & planning experience retire, the organisation will need to use consultants - possibly using an engineer from a different consultant to manage the technical aspects of the consultancy. This arrangement leaves little residual experience in organisation.

Respondent 1959:

While most of my skills and capabilities are used, I would say that far too much of my time is committed to administrative work, rather than value-adding engineering work. Both organisations I have worked with in my career reduced administrative staff as a cost cutting measure, shifting the burden of administrative work onto specialist staff - without adequately recognising the reduction in productivity this brings. I'm sure my experience is not unique!

16 - IN YOUR CURRENT POSITION, HAVE YOU HAD PROFESSIONAL DEVELOPMENT OPPORTUNITIES OFFERED TO YOU?



Mostly, professional development was present in workplaces. Three quarters of engineers had had professional development opportunities offered to them in their current position. One quarter had not. Indicative comments from this group included:

Respondent 2007:

yes; however, these are not directed toward engineering skills; rather the development is typically directed at market improvements (management, contracts, leadership) and really fall short of true Engineering skill development. Are management classes and structural engineering classes equivalent? They are different degrees at universities and engineering is getting further lost in the real world.

Respondent 2065:

In the 16 years within the industry most of my employers have been reluctant to support professional development for individuals due to cost and the fear of losing staff once experience has been obtained. This culture must improve for the future generation of our professional engineers. They must be supported not only for their current role but the greater good of our community and the industry.

More than half of respondents indicated that graduates were well-supported to translate their degree into work-ready skills. Indicative comments included:

Respondent 21:

Very well. The company has a program to rotate engineers throughout different work groups to give them exposure and develop experience, and allow them to make a more informed decision regarding the specialist area they will go into.

Respondent 510:

Graduates are supported very well in my organisation but the pay that they receive is well below industry market rates and they eventually (after a year or so) leave for the private sector.

Respondent 984:

In my organisation this has improved greatly over the last few years. The need to replace the ageing engineering workforce and retain knowledge and skills has been recognised.

However, **30.2%** of respondents indicated that graduate support was patchy at best. Indicative comments included:

Respondent 1250:

My experience is that most graduates need a significant amount of support beyond their undergraduate training in order to become world-standard engineers. The amount of support required is very difficult to provide with on-the-job training alone and I believe that some formalised system to address this shortfall is necessary to arrest the degradation of skills in the workplace.

Respondent 140:

We lack the opportunity to give [graduates] field construction experience. Our commercialised arm won't do it, as they feel there is no long term financial benefit to them for a graduate to join them for a few years then leave when he/she starts to be productive.

Respondent 686:

In my experience in many different workplaces, graduates are always thrown in the deep end, sink or swim. This can work, but also causes potentially good engineers to leave or get demotivated when they cannot make progress with problems. Sandwich course engineers are better prepared for the transition, full time students not so much.

Respondent 694:

I have worked at 4 different local government councils. Two of those had a very good program for training engineers in all aspects of local government engineering. The other two did not. As such, it is very much dependent on the organisation and its HR team as to whether they are proactive in this respect or not. Find the organisations which do this aspect well, document the process and the ideas and try and spread the word to those organisations that do not.

For more information about this survey, please contact Alicia Pearce, Coordinator Strategic Research, APESMA on apearce@apesma.asn.au or (02) 9263 6522.