



Australian Government



Australian Workforce and Productivity Agency

Case study submissions



AWPA invites you to submit examples of successful programs or initiatives designed to address issues in the engineering workforce relating to:

- the participation of women, mature-age workers and Indigenous Australians
- engineers not working in engineering
- reliance on skilled migration
- the lack of students studying STEM.

In addition, AWPA is also interested in receiving information about innovative programs that aim to address engineering skills needs of the future.

These case studies will enable AWPA to feature real-world examples of successful approaches to engineering workforce development in its final report. AWPA will seek the express permission of organisations to include particular case studies in the final report.

AWPA invites you to use the template below to submit your case study. You are welcome to provide any additional information and supporting material.

Please ensure that we receive your case study by **26 March 2014**.

Please email your case study to AWPA at engineeringstudy@awpa.gov.au.

Contact information

Organisation: Australian Council of Engineering Deans

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Name of case study (initiative/program/example):

1. Outline of case study

Please provide concise information about the initiative/program/example, including if it is run in partnership with other enterprises, professional organisations, government agencies, training providers, etc.

Project Title: Enhancing Industry Engagement in Engineering Degrees

Project Aim: to explore and test improvements to enhance industry engagement in formative engineering degrees that qualify graduates to enter supervised practice as professional engineers and engineering technologists. The underlying hypothesis is that such improvements

will increase student retention, increase the number of graduates, and improve their employability. The outcomes of the project are intended to be applied to all engineering degree providers in the higher education sector.

The project has two themes:

- 1) To develop, implement, and evaluate guidelines for effective industry engagement throughout engineering degrees, especially with the resources and construction industries.
- 2) To develop, implement, and evaluate industry-based projects.

Project participants: the Australian Council of Engineering Deans (ACED) is leading the project, with 12 (of the 35) Australian universities that provide formative engineering degree programs externally accredited by Engineers Australia. The project reference group includes several industry peak bodies: Engineers Australia; Minerals Council of Australia; Australian Mines and Metals Association; Consult Australia; and the Australian Petroleum, Production and Exploration Association.

Project funding: Department of Industry, Workplace Innovation Program. The project was conceived as a response to a recommendation to ACED by the National Resources Sector Workforce Strategy Taskforce (NRSWS). The project commenced in July 2012, with completion due 30 June 2014.

Project team: Professor Robin King, ACED Project Director, has led the project, with research and management by Research Associate Professor Sally Male, based at The University of Western Australia. Specific activities have also been conducted by the participating universities, industry partners, and in a small number of final-year engineering students' projects.

2. How has the initiative/program/example boosted participation, improved productivity, or made some other impact?

Please provide any evidence if available.

Literature and prior studies in Australia have demonstrated that good industry exposure can improve retention and employability of engineering degree students. Whilst program accreditation by Engineers Australia requires 'exposure to industry practice', there is considerable variability of depth and quality of such exposure.

The original impetus for the project was national concern about skills shortages for the resources and resources construction boom in the late 2000s. The NRSWS taskforce urged ACED to concentrate specifically on measures to improve graduation rates for these areas. In fact, civil engineering was already enjoying a steady increase in graduations, and is now numerically the leading branch, displacing electrical & electrical engineering. Such trends reflect prospective students' responsiveness to employment demand at the time of enrolment, typically 4-5 years before graduation. The current downturn in graduate employment in the resources and construction areas is thus out of phase with graduation growth. In any event, ACED argued that improving industry exposure in the early and middle years of the engineering curriculum, and examining the role and effectiveness of industry placements would be the most beneficial ways of addressing the issues, largely irrespective of branch of engineering. In addition ACED argued that there were already many examples of

good practice in industry engagement in the university sector, but many of these impact only on a small and selected proportion of the students and graduates.

The challenge for Australian educators is to more strongly embed good industry exposure and practice for ALL engineering degree students, prior to completion of their academic program. Finding and monitoring good industry placements for the 12,000 graduates entering the final year of formative bachelors and masters degrees, for example, is challenging both for engineering employers and the universities. (About one third of this graduating cohort is international, mostly studying in Australia; their industry exposure should be of no lesser quality than that of Australian students.) As well as providing opportunities for students to undertake work placements, arguably there need to be more occasions for authentic engineering practice to be brought into the classroom.

The project takes the long-term view that significant changes will be needed within the cultures of the engineering faculties and industry, to make substantial and sustainable improvements to industry exposure. By participating in socio-technical activities closely aligned with engineering practice, students will develop stronger identities as 'student engineers' in contrast to thinking of themselves as students of apparently disconnected topics. They will develop deeper understanding of the relevance and connectedness of their studies, and improve their motivation. With realistic perceptions of engineering practice, and better opportunities to develop competencies required for engineering practice, engineering graduates will be better prepared for engineering practice.

In the course of the project, more than 280 students, graduates, academics and industry representatives have been consulted by interview, focus group and survey. Draft guidelines for improved performance were revised following review by 149 industry members and academics at five forums in Sydney, Melbourne, Brisbane, Adelaide and Perth in June 2013. Subsequently, the participating universities (and the engineering education community as a whole) have been encouraged to reflect on their performance, using a 'reflection tool' to help their program leaders identify strengths and weaknesses.

Theme 1 Outputs: 'Best practice' guidelines include recommendations for engineering faculties, industry, industry organizations and government. The project has also compiled 'exemplars' of good practice from which others can learn. These resources are listed at the end of this submission. Many of them cover work integrated learning and internships.

Theme 2 Outputs: The set of 'industry-inspired' projects that will have been developed, implemented and tested at seven of the partner universities. These projects have been selected by each university to demonstrate how current industry practice relates to what students see as highly 'theoretical' or somewhat disconnected curriculum topics, in the middle two years of the professional engineering program. These projects will be packaged into resources that can be used by others, beyond the life of the funded project.

The challenge, as noted earlier, is to encourage all engineering faculties to provide exemplary industry-based learning opportunities at reasonable cost, to all of their engineering students in formative degrees. Under the project funding agreement ACED is required to disseminate the project outputs, and monitor the performance of the engineering faculties with regard to industry exposure. While the mechanisms for ACED to do this have yet to be finalised, both the accreditation body, Engineers Australia, and the group of Associate Deans (Learning & Teaching) for engineering have indicated commitment to using the guidelines and the

reflection tool referred to earlier in developing improvements to industry exposure within the faculties.

3. How might the initiative/program/example be expanded and/or translated to other enterprises or jurisdictions?

All of the project resources from Theme 1, including the exemplars, will be available online. ACED will encourage its members and its national associates (Engineers Australia, the Associate Deans (Learning & Teaching), and the Australasian Association for Engineering Education) to adopt the guidelines and resources developed. The industry peak bodies associated with the project are also likely to continue their interest.

Regarding application to other discipline areas, the project has gained attention of the Australian Council of Deans of Information & Communications Technologies (ACDICT), in their desire to increase the effectiveness of Work Integrated Learning in their area. In the same vein, the Office of the Chief Scientist invited the project leader to a meeting of the Industry Working Group to discuss how engineering practice can be translated into other STEM areas.

4. Any further information?

Project resources produced to date are listed below. These will be updated and completed following project completion on 30 June 2014, and will include information on the use of the industry-inspired projects developed under Theme 2.

Project Resources

Best Practice Guidelines for Effective Industry Engagement in Australian Engineering Degrees	http://arneia.edu.au/resource/59
Summary of Best Practice Guidelines for Engineering Faculties on Effective Industry Engagement in Australian Engineering Degrees	http://www.arneia.edu.au/resource/56
Tool for Reflecting on Effective Industry Engagement in an Engineering Program	<i>In pdf</i> http://www.arneia.edu.au/resource/57
	<i>Online</i> http://uwa.qualtrics.com/SE/?SID=SV_6L5qlmMfwOP45Ip
Benchmark Responses to Tool for Reflecting on Effective Industry Engagement in an Engineering Program'	http://www.arneia.edu.au/resource/58

Employer Exemplars

Student Engineering Induction Guide	http://www.arneia.edu.au/resource/55
Vacation Student Buddy Training Presentation	http://www.arneia.edu.au/resource/54

University Exemplars

AMC Employer Handbook	http://www.arneia.edu.au/resource/49
Curtin University Design Project	http://www.arneia.edu.au/resource/52
ECU Engagement Handbook	http://www.arneia.edu.au/resource/51

QUT Work Integrated Learning Unit	http://www.arneia.edu.au/resource/48
QUT Work Integrated Learning Unit background	http://www.arneia.edu.au/exemplar/23
RMIT Student Engineering Experience Guidebook	http://www.arneia.edu.au/resource/60
Swinburne IBL Responsibilities	http://www.arneia.edu.au/resource/50
UTS Engineering Practice Program Student Guide	http://www.arneia.edu.au/resource/55
UWA Career Mentor Link Guide	http://www.arneia.edu.au/resource/44