



ASSOCIATION OF CONSULTING
ENGINEERS AUSTRALIA

HIGHER EDUCATION REVIEW

JULY 2008

Review of Australian Higher Education

ACEA SUBMISSION

Enquiries |

Megan Motto: *Chief Executive*

Caroline Ostrowski: *National Policy Officer*

The Association of Consulting Engineers Australia (ACEA) is an industry body representing the business interests of firms providing engineering, technology and management consultancy services.

L6/50 Clarence Street
Sydney NSW 2000

P . 02 9922 4711

F . 02 9957 2484

E . acea@acea.com.au

W . www.acea.com.au

INTRODUCTION.....	2
ABOUT THE ACEA.....	2
AUSTRALIA’S HIGHER EDUCATION SECTOR: POTENTIAL FOR IMPROVEMENT.....	3
HIGHER EDUCATION REVIEW	3
DROP OUT RATES	4
CURRICULUM REQUIREMENTS.....	5
WORKFORCE LEARNING	6
FLEXIBILITY FOR LIFELONG LEARNING	7
MEETING LABOUR MARKET AND INDUSTRY NEEDS.....	7
HIGHER EDUCATION AND THE COAG PRODUCTIVITY AGENDA	8
THE EXPANSION OF SKILLS AUSTRALIA	8
GRADUATE EMPLOYABILITY SKILLS	9
THE STUDENT EXPERIENCE OF HIGHER EDUCATION.....	15
CONNECTING WITH OTHER EDUCATION AND TRAINING SECTORS.....	15
AUSTRALIA’S HIGHER EDUCATION SECTOR IN THE INTERNATIONAL ARENA	16
FUNDING ARRANGEMENTS FOR UNIVERSITIES.....	16
HIGHER EDUCATION’S CONTRIBUTION TO AUSTRALIA’S ECONOMIC, SOCIAL AND CULTURAL CAPITAL.....	16
IMPROVING THE LINK BETWEEN THE TERTIARY SECTOR AND INDUSTRY.....	17
RETHINKING AUSTRALIAN ENGINEERING EDUCATION.....	18
KEY RECOMMENDATIONS SUMMARY	18
CONSULTATION REFORM	19

INTRODUCTION

ABOUT THE ACEA

The Association of Consulting Engineers Australia (ACEA) is an industry body representing the business interests of firms providing engineering, technology and management consultancy services.

There are over 260 firms, from large multidisciplinary corporations to small niche practices, across a range of engineering fields represented by ACEA with a total of some 41,000 employees.

ACEA presents a unified voice for the industry and supports the profession by upholding a professional code of ethics and enhancing the commercial environment in which firms operate through strong representation and influential lobbying activities. ACEA also supports members in all aspects of their business including risk management, contractual issues, professional indemnity insurance, occupational health and safety, procurement practices, workplace/industrial relations, client relations, marketing, education and business development.

AUSTRALIA'S HIGHER EDUCATION SECTOR: POTENTIAL FOR IMPROVEMENT

ACEA sees a great potential for improvement within Australia's higher education sector among a number of key areas as outlined within this submission.

The first is to increase the completion rates of graduate engineers. In order to achieve this we must first determine why the non-completion rate is so high for engineering degrees across Australia.

The effectiveness of Australia's universities should primarily be measured by their abilities to produce graduates which meet labour market and Industry needs. There are a number of avenues through which a better graduate output can be achieved. Work-integrated learning is one such avenue. Although we view the primary role of work integrated learning or internship programs should be not be to provide graduates with employability skills, this does occur as a bi-product of this process and is clearly beneficial. We consider that university curricula should be able to provide graduates with employability skills in the primary instance in order to meet the needs of modern businesses.

The expansion of *Skills Australia* to include professional skills within their scope will create one central data collection point to determine where skills are lacking in Australia. The skills shortage reaches across all levels of skill sets, having a central body which gathers information and then allocates Government funded places to VET, tertiary and other training organisations will offer all Australian industries a chance to benefit from the existence of *Skills Australia*.

The student experience of higher education should continue to be measured through surveys and teacher evaluation. It is important that the right questions are asked and that surveys aim to capture responses from first year students' right through to final year students and graduates.

Connecting with other education and training sectors is a critical role of the tertiary sector in modern Australia. As movement of persons between sectors, employers, and skills upgrading becomes more frequent and common, the higher education sector needs to adapt and provide the avenues required for Australians to participate in the contemporary labour market. ACEA see a huge potential in improving the transition between the Vocational Education and Training (VET) sector and university with regards to mutual recognition.

Maintaining Australia's higher education competitiveness in the international arena will aid in providing students with the best possible education, improving the link and the level of information sharing between the tertiary sector and industry is one way that universities can remain internationally competitive.

The Higher Education Review (the Review) should consider the current availability for Australians to engage in lifelong learning and how to improve access to these opportunities. This should be considered in a context of both the tertiary and VET sector and how they relate to one another. It is important to acknowledge how the different education sectors impact one another and how they can operate in a more fluid way.

General ACEA member feedback has revealed that graduates now tend to rely too much on previous solutions rather than developing innovative or new approaches to problems, this issue has been described by our members as a lack of thought input to designs. ACEA believe that there is an opportunity for some tertiary providers, guided by industry feedback, to rethink their curriculum to incorporate a range of industry needs.

HIGHER EDUCATION REVIEW

ACEA supports a more competitive tertiary education system with an increased focus on student and industry engagement. The engineering industry needs graduates who emerge from tertiary education

well rounded and business knowledgeable as well as technically competent. We see a more fluid movement of people between the VET and tertiary education sector, and a higher education sector that is consultative and relevant to contemporary industry.

The Higher Education Review has the opportunity to consider a range of options for improvement in the higher education sector and we thank the Review Panel for their consideration of our views and recommendations.

DROP OUT RATES

ACEA views that there is a huge potential for improvement in the Australian higher education sector. Over the past 10 years (as evidenced below in table 1.) engineering has exhibited a drop-out rate of around 50%.

According to the data from the (then) federal Department of Education, Science and Training, most of Australia's 38 public universities have drop-out rates of between 15 and 30 per cent.¹

Table 1.²

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Domestic Commencements	13493	13960	13520	13482	13034	14031	14171	14033	13742	13580	13932
Domestic Bachelor Commencements	10596	10982	10895	10921	10442	10786	10278	10089	9910	9920	10288
Domestic Completions	7018	7356	7270	6946	6693	7856	7686	7843	8174	7577	7984
Domestic Bachelor Completions	5289	5524	5550	5264	5190	6061	5721	5831	5980	5680	6026
O/Seas Students Commencements	2397	2585	2467	3058	3541	5280	6314	7783	7436	7300	7247
O/Seas Bachelor Commencements	1637	1781	1619	2053	2234	3374	3859	4280	3936	3778	3854
O/Seas Student Completions	1320	1528	1729	1975	2279	2857	3150	4100	4573	5214	4872
O/Seas Bachelor Completions	719	806	1009	1244	1423	1658	1748	1997	2220	2396	2343
Total Commencements	15890	16545	15987	16540	16575	19311	20485	21816	21178	20880	21179
Total Completions	8338	8884	8999	8921	8972	10713	10836	11943	12747	12791	12856
Total Bachelor Commencements	12233	12763	12514	12974	12676	14160	14137	14369	13846	13698	14142
Total Bachelor Completions	6008	6330	6559	6508	6613	7719	7469	7828	8200	8076	8369

¹ West, A. 2003. '1 in 5 uni students drop out'. *The Sun Herald*.
<http://www.smh.com.au/articles/2003/09/06/1062549061872.html?from=storyrhs>

² Data extrapolated from Kaspura, A. Institution of Engineers Australia 2008. *The Engineering Profession, A Statistical Overview, Fifth Edition (2008)*.

As the table shows, engineering graduate numbers have remained relatively the same over the past 10 years, increasing only a small amount. The issue lies in the fact that demand for engineers has increased, this is primarily due to two occurrences. The first is that graduate engineers are now being distributed throughout a wider range of sectors. For example engineers are now being employed more and more by management consultancies, banks, the wider finance sector and Local, State and Federal Governments. All these sectors have schemes in place to attract and recruit engineers. The pool of students available to the consulting engineering industry is obviously much smaller. The second occurrence is the massive increase in infrastructure enhancements Australia has planned over the next 10 years. Due to the wider dispersion and relative non-increase of engineering graduates from year to year, there is a huge lack of engineers available to consulting engineering firms who are tasked to engineer the billions of dollars worth of infrastructure works planned by the Federal and State Governments.

It is critically important that we address these low graduate completion rates now. This is a systemic problem that needs a significant investigation and policy response.

Realising this, ACEA believes the Department of Education, Employment and Workplace Relations (DEEWR) should undertake or commission a significant study to determine why these students are exiting engineering degrees across all universities and where these students are going. ACEA will be joining with other interested parties, associations and groups to ask DEEWR to commission this study and we appreciate any support which can be provided by the Review Panel in this endeavour.

CURRICULUM REQUIREMENTS

First year university for many engineering students is a re-education of basic science and mathematics principles. Addressing this challenge relies heavily on changes being made to the secondary school curriculum and a better cohesion between the syllabuses in each state. Australian universities can also realise this and adapt their curriculums suitably.

In principle, ACEA members support the Melbourne University model which allows the university's students to undertake one quarter of their studies in other disciplines. This model has the potential to provide students with a more focussed and relevant degree, as the remainder of the course is concentrated on their discipline and the other quarter provides room to expand further knowledge.

ACEA supports that the scheme is attempting to increase the breadth and depth of the student experience and produce talented students. We recognise that the significant research effort conducted by the Melbourne University identified within the Bologna Process, the objectives of North American undergraduate 'liberal education', and related developments in Asia, and then considered these in the context of Australian higher education policy and history.

We believe that there must be care taken to ensure that students have strong incentives to continue the five year masters degree in engineering. Rigorous standards at the undergraduate level will ensure that students who exit after three years have relevance to industry, and have a clear pathway to return for the remaining two years if required.

ACEA contends that it will be difficult to identify and gauge the graduate outcomes prior to 2018. We perceive that a ten year period will reveal whether graduates are emerging with the intended outcomes.

For students that do not study science and maths or do not reach the required scores to enter into a tertiary engineering degree ACEA supports the Australian Technology Network of Universities' (ATN) *Engineering tomorrows engineers* initiative. Part of the project enables the use of an engineering aptitude test which is aimed at increasing the cohort of potential engineers to include those that can not necessarily demonstrate the appropriate background preparation, but can demonstrate an aptitude for the course and a profession as tomorrow's engineer.

WORKFORCE LEARNING

Having the ability to learn through interaction with the workforce creates a better correlation between tertiary students leaving the educational institution and entering the workplace. Understanding skills that may not necessarily be taught at university like coping with pressure and management capabilities or leadership competencies has a huge impact on whether or not a graduate is work ready once their studies are complete.

Workforce learning as part of an engineering degree should become a compulsory unit of study. By engaging the business community, Australian universities have the ability to build relationships with firms within their state, and students in turn will have better opportunities and contacts for internships.

Work experience

ACEA believes that a stronger emphasis on encouraging more opportunities for work experience like cadetships and internships for tertiary students should become a priority for tertiary education strategy. These kinds of placements of course cannot occur without a level of support being provided to the business community.

It is imperative for businesses hosting and training students to be provided with government support from an advisory perspective, which might best be delivered through the appropriate industry association. Information should be made available to businesses around minimum pay requirements, length of term, how the selection process should work, the type and level of work that can be expected of students and other day to day issues. ACEA would support this incentive being provided in the form of an interactive website or a telephone help-line, preferably a combination of the two.

Increased industry-tertiary linking and consultation will also provide for growth in placements offered and the ease in which they are administered.

Cadetships

ACEA views Cadetships as a meaningful way for engineering students to obtain experience in the workplace. Many years ago, a cadetship model existed in the engineering industry which allowed university students to spend time within consulting engineering firms throughout their degrees, with the firms investing significant time and money on training and mentoring the students. In turn the student was bound to work for the firm for two years or so on completing their degree.

Australia's current Industrial Relations laws prohibit employers binding employees to their companies. However it is important that mechanisms are investigated to ensure that companies get a return on their investment in training students. Australian companies will find it increasingly difficult to see the business case in investing in students throughout their degrees if they do not receive a return on their investment in the process, i.e. gaining a graduate employee.

Cadetships, work-integrated learning and work experience all have the potential to make the student feel a greater level of connectedness with their degree by seeing how it can be applied in the business world. This has the possibility to aid in the effort of reducing the drop out rates of engineering students.

Work readiness

The engineering industry requires graduate engineers that are technically competent as well as work ready to start narrowing the skills shortage gap as soon as they leave university. Work readiness extends to graduates having already been exposed to business environments and understanding the range of current industry issues which they will have ideally gained through internships or cadetships during tertiary education.

Contemporary businesses require graduates that can display an adaptable approach to a variety of situations. Being aware of global standards and markets and having a desire to accumulate core leadership competencies are key areas that can be developed through encouraging workforce learning during tertiary studies.

Again, ACEA believe that increased work experience opportunities may also help with drop out rates of engineering students. Work experience will allow students to feel connected with their intended industry and also be able to relate their own learning activities to practices in the workplace.

FLEXIBILITY FOR LIFELONG LEARNING

A flexible approach to lifelong learning includes a tertiary education system which can provide access to part time and after hours study. Flexibility for lifelong learning includes making learning available at different times of the day, to a range of different groups. A mature age student for example who has a desire to complete an engineering degree should have access to evening classes, whether they be at TAFE or University, to make the course or desired degree attainable.

Although part-time university study has been readily available across some universities, part-time courses do not extend to every tertiary body, nor do they extend to all degree and diploma types. Measures put in place to allow the flexibility of lifelong learning would encourage and enable a number of previously not catered for groups to obtain relevant and contemporary qualifications to aid in our industry's skills shortage crisis.

In particular, the university sector should be encouraged to be more flexible so as to allow employees with vocational training to up skill to an engineering degree without having to give up full time employment.

Courses and classes outside of work hours would also provide for an opportunity for practitioners from industry to engage in teaching without it affecting their normal working day.

ACEA has recently initiated this process through *Universities Australia*. The intended result is the creation of a part-time, distance mode engineering degree which will allow entry through two stages, first year entry as well as third year entry for students with credit that can be transferred and recognised.

In addition, we believe that the Review must consider how the higher education sector prepares Australians for learning beyond their degrees. One view that has emerged recently is that graduates are now 'question poor and answer rich', meaning that multiple answers are available to one question when typed into an internet search engine for example. This is contrasted by a time prior to limitless access to internet and electronic information where students had to ask more questions in order to obtain the one answer they needed, or they were 'question rich and answer poor'. This shift, although somewhat contentious, may require some thought on the part of the higher education sector as to how the sector can either adapt to this trend or alter its teaching methods/curricula to move students back to traditional tertiary outcomes. This is explored further in the attached "Rethinking Engineering Education" report

MEETING LABOUR MARKET AND INDUSTRY NEEDS

There currently exist a range of impediments which restrict the higher education sector in being able to innovate when developing or redeveloping courses and programs.

For engineering degrees, one area where ACEA sees a huge potential for improvement is the implementation of employability skills across all university curricula. This is further explored within this submission under the Graduate Employability Skills section.

Collaboration between universities and industries will be the conduit for improving the quality of graduates and aligning the needs of business with contemporary higher education outcomes. As mentioned previously in the Submission, ACEA believes that the primary responsibility and role of the higher education sector is to produce high quality graduates which meet the needs of industry.

As Governments across Australia announce record infrastructure spending, the engineering industry has warned that many of these planned projects will be delayed, over budget or completely shelved because there aren't enough skilled engineers to get the job done. Australia's ability to design and deliver an estimated \$500 billion in infrastructure projects over the coming decade is under threat.

ACEA's 2008 Skills Survey (Attachment 1), which surveyed our member firms on skills shortages, found that on average, two-thirds of firms across Australia are delaying projects and some are even declining projects outright because they simply don't have the available staff. This is the third year in a row this has been reported.

According to the survey, 3 out of 5 firms are experiencing critical shortages causing around half of firms to restrict business growth in 2008. Civil and structural engineering firms are the worst affected because they are in highest demand with 50 per cent of firms indicating shortages.

Engineers Australia has estimated that in the next five years to the 2011 Census, "70,000 engineering professionals will have retired. At current rates, the expected 45,000 graduates will not even cover the losses over the same period. It is possible that current professional engineering skills shortages will double by 2011: the numbers are unnerving for Australia's future."³

A collaborative effort by both the higher education sector and the Australian consulting engineering industry is the only way to increase the engineering effort in Australia in the long term.

In such times of extended labour demand pressures, The Australian Higher Education system must be one that is responsive to industry demand as opposed to its traditional supply driven approach. This will require a substantive change in how courses are designed, resourced and marketed.

HIGHER EDUCATION AND THE COAG PRODUCTIVITY AGENDA

ACEA contend that higher education in Australia needs to be part of the broader COAG productivity agenda. Higher education has a central role in producing people with the skills required to participate in the contemporary Australian economy.

The incorporation of the higher education sector into the COAG Productivity Agenda would enable a more streamlined approach to addressing skills shortages in critical industries and simplify the funding process across the post secondary sectors. This would also strengthen the links within the post compulsory sector and develop stronger pathways that allow transitions between universities and the VET sector.

The COAG Productivity Agenda needs to formally recognise that the skills obtained through the higher education sector are a huge contributor to productivity growth. Australia has a shortage of professional skills not just vocational skills.

THE EXPANSION OF SKILLS AUSTRALIA

The skills shortage in Australia is evident across trade skills, semi-skilled and unskilled labour and high level tertiary trained professionals. The consulting engineering industry requires skills across a range of skill sets, predominantly drafts people, engineering technologists and tertiary qualified engineers.

³ Engineers Australia weekly newsletter, 30 June 2008: <http://www.quivamail.com/go/?474C47435F555F40455446574247584847>

A central body which is able to gather information across all disciplines and skill sets is critical in planning for Australia's current and future labour needs.

The role of *Skills Australia* should be expanded to include planning for higher education. Instead of having a separate body to determine and plan the future of higher skills needs, *Skills Australia* needs to encompass skills shortage analysis and planning for higher education skills within its scope.

The expansion of *Skills Australia* to include professional skills will clearly provide a benefit to mitigating Australia's skills shortage. Firstly it will recognise that the skills shortage extends to not only trade skills, but professional skills also. Secondly it will offer an opportunity for a better level of cohesion between industry and professional associations and the Industry Skills Councils. This will drive collaborative actions and make more effective use of the resources available.

The higher education sector could also engage in this process to assist in demand driven course planning. This data should also be fed to the Department of Education, Employment and Workplace Relations to better plan how they allocate their Commonwealth funded places and be proactive rather than reactive.

It seems apparent that a proactive response to skills needs by the previous Government could have foreseen the skills shortage that now extends across many of Australia's industries. Australia could have already had meaningful initiatives underway aimed at tackling the lack of skilled professionals.

GRADUATE EMPLOYABILITY SKILLS

ACEA views that one of the greatest opportunities for investment in Australia's higher education sector is the investment in implementing graduate employability skills into all curricula.

The establishment of an Employability Strategy Fund will be crucial in delivering employability skills. ACEA sees this fund as the catalyst for encouraging and also providing the means for universities to develop and implement programs to enhance employability skills into their curricula.

It is important for funding to be available for grants through an application process, assessed and allocated by the relevant government department to allow fair and equal distribution. Portions of the fund should be allocated and divided between universities, the business sector/industry associations and existing programs and projects which are already seeking to enhance the development of employability skills. For example the University of NSW, Faculty of Science, have already mapped many of their courses to include graduate attributes, but could be eligible for funding and assistance to complete the remainder.⁴

Universities should be tasked with using the funds to integrate the teaching of employability skills into existing curricula. ACEA believes that the integration of employability skills should occur through a process that fully incorporates these skills into university curricula. Employability skills should fully complement and be ingrained into the curriculum so that they are not forgotten, separated or downgraded.

Applications and the allocation of funding should be a transparent process, with all parties having to detail how exactly the funds will aid in the development of university students acquiring employability skills. Greater levels of funding should be allocated to universities who plan to integrate employability skills across their entire range of courses.

Identify and implement employability skills in all university curricula

ACEA endorses the eight employability skills identified in 2001 by the Australian Chamber of Commerce and Industry (ACCI) and the Business Council of Australia (BCA) who undertook research to clarify the generic and

⁴ University of New South Wales, Faculty of Science webpage: <http://www2.science.unsw.edu.au/guide/slatig/sciga.html>

employability skills required by industry. This project culminated in a report titled *Employability Skills for the Future* (DEST 2002).⁵ These skills are identified as: Communication, teamwork, problem solving, self-management, planning and organising, technology, life-long learning, and initiative and enterprise. The BIHECC report confirms that the Employability Skills Framework is widely acknowledged as evidencing what employers need in the workforce.⁶

ACCI (with a membership of over 350,000 businesses) and BCA (membership of 100 businesses) have broadly recognised the importance of employability skills. Universities should now be encouraged to map the implementation of these skills into their curriculum. This process can be encouraged with the proposed Employability Strategy Fund, with applications available for either a complete and university-wide curriculum mapping exercise or faculty-specific integration of graduate employability skills.

It is important for the Department of Education, Employment and Workplace Relations to encourage processes that integrate the employability skills within curricula, as this will ensure the skills have meaning and relevance. There should be a clear and consistent message that technical competence alone will not amount to 'employability'. The message must be conveyed that employability skills acquisition *and* technical competence are both required to succeed in the modern Australian business environment.

Once universities have identified how they plan to integrate the eight employability skills into their curriculum, the business community should be given the opportunity to comment on the relevance and suitability of how universities propose to teach and integrate employability skills.

Universities cannot effectively implement these skills without the aid of the business sector. ACEA member firms are keen to offer such suggestions and work with the tertiary sector to ensure engineering students understand the skills required to obtain employment once they have graduated.

Improve and increase access to Work Integrated Learning (WIL)

Work Integrated Learning (WIL) is a critical component of developing and fostering graduate employability skills. Structured workplace learning during a degree is key in developing an understanding of what it means to be part of a team, be self motivated and able to learn in an environment outside of the classroom.

ACEA member firms offer structured learning opportunities which allow students to apply theoretical knowledge in an authentic industry setting and professional environment. The benefits of providing WIL are clear and although consulting engineering firms are currently operating in a climate where the skills shortage is creating more work and less time for non-core business activities, engineering firms understand that it is necessary to develop and offer structured WIL for university students, so as to ensure the future of their firms and their industry.

A number of Australia's Universities provide a unit of study which encompasses or is solely comprised of work integrated learning/project work. Swinburne University for example offer a student the ability to complete 15 weeks of work integrated learning, which then equates to one unit of study for the semester. WIL is a good method of encouraging the development of employability skills. To ensure students are exposed to WIL it may be possible for some university degrees to mandate a core unit of study in this area, rather than an elective unit. This will send a clear message that work experience throughout the degree is key to developing superior employability skills.

⁵ DEST 2002, *Employability skills for the future*, a report by the Australian Chamber of Commerce and Industry and the Business Council of Australia for the Department of Education, Science and Training, Canberra.

⁶ BIHECC Graduate Employability Skills Report, August 2007. Page 10 <http://www.dest.gov.au/NR/ronlyres/E58EFDBE-BA83-430E-A541-2E91BCB59DF1/18858/GraduateEmployabilitySkillsFINALREPORT.pdf>

ACEA member firms identify the best graduates as those who have an ability to understand problems practically either by intuition or by hands-on learning which is obtained through work integrated learning throughout university.

A key area for improvement is making it easier for employers to obtain information about WIL opportunities, including the specific dates that university students have time allocated to complete their workplace learning. A work integrated learning program for an employer requires a great deal of planning as well as the allocation of resources. By providing employers with clear timelines they will have the opportunity to plan in advance both with the preparation of a structured program and resources to assist students through their work integrated learning experience.

Encouraging employers to offer university students WIL opportunities can be accomplished by the university providing guidance as to what kinds of activities the students can and should perform. Offering employers information and guidance in this area has the potential to increase a broader cross section of firms to offer cadetships, internships and other forms of WIL to students.

Enhancing teaching and assessment of employability skills

Adequately teaching employability skills to aspiring engineers requires input from industry. In this respect, ACEA members often input into curriculum for a number of universities. Through this process ACEA members have observed that enhancing teaching of employability skills has its barriers, namely the current shortage of academic staff.

The BIHECC report identifies that “there is no national professional development program on employability skills which targets academic staff.”⁷ Most academics have little industry experience and so endeavour to juggle work with external commissions of a technical nature. In order to train young graduates in employability skills we need academic staff who themselves are employable in a commercial context, and who understand the complex needs of business. In a submission to the (then) Department of Education of Science and Training (DEST), the Australian Council of Engineering Deans (ACED) revealed that over the period 1986-2000, engineering enrolment and graduate numbers have doubled while total staff increased by only 10%.⁸ Professional development for educators therefore is a challenging task due to time constraints.

One initiative that has been raised within the engineering industry is rotating academic staff through consulting engineering practices to provide educators with this experience. This could decimate the academic staff numbers even further, however well planned and short rotations could be the solution.

Even with time pressures, the development and delivery of a professional development program for university teaching staff is an effective and necessary solution to the problem. All academic professionals should have access to a suite of supporting resources which specifically address best practice in teaching and assessment of the eight employability skills in the higher education context.

The timeframe for delivery of employability skills is an important part of effectively teaching these skills to students. The second year and beginning of third year university are the most desirable times to begin introducing and teaching employability skills. This is the time when most students are thinking about permanent employment, teaching these skills early will give students the dexterity to gain a work experience position successfully. Using the process of gaining vacation or work experience to test the employability skills students have learnt should be an assessment component, which could then be included in the student’s e-portfolio.

⁷ BIHECC Graduate Employability Skills Report, August 2007. Page 52 <http://www.dest.gov.au/NR/rdonlyres/E58EFDBE-BA83-430E-A541-2E91BCB59DF1/18858/GraduateEmployabilitySkillsFINALREPORT.pdf>

⁸ Submission on DEST Discussion Paper: “Higher Education at the Crossroads”, June 2002. Australian Council of Engineering Deans (ACED)

ACEA member-firm recruitment specialists have seen a number of students go through to the final year of their engineering degree without obtaining any work experience because they appear to have some barriers to obtaining employment, namely the understanding and aptitude for the eight employability skills.

Another barrier exists which constricts time available for teaching employability skills. It has been identified by university staff that first year engineering students frequently do not possess the required level of mathematics necessary to launch straight into engineering studies at university. First year for many students is a re-education of high school maths and sometimes science principles. This means that it is taking Australian universities longer to bring students up to speed technically throughout the undergraduate courses as a result of poor technical development in secondary schools. The Government's recent announcement of a national curriculum for Australian education will do much to mitigate this gap.

Self assessment options for employability skills

Self assessments are important in raising awareness of employability skills. One of the best ways to develop the ability to self-assess is through an online tool. A number of educational institutions have already completed quick self assessment guides and uploaded them online for easy access. TAFE WA⁹ for example, has created a publically accessible webpage for students to identify and self-assess their employability skills. This highlights to students the importance of employability skills and allows industry to view the types of skills that students of TAFE WA are exiting with.

Another option for the development and self assessment of employability skills is an 'assessment centre' scenario, which would put students under pressure in real situations. This practical approach would allow students to experience a series of role plays and exercises to self assess the progress of their employability skills acquisition.

We know from research conducted about Generation Y that recent graduates want responsibility, travel opportunities, and social responsibility. By teaching students that the acquisition of employability skills will lead to obtaining the career features they desire, it will encourage students to seek the development of these skills for themselves and learn how to demonstrate them. Introducing self assessment into the curriculum on an annual basis will allow students to become more self-aware and more prone to assess their own progress.

A practical test for students to examine their ability to self-assess should also include teaching students how to compile their application letter and resume or e-portfolio in the correct format and how to demonstrate to employers their grasp and application of employability skills.

Reporting on employability skills through work integrated learning

A standardised reporting tool for Work Integrated Learning (WIL) should address employability skills and allow for customisation for discipline-specific reporting and required university information. By having a single format which is utilised by all workplace supervisors and includes employability skills reporting options, it will create best practice and a tool for easy comparisons.

Recruitment experts within ACEA consulting engineering firms have commented that the standardisation of reports would be valuable to increase the integrity of the reporting system and make it easier to identify a quality graduate.

⁹ TAFE WA Pilbara *Employability Skills for the Future* webpage: <http://careers.pilbaratafe.wa.edu.au/recognise-your-skills/>

The BIHECC report outlines that “WIL is a tri-partite arrangement and all parties need a clear understanding of what is to be assessed, by whom, and how.”¹⁰

This sentiment is supported by Simmonds and Pedersen’s Orchestra model which suggests that “In work-integrated learning, there is a dual emphasis on the development of both the learner and the organisation.”¹¹ This model outlines that the learner (student) is not only required to demonstrate an understanding of new knowledge but must also apply that knowledge in ways that perceptibly benefit the organisation. This type of contextual learning is based on the theory that learning by contextualising the content is far more effective within the workplace learning environment.

Understanding the importance of WIL, ACEA sees the need for workplace learning components to be integrated well before the completion of a university degree to allow time for students to improve their skills. The analysis and collation of workplace supervisor feedback will also provide academic staff with important information about how their program design is preparing students for their given profession.

Employability skills and e-portfolios

ACEA supports BIHECC report’s recommendation that research should be conducted to ascertain employer preferences for the structure, content and format of e-portfolios.

All consulting engineering firms have their own unique strategies and set of employability skills they seek from potential employees. An e-portfolio which includes a skills breakdown helps employers to measure the fit of a potential employee in relation to the current gaps within their operating structure. A skills breakdown will also make it easier to assess if the candidate fits the organisational culture and whether the candidate should be eligible for an interview.

The creation of an e-portfolio should form part of the learning experience of a university degree. E-portfolio’s present employers with a much more well-rounded view of the graduate candidate which makes it easier to assess whether the candidate possesses the skills desired, reducing recruitment time and cost.

E-portfolio’s should list all employability skills acquisition, self assessment of these skills as well as academic comment on how these skills were developed and then tested by the student gaining work experience during their degree.

Australian diploma supplement and employability skills

When the Australian Diploma Supplement is produced it should include a report on how students have obtained and demonstrated employability skills. Employers need meaningful and relevant information about what is covered in qualifications; they need to know what skills and knowledge graduates from different programs have acquired. Consulting engineering firms benefit from being able to assess as much information as possible about a candidate prior to determining whether or not to offer the candidate an interview. For the diploma supplement to provide any real benefit to employers, it would need to provide a different scope of information and attributes to the proposed e-portfolio (recommendation 7). Alternatively these two options could be fused for a more comprehensive document.

The Diploma Supplement, used internationally, details a graduate’s qualifications in a way that can be interpreted in different cultural contexts and for different audiences. “In Europe the Diploma Supplement

¹⁰ BIHECC Graduate Employability Skills Report, August 2007. Page 40 <http://www.dest.gov.au/NR/rdonlyres/E58EFDBE-BA83-430E-A541-2E91BCB59DF1/18858/GraduateEmployabilitySkillsFINALREPORT.pdf>

¹¹ Simmonds, D. & Pedersen, C. (2006). HRD: The shapes and things to come. *Journal of Workplace Learning*, 18(2), 122-134.

(which applies to a range of diplomas, degrees and certificates) aims at improving international 'transparency' and at facilitating the academic and professional recognition of qualifications."¹² The current Australian project to research the introduction of an Australian Diploma Supplement should seek to ensure that the Australian version will be of the same standard as the international supplement in recognition of the global business environment.

Incentives for Business to Offer Structured Cadetships

The *Graduate Employability Skills* report suggests that work is undertaken to investigate ways in which companies that offer structured cadetships could be eligible for tax relief. ACEA supports this idea and further suggests that tax relief for firms wanting to invest in education of any variety will be a key driver in building Australia's knowledge economy.

ACEA believes that any form of authentic and formal training and development, which expands and adds to an employees skills set, whilst costing the employer significant funds should receive a tax concession, much like the Research and Development Tax Concession currently available to businesses.

A concession will encourage more businesses to partake in structured cadetship programs, with clear benefits for both students/graduates and business.

Final Comments Summary on Employability Skills

- An Employability Strategy Fund should be set up with a transparent application process allowing more funding for universities who plan to map employability skills across their entire curricula.
- The eight employability skills already identified by ACCI and BCA: Communication, teamwork, problem solving, self-management, planning and organising, technology, life-long learning, and initiative and enterprise should be implemented into university curricula nationally.
- Access to Work Integrated Learning (WIL) can be improved by allowing better communication through a WIL online Portal accessible to Universities/Students and Pre-registered Employers who can apply and offer work experience opportunities.
- To enhance the teaching and assessment of employability skills, business must be consulted and self assessment options should be utilised.
- Reporting on employability skills through Work Integrated Learning should be a standardised process for greater consistency.
- E-Portfolio's will be a welcome addition for the business sector as will an Australian Diploma Supplement.
- Structured cadetships should attract an Education and Training Tax Concession for businesses willing to take on and develop the employability and technical skills of a university student.

¹² BIHECC Graduate Employability Skills Report, August 2007 <http://www.dest.gov.au/NR/rdonlyres/E58EFDDBE-BA83-430E-A541-2E91BCB59DF1/18858/GraduateEmployabilitySkillsFINALREPORT.pdf>

THE STUDENT EXPERIENCE OF HIGHER EDUCATION

The quality of the student experience within Australia's higher education institutions can be monitored and investigated nationally through surveying students regularly. This should be always conducted by discipline to ensure that issues specific to each area of study can be identified and addressed.

DEEWR recently completed the Final Year Engineering Student Survey. This national survey targeted engineering students in their final year of undergraduate and Masters by coursework awards. It provides insights into the attitudes and aspirations of 1,540 final year engineering students from 31 universities across Australia.

Survey questions were designed to gain understanding of engineering students in terms of the profile of engineers (gender, age, ethnicity and citizenship status); why and when they chose to study engineering, including who or what influenced their decision; what they thought of their university course experience and their work experience placements; and their career intentions in relation to future employment and what constitutes an 'ideal' engineering job.

The report revealed a number of key findings including those pertaining to the student experience for final year engineering students.¹³ However the student experience in the first three years of engineering is not being measured or gauged widely enough. We can assume that the experience across the university sector is not impressive as evidenced by the drop-out rates exhibited in table 1. Gauging these earlier experiences in the early years of university will be critical in determining why it is that students are leaving the degree.

CONNECTING WITH OTHER EDUCATION AND TRAINING SECTORS

The movement between the sectors of students with credit needs to be significantly improved. In a modern Australia, people move between jobs and upgrade their skills often, requiring flexibility to do so.

ACEA appreciates that better transition and further expansion of mutual recognition is not a simple process, however without a move in this direction, student and industry needs will be unmet.

Introducing content standardisation which maintains a correlation where possible between TAFE and university subjects will benefit the higher education system as well as its students. In application this consistency will ensure that advanced standing can be offered to students who have completed a TAFE degree for university subjects and vice versa. This is not to say that a TAFE diploma should become the same as a tertiary degree, only that if there are similar or same subjects offered at a university and a TAFE within the same discipline, these two subjects should be similar enough to be interchangeable between the two learning sectors.

The government should encourage higher education sectors to adopt a flexible and collaborative approach that will allow content standardisation (where possible) to occur. This process will allow students who have either not completed their studies or want to move between the sectors the opportunity to resume or further their education and (re)enter the workforce.

Recognition of Prior Learning

ACEA member feedback has outlined that recognition of prior learning from within the workplace is an extremely difficult and time consuming process.

Training and education is frequent in the workplaces of consulting engineering firms and employees often seek to have this learning recognised through a higher education institution to count towards a Masters

¹³ http://www.dest.gov.au/sectors/higher_education/publications_resources/profiles/views_engineering_students.htm#abstract

program for example. The issue exists in the extraordinarily large amount of written work which is required to substantiate prior learning.

ACEA contends that documentation from the employer outlining the level of prior learning completed should be sufficient in an employee/potential student being granted recognition of prior learning in the higher education sector.

AUSTRALIA'S HIGHER EDUCATION SECTOR IN THE INTERNATIONAL ARENA

The Australian tertiary education sector must remain internationally competitive to attract the best international and domestic students. International fee paying students encourage improved standards for course design, content and delivery.

Australian Universities need an appropriate balance between domestic places and full fee paying overseas places and we would like to see more Australian students going into university to study engineering. ACEA believes Australia needs to attract overseas students which will in turn force universities across the nation to deliver internationally competitive and high standard courses benefiting our domestic students as well.

By having the most internationally comprehensive courses, tertiary institutions can provide the best and most globally competitive graduates alongside attracting the best and brightest from overseas to study (and potentially work) in Australia.

FUNDING ARRANGEMENTS FOR UNIVERSITIES

ACEA support the premise that more funding should be made available to universities for critical learning infrastructure like laboratory equipment and for other key areas like increased face to face learning opportunities (more staff, where appropriate).

We applaud the Education Investment Fund (EIF) announced in the recent Budget, which will provide \$11 billion to fuel strategic investment in Australia's universities, vocational education institutions and major research institutes.

We contend that funding to improve the quality of academics which Australia attracts and retains is a critical issue for this Review to consider. The skills shortage and ageing population means that university academics are retiring and not being replenished at the same rate, as is happening in many other industries.

We believe that universities should be funded based on their education outcomes, and graduate quality rather than Research and Development work (R&D). Although we see R&D as beneficial to the Australian community, we believe the primary outcome and measurement tool for universities should be on the number and quality of graduates they are producing.

Another area for consideration for the Review when contemplating funding models should be student assistance programs. In particular the amount of money which is provided through these schemes must be adequate to the cost of living in capital cities. A way to offer and provide cheap student loans to all Australians will also be beneficial for consideration by the Review team.

HIGHER EDUCATION'S CONTRIBUTION TO AUSTRALIA'S ECONOMIC, SOCIAL AND CULTURAL CAPITAL

The aim of the university sector should always focus on academic outcomes, when these can be further enhanced through community engagement in a meaningful educational way, ACEA view that this is clearly beneficial however care should be taken to not to expand the university sector's primary role too far beyond producing high quality graduates.

ACEA believe that knowledge transfer and community engagement are additional, not primary roles for contemporary higher education institutions. A university's primary role should encompass producing high skilled, innovative graduates.

The more a university is expected to participate in other areas, like community engagement, it is apparent that less time will be available to academic activities like refining course work, teaching innovatively and additional student assistance.

Australian university staff currently struggle balancing R&D activities and teaching, if other aspects and roles are placed within the sector's scope this may take away from academic rigour. However if a university is producing outstanding graduates, the university could look at blending this with other roles like engaging with the community.

The statement of functions and characteristics of higher education in modern Australia

ACEA contends that the statement of functions of higher education in modern Australia is correct, with one exception.

1. Meet the needs of the labour market and industry for high level skills
2. Provide opportunities for all capable students to participate
3. Provide students with a stimulating and rewarding higher education experience
4. Connect effectively with the other education and training sectors
5. Play a vital role in the national research and innovation system
6. Operate internationally
7. Contribute effectively to the development of Australia's social and cultural structures and its national and regional economies

ACEA views that point number 7 should be reworded to *"Produce students that are socially and culturally aware and are able to contribute effectively to the development of Australia's national and regional economies."*

ACEA believes that the sectors contribution to Australia's social and cultural structures and its national and regional economies is a bi-product of producing graduates that contribute to Australia's economy and not a statement of purpose or function for the higher education sector.

IMPROVING THE LINK BETWEEN THE TERTIARY SECTOR AND INDUSTRY

ACEA considers that there should be adequate opportunities for meetings between industry and the tertiary sector to ensure that as Australian industries change and grow; graduates are being prepared for work in a contemporary setting, with modern skills and competencies.

For example, ACEA believes that industry associations, as the voices of their industry sectors should be a party to the consultation process when course work or curriculum reviews occur in the tertiary education sector. It is important that industry is able to offer advice to the tertiary sector which outlines the needs of contemporary business. In theory this will see a greater number of graduates exit university with the skills required for employment.

The consulting engineering industry recognise that we have a role to play in highlighting a career in engineering as attractive and exciting to encourage school leavers into university to study engineering.

We do this through promoting engineering at secondary school using our Engineering Design your World DVD (copy attached), by working with State and Federal stakeholders at the primary school level, with our recent ACEA Primary School Science Education Summit to make primary school science education more experiential and experimental. We also engage in this space within adult education by creating a part-time distance mode engineering degree with Open Universities Australia. We see the role of the tertiary education sector as educating students and producing competent graduates which meet the needs of contemporary industry.

RETHINKING AUSTRALIAN ENGINEERING EDUCATION

Through ACEA's work to engage with the rethinking engineering education project, we offer the Higher Education Review our findings. The employers of graduate engineers, Australia's consulting engineering industry, have a valuable perspective when re-thinking Australia's current engineering education system. Employers can offer an extremely valuable perspective and ultimately a critique of the 'end product'.

Consultation with industry should remain a key component of university standard business practice. Gauging the satisfaction of the 'end user' or employer is important to create business-ready and technically competent graduate engineers. A great number of ACEA members have existing relationships with Australian universities and provide input into course work, collaboratively aiding in providing an industry perspective to educators.

We attach our submission to the Rethinking Engineering Education project (Attachment 2) and trust that it a useful report for consideration by the Review Panel.

KEY RECOMMENDATIONS SUMMARY

- An investigation, completed by DEEWR should occur to determine why engineering degrees across Australian universities attract a 50% student drop-out rate.
- To meet the needs of industry, graduate employability skills should be implemented within courses across all higher education curricula.
- Work integrated learning opportunities for students should be strengthened through support by the Government in the form of an Education and Training Tax Incentive and through better industry and higher education sector links. The same Education and Training Tax Incentive would also provide access to lifelong learning opportunities to people already in the workforce.
- To meet the skills needs of all industries, *Skills Australia* should be expanded to include scope for gathering information for professional skills, i.e. those obtained through the higher education sector. These should be fed back through to the higher education sector to assist in demand driven course planning. This data should also be fed to DEEWR to plan how they allocate their Commonwealth funded places.
- The Higher Education Review should consider that the tertiary education sector is part of a larger entity; this being the Australian education system and does not exist in separation of the other sectors. Primary and secondary education and the VET sector all impact on and are impacted by tertiary education. This is an important realisation when considering any changes to the tertiary education sector.
- Seamless transition between VET and tertiary sector should include an attempt to standardise subjects where possible to allow for mutual recognition of prior learning. This would occur in recognition that Australians do not always move from VET to tertiary education, movement occurs post-tertiary to VET as well.

- Remaining internationally competitive is critical in creating a world class higher education sector in Australia.
- The formal links between the university sector and industry associations should be strengthened.
- Work experience and cadetships have the potential to decrease the graduate drop out rate; however businesses are finding it difficult to see the returns on their investment in this area.
- A lifelong learning approach, recognising that Australia's future prosperity will rely on its knowledge economy. Flexibility including distance mode and part time delivery of courses will ensure that lifelong learning is available to all Australians.
- Recognition of prior learning should be a simple and non-time consuming process.
- As requested by the review team, ACEA attaches our 2008 Skills Survey Results (Attachment 1) which outlines the disciplines and geographical areas experiencing shortages within the consulting engineering industry.

CONSULTATION REFORM

ACEA believes that the process in Australia for National and State public Government consultation requires reform.

The United Kingdoms' Government Department for Business Enterprise and Regulatory Reform¹⁴ has implemented *The Code of Practice on Consultation* which sets out the basic minimum principles for conducting effective Government consultations. It aims to standardise consultation practice across Government and to set a benchmark for best practice, so that all respondents would know what to expect from a national, public Government consultation.

It is centred around six key consultation criteria which are as follows:

- Consult widely throughout the process, allowing a minimum of 12 weeks for written consultation at least once during the development of the policy.
- Be clear about what your proposals are, who may be affected, what questions are being asked and the timescale for responses.
- Ensure that your consultation is clear, concise and widely accessible.
- Give feedback regarding the responses received and how the consultation process influenced the policy.
- Monitor your Department's effectiveness at consultation, including through the use of a designated Consultation Co-ordinator.
- Ensure your consultation follows better regulation best practice, including carrying out a Regulatory Impact Assessment if appropriate.

The additional benefit of this system is that the Government is required to complete an impact assessment. Impact Assessments ensure those interested in certain policies understand and can challenge why the

¹⁴ Department for Business Enterprise & Regulatory Reform, United Kingdom, webpage: <http://www.berr.gov.uk/bre/consultation%20guidance/page44459.html>

Government is proposing to intervene, how and to what extent new policies may impact on them, the estimated cost and benefits of proposed and actual measures.

ACEA believes that the Australian Government should move to implement these changes and adopt them as part of an every-day business policy which applies across all policy making activities.