

Ai GROUP SUBMISSION

to the House of Representatives
Standing Committee on
Education and Employment
Inquiry into innovation and creativity:
workforce for the new economy

MARCH 2016

Ai
GROUP

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About Australian Industry Group

The Australian Industry Group (Ai Group) is a peak industry association in Australia which along with its affiliates represents the interests of more than 60,000 businesses in an expanding range of sectors including: manufacturing; engineering; construction; automotive; food; transport; information technology; telecommunications; call centres; labour hire; printing; defence; mining equipment and supplies; airlines; and other industries. The businesses which we represent employ more than one million people. Ai Group members operate small, medium and large businesses across a range of industries. Ai Group is closely affiliated with more than 50 other employer groups in Australia alone and directly manages a number of those organisations.

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Executive Summary

We recognise the central role of innovation in the advance of the Australian economy and in the ability to sustain further rises in Australian living standards. In particular we have no doubt of the potential benefits that could flow from a dramatic improvement in the level and quality of collaboration and cooperation between businesses, universities and other research organisations. These relationships are not as strong or widespread in Australia as they should be, and as they are in many other OECD economies.

The rapidly changing nature of the economy with its focus on higher order skills increases the pressure on tertiary education to meet these skills needs. It is clear that there is an increasing need for graduates with advanced skills including digital literacy and Science, Technology, Engineering and Mathematics (STEM) skills. However, employers are dissatisfied about the lack of relevant qualifications, employability skills and workplace experience. It is a high order priority for increased connections between business and tertiary education.

Notwithstanding the increasing importance of innovation there is currently a low level of research partnerships for the necessary collaboration to achieve this. Business is either unaware of or unconvinced by the benefits of partnerships with tertiary education. Issues often emerge in relation to Intellectual Property, collaboration on business priorities and the commercialization of research outcomes.

There are many initiatives under way to improve business-research connections. Some are embodied in the recent National Innovation and Science Agenda (NISA). NISA is a very positive package which elevates the recognition of innovation; improves the allocation of innovation resources; provides important incentives for early-stage investment and introduces initiatives that represent fruitful new directions for Commonwealth policy.

In particular the reworking of the formulae for allocation of public research funding was long awaited. Giving industry collaboration equal weighting with academic publication shifts the basic incentive structure of academia, giving encouragement to researchers who want to work with industry. The new system will need monitoring, but it is a major step in the right direction.

The rise of entrepreneurialism is an important factor to promote innovation in the new economy. A highly skilled workforce is a key ingredient across the economy and for the growth of small business. These skills need to include the technical as well as the non-technical and the role of the Vocational education and Training (VET) sector should not be overlooked. The spread of entrepreneurialism is facilitated by digital technology and Australia has a solid foundation for the expansion of this through the recent significant growth of the small business sector. The strengthening of the newly renamed Innovation Connections element of the Entrepreneur's Programme will also help high-growth-potential businesses access expertise that can boost them.

The Industry Growth Centres being established for various sectors are industry-led and have a directive to foster more effective research-industry collaboration. It is still early days for these bodies, but we are hopeful they can play a strong role.

Another sectoral initiative is the Innovative Manufacturing Cooperative Research Centre (IMCRC), which will develop and disseminate technologies that help Australian businesses transform their practices. Industry leadership will be central to making the IMCRC a success, and Ai Group has been a partner all the way along. There is an important role for initiatives like the IMCRC and the Growth Centres, or for that matter the Australian Renewable Energy Agency, which intensify efforts in identified areas of advantage and opportunity.

However, that is not the whole story. Valuable innovation can happen anywhere in the economy. Serendipity and unexpected directions are powerful forces. Australian policy also needs to provide broader demand-led incentives for innovation that are credible and stable enough for business to rely on.

The R&D Tax Incentive is the key policy in this area. The Incentive plays an important role for many of our members in enabling a higher level of R&D investment than they would otherwise be able to support. While there are always ideas for improving the incentive or targeting it more tightly, the policy has been through a lot of changes in recent years and stability is badly needed. Ai Group wants to retain the incentive and to ensure that any amendments are directed at improving its function, not simply savings measures like those that recent governments have proposed.

The existing Incentive encourages investment in R&D. There is also considerable interest in measures like the UK 'Patent Box', which encourages commercialization of intellectual property developed here. This could be a valuable complement to existing policy, though not a replacement. The Patent Box is worth investigating further.

Beyond public policy, there is a need for researchers and industry to improve their own practices. Effective collaboration is built on good practices, skills and experience that need tending.

The extent to which students are graduating with skills needed for the jobs of today and of the future

Australia's workforce needs to be a source of competitive strength: the economy needs higher order and highly specialised skills that straddle traditional industry silos, as well as broadly applicable skills to innovate in order to meet transforming industries and jobs. With 5.1m jobs estimated to be at risk from digital disruption over the next 10 years¹, the exploration of new tertiary education models that embed fluid knowledge and capabilities for enquiry, initiative, problem-solving and teamwork is likely to better equip graduates for change².

The ability to exercise critical thinking and contribute to a civil society will be paramount. The jobs that experience growth will require high level thought and judgement. The concept of teamwork and social skills will be broader – not just within a workplace but across countries³.

In the increasingly challenging global environment, more than ever Australia needs its tertiary education sector to be able to produce world class graduates and researchers. However without being able to predict the shape of many future jobs, this sector needs to develop knowledge in its students that is adaptable in the face of changing work, as well as capabilities that allow graduates to quickly fit within the workforce.

McKinsey's has categorised the jobs developing as a result of technology and global supply chains into Interaction jobs, Production jobs and Transaction jobs⁴. The Interaction jobs, involving more complex interactions and judgement, represent almost half the jobs in the economy but are the source of all employment growth. They suggest that a focus on these types of jobs will be a key to Australia's competitiveness.

The CSIRO's latest report on megatrends for Australia's future workforce in the next 20 years highlights the need for a paradigm shift of mindsets for workers, employers, education sector and governments to accommodate for the predicted jobs of the future. While there may be a focus on the types of technology that may arise that produce jobs where specialised skills will be advantageous, an underlying message is that foundational skills as well as new capabilities will become more important than ever before in the wider workforce of the future. As the report notes, creativity, problem solving, advanced reasoning, complex judgement, social interaction and emotional intelligence will become highly important in these roles; equally, literacy, numeracy and digital literacy will need to be just as critical for these future jobs.⁵

Ai Group research has found that in the current environment employers still need graduates with degrees. Employers were asked about the proportion of full-time jobs that require a degree qualification.

¹ Committee for Economic Development of Australia, Australia's future workforce?, 2015

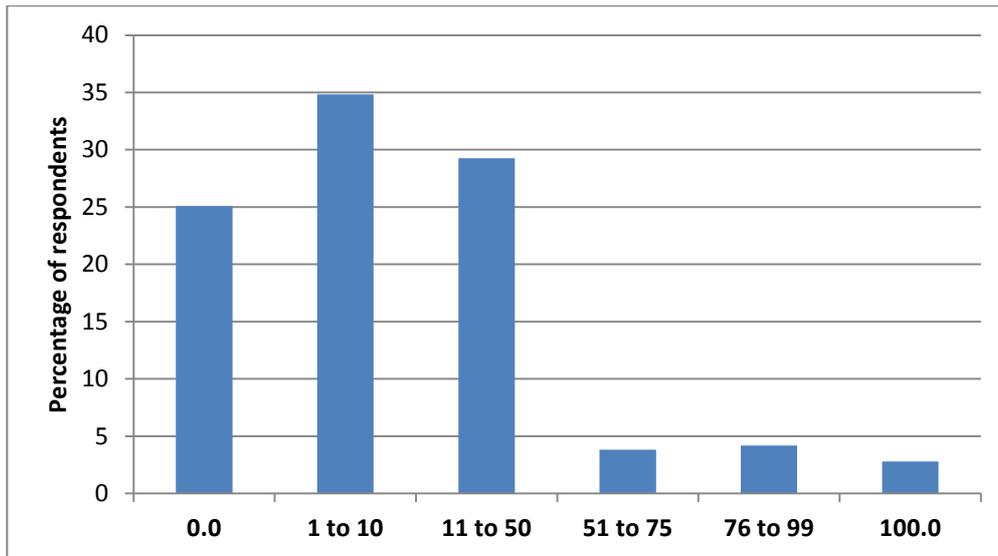
² Edge/SCRE Centre, Employers' perceptions of the employability skills of new graduates, 2011

³ John Lydon, David Dyer, Chris Bradley, McKinseys, Compete to Prosper: Improving Australia's Global Competitiveness, 2014

⁴ McKinsey Australia, Compete to Prosper: Improving Australia's global competitiveness, 2014

⁵ Tomorrow's Digitally Enabled Workforce, CSIRO, January 2016

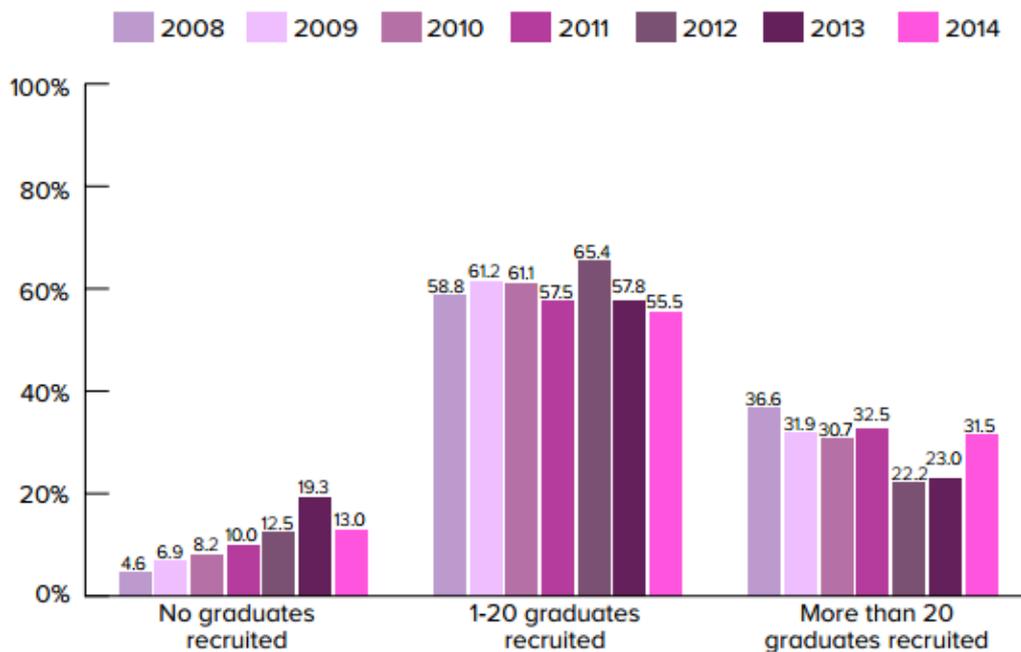
Chart 1: Proportion of full-time jobs requiring a degree qualification



As shown in Chart 1, degrees are needed for 75 per cent of the jobs in respondents' workplaces. Only a small percentage of employers (8 per cent) required over half their workforce to hold degrees. One quarter reported that no jobs need degree qualifications.

This is similar to the graduate intake trend information provided through Graduate Careers Australia.

Chart 2: Graduate Intake for 2008 – 2014 (%)



This data indicates an increase of 8.5 per cent on more than 20 graduates being recruited compared to the previous year. The one to 20 graduates category is relatively stable and the no graduates recruited category decreased by 6.3 per cent on the previous year.⁶

⁶ Graduate Outlook 2014, Employers' Perspectives on Graduate Recruitment in Australia, Graduate Careers Australia, 2015, page 3.

As industry meets the challenges of new business models, new ways of working, and new technology, there are some questions around the ability of Higher Education graduates recruited to meet these challenges. Industry needs graduates who embody T-shaped attributes - they develop in-depth disciplinary knowledge but also develop skills and abilities not simply specific to one area⁷. They work in teams and are capable of 'deep listening'. They have an entrepreneurial spirit to create new jobs and they can communicate. It is the mix of skills and capabilities needed for the future. Capabilities seen as important to foster in Higher Education students include intellectual openness, skills for retrieval, methods of enquiry ethics, and discovery⁸. Educators are being called on to stretch and inspire students. It could be argued that these have always been attributes central to tertiary study, however a new world means a new application for them. Fixed knowledge is predicted to have decreasing value with fluid knowledge becoming more important.

With digital innovation increasingly central in every part of the economy, Science Technology Engineering and Mathematics (STEM) skills are also now seen as critical workforce skills important for digital capabilities and the basis for innovation and growth.

Discussion focusing on the ability of our education systems to keep up with changing business needs is present in a number of fora and papers, including *Investment in Global Education: a strategic imperative for business*⁹ which suggests that the global pool available through education will not be able to support the human capital needs of the private sector.

According to Ai Group's Workforce Development Needs Surveys¹⁰, the proportion of employers saying recruits have a lack of relevant qualifications doubled between 2012 and 2014, and dissatisfaction rose with regard to lack of employability skills and workplace experience. The 2014 Workforce Development Needs Survey found that employers continue to experience difficulties recruiting STEM qualified workers. One fifth had difficulty recruiting professionals with STEM.

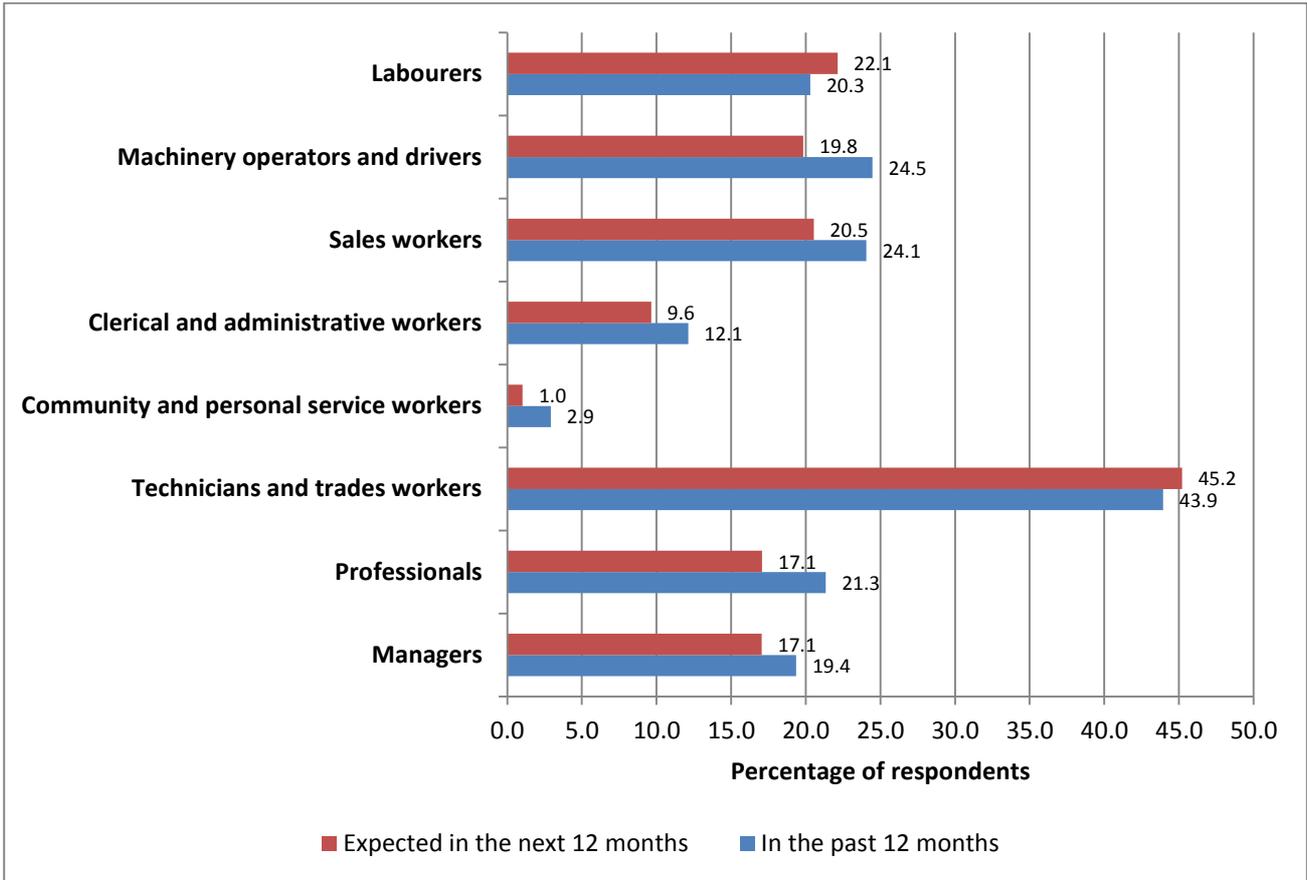
⁷ David Guest, The hunt is on for the Renaissance Man of computing, 1991

⁸ Dr Kaye Bowman, Background paper for the AQF Council on generic skills, 2010

⁹ Rebecca Winthrop, Gib Bulloch, Pooja Bhatt and Arthur Wood, *Investment in Global Education: A Strategic Imperative For Business*, 2013

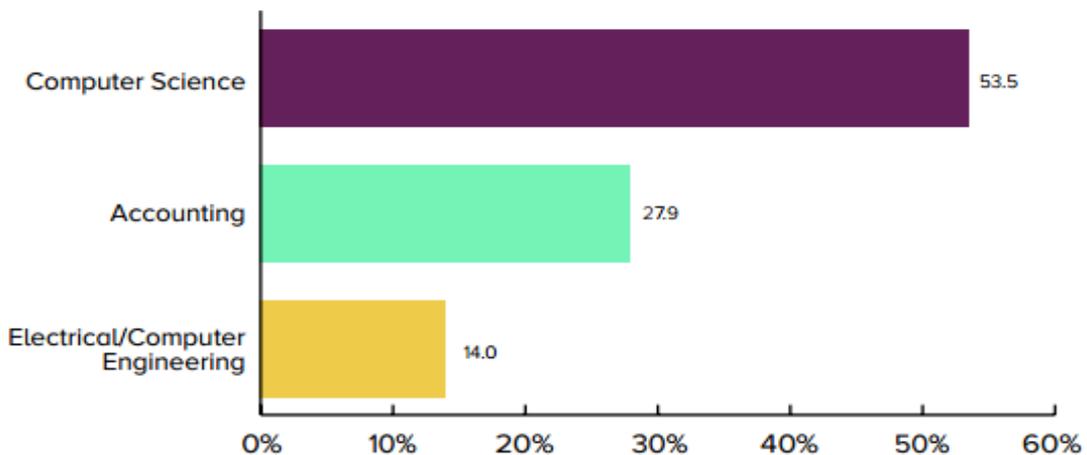
¹⁰ The Australian Industry Group, Workforce Development Needs Survey 2012 and 2014.

Chart 3: Difficulties Recruiting STEM Skills



The latest report from Graduate Careers Australia also included information on the proportion of employers experiencing difficulty sourcing graduates by discipline areas. Computer science (53.5 per cent), accounting (27.9 per cent) and electrical/computer engineering (14 per cent) were the most difficult areas to source. It is interesting to note that these all fall within STEM disciplines.¹¹

Chart 4: Proportion of employers with difficulties sourcing graduates by discipline area 2014 (%)

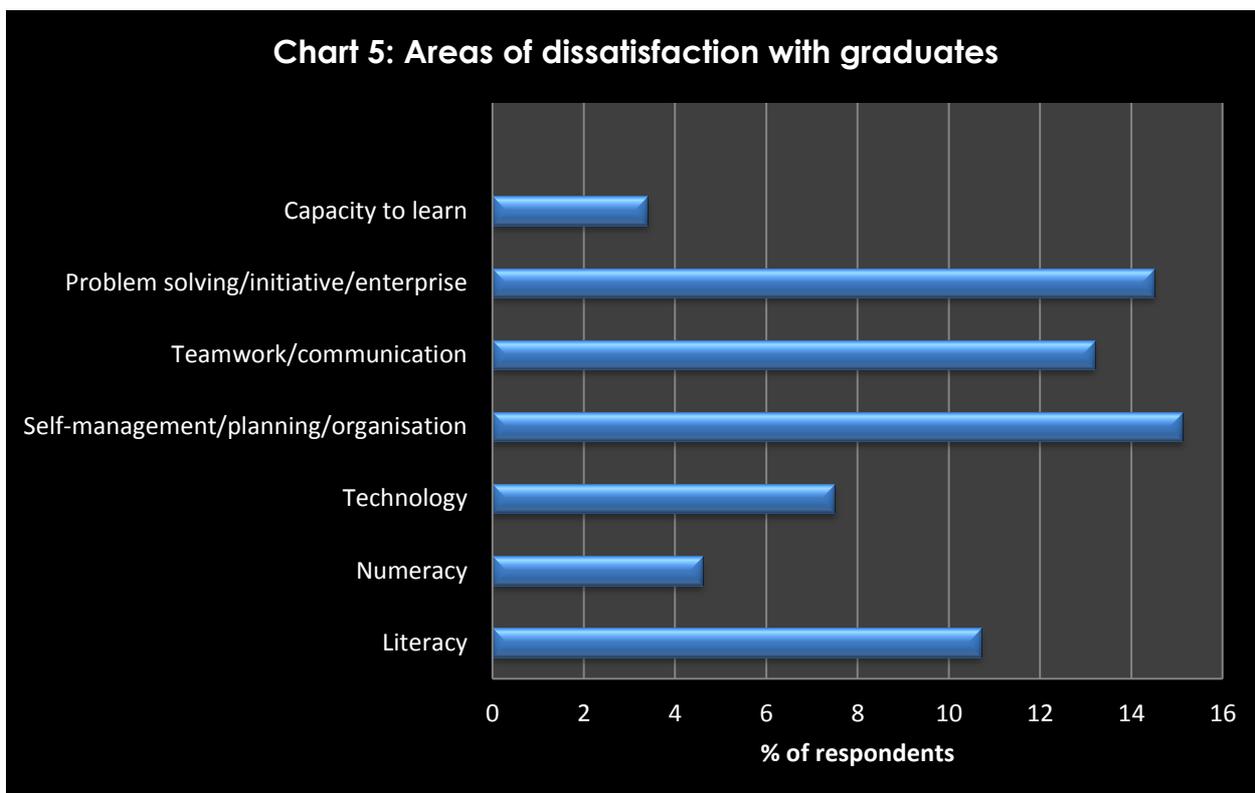


¹¹ Graduate Outlook 2014, Employers’ Perspectives on Graduate Recruitment in Australia, Graduate Careers Australia, 2015, page 6.

All graduates are better prepared to contribute productively in the workplace if they have had opportunities to integrate theoretical knowledge with practice. As stated, for example, in the 2014 Manufacturing Workforce Study¹²

‘any work experience should enable students to join theoretical knowledge to the practical application of skills as well as significantly enhancing communication and business, or the soft skills, of students’.

Ai Group’s 2014 survey asked about areas of dissatisfaction once tertiary graduates are recruited. Chart 5 shows that the areas of most concern focus on generic skills. They include self-management/planning and organising (15.1 per cent), problem solving/initiative and enterprise (14.5 per cent), and teamwork/communication (13.2 per cent).



One responding employer commented that rather than lacking the skills, graduates need ‘fine tuning’ and that their potential has not been tapped. The employer believed that graduates should possess a deeper understanding of the changing face of Australian work, whether technology related, structural, or lean focused, and they should understand how the impact of globalisation is affecting Australian industries. Another member company that employs a number of graduates each year provided an outline of the generic capabilities it looks for in graduates during recruitment:

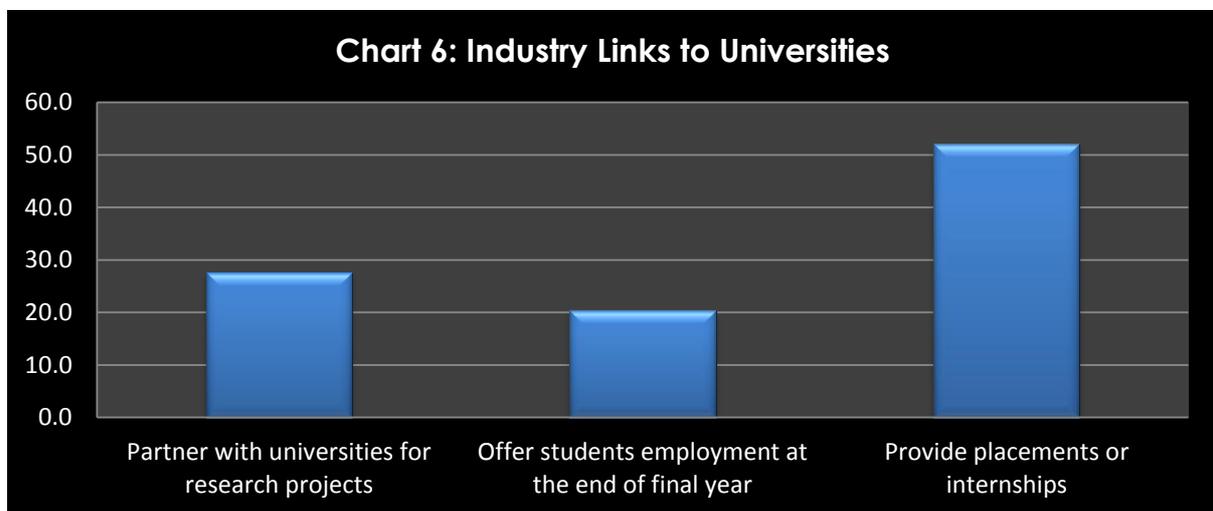
- Ability to be able to work as part of a team
- Soft people skills – to enable involvement in the consultation process when introducing change
- Preparedness to seek input and opinions of others
- Project management skills (many graduates struggle to establish and deliver a project plan that meets operational measures)
- Flexibility (in a three shift operation where graduates may need to provide support to all shifts)

¹² Australian Workforce and Productivity Agency, Manufacturing Workforce Study, April 2014.

- Courage to seek assistance
- Motivation to work with shop floor employees as well as other engineers and senior people
- Ability to take a broader look at the full picture – not just focus on the piece of the puzzle an individual is working on
- Resourcefulness – broad thinking, able to seek out alternative ideas, different approaches.

Add to the development of these capabilities the concept of ‘nano-learning’, that is, two to ten minute blocks of quick learning, and current delivery models face complex challenges. Educational content may need to be delivered faster, cheaper and on demand and with new learning experiences – ensuring more focus is on questioning, exploration and authentic environments.

A key solution to a lack of work readiness in graduates is to expose students to the workplace during their studies. Chart 6 shows that around half of the employers responding to Ai Group’s survey (51 per cent) provide placements or internships for students. 27 per cent partner with universities for research, and 20 per cent offer students employment at the end of their final year of study.



Factors that discourage closer partnerships between industry; in particular, small and medium enterprises, the research sector and education providers; including but not limited to: intellectual property; technology transfer; and rapid commercialisation

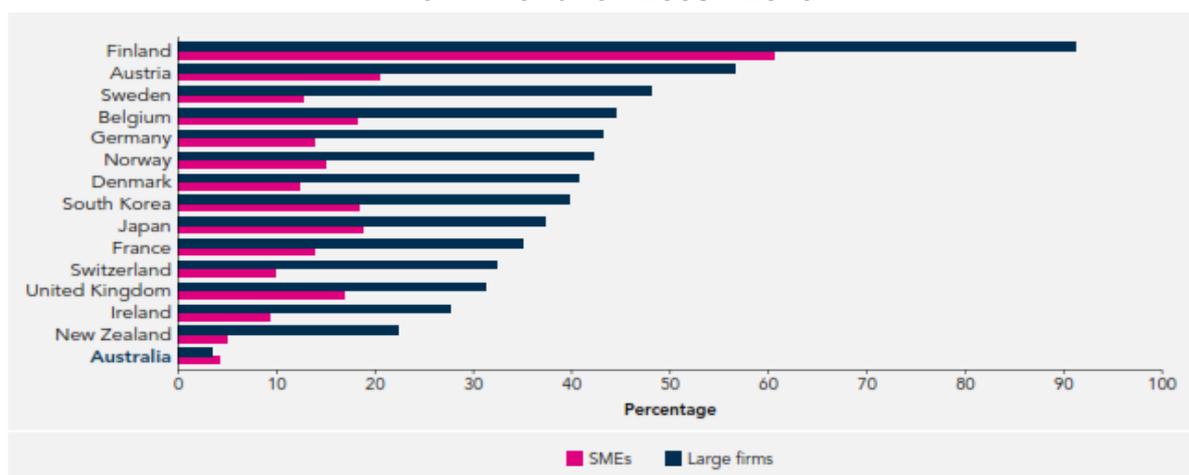
Partnerships between industry and universities are particularly needed for the purposes of research. There is a relatively low level of industry – university collaboration and Australia has the lowest level of business to research collaboration among comparator countries and ranks last in the OECD for industry – university collaboration on innovation. Some 60 per cent of all researchers in Australia are based in universities and a further 10 per cent in research agencies. This means unusually, only 30 per cent of Australian researchers are based in industry compared with 80 per cent in the United States, 70 per cent in Japan and 64 per cent in Switzerland.¹³

Universities and business need each other. Their resources, ideas and capabilities can achieve more together than separately to produce new knowledge and turn it into economic and social impact.

“Businesses that collaborate on innovation with research organisations are three times more likely to experience productivity growth, improved sales and exporting activity.”¹⁴

Despite that imperative, Australia has a long way to go. Australia has the lowest level of business to research collaboration among comparator countries within the OECD. It ranks 32nd out of 33 OECD countries for SME collaboration and last for large enterprises.¹⁵

Chart 7: Industry – Higher education and research Institutions Collaboration on Innovation 2008 - 2010



Notes: By OECD classifications, firms with 10–250 employees are considered SMEs, and firms with more than 250 employees are large firms. Where no data were available for 2008–2010, other years are displayed: Australia 2010–2011, New Zealand 2009–2011, Ireland 2006–2008, Switzerland 2009–2011, Japan 2009–2010 and South Korea 2005–2007.

Source: OECD 2011b.

Ai Group’s members report a range of different experiences with the universities. There are some successful long standing relationships, often with larger or multinational businesses, sometimes mediated

¹³ Science, Technology, Engineering and Mathematics in the National Interest: A strategic approach, Office of the Chief Scientist, July 2013, page 8

¹⁴ National Innovation and Science Agenda, Australian Government, 2015, page 10.

¹⁵ Benchmarking Australian Science, Technology, Engineering and Mathematics, Office of the Chief Scientist, November 2014, page 30.

by Cooperative Research Centres and sometimes direct. Some report a growing stream of innovative start-ups driven by students and recent graduates, rather than more traditional spinoffs by the university or senior staff. But many are either unaware of the capabilities of the universities, unconvinced of the potential benefits, or actively repelled by bad experiences or negative perceptions.

There are difficulties on both sides. Effective collaboration practices are no more universal within business than within the tertiary sector. To make the most of collaboration, all parties need to be able to:

- build trust, including through building joint teams and embedding staff with each other;
- share goals, aligning their incentives; and
- move beyond pre-defined solutions and transactions to be open to unexpected opportunities that emerge in the collaboration, including new approaches to the underlying commercial problem or opportunity.

Businesses often refer to other problems with university collaboration. Intellectual property is a frequent stumbling block. Often businesses seeking relationships with Australian universities find themselves immediately drawn into long and complex IP negotiations, with universities insisting on ownership and licensing arrangements that make business participation unattractive.

Businesses often see university researchers as looking for sponsorship for their pre-existing projects, rather than opportunities to collaborate on business priorities. Business and universities often simply do not speak each other's language, with little appreciation for commercial pressures – or the complex politics and processes within and between universities. Innovation collaboration is often more frequent and more successful overseas.

Industry needs quality researchers who have the ability to work within industry and innovation systems in order to commercialise research. Research students similarly need a broad set of skills. The Discussion Paper of the recent Review of Australia's Research Training System refers to both generic training and transferable skills as the components of research training models across and within different research systems¹⁶. Whilst businesses increasingly need high level competencies in research graduates to keep pace with technology advances, our evidence is that they equally value, and need, broader skills to ensure the effective translation of research to commercialisation.

However, nothing is guaranteed and there is a risk that the specific metric used as a proxy for collaboration, the income researchers generate from working with industry, may prove imperfect. It would be counterproductive if researchers are driven to pursue immediate income over wider impact or long term commercial relationships.

Improving innovation collaboration needs action from government, universities, and industry. In terms of Government actions, the Australian Government's recent National Innovation and Science Agenda announced some very important steps. One is the long-sought realignment of research funding formulae to give greater weight to impact and commercial collaboration. This is very positive and will help ensure university researchers get clear backing to increase and deepen collaboration with industry as a path to research excellence every bit as important as publication and citation.

¹⁶ Australian Council of Learned Academies, Review of Australia's Research Training System, 2015

That is why the second announcement, piloting new measures of impact and engagement in university research, is so important. Better metrics are needed to identify the full value of industry collaboration, just as much as the value of the humanities.

It is increasingly clear that leading universities are themselves proactive to change industry perceptions and the underlying reality of collaboration. There are some extremely positive initiatives like establishing common processes for IP agreements or ethics approvals; building industry collaboration into more degrees; and spreading industry engagement expertise throughout the faculties.

Ai Group is part of the Innovative Manufacturing Cooperative Research Centre to help connect researchers and their work with more small and medium sized businesses than most CRCs have attempted before. That is where the potential for genuine industry transformation lies.

A broader effort on the industry side to build collaboration skills and practices will be needed. The cultural barriers to collaboration may be higher in Australia than elsewhere, but they are not set in stone.

Relationships between tertiary education entrepreneurship programs and private incubator and accelerators

A key factor in the promotion of innovation is the presence of a highly skilled and adaptable workforce and measures required to bring this about. The OECD suggests that what is required is:

“a skilled workforce that has the knowledge and skills to generate new ideas and technologies, to bring them to market, and to adapt to technological changes across society. Reforms to education and training systems, and to skills policies more broadly, are therefore of the utmost importance to innovation.”¹⁷

The Australian Council of Learned Academies (ACOLA) has reported on the role of science, research and technology in lifting Australia’s productivity. This report highlights that an innovative workforce combines technical and non-technical education. This enables effective business management necessary to develop competitive advantage and realise opportunities to increase productivity.¹⁸ It is important when considering the connection between innovation and the workforce for the new economy that the role of the Vocational Education and Training (VET) sector is not forgotten.

This has unfortunately occurred in the Government’s National Innovation and Science Agenda statement. In the two key areas of Collaboration and Talent and Skills there is no reference to the VET sector. Collaboration is considered solely as necessary co-operation between businesses and the higher education sector. Similarly, in the Talent and Skills component initiatives covering STEM are prominent but again there is no reference to the VET sector. There is no recognition, for example, that the apprenticeship system represents an effective method of collaboration between business and the VET sector as well covering many of the STEM skills so important for the new economy.¹⁹

Individuals are increasingly creating their own employment and the CSIRO refers to this phenomenon as a megatrend – the era of the entrepreneur. Digital technology is a significant enabler for small business. Australian small businesses employing 1 – 4 people grew significantly by 35 per cent between 2003 and 2007 before the Global Financial Crisis and flatten after that. Small business still accounts for the largest proportion of employment with 43 per cent in 2012 – 2013 reducing from a high of 47 per cent in 2008 – 2009.²⁰

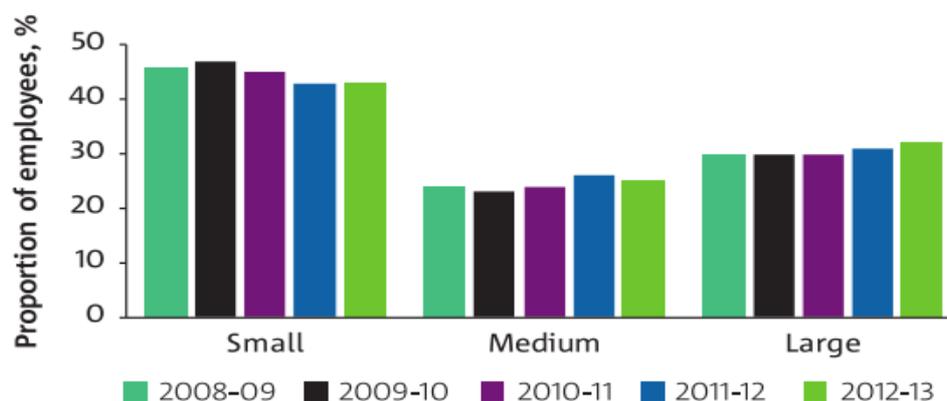
¹⁷ The Innovative Imperative, OECD 2015

¹⁸ The role of science, research and technology in lifting Australia’s productivity, Australian Council of Learned Academies, June 2014.

¹⁹ <http://www.ncver.edu.au/wps/portal/vetdataportal/restricted/newEventsOpinionpiece>

²⁰ Cited in Tomorrow’s Digitally Enabled Workforce, CSIRO, January 2016, page 40.

Chart 8: Proportion of employees by business size



According to rankings provided by Ernst and Young Australia has one of the top five entrepreneurial ecosystems and is ranked third in the world for entrepreneurship attitude by the Global Entrepreneurship and Development Institute.²¹ Education and training is one of the key elements of this index.

Chart 9: Top Ten Countries Global Entrepreneurship Index

Country	GEI 2016 lower limit	GEI 2016 upper limit	GEI 2016	Rank 2016	GEI 2015	Rank 2015
United States	91.4	81.1	86.2	1	85.0	1
Canada	85.5	73.4	79.5	2	81.5	2
Australia	87.4	68.6	78.0	3	77.6	3
Denmark	85.8	66.3	76.0	4	71.4	6
Sweden	84.6	67.1	75.9	5	71.8	5
Taiwan	77.0	62.4	69.7	6	69.1	8
Iceland	78.7	59.2	68.9	7	70.4	7
Switzerland	75.7	59.8	67.8	8	68.6	9
United Kingdom	71.8	63.5	67.7	9	72.7	4
France	76.8	56.0	66.4	10	67.3	12

The rise of new technology and digital disruption will contribute to the development of entrepreneurialism. This will especially be the case for young people entering the workforce looking for new models of employment. One major report has predicted that the first-half of the 21st century will see the rise of small technology based businesses.²² The CSIRO report references studies to generation Z, the ‘digital natives’. Surveys indicate that up to 72 per cent of them want to start a business and 32 per cent believe that within five years they will manage other employees.²³ It is encouraging to note that the NISA statement builds on the Entrepreneurs’ Programme and its ability to connect researchers to high-potential businesses in growth sectors.

²¹ Global Entrepreneurship Index 2016, The Global Entrepreneurship and Development Institute, 2016

²² Super Connected Jobs, Understanding Australia’s future workforce, Australia’s Broadband Network, 2015.

²³ Tomorrow’s Digitally Enabled Workforce, CSIRO, January 2016, page 55.



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