



Level 11, 33 King William Street  
Adelaide SA 5000  
PO Box 8288 Station Arcade  
Adelaide SA 5000

p +61 8 8230 8400  
f +61 8 8212 3436  
e [ncver@ncver.edu.au](mailto:ncver@ncver.edu.au)  
[www.ncver.edu.au](http://www.ncver.edu.au)

# Submission

**by the National Centre For Vocational Education Research (NCVER)**

**To**

**House of Representatives Standing Committee on  
Education and Employment**

([http://www.aph.gov.au/Parliamentary\\_Business/Committees/House/Education\\_and\\_Employment/Innovation\\_and\\_Creativity](http://www.aph.gov.au/Parliamentary_Business/Committees/House/Education_and_Employment/Innovation_and_Creativity))

March 2016

## Innovation and creativity: a workforce for the new economy

Name: National Centre for Vocational Education Research (NCVER)

Category: Ministerial Owned Company

Contact: Dr Craig Fowler, Managing Director

Phone: 08 8230 8400

Email: [craig.fowler@ncver.edu.au](mailto:craig.fowler@ncver.edu.au)

### RESPONSE TO THE TERMS OF REFERENCE<sup>1</sup>

The National Centre for Vocational Education Research (NCVER) is an independent body responsible for collecting, managing, analysing, evaluating and communicating research and statistics about tertiary education and training.

With regard to the overarching question of whether Australia's tertiary system can meet the needs of a future labour force focused on innovation and creativity, NCVER makes the following comments in response to the Terms of Reference, with particular emphasis on the first and third Terms of Reference. In addition we provide references to Australian and international publications for further consideration.

#### *What is innovation?*

Innovation is somewhat of a vague concept that means different things to different people. It is broadly conceived of as technological innovation, including research and development, or invention. The Australian Bureau of Statistics defines it as 'the introduction of a new or significantly improved good or service; operational process; organisational/managerial process or marketing method' (2015). For something to be an innovation, it needs to be new to the organisation. It can either be developed by the firm or be introduced to the firm. Innovation does not need to be something completely new (Stanwick 2011).

But, as Peter Drucker warns:

<sup>1</sup>[http://www.aph.gov.au/Parliamentary\\_Business/Committees/House/Education\\_and\\_Employment/Innovation\\_and\\_Creativity/Terms\\_of\\_Reference](http://www.aph.gov.au/Parliamentary_Business/Committees/House/Education_and_Employment/Innovation_and_Creativity/Terms_of_Reference)

Above all, innovation is work rather than genius ... There are clearly people who are more talented innovators than others, but their talents lie in well-defined areas ... In innovation as in any other endeavour, there is talent, there is ingenuity and there is knowledge. But when all is said and done, what innovation requires is hard, focussed, purposeful work. If diligence, persistence, and commitment are lacking, talent, ingenuity and knowledge are of no avail (Drucker 2002, p.102 cited in Misko & Nechvoglod 2011).

#### *The economic imperative for innovation and creativity*

But why should we care about innovation and creativity?

The driving force behind the interest in innovation is that it feeds into productivity growth and hence economic growth and improved living standards, as pointed out by the Organisation for Economic Co-operation and Development (OECD 2015). Innovation therefore is not an end in itself but an element of economic growth (Karmel 2011).

#### Responses to Terms of Reference

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

#### *Skilling for the new economy*

In 2014, as part the Australian Government review of its industry investment and competitiveness agenda, NCVER was tasked by the then federal Department of Industry to investigate the readiness of the education and training sector to meet demand from five industries where potential market opportunities have been identified: food and agribusiness; mining equipment, technology and services; medical technologies and pharmaceuticals; oil and gas; and advanced manufacturing (Beddie et al 2014).

The aim of this work by NCVER was to identify issues pertinent to ensuring that the education and training system could respond to emerging skills demand in these industry areas. Some of those issues apply more broadly across the economy, and most need to be addressed in conjunction with other areas of industry policy.

The study found that the question of how ready the Australian training sector is to meet demand for skills in new and emerging industries has no straightforward answer. Further, the gap between the knowledge generated in the education system and the skills demanded by employers and individuals is widening.

Differences within and between the industries notwithstanding, a common theme across all new and emerging industries is the need for a significant cultural shift in thinking about the way skills are generated and deployed. As was the role of employers which is seen as crucial for encouraging and supporting a more nimble workforce, that is, one willing to learn new skills and adapt to change. This will require partnerships with schools, vocational education and training (VET) providers, universities and research organisations (Beddie et al 2014).

#### *What skills are needed to meet the demands of innovative and creative industries?*

It could be argued innovation skills per se do not exist; rather, there are skills for innovation that are essentially technical (e.g., science, technology, engineering, business skills) as well as generic skills which are often cognitive or soft skills such as critical thinking, problem solving, communication, entrepreneurship, writing and numeracy (OECD 2015; Stanwick & Beddie 2011). The skills required will depend on the context of their use.

That skills for innovation are also considered to encompass a range of cognitive or soft skills highlight the imperative of ensuring individuals have sufficient foundation skills, that is, English language, literacy and numeracy (i.e. listening, speaking, reading, writing, digital literacy, and use of mathematical ideas) as well as employability skills (e.g. problem solving, collaboration, and self-management) (SCOTese 2012). However, OECD assessments indicate that around 44% of Australia's working-age population (15 – 74 years) have low to very low literacy skills with approximately 54% having low to very low numeracy skills. For problem solving skills in a technology rich environment, 44% of 15 – 74 year olds were estimated to have low to very low skills (ABS 2013). A recent survey of employers undertaken by the Australian Industry Group found that 93% of participants identified low levels of literacy and numeracy having an impact on their business (Ai Group 2013) and note that the "mastery of literacy and numeracy is increasingly more important to meet the challenges of the

evolving economy” (2016, p.4). Innovation, in whatever form it takes, cannot be fostered among individuals, enterprises, governments, unless the issue of low foundation skills among the broader population is addressed.

#### *VET's role in fostering innovation*

Innovation involves a broad range of skills across a broad range of occupations. Toner (2009, cited in Stanwick & Beddie 2011) notes that a central message in the literature is that much of innovation is incremental. As such, it involves changes to organisational structures and processes as well as the introduction of new products and services. Hence there are substantial roles for occupational groups such as trades and technicians, and also financial management, marketing and business management.

There is a role for VET in the imparting of soft skills described earlier, although this may be a contested area with universities. However, it can be argued that these are practical courses that do not need to be taught in an academic or research environment and that the VET sector is well placed to serve these areas. In addition to teaching softer skills, the VET sector is clearly well-placed to teach the trades and related skills that are important to the implementation of innovative activities. The challenge for the sector is to remind employers of this (Stanwick & Beddie 2011) although NCVER's recent survey of employers' views of the VET system highlights significant satisfaction among employers with the skills the VET sector is providing:

- 76.2% of employers were satisfied that vocational qualifications provide employees with the skills they require for the job,
- 66.2% of employers believed all their employees were fully proficient at their job
- 81.7% were satisfied that apprentices and trainees were obtaining the skills they require from training (NCVER 2015).

The flexibility of the VET sector too means it can more easily provide ongoing or top-up training, which assists with innovation. Research on the Research and Development technician workforce found around 70% of trades and technicians had undertaken post entry-level training, mostly in VET and mostly at the diploma level (Toner 2011).

Flexibility of the VET sector could be further enhanced through the development of vocational streams, a modern concept of vocations promulgated by Wheelahan, Buchannan and Yu (2015). Vocational streams provide a better frame of reference for shaping the evolution of qualifications and jobs. Vocational streams increase the adaptability of individuals by instilling the basic knowledge required for a number of jobs within a broad vocational field of practice rather than for a specific job. Education and training in *vocational capabilities*, as opposed to specific occupational tasks, could result in a more sustainable, adaptable, mobile and innovative workforce.

## **2. Matters relating to laws and regulations that may act as a barrier to education providers being able to offer qualifications that meet the needs of the new economy and fastest growing sectors**

Apprenticeships and traineeships are an enduring tradition in VET and combine 'learning for the job' by gaining a qualification and 'learning on the job' as an employee. There are a myriad of practices across Australia's tertiary education system supporting 'learning for the job', such as expert industry input into VET training packages and industry input into the curriculum to ensure university graduates attain professional accreditation; or more directly, learning on the job (Fowler 2016). But in order for this method of skill development to be responsive to the needs of new and emerging industries consideration of innovative changes or additions to the traditional practices are warranted. For example, in the United Kingdom, there has been a growth in higher or degree apprenticeships in areas such as advanced manufacturing engineering, aerospace engineering, chartered surveying, construction management and digital media. For these types of apprenticeships the entry standards are higher than traditional apprenticeships, with off-the-job training blending both vocational and university courses. The implementation of these types of apprenticeships is a direct response to companies seeking higher skilled apprentices who are more employable in the longer term (Fowler 2016).

Such innovative changes to the traditional apprenticeship model merits consideration in Australia but would require an exploration of how models of practice, such as the higher or degree apprenticeships, could be

authorised in Australia given the governance of the current apprenticeship system is devolved to individual jurisdictions.

### **3. 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**

The ABS Business Longitudinal Survey (ABS 2013), which looks at the types of innovative activities implemented in firms, categorises innovative skills into ten main discipline areas: engineering, scientific and research, IT professional, IT technician, trades, transport, plant and logistics, marketing skills, project management, business management and finance-related skills.

The best of the VET sector produces graduates skilled in these discipline areas in the form of electricians, cardiovascular technologists, aircraft mechanics, mechatronic engineers (Wyman 2016, cited in Fowler 2016), just to name a few, and yet a concern by some is that firms will often overlook the VET sector as a source of skills for innovation and turn instead to the higher education sector (Misko & Nechvoglod 2011).

The current National Innovation and Science Agenda is also cause for some concern in that it has a greater focus on collaboration between higher education and industry, not addressing sufficiently the need for improved collaboration between industry and the broader tertiary education sector (Fowler 2016).

Indeed, the VET sector is better placed than the university sector in facilitating collaboration with industry given that it is not beholden to a research agenda and related intellectual property issues. Instead, of greater appeal to small and medium enterprises in particular, the VET sector should be seen as the applied researchers—the problem solvers—for industry. A model of practice that formalises the applied research and development capability of a vocational education provider is SAIT Polytechnic in Alberta, Canada. Here they have the ‘Applied Research and Innovation Services’ which brings together the needs of industry with the knowledge, skills and experience of teaching staff and students to help move innovations towards the market (see <http://www.sait.ca/research-and-innovation/about-aris.php>). CPIT (Christchurch Polytechnic Institute of Technology) is another provider of vocational education that has a focus on developing and expanding the research and innovation capabilities of staff and students in collaboration with industry partners (see <http://www.cpit.ac.nz/industry-and-research/research-and-innovation-capabilities>). .

NCVER’s interest in innovation and the benefits for industry is demonstrated through the recent commissioning of research focusing on the role of VET skills in fostering innovation within firms, particularly in relation to the VET student placement process. This research, being undertaken by Dr Steven Hodge and Dr Raymond Smith from Griffith University, poses the following questions:

- How does the process of student placement reflect and contribute to the openness of host firms to new skills, knowledge and attitudes?
- What role do placement students play in promoting innovation in host firms?
- How do competencies learned in formal VET transfer into host firms to promote innovation?
- What role do staff from training providers play in promoting innovation in host firms?
- What are the features of the student placement process as a whole that contribute to innovation?
- What are some examples where the student placement process has demonstrably contributed to innovation and how did this innovation come about?

This research is due for completion in early 2017.

### **4. Relationships between tertiary education entrepreneurship programs and private incubator and accelerators**

This is a legitimate area of inquiry and NCVER’s interest in this is demonstrated through the recent commissioning of research which aims to develop a foundation for assessing the current and possible future

role of VET in the emerging entrepreneurial 'system' in Australia. Being undertaken by Don Scott-Kemmis, this project will look at how VET contributes to the development of skills used by entrepreneurs in the early stages of forming new ventures, as well as to the development of skills used for innovation in new entrepreneurial ventures. This project is due for completion in December 2016.

**For further information, contact:**

Jodieann Dawe (National Manager, Research and Business Development Division) & Michelle Circelli (Senior Research Officer) NCVER, 08 8230 8400  
[jodieanne.dawe@ncver.edu.au](mailto:jodieanne.dawe@ncver.edu.au); [michelle.circelli@ncver.edu.au](mailto:michelle.circelli@ncver.edu.au)

**References**

- ABS (Australian Bureau of Statistics) 2015, *Selected characteristics of Australian businesses, 2013-14*, cat.no.8167.0, ABS, Canberra, viewed 29 February 2016.
- — 2013, *Microdata: Business Longitudinal Database, Australia, 2006-07 to 2010-11*, cat.no.8168.0.55.001, ABS, Canberra, viewed 29 February 2016.
- — 2013, *Programme for the International Assessment of Adult Competencies, Australia, 2011-12*, cat.no.4228.0, ABS, Canberra, viewed 29 February 2016.
- Australian Industry Group 2016, *Tackling foundation skills in the workforce*, Ai Group, Sydney, [http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE\\_CONTENT/Publications/Reports/2016/AIG9675\\_EMAIL.pdf](http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2016/AIG9675_EMAIL.pdf).
- — 2013, *Getting it right: foundation skills for the workplace*, Ai Group, Sydney, [http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE\\_CONTENT/Publications/Reports/2013/LLN\\_report\\_oct\\_2013.pdf](http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2013/LLN_report_oct_2013.pdf).
- Australia Parliament House of Representatives, Standing Committee on Education and Employment 2016, *Innovation and creativity: a workforce for the new economy: terms of reference*, House of Representatives Standing Committee on Education and Employment, [Canberra], viewed 15 Feb 2016, [http://www.aph.gov.au/Parliamentary\\_Business/Committees/House/Education\\_and\\_Employment/Innovation\\_and\\_Creativity/Terms\\_of\\_Reference](http://www.aph.gov.au/Parliamentary_Business/Committees/House/Education_and_Employment/Innovation_and_Creativity/Terms_of_Reference)
- Beddie F, Creaser M, Hargreaves J & Ong A 2014, *Readiness to meet demand for skills: a study of five growth industries*, NCVER, Adelaide.
- Fowler, C 2016, *What the National Innovation and Science Agenda (NISA) didn't say about skills and jobs*, NCVER, Adelaide.
- — 2015, 'Learning on the job: alternate views from afar', *Insight no. 56*, NCVER, Adelaide.
- Karmel T 2011, "Some thoughts on VET and innovation: an economic perspective" in P Curtin, J Stanwick & F Beddie (Eds), *Fostering enterprise: the innovation and skills nexus – research readings*, NCVER, Adelaide.
- Misko J & Nechvoglod L 2011, "Why firms innovate and what it means for VET" in P Curtin, J Stanwick & F Beddie (Eds), *Fostering enterprise: the innovation and skills nexus – research readings*, NCVER, Adelaide.
- National Centre for Vocational Education Research 2015, *Australian vocational education and training statistics: employers' use and views of the VET system 2015*, NCVER, Adelaide, viewed 25 Feb 2016, <<http://www.ncver.edu.au/publications/2822.html>>.
- OECD (Organisation for Economic Co-operation and Development) 2015, *OECD Innovation Strategy 2015: an agenda for policy action*, viewed 23 February 2016, <<http://www.oecd.org/sti/OECD-Innovation-Strategy-2015-CMIN2015-7.pdf>>

- Stanwick J 2011, *Innovation: its links with productivity and skill development, At a glance*, NCVER, Adelaide.
- Stanwick J & Beddie F 2011, "What skills are relevant to innovation?" in P Curtin, J Stanwick & F Beddie (Eds), *Fostering enterprise: the innovation and skills nexus – research readings*, NCVER, Adelaide.
- Toner P, 2011, 'Tradespeople and technicians in innovation', in P Curtin, J Stanwick & F Beddie (Eds), *Fostering enterprise: the innovation and skills nexus – research readings*, NCVER, Adelaide.
- UK Commission for Employment and Skills [2014?], *Not just making tea...: reinventing work experience*, UKCES, [Wath-upon-Deane], viewed 25 Feb 2016, <https://www.gov.uk/government/publications/not-just-making-tea-a-guide-to-work-experience>
- Wheelahan L, Buchanan, J & Yu, S 2015, *Linking qualifications and the labour market through capabilities and vocational streams*, NCVER, Adelaide.

## Bibliography

- Atkinson, G, Misko, J & Stanwick, J 2015, *Work integrated learning in STEM disciplines: employer perspectives*, NCVER consultancy report, Office of the Chief Scientist, Canberra, viewed 10 Mar 2016, <<http://www.chiefscientist.gov.au/2015/08/report-work-integrated-learning-in-stem-disciplines-employer-perspectives/>>.
- Australia Department of Innovation, Industry, Science and Research 2011, *Research skills for an innovative future: a research workforce strategy to cover the decade to 2020 and beyond*, Research skills for an innovative future, DIISR, Canberra.
- Australian Industry Group & Deloitte Touche Tohmatsu 2008, *National CEO Survey: skilling for innovation*, Australian Industry Group national CEO survey series, Ai Group, Sydney, viewed 15 Feb 2016, <[http://pdf.aigroup.asn.au/publications/reports/general\\_reports/Skilling\\_For\\_Innovation\\_CEO\\_Full\\_Report.pdf](http://pdf.aigroup.asn.au/publications/reports/general_reports/Skilling_For_Innovation_CEO_Full_Report.pdf)>.
- Callan, V 2004, *How vocational education and training providers are working innovatively with industry*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1486.html>>.
- Chamber of Commerce and Industry of Western Australia 2010, *Building Western Australia's workforce for tomorrow: discussion paper*, CCIWA, Perth.
- Colahan, M, Johnson, C 2014, Apprenticeships evaluation: employers, BIS research paper no. 204, Department for Business, Innovation and Skills, London, viewed 19 Feb 2016, <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/387595/bis-14-1207-Apprenticeships-Evaluation-Employers-December-2014.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387595/bis-14-1207-Apprenticeships-Evaluation-Employers-December-2014.pdf)>.
- Curtain, R 2004, *Innovation and vocational education and training: lessons from leading national innovation systems*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1486.html>>.
- Curtin, P, Stanwick, J & Beddie, F 2011, *Fostering enterprise: the innovation and skills nexus: research readings*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/2367.html>>.
- Dalitz, R, Toner, P & Turpin, T 2011, *VET and the diffusion and implementation of innovation in the mining, solar energy and computer games sectors*, NCVER monograph series 06/2011, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/2392.html>>.
- Dawe, S, (ed.) 2004, *Vocational education and training and innovation: research readings*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1486.html>>.
- Ferrier, F, Trood, C & Whittingham, K 2001, 'VET and the National Innovation System', in *10th National*



*Vocational Education and Training Research Conference, Waterfront Campus, Deakin University, Geelong VIC, 10-13 July 2001*, ed. National Centre for Vocational Education Research, NCVER, Adelaide, 12 p.

Lindhjem, A, Royle, J 2004, *Vocational education and training engaging with emerging industries: opportunity analysis model*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1486.html>>.

McDonald, P, Temple, J 2008, *Demographic and labour supply futures for Australia: final report*, Australian Demographic and Social Research Institute, Canberra, viewed 15 Feb 2016, <[http://www.immi.gov.au/media/publications/research/\\_pdf/demo-labour-supply.pdf](http://www.immi.gov.au/media/publications/research/_pdf/demo-labour-supply.pdf)>.

McDonald, P, Withers, G 2008, *Population and Australia's future labour force*, Occasional paper series (Academy of Social Sciences in Australia) 1/2008, Policy paper (Academy of Social Sciences in Australia) no. 7, Academy of the Social Sciences in Australia, Canberra, viewed 15 Feb 2016, <[http://www.assa.edu.au/publications/occasional\\_papers/2008\\_No1.php](http://www.assa.edu.au/publications/occasional_papers/2008_No1.php)>.

Misko, J, Saunders, J 2004, *Training needs of emerging industries*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1444.html>>.

Shah, M, Nair, C 2011, 'Employer satisfaction of university graduates: key capabilities in early career graduates', Curtin University, Perth, paper presented at the Teaching and Learning Forum, viewed 19 Feb 2016, [https://cel.curtin.edu.au/professional\\_development/conferences/tlf/tlf2011/refereed/shah.pdf](https://cel.curtin.edu.au/professional_development/conferences/tlf/tlf2011/refereed/shah.pdf)

Smith, A, Courvisanos, J, Tuck, J & McEachern, S 2010, 'Building innovation capacity: the role of human capital formation in enterprises', AVETRA, Crows Nest, paper presented at the 13th Australian Vocational Education and Training Research Association Conference, viewed 15 Feb 2016, <<http://avetra.org.au/wp-content/uploads/2010/04/51.00-Andy-Smith.pdf>>.

Toner, P 2005, *Keeping up with technology: a pilot study of TAFE and the manufacturing sector*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1508.html>>.

Toner, P, Marceau, J, Hall, R & Considine, G 2004, *Innovation agents: vocational education and training skills and innovation in Australian industries and firms - volume 1*, NCVER, Adelaide, viewed 15 Feb 2016, <<http://www.ncver.edu.au/publications/1451.html>>.

Western Australia Department of Education and Training & Western Australia State Training Board 2007, *Beyond the resources boom*, Western Australia. State Training Board, East Perth, viewed 15 Feb 2016, <[http://www.stb.wa.gov.au/SiteCollectionDocuments/Beyond\\_the\\_Boom\\_Final\\_Report\\_Published\\_2007.pdf](http://www.stb.wa.gov.au/SiteCollectionDocuments/Beyond_the_Boom_Final_Report_Published_2007.pdf)>.