



University of
South Australia

9 February 2016

Inquiry into Australia's Future in Research and Innovation
PO Box 6021
Parliament House
CANBERRA ACT 2600

Dear Mr O'Dowd, Mr Conroy, and members of the Joint Select Committee on Trade and Investment Growth

Re: Submission to the Inquiry into Australia's Future in Research and Innovation

The University of South Australia (UniSA) is pleased to be provided with the opportunity to make a submission to the *Inquiry on Australia's Future in Research and Innovation*, and commends the Committee for undertaking to produce the subsequent report on this topic.

The following paragraphs provide a more nuanced perspective to our response, but, in summary, UniSA's recommendations are that:

- A greater emphasis should be placed on facilitating and producing end-user led research proposals from the outset.
- Areas of research excellence should be identified which have critical mass to compete in both the national and international context.
- Robust business development and industry engagement capacity must be built around these priority activities.
- The federal government should consider approaches that foster an *outcome* rather than *output* culture.
- National initiative(s) should be developed to encourage greater fluidity of employment between industry and academia.
- Funding processes could to be improved (in particular response times and focus on pilot projects) and there should be long term commitment to maintaining a consistent suite of funding schemes.
- International comparators should be reviewed to develop Australian approaches to systematically develop career and industry skills in PhD (and undergraduate) students.

UniSA is committed to undertaking research that is inspired by challenges and opportunities, partnered with end-users and communities, and underpinned by excellence. To this end, we believe that transferring the outcomes of research to industry partners is a core element of the measures that will further boost Australia's trade and investment performance. By taking a flexible and pragmatic approach, industry partners will be enabled to focus on commercialising the resultant products and services to the fullest extent – which ultimately derives the maximum social and economic benefit.

At UniSA, we appreciate that the means by which many universities work with industry members is under increasing attention – given the need to be able to partner effectively with industry but to also promote alternative means to financially support the research undertaken at our institution. UniSA is positioning

Office of the Deputy Vice
Chancellor:
Research and Innovation

Chancellery
University of South Australia

Adelaide
South Australia 5000

GPO Box 2471
Adelaide
South Australia 5001

t: +61 8 8302 3471
f: +61 8 8302 3921

www.unisa.edu.au

CRICOS Provider Number 00121B

itself as Australia's University of Enterprise and we operate to a set of principles that clearly outline how we approach industry collaboration. Our approach is pragmatic, tried and tested.

Specifically, UniSA is committed to the effective management and transfer of IP developed by our research to our partners. We offer a flexible approach to ensure that the outcomes of our research have every opportunity to deliver economic, social and environmental benefits to our industry collaborators and entrepreneurs in Australia and internationally. We are committed to working in an agile and nimble way that respects the often tight timeframes and unique requirements of our partners allowing us to meet these requirements to the utmost of our ability.

Our principles outline that:

- We actively encourage students and staff to undertake research that is relevant to challenges faced by society and in partnership with community groups, government and industry.
- We aim to ensure new knowledge is most effectively applied to producing trained graduates and for the purposes of creating economic and/or social benefit to the community.
- We aim to be recognised as the partner of choice in collaborative and funded research partnerships and we encourage our industry partners to own and to take the lead in commercialisation of intellectual property.
- Our interactions with industry will be governed by a transparent and user-friendly system that supports and encourages engagement using a range of flexible models.
- We provide open access to our Intellectual Property Policies and Standard Commercial Agreements, to provide a simple and transparent framework.
- All partnerships and resultant commercial agreements will be developed and negotiated in a prompt manner and in keeping with these core principles.
- We actively encourage and promote an entrepreneurial culture for our staff and students. This includes a system of supports to facilitate the creation of new ventures led by our staff and students or where they are actively involved.
- IP Principles that provide clarity to partners, entrepreneurs (from outside and within the university) and staff about how they can engage with UniSA intellectual property.

How to better translate research into commercial outcomes.

UniSA suggest that a greater emphasis should be placed on facilitating and producing end-user led research proposals from the outset. Enabling the input of end-users from the start of a research program can ensure that research is industry-driven and industry-relevant and focused from the early stages of development, i.e. the likelihood that mature research will necessarily align with market-need is low. In tandem, we also need to identify areas of research excellence with critical mass that compete in both the national and international context, and build robust business development and industry engagement capacity around those priority activities.

It is noted in many recent reports that Australia ranks poorly out of the 17 OECD countries on 'new to the world' innovation; which is partly attributed to Australian businesses' preferences to invest or modify existing innovations. This may be perceived as a reluctance for businesses to support and invest in innovation, however, our experience from working with industry suggests that in most cases businesses are focused on minimising financial risks and are, therefore, more willing to invest in a research program that clearly articulates milestones and timelines that align with industry decision points and opportunities. Australia is predominantly an SME economy - often there is a need to develop a broader appreciation for what innovation, and Research and Development (R&D), can do to improve or enhance a business' operations, or to provide a competitive

advantage and/or new products. This is especially true for the traditional manufacturing industry which may view investment in innovation as high risk.

Currently in Australia, the development of many novel technologies often starts by aiming for smaller-scale results – as the cost associated with larger programs are prohibitive in an industry context. This results in programs frequently taking a long time to demonstrate credible progress or sufficient technological maturity to interest potential investors or sponsors – particularly against the backdrop of a strong and innovative international competition. Furthermore, ‘disruptive innovation’, which can include transformational technologies, are often derived from research occurring at the boundaries of individual disciplines. This can create tension between the existing structures of a company or university, which reflect current core-market or discipline-specific capabilities, and the future investment and resource priorities required to realise the full commercial outcomes of a transformational idea/product.

Another of the main factors impeding the commercialisation of our research output is that we have an *output* not an *outcome* culture, driven in large part by Federal Government policy. At present in Australia our research funding systems are largely agnostic to the potential for impact of research – all research with equivalent “excellence” is essentially equally likely to be funded. But not all research is equal in terms of its likelihood of leading to tangible pathways to industry engagement and commercialisation. Another viewpoint is that Australian industry often does not have the resources to invest sufficient capital to scale up discoveries. This can lead to Australian discoveries being commercialised overseas.

Co-operation between academia and industry

The development of a productive research relationship needs to be based on trust and with the appropriate levels of maturity and willingness to engage from both sides. End-users of research must see inherent value in the interaction, and incentives and rewards for researchers much recognise and promote successful end-user engagement.

It is acknowledged in Australia that one of the contributing factors to poor collaboration between universities and industry is the higher proportion of academics working outside of business when compared with other countries. For example sixty per cent of Australian researchers are currently employed by the Higher Education sector, compared with approximately thirty per cent in Germany, Canada and Sweden. While the UK has a similar mix to Australia, it achieves far better results on measures of collaboration and innovation. A contributing factor to this disparity could be the successful operation of the *Knowledge Transfer Partnerships* program in the UK, which is supported by the Technology Transfer Board; a body consisting of an amalgamation of an independent industry board and a government agency. Consideration should be given to exploring the delivery of a similar program in Australia, which allows industry to employ a research graduate in varied scenarios and to gain access to the expertise of the student’s supervisor. There is a knowledge gap amongst Australian companies about how a PhD qualified workforce can add value to a business, so it is as important to construct pathways for PhD students to work within an industrial context, as well as encouraging and making it easier for industry to engage more directly with universities.

In examining ways in which research could work better with industry, discussion has often centred on the development of relationships between research organisations with individual SMEs. This is often difficult, because research is a high risk activity that requires often an investment of cash – competing with other calls on company resources. Careful consideration should be given to how universities are currently supported to work with industry sectors as a whole, as opposed to individual, smaller organisation. Government incentives/schemes/enablers must also incentivise industry to work with universities.

One major barrier is funding. Funding processes need to be improved and there needs to be long term commitment to maintaining a consistent suite of funding schemes. In some areas (e.g. rural), corporation grants are aligned to industry needs but in others there is a large void. We need more CRC and partnership type granting opportunities and tax incentives to encourage industry investment. We have to keep pace with what would encourage industry to invest resources including funds and staff time. One possible part of a solution would be to offer tax incentives to companies who hire PhDs to bring industry and universities closer.

Currently, the Australian Research Council Linkage Project scheme is an excellent vehicle with which to bolster the commercial return on research – and is one area where the Government has recently brought further benefits with the introduction of a ‘rolling submission’ and a much needed improvement in speed of decision making (this is essential as if the Government is committed to supporting business to pursue new markets and technologies there needs to be speed behind the process otherwise only very large companies are able to engage with the process – in addition to Linkage, this is also particularly relevant to schemes such as NHMRC Development grants and CRCs). A successful Linkage project establishes trust between researchers and end-users, and encourages future, non-government sponsored industry engagement in university research, and develops the interest of academic researchers in the challenges faced by industry. The flow-on effects can include PhD supervision and the establishment of a conduit through which PhD graduates can transition from academics to industry, and vice versa. National success rates in the Linkage Project scheme have dropped dramatically from 47.4% in 2009 to 35.9% in 2014. Across the same period, applications to this scheme have remained high (963 in 2009, 785 in 2013 and 698 in 2014) – two conclusions can be drawn from these figures. Firstly, Australian industries continue to consider this vehicle to be a viable and successful way of engaging with academics to advance industry performance. Secondly, a significant number of opportunities for improving the performance of Australian industries, and realising the full potential of university research to drive this activity, have been lost.

Additional funding schemes that support exploratory pilot projects, fast start, short review timelines, would be beneficial to SMEs that are looking to work with research institutions to develop disruptive technologies and solve pressing problems. Being able to work with academic expertise to rapidly ascertain if a novel approach was worth pursuing would have the potential to bring significant benefit to the company’s development. If negative, the company has avoided wasting time and resources in developing the technology and a funding proposal; if positive, the company and academic collaborator have a demonstrated ability to collaborate and would therefore be more likely to prepare a full proposal for another funding scheme.

Increasing industry-relevant research training

As identified in previous reports and consultations; the Australian system provides a sound researcher training experience, but is less effective at systematically developing career and industry skills. And, with just over 3 researchers in business per 1000 workers in Australia, there is also cultural resistance to employing PhD graduates. In addition, vanishingly few of the nation’s HDRs end up working as academics. As a result, we need to change the funding rules to encourage and recognise training that supports the development of trained researchers who have the skills to work outside academia. With the size of the HDR programme currently in Australia, clearly graduates are moving to employment areas beyond those in which they are specialising in, there must be a need to ensure they are adequately skilled in broad problem solving, communications, analytics and writing and life skills in general.

Evidence from other countries suggests that significant, economically valuable changes to research training and industry interactions can be most successfully achieved via sustained, co-ordinated national initiatives. For example:

- Mitacs Accelerate is a Canadian research internship program that began in 2003 and has placed more than 5,500 PhD students in work placements. It is open to all disciplines and in just under 40 per cent of cases the student is retained as an employee.
- The Danish Industrial PhD program commenced in 1988 (although its roots date back to the Industrial Researcher Program that commenced in 1971). Between 1988 and 2009, 1,200 PhD candidates have participated in the program. As at 2011, one in four applications were from the fields of social sciences and humanities with the remainder in science, technology, engineering and mathematics disciplines (STEM). About 40 per cent of all approved projects involve small-medium sized enterprises.
- In France, since 1981 over 12,000 PhD students and 6,000 companies have participated in industrial PhD projects under the Industrial Arrangements for Training through Research scheme (the CIFRE scheme).

- The UK funds industrial CASE studentships and industrial doctorate centres. The doctoral centres commenced in 2009 and enable PhD students to be immersed in a research environment that has a strong industrial focus. The program is funding 26 centres, each of which will take in approximately 10 PhD students per year for five years.

UniSA has identified a transformation of the PhD in its strategic action plan, *Crossing the Horizon 2013-2018*. The philosophy behind the Transformed PhD is centred on increasing graduate researchers' capabilities to work collaboratively and productively with end-users, and in multidisciplinary and multi-sectoral research ventures. The Transformed PhD incorporates a coordinated suite of activities and exposures to achieve the:

- Integration of end-users into the PhD machinery to assist with scoping research projects, supervision and mentoring;
- Development of relevant transferable skills to our knowledge-based enterprise economy;
- Particular focus, in science, technology and engineering, on entrepreneurship and innovation, and;
- Deliberate aggregation of research students into research themes which align to national priorities and global challenges.

Inspired by the examples described above, and mindful of the approach already being implemented at UniSA; we believe that future research training arrangements should focus on national and sector-based mechanisms that will achieve these outcomes. These mechanisms must optimise and extend targeted national schemes, including Industrial Transformation Training Centres, as well as existing university initiatives. Examples of the latter at UniSA include: embedding Hewlett Packard on-campus to increase the industry capability of undergraduate students (the pipeline to research students); the Industry Partnership Initiative Scheme, designed to support industry employees undertaking PhDs; and the Venture Catalyst Initiative with State Government, aimed at building students' practical entrepreneurship.

Yours sincerely

Professor Tanya Monro
Deputy Vice Chancellor: Research and Innovation
University of South Australia