



**Submission to the
Australian Government Inquiry
into Australia's Future in
Research and Innovation**

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Introduction

The University of Wollongong (UOW) is a comprehensive, research intensive institution. The University currently employs over one thousand FTE academic staff involved in research-related roles. Over 1600 higher degree research students are currently enrolled at UOW and in 2014, 290 PhD and Masters (Research) students graduated. UOW has consistently delivered research of outstanding quality and impact, as evidenced by our placement in the top 2% of QS and Times Higher Education world university rankings. The dissemination of our research to user communities, including industry, is one of UOW's key goals and we have a justifiably strong reputation for our engagement with industry. We therefore welcome the opportunity to comment on how higher education institutions can play a significant role in the successful future of innovation in Australia.

The value of collaboration between universities and industry

Universities can function as a catalyst for bringing together industry into research-focused forums to interchange information and ideas. Since universities are globally connected, small and medium sized enterprises (SMEs) that collaborate with universities can gain access to global supply chains as well. For example, UOW has a research contract with multinational corporations (MNCs) in chemicals for use in mines. As part of this research, a local SME with expertise in spraying has become involved in the proof of concept testing.

As part of its Global Challenges Program, UOW has also recently formed the Southern Manufacturing Innovation Group (SMIG)¹, comprising 13 Illawarra based manufacturers (SMEs). We have had meetings in which the industry partners described their innovation processes and challenges and others in which UOW presented information on research in advanced materials and robotics. The feedback from SMIG members has been very positive and some new industry-to-industry discussions have occurred as result of this UOW initiative.

Universities can also undertake excellent fundamental research in areas that are relevant to industry. For example, research undertaken at the ARC Centre of Excellence for Electromaterials Science (ACES), headquartered at UOW, to develop electromaterials into the next generation of 'smart devices' is of direct interest to industry. The UOW node of the ARC Centre of Excellence in Geotechnical Sciences and Engineering (headquartered at UNewcastle), also undertakes research which is directly relevant and conducted in partnership with the rail industry and civil engineering sector.

¹ UOW Global Challenges Program, Southern Manufacturing Innovation Group, available at: <http://globalchallenges.uow.edu.au/manufacturing-innovation/UOW191273.html>

Universities and industry need to actively engage with each other in technology areas of mutual interest and collaborate through available mechanism and joint investments. UOW actively engages with local, domestic and international industry through funding avenues that allow us to transfer research outcomes to industry. For example, UOW has worked extensively with large regional employers such as BlueScope Steel over many years on research of importance to their core business. This collaboration has now been expanded to involve other key players in the supply chain, through the ARC ITRP Research Hub for Australian Steel Manufacturing. UOW also collaborates extensively with industry through many ARC Linkage Projects, Australian Coal Association Research Program (ACARP) grants and CRCs (e.g., Innovative Manufacturing, Energy Pipelines, Rail Manufacturing, Automotive) to ensure transfer of research outcomes.

Universities can seed and nurture innovative companies through knowledge transfer and collaboration. For example, iAccelerate is a UOW initiative designed to support students, staff and the greater Illawarra Community to build an innovation ecosystem. iAccelerate, based on the lean start-up model, is designed to support entrepreneurs who use technology as an enabler for a scalable service or product that can be globalised. It consists of multi-faceted business acceleration programs to help grow the skills of entrepreneurs, create commercially sustainable businesses within a purpose-designed space to enhance innovation in the Illawarra region. The UOW iAccelerate initiative has recently launched its \$10 million seed fund. The seed fund will enable a raft of Australian early and advanced start-ups to grow and thrive.

Strengthening the relationship between universities and industry

A fundamental rethink of HDR degrees, particularly doctorates, would serve to create a culture of strong engagement between universities and industry. While there needs to be a base level of funding based on appropriate performance metrics for high quality candidates and academic programs, there is an opportunity for stronger employer-university partnerships to drive training of the next generation of the research workforce. This would need to be a multifaceted strategy involving employer funded undergraduate and postgraduate scholarships, courses tailored to specific employers and industries and a stronger focus on professional doctorates. This could include developing core innovation skills (ie, understanding how to fit into the innovation ecosystem), communication skills and understanding how to solve real world problems. Reframing HDR degrees, particularly professional doctorates to support innovation skills, rather than just commercialisation skills, is relevant to industry and other employers.

Industry experience and engagement activities could be recognised and rewarded in a manner similar to research excellence i.e., with relevant awards and fellowships. The Government could consider providing additional funding for spending time in Industry

through focussed industry fellowships such as the Australian Post-Doctoral Industry Fellowship and Linkage Industry Fellowship which used to exist under ARC Linkage Projects. Industry research fellowships could be expanded upon through the introduction of an industry mid-career and senior research fellowship with explicit research and technology transfer objectives. Industry focussed fellowships will allow for Australia to redress the (often correct) perception that industry collaboration is at the expense of academic progression as it usually brings extra overheads, IP restrictions, publication delays and will also increase incentives and alternative career pathways for early and mid-career researchers.

Another strategy could be to provide funding opportunities for a half year “industry sabbatical” or teaching relief support for academics through competitive grant processes, to take research to market. This would visibly value industry engagement or efforts to start-up companies in academic track records and resolve workload constraints. Indeed the Dutch Technology Foundation STW² – which is part of the Netherlands Organisation for Scientific Research (NWO)³ - provides opportunities to apply for such start-up funding for all awardees of project grants in applied disciplines.

The ability to award extra funding for promising ventures to take technology to market via competitive grant process through the usual funding body adds to the prestige of these funds and thus assists both academic careers and transfer of research to industry. It also ensures the most promising ideas get funded.

Barriers to the commercialisation of the research output of Australia’s universities

- Currently there is insufficient infrastructure and support to translate university research into results. Research outputs need to be taken to the next stage in development before they can be of interest to industry. For example, while there is a well-established research and development to commercialisation pipeline for drug development, for many materials and engineering technologies there is no clear development pathway. The lack of financial support and specialised infrastructure for translation activity means that Australian research is then often commercialised elsewhere.

² Netherlands Technology Foundation, available at: <http://www.nwo.nl/en/about-nwo/organisation/nwo-divisions/tw>

³ Netherlands Organisation for Scientific Research, available at: <http://www.nwo.nl/en/about-nwo/organisation>

- There is a lack of national roadmaps for research and development. In the UK, USA, and EU there are well-defined research priorities and technology development roadmaps that inform university research priorities and identify timelines for translation of research results to industry. The roadmaps are created by government in collaboration with local industry and academia. Australian research would benefit by adopting a similar approach.
- Australia needs to create an environment that not only produces world class research outcomes, but is attractive for MNCs to develop a research and development (R&D) presence here and for locally based high technology companies to grow into global R&D leaders. Areas of research excellence within Australian universities may not have a corresponding number of Australian based companies with the capacity to take up the research; for example in the areas of materials and advanced manufacturing, Germany, the Netherlands, UK and USA have local SMEs and MNCs to translate the research outputs to commercial products.

Issues that need to be addressed in improving research-industry collaboration:

- Improved incentives for University Researchers to engage with Industry would greatly boost collaboration. Industry research engagements may provide economic income for the university and be commercially important. However, the work may not be academically significant. Researchers' career advancement is often based on competitive grant income and scholarly publications, rather than industry engagement activities. An associated factor is the typical academic teaching and research workload model, which often do not recognise or allow sufficient time for researchers to focus on industry collaborations.
- Improving awareness in industry of University collaboration mechanisms and research funding would foster a stronger working relationship between the two. Universities can engage in consultancies, contract research and collaborative research. The difference between these can be confusing to industry. There is also a complex array of ARC, Commonwealth and State government grants that can be used to leverage industry dollars. Misconceptions in industry about IP ownership, publication rights and further research rights are further barriers, often resulting in a protracted and drawn out contract setup process.
- Promoting the exchange of personnel between University and Industry would serve to advance an innovative culture in Australia. While academics focus on research publications and teaching, industry-based researchers focus on commercial deployment of research outcomes. Successful collaboration between the two requires an understanding of both aspects of research. In Australia most PhD

students are employed in universities. In other regions such as the UK, USA and EU there is much higher employment in industry and many researchers alternate between academic and industry employment over the course of their career.

Strategies to address these issues:

- **Standardised Commercialisation Collaboration Contracts.** Completely uniform contracts are not feasible or desirable, but issues are consistently encountered around IP ownership, licensing, publications, and rights to further research. If an industry partner is engaged with multiple universities, the complexity and time required multiplies almost to the point of impossibility. The recent Australian Defence Science Partnership is an example of collaboration with well-defined terms for all participants. Although far from ideal it provides a framework within which all parties can operate. Additionally the Cooperative Research Centre (CRC) participant's agreements provide another example, albeit a poor one since each CRC has a unique agreement. However, projects are much simpler to get underway since most of the contractual issues are defined in the CRC participant's agreement.
- **Development of a University and Industry Collaboration Portal.** Currently there is no single portal for a business to explore from one central location, engagement methods for research collaboration and commercialisation with universities. The *business.gov.au* website provides general resources for business. Something similar should be provided for university engagement including areas of research excellence. IP Australia will be providing a database for patents that could provide a basic input to a portal. UOW experience with new industry partners is that significant time is spent educating them on engagement options and issues such as publication, ongoing research rights etc.
- **Sector coordination through technology roadmaps with appropriate funding.** Most countries use technology roadmaps to direct government and industry funding for research and development. These countries also use directed R&D tax credits to ensure that strategic industry investment is supported. The USA and EU have successfully used this approach for a long time. The UK has shown in the past 15 years the effectiveness of this approach in creating new UK industry around research-intensive universities. We recommend a similar approach be adopted in Australia.
- **Creation of grants to support early stages of research translation similar to ERC approach.** Commercialisation activity needs to be seen as prestigious activity rather than an alternative income stream. The European Research Council (ERC) has established the prestigious Starting and Advanced Fellowships offering €150,000 to

take blue sky research to a closer to market (where no industry partner has yet been identified). This initiative could be introduced here to include an option for researchers to apply for an additional year of competitive grant funding for them to develop and take products from the lab to market. Australian researchers awarded competitive grants could also have access to this type of funding to support research translation activities. UOW experience with Australian industry indicates that the more defined the market for a technology and the further along the research is to a commercial prototype, the more interested they are in a research collaboration activity.

Useful international models for increasing research-industry collaboration

As noted previously there are many international models that can be implemented in Australia. A useful top-down model to consider is the Dutch Top Sectors Policy⁴ which would require government to drive technology roadmap discussions, initiate technology platforms where industry and academia can meet and negotiate co-investment with domestic industry in topic areas that support Australian competitive advantage and for sectors that the government wishes to grow – the latter should have a different expectation for industry matching as ability to invest will differ across industries.

Another strategy in an endeavour to grow more Australian high tech companies would be competitive funding for developing research outcomes into start-up companies around marketable university inventions. This should include funds for market studies and technical development of marketable prototypes. It would be prudent to more adequately fund existing instruments to capitalise on collaboration schemes that are by now well understood by industry and research sector.

Finally, internationally there is increasing focus placed on investing in “smart regions” that bring together universities and local industries around technologies of interest. This often involves co-location, with such efforts creating attractive ecosystems. Where relevant industries exist, the government should invest in regional universities to undertake such efforts.

⁴ Enterprise Policy and Dutch Top Sectors, available at <http://topsectoren.nl/english>