Enhancing industry university engagement
through graduate research students:
a guide for industry

Ai GROUP
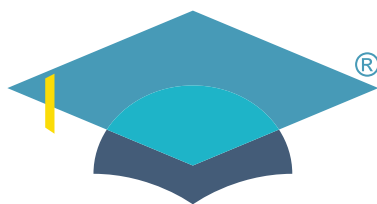
AUSTRALIAN COUNCIL OF
GRADUATE RESEARCH

Graduate research students undertaking a PhD or a Masters by Research represent a rich talent pool - possessing the knowledge, intellectual abilities, technical capabilities and professional standards to work on and solve industry-defined problems or generate new knowledge. By bringing a researcher mindset to industry, graduate research students can contribute to innovation across all sectors of the Australian economy and society and help underpin university-industry engagement.

This guide provides principles for collaboration and assists companies in realising the substantial short-term and long-term gains from graduate research student-industry engagement.

It has been collaboratively produced by the Australian Industry Group (Ai Group) in consultation with the Australian Council of Graduate Research (ACGR) and is underpinned by the jointly developed Principles to Guide Industry-University Collaboration in Graduate Research Training.

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1. Benefits to industry

Industry* and universities collaborate via graduate research student engagement because it builds workforce capability, enhances innovation and provides career development opportunities for students. By applying their knowledge and research capabilities in the workplace, graduate research students are empowered to solve industry problems and develop new innovative ideas

Industry benefits from graduate research students who can develop joint research programs that enhance business performance, develop innovative solutions to industry problems and produce commercial outcomes.

Graduate researchers' degrees sit at the highest level in the Australian Qualifications Framework. Through research a different type of graduate is developed. They acquire systematic and critical understandings of complex fields of learning as well as specialised research skills, preparing them to meet future challenges in a variety of careers.

Industry engagement represents one of the best ways for a graduate to demonstrate they are practical and outcomes focussed, have capabilities as a researcher, and have transferable and professional skills. They represent the most flexible cohort through which research collaborations can develop since they can be involved in research with industry through their entire candidature or for more discrete periods via a placement or internship.

For each company engaging with graduate research students the benefits can include:

- impetus for new thinking, ideas and research

- research solutions for challenges facing the organisation or the whole industry

- working on short-term projects, allowing flexibility for others in the organisation

- collaboration with academic supervisors who have other specialist knowledge

- additional skill sets brought to the organisation

- improvement in broader employee engagement and workplace culture

- a building of the talent pipeline to assist with future recruitment.

*While Ai Group is focussed on collaboration with companies, the ACOLA Review of Australia's Research Training System defined industry in its broadest sense to include businesses, government business enterprises, non-government organisations, not-for-profit organisations, and community organisations.

2. Establishing the industry-university engagement

Mutually beneficial relationships between industry and universities are established through trust and open communication which addresses different priorities, cultures and approaches between the sectors. Flexibility by both employers and university partners around research project/activity size, timing and length of engagements increases the number of industry opportunities available, benefitting all parties.

Industry-university engagement occurs in many forms. As the relationship is established the university should provide a clear description of the way in which industry engagement is managed and the points of contact and processes relating to development of placements/ projects and management of agreements. The university should work with the industry partner to develop projects appropriate for a graduate researcher.

Once a point of contact has been made it will assist the establishment of your research engagement if the following has been considered by the partners:

- the nature of the research challenge/ problem, related commercial outcomes and the specific projects/ roles a graduate research student could undertake. The challenge can then be scoped and developed into a project with the relevant university academic supervisor and student.

- the requirements and expectations of each organisation during the project

- the support, supervising and mentoring to be provided to the graduate research student by the organisation

- the outcomes for the graduate research student and how they can be linked into their degree

- a timeline for the activity to occur.

It is preferable you become involved with the student selection process to find the perfect fit for your challenge and workplace.

Your university contact should maintain contact and provide support throughout the engagement. The arrangement should include regular monitoring by the student's academic supervisor and broader university team to ensure the research objectives and outcomes are being achieved.

In some instances multi-disciplinary teams of students can be developed to solve particular research problems for organisations.

Types of research engagement:

Australia has a rich and diverse range of programs involving graduate researchers in which the entire PhD project is jointly funded and/or jointly supervised by industry.[1]

In this guide the focus is on short-term Industry engagement, although it should be noted that from such interactions a deeper, long term form of engagement may emerge.

The Department of Education and Training recognises graduate research student engagement with industry partners in several ways, outlined below:

- A research internship is defined as a temporary position with a research end user where a student has undertaken research and development (R&D) related to their higher degree by research (HDR). A research internship must be for a period of at least 30 days, can be either paid or unpaid, and can form part of the enrolment or be undertaken during an HDR period of suspension.

- Jointly supervised by a research end– user is defined as an HDR student that has at least two HDR supervisors, with at least one supervisor from a

research end user organisation. The supervision arrangements must be endorsed by the HDR student's higher education provider and the research end user supervisor must be actively engaged in the student's HDR.

- Jointly funded or fully funded by a research end–user is where a research end user contributes financially to the cost of an HDR student's course of study or to other costs borne by the student during their study (such as a stipend for general living costs). The arrangement must be awarded specifically in relation to an HDR student rather than a general higher education provider research project that a student may be involved with.

- Other commercialisation and engagement activities is defined as an arrangement with a research end user that enables experiential learning related to the student's HDR. This includes practicums or performances, R&D consultancy work, R&D commercialisation work, entrepreneurship, community engagement/outreach, and research extension work either with or for a research end user. These activities can be paid or unpaid, and no minimum amount of learning days applies. The activities exclude research internships unless they are shorter than 30 days, and exclude joint funding arrangements.

Although these categories are not intended to rigidly define the precise form of the industry project they can help define mutual expectations. Some examples of formal engagement programs are listed on the next page and others can be found on individual university webpages. It would be useful for you to obtain some examples of the types of placements/internships possible at your university partner's institution and their outcomes for all parties.

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[1] Dr Peter Bentley, Dr Emmaline Bexley & Ms Mollie Dollinger, Mapping the External Engagement of Australia's PhD Candidates, LH Martin Institute, November 2017.

Examples of short-term graduate research student-industry programs

Research internships:

APR.Intern, Australian Mathematical Sciences Institute

http://aprintern.org.au/

The APR.Intern is a national scheme that provides a platform for industry to engage and attract talent into their organisation through short-term (3-5 month), tightly focused research projects across all study disciplines and business sectors. HDR students are drawn from all universities in Australia.

Entrepreneurs' Programme Innovation Connections

https://www.business.gov.au/assistance/ entrepreneurs-programme/innovation-connections

This program, for eligible SMEs, involves specialist Innovation Facilitators providing businesses research needs assessments, which may then involve a matched funding grant that assists direct access to research capability, including placement of graduate students.

UQ 30 day-plus Placement Scheme

https://cdf.graduate-school.uq.edu.au/placements

This scheme involves (usually unpaid) placements for a minimum 30 working days in duration. Students can self-source their own industry placement, often with the help of their supervisors.

Australian Technology Network of Universities (ATN) Universities Industry Doctoral Training Centre

https://www.atn.edu.au/industry-collaboration/ IDTC/

Research students (Masters, Doctorates) collaborate with an industry partner to work on an industry/organisation problem, where solutions are driven by fundamentals of mathematical, statistical, information technology, and information sciences.

Team-based research and consulting:

Monash Graduate Research Industry Partnerships

https://www.monash.edu/graduate-research/ partnerships/grip

This program enables businesses to develop new ideas, products and services for the market with researchers and academic experts with interdisciplinary expertise; and to reduce research costs by gaining access to research facilities and state of the art technologies and equipment.

WA Industry & Research Engagement Program

https://www.iprep.edu.au/

iPREP WA is a collaboration between the five WA universities and has been established for PhD candidates who may not have had previous industry experience. The program involves interdisciplinary teams, working on a six week project (with scholarship) for an industry partner.

3. Developing the Project

In creating a project with the university it is critical that a mutual understanding of expectations is developed:

- Ensure you are clear about the differences in research capabilities between a graduate research student and a coursework student. Your university contact can brief you on the graduate attributes for HDR students and also the Australian Qualifications Framework description of different levels which help to clearly describe the capabilities of a graduate research student.

- Ensure the university contact has an understanding of the nature of the industry research challenge/problem and helps craft a project plan that fits your needs and the capabilities of a graduate researcher.

- Be aware that graduate researchers are students and that the principal purpose of the project is educational even though there can be collateral advantages to an industry partner.

- Given that industry has a commercial imperative ensure that the university will make every effort to ensure that the graduate researchers understand these expectations.

Intellectual Property Agreements

Universities have developed flexible and transparent systems around IP matters that are able to accommodate a range of models (some of which will be defined by the scheme e. g. APR.intern). IP arrangements in an industry-university collaboration may vary. In some cases universities may encourage industry partners to own and commercialise the intellectual property arising from industry-funded research. Where university-owned or jointly-owned IP is needed for commercialisation, negotiations can bring about equitable terms for all parties.

The Australian Government's Australian IP Toolkit for Collaboration may simplify the management of intellectual property (IP) in collaborative projects between researchers and industry.

The toolkit can help researchers and business to:

- develop and build effective partnerships

- identify the important issues in developing collaborations, assisting them to understand what is important and how to protect their interests

- deal with key issues before beginning the collaboration

- reduce the need for legal advice, freeing up resources to focus on building the partnership

- attract funding.

The toolkit has been designed to be used for collaborations of around $100,000 or more. There is a Mini IP Toolkit suitable for lower value or less complex collaborations or both.

The toolkit contains:

- checklists of the key issues that need to be considered

- template contracts, confidentiality agreements and term sheets

- guides on developing partnerships and advice on the management of IP.

In circumstances where the university establishes an IP or other contractual agreement with an industry partner which impacts upon the experience or rights of the research student, an appropriate agreement may be necessary between the university and the student.

Confidentiality and Moral Rights

Although graduate research students retain the copyright of their final thesis and it is examined by external examiners, confidentiality and non-disclosure agreements may be organised between industry and university partners should this be required by your company. In drafting these arrangements, industry partners will advise you about the rights of the graduate research students and their academic supervisors, especially in relation to publishing of scholarly works that are linked to ownership of copyright. Quite often in industry collaboration a student is required to waive their moral rights in relation to the industry-linked research output since it is likely that further development/modification of the invention/output from this research product will occur.

4. Compliance and Managing Risk

Payment considerations

Legal frameworks exist to determine whether any payments are to be made to students undertaking research for industry. The Fair Work (FW) Act recognises formal work experience arrangements that are part of an education or training course. These arrangements are referred to as vocational placements, and are defined as being:

- undertaken as a requirement of an Australian based educational or training course, and authorised under a law or an administrative arrangement of the Commonwealth, a State or Territory, and

- undertaken with an employer for which a person is not entitled to be paid any remuneration.

It is recommended that students maintain an 'enrolled' status whilst undertaking an educational internship and that the learning and assessment components of the educational experience are clearly articulated. If these criteria are met, the person will not be covered by the FW Act and is therefore not subject to the minimum wage and other entitlements provided in the National Employment Standards, Awards and agreements.

Depending on the engagement, the activities may require payment if there is deemed to be an employment relationship. The student must be paid if an employment relationship exists as follows:

- the student undertakes work beyond that required by the university e. g. filling in for a sick employee

- the placement exceeds the duration of time required by the university

- the work undertaken by the student is integral to the running of the company

- the focus of the arrangement is on productive work rather than meaningful learning for the student

- the company is predominantly benefiting; in a lawfully unpaid arrangement the main benefit should go to the student.

If the arrangement is considered to be an employment relationship, the student must be paid the minimum entitlements and there must be an employment agreement.

For further information please refer to the Fair Work Australia factsheet and the Australian Collaborative Education Network's student placement FAQs.

Tax considerations

In cases where student research projects involve scholarships or other payments, with respect to income taxation, the collaborating parties need to establish that the relevant principal purpose of the project is educational even though there may be collateral advantages to the industry partner. A clear understanding of the benefits to the industry partner arising from student engagement in comparison to those that would arise from those of an employee or contractor should be established.

Organisations may also be eligible for the R&D tax rebate, which can significantly reduce the total cost of a research project.

Insurance

If the student's project is part of a lawfully unpaid vocational placement they are not considered to be employees and do not need to be covered by an industry insurance policy. You should check that the university's insurance covers unpaid student placements that are a requirement of their course, including public liability and workers compensation.

The development of an agreement that outlines roles and responsibilities should include all legal requirements and insurances. The university contact should discuss this with you prior to the commencement of the engagement.

5. Delivering the Project

Recruitment/Student Selection

Students interested in industry engagements may have responded to advertisement of projects (as in the APR.Intern scheme) but in some cases a university may enable the self-sourcing of a project in which a student makes use of university/supervisor connections to develop an industry placement. Irrespective of the route through which a student applies for or develops an industry project it is important that the industry partner has the opportunity to meet/interview the student and is supportive of the selection.

Induction, supervision and mentoring

Prior to beginning an internship students should receive a briefing regarding the placement that they are to undertake and have a clear understanding of expectations and responsibilities. In some cases the student's university supervisor/advisor will also be involved.

All students should be introduced to their workplace research experience through an induction which covers company/organisation procedures and the standards and behaviours of the company/organisation. It is important that high quality professional and pastoral care is provided during the placement. This should include:

- going through the agreement that outlines the research aims, learning objectives and responsibilities

- briefing students on industry expectations, the types of tasks they will undertake and the team(s) with which they will work

- assigning an experienced employee as a mentor/supervisor whom the student can approach for advice

- encouraging open communication and reflection by the graduate research student

- regularly checking on progress and provide honest feedback and support. In particular, discussing the development of the student's employability skills that are important for your organisation

- in cases where the academic supervisor is involved liaising regularly on input to the research learning process

- providing specific feedback to the student by describing performance with examples and highlighting strengths

- in review meetings working with the student to develop concrete strategies to improve areas, reflect on their learnings and how they have developed.

Constructive informal and formal feedback to the student and review meetings will assist to focus on outcomes for both parties, as well as the strengths and areas of development identified for students, for example problem solving, initiative, planning and organisational skills, ability to communicate and to learn from others.

Assessment of Outcomes

Measuring the outcomes of the project is important for industry, university and for the graduate researcher.

- For industry, the immediate question relates to the impact of the student on the organisation's activity; did she/he solve an important problem, help develop a new product or more indirectly improve a business through a research project?

- For the university, feedback should be sought in relation to the quality of the graduate researcher's performance in relation expectations relating to their research, professional and transferable skills.

- For students, feedback from industry and their own reflection on the effect of the placement on their development as graduate researchers should be clearly documented since it is critical that the educational dimension of the student experience be well-defined.

Conducting a robust assessment of outcomes enables the industry and university partner to deepen their relationship, leading to sustained collaboration.

6. Examples of university/industry engagement involving PhD candidates

Sydney Water partners with PhD candidates to produce innovative research

Sydney Water has partnered with both the University of New South Wales and the University of South Australia to conduct a project on the beneficial re-use of bio-solids. This project focusses on carbon footprint reduction, energy efficiency, odour emission management and other improvement opportunities.

A PhD candidate working on minimising odour emissions from bio-solids has been involved with this project. The candidate's project has a real world focus, working with data gathered from the wastewater treatment plants managed by Sydney Water to integrate and analyse relationships with bio-solids across sites. One particular case study conducted has shown positive findings that can demonstrate a specific method can achieve lower odour emissions and higher bio-solids content.

Linkages between research and academia were crucial to ensuring that positive results were identified. Linkages have brought in necessary talent to develop example projects to conduct deeper investigations. The collaboration between academia and industry meant better access to data and laboratory equipment, and also resulted in better relationships between the two parties.

Trajan specifically hiring PhD students due to the expertise they bring

Trajan works in the scientific and medical industry with a focus on developing and commercialising technologies. Trajan works closely with a number of universities to employ PhD students into their organisation, in particular the

University of Tasmania and the University of South Australia.

Trajan seeks to offer PhD candidates a true alternative to the regular academic PhD route. One university based stakeholder who engages with Trajan noted that students receive the "best of both worlds" through this model, given that they received both academic input and the daily experience of working in industry. A senior employee at Trajan indicated that PhDs provided the essential training that was required in the organisation, demonstrating why Trajan is excited to develop even closer relationships with teaching institutes in Australia.

PhD candidates bring a deep level of expertise to their work and have contributed strongly to Trajan. A senior employee at Trajan noted that PhD candidates were all "contributing sensationally" and that "it [was] hard to think where they [were] not having a positive impact". To ensure candidature success, Trajan is proactive in being a true partner to the research sector through playing an active role throughout all stages of the PhD. Trajan works with universities to structure PhD programs to align to both industry and PhD needs. On top of an industry supervisor, Trajan invests in PhD candidates by providing a mentor to ensure that they have the best chance of success in industry.

RETAW benefits from intern and fluids lab at University of Sydney

When early testing of the water retention and purification system developed at ACP Sales (formally Retaw) produced some unexpected results, the SME knew they needed an expert to investigate this problem further. APR.Intern knew that the new state-of-the-art Fluids Lab at the

University of Sydney would be perfect to further design, test and optimise Retaw's SDU's operating parameters. So an honours student and his supervisor were matched to tackle the problem. The student constructed a laboratory model to simulate the real-world conditions that SDU operated under. The ability to regulate the water flow rates allowed different rainfall scenarios to be investigated, and then by varying the concentration and type of contaminants, SDU's efficiency could be tested.

Intern mines and analyses critical data at CSL

Global therapeutics leader, CSL, was looking for the expertise needed to overhaul their data storage and analysis systems. This came in the form of a computer sciences, engineering and business PhD student, placed by APR.Intern's national PhD internship program. It did not take long for the graduate research student to impress during her internship, with her work transforming CSL's ability to quickly and accurately mine and analyse large volumes of gene-sequencing data. This work has become critical to CSL's capacity to identify new drug targets and improve treatments for a range of conditions including coagulation disorders as well as neurological disorders.

[2]ATN Report – Enhancing the Value of PhDs to Australian Industry https://www.atn.edu.au/siteassets/publications/atn01-phd-report-web-single.pdf
[3] ibid: [4]Australian Postgraduate Research (APR) Intern program, https://careers.amsi.org.au/ : [5]ibid

7. University contacts

Each university has dedicated personnel to assist with enquiries relating to the engagement of graduate students.

See the list of universities and contact information at *acgr.edu.au.*

Appendix 1 – Principles to guide industry-university collaboration in graduate research training

Graduate research candidates (PhD and Research Masters) develop expert knowledge and research skills, authoritative judgement, adaptability and independence during their candidature. They can make a significant contribution to innovation within an industry and equally a graduate research candidate can benefit from the experience of working in industry from a career development and learning perspective. These principles form the basis for a guide for industry-university collaboration involving HDR students.

Benefits for Industry

- Graduate research candidates apply their expert, specialised cognitive, technical and research skills in a discipline area to independently and systematically provide creative solutions to challenging questions and to innovate.

- Industry benefits from knowledge transfer from the university to the Industry.

- Industry supports development of high quality graduate researchers who may realise opportunities for careers outside academia

- Mutually beneficial relationships between companies and universities are established.

Benefits for Graduate Research Candidates and Universities

- Graduate research candidates develop their capabilities as producers of knowledge or creative solutions while developing transferable and professional skills, exposure to work place cultures and establishing professional networks.

- University staff and Graduate research candidates may work collaboratively with an industry partner to co-create a new product or develop a creative solution to a problem.

- Universities develop a better understanding of industry expectations, priorities and cultures leading to deeper collaborative partnerships with industry.

Establishment of Expectations and Protections for all parties

- Industry collaboration involving graduate research candidates varies around project scope, timing and length of interaction. This requires a clear understanding of the types of industry-university engagement (using RTP categories as a guide) that graduate research candidates can undertake and the roles of academic and industry based advisors.

- The primary purpose of the interaction of the graduate research candidate with industry should be educational although collateral advantages to industry can occur. It is not sufficient that an educational purpose is a by-product of the industry interaction.

- Projects developed by Industry and Universities involving graduate research candidates should include an agreement relating to insurance and public liability as well as university confirmation of a candidate's fitness to participate in the project and each party should sign a formalised agreement.

- Intellectual property agreements arising from industry-university collaboration should be negotiated at an early stage and may consider a range of IP models, information sharing and packaging of IP, and can make use of available resources such as The Australian Toolkit for Collaboration.

Mentoring and Assessment

- Graduate research candidates are supported in their industry collaboration through induction, which should involve company procedures, the standards and behaviours of the company, assignment of an industry advisor (supervisor) or mentor and agreement on project aims and objectives.

- Universities should work with Industry to co-design assessment tasks, measuring outcomes and evaluating the performance and development of the HDR candidate against the expected attributes of a research student. These attributes include disciplinary knowledge, technical and intellectual capabilities, personal qualities, professional conduct and knowledge transfer capabilities.