



Inquiry into research training and research workforce issues in Australian universities

Terms of Reference addressed in this submission are highlighted below:

1. The contribution that Australian universities make to research training in Australia, including:

- a) The contribution of research training programs to Australia's competitiveness in the areas of science, research and innovation;**
- b) The effectiveness of current Commonwealth research training schemes; and
- c) The adequacy of current research training schemes to support Australia's anticipated future requirements for tertiary-qualified professionals in a wide range of disciplines.**

2. The challenges Australian Universities face in training, recruiting and retaining high quality research graduates and staff, including but not limited to:

- a) Adequacy of training and support (including income support) available to research graduates in Australia;
- b) Factors for graduates that determine pursuit of a career in research;**
- c) Opportunities for career advancement for research graduates and staff;**
- d) Factors determining pursuit of research opportunities overseas;**
- e) Australia's ability to compete internationally for high quality researchers; and**
- f) Whether Australia's academic workforce is ageing, and the impact this may have on Australia's research capacity.

Summary of Key Recommendations:

- 1. A Research and Innovation Workforce Road Map for Australia should be developed which integrates the national research workforce requirements in specific academic discipline areas, health and other major industry sectors and the professions and government for 2010-2020. This will allow an understanding of the level of recruitment of HDR students required in Australian Universities during this key period.**
- 2. The APA stipend should be raised to at least \$27,000 per annum and should be indexed and be tax free. The length of APA funding should be increased to a maximum of 4 years funding.**
- 3. It is important to ensure that any funding mechanisms associated with the introduction of ERA or similar exercises do not act as a disincentive for the growth of institutional HDR activity in areas of emerging strength, national need and HDR engagement in multidisciplinary research.**
- 4. Reward and promotion systems must be put in place to encourage a new generation of research trainees to engage productively with a range of external stakeholders outside academia, eg: through an 'innovation catalyst' scheme on graduation.**
- 5. There are significant opportunities to value add to a PhD candidature through development of both generic capabilities and specific workplace experiences which ensure that the PhD graduate is workplace ready, whether that workplace is inside or outside academia.**
- 6. There should be the development of a coordinated national strategy to recruit international HDR trainees to Australia and an increase in the number and funding of IPRS awards.**
- 7. A professional body should be established which would have oversight of the requirements, work conditions and accountability of the 'research and innovation professional' and which would communicate the high value of all professional research and innovation career streams.**
- 8. Australia should invest on a 'whole of country' basis in at least one major international consortium funded to deliver the scale and focus required for globally competitive research and innovation in national priority areas including an enhanced opportunity for internationalisation of HDR programs.**
- 9. HDR training must take place in an appropriately resourced environment. Australia should calibrate its strategic research allocation to Universities against international benchmarks and move to increase the research block grant funding to 55c for each dollar earned.**
- 10. Australia should set a target of doubling the number of HDRs and more generally set a target of 3% of GDP for investment in R&D (GERD) recognising that research productivity is driven by investment and a strong competitive system that rewards excellence wherever it occurs.**
- 11. HDR training is critically dependent on a well funded research environment. Funding to the ARC must be at the level which allows a 30% success rate in its major funding schemes and the recommended funding level for each grant should be at the level required to enable the research plan be carried out within a competitive timeline.**

Submission

1 a) The contribution of research training programs to Australia's competitiveness in the areas of science, research and innovation.

In the face of the international 'war for talent' Australia needs a superb education system to build the human capital required to support social cohesion and a strong knowledge based economy.

The key elements required to underpin a superb education system are support for:

- The recruitment and retention of talented academic staff attracted to Australia from across the world;
- Research training programs which meet the needs of the next generation of researchers, professionals and academics;
- Competitive funding systems and infrastructure support that provides research and research training environments which are on a par with our international competitors and collaborators; and
- Change and innovation in education and research practice to ensure Australia is well placed to address emerging, rather than known, challenges.

These are very significant challenges given the ageing demographic of our University workforce (two thirds of Australia's lecturers and tutors are over 40) and the existence of a \$3.9bn wage cost funding gap which has arisen in the University system during the past decade.

In this context it is clear that research trainees are absolutely critical to the health of our research and innovation system. They engage in the process of discovery, often supporting senior researchers move into newer and untested fields of enquiry, they engage in deep scholarship within discipline areas and through the process of engagement and training they develop as research educators, professionals and leaders.

There are challenges, however, in providing the supply of research trained graduates to meet the demands which will ensure academic workforce renewal in Australia and provide the foundation of an innovation workforce in industry, business and government. After an increase in the number of Australian students commencing 'higher degrees by research' (HDR) between the 1980s and 1995, there was then a 30% decrease in HDR students enrolling between 1995 and 2006. Furthermore based on the current data on the destinations of HDR graduates (*Graduate Careers Australia 2006: Postgraduate Destinations*) there is a significant projected shortfall of the order of 800 graduates per year in the number of PhD graduates required to replace the current academic workforce in Australia.

It is now important for Australia to develop a ***national research and innovation workforce plan*** that would inform policy on how to ensure we will have enough research active academics teaching in our Universities, enough graduates in education of school students in science and maths, and enough innovation ready PhD graduates adding value to new and existing industry sectors.

The absence of such a road map for the innovation workforce will be particularly limiting in the science, technology, engineering and mathematics fields at a time when international investment in these fields is escalating including in the large economies of India and China.

1 c) The adequacy of current research training schemes to support Australia's anticipated future requirements for tertiary-qualified professionals in a wide range of disciplines.

Issues that limit recruitment and retention of HDR students will inevitably limit the capacity for the research training schemes to meet the future requirements for tertiary qualified professionals to support the replacement of ageing academics and to meet the growing need in industry and government agencies for the analytical graduate that understands the importance of evidence based decision and policy making.

Key Points

- 1) The Australian Postgraduate Award (APA) stipend will fall below the poverty line this year;
- 2) Scholarships such as the APA are awarded for shorter periods than the length of a PhD student's candidature;
- 3) The Research Training Scheme is complex, poorly funded and results in funding anomalies between institutions; and
- 4) There needs to be an expansion in the number of Research Training Scheme places to accommodate the Government's recent announcement of a doubling in the number of APAs by 2010.

The APA Scholarship

The stipend paid to HDR students (\$20,007 p.a. in 2008) is inadequate to attract the brightest and best students or to attract staff currently employed by industry or government agencies to engage in a postgraduate research degree. In 2001, the value of the APA was \$339 per week and by 2008 had increased to \$385 per week – an increase of 13.5%. In 2001 the full-time average adult earnings was \$809.70 per week compared with \$1,123.30 per week in 2008 – an increase of 38.7%. In 2001, the APA represented 42% of the average weekly earning whereas in 2008 the comparable figure is 34%. Figures released by the Council of Australian Postgraduate Associations show that for the first time the stipend rate for APAs will slip below the poverty line by the end of 2008 (Figure 1). Income support is especially inadequate for students already disadvantaged (for example from low socio-economic areas and rural and isolated students who cannot remain living at home). A rationalisation of government policy in particular the taxation system and Social Security Act, also disadvantages some PhD students currently receiving part-time scholarships.

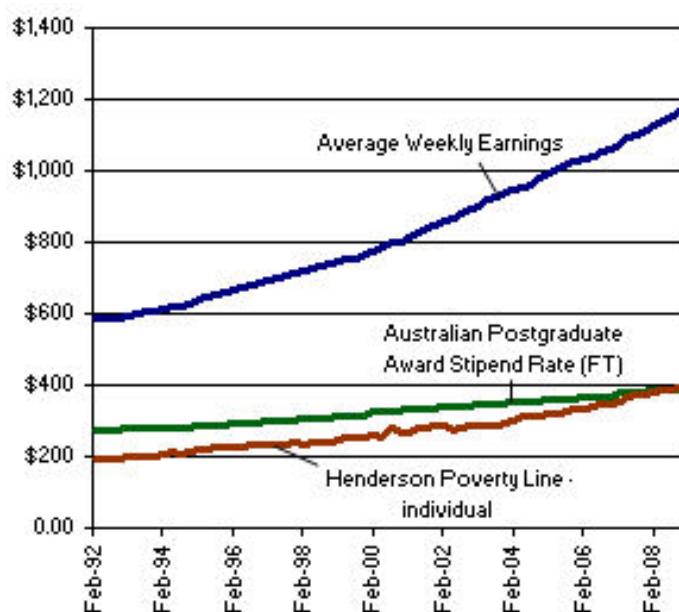


Figure 1: The stipend rate for Australian Postgraduate Awards (APAs) will slip below the poverty line by the end of 2008.

An increase in the living allowance (stipend) is essential to recruit new HDR students if Australia is to renew its ageing academic and research workforce. As well as being active in today's research, HDR trainees are the next generation of researchers necessary to build capacity within and outside of the higher education sector.

In a recent study on HDR students withdrawing from their degree program at the University of South Australia between 2004 and 2006, it was found that the final predictor variables in a mathematical model of predictors for HDR withdrawal included load type (part-time vs full-time), approved leave (taken or not), and whether the candidate held a scholarship of any type (awarded or not). Data derived from this model indicated that the likelihood of a postgraduate student withdrawing in 2004-2006 was more than 3 times greater for students who were enrolled part-time rather than full-time and more than 2.5 times greater for students who did not hold a scholarship. In this context the recent announcement by the Federal Government to increase the number of new APAs provided from 4,800 (2008) to 9,600 by 2012 is welcome. It is critical that all APAs are funded at a level (at least \$27,000) which will ensure greater retention of HDR students within the system.

Time to completion

The introduction of the Research Training Scheme (RTS) in 2001 had the objectives of reducing attrition and increasing the number of completions and Australian universities remain under increasing pressure to shorten doctoral completion times while attempting to fund the demand for places. There are ongoing concerns that completing a PhD in less than 4 years can result in 'safe' research projects, with less opportunity to undertake longitudinal high risk studies, generate fewer publications through candidacy, and for HDR students to engage less in professional and career skills training. Furthermore the current duration of APAs (3 years with a possible extension of 6 months) is not aligned with the full candidature period (4 years) supported by the RTS. It is important that the duration of the APA award and the RTS candidature period be aligned i.e. each to a maximum of 4 years.

The RTS

Since the introduction of the RTS, the increase in the number of RTS places funded has not matched the increase in HDR enrolments and in order to respond to demand for HDR places, many institutions have been compelled to enrol HDR students above their 'funded' places. There is also a discrepancy between the full cost of delivering HDR programs and the funding available through the RTS program. Currently in many instances the funding of the research program of an HDR student relies on the uncertainty of their supervisor attracting external funding during the tenure of their candidature. It is also the case that the differential costings currently applied to 'high cost' and 'low cost' bands are based on a set of historic assumptions rather than on an evidence base of contemporary costings.

In considering whether there should be a new basis for determination of the RTS funding allocation to individual universities, it is important to ensure that there is an alignment of the national drivers required to grow a vibrant research training environment and the funding allocation mechanism.

A key issue is ensuring that students have access to high quality supervision. There are different views on how this may be best achieved. For instance, the foreshadowed Excellence in Research Australia (ERA) exercise emphasises the primacy of performance of individual staff in a discipline as a measure of research excellence and it has been suggested that this could be linked to the capacity of researchers or research concentrations to recruit HDR students. It is

the case, however, that whilst ERA will provide a lagged view of the strength of research disciplines in an institution during the previous 5-6 years, it will not provide an insight into the current health of disciplinary, interdisciplinary or cross disciplinary research activity in institutions. This can be a significant issue when institutions are growing their research activity base (i.e. are not in steady state) and when research questions of major national priority (such as climate change adaptation, combating the obesity epidemic etc) are ones on which the next generation of researchers should be engaged. Recent data from a study investigating the causes of attrition of HDR students at UniSA showed that being a member of a strong multidisciplinary research concentration (such as a research institute or centre) was a protective factor against withdrawal. Students who were members of such a concentration were 3 times more likely to continue with their degree than students who were not. This highlights that multidisciplinary research concentrations can provide a vibrant research environment for early researchers.

There is a risk that the rewards for institutions to support the pursuit of excellence in discipline specialisations will be significantly greater than those for supporting researchers engage in multidisciplinary research and collaborations with industry and other end user partners. This could have inadvertent negative consequences for the training of researchers in emerging areas of global importance.

A more appropriate approach to ensure quality supervision is for institutions to have in place supervision quality assurance programs including:

- research performance criteria for principal and associate supervisors (some institutions maintain a register of research supervisors with access to the register determined by the achievement of defined research performance criteria);
- panel review of research proposals/seminars at an early stage of HDR candidature; and
- formal monitoring of attrition rates, completion times, and thesis examination outcomes for supervisors.

Broadening the Career Path for HDR Graduates

Currently more than half of Australia's HDR students choose a career outside of academia and individual research. In this context it is timely to consider whether the PhD can continue as a 'one size fits all' degree. There are significant opportunities to 'value add' to PhD training which can extend through engagement in research projects with external stakeholders through to:

- Formal intern placements in industry, NGOs and government agencies;
- Training in commercialisation (e.g. the ATN Graduate Certificate in Commercialisation), research management, and education of the 'board room ready graduate'; and
- The development of a teaching portfolio or completion of a Graduate Certificate in Tertiary Teaching and Learning.

UniSA has adopted a set of Research Degree Graduate Qualities which encourage HDR students to undertake a range of self-selected skills based workshops and the final Review of Progress enables HDR students to reflect on the skills built during the research traineeship and which can be included in a detailed resume. The Australian Technology Network (ATN) of Universities have also recommended that there should be a mandatory inclusion of generic capabilities in research training, including 150 hours of specific skills development over each PhD student's period of candidature. Such development could be focussed on the likely career destination of the graduate and this could occur in the form of a graduate certificate such as the recent Graduate Certificate in Research Commercialisation developed by the ATN and selected by the CRC Association as the preferred delivery model for all PhD students enrolled in CRCs.

The ATN have also recently put forward a proposal (to the National Innovation System Review) for a 50:50 co-investment between government and enterprise for employment of recently graduated PhD candidates as ‘innovation catalysts’.

In this proposal the government component is linked to the award of a postgraduate scholarship but must be expended for the purpose of facilitating the transfer of the PhD graduates into enterprises as ‘innovation catalysts’. Clearly in this, and similar novel schemes, evaluation should be inbuilt to determine whether enterprises gain value from employment of innovation catalysts and hence will commit to longer term employment of graduates with a view to enhance innovative capacity and expenditure on R&D in the long term.

International Students

Foreign PhD students make up 21.4%, 26.9%, 34.0% and 36.8% in Australia, the US, UK and Switzerland, respectively. At UniSA, international HDR students comprise 30% of our research trainees and play an important part of our research strategy. The majority of UniSA’s international student population come from the Asian region and on graduation will assist in maintaining Australia’s focus in building trade and cultural links in the Asia-Pacific region. An increase in the number of talented and highly qualified international research trainees will be important for Australia’s future, as a source of potential academic staff, skilled migrants, and ensuring universities maintain and strong global focus.

In order to remain innovative, it is important that Australia attract international scholars and yet there has been a decline in the support for International Postgraduate Research Scholarships (IPRS). There should be at least a doubling of IPRS awards available and the amount of funds should be increased to include the full costs of tuition in each institution and Overseas Health Cover. The IPRS scheme could also fund living allowances at a minimum of \$27,000 per annum. There is the opportunity to streamline the international scholarship schemes currently on offer including those in the Endeavour program and to target scholarships to priority regions including China, India, Vietnam and Malaysia.

Key Recommendations:

- 1. A Research and Innovation Workforce Road Map for Australia should be developed which integrates the national research workforce requirements in specific academic discipline areas, health and other major industry sectors and the professions and government for 2010-2020. This will allow an understanding of the level of recruitment of HDR students required in Australian Universities during this key period.**
- 2. The APA stipend should be raised to at least \$27,000 per annum and should be indexed and be tax free. The length of APA funding should be increased to a maximum of 4 years funding.**
- 3. It is important to ensure that any funding mechanisms associated with the introduction of ERA or similar exercises do not act as a disincentive for the growth of institutional HDR activity in areas of emerging strength, national need and HDR engagement in multidisciplinary research.**
- 4. Reward and promotion systems must be put in place to encourage a new generation of research trainees to engage productively with a range of external stakeholders outside academia, eg: through an ‘innovation catalyst’ scheme on graduation.**

5. There are significant opportunities to value add to a PhD candidature through development of both generic capabilities and specific workplace experiences which ensure that the PhD graduate is workplace ready, whether that workplace is inside or outside academia.
6. There should be the development of a coordinated national strategy to recruit international HDR trainees to Australia and an increase in the number and funding of IPRS awards.

2 b) Factors for graduates that determine pursuit of a career in research; and

2 c) Opportunities for career advancement for research graduates and staff.

One of the difficulties in the recruitment of Australia's brightest and best students to engage in research training and in research is that research is not viewed as or constitutes a 'profession'. Currently Australia's brightest and best students routinely look to the professions of law, medicine, and engineering etc, rather than aspire to be 'a researcher' in academia, industry or government. If any workforce plan is to deliver the desired outcomes for an innovation system, it is time to change the ad hoc approach to the recognition and valuing of the research career.

Currently there is no formal post doctoral career path and graduates with some 10 years of training are routinely employed on successive short term contracts resulting in high wastage to a range of other career roles in times of high employment.

A representative body of research professionals with specialist chapters for specific disciplinary areas such as science, health or social science could monitor workforce capacity in areas of strategic importance for Australia's innovation agenda, have oversight of career progression milestones, and ensure research training systems deliver the appropriate skills required. Importantly the establishment of such a professional body would provide recognition of the status and importance of research as a career path for bright and ambitious young Australians.

Specific Workforce Issues

A range of recent international studies in the OECD, UK, US and Australia have also highlighted the specific difficulties in recruiting, retaining and promoting the interest of women in science, technology, engineering and mathematics (STEM) careers. These issues have moved from being ones of individual equity to ones of relevance to the national skills shortages in key industry areas. It is time for a national co-ordinated effort to increase the participation, retention and advancement of women in careers in all STEM related fields. One such initiative positioned to address this is the proposed Hypatia Centre, operating as part of the recently launched Royal Institution (Australia). The Centre will work to draw together existing activities and initiatives at both State and national levels to enable better coordination of effort and the strategic targeting of resources and trialling of evidence based intervention programs. This is a timely and important initiative. Universities, with the support of government and industries, are uniquely placed to be able to engage with such initiatives and lead the way in recruiting, retaining and promoting the interest of women in STEM careers.

2 d) Factors determining pursuit of research opportunities overseas

Australia risks being isolated in the global innovation system - Australia has found it difficult to get significant traction in the EU Framework Programme and its investment in partnerships with India and China have been fragmented and dependent on relationships between individual entities or researchers. Australia should invest on a 'whole of country' basis in at least one major international consortium funded to deliver the scale and focus required for globally competitive research and innovation in national priority areas.

Two interesting options for such partnerships include:

- Canada – based on shared history, similar geographical challenges, resources base and research and business structures;
- The Nordic countries - two countries with the highest percentage of GDP diverted into venture capital are Denmark (0.4%) and Sweden (0.3%) with the US ranked third (0.3%). While 33% of Finnish firms collaborate with higher education institutions only 2% of Australian firms do so. A research based consortium including Australia, Denmark, Sweden and Finland would therefore offer opportunities for Australia to collaborate in world class research and gain insights into how high level design can add significant value to manufactured products (e.g. Bang and Olufsen, Volvo, Ericsson, Nokia etc).

Such international consortia will result in:

- Greater exchange of research students, fellows and staff between Australia and international partners; and
- Building a broader experience in engagement and translation of research, eg: through internship placements with international industries which do not have a major presence in Australia; and
- Building of 'research and innovation clusters' of sufficient scale to provide definitive national strategies, eg: the development of national preventive health agenda based on data derived from large scale population studies.

In this context the recent announcement of the Future Fellowship scheme with the opportunity to recruit 1,000 outstanding international and national mid career researchers to Australia is an excellent initiative. There are however a range of factors which currently limit the international competitiveness of Australia researchers and which will also limit the competitiveness of the Future Fellows if they are not addressed in the immediate future.

2 e) Australia's ability to compete internationally for high quality researchers.

An international level of investment in research

In Lisbon March 2000, EU heads of state and government agreed on making the EU "*the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*". The Lisbon Summit agreed that this required a necessary investment in R&D - 3% of GDP. Between 1991 and 2004, total investment in R&D in China grew thirteen-fold and India passed the 1% threshold for GERD as a percentage of GDP in 2004. Australia should set a target of 3% of GDP for investment in R&D (GERD) recognising that research productivity and high calibre research training is driven by investment and a strong competitive system that rewards excellence wherever it occurs.

Limitations to growth in the research training pipeline

Whilst the total research income earned by Australian Universities in 2006 (\$2.207 billion) was 21% higher than in 2005 (1.826 billion) there was only a 2% increase in the associated 'research block grant allocation' provided to the Universities which is intended to support the 'general fabric of the research and research training activities'.

The current level of research infrastructure funding provided through the Research Infrastructure Block Grant (RIBG) is 23c/\$ and this funding is intended to:

- enhance the development and maintenance of research infrastructure in Higher Education Providers (HEPs) for the support of high quality research in all disciplines;
- meet project-related infrastructure costs associated with Australian Competitive Grants;
- remedy deficiencies in current research infrastructure; and
- ensure that areas of recognised research potential, in which HEPs have taken steps to initiate high quality research activity, have access to the support necessary for development.

The above aims of the RIBG scheme are simply not achievable at this funding rate which lags significantly behind the US (45c/\$) and UK (55c/\$).

Whilst there has been recent increased investment in the NHMRC, investment in the ARC has lagged behind. A 20% success rate in the ARC system, coupled with an at least 30% reduction in allocation of funds to each grant compared to the full costs of the research, means that there is high wastage in the system. This will be compounded if plans to reinvigorate Australia's research workforce succeed through the Future Fellowship and other schemes. It is critical that having attracted high performing researchers to Australia, their research has a greater than 1 in 5 chance of being funded and at a funding level which will enable them to complete the research within a competitive time frame. Funding to the ARC must be at the level which allows a 30% success rate in its major funding schemes and the recommended funding level for each grant should be at the level required to enable the research plan be carried out on a competitive timeline.

The recent national investment in research infrastructure through the National Collaborative Research Infrastructure Strategy and the proposal to develop the teaching and research infrastructure through the Education Investment Fund are critical steps in building the next generation of infrastructure required to underpin a superb education system.

Key Recommendations:

- 7. A professional body should be established which would have oversight of the requirements, work conditions and accountability of the 'research and innovation professional' and which would communicate the high value of all professional research and innovation career streams.**
- 8. Australia should invest on a 'whole of country' basis in at least one major international consortium funded to deliver the scale and focus required for globally competitive research and innovation in national priority areas including an enhanced opportunity for internationalisation of HDR programs.**
- 9. HDR training must take place in an appropriately resourced environment. Australia should calibrate its strategic research allocation to Universities against international**

benchmarks and move to increase the research block grant funding to 55c for each dollar earned.

10. Australia should set a target of doubling the number of HDRs and more generally set a target of 3% of GDP for investment in R&D (GERD) recognising that research productivity is driven by investment and a strong competitive system that rewards excellence wherever it occurs.
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