University of South Australia

University of South Australia
Submission to the House of Representatives Industry, Science and Innovation Committee Inquiry into Australia's international research engagement

EXECUTIVE SUMMARY

Submission Point 1: The nature and extent of existing international research collaborations

1.1 Australia risks being isolated in the global innovation system and should establish and support international consortia of the scale required to meet the global innovation challenge.

1.2 The developmental trajectory of building international research engagement and collaborations mirrors the trajectory of research activity itself. An increase in the volume of research activity precedes a more mature phase when work of high quality is generated which attracts attention from international peers resulting in the opportunity to develop international research collaborations of high value. There will come a point, however, when the level of international research engagement that can be sustained by any one researcher or institution will essentially be maximal.

1.3 If Australia is to grow international research engagement sustainably, it must not only support those research groups currently performing at world class levels to engage internationally, but must also support the development of the next generation of 'upwardly mobile' research groups and their international engagement through for example the co-funding creation of international Centres of Excellence. This is critical to ensure that Australia's international research engagement is not carried by relatively few groups or organisations with a limited age or geographic distribution and will ensure the sustainable growth required to maintain Australia's long term international reputation and profile.

Submission Point 2: The benefits to Australia from engaging in international research collaborations

2.1 Available evidence highlights that international research engagement results in an increased capacity to:

- Publish first-class research papers
- Generate international research funding
- Build industry engagement to deliver innovation
- Recruit first-class research students
- Recruit research-competitive staff and innovation leaders

Submission Point 3: The key drivers of international research collaboration at the government, institutional and researcher levels

3.1 There is a need for a systematic and coordinated approach to the engagement of Australian research students and research competitive academics in the 'global academy', targeting doctoral students and early- and mid-career researchers, and with a focus on the development of international collaborations in addition to travel to international conferences and meetings.

Submission Point 4: The impediments faced by Australian researchers when initiating and participating in international research collaboration and practical measures for addressing these.

4.1 Impediments for Australian researchers in initiation and participation in international research collaborations include:

- significant competing pressures on time given the current financial constraints faced by universities (the impact of no or limited federal funding for academic salary increases has constrained the capacity of Australian institutions to invest in international research activities and led to an increase in the student: staff ratio in the past decade),
- the lack of the capacity to provide resources to cover time spent by individual academics in international research engagement
- the lack of a coordinated program which offers targeted support appropriate for different stages of research training and career (doctoral, post doctoral, 'the new academic', the mid career academic)
- the difficulty of obtaining international research funds, which is a disincentive for research competitive academics to invest significant time in obtaining such support
- the lack of funding for major international consortia on a 'whole of country' basis or for establishment of associated international Centres of Excellence with truly international collaboration

4.2 The rating scale proposed for the quality of Australian research in the Excellence in Research for Australia (ERA) exercise is a 5 point scale where *world class research* is rated at a value of '2'. The apparent low rating ascribed to a world class performance is will result in a significant undervaluing of Australian research quality by international peers and make it significantly more difficult to recruit research-competitive staff and students from overseas.

Submission Point 5: Principles and strategies for supporting international research engagement

Principle 1. The key objectives of Australia's international research engagement strategy should be clearly articulated and could include:

- Generation of first-class research outputs and attraction of international funding;
- The recruitment of first-class research students and research competitive staff to build a high quality academic, research and innovation workforce;
- The development of 'Research and Innovation clusters' of sufficient scale to provide definitive national strategies, e.g.: the development of national preventive health agenda based on data derived from large scale population studies;
- Exchange of research talent and shared arrangements for research training between Australia and strategic partners; including the co-funded establishment of international Centres of Excellence.

- A greater engagement with international industry and spill over of global knowledge and innovation in the regions; and
- A broader experience in engagement and translation of research, e.g.: through internship placements with international industries which do not have a major presence in Australia.

***Principle 2*.** It is important to develop an accepted suite of measures of international engagement to map the types of research engagement which are required to generate first class outcomes.

Principle 3. Australia should aim to build ***at least 1000 world class research concentrations***, and ensure national funding strategies do not result in a limitation on the emergence of world class research concentrations wherever they are located in Australia.

Principle 4. The development of any rating system for the measurement of disciplinary research excellence in Australian institutions should be benchmarked against existing or recent international research excellence frameworks such as the Research Assessment Exercise in the UK and take account of the impact of such ratings on the international profile of Australia's research.

Strategies for supporting international research engagement

1. The development of an ***Australian International Research Engagement Strategy*** is required, supported by the development of some common measures of international research engagement. Such a sectoral mapping exercise would lead to a greater understanding of how best to support the critical stages in the developmental trajectory of building successful international research collaborations. National targets and strategies to achieve those targets should be developed to increase the recruitment of first class international students and early and mid career research competitive staff.

2. Australia should engage as a funding partner in new major international consortia on a '*whole of country'* basis. Such international consortia should aim to build:

- 'Research and Innovation clusters' of sufficient scale to provide definitive national strategies, e.g.: the development of national preventive health agenda based on data derived from large scale population studies;
- Exchange of research talent between Australia and partners; and
- A broader experience in engagement and translation of research, e.g. through internship placements with international industries which do not have a major presence in Australia.

3. A systematic and coordinated approach is required to target resources to support:

- The establishment of an International Research Centre of Excellence Scheme with significant investment and clear performance indicators.
- Bilateral exchange of research students, fellows and early- and mid-career academics to build strategic research partnerships. Such schemes should be fully funded and recognise

the importance of providing resources to cover the impact of engagement by academics on the capacity of the institution to maintain the delivery of high-quality academic programs.

- Increased funding support for early-mid career researchers to spend up to 3 years working with international researchers with a guarantee of 3 years funding on return to Australia.

4. Australia's research funding strategies should align to support the development of at least 1000 world class research centres to operate as nodes of substantive international engagement. In particular research organisations with capacity should be encouraged to make investment decisions in emerging areas of research where they consider this strategy will build world class strength- rather than be constrained by funding allocation mechanisms based on historically referenced, metrics based frameworks such as ERA

5. Compact discussions between universities and DIISR should focus on how to ensure alignment of institutions' international research engagement strategies with their current and emerging areas of research strength. Such discussions could also focus on understanding the impact of national and institutional drivers and impediments to Australia's international research engagement strategy.

6. An independent group should be formed to provide advice to the Australian government on the calibration of the proposed ratings of research excellence to be used by ERA with those of existing internationally accepted rating schemes. This advice should take into account the impact of international research ranking schemes on the capacity to recruit world-class staff and students in a highly competitive global market.

INTRODUCTION

The House of Representatives Industry, Science and Innovation Committee is undertaking an inquiry into Australia's international research engagement. The Minister, for Innovation, Industry, Science and Research, the Hon Kim Carr MP, has requested that the Committee consider:

1. The nature and extent of existing international research collaborations;
2. The benefits to Australia from engaging in international research collaborations;
3. The key drivers of international research collaboration at the government, institutional and researcher levels;
4. The impediments faced by Australian researchers when initiating and participating in international research collaboration and practical measures for addressing these; and
5. Principles and strategies for supporting international research engagement.

This submission outlines the views of the University of South Australia (UniSA) in relation to each of the key points listed above in the context of the current reform agenda set out in *Powering Ideas: An Innovation Agenda for the 21st Century (Department of Innovation, Industry, Science and Research, DIISR May 2009*).

International Research engagement: The Context

Given the current national research and innovation agenda outlined in *Powering Ideas, UniSA* considers that there is no better time for Australia to develop and implement a set of principles and strategies to support international engagement in research and research education.

International engagement plays a critical role in ensuring Australia builds a globally competitive research and innovation system which delivers advances in knowledge and has the capacity to drive innovation through knowledge transfer and the development of a skilled workforce and the next generation of research and innovation leaders (Figure 1). ***As summarised in Figure 1, international engagement by Australia's research organisations results in the spill over of world knowledge and innovation to partner organisations including regional and national industry, business and government agencies.***

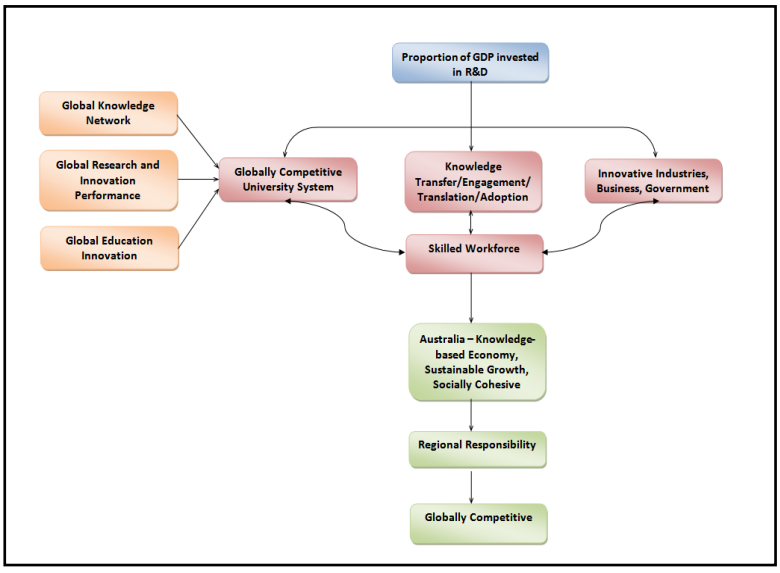

Figure 1: Derived from UniSA Submission to the National Review of the Innovation System April 2008

Submission Point 1: The nature and extent of existing international research collaborations;

Who are our global partners in research and innovation?

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. It is time for Australia to establish and support international consortia of the scale required to meet the global innovation challenge. It would be worthwhile exploring whether Australia could engage as a funding partner in new major international consortia on a 'whole of country' basis. While being cognisant of the need to engage decisively with China and India, 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. Nokia, Volvo, Vestas Wind Technologies, Bang and Olufsen, Ericsson, Novo Nordic, Asa Abloy, Kone etc).

Such international consortia could result in:

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

It should be noted that the Nordic countries in general perform exceptionally well in research publications and citations per capita and in engagement with industry, and are therefore strategic targets for collaboration.

The developmental trajectory of building international research engagement and collaborations mirrors the trajectory of research activity itself. An increase in the volume of research activity and precedes a more mature phase when work of high quality is generated which attracts attention from international peers resulting in the opportunity to develop international research collaborations of high value. There will come a point, however, when the level of international research engagement that can be sustained by any one researcher or institution will essentially be maximal.

If Australia is to grow international research engagement sustainably, it must not only support those research groups currently performing at world class levels to engage internationally, but must also support the development of the next generation of 'upwardly mobile' research groups and their international engagement through for example the co-funding creation of international Centres of Excellence. This is critical to ensure that Australia's international research engagement is not carried by relatively few groups or organisations with a limited age or geographic distribution and will ensure the sustainable growth required to maintain Australia's long term international reputation and profile.

The importance of mapping international research engagement

In order to determine the best strategies to enhance the internationalisation of research, it is important to understand what the appropriate level of international research engagement should be for different types of research institutions (e.g. older, more research intensive institutions compared to younger, upwardly mobile research institutions). In this submission we have provided information on the process by which UniSA has mapped its international research engagement activity and suggest that it would be important for the sector to develop some common measures of international engagement to map the types of research engagement required to result in collaborative research publications or international funding. This allows a targeting of appropriate national and institutional support to ensure that such international engagement activities develop their full research potential.

The process of mapping International Research Engagement

UniSA is a young upwardly mobile research organisation – at only 19 years of age, it has doubled its research income in the past 5 years and is already ranked 13th in Australia in terms of research income earned (as classified by the Higher Education Research Data Collection). Our 20 supported Research Institutes and Centres earn around 85% of our total research income and represent areas of disciplinary or multidisciplinary research strength in areas of telecommunications, particle and material science, marketing, health, social sciences, advanced manufacturing, defence systems and sustainable technologies.

UniSA has mapped the key international research relationships of its Research Institutes and Centres and has attempted to define the relative 'ranking' of its partners in terms of their research reputation and also the relative intensity of the research relationship. There is a range of academic rankings of world universities such as those prepared by the Shanghai Jiao Tong University (SJTU), the Time Higher Education Supplement (THES) and the University of Leiden which could be used to provide a ranking of an international research partner. Each of these ranking systems has significant limitations. For instance there is no doubt that the age of an institution contributes strongly to a number of indicators in the SJTU ranking and to the peer review indicators of the THES and that the use of highly lagged indicators of performance (such as the total number of Nobel/Field laureates in the SJTU ranking) limits the value of such ranking schemas in determining the performance of world universities established in the last 50 years. Whilst an institution may be highly ranked in the SJTU ranking system, there is no guarantee that the current research performance in specific discipline areas of direct relevance to Australian partners will be world class – it is not unusual to find centres

of world class research within new institutions who do not rank highly or at all in world ranking systems. With the global interest shown by governments and senior university administrators in the importance of engaging with international partners, more world ranking systems are being developed, each based on a different balance of research and education performance indicators. For instance, the Centre for Science and Technology Studies (CWTS) at Leiden University has developed a new ranking system which focuses on all universities in the world with more than 700 Web of Science indexed publications, and which aims to use criteria which are relevant to each disciplinary field-normalised criteria to rank relative performance.

As a starting point and bearing in mind the limitations discussed above, we have determined the relative ranking of our international university partners using the THES World University Ranking. We determined the relative intensity of the engagement of each UniSA research concentration with each international partner using measures of collaborative activity including joint publications, joint grants, shared HDR students or visiting HDR students from the partner organisation, visiting scholars, existing institutional or local agreements to collaborate and any other measure of joint activity as recorded by the research concentration. Based on these measures, the intensity of each collaboration was designated as low, moderate or strong.

Currently, the majority of UniSA's 'strong' research collaborations are formed with universities and other institutions of the 'first rank' in North America, the UK and Europe. Interestingly, as in the rest of the sector, we are also seeing the emergence of strong research collaborations with premier Asian organisations including the University of Tokyo, IIT Bombay, LV Prasad, Tianjin University etc. It is argued in the remaining sections of this submission that development of relationships with 'first-class' partners (defined on the basis of the strength of the individual research groups in the relevant disciplinary fields) will result in stronger research outputs, provide access for early- and mid-career staff to the 'global academy' at career-critical stages and ultimately build the research reputation and profile of the university based on the relationship between *'first-class company, first-class research'*.

Submission Point 2: The benefits to Australia from engaging in international research collaborations

Available evidence highlights that international research engagement results in an increased capacity to:

- Publish first-class research papers
- Generate international research funding
- Build industry engagement to deliver innovation
- Recruit first-class research students
- Recruit research-competitive staff and innovation leaders

Doing First-Class Work: Research Publications

There is no doubt that the quality of a university's published output rightly will remain a key component of any world university ranking system or national research quality framework. The volume of publications and citations per published output are likely to remain critical indicators of

the global 'research footprint' of an individual university. One of the key objectives in building strong relationships with international partners is to support our academic and research staff to produce first class research outputs. There is an international literature which supports the conclusion that research outputs which include co-authors from more than one country are, in general, more highly cited than those with co-authors from only one country. For instance, a recent study of the patterns of international collaboration for the UK and its leading research partners (*Adams, Gurney and Marshall, 2007: A report commissioned by the UK Office of Science and Innovation*) found that:

- The volume of international collaboration had increased significantly between the periods 1996-2000 and 2001-2005. For the period 2001-2005, ~40% of research outputs from the UK, Canada, France, Germany and Australia had co-authors from other countries whereas only 21%, 25% and 26% of the research outputs from Japan, the US and China respectively had international co-authors in this period.
- The UK, US and Germany dominate world research links as the largest and highest 'research economies'.
- The average citation impact of internationally co-authored work is significantly higher than the overall average. There is, however, a different outcome for collaborations with China, where there are examples of lower citation impact for all leading research economies. For instance, the US has the highest overall national impact but suffers from lower than average impact in every field when it collaborates with China. This could well be a temporary phenomenon representing the outcome of an important investment in a relationship with an emerging world power of research.
- China does not suffer a decline in citation impact with international collaboration, as collaboration lifts its research, but the gain is not sufficient to boost its average above the level of its international partners because of the relatively low starting base of the citation impact of its domestic publications.
- For most countries, engaging in collaboration with the UK in the biomedical areas raised the citation impact of their publications two fold.

This study also raised the issue of what happens when the leading researchers in a country are already collaborating to a maximum extent and suggests that the gain to be expected in further international collaborations will be less because this may recruit a 'second tier' research activity. For instance, Canada, Australia and China appear to gain little benefit from collaborations in mathematics with the UK and this study suggests that the UK's limited capacity is this field is already stretched by its major collaborations in Europe. This is a key point in the development of any national strategy for the development of international research engagement as it highlights the importance of the development of the next generation of upwardly mobile researchers and institutions to ensure sustainable growth in the delivery of the benefits of such engagement.

The Forum of European-Australia Science and Technology cooperation (FEAST) has recently completed a bibliometric analysis of Australia's international research collaboration in science and technology (*Matthews et al 2009*). The proportion of Australian publications in the Science Citation Index with international co-authorship increased from 21% in 1991 to over 44% in 2005 and the output of internationally co-authored papers was growing at almost double the rate of purely domestic papers. This study found that bilateral collaborations between Australia and Europe or

between Australia and the US are associated with higher citation rates (relative citation impact ~1.25 and 1.5 respectively) than achieved by publications with no international co-authorship (relative citation impact ~0.99). Furthermore, in most major research fields multilateral collaboration involving Australian, European and US based co-authors resulted in higher citation rates (~3.2) than bilateral cooperation alone.

In a recent analysis of UniSA research publications, we have found that there was a higher proportion of the total number of internationally co-authored papers in journals rated in the ARC draft journal ranking list as A*or A (i.e. top 20% of journals) compared to papers without an international co-author. Similarly it was shown that there was a lower proportion of papers with an international co-author in C ranked journals (bottom 50%) when compared to papers without an international co-author. Interestingly in the research institute which had over 50% of its publications in A and A* journals, there appeared to be less of an additional benefit in having an international coauthor.

Doing First-Class Work: International Research Funding

Accessing international research funds is an important benefit in international research engagement and is usually a measure of a more mature stage of a research partnership. We note that UniSA is in the top third of Australian universities in terms of the proportion and amount of research income earned from overseas sources. During the period 2003-2008, UniSA's total research income has grown 2.5 fold but importantly the relative share of UniSA's research income generated from international sources has remained around 6-10%.

Doing First-Class Work: Industry Engagement

The *global* availability of knowledge does not guarantee its *national, regional or local* availability. It has been shown that there is almost no spillover value in Australia for R&D dollars spent in the G-5. Similarly it has been calculated that knowledge spillover, meaning the use of knowledge beyond formally contracted parties to the technology development, declines by half on average for every 1200km *(Keller 2002, American Economic Review, 92).*

This has obvious implications within a geographically isolated and sparsely populated country like Australia, both for the spread of 'homegrown' innovation and for the diffusion of knowledge resulting from international collaborations, and highlights the potential importance of a network of internationally engaged research concentrations.

The recent report, '*The Race to the Top: A Review of Government's Science and Innovation Policies' (Lord Sainsbury of Turville October 2007),* concluded that "***the paradox is that while innovation is a global phenomenon, the role of regions as the critical nexus for innovation based economic growth has increased". Universities have a critical role to play in the transfer of global knowledge to local and regional industry, business and other external stakeholders.*** This is a key point in the development of any national research strategy which is focussed on building world-class research groupings. It is possible to focus on the maintenance of a few centres of excellence in a narrow geographic 'belt' in Australia (Figure 3 below) which would result in a limited spillover of global

knowledge within Australia and a limitation in the capacity of Australia to develop international research engagement, given the lack of investment in the growth of the next generation of world class research groups.

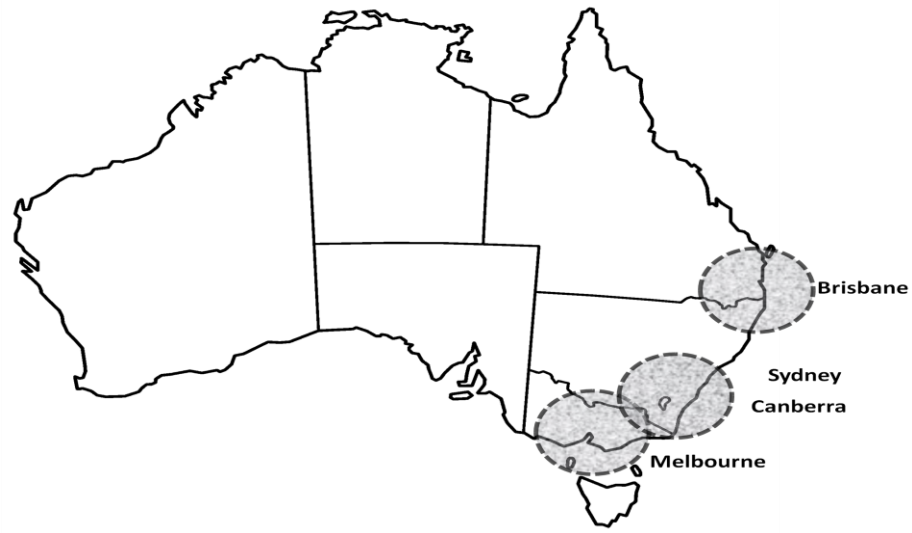

Figure 3: The impact of investing in a few world class research centres on the spill over of global knowledge and innovation in Australia.

A more sustainable approach to building international research engagement to result in enhanced spillover of global knowledge across Australia ***would be to aim to build up to 1000 world class research concentrations***, and ensuring national funding strategies do not limit the emergence of such concentrations wherever they are located – either institutionally or regionally

International research collaboration also provides potential access to new industry partners. It is possible for instance for research leaders to select international collaborators who have a strong record of collaboration with industry partners. The University Industry Cooperation (UIC) Index developed by the University of Leiden (Netherlands) has comparative information of co-authored industry and university publications from the world's top 350 Universities. The index can be measured in terms of volume of publications (magnitude) or the ratio to total publications (intensity). The world's top universities rated by the UIC index are contained in Table 1. To date, there are relatively few national support schemes which recognise the benefit of international collaboration based on any other metrics than those used in the SJTU or THES ranking systems.

Table 1: Top 10 most highly ranked universities according to University Industry Cooperation Index (2002-2006).

University	UIC
Eindhoven Univ Technol Netherlands	10.5%
Delft Univ Technol Netherlands	8.3%
Tech Univ Denmark	7.4%
Chalmers Univ Technol Sweden	7.2%
Kungliga Tekniska Hogskolan Sweden	7.2%
Med Univ Wien Austria	6.7%

Helsinki Univ Technol Finland	6.1%
Univ Aachen (Rwth) Germany	6.0%
Ecole PolytecH Lausanne Switzerland	6.0%
Med Hochschule Hannover Germany	5.8%
Kobenhavns Univ Denmark	5.7%
Uppsala Univ Sweden	5.5%
Univ Auckland New Zealand	2.5%

Recruiting First-Class Students

International Higher Degree by Research (HDR) students can contribute to the national research output, forge links with international research partners and on their return to their home country can build research capacity in the region. As highlighted in the UniSA Performance Portfolio prepared for AUQA (2009), UniSA ranks second among Australian universities for the percentage of HDR students who are international students. International load increased by 16% between 2002 and 2008 and currently represents 32.4%% of total HDR load (Figure 4). This trend is continuing through 2009 and 2010 with a marked increase in the growth of quality applications from international students.

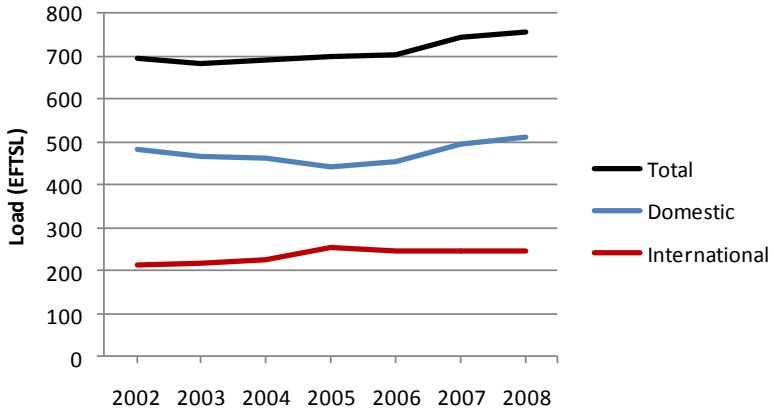

Figure 4: UniSA domestic and international HDR load (EFTSL) 2001-2008

Source: **DEEWR (2002; 2003; 2004; 2005; 2006; 2007) Higher Education Statistics: Student participation and achievement.**

International load = Total load (Doctorate by Research + Masters by Research) – Domestic load (Doctorate by Research + Masters by Research)

At UniSA, the study mix has changed from predominantly offshore part-time to onshore full-time, and this transition has occurred through the award of an increasing number of *'University President's Scholarships (UPS')* and additional support from foreign governments or AusAid. The University funds a fee waiver for students selected into the UPS scheme and the institution also funds the living stipend for the UPS students. In 2008, there were 104 UniSA UP Scholars who came from 31 different countries, and were graduates from 68 different international institutions and 10 different Australian Universities. It is critical that Australia works to retain the significant skill and talent of these 'innovation leaders' after graduation- particularly in areas such as minerals, mining, engineering, advanced manufacturing etc where there are significant national skill shortages. We

note some recent reports of the effects of changes to permanent residency processing which appear to have given doctoral graduates lower priority. Such changes, if they are indeed in place, may damage universities' ability to attract international doctoral students.

Research Education: Building Regional Research Capacity

UniSA has also signed agreements with various government scholarship bodies in Vietnam, Thailand, Kazakhstan, Iraq and Chile on support arrangements for government sponsored international students with most of our current sponsored students coming from Malaysia, Vietnam and Thailand, where there is an emphasis on academic staff members upgrading their qualifications. Together with AusAid, international sponsored students are a major source of full-fee paying international HDR load, increasing from 5 in 2005 to 28 in 2008.

Recruiting First-Class Academic and Research Staff

The Australian government is committed to supporting an increase in international collaboration in research by Australian universities over the next decade. As evidence of its intent, the government has opened up a number of funding schemes to international applicants (e.g. Australian Postgraduate Industry Awards, Future Fellowships etc). The research capacity of any university is directly linked to the quality of its academic and research staff and there is no doubt that if Australian Universities are to increase their research performance, they will need to be proactive in attracting and recruiting high-performing staff from wherever they are located in the world. The Case Study below highlights the key steps in recruiting international research competitive staff.

A Case Study: Recruiting First Class Academic and Research Staff

Over the last ten years, the Institute of Telecommunications Research (ITR) at UniSA has developed an international reputation in the area of Information Theory. This has placed ITR on the world map as a credible destination for high-quality researchers in this area. Without such critical mass, there is almost no hope of attracting the young research superstars. Over the last two years, ITR has recruited ten new research-only academic staff members (9 level B and 1 level D). Research excellence is the main context for all new appointments at ITR. This is made explicit in all position descriptions, and is applied stringently within selection panels. Particular attention is paid to a candidate's demonstrated track record for (a) delivery of high-quality research outcomes and (b) (potential) ability to attract further competitive research income.

There are two main components to our hiring strategy:

- Actively and pre-emptively seek candidates
- Respond to strategic opportunity

It is one thing to demand high-quality attributes, it is another to be successful in securing lists of candidates who possess them. ITR actively develops competitive candidates for open positions, leveraging its current staff member's International networks. We have found public advertising to be of almost no help in obtaining the final successful candidate (with a single exception). *It is very revealing to note that of the ten appointments made during the last year, only one was a "cold call". In every other instance, there was a pre-existing relationship which played an important role.*

For example, ITR Director's Fellow, Dr Sui-Wai Ho (most recently a postdoctoral fellow at Princeton) was encouraged to apply by a previous colleague, ITR senior research fellow Dr Terence Chan. Dr Chan in turn was attracted to ITR as a result of a relationship developed between the ITR Director and Chan's PhD advisor. Notably, in both cases (Ho and Chan), research visits to ITR were instrumental in securing the application. It has proved vital to maintain a high international profile within the main areas of research activity, and to continually "scan the field" for imminent availability of high quality candidates. Examples include letting International research partners know of forthcoming vacant positions even before they are secured or available. It should be noted that Dr Ho was awarded an APD in the 2010 ARC Discovery Round. Conversely, it is important to know when *not* to appoint. Of the appointments made over the last two years, four were re-advertised when suitably high-quality applicants were not found in the first round.

Professor Alex Grant, Director of ITR

In summary there are clear benefits to Australia which arise through international research engagement. For Australia to access these benefits it must grow the number of world-class research groups to ensure that international engagement is not geographically or institutionally limited. It is important to support programs focussed on bringing international research talent (students and staff) to Australia for short and longer term visits, to develop a coordinated national strategy to recruit international HDR trainees to Australia and to remove administrative barriers to the recruitment of talented individuals from overseas.

Submission Point 3: The key drivers of international research collaboration at the government, institutional and researcher levels;

Key Drivers: Promoting Engagement in the Global Academy

One of the critical elements of building an understanding of the 'global academy' within any discipline, and research engagement with members of that academy, is participation in an international conference with peers. This is particularly important early in a research career, during doctoral training or in the first five years of an academic appointment. These are periods when students and new academics are faced with significant financial, academic and family commitments that can limit their ability to engage in overseas conferences or visits to the leading research practitioners in their field. Whilst many institutions run programs to support the international research engagement of Higher Degree by Research students and new academics, these programs are limited by the necessity to maintain the delivery of academic programs and by the capacity to fully fund such visits.

There is a need for a systematic and coordinated approach to the engagement of Australian research students and research competitive academics in the 'global academy', targeting doctoral students and early- and mid-career researchers, and with a focus on the development of international collaborations in addition to travel to international conferences and meetings. It is also the case that

hosting high profile research meetings in Australia brings the worlds best to meet our graduates and researchers and result in the initiation of significant international collaborations.

A critical phase of any PhD is in the examination of the thesis by international peers. Examination of an Australian thesis by world leaders in the field results in an appreciation of the high quality of Australian research and job offers for doctoral candidates. In this context, it is important that Australia supports its brightest and best students to take up the opportunity to work overseas before returning to Australia. Schemes such as the NHMRC CJ Martin Fellowship scheme which provide funding for competitively selected postdoctoral trainees to spend 2 years working overseas before returning to Australia for a further 2 years should be expanded across all discipline areas.

Key Drivers: Institutional

As summarised above, the key drivers for institutions to build international research engagement include:

- The importance of such engagement for the development of world-class research groups, wherever they are located within Australia.
- The generation of 'first-class work' including high-profile publications and international research funding; these are essential in the development of world class research capacity
- The opportunity to develop and establish Centres of Excellence with truly international collaboration
- Access to global knowledge and engagement with international industry in order to build regional innovation, a skilled workforce and the next generation of research and innovation leaders.

Submission Point 4: The impediments faced by Australian researchers when initiating and participating in international research collaboration and practical measures for addressing these.

Impediments for researchers and institutions

The impediments for Australian researchers in initiation and participation in international research collaborations include:

- significant competing pressures on time given the current financial constraints faced by universities (the impact of no or limited federal funding for academic salary increases has constrained the capacity of Australian institutions to invest in international research activities and led to an increase in the student: staff ratio in the past decade),
- the lack of the capacity to provide resources to cover time spent by individual academics in international research engagement
- the lack of a coordinated program which offers targeted support appropriate for different stages of research training and career (doctoral, post doctoral, 'the new academic', the mid career academic)
- the difficulty of obtaining international research funds, which is a disincentive for research competitive academics to invest significant time in obtaining such support

- the lack of funding for major international consortia on a 'whole of country' basis or for establishment of associated international Centres of Excellence with truly international collaboration

National Impediments: ERA and Australia's international reputation

One emerging impediment for Australian researchers is the potential inadvertent impact of the Excellence in Research for Australia (ERA) exercise on Australia's research reputation and on the capacity to build the world class research groups of the future in those younger institutions which are currently 'hitting above their weight ' in terms of research performance relative to age.

ERA classifies research performance into five categories (1 to 5, of which 5 is the highest). It classifies level 2 as 'world-class performance'. UniSA considers that it is not a good outcome for Australia to have a system which categorises a *world-class* level of performance in any discipline at a rating of 2. A rating of 2 is likely to be perceived in the international arena as a relatively low rating despite the national descriptors used, *and to lead to significant undervaluing of Australian research. In turn, this perceptual problem is likely to make it more difficult to recruit research-competitive staff and students from overseas.*

UniSA considers that the ARC should recalibrate the ERA ratings to align more closely with those of the Research Assessment Exercise carried out in the UK and which has set international benchmarks for research excellence (Table 2). We would suggest that a rating of 3 should be taken to mean a world-class research performance and that a rating of 2 could be a high level of performance but not at the world level. This would then leave two levels above 'world-class'performance'. This would allow more of Australia's research groupings to be placed in the higher band of performance – at an equivalent level to the highest level of performance as determined through the RAE.

UK RAE ratings

Rating	Descriptor
4*	Quality that is world-leading in terms of originality, significance and rigour
3*	Quality that is internationally excellent in terms of originality, significance and rigour but which nonetheless falls short of the highest standards of excellence
2*	Quality that is recognised internationally in terms of originality, significance and rigour
1*	Quality that is recognised nationally in terms of originality, significance and rigour
Unclassified	Quality that falls below the standard of nationally recognised work. Or work which does not meet the published definition of research for the purposes of this assessment

Australia ERA ratings

Rating	Descriptor
5	Exceptional quality research outputs consistently and substantially exceeding world performance in this Field of Research. The Unit of Evaluation profile is characterised by evidence of outstanding performance presented by the suite of indicators used for evaluation. The research outputs demonstrate the highest standards of quality and scholarly impact.
4	Very high quality research outputs consistently exceeding world performance in this Field of Research. The Unit of Evaluation profile is characterised by evidence of **excellent performance** presented by the suite of indicators used for evaluation. The research outputs have made several major international contributions.
3	High quality research outputs generally exceeding world performance in this Field of Research. The Unit of Evaluation profile is characterised by evidence of **above world performance** presented by the suite of indicators used for evaluation.
2	Research outputs commensurate with world performance in this Field of Research. The Unit of Evaluation profile is characterised by evidence of **world performance** presented by the suite of indicators used for evaluation.
1	Research outputs generally below world performance in this Field of Research. The Unit of Evaluation profile is characterised by evidence of **below world performance** presented by the suite of indicators used for evaluation.

National Impediments: Impact of ERA on building the next generation of world class research groups

Figure 6 shows that it is possible to identify institutions which are 'hitting above their weight' in terms of research activity (expressed as research income earned/Level B and above FTE in 2007) relative to their age. There are Australian universities which are under 20 years old which are performing as strongly as institutions which are between 30 and 60 years old. The performance of some of these institutions is increasing so rapidly that classification systems such as ERA, which rely on the past 3-6 years' performance, significantly underestimate their current performance. Researchers in these 'upwardly mobile' institutions represent the next generation of leaders who will develop their research activity through international research engagement. If Australia is to grow international research engagement sustainably and on the scale required, it must provide a dual system of support. First Australia must be able to identify and support those institutions and research groups currently performing at world-class levels to engage internationally. Secondly it is critical that research funding allocation mechanisms, e.g. through Sustainable Research Excellence, do not limit the growth of those institutions who clearly represent the 'growth cone' of Australia's research effort.

A broader investment portfolio will ensure that international research engagement is not carried by relatively few groups or organisations with a limited age or geographic distribution within Australia and will ensure the sustainable growth required to maintain Australia's long-term international reputation profile.

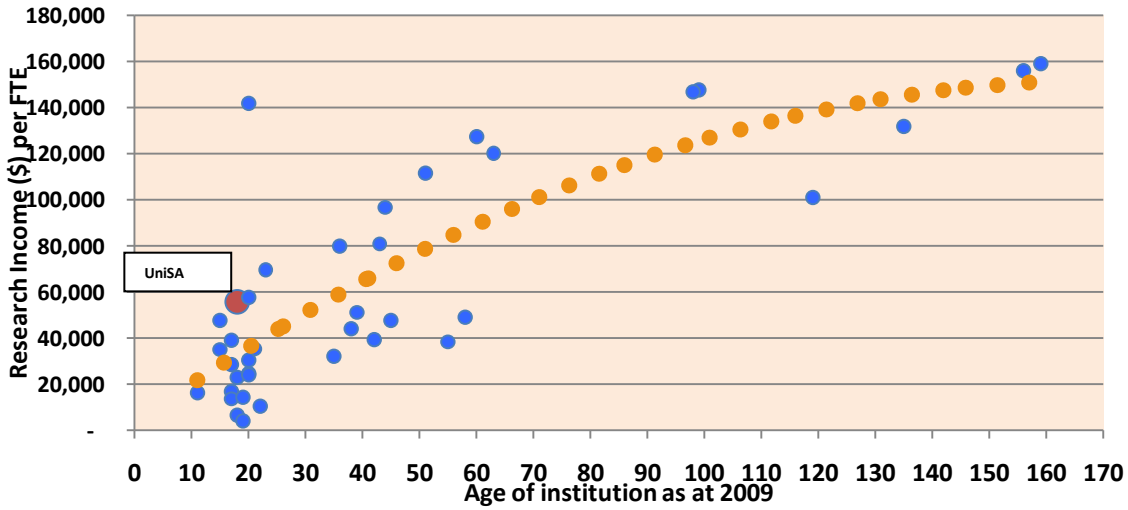

Figure 6: Total research income/FTE (Level B and above) earned for each Australian University in 2007 relative to the current age of the University

Submission Point 5: Principles and strategies for supporting international research engagement

Principle 1. The key objectives of Australia's international research engagement strategy should be clearly articulated and could include :

- Generation of first-class research outputs and attraction of international funding;

- The recruitment of first-class research students and research competitive staff to build a high quality academic, research and innovation workforce;
- The development of 'Research and Innovation clusters' of sufficient scale to provide definitive national strategies, e.g.: the development of national preventive health agenda based on data derived from large scale population studies;
- Exchange of research talent and shared arrangements for research training between Australia and strategic partners; including the co-funded establishment of international Centres of Excellence.
- A greater engagement with international industry and spill over of global knowledge and innovation in the regions; and
- A broader experience in engagement and translation of research, e.g.: through internship placements with international industries which do not have a major presence in Australia.

***Principle 2*.** It is important to develop an accepted suite of measures of international engagement to map the types of research engagement which are required to generate first class outcomes.

Principle 3. Australia should aim to build ***at least 1000 world class research concentrations***, and ensure national funding strategies do not result in a limitation on the emergence of world class research concentrations wherever they are located in Australia.

Principle 4. The development of any rating system for the measurement of disciplinary research excellence in Australian institutions should be benchmarked against existing or recent international research excellence frameworks such as the Research Assessment Exercise in the UK and take account of the impact of such ratings on the international profile of Australia's research.

Strategies for supporting international research engagement

1. The development of an ***Australian International Research Engagement Strategy*** is required, supported by the development of a suite of measures of international research engagement. Such a sectoral mapping exercise would lead to a greater understanding of how best to support the critical stages in the developmental trajectory of building successful international research collaborations. National targets and strategies to achieve those targets should be developed to increase the recruitment of first class international students and early and mid career research competitive staff.

2. Australia should engage as a funding partner in new major international consortia on a '*whole of country'* basis. Such international consortia should aim to build:

- 'Research and Innovation clusters' of sufficient scale to provide definitive national strategies, e.g.: the development of national preventive health agenda based on data derived from large scale population studies;
- Exchange of research talent between Australia and partners; and
- A broader experience in engagement and translation of research, e.g. through internship placements with international industries which do not have a major presence in Australia.

3. A systematic and coordinated approach is required to target resources to support:

- The establishment of an International Research Centre of Excellence Scheme with significant investment and clear performance indicators.
- Bilateral exchange of research students, fellows and early- and mid-career academics to build strategic research partnerships. Such schemes should be fully funded and recognise the importance of providing resources to cover the impact of engagement by academics on the capacity of the institution to maintain the delivery of high-quality academic programs.
- Increased funding support for early-mid career researchers to spend up to 3 years working with international researchers with a guarantee of 3 years funding on return to Australia.

4. Australia's research funding strategies should align to support the development of at least ***1000 world class research centres*** to operate as nodes of substantive international engagement. In particular research organisations with capacity should be encouraged to make investment decisions in emerging areas of research where they consider this strategy will build world class strength- rather than be constrained by funding allocation mechanisms based on historically referenced, metrics based frameworks such as ERA

5. Compact discussions between universities and DIISR should focus on how to ensure alignment of institutions' international research engagement strategies with their current and emerging areas of research strength. Such discussions could also focus on understanding the impact of national and institutional drivers and impediments to Australia's international research engagement strategy.

6. An independent group should be formed to provide advice to the Australian government on the calibration of the proposed ratings of research excellence to be used by ERA with those of existing internationally accepted rating schemes. This advice should take into account the impact of international research ranking schemes on the capacity to recruit world-class staff and students in a highly competitive global market.