INNOVATIVE RESEARCH UNIVERSITIES AUSTRALIA

# Submission to Review of the National Innovation System

**April 2008**

*Flinders University, Griffith University, James Cook University, La Trobe University, Macquarie University, Murdoch University, and The University of Newcastle*

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# 1 Introduction

Innovative Research Universities Australia (IRU Australia) is pleased to present this submission to the Review of the National Innovation System.

IRU Australia is consortium of seven research-intensive universities covering five States. Six of the seven universities are in the top 500 of the 2007 Shanghai Jiao Tong ranking. In 2006, member universities enrolled over 165,000 students. This included over 7,700 PhD and Masters by Research students, representing 16% of all such enrolments in Australia. In the same year, the universities collectively attracted research funding of $245 million.

IRU Australia welcomes the government's recognition of universities as 'engine rooms of innovation and economic and social progress'. In the last two to three months, the government has also acknowledged that there are significant deficiencies in some aspects of our national innovation system that deserve to be addressed through government policy measures:

- Business expenditure on R&D is well below the OECD average and gross expenditure of R&D needs to be radically boosted;
- Australia ranks last out of 26 OECD countries for research collaboration between industry and universities;
- Australia has only eight PhDs per thousand in the workforce, compared with 11 in the US, 20 in Germany and 28 in Switzerland, and the take-up of research degrees by Australian students has flat-lined over the last decade;
- University facilities are in decline, with a major backlog of deferred maintenance;
- There is a dangerous over-reliance on cross-subsidisation from international student revenue in Australian higher education; and
- There is a critical need to internationalise our innovation system.

IRU Australia is encouraged by the government's response to these challenges to date and in particular supports the following government policy positions and initiatives:

- The need to build a world class university system rather than seeking to create one or two 'World Top 50' universities;
- The Enterprise Connect and Researchers in Business programs;
- Doubling the number of Australian Postgraduate Awards and extending their maximum duration to four years;
- Funding for 1,000 Future Fellowships; and
- Internationalising ARC programs.

## *Summary of key points*

Building on the government's recognition of current deficiencies in the innovation system and its early policy responses, IRU Australia's submission to the Review emphasises four key points:

1. A national innovation strategy and steering framework is required to drive the future development of the Australian innovation system and the coordination of innovation strategy and programs across jurisdictions.
2. A more strategic approach and greater investment is required to link Australia with the global innovation system and capitalise on the global mobility of the knowledge and innovation workforce and research student population.
3. Existing barriers to research collaboration need to be removed and new explicit and persuasive incentives introduced to the system. This will require the reform and refinement of existing innovation and research programs and mechanisms (e.g. a Premium R&D tax concession to encourage public-private collaboration) and the introduction of new ones (e.g. a new generation of programs to replace the CRC program).
4. The vicious circle created by the lack of full funding for university research needs to be broken. The lack of full funding has significant deleterious flow-on impacts and is one of the most significant barriers to the university sector realising its full potential in contributing to the national innovation system.

## *Declaration of interests and affiliations*

The IRU Australia member universities are strongly committed to: building their national and international research profiles; developing strong collaborative partnerships across local, national and global innovation systems; and, applying their multidisciplinary strengths to achieve real outcomes and impact for the benefit of Australia's economic, social and environmental future.

The universities were established as research-intensive institutions in the 1960s/1970s at a time of major expansion of the higher education system. As such, they have not benefited from the historically generous government investment and philanthropic foundations made available to the previous generation of universities.

In this context, IRU Australia has a vested interest in ensuring that government policy supports the development of a diverse world class university system that rewards excellence wherever it is found. We reject the view that some universities should be singled out for targeted investment. In contrast, we believe the role of government should be to create the conditions to enable all Australian universities to build their distinctive strengths and make their unique contribution to the national innovation system.

# 2 A national framework for innovation

The Australian government places value on a strong national innovation system and is determined to harness the economic and social benefits of innovation for all Australians. The innovation system is extremely complex and requires collaboration and coordination across all agents in the innovation process. It is critical for there to be a national coordination of innovation strategy, policy and programs if Australia, as a small nation, is to maintain and grow its innovation performance.

## The changing face of innovation

The recent UK White Paper *Innovation Nation* refers to the 'changing face of innovation'. The 'triple bottom line' for innovation policy and programs articulated in the *Call for Submissions* reflects this changing face.

A strong national strategy for innovation will demand a shared view of what we mean by 'innovation' in the contemporary context. For the purposes of public policy, we need a forward-looking and broad definition of innovation which acknowledges the following factors:

- There is now a strong body of evidence indicating that the historical concept of innovation as a simple process of investment in fundamental research leading to commercialisation via a direct pathway from laboratory to the marketplace is highly flawed. Innovation involves a complex process which occurs through diverse and often non-linear pathways.
- Innovation can be conceived as 'creative problem solving designed to produce practical outcomes' and is relevant to all sectors, including industry, business, government and community/not-for-profit sectors.
- While science and technology are a vital source of innovation, 'improvements in products, services and quality often come from innovations in business processes, models, marketing and enabling technologies'[1]. This is particularly relevant for Australia with the services sector now accounting for 78% of the Australian economy[2]. It is also very relevant to the many challenges currently faced by governments in delivering public services.
- The humanities, arts and social sciences are increasingly vital to innovative capacity. These disciplines and sectors 'contribute in a number of ways: not just as a supporting act to science; but also as an equal partner with science, technology, engineering and medicine in collaborative projects; and in the new post smoke-stack era of industry, as

[1] Department for Innovation, Universities and Skills, *Innovation Nation*, March 2008.
[2] Business Council of Australia, *Underserviced: Why Australia's Service Economy Deserves More Attention, Discussion Paper*, July 2007.

innovators in their own right'[3]. They also have a central role to play in public policy innovation (e.g. social inclusion, health promotion, climate change).

Public policy and supporting innovation strategies and programs need to be significantly reformed in line with this 'changing face of innovation'.

**Recommendations:**

1. That the Australian government develop a contemporary definition of innovation to underpin the future reform and development of national innovation strategy, policy and programs.

## National innovation strategy

### *National innovation advisory body*

The Business Council of Australia (BCA) has proposed the establishment of a new national body, 'Innovation Australia' to drive the national innovation strategy[4]. The Victorian government has also put forward a proposal for a coordinated national approach to boosting Australia's innovation system[5]. IRU Australia supports the establishment of a national body charged with developing innovation strategy consistent with the 'changing face of innovation'. This body should replace the existing Prime Minister's Science, Engineering and Innovation Council (PMSEIC), as the Council's terms of reference now reflect an outmoded conception of innovation policy tied exclusively to science and technology. The Council's governance structure and support infrastructure also limits its capacity for real action.

Consistent with the governance structures of Skills Australia and Infrastructure Australia, Innovation Australia should be established as an independent statutory authority to provide advice to the Minister for Innovation, Industry, Science and Research on the determination of national innovation priorities and world-leading policies and strategies for building national innovation capacity. It needs to have the appropriate resources to undertake high level policy research and analysis to inform its evidence-based advice to the Minister.

### *National innovation priorities*

IRU Australia proposes that the national innovation priorities be conceptualised as comprising two elements:

- Priority national industries or sectors where Australia has clear current or potential global competitive economic advantages or where Australia faces particular challenges that need to be addressed (e.g. health-care). A number of jurisdictions have taken the lead in setting

[3] Council for the Humanities, Arts and Social Sciences, *Submission to the Productivity Commission Study on Science and Innovation*, 2006.
[4] Business Council of Australia, *New Pathways to Prosperity: A National Innovation Framework for Australia*, November 2006.
[5] Department of Innovation Industry and Regional Development, *Governments Working Together: National Innovation Agenda*, March 2007.

State-level priorities of this nature. The national priorities should reflect the structure of the Australian economy, in particular, the very high contribution of the services sector to GDP.

We emphasise that 'industry' should be interpreted here in the broadest sense as applying to the many sectors of our society, including health-care, education, security, and environment.

- **Public policy priorities** that need to be taken up by government to create an environment conducive to innovation. These priorities would focus on the role of government in creating favourable conditions, overcoming market failures and stimulating demand. The Victorian government's National Innovation Agenda proposal, for example, has identified the following five innovation priorities: increase business innovation; provide the infrastructure to enable innovation; develop skills for the innovation economy; create a better regulatory environment for innovation; and, forge better connections and collaborations.

  Other examples of priorities that might be considered include: advancing frontier science and knowledge; driving innovation through government procurement; developing skills for the new global economy (e.g. foreign language skills); and, linking with the global innovation system.

### *Industry innovation councils*

Innovation strategy needs to be tailored to meet the specific circumstances and requirements of different industries and sectors. IRU Australia supports proposals for the establishment of long-term industry innovation councils[6], or similar, to lead innovation strategy in their industry or sector. Existing national industry bodies could be tasked with this role and given government support for this purpose, or where necessary, new bodies could be established. The councils would be informed by the work of Innovation Australia.

IRU Australia believes that a targeted range of industry innovation councils can play a key role in mapping the needs of their industry or sector, and translating these into innovation and research goals and priorities, with associated scoping of skills requirements in collaboration with Industry Skills Councils. Funding for strategic developments might be derived from industry levies (this has been effective for the minerals industry through AMIRA International, and for rural industries through the Rural Research and Development Corporations). Industry goals and priorities for R&D should be in sufficient detail to enable specific responses from research providers.

[6] Rudd, K. and Carr, K. (2007), *New Directions for innovation, competitiveness and productivity*, Australian Labor Party, April 2007.

**Recommendations:**

2. **That the Australian government establish:**
   a) **A national independent advisory body, Innovation Australia, to provide advice to the Minister on national innovation strategy and priorities.**
   b) **Innovation industry councils, or similar, to identify and drive industry- and sector-specific innovation and research goals.**

## Coordination across jurisdictions

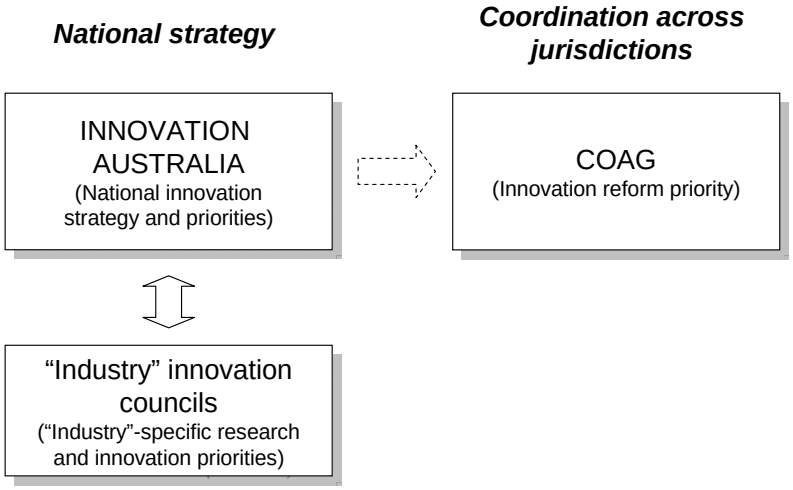
The government has identified three key contributors to productivity growth: education; infrastructure; and innovation. The Council of Australian Governments (COAG) has initiated reform priorities in the first two of these. If innovation is to receive the focus it needs, it should also be clearly identified by COAG as a national reform priority.

IRU Australia supports the government's view that there is a need to address the current uncoordinated and duplicated nature of innovation strategies and programs operating in various jurisdictions and also sees a need to significantly enhance the coordination of access to information about the different initiatives and programs in place across the country. The success of a national innovation strategy will rely significantly on the capacity and willingness of governments to work together to:

- Streamline and significantly improve the coordination of government innovation strategies, policies and programs;
- Achieve consistent action across jurisdictions in addressing the national innovation priorities; and
- Advance the role of governments in leveraging procurement to drive innovation.

COAG reform agendas are driven through Ministerial Councils. Unlike other key government priorities such as education, however, there is currently no Ministerial Council responsible for joint action in the innovation and related policy areas. COAG should consider the benefits of establishing a Ministerial Council to facilitate the coordination of innovation strategy and policy across jurisdictions.

**Figure 1: A national framework for innovation**




**Recommendations:**

3. **That the Council of Australian Governments:**
   a) **Adopt innovation as a national reform priority.**
   b) **Consider the establishment of a Ministerial Council for Innovation to facilitate coordination across jurisdictions in the implementation of innovation reforms.**

## National strategy for human capital development

IRU Australia welcomes the Australian government's recognition of the critical importance of human capital development to Australia's economic and social development, and supports the government's policy initiatives in this area (e.g. the expansion of the Commonwealth Scholarships program and the substantial increase in the number of funded training places at Certificate Level III and above). IRU Australia is also strongly supportive of the government's focus on social inclusion. We need to ensure that all Australians have an opportunity to achieve their potential and contribute effectively to the nation's prosperity and quality of life.

Universities make a core contribution to the national innovation system through the production of graduates and researchers. The Australian higher education sector produces approximately 240,000 graduates per year, including 5,500 PhD holders. There is more that needs to be done, however, if we are to build the human capital base required for the global knowledge economy. Some issues are most appropriately addressed through the Review of Australian Higher Education. We wish to raise two key points of particular relevance to the innovation review.

### *Work- and socially-integrated learning partnerships*

The national innovation system needs access to graduates who have a strong academic grounding in their fields of study and a range of skills that will enable them to contribute effectively within the professional work environment. Recent research on university student finances has established that 85% of all students work in paid jobs at some stage of each year[7], however, that work is often not structured or related to their area of study or intended employment.

*Structured* work integrated learning offered as part of degree programs is a long established feature of many disciplines, especially those where work experience is mandated by professional accreditation requirements. Creating opportunities for more students to gain value from structured programs where they have the opportunity to learn in the workplace or appropriate community settings and reflect on their experiences in the academic context is highly desirable. There are also clear benefits for industry and employers, especially in a skills shortage environment, in contributing directly to the development of employability and related social skills and having ready access to potential employees. Experience also indicates that partnerships of this nature have a range of innovative spin-offs which emerge from cross-sectoral dialogue.

IRU Australia member universities are strongly committed to enhancing opportunities for structured work integrated learning. However, the universities are facing a number of key challenges: a lack of single coordination or contact point in many companies and organisations; locating sufficient placements relevant to a wide range of degree programs; and, funding the resource-intensive placement search and coordination functions required. IRU Australia accordingly has given in principle support to the National Internship Scheme proposal put forward by Universities Australia, though we would propose a less centralised national internship strategy which supports individual institutions in developing relationships which suit their particular programs and circumstances.

There is an evident role for the national industry innovation councils, or similar, to work in partnership with universities to capitalise on the potential for significant skills enhancement through integrated work and learning experiences. Support is needed from government to facilitate these partnerships. In particular, funding support for the establishment of appropriate intermediary and coordination functions within employing organisations and universities would enable the expansion of opportunities.

Given the prominence of SMEs in the Australian economy, some of this support would need to be channelled through industry associations and networks. The new Enterprise Connect program could potentially provide a very helpful foundation and mechanism for supporting partnership development. There would also be a role for regional coordinating bodies.

[7] Universities Australia, *Australian University Student Finances 2006: Final report of a national survey of students in public universities*, Canberra, August 2007.

**Recommendations:**

4. **That the Australian government provide funding support to facilitate an expansion of structured work integrated learning opportunities for Australian higher education students.**

### *Increasing high end skills*

It has been recognised by government that research higher degree attainment rates in Australia are low compared to other developed economies and are projected to get worse with the impending retirement of the baby boomer generation of academics and researchers. The doubling of Australian Postgraduate Awards (APAs) will be of great assistance in achieving a needed boost in the number of research graduates in the Australian workforce. One of the challenges facing Australian universities, however, is the lack of demand for enrolment in research degrees by high quality domestic students.

In our view, a key barrier to demand for research degree study is student financial circumstances. Students need to choose, especially in an environment of skill shortages, between entering the workforce and earning attractive graduate salaries or continuing onto a research degree with very modest support through a postgraduate award. For some, their accumulated HECS debt may also be a factor in their choice of pathway. We believe that the APA stipend needs to be increased to lower barriers to research degree enrolment and completion.

There is also a role for industry in identifying workforce needs for higher end skills and developing strategies to encourage student uptake of research qualifications. This might include, for example, scholarships targeted at attracting students to undertake research degrees in identified areas of priority for industry research. There is also potential for enhancing the Australian higher end skill base through access to the global pool of talent (discussed further in section 3).

The definition of 'high end' skills needs to move beyond technical skills to embrace skills that foster innovation: problem-solving; willingness to deal with challenges and change; adaptability; creativity; interpersonal skills; openness to collaboration; and, leadership.

**Recommendations:**

5. **That the Australian government introduce incentives to increase domestic student demand for research higher degree programs, including increasing the APA stipend.**

## National research priorities

In principle, national research priorities are important in focusing Australian research investment and effort in areas of particular economic, social and environmental importance. In practice, the National Priorities for Research established under the previous government are extremely broad and do not appear to have had a very strong influence on research directions, at least in universities (in any event, there has been little documentation or analysis of their effect).

On the contrary, there seems to be a significant mismatch between Australian research strengths and the evident strengths of the larger part of the Australian economy such as financial services, tourism and other service industries where Australian research is either weak or small in scale.

### *Industry-led research priorities*

IRU Australia argues that the current national research priorities should be abandoned in favour of the development of more targeted and fine-grained research priorities through the national industry innovation councils. This will have a number of benefits, including:

- Facilitating the analysis and recognition of industry/sector research needs and raising awareness within Australian industry and business of the contribution of R&D to innovation and productivity;
- Achieving a better alignment between national research priorities and the structure of Australian industry and business;
- Establishing a strong platform for the creation of research and knowledge transfer networks (discussed further in section 4).

### *Priorities for basic research*

National research priorities identified by industry councils will tend to focus on applied research. It is important to highlight, however, that the national innovation system will continue to rely significantly on basic 'blue skies' research and continued funding through the ARC Discovery and the NHMRC Project/Program grant schemes is consequently vital.

Given Australia's size, there is justification for some broad thematic prioritisation of basic research funded through these schemes. However, it also critical for the university system to have the flexibility to play its distinctive societal role in developing and maintaining the knowledge base in novel or 'unfashionable' areas. Such areas often provide the springboard for future innovation and safeguard the nation's capacity to respond to unexpected critical events or conditions. Recent history, for example, has called on academics with knowledge of the Solomon Islands, Afghanistan, tsunamis and Asian languages, areas previously not seen as a priority. Broad priorities for basic research need to reflect the diversity of Australia's innovation knowledge needs, including science, technology and the humanities, arts and social sciences.

**Recommendations:**

6. **That the Australian government:**
   a) **Abandon the existing National Research Priorities in favour of industry- and sector-specific research priorities developed by industry innovation councils.**
   b) **Through the ARC and NHMRC, develop broad thematic priorities for basic research whilst also ensuring that the university system retains the flexibility to undertake high quality basic research across a wide range of fields.**

# 3 Building links with the global innovation system

## Establishing priorities for long-term global collaboration and investment

It is critical for Australia to achieve a close alignment between the innovation and research *needs* of Australian industry and community and the innovation and research *capabilities* we seek to develop and maintain. We accordingly need to develop and maintain a broad spectrum of world quality research capability and expertise in Australia.

In addition, IRU Australia believes that it is critical to enhance and maintain capabilities in Australia which enable us to lead, influence, adopt and adapt international innovation and R&D outcomes. This requires effective mechanisms for participating fully in international research collaborations, partnerships, networks and exchange processes.

Mechanisms for Australian engagement in global innovation and research should support a broad range of activity at a basic level to ensure we capture new innovation opportunities when and where they arise. However, there clearly needs to be a strategic focus on countries that possess innovation/research capabilities identified as especially important to us (e.g. established Western trade and political allies) and those which offer the potential for establishing long-term partnerships in the context of major emerging and regional economies (e.g. China, India, Brazil, Malaysia). It is also desirable, and in our long term interests, to work with developing countries to assist them to adapt and adopt knowledge to enhance their economic, social and environmental conditions and build their own innovation systems.

We believe that Australia's current approach to international partnering in innovation and research lacks effective strategy and planning in three key respects. First, it lacks integration across sectors and government portfolios. Second, it fails to adopt a targeted approach in terms of both countries and areas for collaborative focus. Third, it is also substantially under-resourced. This must change if Australia is to compete with other countries in accessing innovative processes and technologies, and new markets. We need to analyse global markets and then develop strategies which appropriately target international partnerships. Government can provide a range of enabling frameworks and programs to facilitate those partnerships.

Such frameworks should include:

- Determination of country-specific priorities for the development of research and innovation links which support Australian industry goals as well as broader capability and skills development.
- Establishment of bilateral agreements reflecting those priorities, and related funding programs adequate to support development and maintenance of long-term partnerships at appropriate scale.
- Programs that are integrated across sectors and government portfolios. The UK-India Education and Research Initiative (UKIERI)[8], for example, aims to create a 'step change' in educational relations between India and the UK so that in the longer term the two countries are each other's partner of choice in education. The initiative covers higher education and research, schools and professional and technical skills.
- Creation of platforms, programs and infrastructure to facilitate joint knowledge generation and exchange in the targeted areas. Examples from other countries include: the agreement between the German Research Foundation and the National Natural Science Foundation of China for the establishment of Transregional Collaborative Research Centres[9]; and, the China-Ireland Research Collaboration Fund[10].
- Support for participation in international networks.
- Facilitation of access to overseas funding programs for Australian businesses and research organisations (eg Australian access to the EU's Seventh Framework Program for Research and Technological Development).

The establishment of these frameworks will require a substantial additional investment of government funding.

**Recommendations:**

7. **That the Australian government significantly increase its investment in mechanisms that build links to the global innovation system including:**

   a) **Programs that support a broad range of connections to global innovation and research systems.**

   b) **Targeted programs that facilitate the establishment of long-term partnerships based on country-specific priorities for collaboration in research and innovation.**

[8] See http://www.ukieri.org.
[9] The agreement provides for the establishment of Transregional Collaborative Research Centres, each based at one principal location in China and one principal location in Germany, to enable researchers to undertake ambitious long-term research at an internationally competitive level, promote interdisciplinary cooperation, and advance young researchers.
[10] The China-Ireland Research Collaboration Fund provides for exchanges of leading researchers at institutions in Ireland and China working in the fields underpinning Biotechnology and Information and Communications Technology.

## Capitalising on global mobility

While there has been considerable attention paid to the Australian 'brain drain' phenomenon, the realities of the global economy will mean that Australians will continue to be lured overseas by work opportunities, remuneration and financial benefits and other factors. The challenge for Australia is to look for opportunities to capitalise on the increasing borderless nature of the global economy and the consequential increased mobility of people. This needs to include strategies for achieving a balance between the export and import of talented individuals.

The Australian government has made a strong start by opening ARC fellowships and some other awards to international competition. Additional measures to capitalise on global mobility to strengthen the national innovation system should include:

- Developing systematic and targeted approaches to linking with the Australian diaspora, especially in national research and innovation priority areas[11].
- Supporting programs that encourage talented Australians to work abroad for a period of time and then bring their knowledge back to Australia. The NHMRC Biomedical (C J Martin) Fellowships are an excellent example of this type of program. The full time Fellowships are awarded for a period of four years, with the first two years spent overseas and the last two years spent in Australia.
- Increasing support for Australian students to study overseas.
- Enhancing alignment between Australian higher education award structures and the Bologna framework.
- Increasing government support for international research scholarships and cotutelles, with the aim of attracting increased research and innovation talent to Australia. While Australia leads the OECD in international students as a percentage of all higher education coursework enrolments, it falls substantially behind countries such as the United Kingdom, United States, Switzerland and France in research student enrolments as a percentage of total research enrolments[12]. Given that a large percentage of international students are highly motivated to stay in Australia, there would be benefits to Australia in opening up Australian Postgraduate Awards to overseas applicants.
- Increasing funding support for visiting fellowships and similar programs.

In addition, IRU Australia believes that current immigration policy needs to be overhauled to ensure that it aligns with the future skill and innovation needs of Australia. Current policies inhibit rather than facilitate our access to the global talent pool and tend to focus on immediate skills shortages rather than longer-term national research and innovation priorities. In particular,

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[11] An interesting example is the Irish Technology Leadership Group. This is a group of Irish and Irish American senior executives based in Silicon Valley and active in the global technology industry who are committed to ensuring that Ireland remains a strategic area of investment and opportunity for US technology companies and keen to support the growth and development of Irish based technology companies. The Group is funded by both the public and private sectors (see www.itlg.org).

[12] Organisation for Economic Cooperation and Development, *Education at a Glance 2007: OECD Indicators.*

IRU Australia supports a relaxation of the visa rules to attract the most talented PhDs to migrate to Australia irrespective of age, work experience and other requirements of the points system.

**Recommendations:**

8. **That the Australian government:**
   a) **Develop and implement strategies and programs across the innovation system, as outlined above, which capitalise on the global mobility of people and the consequential opportunities to access talent and exchange knowledge**
   b) **Review immigration policy to ensure that it facilitates rather than inhibits Australia's access to the global talent pool and is based on providing flexibility to meet longer-term national research and innovation priorities.**

# 4 Strengthening collaboration across the innovation system

## Collaboration between universities and business

The evidence is clear on two points:

- Business expenditure on R&D in Australia has typically remained significantly below OECD averages for the past 4 decades[13], despite a range of public policy interventions designed to change the situation.
- The extent of collaboration between Australian universities and business falls well below OECD averages. ABS survey data indicates that only 1 in 50 innovating Australian companies collaborate with universities or other higher education institutions[14]. Moreover, a very small fraction of business R&D expenditure crosses sectoral boundaries to reach public research institutions: only 6% of university R&D expenditure is sourced from business and only 3% of all business R&D expenditure is spent through the higher education system[15].

There is a temptation to point to particular factors (e.g. the tax regime) as the prime causes of this situation, however, the reality is that there are a multitude of contributing factors. We highlight just a few key relevant factors here:

- Government innovation policy and programs and university research profiles are not well aligned with Australia's industry structure: as noted previously, greater recognition needs to be given to the services sector and the ways in which innovation occurs in that sector. The development of industry-led research priorities will greatly assist in changing this situation.

[13] Organisation for Economic Cooperation and Development, *Science, Technology and Industry: Scoreboard 2007*. Figure A.3.1
[14] Australian Bureau of Statistics, *Innovation in Australian Business*, 8158.0, 2005.
[15] Australian Bureau of Statistics, *Research and Experimental Development, All Sector Summary*, 8112.0, 2004-05.

- Business innovation is driven as much by the knowledge within the company and the demands of customers and suppliers as it is by traditional R&D[16]. The university sector needs to more actively recognise this and pursue opportunities for accessing this 'intelligence' to inform their research programs. There is also a need for universities to review their research systems and methodologies to ensure they can add value in a timely manner to dynamic business innovation. Government programs also need to be reviewed to move beyond a narrow conventional product-based view of innovation.
- Australian industry is very reluctant to meet the full cost of outsourced research in 'publicly-funded' institutions. Universities and PFRAs are consequently compelled to meet a substantial fraction of the indirect costs and seek to retain a significant share of the project IP to recoup costs. This creates difficulties for the partner company and introduces impediments to collaboration. In exchange for fully funded research, universities will need to accept that an industry client has the right to manage and even terminate projects on their own terms.

Both universities and businesses need to examine how their cultures, structures and systems may be inhibiting collaboration and look for new ways of working together for mutual benefit. There is also a need for changes to government innovation policy and programs, as outlined below.

### *The exchange of people*

National innovation systems depend crucially on the exchange of people between different parts of the system. The OECD[17] observes that

> *The movement of people and the knowledge they carry with them (often termed "tacit knowledge") is a key flow in national innovation systems. Personal interactions, whether on a formal or informal basis, are an important channel of knowledge transfer within industry and between the public and private sectors. Sometimes, it is not so much the specific knowledge transferred which is important, but rather the general approach to innovation and competence to solve problems. The ability to locate and identify information and to access networks of researchers and personnel is a valuable knowledge asset. In most studies of technology diffusion, it is shown that the skills and networking capabilities of personnel are key to implementing and adapting new technology. Investments in advanced technology must be matched by this "adoption capability" which is largely determined by the qualifications, overall tacit knowledge and mobility of the labour force.*

University graduates provide for the most significant exchange of people between the university sector and industry, business and government. As described earlier, there is also significant untapped potential for the exchange of students between universities and industry to stimulate two-way knowledge flows.

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[16] Cosh, A., Hughes, A. and Lester, R., *UK PLC Just How Innovative Are We?*, Cambridge MIT Institute, 2005.

[17] OECD (1997) National innovation systems, Paris: OECD, p 18, retrieved from http://www.oecd.org/dataoecd/35/56/2101733.pdf on 6 April 2008.

The government's new Researchers in Business program will be a valuable mechanism for promoting the exchange of expert researchers between universities and SMEs. The UK Knowledge Transfer Partnerships scheme is also worthy of close examination. It has been very successful, with the recent *Innovation Nation* White Paper proposing backing the Sainsbury review recommendation to double the number of Partnerships.

With the 'changing face of innovation', universities have as much to learn about innovation from industry and business as vice versa. There would be great value in supporting the exchange of people *from* industry, business and government *to* universities, including not only R&D professionals, but also other categories of professionals who play a key role in innovation. Similar to the Knowledge Transfer Partnerships, these exchanges could be built around a particular research project of strategic value to the partner or their sector. Given salary differentials between academia and industry, particularly in some professional fields, exchanges of this nature are unlikely to occur without some funding support from government.

**Recommendations:**

9. **That the Australian government introduce programs to encourage the exchange of innovation professionals *from* industry, business and government *to* universities.**

### *Tax incentives*

The OECD reports that R&D tax concessions are an increasingly popular measure among both OECD and non-OECD countries[18]. The recent UK Sainsbury review concluded that the UK R&D tax concession scheme had played an important part in supporting and sustaining business R&D in the UK, with business take-up rising substantially since the scheme's introduction, from under 2,000 companies in 2000–01, to 6,000 in 2004–05.

In Australia, however, early gains in reported R&D activity (measured in dollar terms) in Australian companies have been offset by a substantial drop in growth over the past decade, coincident with the cut in the basic R&D tax concession from 150% to 125% [19].

IRU Australia argues that the current R&D tax concession is effectively an impediment to collaboration between public research institutions and industry sectors. Since in-house R&D can be fully costed and claimed against the tax concession, there is almost always a greater financial advantage to keeping company R&D in-house. We believe that creation of a genuine incentive for companies to engage with universities in R&D will require two key actions:

1. A shift to the full funding of the costs of university research by both government and industry, to reduce the pressures on universities to look for revenue through IP mechanisms (discussed in section 5).

[18] OECD, *Science, Technology and Industry Scoreboard 2007: Innovation and Performance in the Global Economy*, 2007.
[19] Rudd, K. and Carr, K. (2007), *New Directions for innovation, competitiveness and productivity*, Australian Labor Party, April 2007.

2. The introduction of a premium R&D tax concession rate (possibly as high as 175%) for full-costed R&D contracted by companies to Australian universities.

Taken together, these two measures will ensure that: there is financial benefit to companies in outsourcing R&D to public research institutions; and, IP ownership conflicts will be significantly reduced. From the universities' point of view this would provide incentive for realigning research with industry needs, and the capacity to properly address effective project management and thus delivery of R&D results.

In recognition of the 'changing face of innovation', the R&D tax concession should be extended to cover research in the humanities, arts and social sciences where it can be demonstrated that it will support innovation.

**Recommendations:**

**10. That the Australian government**

**a) Introduce a premium R&D tax concession rate for full-cost R&D contracted to Australian universities and PFRAs.**

**b) Extend the tax concession to cover research in the humanities, arts and social sciences which supports business innovation.**

### *Government innovation programs: the devil is in the detail*

Government funding programs supporting R&D and knowledge transfer are essential to a vibrant innovation system. Considerable care, however, needs to be taken to ensure that the detailed design of these programs support the kinds of outcomes being sought, rather than conspiring against them.

Direct support of R&D for product and process development through Commercial Ready and its predecessors, for example, has been of particular value to small companies, and is a key program underpinning innovation in many technology-based 'start-up' companies. Though we strongly support the continuation of this program, we believe there are aspects in the detail of the program which militate against university participation as R&D providers for Commercial Ready projects. For example, experience with start-up companies receiving Commercial Ready grants indicates it is preferable for them to conduct R&D within the company rather than contract to a university since overheads of managing the research are claimable by the company only if they perform the research themselves. This again is an undesirable impediment to R&D collaboration between the public and private sector.

**Recommendations:**

11. **That details of government innovation programs, such as Commercial Ready and related programs, be reviewed and revised to remove impediments to collaboration between public and private sectors.**

### *The benefits of co-location*

Close proximity to universities is a major factor influencing choice of research collaborators by small, medium, and even large businesses. This case is well supported by evidence from the UK's Lambert review of business university collaboration[20]. It cited a survey which found that firms with local markets overwhelmingly collaborated with local universities, but even 37% of firms with national markets and 26% of firms with international markets collaborated with local universities. It is therefore clear that if Australia wishes to foster innovation reasonably broadly throughout the nation it should support a reasonably broad dispersion of research intensive universities throughout its cities and major regional centres. A common finding of innovation studies is also that innovating firms tend to cluster geographically and innovating firms in all sectors employ science and knowledge not generated internally[21].

These factors have provided the theoretical rationale for establishing technology/research parks. In practice, however, developments of this nature in Australia have often been disappointing in terms of their collaboration outcomes. A number of factors have contributed to this. First, there is a lack of government funding to support the establishment of the site and facilities. This results in pressure on all parties to focus on the 'real estate' aspects of the initiative rather than the potential for collaboration in research, innovation and commercialisation. Second, the funding constraints often result in the selection of sites that are not ideally situated to foster collaboration: ease of movement between the university and the research/technology park is critical to success. A recent US study highlights that a new model of strategically planned mixed-use campus expansions is emerging that includes space for academic and industrial uses and on-site amenities considered important in attracting innovation staff and students[22].

This study also concludes:

> *For research parks to be drivers of economic development, they must continue to invest scarce resources in their quality attributes. As a result, most parks will continue to have limited retained earnings. Parks need diversified funding sources, and investments in research parks need to be considered as investments in a region's or nation's economic development infrastructure.* (p. xiv)

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[20] Lambert, R., *Lambert Review of Business-University Collaboration, Final Report*, HM Treasury, the Department for Education and Skills and the Department of Trade and Industry, 2003.
[21] Professor Jonathon West, *A Strategy to Accelerate Innovation in NSW: Outline for Policy Development*, Australian Innovation Research Centre.
[22] Batelle Technology Partnership Practice, *Characteristics and Trends in North American Research Parks: 21st Century Directions*, October 2007.

Successful models internationally for industry/university collaboration in research-based innovation often involve co-location precincts for which building and infrastructure costs are met from public funds. This provides fledgling companies with low-cost facilities and infrastructure for periods of stable growth which are unachievable for privately-funded commercially-based facilities. We believe Commonwealth/State government funding of capital costs of industry/university co-location precincts would substantially enhance long-term viability of these types of 'incubation' sites, and deliver levels of collaboration in R&D which are unlikely to be achieved through existing short-term funding arrangements.

Similarly, we argue that there are significant collaborative benefits to be achieved from the strategic co-location of university and PFRA facilities and infrastructure where there is aligned research capability and especially where organisations already operate in close physical proximity.

**Recommendations:**

12. **That the Australian and State governments cooperate in funding capital costs of industry/university co-location precincts to facilitate collaborative R&D.**
13. **That the Australian government capture opportunities, as they arise, for the strategic co-location of university and PFRA facilities and infrastructure.**

### *Potential impact of research quality assessment on collaboration with industry*

Excellence in Research for Australia (ERA), to be developed by the Australian Research Council (ARC) in conjunction with the Department of Innovation, Industry, Science and Research, will assess research quality using a combination of metrics and expert review by committees comprising experienced, internationally-recognised experts.

ERA has the potential to impact significantly on the collaborative behaviour of Australian academics. Even though the now defunct Research Quality Framework (RQF) never reached implementation, there is evidence that the design of the Framework has already had an impact. The IRU Australia universities have noted a significant increase in applications for ARC and NHMRC grants and a parallel decrease in contract research and consultancy. Academics have listened to the strong messages sent by the RQF about what will be valued in assessing research quality, and unfortunately, collaboration with end-users of research and research impact do not feature strongly.

Assessments of research quality, and the funding that may be attached to those assessments in due course, are very powerful drivers of behaviour. IRU Australia believes that it is critical for ERA to create incentives, rather than disincentives, for university researchers to work in collaboration with industry and business.

**Recommendations:**

14. **That the ERA framework, under development by the ARC, include measures of collaborative activity and research impact to ensure that it creates incentives, rather than disincentives, for university researchers to work in collaboration with industry and business.**

## Cooperative Research Centre Program

The clear overarching finding of the 2006 *Economic Impact Study of the CRC Programme* was that the CRC program is delivering strong net positive economic benefits for Australia, through: the application of CRC generated knowledge; access to international knowledge networks; and, enhanced skills formation for postgraduate students, researchers and end users. Other countries have emulated the CRC model, lending further weight to the value of the program.

The objectives of the CRC program align strongly with the triple bottom line outlined in the *Call for Submissions*. In particular, it is important to highlight that a significant emerging benefit of the CRC program has been the active participation by State governments with flow-on impacts for innovations in public policies and service delivery around the production of public goods.

### *Alternative models*

Established in 1991, the CRC program is now 17 years old. The environment for research and innovation in Australia and internationally has changed dramatically in that time and IRU Australia believes that this Review offers an important opportunity to ask whether the present CRC program is the best model for the future environment. While the CRC program has been successful in broad terms, barriers to participation in the program have accumulated over time for various stakeholders and there is a risk that the longevity of the program and its associated established structures and practices will inhibit the potential for innovative responses within the existing program framework.

There are a number of overseas examples of successful alternative models that are well worth examining for application in Australia:

- **Canadian Networks of Centres of Excellence (NCEs)**. This program (see Attachment 1 for more detail) is supported and overseen jointly by the federal research agencies and Industry Canada. The Networks are 'institutes without walls, formed by Centres coming together to assemble a critical mass of intellectual capacity and to address strategic research questions deemed vital to Canada's social and economic development'. The networks are partnerships among universities, industry, government and not-for-profit organisations and are aimed at turning Canadian research and entrepreneurial talent into economic and social benefits. Competitive selection criteria include processes for allowing new entrants and building national capacity. The core NCE program is supplemented by a range of progressive schemes aimed at building national and international research networks.

- **Irish programs**
  - The Industry-Led Research Programme allows Irish companies in a specific sector to specify and lead research projects that will have commercial benefit and increase international competitiveness. The R&D is carried out on behalf of the companies by teams of leading academics from Irish universities. The Programme is part of a suite run by Enterprise Ireland in its commercialisation program.
  - The Centres for Science, Engineering & Technology: Campus-Industry Partnerships (CSETs) funded through Science Foundation Ireland help link scientists and engineers in partnerships across academia and industry to address crucial research questions, foster the development of new and existing Irish-based technology companies, attract industry that could make an important contribution to Ireland and its economy, and expand educational and career opportunities in Ireland in science and engineering.
- **UK Knowledge Transfer Networks**. The objective of a Knowledge Transfer Network is to improve the UK's innovation performance by increasing the breadth and depth or the knowledge transfer of technology into UK-based businesses and by accelerating the rate at which this process occurs. The UK program is strongly targeted at knowledge transfer into UK businesses, but the same model could be applied more broadly to encompass knowledge transfer into other sectors.

IRU Australia argues that the key potential benefits of schemes of this nature include:

- The 'network' model which typically incorporates:
  - A requirement for the scheme to encourage and accommodate new participants in the network, including SMEs, which assists in driving the dynamism of the research and innovation process. This is in contrast to the CRC program where there are significant barriers to admitting new entrants once the Centre has been established.
  - The capacity to locate and engage the best researchers available to address any particular research question, wherever they are located, in contrast to CRCs which tend to be restricted to researchers within partner institutions.
- The industry-led nature of some of the schemes. The research literature consistently points to the relative success of knowledge exchanges that are demand-driven by industry or other groups of knowledge users[23].
- The availability of a range of schemes that are similar in broad concept and design, but tailored to best suit the objectives of the research collaboration. The Canadian scheme, for example, includes a specific program targeted at commercialisation outcomes.

It would be highly desirable for the Australian government to conceptualise a continuum of collaborative programs that incrementally build upon each other. For example, ARC Linkage projects which build collaborative relationships at the individual project level could be the starting point of the continuum, and long-term networks of centres of excellence could be the end point, with a range of intermediary programs to suit particular objectives, such as Enterprise

[23] PhillipsKPA Pty Ltd, *Knowledge Transfer and Australian Universities and Publicly Funded Research Agencies*. A report to the Department of Education, Science and Training, March 2006.

Connect, in between the two. The design of these programs would be informed by the research and innovation priorities identified by Innovation Australia and industry innovation councils.

**Recommendations:**

15. **That the Australian government replace the CRC program with a coordinated suite of collaborative research programs, including networks modelled on programs such as the Canadian Networks of Centres of Excellence.**

### *Reforming the existing CRC program*

If the government retains the CRC program, there is considerable scope to refocus the program to strengthen its contribution to the national innovation system:

- Restore the 'public benefit' objectives of the CRC program, as proposed by Minister Carr.
- Introduce more flexible governance arrangements that can be tailored to suit the specific objectives of each CRC, including arrangements that facilitate the entry of new partners during the life of the Centre and reduce the barriers created by IP management[24]. A number of model governance frameworks could be developed for this purpose. The current corporatisation model is creating barriers to collaboration, due to its complexity, cost and legal constraints.
- Reduce the costs of entry to participation in the program. Approximately $350,000 is required to develop a two-stage proposal and the requirement for matching cash or in-kind contributions from participants can create unnecessary barriers in some instances.
- Introduce a mechanism for the independent evaluation of Centre outcomes towards the end of each funding cycle to make recommendations about the Centre's continuation and future directions. Given the quantum of government funding invested in each Centre, it is in the public interest for evaluations to be conducted.
- Determine a 'post-CRC' strategy for those Centres demonstrating value over a sustained period of time. This might include a scheme modelled on the Canadian NCE Management Funds whereby transition funding is provided to support management and networking costs only, with research funding needing to be sourced from participants or other funding schemes.

[24] For example, a subscription model for large industry-university collaborative ventures could be considered whereby IP would be shared, with subscribers having a right of first refusal around the commercialisation of IP.

**Recommendations:**

16. **That if the CRC program is retained, the Australian government implement changes to:**
    a) **Refocus on public benefit outcomes;**
    b) **Introduce more flexible governance arrangements tailored to the specific objectives of each CRC, including mechanisms to admit new partners after the Centre is established;**
    c) **Reduce the costs of entry for collaborating partners;**
    d) **Introduce mechanisms for the independent evaluation of Centre outcomes towards the end of each Centre's funding cycle; and**
    e) **Determine a 'post-CRC' strategy for those Centres demonstrating value over a sustained period of time.**

## Reframing the proposed hubs and spokes model

While IRU Australia strongly endorses the government's intentions to strengthen Australian research networks to get maximum value from the public research dollars, it believes that considerable caution would need to be exercised in implementing the proposed hubs and spokes model. There is a risk of unintended consequences that may serve to undermine the program's objectives.

The *Review of Closer Collaboration between Universities and Major Publicly Funded Research Agencies*[25] noted that:

> *… collaboration is driven from the bottom-up and based on personal networks between trusted individuals. Cooperation between two or more researchers is the fundamental unit of collaboration and is intrinsically a social process.*

Collaboration is an inherent feature of academic research and researchers build on the work of others and collaborate with their colleagues within their institution, across institutions and across the world as a matter of course when the conditions are right.

There is a clear role for government in establishing frameworks and providing enabling mechanisms to promote collaboration. However, caution needs to be exercised in how this role of government is actioned in practice. For example, with respect to industry networks, the OECD[26] has concluded the following:

[25] Department of Education, Science and Training, *Review of Closer Collaboration between Universities and Major Publicly Funded Research Agencies*, March 2004. (p.1)
[26] Organisation for Economic Cooperation and Development, *Science, Technology and Industry Outlook 2000*. (p. 14)

*Governments have recognised the growing importance of co-operative networks. Governments and non-profit organisations can promote firms' awareness of networking, notably by distributing information. Governments can also assist firms in their search for network partners by furnishing them with information, brokerage and matching services. Experience suggests that governments cannot create networks from scratch, however. They can sometimes reduce firms' reservations about inter-firm co-operation, although building trust takes time.*

In our view, the principle that applies in industry also applies to universities or any other group of organisations or collaborating parties: that is, collaboration can't be artificially orchestrated by government. It needs to emerge from genuine mutual interests and from levels of trust that are built incrementally over time through experience in working together successfully, often starting with very small joint projects or initiatives.

Existing programs, such as the ARC Centres of Excellence, are very positive examples of how the government can stimulate collaboration without being overly prescriptive about who will collaborate with whom and in which research fields.

Our concern is further exacerbated by the 'hubs and spokes' terminology which unfortunately carries connotations of a hierarchical model. IRU Australia believes collaboration could potentially be inhibited rather than encouraged under these conditions. A preferable language would be 'networks of research nodes' or something similar.

We also have other reservations about the hubs and spokes model:

- In many instances, the model would need to go down to the third level of the Research Classification to be meaningful, resulting in a potentially very large number of hubs. For example, a node of research excellence in Atomic and Molecular Physics may have very little in terms of research interests or research application in common with a node of research excellence in Quantum Optics and Lasers.
- The focus is on academic disciplines when it is clear that the priorities for the national innovation system need to be in multidisciplinary research addressing industry and social needs.
- The focus is on collaboration between universities, when we need to expand collaboration to include PFRAs, industry and other sectors.

IRU Australia believes that the responsibility of government is to create an environment which promotes, supports and rewards collaboration in research and innovation. This requires a comprehensive and systematic approach to removing impediments in the current system and replacing them with incentives and rewards.

We argue that getting maximum value for public research dollars by minimising duplication nationally would be best achieved by the government investing in an expanded range of network programs (as discussed on pages 20 and 21) that enable multidisciplinary research expertise from universities, PFRAs and industry to be bought together to address innovation and research priorities identified by Innovation Australia and industry innovation councils. For this purpose, we highly commend the Canadian Networks of Centres of Excellence program.

**Recommendations:**

17. **That the Australian government invest in an expanded range of network programs that enable multidisciplinary research expertise from universities, PFRAs and industry to be bought together to address research priorities.**

# 5 Creating a virtuous circle: funding the full cost of research

## The current vicious circle

IRU Australia believes that the current lack of full funding for the cost of research perpetuates a vicious circle that prevents universities from maximising their contribution to the national innovation system.

In addition to this issue, which has been an historical feature of the Australian research environment, there has been an observable drift in public policy over the last decade or so to increase universities' and PFRAs' responsibility for *funding* research in addition to *providing* research. Numerous Australian and State government funding schemes require universities to contribute substantial funding or in-kind support to funded projects and infrastructure developments. This begs the question of where the money should come from, especially when core research is itself not fully funded.

The lack of full funding for research in Australia has a number of impacts that weaken the contribution of universities to the national innovation system.

### *Risky business: the significant cross-subsidisation of research*

International education now represents Australia's third largest export industry. International education is important to Australia, not only in economic terms, but also in terms of international trade and diplomacy, links with the global innovation system, access to skilled migrants, and our contribution to developing countries. International education has also provided financially constrained universities with the capacity to make strategic investments in priority areas such as research, new technologies and infrastructure.

Minister Gillard, however, has also acknowledged the 'dangerous over-reliance on cross subsidisation from overseas student revenues'[27]. In our view, a continuation of this over-reliance to the extent currently demanded by higher education and research funding policy will significantly weaken Australia's innovation system. It creates a number of unhelpful distortions in the system:

[27] The Hon Julia Gillard MP, *A Higher Education Revolution: Creating a Productive, Prosperous, Modern Australia*, Speech presented in Sydney at the Australian Financial Review Higher Education Conference, 13 March 2008.

- The national research system is left exposed to significant risks in the event of a downturn in the market, leading to a lack of confidence by universities to invest in new research infrastructure and provide research staff with tenure.
- International perceptions of the quality of the Australian higher education system will have a major impact on our ability to attract talented international researchers and research students. A continued transfer of student fee income from learning and teaching budgets to research budgets could over time erode the quality of course delivery and student services. It is far preferable for surpluses generated from international student revenue to be re-invested in enhancing the quality of student experience.
- The international student profile is biased towards disciplines that attract large student numbers, rather than aligned with research and innovation priorities. Given the large percentage of international students in many universities, this in turn has a key impact on the overall academic profile of our universities. In 2006, about 50% of international student enrolments were in Management and Commerce, with 4% in Natural and Physical Sciences. As noted earlier, we also under-perform against other knowledge economies in enrolment of international research higher degree students.

UNESCO has coined the phrase 'the new geopolitics' of higher education which reflects an international shift from student recruitment to bolster cash-strapped universities to higher education as a competitive 'weapon' for attracting elite talent[28]. Australia's innovation and international education strategies are at great risk of working at cross purposes. They need to be bought into close alignment and a key enabler of this will be a reduction in the dangerous over-reliance on cross-subsidisation from overseas student revenues identified by Minister Gillard. This will free up the university sector to take a more strategic approach to the future development of the international education export industry.

### *Intellectual property under lock and key*

The lack of full funding for government-funded university research reinforces a perception in industry and business that they also do not need to pay the full cost of research outsourced to universities. Negotiations on price are accordingly often very difficult, with universities needing to compensate for low contract pricing by fiercely attempting to protect their IP. This leads to long delays and complex contractual arrangements that are significant disincentives for industry and business to outsource their R&D to universities.

In addition to addressing the full funding of research, consideration should be given to the introduction of an equivalent to the US *Baye-Dohl Act* in which publicly funded institutions are required to actively commercialise IP generated by public funds or relinquish the IP to industry.

### *Deterioration in research infrastructure*

The quality of the research infrastructure in Australian universities has been deteriorating for some time, due to the relative decline in research block funding, lack of access to funding for new infrastructure other than the very small Capital Development Pool, and the general decline in higher education funding in real terms. The Higher Education Endowment Fund is a very positive

[28] For example, see http://www.educationalpolicy.org/pub/commentary/080208.html,

initiative, however, the funds available need to be increased if it is to support capital investment at the level required to maintain a world class university system.

Universities Australia has noted that between 2001 and 2006, research infrastructure funding to universities has grown by only 25% compared with growth of 280% in NHMRC funding and a growth of 120% in ARC funding. Thus the lack of full funding through the competitive schemes has been further exacerbated by the failure of infrastructure funding to keep pace with increases in grant funding. It has been notionally estimated that at least doubling the current level of block funding is required to restore an appropriate balance between competitive grants and block funding.

The Productivity Commission concluded in its report on *Public Support for Science and Innovation* that there is a sound public policy rationale for dual streams of funding of higher education research – funding through the Commonwealth competitive grants schemes mainly the ARC and NHMRC, and funding for research infrastructure and support for emerging research areas and researchers through competitively allocated institutional block grants. Australia needs to maintain a strong dual system of research funding that ensures the continuing quality of research infrastructure. Given the experience over recent years of the ratio between competitive funding and block funding becoming incrementally distorted, it would be highly desirable for policy parameters to be established to ensure the maintenance of an appropriate ratio between the dual streams. In a number of research environments (e.g. the UK Engineering and Physical Sciences Research Council and the US federal research agencies), the norm is for approximately 80% of overhead costs to be tied to the grant and 20% funded through block grants.

## Creating a virtuous circle

The full funding of research is pivotal to securing the long term sustainability, security and competitiveness of the Australian innovation system. Rather than a vicious circle, we need to create a virtuous circle that builds the research cultures, collaborative drive and infrastructure needed to ensure a vibrant and productive innovation system.

The previous Australian Vice-Chancellors' Committee developed proposals for the full costing of research[29]. The UK government is currently working towards full cost funding through the Research Councils by early in the next decade and has recently introduced the Transparent Approach to Costing (TRAC) method to help institutions calculate the full economic cost of the research they do for inclusion in research proposals to Research Councils[30].

[29] Australian Vice-Chancellors' Committee, *University Research: Some Issues*, February 1996.
[30] See http://www.hefce.ac.uk/research/funding/dual/.

**Recommendations:**

18. **That the Australian government:**
    a) **Adopt a target of full funding of research over the next five years and develop supporting national guidelines on the full economic costing of research.**
    b) **Double research block grant funding and develop policy guidelines on the appropriate distribution of research full funding between competitive and block grants.**

## Increasing the overall quantum of Australian R&D expenditure

There is an increasing international recognition of the links between R&D expenditure, innovation and economic outcomes. This is reflected in the targets being set by many countries to increase spending on R&D. For example: the European Union has set a target of investing 3% of GDP in R&D by 2010; and, China's R&D expenditure is growing at an astonishing rate. The government has acknowledged that Australia's R&D spending, at 1.8% of GDP in 2004, is not adequate for Australia to maintain its international competitiveness[31].

The government needs to set firm targets accordingly. In 2006, the Australian Vice-Chancellors' Committee proposed that the national commitment should be to increase total R&D spending to 2% of GDP by 2010 and 3% of GDP by 2020[32]. IRU Australia argues that targets of this order are required to deliver the innovation outcomes needed to keep Australia competitive.

In addition to increasing expenditure on R&D funded by business and global funding sources, as discussed in earlier sections of this submission, there is a need for increased government funding to expand current research programs through the ARC and NHMRC to keep pace with growth in the Australian higher education sector and the economy more broadly.

In expanding funding for competitive grant schemes, however, IRU Australia stresses the importance of this occurring hand in hand with a shift to full funding of research. Otherwise, the increased funding will in effect be a 'poisoned chalice', with universities needing to further increase cross-subsidisation from other sources. An increase in competitive grant funding will ensure that the full funding of research does not result in unacceptable application success rates. It is desirable to maintain minimum application success rates of approximately 25-30% across the major ARC and NHMRC grant schemes, and a higher success rate of approximately 50% for ARC Linkage grants, reflecting the fact that these applications have already been assessed and endorsed by industry partners.

[31] Senator the Hon Kim Carr, *Science Serving Society*, Address to National Press Club of Australia, 19 March 2008.
[32] Australian Vice-Chancellors' Committee, *AVCC Submission to the Productivity Commission Research Study on Public Support for Science and Innovation*, August 2006.

**Recommendations:**

19. **That the Australian government increase the funding available through the national competitive grant schemes.**

**Attachment 1**

## Canadian Networks of Centres of Excellence

The Canadian Networks of Centres of Excellence (NCEs) are partnerships among universities, industry, government and not-for-profit organizations aimed at turning Canadian research and entrepreneurial talent into economic and social benefits for all Canadians. These nation-wide, multidisciplinary and multisectorial partnerships connect excellent research with industrial know-how and strategic investment. By involving thousands of talented young Canadians in their work, NCEs are training tomorrow's scientific leaders and ensuring Canada's continued role as a world science and technology leader.

Three Canadian federal granting agencies – the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC) – and Industry Canada combine their efforts to support and oversee the NCE initiative.

The funding for research and training in Canadian universities through the agencies' peer-reviewed research programs is the foundation upon which the successful networks are built.

The Networks of Centres of Excellence (NCE) program has been operating successfully for 15 years. In February 1997, the government established the NCE as a permanent program, with an annual budget of $82.4 million in 2005-06.

The program name is based on the following three principles:

- **Excellence** defines the individual researchers who have distinguished themselves through a record of peer-reviewed research.
- The **Centres** are created from this pool of excellent researchers who work together on common research projects.
- The **Networks** are institutes without walls, formed by Centres coming together to assemble a critical mass of intellectual capacity and to address strategic research questions deemed vital to Canada's social and economic development. Together, the Centres are capable of achieving more than the sum of their individual efforts.

Currently the NCE Program supports more than 6,000 researchers and highly qualified persons in 71 Canadian universities. The program partners include 756 Canadian companies, 329 provincial and federal government departments, and 525 agencies from Canada, along with 430 international partners – making it a truly national and international program.

In 2005-2006, the networks stimulated outside cash and in-kind investments totalling almost $70 million, including more than $27 million by the participating private sector companies. With the program's own investment, the total dedicated to research, commercialization and knowledge transfer was almost $150 million.

There are 21 networks in operation, including:

- National Initiative for the Care of the Elderly
- Canadian Institute for Photonic Innovations
- Advanced Foods and Materials Network
- Promoting Relationships and Eliminating Violence Network
- Canadian Obesity Network
- Canadian Network for Vaccines and Immunotherapeutics.

Extensions to the core NCE program include:

- **Business-Led Networks of Excellence** to be established by not-for-profit consortia that represent the interests of private sector enterprises with substantial R&D operations in Canada or potential to benefit from R&D (comprising a mix of SME and large companies, and research providers and research-users). The consortia must provide a well described and managed collaborative research program involving the most suitable expert researchers from academia, government and/or the private sector.
- **Centres of Excellence for Commercialisation and Research** established to pursue major discoveries and bring them to the marketplace over the next five years.
- **The International Partnership Initiative** which provides established NECs with additional support to develop and enhance links with equivalent organisations in the rest of the world. This extends to building new relationships with researchers from the developing world.
- **Industrial R&D Internships** which select, through a competitive, peer-reviewed process, recipient organisations who will match graduate students and post-doctoral fellows with private sector organisations for private sector research internships.
- **NCE-New Initiative (NCE-NI)** created to support networking among well-established researchers or research teams to encourage them to develop new partnerships with receptor communities. The funding is not intended to support research as it is expected that the teams will already have existing research funds. NCE-NI funding supports networking among researchers whose work seeks ultimately to improve the well-being of Canadians, be it social, health-related and/or economic. NCE-NI has been designed to respond to a need of both the researchers and the receptor communities, a need for interaction, partnership and networking. For some groups, elements of networking are already in place but they lack the infrastructures and the resources to support their networking activities. The goal of this new initiative is to facilitate the creation of networks.
- **NCE Management Funds.** Networks successfully completing the end of an NCE funding cycle may opt to compete for Research Management Funds (RMF) to continue their networking activities. The RMF award is restricted to covering some network administration and networking costs and may not be used for the support of research itself. Research support must be provided through other sources of funding such as granting agency programs and partner organisations and is a required element.


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