

30 April 2008

Review of the National Innovation System – Submission
Secretariat to the Expert Panel
Review of the National Innovation System
Department of Innovation, Industry, Science and Research
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UNSW



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Dear Expert Panel,

UNSW SUBMISSION TO THE REVIEW OF THE NATIONAL INNOVATION SYSTEM

1. DECLARATION OF INTERESTS

This submission is being made on behalf of The University of New South Wales (UNSW). UNSW is a member of the **Group of Eight**¹ research intensive Universities, and a member of **Universitas21**², an international network of research intensive Universities. In 2007 UNSW received research funding of approximately \$250M, from a range of sources including the ARC and NHMRC, and is a world leader in the areas of Biomedical Sciences, Water, Environment & Sustainability, Next Generation Materials & Technologies, Social Policy, Government & Health Policy, ICT, Informatics & Robotics, Business, Law & Economics. UNSW is also a core or supporting participant in 13 Cooperative Research Centres, and 8 National Centres of Excellence, 8 ARC Centres of Excellence, and more than 60 UNSW Research Centres representing areas of research critical mass.³

2. INTRODUCTION & GUIDING PRINCIPLES

The University of New South Wales welcomes the opportunity to make a submission to the Review of Australia's National Innovation System to the Expert Panel. This is a response to the "**Review of the National Innovation System: A call for submissions**" and makes practical recommendations to address these from a University research perspective.

As one of Australia's large research-intensive Universities the recommendations made in this submission are based on the following overarching principles:

- It is essential for Australia to maintain a strong University research sector. There is no question that a strong research and development base underpins the national economy and drives innovation.
- The policy framework around the University research sector should flexibly reflect the needs and wishes of system stakeholders - in particular, students, industry, government and staff - expressed via competitive choice processes to the greatest extent possible. Government should intervene directly only where these processes are likely to be ineffective. Put another way, we are arguing for a lightly regulated market model, supplemented by direct government action only where market failure is likely and government action can be expected to be effective.

¹ See <http://www.go8.edu.au/>

² See <http://www.universitas21.com/>

³ See <http://www.gmo.unsw.edu.au/CentresSecretariat/ListOfUNSWCentres.html>

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- Australia has a good University system, with 6 of the top 50 Times HES Universities. It is hard to think of another significant Australian industry with so many world class institutions. Our Universities perform well by any measure, and remarkably well considering the decline in funding in real terms in recent years.
- The research intensive Universities provide the research environment in which we train the future generation of skilled research staff and build capacity to drive the emerging industry sectors like nanotechnology, advanced manufacturing, the biomedical and pharmaceutical industry, medical sciences and the treatment of disease, the IT and communication sector *etc.*
- There must be a vibrant cohort of higher degree research students to set the foundation for the next generation of researchers to drive innovation. This ensures that Australia produces sufficient highly qualified professionals, researchers and academics in core disciplines, in order to address the established skills shortage in key areas that underpin Australia's future.

3. SUMMARY OF RECOMMENDATIONS

- The RTS and the IGS should be overhauled and a new model for block research grant funding needs to be developed. This should be fully indexed and reflect/reward increased research performance and research output of the University sector.
- Granting agencies such as the ARC & NHMRC should be resourced appropriately so that they can fully fund the costs of doing excellent research without compromising success rates.
- University spin-off companies should qualify for the full range of R&D Tax Concessions and Offsets irrespective of the level of University equity in the company.
- The R&D Tax Concession should be increased (to say 200%) with the requirements that R&D be conducted at Australian Universities.
- The Commercial Ready Plus Scheme should be reviewed to reduce the matching funding requirement and to allow for projects to be funded directly through commercialisation offices within Universities.
- The CTS should be abolished and the funds be allocated to Universities who have demonstrated industry and commercial linkages (including APAs and Linkage grants) to incorporate into the training of research students working with industry.
- A new scheme is needed to bridge the gap for early stage proof-of-concept research and its translation into a commercial product.
- The CRC program has evolved to a stage where it is not attractive for Universities to engage as partners. The Government (and universities) could make significant administrative time and cost savings, with real benefits to the university sector, and innovation outcomes, by rolling the CRC Program into an expanded ARC Linkage Project Grant Scheme or by another means of supporting industry to engage with the research capacity of the University sector.
- Consolidation of the CRC Program with the ARC Linkage Program would provide the opportunity to accommodate longer (7-year) projects and to allow the inclusion of publicly funded research agencies as "industry partners" into the Linkage Project Grant Scheme.
- A long-term strategic plan for critical research infrastructure needs to be developed, that centres around the critical mass of research excellence.
- A long-term strategic plan for critical research infrastructure needs to be developed. In developing this plan, NCRIS (and its funding) should be rolled into the ARC LIEF Grants Scheme to ensure mid-range research infrastructure is funded at all levels and to ensure transparency and accountability.
- HDR Scholarships must be higher in value if we are to compete on the international stage for the best candidates, and need to take into account the higher costs of living in Sydney.

- Universities should have flexibility in the management of Higher Degree Research Scholarships (APA and EIPRS) as a single block grant to award scholarships at the appropriate value to the best students (both local and international) in order to attract the next generation of researchers.
- An urgent review and rationalisation all international postgraduate scholarship schemes (Endeavour, AusAID, EIPRS) is required to deliver a core set of high quality, internationally competitive scholarships that fully-fund living and training costs.
- The number and types of research fellowship schemes need to be reviewed and simplified to ensure that there are good career paths for researchers at all stages of their careers.
- Elite schemes such as the Federation Fellowship and Australia Fellowship Schemes are critical to underpin research leadership in Australia and should be continued.
- There needs to be a significant increase in the number of Australian Postdoctoral to Australian Professorial-type research fellowships to create a career path for PhD graduates/academic researchers.
- There needs to be a focus on the transition from PhD or MSc into industry/ business/ government in the form of a program to transition graduates from training into the innovation workforce.
- Career paths for research technical and professional support staff should be reviewed and block grant schemes for research needs to be at an appropriate level and include provisions which facilitate ongoing career paths.
- UNSW recommends closer collaboration between publicly funded research organisations. One of the significant barriers to collaboration with PFRA centres around intellectual property ownership and the return on technology transfer. Mechanisms need to be put in place to break down barriers to collaboration.
- Australia must have a robust and reliable system for monitoring and benchmarking research quality. The new ERA must be administratively streamlined, and take into account the costs of preparation/submission versus the national benefits of undertaking such an exercise. The new ERA must be carefully engineered to drive positive behaviour in the sector.

4. THE FULL COST OF UNDERTAKING RESEARCH

For every dollar spent on research in Australia, there is a fivefold return on that investment to the nation. The enormous benefits are obvious, whether they be in the areas of health, climate change, renewable energies or social policy, or meeting the challenges of an ageing population. ***The on-costs of research are only partially defrayed by Commonwealth funded research grants.*** This situation is untenable, as Universities cannot continue to struggle to meet the costs of undertaking world-class research at the expense of other areas requiring attention.

While improvement is always possible, our Universities cannot improve performance significantly by further re-allocating existing resources: we are already achieving results well above what could be expected, given the resources available. It will always be possible to point to a particular project or practice that is not cost effective but, in total, the University system is efficient. In costs per person year, Universities perform research and development at half the cost of the government sector and almost one third of that of the business sector.⁴

⁴ Address to the National Press Club by Professor Alan Robson, Chair of the Group of Eight, 2 April 2008

There must be consistent principles and themes across the innovation system. For example the HEEF Advisory Board have adopted a "capacity building" theme for the \$300M-\$400M a year that will be dispersed to universities.⁵ This is at a time where the Commonwealth Government forward estimates for ARC Project funding is reducing in real terms.⁶ There is risk is that significant additional capacity will be added to universities which will not be matched by additional funding to operate and achieve the benefits of the new infrastructure.

UNSW fully supports the recommendation in the Go8 submission calling for the Government to fully fund the real costs of undertaking research.

Research Block Grant Funding

Research Block Grant funding to the University sector comprises the Institutional Grants Scheme (IGS), the Research Training Scheme (RTS), the Research Infrastructure Block Grants Scheme (RIBG), as well as the Australian Postgraduate Awards (APA), and Endeavour International Postgraduate Research Scholarships (EIPRS). The block funding supports research activities at our Universities including the research training at the postgraduate level. All of the research block grant funds provided to universities are driven by four key performance indicators: Higher Degree Research student domestic Load, Higher Degree Research student Completions, research publications, and research grant income.

Because of the nature of the funding model (fixed pie) and the dramatic improvement in research performance of the sector, the return per driver has been declining for almost all indicators by about 7% each year at UNSW. Each year UNSW's research performance has increased significantly. This means that UNSW researchers must work harder, and produce more research publications, attract and complete more research students and attract more research income to receive the same level of block research grant funding each year. Over the 5 year period 2004-2008:

- UNSW's return per research publication declined by 32%;
- UNSW's return per research dollar earned has declined by between 30% (Category 1) and 33%;
- UNSW's return per HDR enrolment has declined by 3% for both high-cost and low-cost HDR students; and
- UNSW's return per HDR completion has declined by 34% for both high-cost and low cost PhD completions.

UNSW would have received an additional \$44M in the research block grant had we been funded at 2003 levels for the performance that we actually achieved in 2008. This level of research block grant funding is not sustainable and the model providing support for research to the University sector via the block grant scheme must be overhauled.

The RTS and the IGS should be overhauled and a new model for block research grant funding needs to be developed. This should be fully indexed and reflect/reward increased research performance and research output of the University sector.

⁵ HEEF 2008 Draft Guidelines. See <http://www.heef.dest.gov.au/> for the for further information

⁶ The Australian Government's 2007-08 Science and Innovation Budget Tables – see <http://www.dest.gov.au/NR/rdonlyres/DC308DF5-853A-44F0-90F0-B4DE4E5B6593/16446/200607ScienceandInnovationBudgetTables.pdf> for further information

Research Project Grant Funding

Funding the full cost of research is extremely important. The UK Economic and Social Research Council, for example, will fund 80% of the full economic costs, including the time costs of principal and co-investigators for their time (to a maximum of 1650 hours *per annum*) as well as other direct and indirect costs. This essentially allows UK institutions to provide teaching and administrative relief to strong researchers who are successful in gaining research funding. This is of particular importance to researchers in areas such as the humanities, social sciences and law, where the team-based approach to research that informs much of the current funding models is not as prevalent as in other disciplines; current ARC grants insufficiently fund the time that principal researchers need to conduct the research directly.

While, more recently, some of the NHMRC Panels have been awarding 100% of the budget requested for Project Grant funding, this is certainly not the case with the ARC. On average, only 57% of the requested budget is funded, with a success rate of about 1-in-5 applications.⁷

Granting agencies such as the ARC & NHMRC should be resourced appropriately so that they can fully fund the costs of doing excellent research without compromising success rates.

5. RESEARCH COMMERCIALISATION & TECHNOLOGY TRANSFER

Any White Paper recommendations need to encompass proposals for Government support and fostering of high-tech applied research with potential commercial outcomes. Areas of national benefit that could be the focus of such support include water resources, renewable energy, and mining and petroleum resources.

Industry Engagement

R&D Tax Concessions. The R&D Tax concession system is overly complex, and is limited in its ability to encourage industry engagement with the University research sector in contract and collaborative research projects.

The short coming of the existing system is that university spin-off companies are not eligible for the benefits until the equity (shareholding) of the parent institution falls below 25%. This is the same problem we had with many university spin-off companies qualifying for Commercial Ready Grants which recently changed with the introduction of Commercial Ready Plus for which controlled entities of Universities now qualify. A lowering of the eligibility hurdle for R&D Tax Concessions and Offsets would allow Universities to attract more investment in these companies at an early stage and make pre-seed and seed funding more effective.

University spin-off companies should qualify for the full range of R&D Tax Concessions and Offsets irrespective of the level of University equity in the company.

It may be better to abolish the 125% R&D Tax Concession and replace it with a more significant (say 200%) concession for R&D conducted at Universities. This would provide a real incentive for industry to collaborate with Universities and ensure that “real cash” is spend on R&D.

The R&D Tax Concession should be increased (to say 200%) with the requirements that R&D be conducted at Australian Universities.

COMET program. The COMET program works well and fills a valuable niche in the technology transfer chain. We fully support continuation of this program.

⁷ See http://www.arc.gov.au/ncgp/dp/DP08_SelRpt.htm for further information

AusIndustry Grants – Commercial Ready etc. Commercial Ready Plus provides support (matching funding required) of up to \$250k to be made by controlled entities and University spin-off companies. The Commercial Ready Plus Scheme still requires matching funding (dollar-for-dollar) and typically the applicant is still required to be a company. Ideally, we really need a similar program that could support very early stage commercialisation “projects” that would subsequently develop into either a company or licensing opportunity.

The Commercial Ready Plus Scheme should be reviewed to reduce the matching funding requirement and to allow for projects to be funded directly through commercialisation offices within Universities.

Commercialisation Training Scheme

The CTS block grant provides commercialisation training to HDR students. This Scheme is poorly targeted for a relatively small pool of funds, distributed to 36 of the 38 Universities with very high administrative, compliance and human resource issues that Universities have had to absorb to deliver the program. While UNSW has a critical mass of HDR students and has successfully implemented a new program to train 37 research students in commercialisation as part of their research training, most Universities have struggled to fill places. Providing funding to Universities to train < 30-40 students in a stand-alone Program is an inefficient use of resources. UNSW considers that the CTS Pilot Program is under-resourced and poorly targeted to deliver its goals by expecting 36 Universities to deliver CTS training.

The CTS should be abolished and the funds be allocated to Universities who have demonstrated industry and commercial linkages (including APAs and Linkage grants) to incorporate into the training of research students working with industry.

Support for Very Early Stage Commercialisation

There is a real need for support for the “proof-of-concept” stage of the commercialisation chain to bridge the gap between good ideas, lodging provisional patents and the development of a more secure patent position, market assessment and a program which is a reasonable prospect for industry investment and commercialisation.

A scheme is needed to bridge the gap for early stage proof-of-concept. The short-term nature of the expected outcomes can be a problem for many of our government funded schemes. One interesting model for this is the Taiwan scheme which funds this kind of “pre pre-seed” activity and enhances prospects for bringing industry on board early⁸. As well as offering the ability to move from the lab to prototypes directly, they are also interesting in that they dedicate a percentage of their funding to long-term prospects (20 years).

A new scheme is needed to bridge the gap for early stage proof-of-concept research and its translation into a commercial product.

6. INDUSTRY LINKAGES – CRCS AND THE ARC LINKAGE PROJECT SCHEME

The University of New South Wales prides itself on the strong links it has with industry, and consistently ranks amongst the best in the country in terms of industry funding for research. In 2006, UNSW secured about \$56 million in industry and other funding for research.⁹ There are three main external research grant income streams to UNSW from industry related programs – the CRC Program, the ARC Linkage Project Grant Scheme, and direct industry partnerships.

Industry funding for research is important to UNSW in terms of contributing a high proportion of external income and underpinning a significant level of research output which are directly relevant to Australia’s innovation system. UNSW places a high importance on the continued growth of industry linkages for discovery and innovation development.

⁸ See <http://www.itri.org.tw/eng/index.jsp> or <http://www.itri.org.tw/eng/research/nano/index.jsp> for further information.

⁹ UNSW Higher Education Data Collection Submission – Category 3 Research Income.

UNSW is currently involved with about 13 CRC's (as well as some which are now formally finished and powering down and some which we have now formally withdrawn from). We are involved in a number of new CRC bids in the last round.

Current CRCs include:

- CRC for Smart Internet Technology (Engineering, Australian School of Business)
- CRC for Advanced Composite Structures (Engineering, Science)
- Poultry CRC (Engineering, Science)
- CRC for Sustainable Development (Engineering, Science)
- CRC for Polymers (Engineering)
- CRC for Greenhouse Gas Technologies (Engineering)
- CRC for Australian Cotton (Engineering, Science)
- CRC for Environmental Biotechnology (Science)
- CRC for Spatial Information (Engineering)
- Bushfire CRC (Science, UNSW@ADFA)
- CRC for Water Quality and Treatment (Engineering, Science)
- CRC for Capital Markets (Engineering, Australian School of Business)
- CRC for Sustainable Tourism (Australian School of Business , Science)

There are some real positives of the CRC Program and these should be protected in any review of the CRC Scheme. These include:

- **Long-term, big research programs.** The CRC Program provides a long-term very significant commitment to research programs – 7 years with the possibility of further support for an additional 7 (or 14) years. The CRC Program generally brings in support much larger than other existing sources of funding eg. ARC, NHMRC; there are very few other programs where long-term, large-scale research investment can be obtained. ***The support available in the CRC Program is sufficient that large research teams can be assembled and there is the prospect of tackling “big” research questions.***
- **Research Critical Mass.** Because the CRC Program supports significant programs, CRCs boost the research critical mass of the Department/School/Faculty – including post-doctoral research fellows, research assistants, postgraduate students, equipment and support for infrastructure. CRCs can boost research numbers by 10-20% in a School and this significantly enhances the research “critical mass” and research activity of any School.
- **Higher Degree Research Students.** The CRC Program provides:
 - scholarship support (often a source of support for students who are not eligible for other support) – also typically provide “enhanced” stipends.
 - an opportunity to work on a well-focussed research program usually as part of a high-flying team
 - an opportunity to gain experience working with industry – deadlines, milestones, a working knowledge of issues associated with IP protection and patenting.
- **Long-term commercial returns.** CRCs can provide long-term commercial returns to the University and its researchers. Some successful CRCs have now “cashed-out” to provide commercial returns (albeit modest) at the end of the CRC.

However there are some more serious notes for caution in the current CRC Program including:

- **Return on Investment.** While there have been some instances where the Return on Investment has been high and where the impact of end-users is easily identifiable,¹⁰ the CRC Program, as a whole, is not working. *On balance there is a negative financial return for UNSW's involvement in CRCs, and there have not been sufficiently high returns on the cash and in-kind investment to justify continued support of the current Scheme.* UNSW simply has not realised the long-term benefits of working with CRCs. In hindsight, the research effort at UNSW would have benefited much more significantly if we had invested our cash and other resources “in-house” in programs other than the CRC Program.
- **Industry Engagement.** Overall, the industry sector hasn't engaged well with the CRC Program. The University sector has actually provided a very significant fraction of the “cash and in-kind” funding for the program. The University sector should be engaged with the CRC program as a “research provider” not as a “research funder”. There needs to be much stronger engagement with the end-user/industry partners to provide direct support in-cash and in-kind for the CRC Program.
- **Risk Management as part of an incorporated venture.** Almost all CRCs are required now to be incorporated with the principal participants as formal partners. The overheads associated with formally adding another entity to which we are legally bound and responsible are enormous. Currently, our preferred mode of engagement with CRC's is as a contract research provider rather than as a full partner. Engaging with CRCs as a contract research provider avoids the legal and administrative overheads, the risk management, and mitigation associated with formal partnership in an incorporated entity.
- **Management and Administration.** CRCs require a very significant management and administrative commitment. Establishment of each CRC requires a time commitment from senior administrative, technical and legal staff of every participant. Each CRC then establishes a formal Board: these again require the commitment of senior staff from the participating institutions and there are also significant legal implications. There are committees and subcommittees of the Board, periodic reviews and onerous reporting requirements. CRCs are amongst the most administratively demanding of all the research enterprises that Universities engage with.
- **Wind-up of CRCs.** It could be argued that the CRC Program already supports Programs of longer duration, (14 years or more), subject to satisfactory performance, business plan and outcome review. The difficulty arises in the lead up to the end of the Commonwealth funding commitment (7 years) when each CRC effectively approaches an abrupt end-date. Critical staff with valuable corporate knowledge are lost. The Program would be much better if there was a formal renewal or extension process (at say 5 years) which would give rolling support for those CRCs which are meeting all of their targets.
- **Public Good CRCs.** There has been a shift away from CRCs focussed on public good issues. There needs to be a move back to supporting public good CRCs. Many of the big issues facing Australian society today are public good issues - eg., climate change, managing water, and environmental sustainability. The CRC Model has proven itself to be a good model to harness the relevant expertise in Australia to bring to bear on these big issues. Similarly, the CRC Program should not be confined to Science, Engineering and Technology-based CRCs, and CRCs addressing social issues – eg., youth suicide, drug addiction, regional development should be encouraged. This is consistent with the Productivity Commission recommendations that:

“The original objectives of the program should be reinstated — namely, the translation of research outputs into economic, social and environmental benefits, rather than focusing public support on the commercialisation of industrial research alone.”¹¹

¹⁰ For example – CRC for Eye Research and CRC for Cardiac Technology

¹¹ Public Support for Science and Innovation - Productivity Commission Research Report. See http://www.pc.gov.au/_data/assets/pdf_file/0014/37121/scienceoverview.pdf

- **Managing Intellectual Property.** IP needs to be carefully managed in the CRC Program. In most CRCs, staff sign their IP to the CRC and staff need to be fully aware of the consequences. For IP associated with most CRCs, agreements override the University's IP Policy and staff equity in any invention may be diluted or lost completely.
- **Training of Higher Degree Research Students.** An ARC Linkage project conducted by the University of Queensland reported on the levels of satisfaction, and the training received by HDR students who undertook PhDs enrolled in CRCs. These results did not provide any evidence of these students obtaining advanced skill sets related to IP, commercialisation etc compared to students undertaking their research in universities and satisfaction levels and graduate employment statistics were comparable with or less than the control group. These results raise serious concerns re the CRCs as the best environment for training of HDR students.¹²

ARC Linkage Project Grant Scheme

The ARC's Linkage Project Grant Scheme is working well, however it appears unable to support the number of high quality applications which it considers, with industry partners at the ready.

The ARC Linkage Project Grant scheme is typically aimed at research contributions to solving problems of importance to industry. Direct commercialisation outcomes are not required as a measurable output, unlike the CRC Program where commercialisation is a key deliverable. ARC Linkage Project Grants and the CRC Program have distinct, defined objectives and outcomes that fulfil similar requirements.

There could be some real benefits to consolidating the CRC Program with the ARC Linkage Grants Program. This is consistent with the Productivity Commission report which recommended:

*A complement to the CRC program with broader collaboration goals should be introduced that supports smaller, shorter and more flexible arrangements between groups of firms either independently or in conjunction with universities and public sector research agencies. As a pilot for further evaluation, this should be achieved through an enhancement of the ARC Linkage program.*¹³

This would mean that the Linkage program could accommodate major (7-year) research programs but would also open up the Linkage program to other Publicly Funded Research Agencies in much the same way that they currently do with the CRC Program.

This would then bring the best of the CRC Program into a scheme which is flexible, managed and working well while avoiding the difficulties with the current CRC Program.

The CRC program has evolved to a stage where it is not attractive for Universities to engage as partners. The Government (and universities) could make significant administrative time and cost savings, with real benefits to the university sector, and innovation outcomes, by rolling the CRC Program into an expanded ARC Linkage Project Grant Scheme or by another means of supporting industry to engage with the research capacity of the University sector.

Consolidation of the CRC Program with the ARC Linkage Program would provide the opportunity to accommodate longer (7-year) projects and to allow the inclusion of publicly funded research agencies as "industry partners" into the Linkage Project Grant Scheme.

¹² Christa Critchley report on CRC Graduates Study at the Australian DDOGS meeting held in Adelaide 18-19 April 2006. See Australian DDOGS web site <http://www.ddogs.edu.au/> for further information.

¹³ Public Support for Science and Innovation - Productivity Research Report. See http://www.pc.gov.au/_data/assets/pdf_file/0016/37123/science.pdf

7. CRITICAL MASS AND RESEARCH INFRASTRUCTURE

A Long-term Strategic Plan for Research Infrastructure

Cutting-edge research relies on complex infrastructure. Such programs are not short-term – they take many years to establish and the benefits will flow over the space of decades rather than months. The infrastructure is typically expensive to purchase and install, and requires an on-going and long-term commitment to properly maintain. The management of critical research infrastructure requires long-term strategic planning at all levels of Government, industry, and research organisations.

The necessity for long-term planning permits the government to better position and coordinate activity. It is absolutely clear that major research initiatives must align strongly with national priorities. Such programs as Higher Education Endowment Fund (HEEF), ARC and National Centres of Excellence Programs (including NICTA), all enhance research capacity, employment, and follow-on industry development in Australia. All of these schemes require the government to have an effective mechanism to engage proactively with institutions. The decision making needs to be well thought out and clearly articulated through a strategic plan for research and innovation in Australia.

A long-term strategic plan for critical research infrastructure needs to be developed, that centres around the critical mass of research excellence.

Research Centres of Excellence

Research Centres are an effective way of developing a strong critical mass of research excellence in a coordinated cross-disciplinary approach. The ARC Centres of Excellence program is the most successful existing "Hub and spoke" model consistent with good governance and building areas of critical mass. The ARC Centres of Excellence Program needs to be expanded and regularised in its funding cycle to address key research areas of national significance.

UNSW is currently involved in 8 ARC Centres of Excellence:

- Centre for Quantum Computer Technology
- Centre of Excellence for Advanced Silicon Photovoltaics and Photonics
- Centre of Excellence for Autonomous Systems
- Centre of Excellence for Design in Light Metals
- Centre of Excellence for Functional Nanomaterials
- Centre for Complex Systems
- Centre for Kangaroo Genomics
- Centre of Excellence for Mathematics and Statistics of Complex Systems

Further the recently advertised \$30 million Centre for Ground-water Research and Training as part of the National Ground-water Action Plan is an excellent example of cross departmental cooperation (it is jointly funded by the National Water Commission and the Australian Research Council) in addressing a significant issue. UNSW is currently involved in 8 National Centres including:

- National Centre in HIV Epidemiology and Clinical Research
- National Centre in HIV Social Research
- National Drug and Alcohol Research Centre
- National Cannabis Prevention and Information Centre
- Dementia Collaborative Research Centre

- National ICT Australia
- International Centre of Excellence in Mathematics Education
- National Centre for Language Training

National Collaborative Research Infrastructure Strategy

While the NCRIS Roadmap process itself seemed to work at least as a method of winnowing the major infrastructure requirements for the country, the overall management of the Program has been a disaster from an institutional management perspective.

UNSW is involved directly as a partner in 6 of the 1st round NCRIS capabilities and we will be the host for major new infrastructure in at least 4 of the capabilities and provide supporting infrastructure for some of the others.

Governance. The governance arrangements around NCRIS projects have been overly complicated. Governance arrangements must be straight-forward, concise and well focused on the purpose of managing the infrastructure.

Matching Support. Institutions were initially advised that matching support would not be required. As NCRIS developed however, facilitators made it clear that if UNSW (or any institution) wished to engage in the process, they would be required to provide significant institutional cash (and in-kind) support. This additional unbudgeted support is a significant financial burden.

State Government Involvement. State Governments became a critical element in the NCRIS process. All State Governments were/are trying to coordinate and optimise their involvement in NCRIS Capabilities. Moreover certain States are much more proactive in supporting innovation than others. State Government involvement unduly influenced the recommendations of the Facilitators and is an additional layer of complexity in pulling together NCRIS bids based on political rather than scientific merits.

Facilitators. Several of the Facilitators have (or had) a potential or real conflict of interest in that they (or their associated organisations from which they were selected) potentially derived benefit from the NCRIS process. This meant that the NCRIS processes had some possible bias based on the selection of Facilitators.

University Engagement. Engagement with key University decision makers was poor. The NCRIS process engaged primarily with individuals who were potential users of instrumentation. In addition, the process was selective and relied on informal networks so it missed many groups during the critical stages where the NCRIS framework was being developed. NCRIS failed to engage with the Universities at the highest levels (eg. with the Deputy Vice-Chancellors (Research)) where there is generally a reasonable knowledge of infrastructure needs and key contacts. There was no easy way of knowing what NCRIS proposals were being developed by staff at UNSW until the very last stage when there was a request for institutional support.

Selective Coverage. Some areas which rely on major infrastructure and which fit squarely within the NCRIS program, did not get coverage by the facilitators or by the focus of the Facilitators that were chosen. Areas such as NMR spectroscopy (in the physical sciences) which clearly involves major infrastructure but spans multiple capabilities (at least in the way that they were defined) fell between the cracks. Likewise major data bases in the Social Sciences and Arts clearly represent systemic infrastructure which failed achieve recognition in the first round of NCRIS.

Large Regional Facilities. There are some facilities such as the UNSW Analytical Centre¹⁴ which serve as a regional focus for major infrastructure and bring together a range of major facilities spanning many of the capabilities. It would be logical for centres like these to be recognised as regional infrastructure centres. Some of the components of these Centres already get NCRIS support but the NCRIS program overall could benefit from wider national access to these facilities.

¹⁴ See <http://www.dvcresearch.unsw.edu.au/analytical.html> for further information

Mismatch with the LIEF Program. The ARC LIEF Program currently funds critical research infrastructure up to a maximum of \$1M-\$2M, whereas NCRIS funds critical research infrastructure above \$5M and generally as part of larger programs up to \$50M. Clearly there is a gap for supporting intermediate facilities in the \$1M to \$5M range. A useful possibility would be to telescope the LIEF and NCRIS programs so that NCRIS becomes an extension of the LIEF Scheme such that a single program could cover the continuum of facilities from smaller to larger. This would address the NCRIS issue related to transparency and accountability.

A long-term strategic plan for critical research infrastructure needs to be developed. In developing this plan, NCRIS (and its funding) should be rolled into the ARC LIEF Grants Scheme to ensure mid-range research infrastructure is funded at all levels and to ensure transparency and accountability.

8. CAREER PATHS FOR RESEARCHERS

Directly or indirectly increasing the funding available for research students is particularly important as research careers become increasingly unattractive to local graduates, and Universities' ageing staffing profiles mean that we are struggling to replace retiring researchers in key areas, particularly in the enabling sciences. This will further impact on skills shortages, with a cumulative shortfall of 19,000 scientists and a significant number of engineers being projected for 2013.¹⁵

Research Scholarships

UNSW welcomes the election promise of additional APA Scholarships for local students, and the recent release on restriction of citizenship for the award of APAI Scholarships. Further changes are required, however, if Universities are to attract both high quality local and international students, and to be competitive on the international stage.

Australian Postgraduate Awards

Recognition of Australia as a country committed to investment in the next generation of researchers requires a PhD scheme to match offerings such as the new funding offered by Canada – approximately 500 PhD scholarships of \$50,000 each year for up to three years – open to both Canadian and international students.¹⁶

The value of APA scholarships must significantly increase to at least \$25K and be indexed to attract sufficient new local students to PhD degrees and thus ensure that the next generation of researchers, academics and professionals are trained to replace the retiring work force that is evident from the current age profile of the Australian workforce.

Universities in major capital cities such as Sydney require the flexibility to offer scholarships at the appropriate level to offset the high cost of living; a fixed \$ value for the stipend, regardless of the location of the student is inequitable.

HDR Scholarships must be higher in value if we are to compete on the international stage for the best candidates and need to take into account the higher costs of living in Sydney.

Universities should have flexibility in the management of Higher Degree Research Scholarships (APA and EIPRS) as a single block grant to award scholarships at the appropriate value to the best students (both local and international) in order to attract the next generation of researchers.

International Postgraduate Research Scholarship Schemes

UNSW has one of the highest proportions of international HDRs (33%), and attracts the second highest number of international students in the country, and is well-positioned to attract and support international HDR students compared to other Universities.

An urgent review and rationalisation all international postgraduate scholarship schemes (Endeavour, AusAID, EIPRS) is required.

¹⁵ Address to National Press Club by Minister Kim Carr, 19 March 2008

¹⁶ See <http://oncampus.macleans.ca/education/2008/02/26/budget-2008-new-grad-scholarships-aim-to-attract-international-talent/> for further information.

The suite of international postgraduate scholarships offered under the Endeavour Program is complex, poorly targeted, and has a high level of administration at the Government and University level including an external third-party provider. ***The Endeavour Program needs an urgent review, to rationalise and simplify the scheme to provide a core set of high quality, internationally competitive scholarships that fully-fund living and training costs to attract and support international students to Australia.***

Similar issues exist with the AusAID suite of scholarships with regulations that include, for example, a requirement for students to leave Australia within 2 weeks of submission of their thesis, which are highly detrimental to attracting and retaining international higher degree research students to Australia.

The funding model for the award of EIPRS scholarships (awarded as a grant since 2008) has greatly penalised Universities that are dominated by high cost disciplines in Science, Medicine and Engineering. As a result, and due to the inflexibility of the funding scheme, UNSW and other Universities that consistently attract high quality international PhD applicants, are only able to offer EIPRS Scholarships to about 5% of applicants with the EIPRS grant covering only 65% of tuition fee costs, while other Universities are unable to fill their places and report surplus funds.¹⁷

An urgent review and rationalisation all international postgraduate scholarship schemes (Endeavour, AusAID, EIPRS) is required to deliver a core set of high quality, internationally competitive scholarships that fully-fund living and training costs.

Research Fellowships

Career paths for Australian researchers are vitally important to the national innovation system. There are at least 7 different Fellowship Schemes within the ARC and 26 Fellowship Schemes within the NHMRC. These need to be reviewed and simplified to ensure that there are good career paths for researchers at ALL stages of their careers.

The number and types of research fellowship schemes need to be reviewed and simplified to ensure that there are good career paths for researchers at ALL stages of their careers.

The Federation Fellowship Scheme has been an excellent Scheme to attract and retain research leaders to Australian Universities. Excellent research leadership is arguably the most important critical element in the development of a strong research culture and UNSW fully supports continuation of an elite scheme such as the Federation Fellowship and Australia Fellowship Schemes.

Elite schemes such as the Federation Fellowship and Australia Fellowship Schemes are critical to underpin research leadership in Australia and should be continued.

While the introduction of the Future Fellowships may go some way to addressing the gap between research fellow and Australian Professorial Fellowship, there needs to be a significant increase in the number of fellowship at all levels (from Australian Postdoctoral to Australian Professorial-type research fellowships) to create a career path for PhD graduates/academic researchers. Currently success rates in these fellowship schemes are far too low and unsuccessful applicants are quickly lost from the innovation system or worse still, consider that the effort of making an application is not worth it and simply do not apply. In addition, the long lead time between application and appointment of postdoctoral researchers needs to be examined as we are losing these excellent researchers to overseas institutions between application and the announcement of successful Fellows.

There needs to be a significant increase in the number of Australian Postdoctoral to Australian Professorial-type research fellowships to create a career path for PhD graduates/academic researchers.

¹⁷ Letters sent to Vice-Chancellors dated 10 September 2007 and 18 December 2007 from Fiona Buffinton, Group Manager, International Education, DEEWR, regarding EIPRS

Another important area that needs attention is the transition from PhD graduate to career positions. Those finishing PhDs wanting to go into industry/business/government rather than post doc/researcher positions may need to be able to access more formal programs (possible built into PhD programs). This is a very difficult jump for many PhD graduates and although there are some small pilot schemes to make such people “industry-ready”, these should be looked at more broadly.

There needs to be a focus on the transition from PhD or MSc into industry/business/government in the form of a program to transition graduates from training into the innovation workforce.

Technical and Professional Staff

Career paths for research professional and technical and research support staff also need careful consideration. These staff have been typically employed as contract staff on extended appointments, mainly funded from research grants. Most of them are graduates who have paid significant HECS bills to obtain their qualifications and the current system does not acknowledge their considerable input into the innovation system. UNSW recommends that career paths for research support staff be reviewed and that block research grant funding be increased to enable permanent support of research technical positions, not unlike the CSIRO model. In this way Universities can capture the corporate knowledge and capitalise on the investment made in the training and development of their expertise.

Career paths for research technical and professional support staff should be reviewed and block grant schemes for research needs to be at an appropriate level and include provisions which facilitate ongoing career paths.

9. PUBLICLY FUNDED RESEARCH AGENCIES

There are already very strong and valuable collaborative links between UNSW and parts of CSIRO and the other Publicly Funded Research Agencies (PFRAs). We are partners with CSIRO in many successful CRCs. We have very strong links with ANSTO – our researchers - from a broad range of disciplines - constitute a large group of users of high-energy radiation, both within Australia and overseas through access programs coordinated through ANSTO. We share joint positions with ANSTO and there are strong links with our Faculty of Science and UNSW@ADFA.

The University sector has a distinct and important role to play in postgraduate research training. Particularly in the research-intensive Universities, where there is a real critical mass of research students and research staff, there is an excellent research environment for the development of research skills.

The strongest interactions with CSIRO are at the researcher level – research groups from within the University interacting closely with key researchers and research groups within the PFRAs to build a critical mass of research effort, to draw on complementary expertise and to share research essential infrastructure.

Intellectual Property (IP) management and arrangements for sharing IP have not always been easy with various PFRAs. UNSW, like most Universities, has a flexible suite of methods for dealing with IP with the underlying principles being:

- (i) that the IP must be secured; and
- (ii) that there should be a fair and equitable arrangement for sharing in any benefits for the University and for staff of the University.

CSIRO and some of the other PFRAs have, in general, been overly protective and possessive with IP and difficult partners with whom to share IP. The managerial approach to IP as a primary driver of PFRAs can often place unrealistic expectations on the financial returns from enhancing or merging their IP through collaborations with the University, which is a serious impediment to collaborations at a scientific level.

The most effective collaborations between the PFRAs and the University sector have been where there is a co-location (or very strong interdependence) between the parts of the institutions. In this way a real critical mass of researchers can be developed and these interact strongly with each other and can easily share resources, infrastructure and expertise.

UNSW recommends closer collaboration between publicly funded research organisations. One of the significant barriers to collaboration with PFRAs centres around intellectual property ownership and the return on technology transfer. Mechanisms need to be put in place to break down barriers to collaboration.

10. MEASURING RESEARCH QUALITY & INNOVATION

Excellence of Research in Australia (ERA)

UNSW firmly believes that Australia must have a robust system for monitoring, measuring and benchmarking research activity and research quality.

It must be sufficiently robust and comprehensive to provide international credibility which properly places research in Australia in the international context.

Any Research Assessment exercise must have peer review as a fundamental platform for the assessment of research quality, and must draw upon a significant proportion of real international assessment/benchmarking as a major component of the assessment.

The implementation of the ERA is rushed. Any new RQF/ERA needs to be thoroughly thought through, be administratively streamlined, and take into account the costs of preparation/submission versus the national benefits of undertaking such an exercise.

Any Research Assessment exercise must be carefully crafted to avoid unintended collateral consequences. There is no question that the impact of any RQF/ERA will be sufficient to drive behaviour (in some cases perverse behaviour) across the sector. The ERA must ensure that the behaviour it drives is positive. In particular we would want to:

- (i) avoid any encouragement of aggressive poaching between institutions – this is basically research churn and has little positive benefit to the sector;
- (ii) avoid anything which discourages active collaboration between research groups across the sector; and
- (iii) avoid any pressures against early career researchers – we cannot afford to discourage the active engagement and recruitment of the next generation of researchers.
- (iv) ensure that any process of evaluation of the quality of research properly reflect the different disciplinary practices in relation to the nature and forum of research output.

Australia must have a robust and reliable system for monitoring and benchmarking research quality. The new ERA must be administratively streamlined, and take into account the costs of preparation/submission versus the national benefits of undertaking such an exercise. The new ERA must be carefully engineered to drive positive behaviour in the sector.

UNSW would welcome the opportunity to contribute further to the Review of the National Innovation System should the Review Panel have any questions.

Yours Sincerely,



Professor Les Field
Deputy Vice-Chancellor (Research)