Innovative Research Universities

IRU Submission - Inquiry into Funding Australia's Research

Australia's university research system is performing strongly by world standards. Australian research has directly improved the quality of life of all Australians and the scholarly endeavours of our academics contributes to our international reputation for high quality teaching and student experience. Our academics are increasingly productive in terms of highly cited disciplinary-based research, while remaining responsive to societal needs in their pursuit of applied, strategic and practically-oriented research. The value of our research is shown by our universities increasing share of research funding from business, Government and not for profit research end users. As we embrace the engagement agenda, universities are also beginning to develop new career paths for academic staff beyond the traditional disciplinary-based teaching and research functions.

The opportunity for this inquiry is to recognise the value the Australian Government gets from its investment in research and identify refinements to the public research funding system that can further improve our research system performance.

The public research funding system must have two primary objectives: 1) target funding towards the highest quality projects and researchers; and 2) be efficient and transparent its allocation of funds. Put simply, the best and most innovative research should be funded, while constraining the administrative costs of applications, selection processes and reporting.

The dual public funding system of open block grants that universities direct to best outcomes and directed competitive grants for projects, has helped target resources to highly productive researchers and incentivised research behaviours. However, its effectiveness in funding breakthrough research and efficiency in allocating resources is facing strains. Success rates for many nationally competitive grants are low, selection processes are slow, administration costs are high and the existing peer-review process disadvantages certain types of research and researchers. These problems are most acute in the early and mid-career stages where researchers are reliant on competitive grants to cover salary costs and unsuccessful grant applications often mark the end of a research idea. There are also considerable opportunity costs.

A nationally competitive, peer-reviewed grants system is nonetheless a crucial underpinning to drive quality and innovation. The Australian Government should be cautious about making changes which risk undermining the benefits of competitive allocations. However, there are potential benefits from refining the dual public funding system to improve the balance between the two elements, putting more emphasis on universities' support for research priority areas and commitment to long-term, curiosity-driven research and talented researchers.

The IRU submission:

1. sets out the core evidence that the research system is performing well. This is an essential precursor to considering how to improve it;
2. outlines how research funding has shifted towards support for specific research purposes, putting great pressure on the base research capability of universities;
3. considers the conceptual bases for allocating research funds; and
4. outlines various alternative models and potential changes for the Committee to explore.

1. Australia's research performance – high productivity, high impact, growing value for end users

Australia is highly productive in scholarly research. With around 0.3% of the world's population and 1.6% of world GDP Australia was responsible for roughly 4% of the total scientific output in the Web of Science (WoS) in 2016. Australia's annual published research has more than doubled over the past decade, with 2016 output 112% greater than 2006 levels. This compares favourably with increases in comparator countries over the same period, such as the UK (49%), USA (30%) and the OECD total (39%), though not compared to China (246%) (see Figure 1).

Australia's growth in research output has coincided with increased citation impact. In 2006 Australian publications were, on average, cited 17% more times than other publications within their field. In 2016 this had increased to 37% above the world average. Australia's citation impact remains well above the OECD total (10% above the world average in 2016), comparable with the UK and USA (see Figure 2).

This growth in publishing productivity and high citation has occurred during the period since the dual funding system was implemented from 2001. Although the introduction of the Excellence in Research for Australia (ERA) assessment commenced in 2010, the incentives towards greater productivity in high quality research were felt much earlier as Australia's research institutions prepared for its implementation.

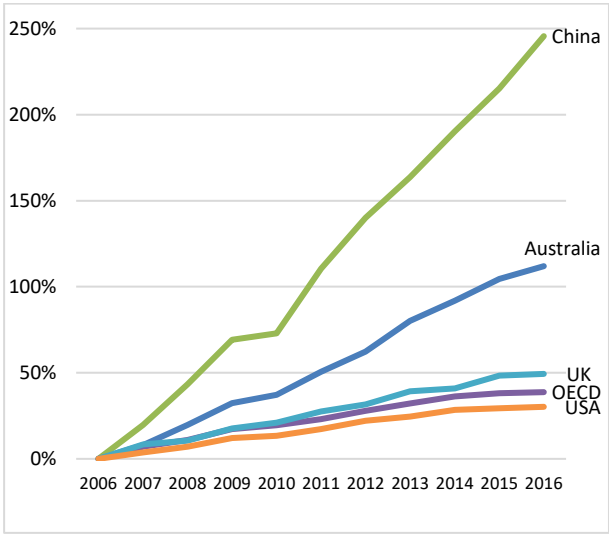

Figure 1. Growth in research output, Web of Science, since 2006

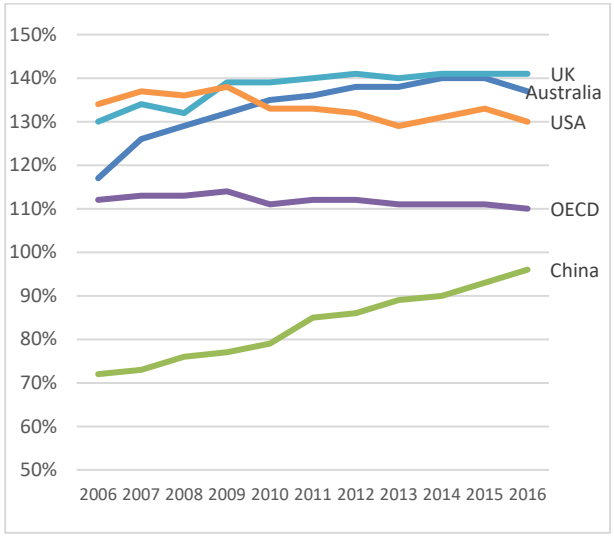

Figure 2. Field normalised citation rate, WoS, 2006-2016

The growth in research output is not simply due to an expansion in the number of Australian researchers or greater co-authorship on publications. Publishing productivity per researcher increased 48% from 0.7 author-fractionalised articles per year in 2006-2009 to 1.1 articles per year in 2013-2016.[1] Consistent with the national results, increased productivity has not led to low-impact

[1] In the 2013–2016 period, Australia's 26 largest universities published 116,619 articles from a research staff profile comprising 93,200 Teaching & Research (T&R) and 62,500 Research-only full-time equivalent (FTE) staff. This equates to 0.7 publications per research staff per year (117,000/156,000) or 1.1 publications per FTE research-only staff (117,000/ ((93,200 * 0.5) + 63,000).
Note: The CWTS Leiden Rankings include Australia's 26 largest universities and report WoS publications fractionalised for the number of authors, avoiding double-counting multi-authored publications (e.g. an article with two authors is worth 0.5 articles for each author). Academic staff data is full-time equivalent (FTE) drawn for the same universities from the Australian Government uCube data. Publications are included irrespective of whether they were published by staff in research roles (e.g. PhD students, Teaching-only staff, honorary staff). WoS has limited coverage of social science publications, such as book chapters and books.

publications. The proportion of highly cited research (top-5% most cited in their field) also increased from 5.3% to 6.3% over the same period. These results, presented in Figure 3, provide further evidence that Australia's research funding system and our universities encourage productivity and highly cited research.

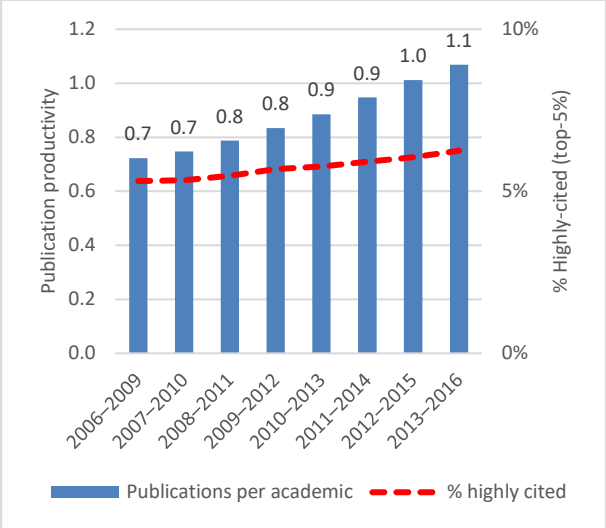

Figure 3. Annual publications per academic and % highly-cited (top-5%), WoS, Australian universities, by period

Australia's growth in research productivity and scholarly impact coincides with a stronger focus on external engagement with industry funders. Research income from industry sources (Category 3) increased 90% from 2006 to 2016, and contract income from government (Category 2) increased 92%. Over the same period, Australian competitive grants (ACG) income, mostly from the ARC and NHMRC (Category 1) increased 62%. The decreasing reliance on ACG income is most evident since 2014, declining from 48% to 41% of total research income (see Figure 4). Australian universities are also collaborating more with industry on research publications. While only around 4% of Australian university publications are co-authored with industry, the total number of industry collaborative publications increased 89% between the 2006-2009 and 2013-2016 periods. This compares favourably with the UK (increase of 51%), USA (29%), and Canada (24%), though again not compared to China (271%) (see Figure 5).

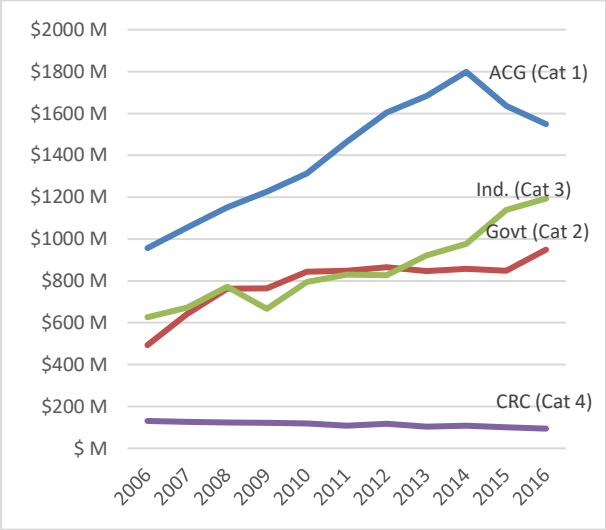

Figure 4. Research income ($M) by category, 2006-2016

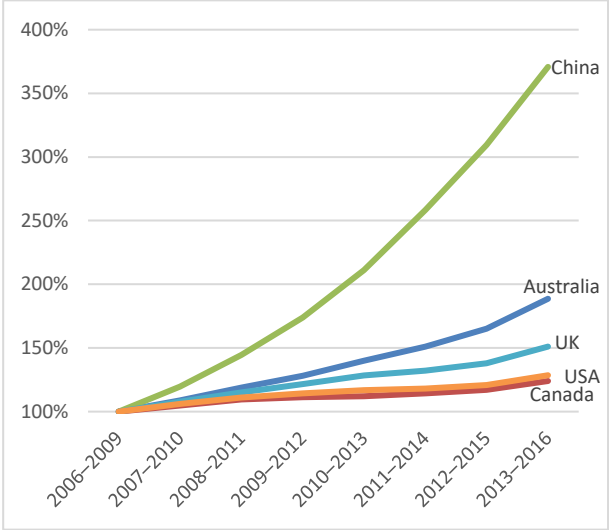

Figure 5. Growth in university-industry co-publications, Web of Science

Overall, the trends in Australia's research performance are overwhelmingly positive and pointing towards greater productivity, impact and support for end user research. This underpins our first recommendation that wholesale changes to the dual funding system are not warranted on productivity grounds. Any changes initiated as a result of the Inquiry ought to be incrementally introduced following consultation with the sector.

Recommendation 1. Australia's research funding system supports research productivity with any proposed changes incremental

2. Australia's research funding – increasingly project focused, putting pressure on development of base capabilities

Universities are required to be engaged in research across multiple fields, with teaching informed by scholarship. Universities finance their research through a combination of direct, open and mixed revenue streams. Direct funding streams are earmarked for specific purposes and generally allocated on a competitive basis. They include grants from the ARC and NHMRC (Category 1) and other research income for specific research tasks, including Cooperative Research Centre (CRC) funding (Categories 2-4). Open sources are funding streams which universities have full autonomy in how resources are expended. Historically these include block grant funding from the Research Training Scheme (RTS), Joint Research Engagement (JRE) and Institutional Grants Scheme (IGS). Mixed sources have elements of both, such as the historical Research Infrastructure Block Grants (RIBG) and Sustainable Research Excellence (SRE).

Over the past decade total research funding and income increased 62% from $3.3 billion in 2006 to $5.3 billion in 2016. However, most of this increase has been in sources where universities have little discretion over allocation. From 2006 to 2016 direct research funding increased by 72% and mixed source funding by 127%. They now comprise 72% and 9% of total research funding, respectively. Open source funding also increased from $859 million to $1.05 billion over this period (22%), mostly due to annual indexation to maintain value against inflation, and hence decreased as a share of total research funding from 26% to 20%. These trends are presented in Figure 6.

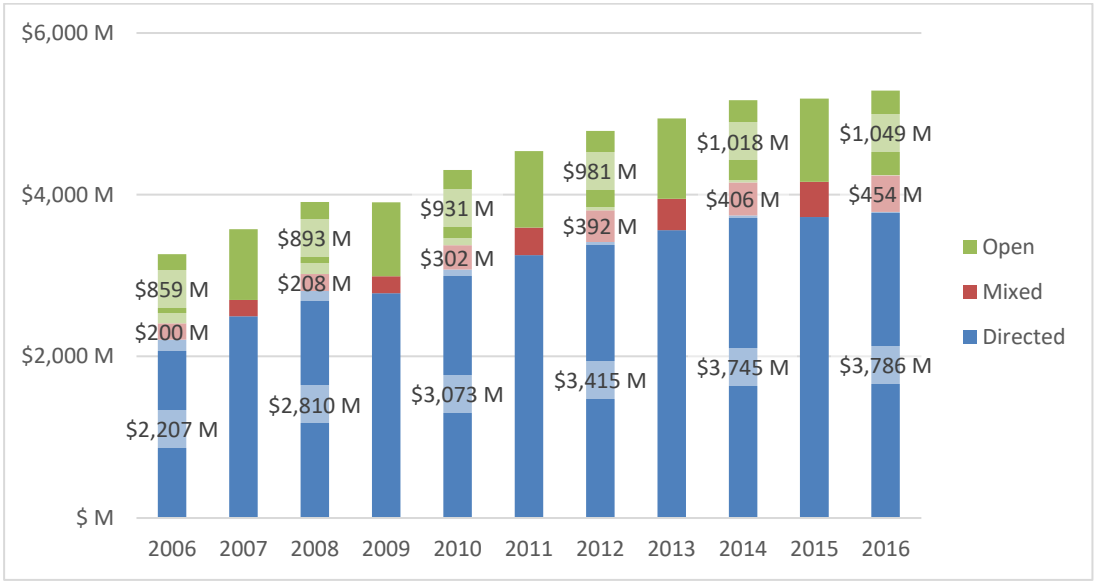

Figure 6. Research funding and income streams - $ Millions

Universities also draw on a portion of Commonwealth Grants Scheme (CGS) funding, student revenue and other "general university funds" to support research. These are the prime basis to support academic staff time for research. There is no Government funding scheme explicitly for this (see Who Funds the Researcher?, IRU November 2015). The surplus from international student revenue is important for university driven investment to build research excellence and distinctiveness. International and postgraduate students enrol at universities in part because those universities are research bodies. Some contribution to that research from international students is reasonable.

The limited growth in discretionary (open) funding potentially constrains universities' ability to implement research strategy. The current system of competitive grants supports current high quality research areas for short periods. An over-reliance on supporting excellence through competitive grants hinders the ability to future-proof for the nation, and develop a critical mass in other areas of research need and opportunity, through long term commitment to research projects and staff.

It limits experimentation and risk-taking in university research projects – essential elements of creativity and innovation. A greater commitment to funding universities would create capacity in regional areas which are isolated from central infrastructure and resources. Regional Australian industries need access to locally-based internationally competitive research capacity which the current system is unable to deliver. The Australian Government should consider increasing Research Block Grants to recognise university driven improvements in research productivity and impact, the reduction in research fellowships from the ARC and their commitment to research relevant to the community.

Recommendation 2. Increase block grant funding to support further growth in research of high quality and of high relevance to research end users

3. Australia's competitive grants system – challenging the conceptual framework

There are numerous good reasons for nationally competitive and peer-reviewed grants schemes. Our emerging and leading researchers should have access to funds to pursue their research. However, peer-review contains some potential drawbacks, including unreliability and biases relating to gender, affiliation, age and ethnicity (Vaesen & Katzav, 2017). Interdisciplinary research, while encouraged at policy level, may be disadvantaged in assessments by disciplinary-based expert panels (Woelert & Millar, 2013) and have systematically lower success in ARC funding (Bromham, Dinnage, & Hua, 2016). The peer-review process must also be balanced against the cost of administration and its appropriateness. By one estimate, applicants spent 34 days per NHMRC proposal or 550 working years of researchers' time across all applications (Herbert, Barnett, Clarke, & Graves, 2013). This excludes the costs of the external peer-reviewers and time spent on project applications started, but not submitted.

The outcomes of the grant peer-review process must be demonstrably superior to the alternatives. Ioannidis (2011) outlines six options for allocating funds:

1. Egalitarian – Fund everybody;
2. Aleatoric – Fund at random;
3. Assessment of career – Fund the strongest career track records;
4. Automated impact indices – Fund the strongest publishing track records;
5. Scientific citizenship – Fund those who commit to open science and high-quality methods;
6. Projects with broad goals – Fund through peer assessment of researchers and high-risk innovative projects.

Each method has its advantages and drawbacks, and the approaches are not mutually exclusive. Conceivably a selection process could contain all elements, or only one. Funds could also be allocated across a mix of methods.

The option of random selection of applications that meet an easy to measure threshold of suitability is regularly raised. It is the benchmark that the intensive scrutiny of applications by ARC and similar bodies has to exceed to justify the assessment costs and time frames. The argument for it is that the differences between many applications are minor with the judgement ultimately about what will come from research. Those judgements are a best assessment, not a guarantee.

Automated impact indices are also low cost, help eliminate favouritism and approach objectivity, but are imperfect proxies for identifying high quality researchers and can be gamed. Most competitive grants include research indices along with an assessment of career, but the assessment process is labour-intensive and prone to peer-review biases. Funding researchers based on scientific citizenship behaviours helps reward researchers who contribute more broadly to the research community, such as following disinterested and high-quality methods on less rewarded topics (e.g. replication studies or studies not finding statistical significance) and open science (e.g. open data, open access publishing, peer-reviews). Generally, data on these behaviours are hard to gather. Funding through a brief peer assessment of a researcher background and focusing on high-risk innovative projects can permit targeted innovation, but at the cost of breadth of research supported.

For distributing scarce research resources between established researchers, the costs of a competitive, peer-reviewed grant process are probably justified. Research track records and career trajectories are valid predictors for future research success, and scientific peers are in the best position to make judgements about the quality, feasibility and innovativeness of research projects. However, for funding postdoctoral research the rationale is weak. The use of career assessment is labour intensive and less appropriate for researchers in their formative years. Expedient and comprehensive selection processes are important for all competitive grants, but particularly so for selecting early career researchers whose careers often depend upon external funding.

In conclusion, the Australian Government and the ARC should seek to simplify their selection approaches and use criteria directly relevant to the career stages and research objectives of the applicants.

4. Potential system improvements

There are various weaknesses with the current arrangements that the Committee should explore to open up discussion about ways to improve the system. Below are suggestions from IRU members, some of which are further outlined in individual member university submissions.

a. Support for early career researchers

In 2017, 84% of Discovery Early Career Researcher Award (DECRA) applications were unsuccessful and the selection process took eight months. Unlike other grant schemes, the DECRA covers salary costs and most junior ranked applicants are insecurely employed. Extended timeframes with mid-November announcements place considerable stress and uncertainty on applicants dependent on funding for their positions in the following calendar year. Unsuccessful DECRA applications are more likely to mark the end of a research idea (and potentially a career) than the start of process of refinement for future funding applications. It is therefore imperative that schemes targeting early career researchers are efficiently implemented.

One option to consider is re-distributing DECRA funding to universities to administer. External peer-review remains the “gold standard”, but the negative effects are greatest in this scheme. Universities

are also well placed to identify high potential postdoctoral researchers aligned with institutional strengths, while maintaining external competition. Universities have well-established and rigorous processes for selecting HDR candidates and scholarship recipients. Postdoctoral researcher recruitment could extend on this to include alignment with future teaching or other engagement areas, facilitating transition into secure employment. Universities also recruit positions in a timely manner. In 2017, the median time for academic recruitment was 67 days, inclusive of the short-listing and interview process. This compares favourably with eight months for DECRA.

b. Two-stage expression of interest process

A two-stage selection process, with an initial expression of interest (EOI) followed by a full application, would reduce the notification times for unsuccessful applicants and the number of full applications reviewed by the ARC's experts. A short-listing process is currently used for Marsden grants in New Zealand, large collaborative grants from the German Research Foundation (DFG) and some Australian university postdoctoral schemes. While a two-stage process risks rejecting applications at the EOI stage which would have been funded following a full application, the benefits of expediency may outweigh the loss of precision for some grant schemes.

c. Provide selection criteria ranks prior to rejoinder process

Providing applicants with detailed information on how their applications rank (on each selection criteria and overall) following the initial assessment by the ARC reviewers would improve transparency and specificity for the relative strengths and weaknesses of applications. For applications ranked in the bottom half of applications at the time of the rejoinders (i.e. unlikely to be funded), it would provide earlier indication that alternative research funding will likely need to be sought.

d. Minimum grant success target of 25%

International success rates vary from the European Research Council (15%), UK Research Council (around 25%) to the German Research Foundation at 35%. ARC success rates of less than 20% for major grant rounds is unacceptably low for Australia when both ERA outcomes and trends in application numbers suggest the presence of high quality research backed by effective internal processes. The low rate is primarily driven by the level of funding allocated to these schemes, rather than research quality and value. A minimum grant success target of 25% across all programs, with acceptance of 50% as an aspirational target in some, would represent an acceptable balance between the benefits of competition and the cost of the peer-review process. This outcome is not successfully met if the funds for a given project are simply reduced to allow more projects to be funded.

e. Support effective grant application scrutiny

The low ARC success rate is primarily due to scarce funding rather than research quality, but universities could be better supported to improve control processes and selectivity for applications. One possibility is for major granting agencies (ARC and NHMRC) to require universities and Medical Research Institutes to provide evidence of effective programs of grant application scrutiny for high volume grant programs. Where this is not demonstrated, application quotas could be set limiting that institution in the following round.

f. Streamline grant applications and data collections processes

The current complexity of Government supported funding streams is onerous. Application requirements are time consuming and could be streamlined as it is in other countries. For example,

in the USA there is one point of entry to all federal funding through the Grants.gov system. In addition this kind of single portal would mean that researchers would only need to enter and maintain their data in one system rather than the multiple currently required (e.g. RGMS, RMS, "GrantConnect" and various Departmental websites).

Combining the HERDC, ERA and ABS HERD collections into annual events is a first step to reduce the effort and cost of compliance reporting in the higher education sector, and in Government departments and agencies. It has the potential to significantly improve the data published by Government and the transparency of performance across the Australian higher education sector, and thus drive ongoing improvement. If these steps are not taken, it is highly likely that the reporting burden on universities will rise, increasing costs across the sector. The effects will be especially marked in smaller institutions that cannot sustain large research office, library and IT budgets.

g. Conduct ERA and EI every six years

The transformational impact of ERA and the internal quality agenda on the Australian university sector has been seen through the increases in research productivity, impact and engagement of Australian universities. However, the rate of improvement since ERA 2015 has slowed, suggesting diminishing returns from an exercise estimated to cost between $60-80 million per round for the Government and universities (ERA alone).

A six-year ERA and Engagement and Impact (EI) cycle, perhaps alternating each of the two assessments so that there is one or other assessment every three years, will free up considerable academic and administrative resources.

h. Maintain investment across disciplines and support for fundamental research

Any changes in administration of funding must be sensitive to equity across disciplines and a continuing focus on fundamental research as key to advancing our knowledge economy. It is difficult to predict where future developments will come from. Continued investment across current and new fields is essential.

i. Maintain commitment to funding schemes attractive to industry partners

The initiatives flowing from the National Innovation and Science Agenda (NISA) that seek to drive university – industry collaboration have been successful for securing investment from industry partners. These kinds of initiatives, which include Innovation Connections, Global Connections and SIEF STEM Fellowships, must be maintained as they are already streamlined and flexible.

j. Maintain a broad definition of 'industry' and 'commercial' partners

To maximise the impact of funding we need broad and inclusive definitions of 'industry' and 'commercial'; many of the direct and indirect benefits delivered by research to society and the economy are difficult to capture and measure. Examples include the impact of research on health and wellbeing, disability, ageing and community resilience.

k. Recognise that grant writing and peer-review are central to research quality

Competitive grant applications allow researchers the opportunity to test innovative research proposals in an open field. Grant writing and the associated peer-review processes, even with 25% success rates, are necessary ingredients of a well-functioning and highly competitive, high quality research system. Unsuccessful grant applications are a part of this process and not all should be considered time wasted. Near miss projects may be revised into future successful ACG grant proposals or re-purposed for other schemes, often with higher success rates.

I. Support a diverse research workforce

Promotion of diversity of research workforce should be considered, especially for indigenous, rural, migrant and culturally and linguistically diverse populations. Funding for training and relevant research programs must be provided to bring the representation towards population relativities. This could be achieved by expanding and enhancing funding already available for indigenous grant schemes to include other diverse populations.

9 July 2018

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