Australian Government

Australian Research Council

RESPONSE TO THE PRODUCTIVITY COMMISSION DRAFT RESEARCH REPORT

PUBLIC SUPPORT FOR SCIENCE AND INNOVATION

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CONTENTS

1. INTRODUCTION

The ARC welcomes the opportunity to respond to the Draft Research Report on Public Support for Science and Innovation.

The response focuses chiefly on two Draft Findings of the Commission:

- Draft Finding 5.1 relating to the availability of papers and data from ARC- and NHMRC-funded research; and

- Draft Finding 9.5, relating to the need for a complement to the CRC program supporting smaller, shorter and more flexible collaborative arrangements between firms and/or universities and public sector research agencies.

The response also makes reference to the level of support for science and innovation, costs funded under research infrastructure programs and the Research Quality Framework. Several minor clarifications and corrections to text and data relating to the ARC in the Draft Research Report will be submitted separately.

2. ACCESS TO PAPERS AND DATA FROM ARC-FUNDED RESEARCH

In its Draft Finding on impediments to innovation (5.1), the Productivity Commission suggested (among other things) that:

> Published papers and data from ARC and NHMRC-funded projects should be freely and publicly available.

The ARC recognises the importance and complexity of access to research outputs. It agrees that wide and timely dissemination of research results is likely to increase the speed and efficiency with which results are accessed by some potential users. This can both increase the final impact of the research and bring it forward in time, raising the total return to the investment.

The ARC has adopted a policy of encouraging researchers to disseminate their findings as broadly as possible to improve access to their findings by other researchers and the wider community. This policy is intended to ensure that Australia can maximise the benefits from ARC-funded research. It has been developed in close consultation with the National Health and Medical Research Council (NHMRC) and the Department of Education, Science and Training (DEST).

This policy was recently put into effect when the Minister for Education, Science and Training approved the inclusion in the *Discovery Projects Funding Rules for funding commencing in 2008* of specific requirements concerning the dissemination of research outputs (ARC 2006a, 1.4.5):

1.4.5. Dissemination of research outputs

1.4.5.1. The Australian Government makes a major investment in research to support its essential role in improving the wellbeing of our society. To maximise the benefits from research, findings need to be disseminated as broadly as possible to allow access by other researchers and the wider community.

1.4.5.2. The ARC acknowledges that researchers take into account a wide range of factors in deciding on the best outlets for publications arising from their research. Such considerations include the status and reputation of a journal or publisher, the peer review process of evaluating their research outputs, access by other stakeholders to their work, the likely impact of their work on users of research and the further dissemination and production of knowledge. Taking heed of these considerations, the ARC wants to ensure the widest possible dissemination of the research supported under its funding, in the most effective manner and at the earliest opportunity.

1.4.5.3. The ARC therefore encourages researchers to consider the benefits of depositing their data and any publications arising from a research project in an appropriate subject and/or institutional repository wherever such a repository is available to the researcher(s). If a researcher is not intending to deposit the data from a project in a repository within a six-month period, he/she should include the reasons in the project's Final Report. Any research outputs that have been or will be deposited in appropriate repositories should be identified in the Final Report.

The ARC expects that similar provisions will be approved for incorporation into the next revisions of the Funding Rules for other ARC schemes.

This policy encourages, rather than mandates, the publication of research papers and data in an appropriate, publicly accessible repository. The ARC believes that there is a need for careful consideration of any policy to mandate such a requirement and/or to provide researchers with additional funding in order to cover the costs of having their work published. There is considerable debate about the likely consequences for funding agencies, research providers, research users and research publishers of imposing open access requirements on recipients of publicly provided research funding. Issues requiring further consideration include the creation of repositories (at agency, institutional or international levels), copyright and licensing agreements, the ability to exploit intellectual property arising from the research, the peer review of publications, the financial models that would best sustain the publication of high-quality research delivering practical benefits to the community, the maintenance of repositories and a host of other practical issues.

Preliminary analysis of policies on the dissemination of research outputs among research funding agencies in other countries suggests variation rather than uniformity in practices. For example, the different Research Councils in the UK impose different requirements on their grant recipients, with some compelling and others simply encouraging researchers to place their publications in a repository.

The balance of costs and benefits

Considerable costs are associated with the publication of a peer-reviewed article in a high-impact journal. The impact of a journal in its discipline is related to the quality of the papers it attracts and the rigour of the review processes it imposes. Peer review is a critical input to research publication, as it facilitates the identification of high-quality research from research with less credibility. This, in turn, increases the likelihood that research with significant potential for public benefit will come to the attention of those most likely to be able to use it. Any costs and time associated with accessing the research will lower, to some extent, the net benefits of the research.

The worldwide push to so-called 'open access' publishing is shifting the incidence – and possibly the magnitude – of pre- and post-publication costs. Under such arrangements, publication costs will increasingly have to be met by submitting authors, rather than subscribing libraries. Researchers are seeking support to fund those costs.

The consequences of shifting the responsibility for publication costs onto researchers and the funding bodies that support them are largely untested. At present, the ARC's Funding Rules do not allow for the funding of publication costs incurred by grant recipients. If such costs were to be met through grant funding, which is approved in advance of the research's being undertaken and papers' being produced, a significant administrative task would fall on funding agencies which would be required to estimate the likely costs of publication at the time of grant approval and, on the expiration of the grant, probably to audit the use of the funds provided for that purpose. Further, if the agencies' budgets were not supplemented to cover those costs in full, then the proportion of grant funding devoted to research activity would diminish. This would occur either because the research activity possible under each grant would fall if an amount had to be left to fund publication costs, or because a smaller number of grants could be awarded if they were to be supplemented for publication costs. Success rates are now as low as 20 per cent in the ARC's largest scheme, *Discovery Projects*, and an average of only 63 per cent of the funding requested in successful proposals was approved in that scheme in 2007.

Consideration should be given to whether a better option may be to supplement the budgets of the researchers' home institutions so that publication and repository costs can be funded at the time of publication. This would enable the quantum of funding to match more closely the actual costs associated with the publication and reduce the costs associated with attempting to estimate them in advance of the research. Centralisation of support for publication costs within research organisations may also result in better understood, more transparent and ultimately more efficient publication processes.

While costs are changing, the nature and magnitude of the ultimate benefits to potential users of more open access are unclear. Users to whom rapid access to research findings is important have always sought to ensure access to the journals they require in a timely way, as the benefits to them are likely to exceed the costs. Such users are unlikely to benefit directly from any move to more open access (although their organisations' libraries may benefit from lower subscription costs).

However, the increment of users for whom publicly accessible repositories will substantially improve access and so generate additional benefit is largely unknown.

The ARC believes that:

- there will be a steady migration towards policies of early 'public access' and that clear signals of encouragement will prompt all stakeholders to think carefully about implementation and funding;

- there should be a focus on encouraging publishers, as well as researchers, to consider greater public accessibility for the work they publish. This will involve, among other things, consideration of copyright issues;

- any move to mandate the publication of research papers in more openly accessible repositories must be accompanied by measures to ensure that peer review and validation processes can be retained and reinforced; and

- if the cost of publication is increasingly to be met by submitting authors rather than subscribing libraries, then consideration should be given to how far the potential saving to libraries can be directed towards meeting upfront publication costs.

3. BUSINESS-ACADEMIC RESEARCH COLLABORATION

In its Draft Finding 9.5, the Productivity Commission suggested that:

> A complement to the CRC program with broader collaboration goals could be developed which supports smaller, shorter and more flexible collaborative arrangements between groups of firms either independently or in conjunction with universities and public sector research agencies.

The ARC agrees that a range of complementary measures promoting collaborative research with and among businesses and other users is required. Partnerships between privately and publicly funded researchers and research users are an important subset of that larger suite of measures.

The Productivity Commission identified both the Cooperative Research Centres (CRCs) and the ARC's *Linkage* schemes as examples of public-private partnerships in research (Productivity Commission 2006, p 9.39). Like CRCs, *Linkage* provides for collaborative research programs and projects to be developed, funded and conducted by specialist academic researchers and user groups (including government, business organisations and community groups). The *Linkage* schemes in total[1] were allocated ARC funding totalling over $261 million in 2005-06. Cash and in kind contributions

[1] The ARC's current *Linkage* schemes include *Linkage Projects; Linkage Infrastructure, Equipment and Facilities; Linkage International; Research Centres; Linkage Learned Academies Special Projects;* and *Special Research Initiatives*. The ARC's contribution to the Australian and New Zealand Council for the Care of Animals in Research and Teaching is also funded under the *Linkage* umbrella.

from participating partner organisations more than doubled this amount. As with CRCs:

- *Linkage* schemes are competitive and proposals are subjected to peer assessment, ensuring that a range of assessment criteria can be applied (including, in the case of *Linkage Projects*, the significance and innovation of the proposed research, commitments from partner organisations, track record of investigators, research approach and training, and national benefit) and that only the highest-ranked proposals are funded;

- *ARC Centres of Excellence* provide for a (generally) small number of partners to direct strategic research decisions and so build research momentum over a period of time, focus on basic research (with a more limited component of applied research) and typically offer very high leverage of public funds, even in areas of fundamental research[2];

- The content of the research is developed in collaboration with end-users and so addresses a perceived need. It is likely to have short- to long-term application within the partners' own organisations or within the business sector more broadly, but can also include discovery-type research;

- Research training is an integral part of the schemes, and may take place within the administering organisation, the partner organisation or both;

- Research risks are shared, so that proposals that would not be possible for either party to undertake independently may become viable under a collaborative arrangement, increasing the likelihood that they will increase the quantum of research being undertaken rather than simply subsidising research that would have occurred in any event; and

- Each party stands to benefit from the research and the collaboration, although those benefits (commercial reward, discovery, academic recognition and validation of research) may well be different for different parties.

The CRC and *Linkage* schemes differ chiefly in the arrangements under which the collaborations develop. While CRCs provide a defined *structure* within which research collaborations can develop around broad themes, *Linkage* schemes provide an umbrella under which flexible, more tightly focused, generally project-based research collaborations of relatively short duration (typically three years) can emerge.

The flexibility of *Linkage* arises from the variety of arrangements that can be negotiated between partner organisations and the researchers and their administering organisations. Funding approved under *Linkage Projects* can range from as little as $20,000 per project per annum to well in excess of $500,000 per project per annum[3],

[2] For example, the ARC Centre of Excellence for Quantum Computing obtained funding in 2006 from sources other than the ARC equivalent to around 1.8 times its ARC allocation in that year. The leverage achieved will vary over the life of an ARC Centre of Excellence and among types of such Centre.

[3] ARC funding averaging $1.7 million per annum over the period 2006 to 2010 ($8.6 million in total) was approved for the Australian Minerals Science Research Institute under *Linkage Projects*. A

and funded projects may extend from one to five years. A wide range of research activity may be proposed and currently two rounds per year are funded, providing a shorter route from proposal to commencement than other major ARC schemes. The ARC does not impose a Funding Agreement on partner organisations, although it requires that an agreement be in place between the administering organisation and the partner organisation(s) for the whole period of the project and that the agreement must comply with the Funding Agreement between the ARC and the administering organisation (ARC 2006b, Clause 10). Within this constraint, the collaborating partners are able to negotiate tailored, mutually acceptable terms for collaboration.

Other elements of the *Linkage* arrangements increase the likelihood of success in its projects and reduce the risks to participants. The process by which proposals are developed jointly by academic researchers and partner organisations means that working relationships must be developed in advance of the research itself. Because proposals typically involve a relatively small number of partner organisations and a focussed research effort, consensus is likely to be achieved and shared expectations developed. Where the resulting relationships are successful, the partnerships are likely to persist beyond the term of the project itself and lead to further collaborations, with or without the support of *Linkage* or other schemes. Where relationships are not successful, the partners are able to terminate their agreement. Access to such an 'escape route' is likely to increase the willingness of partner organisations to enter collaborative agreements in the first place, as it limits the cost and risk to which they are exposed.

Linkage projects are monitored by the ARC through progress and end-of-year reports submitted by the administering organisation. Projects can be amended, delayed, aborted or otherwise varied at the instigation of, or with the agreement of, the ARC and the contracted parties. This flexibility allows for (among other things) adjustment of project timetables and objectives as the project evolves. It increases the likelihood that projects will proceed efficiently, take advantage of emerging opportunities and deliver benefits. It allows dysfunctional collaborations to be terminated and/or new collaborations to be negotiated.

The ARC submits that expansion of *Linkage*, particularly its largest components, *Linkage Projects* and *ARC Centres of Excellence*, to allow the funding of more and larger projects would provide an obvious complement to the CRC program:

- *Linkage* is an established suite of schemes with well-developed processes and procedures and low administrative costs, and would not require the development of a new structure. Its Funding Rules could readily be amended to increase the range of eligible activities;

- *Linkage*'s different components both target and respond to the needs of different end-user communities, with *Linkage Projects* typically (but not exclusively) providing for focused activity from small to medium scale with a limited number of researchers and partner organisations, and *ARC Centres of Excellence* providing for large scale and related multi-project focus within the

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further $14 million (an average of $2.8 million per annum) will be contributed over that period by the partner organisations associated with the project.

framework of a defined research goal. Their management structures reflect these differences;

- *Linkage* conforms with the design principles articulated by the Productivity Commission (Productivity Commission 2006, Box 9.1, p 9.3);

- *Linkage* attracts high-quality proposals. Members of the ARC's College of Experts consistently score very highly many proposals that cannot be accommodated within the current *Linkage* budgets;

- *Linkage* lends itself to global collaboration, and attracts funding and participation from foreign-based partner organisations, enhancing opportunities for access to global markets;

- The *Linkage* schemes are highly regarded in the business community[4], with a number of major industry R&D managers and advisers publicly endorsing its objectives and effectiveness[5]. *Linkage Projects* participants report very high levels of benefit (ARC 2006c, pp 66-67). This view was endorsed recently by the Business Council of Australia when it suggested the use of ARC *Linkage* grants as a possible model for extending the opportunity for researchers in universities and research organisations to have a partner or partners outside their organisation when making an application for research funding (BCA 2006, p 13);

- There is considerable unmet demand for *Linkage* schemes. Pledges of contributions from partner organisations in proposals submitted under *Linkage Projects* have totalled $1 426 million over the last five calendar years, exceeding ARC outlays on the scheme over that period by a factor of 2.67 (ARC 2006d, Table 24, p 81). A proportion of that pledged funding is almost certainly 'lost' to the research sector when project proposals are unsuccessful in obtaining approval for ARC funding. Doubling the funding for *Linkage Projects* would enable much of this funding to be exploited in the interests of the partner organisations and of innovation more generally;

- The Funding Rules for *Linkage* are revised regularly, enabling adjustments to be made to reflect changing conditions and emerging opportunities. They were recently amended to clarify the requirements for management and capability planning;

- As noted above, the principle of public accessibility to research findings is being incorporated into new revisions of *Linkage* Funding Rules, similar to that already approved for incorporation in *Discovery Projects*.

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[4] In 2005, 615 Australian and 166 foreign companies and industry bodies were partner organisations in proposals submitted under *Linkage Projects.* Other partner organisations included government and non-profit organisations.

[5] See Mendham 2006.

The ARC also sees potential for the schemes to be extended to provide for more applied activities, including proof of concept, the development of pilot plants and extension or implementation projects in the public interest.

There is clear evidence that the willingness of business organisations – particularly small and medium-sized firms – to invest time and money in developing collaborative research proposals is directly related to the likely success of those proposals and to the speed with which they can be commenced. Credible proposals can take up to nine months to develop, and so represent a significant investment on the part of all partners. The ARC believes that an increase in administered and departmental funding sufficient to raise success rates to between 50 per cent and 75 per cent and increase from two to three the number of rounds in *Linkage Projects* each year would attract industry partners to the scheme who are currently discouraged from developing proposals by the scheme's relatively low (and declining) success rate and the extended time-to-implementation. Any resulting increase in the willingness to investigate research collaboration in all its forms is likely to increase the number of proposals developed and hence the probability that high-quality, business- and end-user-relevant research that might otherwise never be developed will in fact be undertaken.

4. THE LEVEL OF PUBLIC SUPPORT FOR R&D

The ARC notes the conclusion summarised in Draft Finding 8.1 that:

> There is no evidence that the overall quantum or mix of public support for science and innovation in Australia is currently inappropriate for Australia's needs and aspirations.

The ARC accepts the difficulty of obtaining evidence of the impact of public support for science and innovation of sufficient quality to enable the optimal level and mix of such funding to be identified with any precision. However, at a less aggregated level, we believe that it is possible to draw somewhat stronger conclusions.

A substantial – if fragmented – body of evidence is now being assembled in Australia on the return to public investment in research. Much of this was submitted to the Productivity Commission or cited in submissions. While the scope and method of the different studies vary, the aggregate impression is of a return on investment that is high relative to its opportunity cost.

The ARC itself has no doubt that its own schemes demonstrate the potential for expansion. As noted above in respect of the *Linkage* schemes, members of the ARC College of Experts consistently score very highly a large number of projects that nevertheless cannot be accommodated within existing budgets. This represents a body of high-quality research, with indicated pre-commitment of co-funding from the private sector, that is not coming to fruition. These potential research projects are a lost opportunity to realise defined and relevant outcomes for Australia.

Increased funding for ARC research fellowships under *Backing Australia's Ability* has already helped to reduce the considerable opportunity cost of long periods of research

training, support early career researchers, improve career paths in Australian research and make research salaries and stipends more competitive with rates of remuneration in the wider economy. The opportunity now exists to consolidate that investment by expanding opportunities for mid-career researchers and increasing from three to five years the duration of ARC Australian Postdoctoral Fellowships in order to allow for time to be spent both in Australia and overseas, or both in a university environment and in a *Linkage* partner environment, during the term of the award. As others have pointed out, Australia's engagement with global research communities is ultimately driven and sustained by individual researchers and research groups who find common ground and develop mutually beneficial collaborations. Links formed early in a research career are said to be the most enduring.

5. COSTS FUNDED UNDER RESEARCH INFRASTRUCTURE PROGRAMS

The Draft Research Report makes reference to a proposal by the Australian Academy of Science to 'expense' access to research infrastructure in research grants such as those provided by the ARC and the NHMRC:

> A line item in [ARC and NHMRC] research grants for access to centralised research infrastructure will guarantee that facility users have the means to contribute adequate funds to operate these national research assets… (Productivity Commission 2006, p 5.21).

The Report notes that such an approach does not have to imply an increase in funding for research, but a recalibration of existing funding arrangements (e.g. offsets from existing block funding programs for universities and publicly funded research agencies).

The ARC acknowledges the need to fund access to, as well as provision of, research infrastructure. As noted in the Draft Report, a number of its own schemes incorporate arrangements under which a small proportion of research funding can be directed to purchasing equipment or to maintenance and operating costs. However, the ARC cautions that:

- any increase in such arrangements should not be at the expense of reducing the funding for the research activity itself and additional funding may well be required;

- if additional funding or funds diverted from other funding sources are to be made available, careful consideration would need to be given to the appropriate costing of research access and to the incentives that would then confront the owners and operators of existing research infrastructure; and

- in particular, consideration would need to be given to minimising the potential for duplication of funding.

6. THE RESEARCH QUALITY FRAMEWORK

The ARC notes the decision to proceed with the development and implementation of a Research Quality Framework (RQF). The ARC indicated in 2005 its in-principle support for the establishment of an RQF, believing that it has the potential to:

- provide an information base on the mix and focus of Australia's publicly funded research, which either does not exist at present or exists only in partial forms;
- focus on the outputs of, rather than the input to, Australia's publicly funded research activity;
- provide information on the benefits achieved from Australia's investment in research;
- identify the institutions, research groupings and disciplines in which Australia's research effort excels (including pockets of excellence within otherwise more lowly ranked institutions or disciplines);
- provide benchmarks for international comparisons; and
- inform the allocation of a significant part of government research funding (ARC 2005, pp 3-4).

The incentives delivered by the Framework, and its potential to drive improvements in the quality and impact of Australian research, will depend crucially on the nature of the link between funding and RQF ratings. The latter will in turn be influenced by such details as the configuration of research groupings, the way in which research productivity is measured in institutions which may be increasing or decreasing in relative research strength and the comparability across disciplines of measures of quality and impact. Non-confidential information is held by other organisations involved in the assessment of research quality and impact. Where relevant, and subject to the ability of those organisations to resource its extraction, the RQF panels may choose to refer to that information to inform their own judgements.

The ARC acknowledges the breadth and depth of the expertise contributing to the development of the Framework. The ARC is, nevertheless, concerned that the operation of the RQF, and in particular the demands it will place on assessment capability in 2008, may adversely affect the availability of assessors and hence the quality of the assessments which the ARC will be able to undertake itself in that year. It is clear that the assessment task associated with the RQF, however configured, will be substantial and will, in any event, divert research resources from research to assessment in 2008. It would be unfortunate if an attempt to measure and ultimately improve the quality and impact of Australian research were to have the effect of limiting the ability of funding agencies such as the ARC to guarantee the quality of their own processes in a year in which ARC funding will be at its highest level ever.

7. REFERENCES

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