



Australian Government



Cooperative Research Centres Programme Review

Discussion Paper

Minister's foreword

Australia's prosperity depends on our ability to transform and modernise our economy. This Government is committed to ensuring that we invest taxpayer dollars wisely, for the betterment of the Australian economy and society.

The Cooperative Research Centres (CRC) programme was established nearly 25 years ago. The introduction to the first programme guidelines in 1990 stated that "there is a need to ensure that advances in science and technology are linked as effectively as possible to applications in Industry and other sectors such as health and the environment."¹ The program was intended to "link and build on outstanding research activities in the public and private sectors. Emphasis will be placed on enhanced research cooperation achieved through concentrating research activities in one location, or through effective methods of networking; strengthening research training; and on the economic and social benefits of research."²

A routine review of the CRC programme was already scheduled for this year. While all reviews provide an opportunity to take stock of a programme's achievements and make recommendations to improve it, the recently released Industry Innovation and Competitiveness Agenda with its focus on boosting the commercial returns from research shows this review needs to play an even more fundamental role.

Science and research are essential to laying the foundation of this new industry policy. They will play an increasingly important role in driving business growth and creating the next wave of jobs in Australian industry that are based on sophisticated skills. The problem is that while we perform strongly on research excellence, we are last in the OECD when it comes to the rate of collaboration between business and universities or research institutes. As part of the Industry Innovation and Competitiveness Agenda we will be consulting with stakeholders on a comprehensive plan to lift collaboration rates and boost commercial outcomes from research.

To enable us to move forward with our policy agenda, it is important to test whether the CRC programme is well placed to contribute to these overarching goals. In particular, does the programme represent the best approach to supporting collaboration between business and researchers, and generating economic benefits from excellent Australian research?

I have appointed Mr David Miles AM, former Chair of Innovation Australia, to lead this significant review.

I thank you in advance for your response to this discussion paper, and your participation in the CRC programme review more broadly.

¹ Cooperative Research Centres Program: Guidelines for Applicants (1990).

² Cooperative Research Centres Program: Guidelines for Applicants (1990).

Introduction

More than ever before the Australian economy needs to grow and adapt in an increasingly competitive global marketplace. Solutions to our nation's economic, environmental and social challenges need to be driven by the application of innovative research by those with the capacity to make a practical difference to the way in which we work and live.

As part of the 2014 Federal Budget, the government made the difficult decision to reduce funding for the Cooperative Research Centres (CRC) programme by \$80 million over the forward estimates. This resulted in the 17th selection round not being open to new applications, with decisions on the shape and scope of future rounds dependent upon the conclusions of this review.

This review is being undertaken to examine whether this business-research collaboration programme is the best use of Commonwealth funds to effectively, efficiently and appropriately support businesses and researchers to work together to develop and transition to Australia's industries of the future. It is being conducted taking regard of the government's Industry Innovation and Competitiveness Agenda, which aims to make Australia more internationally competitive, attract investment, and foster stronger and more enduring economic growth.

The review will result in advice being provided to the Minister for Industry on the future direction of the programme. It is anticipated that advice will be provided by early 2015.

The review will provide a range of opportunities for stakeholder input. In addition to this discussion paper, the department is planning a series of consultation forums in selected capital cities, as well as one-on-one meetings with the department and/or the Review Leader where possible.

The review website, <http://business.gov.au/crc-review>, is the most up to date source of information on review matters, including details of consultation forums once confirmed. You are encouraged to check this website regularly for the latest information on the review.

Discussion paper

This discussion paper is one component of the review consultation process. The Review Leader, David Miles AM and secretariat are seeking your views in response to the terms of reference and some of the associated key issues and challenges. The paper also provides some background information.

While any such review may well involve issues that relate to the national research system, like research block grants for universities and research training, the focus of this review is the CRC programme.

Responses to the discussion paper should be submitted online through the [Department of Industry's Citizen Space](#) by **4pm on 11 November 2014**. In the interests of transparency, responses to the discussion paper may be made public in the future. If there are confidential elements to your submission, you may mark these as such.

Early online submissions are encouraged. The Review Leader may, depending on mutual availability, seek follow up meetings with those who have made submissions.

If you have any questions about the discussion paper, please send your queries to crc.review@industry.gov.au.

Key questions

Term of reference A: Is the CRC programme the right vehicle for achieving the Government's priorities for applied science and research? If not, what sort of programme would be more effective?

Improving the translation of research into commercial outcomes is a priority for applied science and research in Australia. This is important as it will help drive innovation in Australia, grow successful Australian businesses, and boost productivity and Australia's exports,³ ensuring the competitiveness of the Australian economy into the future. It is important that our publicly-funded research delivers outputs that have the capacity to help Australian businesses compete domestically and internationally, solve problems for business, help industries adapt to change and improve economic outcomes for the nation.

The CRC programme started almost 25 years ago. Since then, it has undergone a number of changes, including its focus, processes and timing (**Attachment A**). It is timely to revisit the nature and approach of the programme with a view to determining whether it fits current and future circumstances.

In relation to this term of reference, your feedback is particularly sought on:

1. Does the CRC programme effectively encourage and facilitate industry and the research sector to work together to:
 - 1.1. solve problems for business,
 - 1.2. help industries adapt to change, and
 - 1.3. improve economic outcomes for the nation?
2. How should the objective of the programme be articulated so as to best convey the Government's priorities for applied science and research?
3. Are there other domestic or international approaches to driving industry growth and competitiveness through applied science and research that might be more appropriate in today's economy?

The United Kingdom

A Catapult Centre is a physical centre where the best of the UK's businesses, scientists and engineers work side by side on late-stage research and development - transforming 'high potential' ideas into new products and services to generate economic growth.

The Catapult network is being created by the Technology Strategy Board (TSB). Each Catapult focuses on an area which we have already identified as strategically important for the UK, and which has a large global market potential.

The seven current centres focus on:

- High value manufacturing - Driving manufacturing innovation to commercial reality.
- Cell therapy - Growing a UK cell therapy industry that delivers health and wealth.
- Offshore renewable energy - Applying innovative solutions for economic growth in offshore wind, wave and tidal generation.
- Satellite applications - Applying satellite solutions for economic growth.
- Connected digital economy - Accelerating growth through the Digital Economy.
- Future cities - Creating integrated systems delivering products and services that meet the future needs of the world's cities.
- Transport systems - Driving economic growth through the efficient and cost-effective movement of people and goods.

³ Productivity Commission, *Annual Report*, 2007-08.

Catapults add a new dimension to complement existing research and development work, providing business with the next stepping-stone on the journey to commercialisation.

They provide a critical mass of expertise in areas vital to this journey - such as in the core technology domain, or manufacturing processes, regulatory approval or supply chain development. Many offer access to equipment and specialist facilities to test ideas in reality. All use the power of people and organisations working closely together to unlock opportunity and speed innovative products and services towards commercial reality.

<https://www.catapult.org.uk/>

Canada

The Canadian Federal government supports a number of initiatives to promote industry-research collaboration, including industry-driven research carried out in partnership with universities and other publicly-funded research organisations. Each of the three main research funding agencies – the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC) – as well as the National Research Council Canada (NRCC), manage programs to foster collaboration and drive knowledge transfer. These initiatives include:

- theme- and industry sector-specific programs,
- strategic grants with a 10-year horizon,
- business- and research-led Centres of Excellence, and
- industry training programs (which include undergraduate and postgraduate industry training).

The Networks of Centres of Excellence (NCE) initiative, established in 1989, is jointly administered by Canada's the three funding agencies and includes a number of centres explicitly intended to boost the competitiveness of Canadian industries in specific sectors, currently engineering, health, and natural, social and biomedical science. The initiative encompasses both research- and industry-led centres, and includes a network focused on 'bridging the gap between innovation and commercialisation'. Recent outcomes include lighter alloys for motor vehicle manufacture, new grading software for Canadian schools, and exporting systems for managing ocean and other environmental data.

The NRCC website warns that the applications process for NCEs can be protracted, and requires long development. Funding is awarded on a competitive basis. Alongside a traditional academic peer review panel, the selection process also includes a Private Sector Advisory Board made up of Canadian industry leaders. The Board was established in 2007 to provide an additional perspective on proposals; evaluates applications on the basis of their potential for strategic, long-term economic advantage for Canada. The final decision on which centres are to be funded is made based on the advice of the expert (peer review) and industry advisors.

http://www.nce-rce.gc.ca/Programs-Programmes/Index_eng.asp

Germany

The Fraunhofer-Gesellschaft – or more particularly the 'Fraunhofer model' – was established in 1973. The eponymous Institutes are intended to undertake "research of practical utility in close cooperation with its customers from industry and the public sector", particularly "applied research of direct utility to private and public enterprise and of wide benefit to society." The Fraunhofer-Gesellschaft currently comprises 67 institutes and research units. Current priority areas are healthcare, security, communication, mobility, energy and the environment.

The Fraunhofer Institutes are funded by a mix of private and German Federal Government support, the latter provided on a matched funding basis. Some EU funding is also involved. The current annual budget is about €2 billion: 70% from contracts with industry and publicly financed research projects, and 30% in the form of 'base funding' from German federal and Länder (state) governments.

The institutes provide a variety of services to German industry, including advice, concept or product development, and training for specialists and managers. Research projects for and with industry can be small-

scale and short-term or longer term, more strategic and involve multiple national and international partners. The model encompasses the possibility of a small project building scale over time.

There are a number of ways for industry and research partners to get involved with the institutes, including by direct contact or through seminars, trade fairs, other events organised by Fraunhofer. Most projects begin with an initial consultation, and proceed on the basis of a contract and agreement specific to the project.

<http://www.fraunhofer.de/en/about-fraunhofer.html>

Term of reference B: How can the government's investment in the CRC programme better deliver outcomes for industry?

Cooperative research Centres (CRCs) are collaborative ventures that bring together participants including businesses (from multi nationals to SMEs); universities and research institutions; federal, state and local governments; industry associations; community organisations (including not for profits); private enterprise; and international partners. A CRC may have as few as five, or more than 50 participating organisations and have hubs of activity across the country and internationally.

Funding for individual CRCs has ranged up to \$47 million but the average has been around \$3.6 million per year of funding. Participant contributions must at least match the Commonwealth funding and typically participant contributions (cash and in-kind) are two to three times the grant amount. The funding agreement is signed between the Commonwealth and the Recipient which may be one of the CRC participants, a company established for this purpose or any other suitable entity.

CRCs are governed by a board of directors in accordance with the good governance principles identified by the Australian Stock Exchange (ASX). A CRC may be incorporated or be an unincorporated joint venture and its governance and management structure is established by the participants to best suit the needs of the participants and the objectives they are aiming to deliver.

The review seeks to explore whether the programme has been designed and is being delivered in a way that delivers outcomes that are meaningful to industry. Do the parameters, practices and/or processes associated with the programme – either at the departmental level or within CRCs themselves – facilitate or hinder the use and commercialisation of research outputs?

Central to the delivery of outcomes for industry is that industry should be actively involved in identifying the major challenges that research could help address. Is this what happens in reality? If not, what can be done to improve industry-engagement in framing the research questions? Is there another aspect to programme design that should be considered to improve outcomes for industry?

In relation to this term of reference, your feedback is particularly sought on:

1. Do the governance, IP and other commercialisation-related practices of CRCs inhibit application of CRC-driven research? How can this be addressed?
2. To what extent does the programme address the needs of small and medium enterprises?
3. To what extent are the research activities undertaken driven by industry as opposed to research organisations?
4. Do 'priority areas' assist in meeting the needs of industry?

Priorities

The current CRC programme guidelines allow the Minister to call for applications in specific areas (priority areas). Priority areas have been used with a view to encouraging applications aligned with government policy.

Priority areas were identified in the 5th (1996), 13th (2010), 14th (2011), 15th (2012) and 16th (2013) selection rounds and have been broadly defined to support overarching government policy.

The priority areas for the 16th selection round were 'innovative manufacturing', 'social innovation' and 'sustainable regional communities'.

No specific priority areas were set for the 17th selection round but the Minister called for 'applications that are industry-led and focused on practical outcomes' and stated that 'applications should address market needs and focus on solutions that diversify the Australian economy and improve the competitiveness, productivity, sustainability and export potential of Australian industries'. The Minister has also highlighted the importance of applications being strongly aligned with government policy and priorities.

The Government's recently announced Industry Innovation Competitiveness Agenda identifies five sectors where Australia has competitive strengths: food and agribusiness; mining equipment, technology and services; oil, gas and energy resources; medical technologies and pharmaceuticals; and advanced manufacturing. Industry Growth Centres are to be established in each of these sectors. Going forward, these sectors could also provide focus areas for CRC programme, supporting business-research collaborations that are central to Australia's growth and competitiveness.

Term of reference C: How can the government's investment in the CRC programme further drive more frequent and more effective collaboration between industry and the research sector?

The CRC programme is intended to be about end-user driven research that addresses major challenges that face Australia. It aims to differ from the range of Australian Government programmes available for investigator-driven, academia-based basic research, not only because the research agenda should be driven by major challenges identified by the industries that face them (see term of reference B), but also because the relationships developed and maintained to conduct this research and address these challenges should be genuine ongoing collaborations between industry and researchers. CRCs are also required to have education and outreach components to their activities, including providing a mechanism for PhD and other students to gain valuable skills in an innovative industry focussed environment.

A key aim of the programme has been to broaden and strengthen the links between universities and industry, encouraging researchers and their institutions to better recognise the value of collaboration with industry and the application of good ideas, and encouraging industry to greater recognise the potential of research to their corporate goals. The review seeks information on the programme's effectiveness in doing so, and ways in which to improve programme effectiveness in this area. The review also invites comments on the research training role of CRCs, noting that wider issues relating to research training should be addressed in response to the separate review to be conducted by the Department of Education.

Alternative approaches to increasing research-industry collaboration within the Competitiveness Agenda context are also welcome.

In relation to this term of reference, your feedback is particularly sought on:

1. Does the CRC programme encourage industry and the research sector to work together in new ways or engage new players?

2. Does the programme encourage universities to make a cultural change from focusing on publishing to focusing on collaboration and commercialisation?
3. Is the education and outreach element of CRCs addressing the workforce needs of industry and the research sector?

Business-research collaboration in Australia

Australia's global performance

Australia ranks last in the OECD (33rd) on the proportion of businesses collaborating with higher education and public research institutions on innovation.⁴ A distinctive feature of global economic integration is the increasing rate of innovation engagement with foreign partners—Australia performs poorly on international collaboration on innovation by firms, ranking 26th in the OECD.⁵

One of the contributing factors to poor collaboration is the higher proportion of our researchers working outside of business than in comparable countries. 60% of Australian researchers are employed by the higher education sector, compared to around 20% in the US and around 25% in Japan.⁶ The UK has a similar mix to Australia,⁷ but achieves far better results on measures of collaboration and innovation.⁸ There is some evidence, though, that the situation in Australia is changing: the most recent data from the Graduate Careers Council of Australia shows that about 50% of recent PhD graduates obtain employment in the private sector. However, while this represents an important flow of new knowledge and skills into industry, it is not clear whether industry up-take of recent graduates becomes the basis for sustained engagement with the research system.

The CRC programme is considered by many to be one of the success stories in terms of encouraging business-research collaboration. Similarly, the CSIRO works with around 3,000 clients each year, including more than 20% of the ASX top 200 companies and 1300 Small to Medium Enterprises (SMEs).

The Commission of Audit

The Commission of Audit noted that there would be efficiency in consolidating programmes designed to encourage collaboration between universities and the private sector, including rolling the funding for the CRC programme into the Australian Research Council (ARC) Linkages programme.

The ARC's Linkage funding schemes aim to encourage and extend cooperative approaches to research and improve the use of research outcomes by strengthening links within Australia's innovation system and with innovation systems internationally. Linkage promotes national and international research partnerships between researchers and business, industry, community organisations and other publicly funded research agencies. By supporting the development of partnerships, the ARC encourages the transfer of skills, knowledge and ideas as a basis for securing commercial and other benefits of research. The main Linkage schemes are: Linkage Projects; Linkage Infrastructure, Equipment and Facilities; ARC Research Centres; and Special Research Initiatives. Linkage funding is available to Eligible Organisations, typically Australian universities. More information is available at: http://www.arc.gov.au/about_arc/arc_profile.htm#linkage

⁴ OECD, based on Eurostat (CIS-2010) and national data sources, June 2013: <http://dx.doi.org/10.1787/888932891359>.

⁵ International collaboration on innovation by firms, 2008-2010. Australia is ranked 26th of 30 countries in the report, however three countries listed (Russian Federation, South African and Brazil) are not OECD members: OECD, *Science, Technology and Industry Scoreboard*, 2013.

⁶ OECD, *Science Technology and Innovation Scoreboard*, 2013.

⁷ Office of Australia's Chief Scientist, 2014.

⁸ UK is ranked 2nd in the Global Innovation Index 2014, and close to a third of large firms collaborate with higher education or public research institutions according to the OECD, *Science, Technology and Industry Scoreboard*, 2013.

Term of reference D: How could contractual and administrative requirements of the CRC programme be streamlined?

The Australian Government is determined to unlock productivity and competitiveness gains for industry by reducing red tape, including considering how Government grant programmes can be delivered more efficiently.

The Government invites suggestions on how the selection, contract, monitoring and reporting processes of the CRC programme could be amended to reduce the burden on applicants and CRCs while still maintaining a robustness of process and ensuring that expenditure is appropriate, effective and productive.

In relation to this term of reference, your feedback is particularly sought on:

1. Are there elements of the CRC programme guidelines that limit the ability for industry to effectively engage with researchers?
2. Is the current selection process excessively onerous on participants?
3. Do the current reporting requirements appropriately balance the need for the Government to be accountable to taxpayers and the need to allow participants to focus on research, development and commercialisation?

The deregulation agenda

The Government is strongly committed to a deregulation agenda as a means of unlocking productivity and competitiveness gains for industry. This includes reducing red tape by at least \$1 billion every year. The Government has stated that will be achieved through a number of means, including considering how Government granting programmes can: streamline application processes; issue standard form contracts with minimal terms and conditions; and reducing compliance and reporting requirements. The savings that result from the streamlining of administrative process will enable businesses to invest their resources elsewhere, such as, the growth and development of businesses, research and innovation or building internal skills.

Term of reference E: Is there sufficient demand within the research sector and industry for a programme that builds collaborative structures that facilitate end-user driven research?

Data on selection rounds conducted since the last review of the CRC programme indicates that there is still strong interest in the CRC programme, with generally 200-300 people attending selection round information sessions and typically between 25 and 50 one-on-one meetings with potential applicants each selection round. The number of applications received in each round, however, has been substantially smaller than this.

In relation to this term of reference, the review is seeking any comment on:

1. What is the pattern of demand for the programme from within industry and universities/other research organisations over the past 10 years?
2. If there are changes to demand, why have they occurred and how could they be addressed?
3. Are there specific industries of significance to the Australian economy or specific types of enterprises that have not engaged in the CRC programme, and if so, why?
4. What are the factors that influence business and industry to initiate engagement with the CRC programme?

Summary of previous reviews of the CRC programme

1995 – Sir Rupert Myers

The first substantive review of the CRC programme was conducted in 1995. A committee of eight, led by Sir Rupert Myers, concluded that the CRC programme was well conceived and was having a positive impact on research culture.

1998 – Mr Don Mercer and Professor John Stocker

This was a review of “Greater Commercialisation and Self-Funding” in the CRC programme. The review found that the “CRC Programme addresses important weaknesses in the national innovation system, in particular the disincentives to collaboration among research providers and Australian businesses, the weak links between research organisations and users, the lack of critical mass due to the institutional and geographical dispersion of Australian research and research application, the lack of mobility of personnel between government research, academia and industry, and the challenges of effective international links for a country isolated from the international centres of research and innovation. The Programme complements the work of the universities, CSIRO and other research organisations. It encourages greater industry involvement in guiding R&D in the public sector. The focus and critical mass of CRCs, in addition to their leading edge research, attracts international interest and involvement.” (Mercer and Stocker, 1998, iii).

In terms of the Government’s role in the CRC programme, Mercer and Stocker wrote that “The Commonwealth funding has a vital role in the formation and development of a CRC. It is the ‘glue’ that unites research organisations (that are frequently competitors) and users (that are often remote from research organisations) to collaborate in planning, managing and performing long term research and in postgraduate education (Mercer and Stocker, 1998, vi). There was an expectation that while some CRCs had scope to become self-funding, some would not – and that “valuable new centres will emerge and the overall programme will remain substantially dependent on Commonwealth funding” (Mercer and Stocker, 1998, vii).

Mercer and Stocker made a number of recommendations to improve the management of CRCs, particularly around governance and a graduated funding model linked to performance reviews.

2003 – Howard Partners

In 2003 Howard Partners delivered their review of the CRC programme. They noted that the objectives for the Program established in 1991 had, by 2003, ‘drifted significantly’ and become ‘more generic’. Howard Partners recommended that there be an overarching purpose ‘to achieve closer linkages between science and the market by matching the technological capability provided by Australia’s strong public research base with the requirements of industry and other research users’.

It was of the view that there were 3 categories of CRC:

- those operating as national benefit centres, with a focus on resource sustainability
- those operating on industrial research collaborations leading to industry performance improvement
- those operating as business development centres, with a focus on research commercialisation.

Howards Partners reported that ‘the data suggest that there has been a discernible trend towards a greater emphasis on national benefit CRCs over the life of the program’.

The review found that the performance of individual CRCs had been strongly influenced by the extent of the existing match between the technology-push from the research base and the demand-pull from potential research users. When the match was strong (e.g. environment and minerals industry) then CRCs performed well on research, education and collaboration outcomes. When there was little or no pre-existing capacity to match technology-push and demand-pull then the performance of CRCs was more mixed.

The recommendations of Howard Partners focused on positioning the CRC Program as an ‘investment’ program, with preferential treatment to robust ‘investment propositions’ based on industrial research as a means to an end, not an end in itself. While proposing that there be a renewed focus on the Program’s

objectives, it also called for strengthened management, accountability, reporting, governance and evaluation mechanisms. On the governance side, it stopped short of recommending incorporation for all CRCs recognising that there were advantages and disadvantages to both incorporated and unincorporated joint venture models.

Following the Howard Partners review the guidelines were updated to reflect the new purpose, put in place requirements around communication of research findings, reduce the number of selection criteria, streamline reporting and reviews, strengthen governance and a focus on the contribution that CRCs will make to Australia's industrial, commercial and economic growth, among other things.

2008 – Professor Mary O’Kane

This review was part of the broader Review of the National Innovation System.

Submissions to the review indicated strong support for the programme. Overall, the review found that the programme had merit, but that a number of changes should be made and that the need for the programme should be reassessed at the next programme review.

The review made eight overarching recommendations. Proposed changes such as increases in funding, the reinstitution of public good outcomes and encouraging CRC applications in Humanities and Social Sciences were well supported by stakeholders. However, there was opposition to other changes, such as reducing funding terms to as short as 4 years and placing less value on in-kind contributions versus cash contributions. Of the recommendations made, five recommendations were fully implemented; and three were partially implemented.

The Government's response to the review included instituting the following key policy and design principles for the CRC programme:

- benefits) as a key objective of the CRC programme;
- purpose of the CRC programme is to support end-user driven research partnerships to address clearly articulated, major challenges that require medium to long-term collaborative efforts;
- scope of activities to address these major challenges includes:
 - medium to long-term end-user driven collaborative research;
 - an end-user-focused education and training programme at least including, but not limited to, a PhD programme that complements the research programmes and that builds engagement, innovation and/or research and development (R&D) capacity within end-users;
 - global research and education engagement, particularly co-investment arrangements;
 - small or medium enterprise (SME) strategies that build their innovation and/or R&D capacity; and
 - utilisation activities to deploy research outputs and encourage take up by end-users;
- encourage participation from all industry and community sectors and all research disciplines including humanities, arts and social sciences;
- a CRC to include at least one Australian higher education institution and one Australian end-user as essential participants;
 - essential participants required to contribute resources to the CRC, while balancing stability of the collaboration and achievement of activities and outputs with flexibility for participants to join and leave the CRC;
 - flexible governance and management arrangements, including for intellectual property (IP), with greater clarity of requirements and placing the onus on applicants to demonstrate the merits of their proposed arrangements, noting that strong governance and management are essential to the success of any CRC;
 - funding for a CRC's activities will be provided for varying periods up to 10 years. Funding will be contingent on satisfactory outcomes of rigorous reviews by an independent panel of experts;
 - in exceptional circumstances, CRCs may be eligible to apply for further funding, that does not exceed a total number of 15 years of funding, after which the CRC would be required to exit the programme ; and
 - eligibility to apply for further funding would be subject to a rigorous review as well as a competitive selection process.