

Growth through Innovation and Collaboration

A Review of the Cooperative Research Centres Programme

MARCH
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The Hon Ian Macfarlane
Minister for Industry and Science
Parliament House
Canberra ACT 2600

Dear Minister

In September 2014 you appointed me to undertake a review of the Australian Government's Cooperative Research Centres (CRC) Programme to consider whether it is the most appropriate vehicle to support business and researchers to work together to develop and transition to Australia's industries of the future.

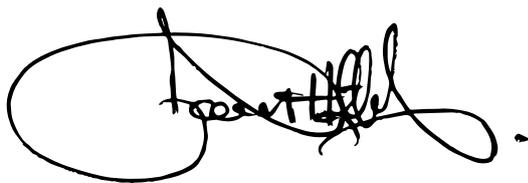
Extensive consultation with stakeholders demonstrated to me that the CRC Programme is seen as valuable and effective, but that there is scope for improvement. My analysis supported these conclusions, and I have therefore made a number of recommendations to sharpen the programme and set it on a path to better meet the government's objectives.

Retaining the CRC Programme as a stand-alone programme serves to put science at the centre of industry policy.

If the suite of recommendations is implemented, I believe the CRC Programme will be well placed to complement and support the government's competitiveness agenda and help the Australian economy to grow and remain internationally competitive into the future.

I would like to thank the people and organisations that took the time to attend the consultation sessions and make submissions. The support provided by Ms Lisa Schofield, General Manager, Commercialisation Policy Branch and her review support team was invaluable and greatly appreciated, as was feedback received from other members of your department.

I commend the report to you.

A handwritten signature in black ink, appearing to read 'David Miles', with a large, stylized flourish on the left side.

Yours faithfully,
David A Miles AM

25 March 2015

CONTENTS

Part 1: Summary and recommendations	7
Executive Summary	7
Recommendations	9
Part 2: Findings against the Terms of Reference	13
Term of Reference A	13
The CRC model	13
Continue with a new focus	14
International experience	15
Previous programme reviews and findings	16
National Commission of Audit	16
Public good	17
Linking to Industry Growth Centres	17
Term of Reference B	19
A new way to engage small to medium enterprises (SMEs)	19
Industry driving research	21
Governance	21
Intellectual Property	22
Prioritising funding	22
Term of Reference C	23
Attracting more industry and research players	25
Funding arrangements and participant contributions	25
Research Culture	25
Industry-relevant research training	26
Term of Reference D	27
Application and selection processes	27
Advisory committee	28
Performance data	29
Performance of existing CRCs	29
Term of Reference E	30
Programme demand	30
Australian economy	31

Part 3: Background and process	33
1. Review process	33
1.1 Approach to this review	33
1.2 Terms of Reference	33
1.3 Process used in this review	35
1.4 List of individual meetings	35
1.5 List of submissions	37
2. Background of the CRC Programme	42
2.1 Introduction	42
2.2 Key facts and figures	42
2.2.1 Industry participation in CRCs	42
2.2.2 Patents filed and held by CRCs	43
2.2.3 Publications	43
2.2.4 PhD graduations and employment	43
2.2.5 Demand for the programme	43
2.3 Overview of previous reviews and evaluations	43
2.4 Summary of changes to the programme	44
3. List of Active CRCs	45
4. Suggested administrative changes	48
5. Summary of industry-research collaboration government initiatives	48
Figures	
Figure 1: SMEs collaborating on innovation with higher education institutions (as a percentage of all firms)	24
Figure 2: Large firms collaborating on innovation with higher education institutions (as a percentage of all firms)	24
Figure 3: Research workforce by broad sector, 2008-09	31
Figure 4: Research expenditure by broad sector, 2008-09	31
Tables	
Table1. Fostering collaboration and commercialising research: Key Australian programmes and Initiatives - Commonwealth Government grant programmes	50
Table1. Fostering collaboration and commercialising research: Key Australian programmes and Initiatives - State Governments	53

PART 1: SUMMARY AND RECOMMENDATIONS

EXECUTIVE SUMMARY

The Cooperative Research Centres (CRC) Programme has been a feature of the Australian Government research and innovation agenda for 25 years.

The programme has been subject to many reviews, each initiated to determine whether it was delivering on its stated objectives. In response to these reviews, successive governments have taken the opportunity to revise the programme to maximise the delivery of the objectives and its flow-on value – largely through amendments to guidelines and processes.

The Allen Consulting Group found in 2012 that the programme has proven to be highly important to the Australian research and development scene and, by linking researchers with domestic and international end users, has delivered significant economic, environmental and social impacts. Their report showed a 3:1 return on investment and cited examples such as the sale of products manufactured in Australia using technology developed by the CRC for Polymers increasing sales revenue by \$25 million, the CRC for High Integrity Australian Pork delivering cost savings of \$14 million annually since 2010 through advances in grain technology and feed efficiency, and the HEARing CRC technology used by Cochlear adding value of approximately \$120 million to 2012.

At the beginning of my review there was significant stakeholder uncertainty about the programme's future, against a backdrop of fiscal restraint. My main focus has been to determine the effectiveness of the programme in supporting government's priorities for applied science and research.

Stakeholders had the opportunity to provide feedback on the programme through open information sessions held in Adelaide, Melbourne, Canberra, Sydney and Brisbane, individual meetings and submissions.

The consistent message I have received is that the programme is valuable and effective, but there is scope for improvement. After careful analysis of the 251 submissions, programme data and other information from a variety of sources, I have concluded that the programme should continue with a new, more targeted focus.

The CRC Programme continues to be extremely important in encouraging and facilitating industry-led collaboration between industry and research. Retaining the CRC Programme as a stand-alone programme serves to put science at the centre of industry policy.

The programme is known and highly regarded internationally. While accounting for only 1.6 per cent of Australian Government spending on science, research and innovation, the programme occupies an important place in building scale, scope, and duration of collaborative activity and increasing the range of partners involved. It also plays a valuable role in providing industry-relevant research training.

The recently announced *Industry Innovation and Competitiveness Agenda* (the Agenda) and the related *Boosting the Commercial Returns of Research* strategy clearly articulate the government's desire to better translate research into commercial outcomes, with the latter stating that 'we must build better bridges between research and industry'. Industry-research collaboration is crucial for Australia to be a competitive and forward-looking economy and therefore the preservation and enhancement of government support through the programme is imperative.

The Industry Growth Centres (Growth Centres), announced as part of the Agenda, will be pivotal in driving business-to-business and business-to-research collaboration by helping define the needs (research and otherwise) of the sectors on which they focus. The CRC Programme can be the engine of innovative research to support the work of the Growth Centres and develop ideas identified by industry and Growth Centres, commercialise them, and take them to domestic and international markets.

The programme should also continue its vital role in training the next generation of researchers and entrepreneurs, and inspiring cultural change in industry and research so that innovation and collaboration become the norm.

In recent times CRC Programme funding has been used to support initiatives which, while meaningful and worthwhile, have led to a dilution of funds available for the original objectives and a muddying of the programme's purpose. To support the government's priorities for applied science and research, the programme should have industry front and centre. It should be refocused and targeted to deliver outcomes for industry through industry-led research.

While placing a priority on the growth sectors, the programme should continue to be available to all industry sectors to allow for building capability, promoting innovation and industry-research collaborative relationships in sectors that are not currently considered to be an area of existing competitive advantage for Australia.

Small and medium enterprises (SMEs) are a significant part of the Australian economy, accounting for more than two-thirds of GDP, national output and jobs. Much can be gained from having more SMEs involved in industry-research collaboration activities supported by the programme. There are, however, a number of perceived barriers to SME participation, which I believe can be addressed by providing a simpler entry mechanism and lower cost threshold to enable participation in the programme. A new stream of activity, CRC projects (CRC-Ps), supporting industry-focused research projects, with shorter timeframes and smaller budgets should be introduced. The funding for this new activity should come from the existing programme allocation.

A simplified selection and review process should be established, including a new, smaller, more industry-focused advisory group. The new arrangements should prioritise timely and cost effective research commercialisation and application of research outcomes for industry to lift the competitiveness and productivity of industry, while recognising the importance of research outputs to knowledge transfer and future career opportunities for researchers and postgraduate students. As far as possible the new process should make use of best practice frameworks, including for intellectual property.

Streamlined administration is also needed to enhance programme efficiency. In addition to providing advice on applications, the advisory group should identify which existing CRCs could potentially link to Growth Centres. It should also assess the performance of existing CRCs against current contracts to determine which of them are on track to achieving stated outcomes, and which need to improve. Only those that are on track to delivering against their stated outcomes should continue for the period of their current funding agreement.

Given the CRC model has proved successful, consideration should be given to rolling the model out across government to support the policy objectives of different portfolios. There is an existing example in the Defence Future Capability Technology Centre Programme which is funded by the Department of Defence and administered by the Department of Industry and Science.

If the suite of recommendations outlined in this report is implemented, the programme will be well placed to support the government's current agenda to boost the commercial returns from research while providing the flexibility required to respond to emerging economic challenges and opportunities.

RECOMMENDATIONS

Refocusing the programme

Recommendation 1

As an integral part of the Australian Government efforts to put science at the centre of industry policy the Cooperative Research Centres (CRC) Programme should continue. It is imperative however that it is refocused and targeted to achieve the Australian Government's priorities for applied science and research.

The review does not support the recommendation of the 2014 National Commission of Audit to abolish the CRC Programme and roll the funding into the Australian Research Council's Linkage Program. The CRC Programme should be an industry led scheme that enables industry to identify and champion collaborative applied research projects. The Linkage Program, while aimed at collaborative research, supports researcher led projects that do not necessarily involve industry partners. Abolishing the CRC Programme and transferring its funding to the ARC Linkage scheme would risk even lower levels of industry-led collaborative research in Australia than is currently the case.

Recommendation 2

The programme objectives should be revised to put industry front and centre. The objectives should focus on:

- improving the competitiveness, productivity and sustainability of Australian industries, especially where Australia has a competitive strength including the recently announced growth sectors: Food and Agribusiness; Mining Equipment, Technology and Services; Medical Technologies and Pharmaceuticals; Advanced Manufacturing; and Oil, Gas and Energy Resources;
- establishing and supporting industry led and outcome focused collaborative research partnerships between industry and research organisations; and

- conducting high quality research to solve industry problems, such as improving or developing new products, processes or services, driving emerging technologies, and exploiting new national and international markets.

These objectives should form the basis of revised programme guidelines to ensure future funding is directed to collaborative research that has a clear industry focus. The success of the revised CRC Programme should be measured against these objectives.

Recommendation 3

The CRC Programme should be structured into two streams of activity:

- traditional CRCs to support medium – to long term industry-led collaborations; and
- CRC projects (CRC-Ps) to support short term, industry-led research.

CRC-Ps will be smaller collaborations operating on short project timelines with simpler governance and administration arrangements and less funding. The process of revising the programme guidelines should establish the selection criteria and details of the CRC-P stream.

Recommendation 4

CRCs and CRC-Ps should work with Growth Centres to share knowledge, experience and resources and achieve common goals.

The review understands the focus of Growth Centres will be:

- encouraging collaboration and the commercialisation of new products;
- enhancing management and improving workforce skills;
- identifying opportunities to reduce regulatory burden; and
- improving capabilities to engage with international markets and global supply chains.

In the context of the CRC Programme, Growth Centres may wish to:

- *identify and/or lead potential CRC or CRC-P participants and consortia;*
- *drive high quality, industry focussed CRC or CRC-P applications; and*
- *review investment proposals and activities of a CRC or CRC-P to provide an industry perspective and influence direction where appropriate.*

Recommendation 5

Future CRC and CRC-P funding should be prioritised to support research that delivers outcomes in growth sectors. While the programme should prioritise these sectors it should not do so exclusively to ensure it can respond to emerging priorities and meritorious proposals from other sectors.

This recognises the need to build scale and depth in specialist areas important to the Australian economy, in the short term (through CRC-Ps) and over the medium to long term (through CRCs).

Recommendation 6

Applicants for CRC funding should demonstrate that the proposed research and related activities are in line with the revised programme objectives, and that they will stimulate growth and lead to outcomes including, but not limited to: increased jobs, exports, productivity, integration into global supply chains, new technologies, products or services, increased revenues and intellectual property outputs such as patents.

These outcomes should be included in revised programme guidelines.

Recommendation 7

Industry should be actively involved in the development of CRC and CRC-P proposals and the subsequent administration, governance and management of any partnership funded through the programme.

The revised programme guidelines should require industry to take a lead role in driving the collaboration, the articulation of the research challenge and details of the proposal.

Lifting performance

Recommendation 8

A simplified and more industry-focused selection and review process should be established, including a new, smaller advisory group. The new process should have a strong focus on industry expertise, management capabilities and research commercialisation skills.

While the current CRC Committee has served the programme well, having regard to the original objectives of the programme, the changes to the objectives and activities necessitate new selection and review processes.

Recommendation 9

When assessing CRC applications regard should be had to:

- the research programme. This should be high quality, based on identified industry priorities and have clearly articulated and tangible goals, including commercialisation potential;
- the proposed management team. CRCs should have senior, ongoing roles filled by industry in addition to a Chair and CEO with the skills and experience required to lead an organisation with diverse participant needs and outcomes;
- an industry-focused education and training programme. This should build engagement, innovation and research and development capacity in both the industry and the research sectors; and
- the broader industry impact of the proposed activities.

When assessing CRC-P applications regard should be had to:

- the research project, which should be based on an identified industry priority and have clearly articulated and tangible goals, including commercialisation potential;
- how the project will be managed;
- the industry participants and the business case for an industry-led research collaboration; and
- the broader industry impact of the proposed activities.

Recommendation 10

All current CRCs should be reviewed by the new advisory group to ensure that they are performing in accordance with their funding agreement and are likely to deliver against their stated outcomes, as well as to determine any potential linkages with the Industry Growth Centres. Only those that are on track to delivering against their stated outcomes should continue for the period of their current funding agreement.

Recommendation 11

CRC funding should be limited to a maximum of up to 10 years with no extension of funding. Given the focus on shorter term research, CRC-P funding should be limited to a maximum of up to 3 years with no extension of funding.

Payments should be dependent on meeting agreed milestones and satisfactory performance reviews.

Streamlining administration

Recommendation 12

The application, selection, reporting and administrative requirements for each stream of the programme should be simplified and streamlined. These processes should be clearly outlined in the revised programme guidelines.

CRC applications should have an annual application round with a revised two stage assessment process:

- *stage 1: A short online proposal. This approach aims to reduce the time, cost and resource burden on applicants.*
- *stage 2: If the Stage 1 application is successful, a full business case which meets the requirements as set out in the revised programme guidelines should be submitted.*

CRC-Ps should undergo a single stage, online application process which is open to new applications up to three times a year.

Reporting and associated administrative requirements should ensure only information that is required is being collected, while still retaining accountability for Commonwealth funding.

Recommendation 13

Each new CRC should be established as an incorporated company, limited by guarantee. The composition of the board should reflect relevant experience and expertise. Funding for the CRC should be managed through an agreement between the company and the Commonwealth.

Mandating a governance model for CRCs should reduce complexities and save time in establishing new CRCs.

Recommendation 14

Funding for each CRC-P should be managed through an agreement between an acceptable entity and the Commonwealth.

CRC-Ps should have a simplified agreement with an acceptable entity which has responsibility to deliver the project. The entity should be nominated by industry.

Recommendation 15

Intellectual Property (IP) agreements should be streamlined for CRCs and CRC-Ps and wherever possible they should use best practice.

Recommendation 16

The priority public good funding mechanism should be discontinued.

CRC Programme funding inherently delivers public good by enabling industry focused research on key issues. There is no need for a separate mechanism.

Recommendation 17

CRC performance data collection should be revised to align with revised programme objectives and outcomes.

The collection of data for the programme should be reviewed, including identifying which is appropriate data to collect and the best way of collecting it. Wherever possible existing collection methods should be used so that 'red tape' is kept to a minimum. The National Survey of Research Commercialisation is a valuable resource for this purpose.

Recommendation 18

The CRC Programme model should be used and funded by other Australian Government portfolios to achieve their policy objectives.

PART 2: FINDINGS AGAINST THE TERMS OF REFERENCE

This review has evaluated the performance of the CRC Programme against the stated terms of reference (Part 3 Section 1.2). In doing so, the review has also taken account of the Department of Finance's Expenditure Review Principles as outlined below:

- *appropriateness* is addressed in terms of reference A and E;
- *effectiveness* is addressed in terms of reference B and C;
- *efficiency* is addressed in term of reference D;
- *integration* is addressed in term of reference A;
- *performance assessment* is addressed in terms of reference A and C; and
- *strategic policy alignment* is addressed in terms of reference A, B and C.

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?

A refocused and better targeted CRC Programme will achieve the government's priorities for science and research.

In the 25 years since the CRC Programme was announced it has undergone a number of changes to its objectives and administrative processes, largely in response to past reviews. This review has been conducted to assist the Minister for Industry and Science to determine whether the programme is supporting the Australian Government's policy objectives for applied science and research.

The recently announced *Industry Innovation and Competitiveness Agenda* and *Boosting the Commercial Returns from Research* strategy articulate the government's focus on,

among other things, improving the translation of research into commercial outcomes for industry.

In forming a view on whether the programme is the right vehicle for achieving the government's priorities the review has paid particular attention to the sub-questions outlined in its terms of reference including:

- whether the CRC Programme effectively encourages and facilitates industry and the research sector to work together to solve problems for business, help industries adapt to change, and improve economic outcomes for the nation?
- how the objective of the programme should be articulated in the current policy context?
- whether there are other domestic or international approaches to driving industry growth and competitiveness through applied science and research that might be more appropriate?

The review has drawn on stakeholder feedback from consultations and submissions received during the review process, programme data, the findings of previous reviews, international collaborative research policy, the 2014 National Commission of Audit and industry-research collaboration initiatives funded by the Commonwealth and state and territory governments.

The CRC model

Stakeholder feedback was positive, emphasising the importance of the programme in supporting industry-focused research and encouraging collaboration between industry and research in Australia.

The programme was described by some stakeholders as the 'glue' in Australian industry-research collaboration, and by others as a unique avenue for industry to identify and solve its research challenges. The programme was also noted as an important funding source for universities to enable long term and complex industry-focused research through collaboration.

Some stakeholders expressed frustration with the programme, noting concerns about its structure and administration and that the aims of the programme were too diffuse. Others questioned whether the programme had strayed from its original objectives and had also become inflexible.

Industry stakeholders saw the programme as capable of making an important contribution to improving global competitiveness and encouraging collaboration.

They highlighted a number of key factors that they believe increase the likelihood of tangible outcomes:

- industry-identified research questions that are clear and commonly agreed, with flexibility in delivery to be able to respond to research developments and changing industry requirements;
- industry leading the design and development of research programmes;
- senior figures from industry holding key positions in the governance, management and decision-making of CRCs; and
- CRCs engaging researchers producing high quality research that also meets the needs of industry in a commercial environment.

Where such factors were not in place, CRCs were seen by industry as less likely to deliver useful outcomes.

Some stakeholders argued that industry-research collaboration should be an end in itself (given the investment in skills, capabilities and collaborative networks), regardless of commercial return. However, the review believes a stronger industry focus for the programme will increase industry benefits such as profitability, productivity and job-creation, and promote skills and career pathways in both industry and research.

Continue with a new focus

The review recommends the programme continue but with a clear focus on industry-led research.

The current programme objective is:

to deliver significant economic, environmental and social benefits to Australia by supporting end-user driven research partnerships between publicly funded researchers and end-users to address clearly articulated, major challenges that require medium to long-term collaborative efforts.

The review agrees with many stakeholders that the purpose of the programme has become muddled over time and has become an ‘everything to everyone’ initiative and that ‘end-user driven research’, as stated in the current programme objective, is too broad. ‘End-user’ means any public or private organisation, government department or agency, not for profit, community organisation or individual with the ability to utilise research outputs.

There was some stakeholder feedback from industry participants in previous CRCs that a weakness in the programme was the potential for research agendas to be dominated by researchers with ‘pet interests’. These stakeholders also stated that there was insufficient emphasis on commercial outcomes.

To better support the government’s priorities for applied science and research, the programme objectives should be amended to put industry front and centre. The focus should be on solving industry problems and encouraging industry to take the lead in collaborative research and development activities.

The objectives should focus on:

- improving the competitiveness, productivity and sustainability of Australian industries, especially where Australia has a competitive strength including the recently announced growth sectors: Food and Agribusiness; Mining Equipment, Technology and Services; Medical Technologies and Pharmaceuticals; Advanced Manufacturing; and Oil, Gas and Energy Resources;
- establishing and supporting industry-led and outcome-focused collaborative research partnerships between industry and research organisations; and
- conducting high quality research to solve industry problems, such as improving or developing new products, processes or services, driving emerging technologies, and exploiting new national and international markets.

Industry stakeholders agreed the most successful CRCs are those where industry is involved at the outset of the project and where the research programme is driven by challenges identified by industry. A number of submissions noted the advantage of projects being informed by road mapping exercises on research and development by industry peak bodies. Advantages cited included relevance, shared vision and take up of outcomes.

Applicants should be required to demonstrate that the proposed research and related activities will stimulate growth and lead to outcomes including, but not limited to: increased jobs, exports, productivity, integration into global supply chains, new technologies, products or services, increased revenues and intellectual property outputs such as patents.

Co-location of industry partners and researchers is useful and helps ensure industry buy-in and input to the research process. The review notes that while this is not always possible, co-location should be supported.

International experience

This review has considered successful international models and policy trends and notes that most developed countries fund initiatives to support applied research and industry-research collaboration. Two models that were of particular interest to the review are Germany's Fraunhofer Institutes and Catapult Centres in the United Kingdom.

Fraunhofer Institutes have been operating since 1973. They conduct applied research in specific fields such as health, security and energy based on priorities determined by government and industry partners. The Institutes have forged strong collaborative partnerships between industry, universities and other research organisations by bringing parties together to address key research challenges. The Institutes are cooperatively funded by government and industry and are managed by a governing board that includes industry representatives.

The Catapult Centres initiative is relatively new, but a recent evaluation indicated that it is already achieving strong results in the UK through lifting collaboration and boosting innovation in critical industries. The Catapult Centres were established by the UK government in response to many of the same challenges that exist in Australia including low levels of collaboration between business and researchers, poor engagement with small to medium enterprises (SMEs) and the need to diversify the national economy beyond a few strong sectors. Catapult Centres operate as independent, not-for-profit, limited guarantee companies, each specialising in a different area of technology. They are funded with a mixture of core public funding, competitively-awarded collaborative research grants, and industry-funded research contracts (about one-third from each).

If the modifications recommended by this review are implemented, the CRC Programme will come to share many of the features of the Fraunhofer and Catapult initiatives. They are important to note in the context of this review because both have a strong industry focus in their programme objectives and administration, and undertake prioritised applied research based on needs identified by both industry and government as important to the German and UK national economies. They also use cooperative funding from government and industry, and have clear governance structures that include industry representation.

Previous programme reviews and findings

The CRC Programme has been examined many times over its 25 years of operation, most recently by Howard Partners (2003), Insight Economics (2006), Professor Mary O’Kane (2008) and The Allen Consulting Group (2012). They looked at its effectiveness in meeting government objectives, focusing on economic and policy priorities as well as administrative issues.

Howard Partners found the programme to be effective, noting that “CRCs have performed a vitally important role in transforming publicly funded discoveries and inventions into products and businesses that are ‘investment ready’”. The report suggested streamlining administration to promote an outcomes focus in application, management and reporting processes and to reduce burden. Howard Partners also suggested more focus when undertaking project planning and in governance on commercialisation, including spinout companies.

Insight Economics, in its economic impact study, found that the CRC Programme was delivering very clear net benefits for Australian economic welfare and that for each dollar invested in the CRC Programme, Australian gross domestic product was cumulatively \$1.16 higher than it would otherwise have been.

Professor O’Kane noted the programme as iconic and highly influential, having been copied by several countries. She suggested modifications to better align objectives to clearly-articulated major challenges, to ensure that a wider range of industry and service end-users participate and to increase flexibility.

The Allen Consulting Group, in its report on the economic, social and environmental impacts of the CRC Programme, found good returns on investment in the programme, estimating \$14.5 billion of gross direct economic impacts and community benefits exceeding the cost of investment by 3:1.

Each of the above confirmed the programme has been successful in bringing together industry and researchers, delivering products to market, training industry-ready PhD graduates and more broadly improving the lives of Australians. They also concluded that the programme provides a strong economic return for government investment.

National Commission of Audit

The review also considered the 2014 National Commission of Audit recommendation to abolish the programme and roll its funding into the ARC Linkage Program.

The review does not support this recommendation.

While on the surface it can appear that the two programmes are about the same thing – linking research and industry – in fact the two programmes are fundamentally different.

The ARC Linkage Program is researcher-led, is only open to applications from university researchers, and ‘supports the growth of research partnerships between university-based researchers and researchers in other sectors in Australia and overseas that generate new knowledge, technologies and innovations’.

There is no requirement to collaborate with industry and the majority of grants do not have industry partners. The 2015 Funding Rules specify:

The objectives of the Linkage Program are to deliver outcomes of benefit to Australia and build Australia’s research and innovation capacity through support for:

- a) *collaborative research between university-based researchers and researchers in other sectors;*
- b) *research training and career opportunities that enable Australian and international researchers and research students to work with industry and other end-users; and*
- c) *research in priority areas.*

The revised objectives for the CRC Programme recommended in this review and the ingredients for success outlined by industry stakeholders would not be met by the ARC Linkage Program. The CRC Programme should be an industry-led scheme that enables industry to identify and champion collaborative applied research projects.

Indeed, abolishing the CRC Programme and transferring its funding to the ARC Linkage Program would risk even lower levels of industry-led collaborative research in Australia than is currently the case.

Public good

The term 'public good' was raised by many stakeholders during the review process. It quickly became apparent that definitions of this term varied widely.

Following the O'Kane review, the objectives of the programme were reframed to include social and environmental benefits described as 'reinstating public good'. In addition, in 2013 a 'priority public good funding mechanism' was introduced to allow funding for relevant CRCs to be extended.

The review recognises government support for the CRC Programme is for the benefit of the public. Whether a collaboration is focused on growing Australian businesses, developing environmental solutions, or improving health outcomes, each has benefits for the taxpayer, and therefore is a 'public good'.

CRC Programme funding inherently delivers public good by enabling industry-focused research on key issues. There is no need for a separate mechanism and therefore the priority public good funding mechanism should be discontinued.

Linking to Industry Growth Centres

The new Industry Growth Centres (Growth Centres), announced as part of the *Industry Innovation and Competitiveness Agenda*, are a key part of the government's strategy to improve the competitiveness of the Australian economy through innovation and collaboration.

The review could not properly consider the CRC Programme without considering the relationship between the programme and the proposed Growth Centres.

Many review submissions and discussions focused on how the two measures could operate side by side. The review understands this issue was also raised during Growth Centres consultations which took place shortly after the programme review consultations concluded.

Initially Growth Centres will focus on five industry sectors to lift competitiveness and productivity in areas where Australia has competitive strengths. The five sectors are Food and Agribusiness; Mining Equipment, Technology and Services; Medical Technologies and Pharmaceuticals; Advanced Manufacturing; and Oil, Gas and Energy Resources. Growth Centres will also facilitate engagement between enabling capabilities, services and technologies, such as information and communications technology.

The review understands the focus of Growth Centres will be:

- encouraging collaboration and the commercialisation of new products;
- enhancing management and improving workforce skills;
- identifying opportunities to reduce regulatory burden; and
- improving capabilities to engage with international markets and global supply chains.

The Minister for Industry and Science has now announced all of the five Growth Centre chairs. The chairs will each be assisted by a facilitator to develop a Growth Centre proposal for consideration by government. The review understands that the facilitation process is expected to occur during the first half of 2015. Growth Centres are expected to be up and running by the middle of the year.

The Advanced Manufacturing; Food and Agribusiness; and Mining Equipment, Technology and Services Growth Centres are expected to be operational first.

As outlined in the Growth Centres Initiative Programme Guidelines, in its first year each Growth Centre will develop and implement a Sector Competitiveness Plan. The plan will identify issues applicable to that key growth sector and priority actions required to enhance competitiveness and include the following elements:

- a) a description of the key growth sector's expected future challenges and opportunities, particularly in relation to the four key themes: regulatory reform; industry-research collaboration and commercialisation; global supply chains and market access; and skills and workforce development, and an outline of actions to be undertaken to respond to these challenges and opportunities in order to accelerate the productivity and competitiveness of the sector. This will include how the Growth Centres will take an active role in coordinating R&D and disseminating knowledge across the sector;
- b) a Regulation Reform Agenda, which considers Commonwealth Government, State and/or Territory Government, Local Government, international and intra-industry regulations, as appropriate to its sector and details recommendations for reform. Each Growth Centre will consult broadly across the Commonwealth Government and State and/or Territory Government in developing its Regulation Reform Agenda; and
- c) an analysis of Industry Knowledge Priorities which set out the industry research needs of, and commercialisation opportunities in, its sector. The Industry Knowledge Priorities will be developed with reference to research being undertaken domestically and globally, and to the national research priorities endorsed by the Commonwealth Science Council. The Industry Knowledge Priorities will be disseminated to the research community to inform their future industry-led research.

In response to element c), the CRC Programme can be the engine of innovative research to support the work of the Growth Centres to develop ideas, commercialise them, and take them to domestic and international markets. CRCs should work with Growth Centres to address common goals and align priorities.

In the context of the CRC Programme, Growth Centres may wish to:

- identify and/or lead potential CRC or CRC-P participants and consortia;
- drive high quality, industry focussed CRC or CRC-P applications; and
- review investment proposals and activities of a CRC or CRC-P to provide an industry perspective and influence direction where appropriate.

Existing CRCs should work with the Department of Industry and Science to identify how they can link with Growth Centres. This may include the development of a memorandum of understanding to articulate roles and responsibilities.

TERM OF REFERENCE B

How can the government's investment in the CRC Programme better deliver outcomes for industry?

Industry needs to be front and centre. The CRC Programme should be refocused and targeted to deliver outcomes for industry, and greater ease of access for SMEs.

The review has considered the design and delivery of the programme to determine how it can deliver better outcomes for industry and analysis has focused on the following sub-questions from the terms of reference:

- to what extent does the programme address the needs of small and medium enterprises?
- to what extent are the research activities undertaken driven by industry as opposed to research organisations?
- do the governance, intellectual property (IP) and other commercialisation-related practices of CRCs inhibit the application of CRC-driven research? How can this be addressed?
- do 'priority areas' assist in meeting the needs of industry?

A new way to engage small to medium enterprises (SMEs)

In addition to the changes to put industry front and centre as previously outlined, particular attention has been given to making the programme easier for SMEs to access.

Some SME participants of past and present CRCs were very positive about the benefits of their participation in the programme, in some cases noting that the outcomes were above and beyond what they expected. The models put in place for SME engagement by the CRC for Spatial Information and by the Deep Exploration Technologies CRC were examples of real and meaningful engagement.

However the predominant view was that the programme was not sufficiently flexible to encourage SMEs participation given time, cost and resource constraints. The importance of SMEs to the Australian economy should not be underestimated and the programme must be more flexible to encourage SME participation.

SMEs are not always able to commit to a CRC for the life of the funding agreement. Some SMEs may wish to participate only for a specific period of time and then depart the programme. The CRC for Spatial Information has adopted a model using a participant unit trust company 43pl to encourage and facilitate flexible SME engagement.

Experience from other programmes¹ shows that up to three-quarters of SMEs will maintain their involvement in a research collaboration or establish new partnerships following their first government-supported project.

This is compelling evidence and the review recommends establishing a second activity stream called CRC-Projects (CRC-Ps) to complement the traditional CRC model.

CRC-Ps should support collaborative research activities with simpler goals, shorter timeframes (up to three years) and smaller budgets (up to \$3 million in total).

Wherever possible, CRC-Ps should be linked to Growth Centre knowledge priority areas. They should be discrete, stand-alone projects designed to benefit SMEs in particular, by solving problems and increasing their capacity to grow and adapt in changing markets.

CRC-Ps should also have simpler application, management and governance arrangements, have more flexible administration, and use simple, best practice templates such as those that will be available through the soon to be released IP Toolkit.

¹ Researchers in Business Programme Data

Case Study: 43pl facilitates SME engagement in the CRC for Spatial Information

SMEs are deeply integrated into the activities of the CRC for Spatial Information (CRCSI), and the CRC established, at the outset, a unique structure to facilitate their engagement and involvement.

43pl Pty Ltd (43pl), a unit trust and essential participant of the CRC, allows SMEs in the spatial information sector to purchase units through which they can participate in the CRC with appropriate flexibility. This permits each member SME to access CRCSI intellectual property and participate in all CRC activities, but at the same time significantly reduces the SME's costs of involvement. 43pl assumes indemnity for each member SME, and the administrative costs and Company Secretary function for the company are provided by the CRC. Board directors are from representative member companies from across Australia and New Zealand and are elected through a nomination process.

Members of 43pl are not necessarily involved in CRC projects, but all CRC projects usually have 43pl participation. All unit trust contributions are applied to the CRC. The company has grown from its initial 39 members, and membership continues to fluctuate as companies join, merge, leave the industry, spin off new companies or choose to leave the CRC. Nearly 100 companies have benefitted from 43pl membership over the last ten years.

Benefits to member SMEs include:

- Equity in the intellectual property of the CRC in proportion to the aggregate cash payments
- involvement in a cluster or ecosystem of spatial companies, clients and researchers, which reduces the barriers to innovation, collaboration and R&D as well as providing neutral ground on which to meet clients and suppliers
- attendance at the CRCSI member-only annual conferences
- project engagement through 43pl participation being sought in all CRC projects
- equal status in all projects with the same privileges as government agencies and universities
- option to participate on the Board and in project governance
- involvement in commercial activities to provide services to CRCSI projects (worth millions of dollars to dozens of companies over the last ten years)
- preferential access to R&D initiatives and CRCSI IP for commercialisation
- skills development and capacity building, including the recruitment of CRCSI postgraduate students
- networking into government and academia, both nationally and internationally, to bring end-user and researcher together, so the SME can participate where their niche expertise can be best applied
- assistance with the development of submissions for grant funds for innovation and business development
- Assistance with technical advice on the development of intellectual property.

Industry driving research

The proposed revised programme objectives are all about putting industry front and centre. The proposed introduction of the CRC-P activity stream is about making it easier for SMEs to be involved and engaged. The connection to the Growth Centres is about getting better targeting of research to match industry needs.

The revised guidelines should make it clear that industry needs to be the partner driving these collaborations. Industry should describe the problem, be involved in pulling together the right players to solve it on both the industry and the research sides, and work on the solution alongside the researchers.

Focus on the problem that needs to be solved

The proposed revision of the programme's objectives signals a shift in focus to solving a problem, rather than establishing an organisation. This should address a persistent criticism of the programme, raised frequently by stakeholders, namely that CRCs aim to gain further support and continue operating well beyond the original timeframes.

The average life of a CRC is 12 years.

The review notes that many CRCs have extended their existence through re-bidding (many have received three or four separate funding terms). This review also notes that a limit of 15 years was placed on funding for CRCs following the O'Kane review (recognising that the O'Kane review recommended a limit of 10 years).

There are inherent tensions between managing a CRC to deliver tangible outcomes in the specified time period (to provide a benefit to industry), building and maintaining a collaborative, trusting relationship between participants (to foster more collaboration), and delivering high quality, sometimes long-term, research (to solve the problem and provide benefits to researchers). All are important goals and all are recognised in the revised objectives for the programme.

Completion of the research programme and delivering a solution to the problem should be recognised as success for a CRC and a CRC-P. Success should not be defined by the duration of the activity.

While having a clear plan for wind-up is important, it should not be an activity that diverts significant resources away from the core activity of solving the problem. In recent years, transition planning has come to mean planning for self-sufficiency. This should not be the goal. Limiting the duration of funding, and not allowing extensions, will make it clear that the focus should be on delivering tangible outcomes from the CRC or CRC-P within the funding period, without unnecessary distractions such as preparing for re-bids or transition planning. CRCs should still demonstrate that they have a plan for the end of the collaboration, and this should form part of the ongoing assessment and review process.

This review therefore recommends a limit of a single term of up to 10 years for CRCs, although it is not expected that every CRC would require a funding period this long. Applicants should be realistic about the time required to achieve expected outcomes.

Governance

Currently, all CRCs must employ a governance model which demonstrates good practice in its design and execution. The CRC Programme guidelines provide flexibility for CRCs to determine the most appropriate model. There is, however, no governance model for CRCs mandated by the programme. While template agreements are provided and the recipient entity is encouraged to operate and manage the CRC to the same fiduciary and good governance standards required by law of incorporated bodies, parties frequently come to the application and establishment process with disparate ideas of how the CRC will operate. This can add considerable time and tension to the establishment phase.

It is important that appropriate structures are in place to ensure proper accountability and integrity in the management of Commonwealth funds while ensuring that regulation and administration is not excessively onerous.

Each new CRC should therefore be established as an incorporated company, limited by guarantee. The composition of the board should reflect relevant experience and expertise. Funding for the CRC should be managed through an agreement between the company and the Commonwealth.

Mandating a governance model for CRCs should reduce complexities and save time in establishing new CRCs. To ensure there are no unintended consequences of this change, alternative structures should be considered in exceptional circumstances.

CRC-Ps should not be required to establish an entity to manage the collaboration. Funding for each CRC-P should be managed through an agreement between an acceptable entity, as defined in the revised guidelines, and the Commonwealth. It should be a simplified agreement with an entity nominated by industry.

Intellectual Property

While some stakeholders were concerned about IP arrangements in the programme, few concrete examples were provided in consultations or submissions of failed negotiations or specific barriers preventing agreement. The most common issue raised was that there was confusion, a lack of clarity or misunderstanding of the IP arrangements in place in CRCs. Most often this appeared to be a result of the IP arrangements not being clearly negotiated at the application stage of the CRC.

The review believes that the programme provides appropriate scope and flexibility in IP management approaches, but that additional guidance could be provided, particularly for a traditional CRC. It should be emphasised that agreement at the time of application is imperative. Further, the development of an IP management strategy should be a requirement alongside the funding agreement of all CRCs and CRC-Ps.

The IP Toolkit, currently being developed by the Department of Industry and Science and IP Australia, could be used as guidance for both CRCs and CRC-Ps.

Prioritising funding

The review recommends that future CRC and CRC-P funding should be prioritised to support research that delivers outcomes in the growth sectors identified by government. While the programme should prioritise these sectors it should not do so exclusively to ensure it can respond to emerging priorities and meritorious proposals from other sectors.

This recognises the need to build scale and depth in specialist areas important to the Australian economy, both in the short term (through CRC-Ps) and over the medium to long term (through CRCs), while still supporting and developing other areas which may become industries of the future in Australia.

Such an approach to prioritisation also aligns with advice from Professor Ian Chubb, Australia's Chief Scientist, who argues that individual actions (such as administering the CRC Programme) must be:

- aligned to clearly articulated national goals;
- focused on priority areas where we have comparative advantage or critical need; and
- scaled appropriately to achieve far-reaching and enduring change.

The review notes that the current programme guidelines allow the Minister to call for applications in specific areas which are generally known as 'priority areas'. Priority areas have been a feature of the programme for various selection rounds including selection rounds 13 (2010) through to 16 (2013) and have focused on broadly defined areas in manufacturing and social innovation as well as regional communities.

Unfortunately, the ad hoc nature of calling for applications in this way did not result in a significant shift to that type of application or activity. It more often resulted in applications that were underdeveloped or artificial as applicants tailored the activity to meet one or more priorities on the assumption that it would give them a competitive advantage. Feedback from stakeholders questioned the value of having priority areas in this way, particularly as they have been unpredictable and typically announced at the same time as the opening of the selection round which leaves minimal time to develop quality applications.

While noting the above, the review believes that if funding priorities as recommended are managed appropriately and made a consistent feature of the programme, this can be a successful feature that delivers focus and scale.

TERM OF REFERENCE C

How can the government's investment in the CRC Programme further drive more frequent and effective collaboration between industry and the research sector?

Revised CRC Programme objectives that include a stronger focus on industry and research sector participation will encourage more researchers to collaborate with more industry partners including SMEs.

The new *Industry Innovation and Competitiveness Agenda* aims to lift the productivity, competitiveness and responsiveness of the Australian economy through four goals, one of which is the development of an industry policy that fosters innovation and entrepreneurship. A key strategy to achieving this goal is improving collaboration between Australian businesses and researchers to develop and commercialise new ideas.

The level of collaboration between Australian businesses and research organisations is low by international standards, despite significant improvement over the last decade. Across almost all industry sectors and firm sizes, the proportion of innovating Australian businesses engaged in research collaborations with universities and other higher education institutions has increased from only 1.6% in 2006-07 to 9.7% in 2012-13.² Even so, Australia remains at or close to the bottom of the Organisation for Economic Co-operation and Development (OECD) on this measure.

Increasing collaboration in the Australian economy is vital. The *Australian Innovation System Report 2014* notes that:

*Australia's research strengths generally align well with our existing trade strengths. However, some research or innovation strengths remain underdeveloped... If research commercialisation and industry-research commercialisation were stronger in Australia, supported by a larger high-risk capital market, these strengths might be better leveraged into high-growth industries.*³

This section examines the broader issues surrounding collaboration and the sub-questions in the terms of reference:

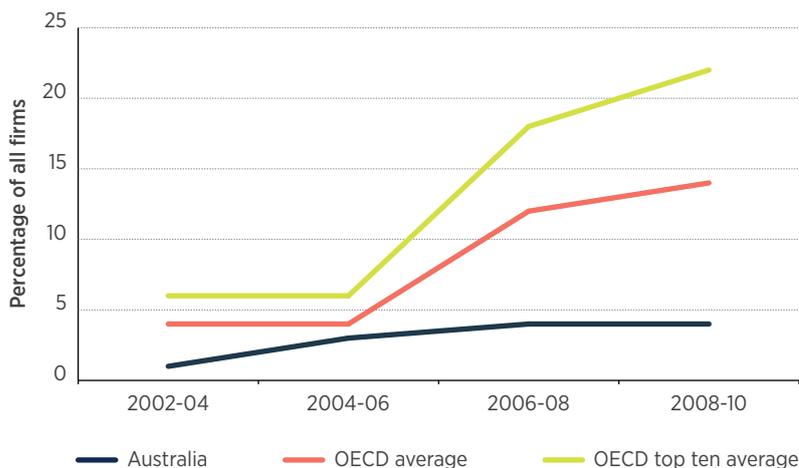
- does the CRC Programme encourage industry and the research sector to work together in new ways or engage new players?
- does the programme encourage universities to make a cultural change from focusing on publishing to focusing on collaboration and commercialisation?
- is the education and outreach element of CRCs addressing the workforce needs of industry and the research sector?

In spite of recent improvements, the current level of research and industry collaboration still puts Australia behind almost all other OECD countries. Analysis by the Department of Industry and Science based on the latest ABS and OECD data suggests that to reach the top 10 of the OECD, 40% of Australian large firms and 20% of Australian SMEs would need to be engaged in research collaborations with universities. Reaching this level of collaboration would require significant cultural and behavioural changes in industry and in the research sector.

² In some industry sectors the level of collaboration is significantly higher: in 2012-13 21% of businesses in the Construction sector, 18.5% of businesses in the Health Care and Social Assistance sector and 16.6% of businesses in the Agriculture, Forestry and Fishing sector engaged in some kind of research collaboration with universities.

³ *Australian Innovation System Report 2014*, p. 8

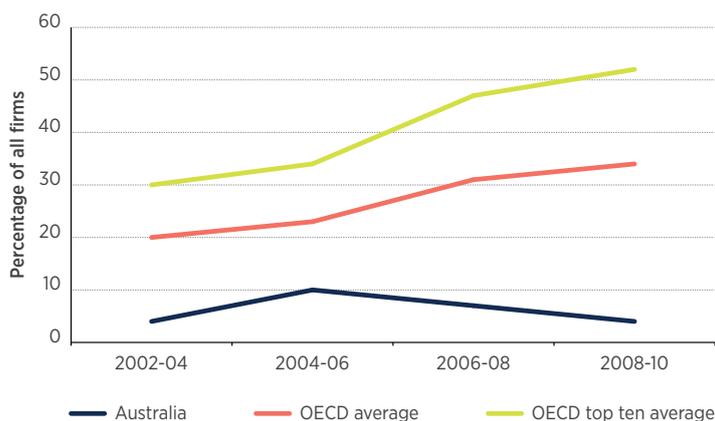
Figure 1: SMEs collaborating on innovation with higher education institutions (as a percentage of all firms)



Note 1: Australian data for 2006-08 is the average of the preceding and following years.

Note 2: 2006-08 and 2008-10 data includes both universities and public research institutions

Figure 2: Large firms collaborating on innovation with higher education institutions (as a percentage of all firms)



Note 1: Australian data for 2006-08 is the average of the preceding and following years.

Note 2: 2006-08 and 2008-10 data includes both universities and public research institutions

While the CRC Programme attracted some criticism from stakeholders for failing to lift Australia’s industry and research collaboration, it needs to be understood that it is only one component of the Australian science, research and innovation landscape. The programme continues to hold great potential for increasing collaboration between industry and research but this can only be achieved if it is a requirement that industry, whether part of a growth sector or not, is actively involved in the development of CRC and CRC-P proposals.

Industry should also be actively involved in the subsequent administration, governance and management of any partnership funded through the programme.

It is noted that CRC Programme funding has declined over time relative to the broader Commonwealth science, research and innovation (SRI) budget, with funding levels dropping from four per cent of the total SRI budget in 1998 to around three per cent in 2007 and 1.6 per cent in 2014–15.

Attracting more industry and research players

Currently the 35 CRCs reflect the sector-based funding trends since the programme's inception. Twenty-one are in the services sector, which includes medical science and technology, environment and ICT. The remainder are in agriculture, forestry and fishing (7), manufacturing (5) and mining (2).

Historically, health, medical and agricultural consortia have been particularly good at coming together for a shared purpose and making use of pre-existing collaborative partnerships to bring larger scale, more complex and risky propositions to the programme.

Pre-competitive projects more readily allow for openness to collaboration, as has been evident with the mining CRCs. Sectors where these conditions are not present may find shorter-term, bilateral collaborations more suitable, such as the initiatives offered under the Entrepreneurs' Infrastructure Programme and the recommended new CRC-P stream of the revised programme.

Currently all CRCs must have at least one Australian university participant. However, it is important that the expertise of the wider publicly funded research sector, including the publicly funded research agencies and medical research institutes, is encouraged to participate in the programme. Indeed both the *Boosting the Commercial Returns from Research* and the *Review to Strengthen Independent Medical Research Institutes* discussion papers point to the benefits of increased collaboration between industry and the broader research sector. The revised programme objectives expand the focus to encourage participation from the broader research sector.

Funding arrangements and participant contributions

The traditional CRC model has involved the requirement for matched funding from participants. The review supports the continuation of this approach for CRCs and CRC-Ps.

The current programme guidelines require all CRC participants to contribute resources including cash and/or in-kind contributions that in total must at least match the amount of CRC funding sought. This should be continued.

Industry and research partners should continue to match CRC Programme funding including a cash component from industry. Details of partner funding contributions should be negotiated and outlined in the revised programme guidelines.

The programme has demonstrated that it is a successful collaborative research model, and should be rolled out across government more broadly. This would encourage more collaborative research linked to the key policy challenges for government. To avoid duplication of administration, the Department of Industry and Science could provide central administration for policy initiatives funded by other portfolios on a fee-for-service basis. The review notes the administration of the Defence Future Capability Technology Centres (DFCTC) Programme uses this model and provides a good example of how it might be implemented across government.

Research Culture

The review received feedback from stakeholders that universities, and the CSIRO, were sometimes difficult to engage and 'unfriendly' to work with. Almost all submissions, and each consultation session, noted there was little incentive within universities to overcome the 'publish or perish' culture. Changing this culture could see more researchers engaging with industry.

As noted in the *Boosting the Commercial Returns from Research* strategy current funding mechanisms and policy settings – such as Australian Research Council and National Health and Medical Research Council competitive grants, research block grants and the Excellence in Research for Australia (ERA) initiative – provide strong motivation for universities to direct research effort toward producing peer-reviewed publications and winning competitive grants. These incentives are generally reflected in universities' recruitment, performance and promotion strategies.

Adjustment of incentives to develop a collaboration-friendly research culture in universities is being progressed through the strategy. If this is achieved, it will positively impact on the CRC Programme by encouraging more researchers to collaborate with industry. Continuing the programme with a revised focus is in step with this broader policy work and will help contribute to the government's policy objectives.

Industry-relevant research training

The role of CRCs in industry-focused research training and in producing research graduates who go on to obtain employment in industry is a valuable contribution to skills and capability development.⁴ A number of tailored training models, including ‘Balanced Scientist’ (Invasive Animals CRC), ‘Molecules to Medicine’ (Cancer Therapeutics CRC) and the ‘Industry Placement Award’ (CRC for High Integrity Pork Production) have been successful in responding to and supporting sectoral industry needs.

These research training strategies provide opportunities for PhD students to undertake professional skills development as part of their research, which helps to break down the cultural barriers between the research sector and industry and help deliver industry-ready graduates.

This element of the programme should be maintained. Consideration should be given to broadening these opportunities to work with industry partners in CRCs and CRC-Ps for students undertaking relevant vocational education and training and undergraduate courses.

⁴ 38 CRC graduates in 2012-13 found industry employment.
<http://www.industry.gov.au/innovation/reportsandstudies/Pages/NationalSurveyofResearchCommercialisation.aspx>

TERM OF REFERENCE D

How could contractual and administrative requirements of the CRC Programme be streamlined?

There is potential for streamlining across all aspects of the administration of the programme – from application and assessment to contracts and reporting.

Administrative changes have been made to the programme in recent years, particularly in the application and selection processes. Changes included the introduction of annual selection rounds, the impact tool, and moving from a three stage process to a two stage process.

This section of the report considers the following sub-questions of the terms of reference:

- are there elements of the programme guidelines that limit the ability for industry to effectively engage with researchers?
- is the current selection process excessively onerous on participants?
- 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?

Feedback from stakeholders during the review was mixed on the administration of the programme. Some stakeholders considered the selection process, particularly stage one, was burdensome and costly, and expressed frustration with inconsistencies in governance, IP and commercialisation arrangements. Others, however, suggested that the application and selection process was valuable in itself and that the impact tool was useful in defining the scope and activities for the research programmes.

A number of changes to the application, selection, governance, and intellectual property processes have been discussed previously in this report. This section looks at other aspects of managing the programme. A list of suggested improvements is also included at Part 3 Section 4.

Application and selection processes

While many stakeholders commented that the process was well established, robust and reasonable given the quantum of funding, there was an appetite for improving these processes. Comments focused particularly on the complexity and therefore cost of the process. One stakeholder noted that the early stages of the bid could be modified to require a short 'concept paper' and another suggested modifying the application process by dividing it into distinct stages, with assessment at each stage and guidance provided to applicants to assist them.

The review agrees that the application, selection, reporting and administrative requirements for the programme should be simplified and streamlined. In particular, the application process and selection criteria for CRCs and CRC-Ps should be designed to ensure greater industry involvement, drawing on existing expertise, and where possible using automated functions to minimise the administrative burden.

CRC applications should have a revised two stage assessment process that occurs annually:

- stage 1: A short online proposal. This approach aims to reduce the time, cost and resource burden on applicants.
- stage 2: If the Stage 1 application is successful, a full business case which meets the requirements as set out in the revised programme guidelines should be submitted.

CRC-Ps should undergo a single stage, online application process which is open to new applications up to three times a year.

The review expects that the government will conduct further consultation with stakeholders to determine the best approach to the processes recommended above.

In terms of selection criteria, applicants must currently address:

1. Research – The proposal will undertake excellent-quality research that addresses issues of economic, environmental and/or social significance to Australia;
2. Results – The outputs from the proposed research, when implemented, will deliver high levels of economic, environmental and/or social benefits to Australia; and
3. Resources – The proposed collaboration will marshal the appropriate participants and other resources necessary to achieve the proposed outputs.

The review recommends a recasting of the selection criteria in line with the revised programme objectives. Revised selection criteria should cover, as a minimum:

- how the proposed activities are in line with the revised programme objectives; and
- how the research and related activities will stimulate growth and lead to outcomes including, but not limited to: increased jobs, exports, productivity, integration into global supply chains, new technologies, products or services, increased revenues and intellectual property outputs such as patents.

In addition, for CRCs they should include:

- the research programme. This should be high quality, based on identified industry priorities and have clearly articulated and tangible goals, including commercialisation potential;
- the proposed management team. CRCs should have senior, ongoing roles filled by industry in addition to a Chair and CEO with the skills and experience required to lead an organisation with diverse participant needs and outcomes;
- an industry-focused education and training programme. This should build engagement, innovation and research and development capacity both in the industry and the research sectors; and
- the broader industry impact of the proposed activities.

While for CRC-Ps they should include:

- the research project, which should be based on an identified industry priority and have clearly articulated and tangible goals, including commercialisation potential;
- how the project will be managed;
- the industry participants and the business case for an industry-led research collaboration; and
- the broader industry impact of the proposed activities.

The role of the impact tool should also be considered in any revised process. The impact tool was the subject of a lot of stakeholder commentary during the review. The majority of comments argued that the impact tool was cumbersome, overly complex, time consuming and costly. One stakeholder noted that the impact tool is elaborate and has a strong conceptual basis, but because it is so rigidly structured and complex, most participants do not understand it and specialist consultants are needed to complete it at significant cost. Some stakeholders, on the other hand, argued that the impact tool is a useful component of the process and makes applicants carefully consider the merits of all aspects of their planned activities and leads them towards selecting a robust portfolio of projects.

The review recognises the value of the impact tool but opportunities for streamlining and improving its usability should be considered as part of the revision of the guidelines arising from this review.

Advisory committee

Currently, the CRC Programme is supported by an advisory committee known as the CRC Committee. The role of the CRC Committee is to provide recommendations to the Minister about:

- applications for CRC funding;
- performance, monitoring and reviews of individual CRCs' activities during their period of operation; and
- the planning, monitoring and evaluation of the CRC Programme.

The CRC Committee can have up to 14 members, including an independent Chair, nine other independent members appointed by the Minister for a period of up to five years, and four ex-officio members.

The programme guidelines also state that in selecting the independent members, the Minister may take into account the need for a broad range of expertise relevant to the needs of the programme in research, education, utilisation, research management, industry and other end-users.

The review recommends that a new, smaller (up to nine members) advisory group be established. While the current CRC Committee has served the programme well, the changes to the objectives and activities necessitate a new advisory group with a strong focus on industry expertise, management capabilities and research commercialisation skills. Such a committee would also be in line with the government's approach to reducing the size and number of government boards and committees.

The process of assessing applications for CRC funding has, over the years, become a complex and time-consuming process, and even with the recommendations contained in this report will continue to be an important process to ensure the ongoing integrity of the programme and proper expenditure of commonwealth funds.

Proper assessment of CRC and CRC-P applications will require:

- rigorous assessment of the merits of the application having regard to the revised objectives;
- application of a diverse range of skills and expertise familiar with the proposed area of the collaborative research project; and
- a transparent process that ensures independence in decision making.

In addition, the new advisory group will need to oversee and review the existing CRCs and monitor the progress towards objectives of future approved applications.

While mindful of the recommendations contained in this review to give priority to Growth Centre initiatives, the advisory group will need to be cognisant of broader objectives, such as those outlined by the Chief Scientist-national goals, comparative advantage, critical need, scale and ability to achieve change.

During the course of consultations, issues were raised about the proposed involvement of Growth Centres in the CRC application process if the programme were to continue.

The review believes there may be limited scope for the Growth Centres to participate in the application and decision-making process (see Recommendation 4) however, where a Growth Centre is involved in assembling the consortia, assisting or driving the application, independent review will be an imperative.

Performance data

To assist with assessing the success of the programme while limiting administrative and reporting burden on CRCs, wherever possible performance data should be collected through the routine programme data collections or other existing data sources. Existing data sources may include IP Australia's Analytics Hub and the National Survey of Research Commercialisation.

Performance of existing CRCs

All current CRCs should be reviewed by the new advisory committee to ensure they are performing in accordance with their funding agreement and are likely to deliver against their stated outcomes, as well as to determine any potential linkages with the Growth Centres. Those which are not performing should be considered by the Minister for termination in accordance with their funding agreements.

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?

There is demand for a collaborative research programme from the industry and research sectors, and Australia needs it to drive innovation and economic development.

The review has considered the structure of the Australian economy and explored demand within the research sector and industry for the CRC Programme. This includes consideration of the following sub-questions from the terms of reference:

- what is the pattern of demand for the programme from within industry and universities/other research organisations over the past 10 years?
- if there are changes to demand, why have they occurred and how could they be addressed?
- 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?

Programme demand

Stakeholders clearly articulated a demand for the programme to build collaborative structures that facilitate industry-driven research.

This view is confirmed by programme data trends.

Demand for the programme has remained relatively consistent over the 25 years of its operation. This is evidenced by the number of applications received, with 744 applications submitted to the programme since it began, including 221 over the last 11 years (2004-2014). A typical selection round receives approximately 20 applications and in the majority of rounds there are more CRC applications ranked suitable for funding than there is funding available.

Demand exists across all organisation types including industry, universities, Australian Government and state and territory governments. Programme data shows that

the ratio of participant contributions to the grant requested has increased by 12 per cent over the period from 2008 to 2014, indicating that participants see the programme as worthwhile and are willing to commit increasing resources to CRCs.

Industry/private sector organisations are the most highly represented partnering organisation type in the CRC Programme. Average contributions from industry/private sector organisations (cash and in-kind) have generally increased over the period 2008 to 2014, further demonstrating increased industry demand.

The programme has also been attracting new entrants in recent years. Since 2008, on average, 47% of all participants in CRC applications in each selection round have been new to the programme.

It was disappointing that there was little input from large businesses to this review. While the Minister for Industry and Science wrote to over one hundred large businesses across Australia, fewer than ten responded. Similarly, few requested individual meetings and there was little representation from this cohort at the open information sessions. Those that did engage suggested that there was little demand from them as they tended to undertake and/or commission their own research as required. Large firms indicated that they had a sound understanding of the research capacity in Australia, and overseas, and sourced what skills and expertise they required as needed. That said, these firms also indicated that they see value in participating in CRCs where the area of research is high risk, pre-competitive, or of potential future interest to the business.

Those large businesses that did provide input to the review also commented on the importance of the programme to increasing the innovation capacity of SMEs.

Australian economy

The *Australian Industry Report 2014* shows the Australian economy is driven by small and medium enterprises (SMEs), which are defined by the Australian Bureau of Statistics (ABS) as businesses employing less than 200 people. The ABS collects employment and other data across 18 different industry sectors, and on average almost two-thirds of all Australian jobs, or more than 7.2 million in 2012-13, are in SMEs.⁵

Business expenditure on R&D, on the other hand, is mostly concentrated in large firms, and even further concentrated in three industry sectors – Mining, Manufacturing and Professional, Scientific and Technical services. ABS data for 2011-12 shows that these three sectors are responsible for more than 60% of private sector R&D expenditure and a similar proportion of private sector human resources dedicated to R&D.⁶

However, most of Australia's R&D workforce is employed in universities and publicly funded research agencies.⁷

This is one of the particular characteristics of the Australian economy: the public sector accounts for less than 40% of gross expenditure on R&D but employs almost 60% of the research workforce, whereas the private sector is responsible for more than 60% of gross expenditure on R&D but only about 40% of the research workforce.

Figure 3: Research workforce by broad sector, 2008-09

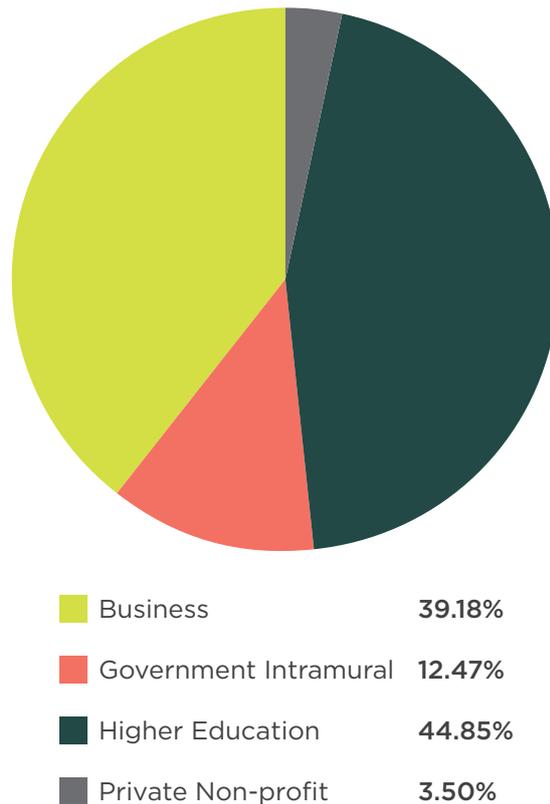
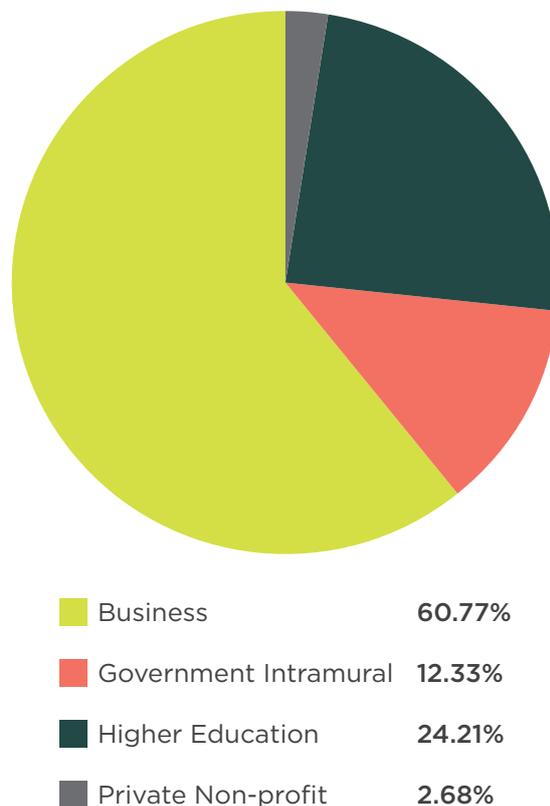


Figure 4: Research expenditure by broad sector, 2008-09



⁵ ABS, 8155.0 - Australian Industry, 2012-13

⁶ ABS, 8104.0 - Research and Experimental Development, Businesses, Australia, 2011-12

⁷ ABS, 8112.0 - Research and Experimental Development, All Sector Summary, Australia, 2008-09. This is the most recent period for which an all-sector summary is available; the balance of human resources and expenditure across different sectors is unlikely to have changed much in the past six years.

In many ways, this mismatch between expenditure and capabilities should be a strong driver for collaboration between industry and research. Yet this is an area where Australia continues to perform poorly.

The major challenge for Australia, given the overall shape of the economy and innovation sector characteristics, is to encourage more innovative activity in, and more collaboration by, industry, especially SMEs. In particular, according to the *Australian Innovation System Report 2014*:

More systemic strategies may be needed to encourage the innovation system to function more effectively, such as encouraging a management culture shift in Australian firms to one of external orientation and providing stronger incentives for the university sector to engage with industry.

The message repeated by stakeholders was that the CRC Programme provides both an important opportunity and a driver for collaboration between industry and research that is not present elsewhere in the range of Australian and State or Territory Government programmes, but that even greater industry focus in the programme would be beneficial. A table of government programmes currently available is at Part 3 Section 5. The review concurs with the feedback received that none of the other programmes provide the same kind of collaborative opportunities and incentives as the CRC Programme.

The recommended changes to sharpen the focus of the programme will provide clarity and direction for potential CRC Programme applicants, moving to 'industry' being the focus of the programme, instead of the more ephemeral 'end-users'. This is in line with the government's broader approach to industry and research policy through the *Industry Innovation and Competitiveness Agenda* and the *Boosting the Commercial Returns from Research* strategy, where greater collaboration and interaction between research and industry is a key goal.

PART 3: BACKGROUND AND PROCESS

1. Review process

This section of the report covers the review process including:

- the approach and processes used in this review;
- Terms of Reference; and
- a list of consultations and submissions.

1.1 Approach to this review

This review of the Cooperative Research Centres (CRC) Programme was announced on 16 September 2014. The Minister set terms of reference and appointed Mr David Miles AM to lead an independent assessment of the programme against these terms of reference.

This review is part of the five-yearly schedule of reviews of Australian Government programmes, but is also an important opportunity to look at whether the programme is the most appropriate vehicle to support business and researchers to work together to develop and transition to Australia's industries of the future. The terms of reference reflect this focus.

The review has been conducted in the context of the government's *Industry Innovation and Competitiveness Agenda*.

1.2 Terms of Reference

The Terms of Reference for this review were:

The objective of the Cooperative Research Centres (CRC) Programme has been to deliver significant economic, environmental and social benefits to Australia by supporting end-user driven research partnerships between publicly funded researchers and end-users to address clearly articulated, major challenges that require medium to long-term collaborative efforts.

Australia's prosperity depends on our ability to transform and modernise our economy. The 25th anniversary of the launch of the CRC Programme is approaching. At this juncture it is timely to consider whether the CRC Programme is the most appropriate vehicle to support business and researchers to work together to develop and transition to Australia's industries of the future.

In addressing the terms of reference below, the review will examine other Australian and international approaches to supporting end-user driven research partnerships that drive industry growth and competitiveness. The review will also consider the content of the Commission of Audit reports, particularly in relation to research, development and innovation.

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?

- Does the CRC Programme effectively encourage and facilitate industry and the research sector to work together to:
 - solve problems for business;
 - help industries adapt to change; and
 - improve economic outcomes for the nation?
- How should the objective of the programme be articulated so as to best convey the Government's priorities for applied science and research?
- 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?

B. How can the government's investment in the CRC Programme better deliver outcomes for industry?

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

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?

- Does the CRC Programme encourage industry and the research sector to work together in new ways or engage new players?
- Does the programme encourage universities to make a cultural change from focusing on publishing to focusing on collaboration and commercialisation?
- Is the education and outreach element of CRCs addressing the workforce needs of industry and the research sector?

D. How could contractual and administrative requirements of the CRC Programme be streamlined?

- Are there elements of the programme guidelines that limit the ability for industry to effectively engage with researchers?
- Is the current selection process excessively onerous on participants?
- 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?

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

- What is the pattern of demand for the programme from within industry and universities/ other research organisations over the past 10 years?
- If there are changes to demand, why have they occurred and how could they be addressed?
- 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?

The review should also take into account the Department of Finance's Expenditure Review Principles, which can be found at the [Department of Finance's website](#).

1.3 Process used in this review

This review provided a range of opportunities for stakeholder input including information sessions, meetings with the review leader and departmental staff and submissions to the discussion paper.

Stakeholders were provided with the opportunity to register their interest in the review via the review website <http://www.business.gov.au/grants-and-assistance/Collaboration/CRC/CRC-Programme-Review/Pages/default.aspx>. A discussion paper was released on 21 October 2014 and made available on the review website and emailed to registered stakeholders.

In addition to the discussion paper, information sessions were arranged in selected capital cities, as well as one-on-one meetings with the review leader or departmental officials. These sessions provided an opportunity for stakeholders to clarify the discussion paper questions, provide feedback on particular

aspects of the CRC Programme and, more generally, talk about ways to improve business research collaboration in Australia.

Information sessions were conducted in Adelaide (27 October), Melbourne (28 October), Sydney (29 October), Brisbane (30 October) and Canberra (5 November) with on average 40 people attending each session.

The review leader conducted 54 individual meetings with key research and industry stakeholders to hear their views about the programme.

Responses to the discussion paper were submitted online via the Department of Industry and Science consultation hub and through email at crcreview@industry.gov.au. Submissions closed on 11 November 2014 and 251 formal submissions were received.

All submissions were reviewed by the review leader and departmental staff and were taken into account when preparing this report.

1.4 List of individual meetings

Date of meeting	Organisation
13/10/2014	Bushfire & Natural Hazards CRC
13/10/2014	Australian Research Council
13/10/2014	National Health and Medical Research Council
27/10/2014	Contamination Assessment and Remediation of the Environment CRC
27/10/2014	Cell Therapy Manufacturing CRC
27/10/2014	Australian Technology Network
27/10/2014	Department of State Development (South Australia)*
27/10/2014	Innovation Australia Board
27/10/2014	South Australian Research and Development Institute
28/10/2014	CRC for Polymers
28/10/2014	Young and Well CRC*
28/10/2014	Cancer Therapeutics CRC*
28/10/2014	Monash University
28/10/2014	Australian Academy of Technology, Science and Engineering
28/10/2014	Defence Materials Technology Centre
28/10/2014	Innovative Research Universities*
28/10/2014	Minerals Council of Australia
29/10/2014	Deep Exploration Technologies CRC
29/10/2014	Energy Pipelines CRC*
29/10/2014	Cochlear Limited
29/10/2014	Glencore
29/10/2014	Orica
29/10/2014	Advanced Composite Structures Australia Pty Ltd*
29/10/2014	Professor Mary O'Kane
30/10/2014	CRC for High Integrity Australian Pork
30/10/2014	Wound Management Innovation CRC

Date of meeting	Organisation
30/10/2014	Queensland State consortia comprised: <ul style="list-style-type: none"> ■ Department of Science, Information Technology Innovation and the Arts ■ Department of Agriculture, Fisheries and Forestry ■ Department of Energy and Water Supply ■ Department of Education and Training ■ Department of State Development, Infrastructure and Planning ■ Department of Natural Resources and Mines ■ Public Safety Portfolio (Emergency Management, Rural Fire Service Queensland / Queensland Fire and Emergency Services and Public Safety Business Agency)
30/10/2014	43pl
30/10/2014	Siemens Hearing Instruments
30/10/2014	Fraunhofer Institute
04/11/2014	Defence Science Technology Organisation
05/11/2014	META
05/11/2014	Cooperative Research Centres Committee
06/11/2014	Cooperative Research Centres Association
07/11/2014	Australian Antarctic Division
07/11/2014	Committee for Economic Development of Australia
07/11/2014	CSIRO
10/11/2014	University of Melbourne
11/11/2014	Australian Chamber of Commerce and Industry
11/11/2014	Queensland Chief Scientist
11/11/2014	Regional University Network
12/11/2014	Attorney General's department (Australian Government)
12/11/2014	Council of Small Business of Australia
12/11/2014	Group of Eight
13/11/2014	Australian Manufacturing Technology Institute Limited
13/11/2014	BHP
13/11/2014	Australian Industry Group
09/12/2014	Federal Ministry of Education and Research (Germany)
15/12/2014	Aurizon*
04/02/2015	Sirca*
05/02/2015	Department of Agriculture* (Australian Government)
10/02/2015	Department of Primary Industries (NSW)*
25/02/2015	CRC Committee chair
02/03/2015	ALS Global*

*meeting conducted by review secretariat on behalf of review leader

1.5 List of submissions

Submission Number	Organisation/Individual
1	Royal Australian Chemical Institute
2	Poultry CRC
3	Monax Mining Ltd
4	Winemakers Federation of Australia
5	Hunter Medical Research Institute
6	YNDK Pty Ltd
7	Energy Pipelines CRC
8	CSIRO Staff Association
9	Hear and Say
10	The Shepherd Centre
11	CRC for Sheep Industry Innovation
12	Piper Alderman
13	Bruce Grey
14	Children's Cancer Institute
15	Kansas State University
16	Australian Council of Engineering Deans
17	University of New England
18	Ian Pitman
19	Association of Australian Medical Research Institute
20	CRC for Low Carbon Living
21	Walter and Eliza Hall Institute
22	Nasdaq
23	City of Nedlands
24	University of Western Sydney
25	University of Wollongong
26	CRC for Low Carbon Living
27	Nathan Bindoff
28	University of Tasmania
29	Murdoch University
30	James Rowe
31	EW Group
32	Bioproperties Pty Ltd
33	Poultry CRC
34	Data to Decisions CRC
35	Bushfire CRC
36	Energy Pipelines CRC
37	GPA Engineering
38	Professional Scientists Australia
39	Office of Science and Research within NSW Trade & Investment
40	Australian Pipeline Industry Association
41	Hatch Pty Ltd
42	Australian Small Business Commissioner
43	Jim Arthur
44	ACT Parks and Conservation
45	Boart Longyear
46	Mark Merritt
47	GC Australasia
48	Department of Conservation – NZ

Submission Number	Organisation/Individual
49	CRC for Cell Therapy Manufacturing
50	Athersys
51	Terumo BCT
52	NSW Bushfire and Rescue
53	Finisar Australia
54	Clinical Genomics
55	CRC for Mental Health
56	Australian Pork Farms Group
57	Charles Sturt University
58	City of Kingston
59	George Raitt
60	CRC for Spatial Information
61	HiSeis
62	Nicholas Gough
63	WA Fishing Industry Council Inc
64	B.F. Grey
65	CRC for Contamination Assessment and Remediation of the Environment
66	Wildlife Health Australia
67	Origin Energy
68	Department of Agriculture and Food (WA)
69	Australian Council of Engineering Deans
70	Fugro ROAMES Pty Ltd
71	Smith and Nephew Medical Inc.
72	Wound Management Innovation CRC
73	KCI
74	Calamvale Medical Centre
75	The Bethanie Group
76	Ego Pharmaceuticals
77	AbRegen Pty Ltd
78	World of Wounds
79	Greater Metro South Brisbane Medicare Local
80	Gallipoli Medical Research Foundation
81	Northern Melbourne Medicare Local
82	Francis Abourizk Lightowlers
83	Royal District nursing Service
84	Blue Care
85	Silver Chain Group
86	Queensland University of Technology
87	Garden City Medical Centre
88	North Coast NSW Medicare Local
89	Acelity
90	International Water Centre
91	Vale Exploration Canada Inc.
92	Glennwarrie Partnership
93	Deep Exploration Technologies CRC
94	PanoptiCrypt Pty Ltd
95	RMIT University
96	Group of Eight
97	Australian Wound Management Association
98	University of New England
99	University of South Australia

Submission Number	Organisation/Individual
100	Mondeléz International
101	Dr Katherine Woodthorpe
102	Antarctic Climate and Ecosystems CRC
103	Australian Institute of Petroleum Ltd
104	Teakle Composites
105	SYNthesis Research
106	Australian Food and Grocery Council
107	Australian National University
108	WoolProducers Australia
109	CRC for Polymers
110	BASF Australia Ltd
111	Bluescope Steel Limited
112	iGlass Pty Ltd
113	Integrated Packaging Australia Pty Ltd
114	City of Karratha
115	pitt&sherry
116	GHD
117	Erica Smyth
118	Eastern Metropolitan Regional Council
119	Research Directions Pty Ltd and Consultant
120	Curtin University
121	Tasmanian Polar Network
122	Bushfire and Natural Hazards CRC
123	Jacobs Australia
124	Water Research Australia Limited
125	City of Melbourne
126	Automotive Australia 2020 CRC
127	Australian Pork Limited
128	CRC for Water Sensitive Cities
129	Department of State Growth (TAS)
130	Autism Aspergers Advocacy Australia
131	43pl Chairman
132	Minotaur Exploration
133	Melbourne Water
134	Attorney-General's Department (Australian Government)
135	VPAC Innovations
136	Minerals Council of Australia
137	Australian Antarctic Division
138	CRC for Remote Economic Participation
139	Marrickville Council
140	CRC for High Integrity Australian Pork
141	Australian Academy of the Humanities
142	City of Port Phillip
143	Murdoch Childrens Research Institute
144	The University of Queensland
145	E2Designlab
146	Walter and Eliza Hall Institute
147	AMIRA International
148	Edith Cowan University
149	Griffith University
150	Australian Academy of Science

Submission Number	Organisation/Individual
151	Lowitja Institute CRC
152	43pl Company Submissions
153	Ergon Energy
154	CRC for Cancer Therapeutics
155	Department of Parks and Wildlife (WA)
156	Oral Health CRC
157	Australian Technology Network of Universities
158	Thales Australia Limited
159	Department of Defence
160	Department of Environment, Water and Natural Resources, Fire Management Unit (SA)
161	APA Group
162	Research Australia
163	Deakin University
164	City of Greater Geraldton
165	Young and Well CRC
166	Queensland University of Technology
167	La Trobe University
168	CRC for Living with Autism Spectrum Disorders
169	Australian Advisory Board on Autism Spectrum Disorders
170	Autism Spectrum Australia
171	Autism WA
172	Robert van Barneveld
173	South East Water
174	Warringah Council
175	Knox City Council
176	University of Sydney
177	CRC for Advanced Composite Structures
178	James Cook University
179	FAL Lawyers
180	CRC for Optimising Resource Extraction
181	Invasive Animals CRC
182	Australian Dental Association
183	NSW Rural Fire Service
184	Paul Hopkins
185	Universities Australia
186	Australian Fire and Emergency Service Authorities Council
187	Southern Cross University
188	Charles Darwin University
189	CRC Association
190	Advanced Manufacturing CRC
191	Central Queensland University
192	Strategic Project Partners
193	ACT Emergency Services Agency
194	Stephen Prowse
195	Department of Health (VIC)
196	Twitter Australia
197	SMR Automotive Australia Pty Limited
198	Futuris Automotive Interiors (Australia) Pty Ltd
199	Suncorp
200	Precision Pastoral
201	Wendy Kiefel

Submission Number	Organisation/Individual
202	Flow Systems
203	Australian Superfine Wool Growers Association
204	Helen Cathles
205	Barrick Gold Corporation
206	Tasmania Fire Service and Tasmania State Emergency Service
207	Rangeland NRM Alliance
208	University of Newcastle
209	University of New South Wales
210	Abalone Council Australia Ltd
211	Australian Industry Group
212	National Farmers' Federation
213	Insight GIS
214	Whelans Australia
215	Dr Laurie Hammond
216	National Disability Services
217	Australian Institute of Marine Science
218	Academy of Technological Sciences and Engineering
219	ResMed Inc
220	Innovative Research Universities
221	Brazier Motti
222	Brien Holden Vision Institute
223	Scolexia Pty Ltd
224	Peter Andrews
225	Crispin Smythe
226	Australian Abalone Growers Association
227	Sydney Fish Market
228	Australian Research Council
229	University of Melbourne
230	Oysters Australia
231	Sheepmeat Council of Australia
232	CRC for Greenhouse Gas Technologies (CO2CRC)
233	Orica
234	Stormwater Australia
235	Dairy Australia
236	CSIRO
237	Neville Sawyer
238	Thomas Foods International
239	Innovation Australia
240	Swan River Trust
241	AusNet Services
242	Western Australian Government
243	Cell Therapies Pty Ltd
244	South Australian Government
245	Medical Technology Association of Australia
246	Department of Environment and Primary Industries (VIC)
247	Murdoch University
248	CRC Committee
249	Brookfield Multiplex Australasia
250	Sirca
251	Queensland Government

2. Background of the CRC Programme

This section of the report provides background information on the CRC Programme to date including:

- key facts and figures;
- overview of previous reviews and evaluations; and
- summary of changes to the programme.

2.1 Introduction

The CRC Programme is an Australian Government competitive, merit based grant programme designed to deliver significant economic, environmental and social benefits to Australia by supporting end-user driven research partnerships between publicly funded researchers and end users to address major challenges that require medium to long-term collaborative efforts. CRCs pursue solutions to these challenges that are innovative, of high impact and capable of being effectively deployed by end-users.

The CRC Programme was established in 1990, having been designed by the then Australian Chief Scientist, Professor Ralph Slatyer to:

- link advances in science and technology as effectively as possible to applications in industry and other sectors such as health and environment;
- overcome the difficulties arising from Australia's scientific and technological resources being dispersed geographically and institutionally, by establishing concentrations of researchers and critical mass of resources;
- strengthen the interaction between government research agencies and the private sector; and
- ensure Australia's science and technology graduate and postgraduate students have experience both in research and in linking research to its eventual use.

Since its establishment, the CRC Programme has been one of the main policy instruments for encouraging high quality, medium to long term collaborative research in Australia. The CRC Programme objectives sought to link advances in science and technology with their eventual application in industry and in other areas of national interest. The collaborative, public-private partnership model of the CRC Programme was designed to maximise the benefits from investment in publicly funded research⁸.

The CRC model aims to bring together researchers and end users to facilitate the generation of outcomes from high quality, user-oriented research. In 2013, a priority public good funding mechanism was established for CRCs to deliver outcomes and impacts that benefit the broader community and society as a whole, rather than being captured exclusively by private or industry interests.

The programme has delivered benefits to Australia, including: directly contributing to improving skills and expanding research capacity; increasing innovation in business, government, research and the community sector; and boosting Australia's domestic and international collaborations.

2.2 Key facts and figures

2.2.1 INDUSTRY PARTICIPATION IN CRCS

A total of 209 CRCs have been funded since 1991 including 1,905 participants. Of these, 883 have been involved as Essential Participants (organisations essential to the activities of the CRC, usually end-users and universities) and 1,022 as Other Participants (other organisations contributing to the activities of the CRC). Of the 1,905 participants, 1,277 (67%) are industry participants:

■ Industry Private sector – Large	328
■ Industry Private sector – Medium	272
■ Industry Private sector – Small	262
■ Industry Private sector – unspecified	383
■ Industry Association	32

2.2.2 PATENTS FILED AND HELD BY CRCS

Over the life of the programme, there have been 1,936 patent applications, and 12,684 patents held, including patents in Australia and overseas.

2.2.3 PUBLICATIONS

A total of 36,434 journal articles and 42,838 end-user reports have been published from CRC research.

2.2.4 PHD GRADUATIONS AND EMPLOYMENT

PhD students are central to CRC research as well as to building industry capability. On average, over the life of the programme, a CRC has had 21.5 active PhD students in any given year. Over the life of the programme, over 3,600 PhD graduates have been produced.

Recruitment of PhD graduates into industry is a key objective of the CRC model. Of 2,008 CRC PhD graduates in the period 2003-04 to 2012-13, 1,755 (87%) found employment with end-users or other industry organisations.

2.2.5 DEMAND FOR THE PROGRAMME

A total of 744 applications have been submitted since 1991, 221 over the period 2004 to 2014. The programme continues to attract new participants. Over the period 2008 to 2014 (selection rounds 11 to 17):

- 47% (1,551 of 3,298) of all participants in CRC applications in each selection round are new to the programme;
- 66% (898 of 1,365) of all industry participants in applications are new (ranging from 47% to 82% over this period); and
- 80% (290 of 362) of all international participants in applications are new.

Many participants return to the programme and collaborate with more than one CRC. The CSIRO, for instance, has collaborated with over 150 CRCs. This demonstrates that partnering organisations get significant benefits from being part of a CRC.

2.3 Overview of previous reviews and evaluations

The programme has been subject to four specific reviews (Myers Report, 1995; Mercer and Stocker, 1997; Howard Partners, 2003; and O’Kane, 2008). The programme was also reviewed as part of a wider review of business programmes by David Mortimer in 1997, Robin Batterham in 2000, and examined in some detail by the Productivity Commission in its 2007 research report on science and innovation.

A number of economic studies have also been conducted – Allens Consulting in 2005, Insight Economics in 2006 and Allens Consulting Group in 2012. The most recent formal programme review was carried out by Professor Mary O’Kane.

O’KANE REVIEW (2008)

The Australian Government commissioned Professor Mary O’Kane to conduct a review of the CRC Programme in 2008 as part of the wider 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 O’Kane review noted that the CRC Programme is an iconic programme replicated in other countries.

The review made eight overarching recommendations. Proposed changes such as increases in funding, the reinstatement 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 four 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.

8. Background paper on CRC Programme, March 2008, Commonwealth of Australia, Canberra

2.4 Summary of changes to the programme

When first established in 1990, the CRC Programme encouraged both industry outcomes and public good research. The research was intended to contribute to national objectives, such as the development of internationally competitive industry sectors, the health and well-being of Australian society and the understanding and management of the environment.

The first three rounds of the CRC Programme funded basic research and the programme objectives included 'the maintenance of a strong capability in basic research'. Basic research generally does not lead to commercial outcomes in the short or even medium term. It can build research capability, lead to the identification of new or more fruitful avenues of research, or build preparedness for a community to deal with major health, security, environmental challenges or other challenges.

From 1994 the reference to 'basic research' was dropped, and 'strengthening of research networks' and the 'active involvement of users in the management of Centres' were included. Otherwise the overall objectives remained similar. From 2000, 'innovation' and 'environmental benefit' were specifically included in the objectives.

For the first eight rounds, the CRC Programme selection documentation made it clear that CRCs should have a mixture of strategically focussed long-term, high quality research of a pre-competitive nature and shorter-term more tactical elements, the results of which will lend themselves more directly to application or commercialisation.

The objectives of the programme were more sharply focused on commercialisation from 2004, reflecting the government's increasing focus to encourage the translation of research outcomes. This change towards supporting industrial, commercial and economic imperatives in the innovation process occurred both in Australia and internationally.

For the 2004 and 2006 rounds, applications for funding could still include public good research, however, their competitiveness was judged on the basis of their commercially focused research proposal(s). Public good research could be included, but as an 'add-on' or subsidiary to commercially oriented research proposals.

The current objective of the programme is:

'to deliver significant economic, environmental and social benefits to Australia by supporting end-user driven research partnerships between publicly funded researchers and end-users to address clearly articulated, major challenges that require medium to long-term collaborative efforts.'

In terms of selection criteria, these remained broadly consistent for the CRC selection rounds from 1991 to 1996. In 1996 there were 12 criteria applied to the assessment of applications, grouped into five categories. In 1998 there were 19 criteria, grouped into seven categories. In 2000 and 2002 there were nine criteria in eight categories. In 2004 and 2006 there were four stand-alone criteria, addressing the objective of the programme. Since 2008 these were reduced to three criteria, which are directly linked to the revised objective of the programme.

3. List of Active CRCs

CRC Name	Objective	Sector	Funding period start	Funding period end	Duration (years)	Funding (\$m)
Antarctic Climate and Ecosystems CRC	To address key scientific questions, including how Antarctica drives global climate, and how the pace and nature of change in Antarctic climate and ecosystems will affect the wellbeing and economic interests of Australians.	Services	1/07/2014	30/06/2019	5	25.00
Automotive Australia 2020 CRC	To tackle the complex problems that currently impede the uptake of low emission vehicles worldwide, such as the technological and social barriers to the uptake of gaseous fuels in cars and trucks, and producing greener vehicles and components more competitively.	Manufacturing	1/07/2012	30/06/2017	5	26.00
Bushfire and Natural Hazards CRC	To conduct research to reduce the risks from bushfire and natural hazards; reduce the costs of disasters; contribute to the national disaster resilience agenda; build research capacity and capability; and enable Australian SMEs to be innovative in natural hazard products and services.	Services	1/07/2013	30/06/2021	8	47.00
Capital Markets CRC	To conduct applied research that will enhance capital market integrity and efficiency.	Services	1/07/2014	30/06/2019	5	32.35
CRC for Advanced Composite Structures	To embed Australian composites industry SMEs into global supply chains by attracting multinational businesses, undertaking collaborative research with Australian researchers and SMEs, and building reliance on Australia's proven capability for major technological advancement.	Manufacturing	1/07/2010	30/06/2015	5	14.00
CRC for Alertness, Safety and Productivity	To develop new tools and products to improve alertness, increase productivity and enhance safety, to boost productivity and lower health system costs by reducing the incidence of motor vehicle and workplace accidents and errors.	Services	1/07/2013	30/06/2020	7	14.48
CRC for Cancer Therapeutics	To build on the drug-discovery engine it has already created to discover effective new drugs for major cancers and improve the lives of Australian children with cancer through tailored and personalised treatment.	Services	1/07/2014	30/06/2020	6	34.01
CRC for Cell Therapy Manufacturing	To increase the affordability and accessibility of cell therapies and position Australia in the vanguard of cell therapy manufacture.	Manufacturing	1/07/2013	30/06/2019	6	20.00
CRC for Contamination Assessment and Remediation of the Environment	To undertake research, develop technologies and provide policy guidance for assessing, cleaning up and preventing contamination of soil, water and air.	Services	1/07/2011	30/06/2020	9	29.10
CRC for High Integrity Australian Pork	To address the major challenge the Australian pork industry's faces in maintaining local production of high quality food for a reasonable price without negatively impacting pig welfare, the environment, or the health of the consumer.	Agriculture, Forestry and Fishing	1/07/2011	30/06/2019	8	19.86
CRC for Living with Autism Spectrum Disorders	To undertake innovative research to directly improve the lifetime prospects of individuals with Autism Spectrum Disorders (ASD); provide guidance, support and direction for their families; and enable medical practitioners, educators, therapists, support workers and employers to work effectively with people with ASD.	Services	1/07/2013	30/06/2021	8	31.00
CRC for Low Carbon Living	To provide government and industry with technological and policy tools to overcome identified market barriers which are preventing the adoption of cost effective low carbon products and services.	Services	1/07/2012	30/06/2019	7	28.00

CRC Name	Objective	Sector	Funding period start	Funding period end	Duration (years)	Funding (\$m)
CRC for Mental Health	To undertake research to identify and validate biomarkers for the early detection and treatment of neurodegenerative disorders such as Alzheimer's and Parkinson's diseases and psychoses including schizophrenia and mood disorders.	Services	1/07/2011	30/06/2018	7	23.11
CRC for Optimising Resource Extraction	To transform the methods used by Australia's mining and minerals industry to evaluate and extract mineral deposits. The CRC will develop technology which will enable selective mining in high tonnage operations with potentially a significant reduction in capital expenditure and energy consumption.	Mining	1/07/2010	30/06/2015	5	17.50
CRC for Polymers	To establish Australian manufacturing as a leading provider and exporter of products that meets emerging global needs in three areas: health therapies and delivery; water and food security; and low-cost solar energy, using enabling and sustainable advanced polymer technology.	Manufacturing	1/07/2012	30/06/2017	5	14.50
CRC for Rail Manufacturing	To develop products, technologies and supply chain networks to increase the capability and globally competitive position of the rail industry.	Manufacturing	1/07/2014	30/06/2020	6	31.00
CRC for Remote Economic Participation	To deliver solutions that address social and economic disadvantage in remote Australia and contribute to the Australian Government's 'Closing The Gap' policy, which aims to halve the unemployment, welfare and other forms of disadvantage experienced by Indigenous people living in remote areas.	Services	1/07/2010	30/06/2017	7	32.50
CRC for Sheep Industry Innovation	To enhance sheep wellbeing and productivity, value-based trading of sheep meat and deliver affordable technologies to transform the Australian sheep industry.	Agriculture, Forestry and Fishing	1/07/2014	30/06/2019	5	15.50
CRC for Spatial Information	To create a coordinated national network of satellite system reference stations; undertake research into the establishment of an Australian and New Zealand spatial information market place; and automate the production of essential spatial information products and combine existing data stores with the rapidly increasing stream of data from earth observation satellites.	Services	1/01/2010	30/06/2018	8	32.19
CRC for Water Sensitive Cities	To deliver the socio-technical urban water management solutions, education and training programs, and industry engagement required to make towns and cities water sensitive.	Services	1/07/2012	30/06/2021	10	30.00
Dairy Futures CRC	To develop new approaches to selective breeding of both pasture and cattle to build a more resilient and profitable dairy industry.	Agriculture, Forestry and Fishing	1/01/2010	30/06/2016	6	27.72
Data to Decisions CRC	To develop robust tools to maximise the benefits that Australia's defence and national security sector can extract from big data to reduce national security threats.	Services	1/07/2014	30/06/2019	5	25.00
Deep Exploration Technologies CRC	To develop new technologies that respond to significant future challenges in the Australian mining industry including: exploring to greater depths in the vast areas of Australia's deep covered prospective basement; and reducing the mineral resources inventory due to high production rates and low mineral exploration success.	Mining	4/02/2010	30/06/2018	8	28.00

CRC Name	Objective	Sector	Funding period start	Funding period end	Duration (years)	Funding (\$m)
Energy Pipelines CRC	To provide the Australian energy pipeline industry with the technology necessary to extend the life of the existing ageing natural gas transmission network and to build the new networks necessary to support increased demand for natural gas.	Services	3/02/2010	30/06/2019	10	17.48
Invasive Animals CRC	To counteract the environmental, social and economic impacts of invasive animals through the development and application of new technologies and by integration of strategic pest management approaches across agencies and jurisdictions.	Agriculture, Forestry and Fishing	1/07/2012	30/06/2017	5	19.70
Oral Health CRC	To undertake research to address the substantial national economic and social burden of oral disease and disorders. The research will include development of early diagnostics, new preventative strategies and products and oral health promotion programmes.	Services	4/02/2010	30/06/2018	8	30.25
Plant Biosecurity CRC	To develop and deploy knowledge and tools to provide the scientific support essential for safeguarding Australia from the economic, environmental and social consequences of damaging pest incursions.	Agriculture, Forestry and Fishing	1/07/2012	30/06/2018	6	29.65
Poultry CRC	To conduct research and drive education and training to help Australia's poultry industry achieve sustainable, ethical poultry production in the face of population growth and climate change.	Agriculture, Forestry and Fishing	4/02/2010	30/06/2017	7	27.00
Seafood CRC	To assist the seafood industry to profitably deliver safe, high-quality, nutritious Australian seafood products to premium markets, domestically and overseas.	Agriculture, Forestry and Fishing	1/07/2007	30/06/2015	7	35.52
Space Environment Management CRC	To monitor, analyse and manage space debris and develop new technologies and strategies to preserve the space environment for the benefit of Australia.	Services	1/07/2014	30/06/2019	5	19.83
The HEARing CRC	To develop new devices, therapies and service delivery models to improve the prevention, detection and remediation of hearing disorders.	Services	1/07/2014	30/06/2019	5	28.00
The Lowitja Institute Aboriginal and Torres Strait Islander Health CRC	To address the major challenge of closing the health gap by producing knowledge, tools and resources that can be used to enhance positive health outcomes for Aboriginal and Torres Strait Islander people.	Services	1/07/2014	30/06/2019	5	25.00
Vision CRC	To deliver innovative solutions to common eye conditions such as myopia, presbyopia and hyperopia. The CRC is also developing effective models for sustainable eye care systems in Indigenous and developing communities.	Services	1/07/2010	30/06/2015	5	27.00
Wound Management Innovation CRC	To improve wound healing, provide quality-of-life for people with wounds and develop cost-effective wound care to lessen the burden on health systems.	Services	1/07/2010	30/06/2018	8	27.93
Young and Well CRC	To explore the role of technology in young people's lives and to address the challenge of how it can be used to improve the mental health and wellbeing of young people aged 12 to 25.	Services	1/07/2011	30/06/2016	5	27.46

4. Suggested administrative changes

As noted earlier in this report, stakeholders suggested changes to the administration of the programme to simplify the selection process and reduce reporting requirements and overall administrative burden. In addition, and in line with the government's policy objectives of regulation reform, the Department of Industry and Science has been exploring options to reduce the programme's regulatory burden on industry, businesses and the research sector.

The following are examples that should be considered following this review:

- reducing and simplifying information collected in the application and selection process;
- the use of short form/simpler contracts;
- the ability to use central or already collected information to simplify annual and other reporting;
- the necessity and timing of reviews and visits for performance evaluation;
- making the impact tool more user-friendly, including potentially through development of a purpose built software application; and
- financial and compliance reporting requirements should be simplified wherever possible, which might include:
 - restructuring the requirements in *Schedule 2 – Activities of the Commonwealth Agreement*;
 - restructuring the departmental requirements for annual reports; and
 - removing the requirement for separate development of transition plans and wind-up plans, to instead be incorporated into the annual report process.

5. Summary of industry-research collaboration government initiatives

In Australia, the Commonwealth, state and territory governments have instituted a range of policies and funding programmes to encourage collaboration between industry and research organisations.

At the national level, the framework includes:

- the new *Industry Innovation and Competitiveness Agenda*, one of the elements of which is the *Boosting the Commercial Returns from Research* strategy;
- tax incentives to encourage investment in research and development, including collaborative research;
- the Cooperative Research Centres (CRC) Programme;
- the CSIRO and its administered programmes;
- university research block grants, especially the Joint Research Engagement scheme, which is more closely focused on collaboration between institutions, industry and other end-users;
- the new Entrepreneurs' Infrastructure Programme, particularly the Research Connections and Accelerating Commercialisation components; and
- other sector-specific arrangements such as the Rural Research and Development Corporations.

This framework includes grants that are explicitly intended to support collaborative research. These range from the competitive grants schemes managed by the Australian Research Council and the National Health and Medical Research Council, to the capability and technology demonstrator grants available through the Department of Defence.

In addition, many of the research grant programmes administered through other portfolios support collaborative projects, even when this is not a stated goal. While some of these programmes (notably those in Defence) are directly accessible by industry, the majority are research-led in that they are only open to applications from researchers or research organisations. Duration of funding varies from up to one to over five years.

State and territory programmes tend to be smaller in scale and more ‘industry-facing’ than Australian Government initiatives. They are often focused on SMEs or on particular industries (manufacturing, mining, biosciences), and usually involve smaller grant amounts. Several states operate innovation voucher schemes intended to support SME partnerships with research organisations.

These usually involve matched funding of \$50,000 - \$100,000 for projects lasting less than a year. Victoria and South Australia offer funding to support CRC bids and operation for research organisations based in the state.

A list of Commonwealth, state and territory programmes is on the following pages. This includes a brief description of the programme and an indication of the grant size, duration and focus.

Table1. Fostering collaboration and commercialising research: Key Australian programmes and Initiatives - Commonwealth Government grant programmes

Portfolio	Fostering collaboration and commercialising research: Key Australian programmes and Initiatives	Description
Education and Training	ARC Centres of Excellence	Build capacity, scale and focus in centres that undertake basic and applied research, collaborate with end-users, provide training and development for the next generation of researchers, and achieve global recognition for their expertise.
	ARC Linkage-Projects	Supports collaborative projects which are undertaken to acquire new knowledge and which involve risk or innovation.
	ARC Linkage-Infrastructure, Equipment and Facilities	Fosters collaboration through its support of the cooperative use of national and international research facilities.
	ARC Industrial Transformation Research Hubs	Engages researchers in issues facing the new industrial economies and training the future workforce by supporting collaboration between Australian universities and industry.
	Industrial Transformation Research Centres	Fosters partnerships between university researchers and other research end-users to provide Higher Degree by Research and postdoctoral training for industries vital to Australia's future.
Defence	Defence Future Capability Technology Centre	Set up to increase R&D collaboration between Defence, industry and researchers. Managed through the CRC Programme.
	New Air Combat Capability - Industry Support Program	Assists defence industry businesses with improving their capability, competitiveness and capacity for innovation with regard to the Joint Strike Fighter (JSF) project. Stream C grants open to research organisations. (Delivered by AusIndustry)
Health	NHMRC Centres of Research Excellence (CRE) - including CRE with Partner Organisations	Support (inter alia) the conduct and development of innovative, high quality, collaborative research, and promote effective translation of research into health policy and/or practice.
	Career Development Fellowship - including Industry Career Development Fellowships	Aims to (in part) encourage the growth of knowledge-based industries in Australia by helping to bridge the gap between research and industry and fostering an environment that values industry achievement
	Program Grants	Provide support for teams of the highest quality researchers to pursue broadly based, collaborative research addressing complex problems.
	Partnerships for Better Health - Partnership Projects	Designed to meet the need for a more effective integration of evidence into health policy and service delivery.
Agriculture, Fisheries and Forestry	Development Grants	Provides financial support to partnerships for health and medical research at the early proof-of-principle or pre-seed stage. The focus is on research that has the potential to commence commercialisation within five years.
	Rural Research and Development Corporations	A partnership between the government and industry created to share the funding and strategic direction setting for primary industry R&D including investment and subsequent adoption.
Industry and Science	Rural Research and Development for Profit	Fund nationally coordinated, strategic research that delivers real outcomes for Australian producers. Only accessible to RRDCs.
	CSIRO Flagships	Flagships deliver benefits to Australia by forming large-scale multidisciplinary research partnerships with Australian publicly funded research institutions, the private sector and international organisations.
	CSIRO SME Engagement	Helps Australian SMEs get the most value out of their research and development activities so that they can overcome technical challenges and enhance their business performance.
Industry and Science	CSIRO Australian Growth Partnerships	A competitive, merit-based pilot funding program which helps high potential, technology-receptive SMEs access CSIRO R&D capability and intellectual property.
	Australian Renewable Energy Agency - Research and Development Program	The Research and Development (R&D) Program supports renewable energy technologies that will increase the commercial deployment of renewable energy technology in Australia.
	Entrepreneurs' Infrastructure Programme - Research Connections	Helps SMEs collaborate with the research sector to develop new ideas with commercial potential
	Entrepreneurs' Infrastructure Programme - Accelerating Commercialisation	Helps entrepreneurs, researchers, start-ups and businesses bring novel products, processes and service to the market.
	Cooperative Research Centres - existing programme	
	Cooperative Research Centres - refocused	
	Cooperative Research Projects	

- All end-users
- Industry end-users

Duration				Total Project Funding				Partners	
< 1 year	1-3 years	3-5 years	5+ years	<\$500K	<\$2M	<\$5M	>\$5M	1 to 1	Multi
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Table1. Fostering collaboration and commercialising research: Key Australian programmes and Initiatives - State Governments

“State / Territory”	Programme / initiative	Description
New South Wales	Innovate NSW	Connects technology SMEs and businesses in key sectors of the NSW economy to develop globally competitive business-to-business (B2B) solutions that address compelling needs. Focuses on ‘enabling technologies’.
	Minimum Viable Product	Supports technology SMEs to engage with a potential business customer in a key market sector, and create an innovative business-to-business (B2B) solution that addresses a compelling need.
	TechVouchers	Supports small to medium-sized enterprises to access technical research infrastructure and expertise such as testing, validation and feasibility studies in NSW public sector research organisations (PSROs).
	Collaborative Solutions	Supports the development of innovative technology-enabled solutions that address an identified barrier to growth in a key sector. Focuses on enabling technologies such as mobile, cloud, analytics, sensors, advanced materials and biosciences.
	Easy Access IP	Aims to improve collaboration between industry and research organisations and develop faster pathways to commercialisation of existing intellectual property.
	Research Attraction and Acceleration Program	Support innovation and investment in the State’s research and development capacity.
Victoria	Bioscience Research Centre project	Key emphasis on supporting and protecting Victoria’s A\$1.6 billion agricultural sector. Fosters collaboration across scientific disciplines to provide solutions to industry problems.
	Technology Trade and International Partnering (TRIP) Program - Biotechnology and Small Technology	Provides grant assistance for eligible Victorian companies to attend recognised overseas conferences, trade events and meetings with regulatory authorities. Supports the growth and internationalisation of Victorian Biotechnology (including health, industrial and agricultural biotechnology, medical devices and diagnostics) and small technology (microtechnology and nanotechnology) companies.
	VISTECH - the Victoria-Israel Science and Technology R&D Fund Program	Facilitates joint R&D projects between Victorian and Israeli technology companies leading to commercialisation of new products or services in the global market.
	Driving Business Innovation	The program supports Victorian small to medium enterprises (SMEs) to develop new products and services for government customers. It provides SMEs with access to capital (grants funding), customers (government agencies) and collaborators (SME partners).
	Smart SMEs Innovation Commercialisation Program	Targets the development, adoption and integration of industrial biotechnology, small technologies (nano and micro scale technologies) and advanced information and communication technology (ICT) by businesses.
	Practical Drug Development Program (PDDP)	Industry-based training program for drug development project managers. Targets biotechnology companies working in the nonclinical, pre-clinical and early clinical (Phase I and II) stages of drug development.
	Innovation and Technology Vouchers	Help companies to undertake R&D, to undertake design research, to learn innovation-relevant skills, and to adopt and develop specific new technologies by providing a voucher that can be exchanged for access to facilities, goods, services, advice or expertise provided by other companies or publicly funded research organisations.
	Future Designers Program	Creates opportunities for education providers to work with Victorian firms and design students on real business problems that are more effectively addressed through a multi-disciplinary approach and where design-led thinking can deliver innovative solutions with a business focus.
	Manufacturing Productivity Networks Program	Designed to assist networks undertake activities and projects that will improve the productivity and competitiveness of Victorian manufacturing businesses.
	Veski Innovation Fellowships	Brings outstanding international scientists and researchers to Victoria. Focuses on following sectors: biotechnology, biomedical, advanced manufacturing including food science and bioengineering, environmental and energy technologies, and the enabling sciences.
Queensland	Australian Institute for Commercialisation	Works with entrepreneurs, businesses, research organisations and governments to convert ideas or intellectual property into successful business outcomes. Establishes partnerships and provides commercialisation advice.
	Queensland Wide Innovation Network	Provides Queensland SMEs with the opportunity to connect with other like minded businesses and with Government and Private Sector support providers to assist with their business growth.
	Life Sciences Queensland	Provides members with tools, services, market intelligence and access to an international network of life sciences organisations with the aim of identifying new business opportunities and accelerating business growth.
	Health Research Fellowship Program	
	QMI Solutions	A government-funded organisation responsible for assisting Queensland industry achieve world best practice in manufacturing and sustainability, recognises the importance of providing companies with the necessary skills and tools to introduce and improve cost-focused innovation. The primary objective is to help local manufacturers meet the identified challenges ahead to develop new products and new markets.

Duration				Total Project Funding				Partners	
< 1 year	1-3 years	3-5 years	5+ years	<\$500K	<\$2M	<\$5M	>\$5M	1 to 1	Multi
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“State / Territory”	Programme / initiative	Description
Western Australia	MRIWA Research Grant	Statutory body established by the Western Australian Government that provides and administers funding grants to carry out minerals research. Able to undertake and procure minerals research itself. Also able to collaborate with local, Australian and worldwide research and scientific institutions.
	International Centre for Radio Astronomy Research	A joint venture between Curtin University and The University of Western Australia, with funding from the State Government of Western Australia, engages with industry and the community whilst delivering world-class outcomes for science, engineering and high performance computing.
	Western Australian Marine Science Institute	A collaboration of State, Federal, industry and academic entities cooperating to create benchmark research and independent, quality scientific information. The Institute carries out research into climate change, biodiversity, the iconic Ningaloo Marine Park, sustainable fisheries, biotechnology and oceanography, and has overseen the development of a marine bioresources library.
	Western Australian Fellowships Program	Attracts internationally prominent researchers from interstate or overseas to Western Australia. Fellows build and lead world-class research teams in the State and contribute to the development of the State’s science capability and capacity.
	Curtin Growth Ignition Program	Ignition is an annual event held in Perth. Run by the Curtin Centre for Entrepreneurship. It is a five and a half day intensive program which prepares participants for taking their idea to the business world.
	Innovation Centre of WA	Government-funded facility providing advice, networking opportunities and aims to improve the innovation and commercialisation infrastructure in WA.
	WA Centres of Excellence Program	Aims to encourage, catalyse or leverage opportunities to expand and enhance Western Australia’s science and innovation capability and performance. Allows Western Australian scientists and innovators to develop centres involving research excellence within universities in collaboration with the vocational education and training sector, government research agencies, the private sector and the community.
	Applied Research Program	Aims to address Western Australian challenges and opportunities of immediate concern to the community.
South Australia	MEGA	3 months startup pre-accelerator program designed to be an evolutionary part of the search of a sustainable business model. Participants receive support from MEGA vibrant community of founders, successful mentors and space to work.
	Premier’s Research and Industry Fund	Aims to support South Australia’s research community to compete successfully on a national and global scale. The fund encourages investment in key science and research areas that have the potential to generate significant economic, social and/or environmental benefits for the State.
	Catalyst Research Grants	Provides funding to support South Australian scientific and technological research projects performed by an Early Career Researcher in collaboration with an industry partner or end user group.
	Innovation Voucher Program	Aims to stimulate innovation in SMEs through collaboration with public and private research providers to develop new manufactured products or processes and drive productivity and business profitability.
	South Australian Research Fellowship	Provides funding to support world competitive research leadership and building research capability that address the States priority areas with direct benefit to the State, both its industries and the wider economy.
	Collaboration Pathways Program	Encourages cross-sector interaction to develop innovative, high quality, collaborative research activities that improve efficiency in the use of intellectual capacity and the pooling of knowledge, expertise and resources.
	International Research Grants	Fund research and supports scientific and technological research being conducted by eligible South Australian organisations with an international partner.
	Medical Technologies Program Premium Food and Wine Co-Innovation Clusters	
Australian Capital Territory	Lighthouse Business Innovation Centre	Provides range of advice and training programs and administers some ACT government programs. Not really business-research linkage programs with grants. They do have linking service.
Northern Territory	Business Innovation Support Initiatives	Run annually, the BISI program is aimed at stimulating, initiating and promoting innovation by assisting businesses to commence research and development projects in the areas of science, engineering, technology and design, which could lead to successful new products, processes and services.
	Innovation Voucher Scheme	A voucher scheme which supports eligible contractual agreements between applicant businesses and research service providers.
	Innovation Grants Scheme	A grant scheme to support applicant businesses with the in-house capacity to do their own research in the areas of science, engineering, technology and design.

- All end-users
- Industry end-users

Duration				Total Project Funding			Partners		
< 1 year	1-3 years	3-5 years	5+ years	<\$500K	<\$2M	<\$5M	>\$5M	1 to 1	Multi
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