INNOVATION AND COMPETITIVENESS THROUGH INDUSTRY/RESEARCH SECTOR COLLABORATION

Submission by
Professional Scientists Australia
(a Division of Professionals Australia)
to the CRC Program Review

November 2014

About Professional Scientists Australia

Professional Scientists Australia is a division of Professionals Australia (formerly the Association of Professional Engineers, Scientists and Managers, Australia). We represent several thousand professional scientists from a broad range of specialisations including health science, automotive design, biomedical science, ecology, veterinary science, neuroscience, mental health, genetics and genomics, astronomy, biochemistry, mineral processing, environmental science, defence research, synchrotron science, environmental science, immunology and water science.

Professionals Australia is an organisation registered under the *Fair Work Act 2009* representing over 25,000 Professional Engineers, Professional Scientists, Veterinarians, Architects, Pharmacists, Information Technology Professionals, Managers, Transport Industry Professionals and Translating and Interpreting Professionals throughout Australia. Professionals Australia is the only industrial association representing exclusively the industrial and professional interests of these groups.

Professional Scientists Australia promotes the views of their scientist members on a wide range of policy issues to government, industry and the community.

We have three objectives:

- to provide a strong voice for professional scientists. This includes considering the kind of support, policies and practices at the enterprise and structural levels that will be necessary to create a sustainable science workforce capable of realising optimal levels of innovation, productivity and competitiveness;
- to play a leading role in encouraging dialogue between industry, government and the higher education sector. This means advocating for investment and structural reforms, building the platforms for collaboration and change and initiating and leading projects to foster collaboration; and
- to promote public understanding of science and the key role professional scientists play in ensuring Australia's future. This involves influencing public policy and resource allocation decisions and promoting the value of science to decision-makers and the wider community. We seek to highlight the critical role science plays in enabling productivity and innovation, promoting economic prosperity, protecting the environment, improving human welfare and quality of life and protecting national security. In doing so, we raise the status of the profession and the professionals who work in it.

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Professionals Australia

Foreword

Now more than ever, the community and government need to understand that investment in science, engineering and technology research in partnership with industry will be a predictor of national innovative capability, and in turn, productivity and global competitiveness.

Yet this review appears to occur in an environment in which the value of science and research and development (R&D) – and the CRC Program in particular – are in question. The review of the CRC Program announced by Industry Minister Ian Macfarlane in September 2014 occurs in the context of the Federal government's decision to reduce funding to the CRC Program in the 2014 May budget by $80 million over the next four years[1] (or 20 per cent of its budget), the National Commission of Audit recommending the program be abolished[2] and the Minister's statement alongside the launch of the Industry Innovation and Competitiveness Agenda that the CRC Program must be integrated within this new policy framework rather than operating as an "adjunct" to it with some of the program contracts likely to be terminated.

Positioning Australia for a future as a science and innovation leader will rely on getting science and industry working more closely together and getting greater commercial returns from research. Creating collaborative linkages between industry and the research sector and encouraging and incentivising commercialisation pathways will be vital. What remains unclear is how this can happen under the new Industry Innovation and Competitiveness Agenda framework without compromising existing linkages and work in progress, and recognising the net economic benefit of $7.5 billion the CRC Program has created to date.

At Professional Scientists Australia, we believe that scientists with a direct understanding of the CRC Program are uniquely placed to provide informed and intelligent insights into the best collaborative features of the CRC Program and what some of the challenges in transitioning to the new policy framework might be.

To that end, we conducted a survey aimed at getting their views on the key issues and challenges of the program in line with the review's terms of reference. This report is based on the views of scientists arising from that survey.

While some would say the outcomes of the CRC Program over time speak for themselves, Professional Scientists Australia believes it is critical to actively communicate the value of the work undertaken as part of the CRC Program to both the broader community and government. We must ensure the best of the CRC Program is acknowledged and effectively and thoughtfully transitioned to the new policy framework. Professionals Australia sees this review as an opportunity to ease the uncertainty created by the Budget cuts and to recognise the enormous innovation and commercialisation potential realised by this highly effective program over its 25-year history.

We thank the Department of Industry and Review Leader Mr. David Miles AM for the opportunity to have input into the review process.

Chris Walton
CEO, Professionals Australia

Robyn Porter
President, Professional Scientists Australia

Key messages from the survey ...

The CRC Program is one of the few that truly focuses on research translation. Without it, I fear innovation will falter in Australia.

Survey respondent

The program maintains a line of sight between community need and what researchers are offering to supply. It is one of the best initiatives to encourage translation of innovation to widespread use.

Survey respondent

Having industry reps as collaborators and part-funders lowers the barrier between academics and business.

Survey respondent

The CRC Program has fostered relationships between industry and researchers, but also between those involved and the government. It is a positive program that has developed open and positive lines of communication and innovation.

Survey respondent

We need innovation and the CRC Program supports and enables that. Long-term commitment and funding would demonstrate that government wants to see Australia at the forefront and on the world stage.

Survey respondent

Positioning Australia for a future as a science and innovation leader will rely on getting science and industry working more closely together and getting greater commercial returns from research ... What remains unclear is how this can happen under the new Industry Innovation and Competitiveness Agenda framework without compromising existing linkages and work in progress, and recognising the net economic benefit of $7.5 billion the CRC Program has created to date.

Chris Walton, Professionals Australia CEO

Professionals Australia sees this review as an opportunity to ease the uncertainty created by the Budget cuts and to recognise the enormous innovation and commercialisation potential realised by this highly effective program over its 25-year history.

Robyn Porter, President, Professional Scientists Australia

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Purpose of this document

We consider it critical that our members are consulted about policy and program issues in the areas in which they work – in this case, in relation to ways to improve collaboration and innovation via the CRC Program. Our member consultation comprised an online survey which mirrored the structure of the review's terms of reference. It was our intention to provide feedback on the specific questions posed in the terms of reference and discussion paper as well as any other significant issues raised by members in relation to the program.

Introduction

The role of government

Professional Scientists Australia believes that strong federal government support for innovation through science and R&D will be a critical antecedent to improving Australia's global competitiveness and growing our economy over the coming decade.

This includes:

- providing sustained public funding support for basic science and blue skies research, and for developing world-class research infrastructure;
- providing policy frameworks and regulatory settings which encourage industry-led and translational research in areas of strategic focus while maintaining a balance between commercialisation and other priorities;
- supporting industry/research sector collaboration programs which address cultural and structural barriers to collaboration;
- framing industry policy, a regulatory environment and business support initiatives that foster the role of the private sector and encourage broadbased business investment in science and R&D-driven innovation; and
- developing workforce strategies at both the structural and enterprise levels to foster a skilled, agile and engaged Science, Technology, Engineering and Mathematics (STEM) workforce.

Provide funding support for basic science, blue skies research and research infrastructure

Basic science and blue skies research

To position Australia for a future as a science and innovation leader, and to tackle the complex problems and opportunities we face, government must provide strategic, stable investment in basic science and blue skies research over the long-term. While the relationship between basic science and competitiveness is a complex one, a 2013 study has found a direct correlation between research productivity in basic science - including physics, chemistry and material sciences - and economic growth. The study also found that those who tried to "skip this step" or focus only on the applied sciences fail.[3]

Recent Department of Industry figures show that expenditure on pure research has declined from around 28 per cent in 1992-93 to 20.6 per cent in 2010-11 in favour of applied or experimental research. By way of comparison, in 2012 South Korea announced plans to increase total expenditure on research from 4 per cent of GDP in 2011 to 5 per cent by 2017 with 40 per cent of that amount to be invested in basic science by the same date.[4] These figures show that we are slipping behind not just other high-income countries but increasingly middle income countries including Malaysia, South Korea and the Czech Republic, and this becomes a major concern when a growing number of our talented scientists leave Australia to work in the new science hubs without us being able to, in turn, attract such international science and research talent.

Clearly, many commercialisation opportunities have arisen from investment in basic research in Australia including Professor Ian Frazer's work which led to the development of the Gardasil and Cervarix vaccines, Professor Stephen Simpson's discovery that a separate appetite exists for protein and its links to human obesity and Professor Barry Marshall's discovery of the link between Heliobacter Pylori and stomach ulcers. These results demonstrate the need to maintain an ongoing commitment to funding basic science not only to provide fundamental support for bringing new products to global market and directly impacting competitiveness and economic growth but to

advance understanding, improve the health of Australians and provide "spillover knowledge" for future research.

Research infrastructure

There is of course also a need for the development of world-class research infrastructure aligned with the nation's research needs and strategic priorities as a means of encouraging international researchers to undertake collaborative research in Australia. By way of example, the Australian Synchrotron forms part of a globally significant network of light source facilities which serves to raise our capability and in turn our reputation as the home of a thriving scientific research community. The significance of the Australian Synchrotron was acknowledged in the $100 million funding agreement announced in March 2012 which demonstrated an ongoing commitment to expanding the facility, an understanding of its capacity to attract international research collaborations and affirmation of our reputation for scientific endeavour.

Encourage industry-led and translational research

Industry-led research

Getting science and industry working more closely together provides the potential for commercial savings and gains and, in turn, economic returns and jobs in areas identified *by industry*. The recently announced consultation on how to maximise the translation of research into commercial outcomes[5] signals the government's intention to frame policy in these terms. While creating incentives for commercialisation will be critical, it is important that there is a balance between commercialisation incentives and publishing in universities, and a focus on maximising linkages between industry and researchers rather than prioritising applied/industry-driven research over blue skies research.

Translational research – the "valley of death"

Chief Scientist Professor Ian Chubb defines translational research as "the valley of death". In the context of health science, he says it is "the gap between basic research and clinical applications" and suggests there is a need to "facilitate a pathway from discovery to health" and "transform basic science breakthroughs into clinical applications on an appropriate scale."

Chubb highlights the lack of government funding or private capital available for translational research in comparison with investment in basic research with the National Health and Medical Research Council increasing its funding for translational research from 0.5 per cent in 2002 to about 4 per cent - or $30 million - in 2011. The US and Europe have by contrast invested heavily in translational research. In the United States, $480 million on Clinical and Translation Science Awards and an additional $500 million on a National Centre for Advancing Translational Sciences. The UK has similarly invested $900 million pounds establishing a system similar to that of the United States.[6]

The October announcement of $1.7 million directed to *Translating Research Into Practice* Fellowships is welcomed but further support is needed.

Support broadranging collaboration

Research has shown that collaboration between industry and researchers is a key driver of innovation and productivity.

Links between collaboration and productivity

As part of the landmark report "The role of science, research and technology in lifting Australian productivity"[7], an econometric analysis of 8,000 Australian organisations found that innovating organisations that also collaborated had a 31 per cent higher productivity level, and that innovating organisations that sourced ideas from research organisations had a 34 per cent higher productivity level. They also found that improving collaboration between businesses and between business and publicly-funded research would significantly enhance innovation.

The 2013 Australian Innovation System Report found that "collaborative innovation with research organisations triples the likelihood of business productivity growth, and that Australian businesses that collaborate with research organisations are 242 per cent more likely to report increases in productivity compared to businesses that don't innovate."[8]

International collaboration

The CRC Program has been highly successful in fostering international collaboration with 448 international alliances and holding 465 overseas patents.

These figures show the CRC Program's success in encouraging industry-led research, industry/research sector collaboration (including internationally) and the Program's fundamental role in helping address cultural and structural barriers to collaboration.

Program initiatives which expand research engagement and encourage global knowledge transfer by way of attracting international researchers to Australia (such as the International Postgraduate Research Scholarship Program) should be expanded and other funding initiatives made available to international students.

Structural and cultural barriers to collaboration

The CRC Program provides valuable support for bringing about better ties between the research sector and business communities. The recent Budget cuts have the potential to significantly diminish opportunities for research careers in industry-led areas and to exacerbate entrenched structural and cultural problems of poor collaboration between industry and research institutions. The CSIRO, the National Health and Medical Research Council Development Grants and the rural Research and Development Corporations are other critical examples of initiatives which facilitate buy-in and linkages between business and the research sector and, in turn, help address the structural and cultural barriers to collaboration.

Encourage business investment

Links between private and public sector investment

Research shows a correlation between public funding of science and R&D and the attraction of private sector investment. Public and private sector research expenditure are complementary and a culture of co-investment and collaboration is required rather than an approach which sees public sector investment as encouraging a 'dependency' culture, or investment in one being at the expense of the other. Public support of science and engineering research is an investment that generates economic growth and encourages concurrent business investment.

Business R&D

Research indicates that Australia's commitment to business R&D is lagging well behind other countries. A recent report from the Melbourne Institute[9] compares US and UK funding with Australia's - the US commits over 0.22 per cent of GDP to business R&D, the UK government 0.14 per cent while the Australian commitment sits at just 0.09 per cent.

Australia also has a low proportion of researchers working in industry with 0.8 per cent of Australian workers holding a doctorate compared with 1.1 per cent in the United States and 2 per cent in Germany.[10] The use of universities and public research agencies by Australian business is currently also among the lowest in the OECD and Australia has one of the lowest proportions of researchers working in business in the OECD, at less than 30 per cent.[11]

Business support initiatives

Professionals Australia supports measures that would provide incentives for business to invest in science and R&D and facilitate more effective commercialisation including:

- support for angel investment (investment by high net worth individuals as opposed to institutional investors as is generally the case with venture capital) and the venture capital industry (through schemes such as the Industry Innovation Fund[12]). A 2014 paper which considered the shifts in policy settings required to create an environment that would encourage technology-based business startups highlighted the importance of ensuring a healthy angel sector. The report noted the comparatively low rate of angel investment in Australia with the rate of investment in New Zealand, for example, six times the rate in Australia.[13] With venture capital-backed firms responsible for 10 per cent of all business R&D expenditure in Australia[14], there is also a strong case for government providing further support for the venture capital industry in Australia. Australia has one of the lowest rates of venture capital investment in the world. In 2013 the entire Australian venture capital industry invested $79m in startups, while one US-based VC invested more than that amount in Australian startups over a 12-month period;[15]

- broadranging policy and funding support for increasing entrepreneurial skills would encourage startups. Initiatives likely to be useful include expanding training and education in the areas of entrepreneurship, business management and intellectual property (IP), and considering university commercialisation companies which would provide research commercialisation services including assisting with commercialising IP created at universities and providing pre-seed and seed venture funds to help bridge the gap between research organisations and venture capital; and
- expanding startup incentives such as tax relief for startups and tax incentives for investing in R&D startups (such as the R&D tax credit), ongoing support for grant schemes (such as those provided under the auspices of Commercialisation Australia[16]), co-investment schemes (with government investing alongside private investors), business startup incubators and incentives such as the recent changes to taxation of employee share schemes.

Collaboration for small to medium businesses and big business

The StartupAUS report found that "large Australian businesses ... are much more likely to collaborate with the research sector and generate new-to-the-world innovations (than small to medium enterprises)." The CRC Program has been extraordinarily successful in getting small enterprises involved in research collaborations with small firms outnumbering participation by nearly two to one in the last financial year (out of a total of 1,230) but further engagement strategies for small to medium enterprises would be likely to be beneficial.

Support STEM workforce development

Workforce strategies at the structural and enterprise levels

While a detailed discussion of workforce development issues is outside the scope of this submission, clearly an ongoing and sustainable supply of high-level skills and experience is critical to creating an agile network of effective collaborative linkages between industry and the research sector and boosting our innovation capability.

The Australian Academy of Technological Sciences and Engineering (ATSE) estimates suggest that 75 per cent of the fastest-growing occupations require well-developed STEM skills and knowledge – and STEM skills are critical not only for core-STEM occupations or those who ACOLA describe as the "high-skill group capable in research commercialisable innovation and effective response to technological change" but also for ensuring tertiary graduates are able to meet the demands of increasingly technology-intensive roles across industry.

ATSE's projections also show that STEM-based employment will grow at almost twice the pace of other occupations, and that currently 26 per cent of employers have difficulty recruiting STEM skilled professionals and managers. In Australia roughly half of all professional occupations with identified skills shortages are in core-STEM areas such as engineering, and most of the rest are in the related area of health.

A recent Professionals Australia report "Realising Innovation Through Science and R&D" (link available from the *Related Documents* section of this Submission) sets out a broadbased strategy for addressing some of the key barriers to growing our innovation capability. We see the development of workforce strategies at both the structural and enterprise levels to foster a skilled and responsive science and R&D workforce as fundamental to increasing the nation's competitiveness and economic growth. The key recommendations of this report are set out in Appendix 1.

Effectiveness of the CRC Program

The survey asked scientists a range of questions around whether or not the CRC Program fitted current and future needs.

Collaboration to solve business problems

All respondents said the CRC Program effectively encouraged and facilitated industry and the research sector working together to solve problems for business. 85.7 per cent of respondents said they thought the CRC program effectively encouraged and facilitated industry and the research sector to work together to help industries adapt and change, and 87.5 per cent of respondents said the CRC program effectively encouraged and facilitated industry and the research sector working together to improve economic outcomes for the nation.

Additional comments were as follows:

Table 1 - Effectiveness of CRC Program

The program maintains a line of sight between community need and what researchers are offering to supply. It is one of the best initiatives to encourage translation of innovation to widespread use.
Having industry reps as collaborators and part-funders lowers the barrier between academics and business.
The CRC Program has fostered relationships between industry and researchers, but also between those involved and the government. It is a positive program that has developed open and positive lines of communication and innovation.
The CRC Program is one of the few that truly focuses on research translation. Without it, I fear innovation will falter in Australia.

Other approaches

In response to the question “Are there other domestic or international approaches that would help support the move toward a greater number of researchers collaborating with and working in industry and more effective translation of discoveries into products and services to take to market?”, 42.8 per cent indicated there were other approaches that would assist. Suggestions included the following:

Table 2 - Other approaches that would assist

University commercialisation companies would assist.
Facilitation of international collaboration through lead-up funding, allowing researchers the chance to travel and spend time working with and developing effective working relationships would be beneficial.

7-year funding cycle

In response to the question “Is the 7-year funding cycle of the CRC program one of the main reasons for the program’s success?”, 75 per cent agreed that it was. The following comment is indicative of other comments made:

Table 3 - Comments on 7-year funding cycle

The basic sciences often need longer timeframes to allow innovations to progress through to market use – the CRC funding cycle supports this.

Impact tool

Respondents made a number of comments on the potential for the Impact Tool to facilitate stronger collaboration and add greater value. Comments included the following:

Table 4 - Impact tool

Using the Impact Tool to better measure performance. At present performance is based on achieving research outcomes (milestones). This is not sufficient. The Impact Tool, if used appropriately, could also help measure ‘translation’.
The Impact Tool very effectively indicates whether a program will be of cost benefit; a wonderful tool to determine return on investment and aid decision-making to achieve better economic outcomes.
The use of the Impact Tool during the application stage forces applicants (in research and business) to think about long-term consequences and impacts.
Use the Impact Tool to measure performance – extend the evaluation to assess whether research outcomes actually translate and are used by end-users. The current evaluation stops at research

outcomes – this is not good enough.

Effectiveness of CRC Program - other factors

The survey asked respondents to comment on any other factors they thought should be taken into account in considering the effectiveness of the CRC program. Comments were as follows:

Table 5 - Effectiveness of CRC Program - other factors

Reduction in government imposed red tape and overburden of compliance and reporting.
The need for academics and researchers to plan and consider the outcomes and impacts of what they are doing. It facilitates effective research translation.
Value for money, transparency of outcomes.
Good training for post-graduate students and connecting with the 'real world' - improved awareness and interworking of the differences in cultures and work methods and aims of commercial and academic environments.

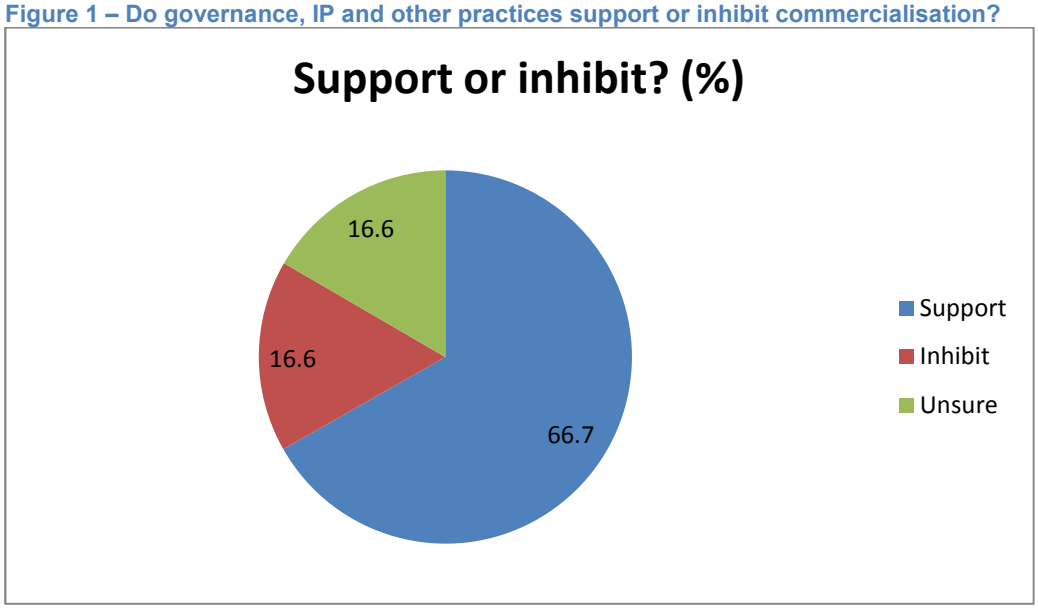
Outcomes for industry

The survey asked scientists a range of questions about whether or not the CRC Program was designed and delivered in such a way as to deliver meaningful outcomes for industry.

Governance, IP and other commercialisation-related practices

66.7 per cent of respondents indicated that they thought the governance, IP and other commercialisation-related practices of CRCs supported the application of CRC-driven research, 16.6 per cent said they inhibited it and 16.6 per cent were unsure.

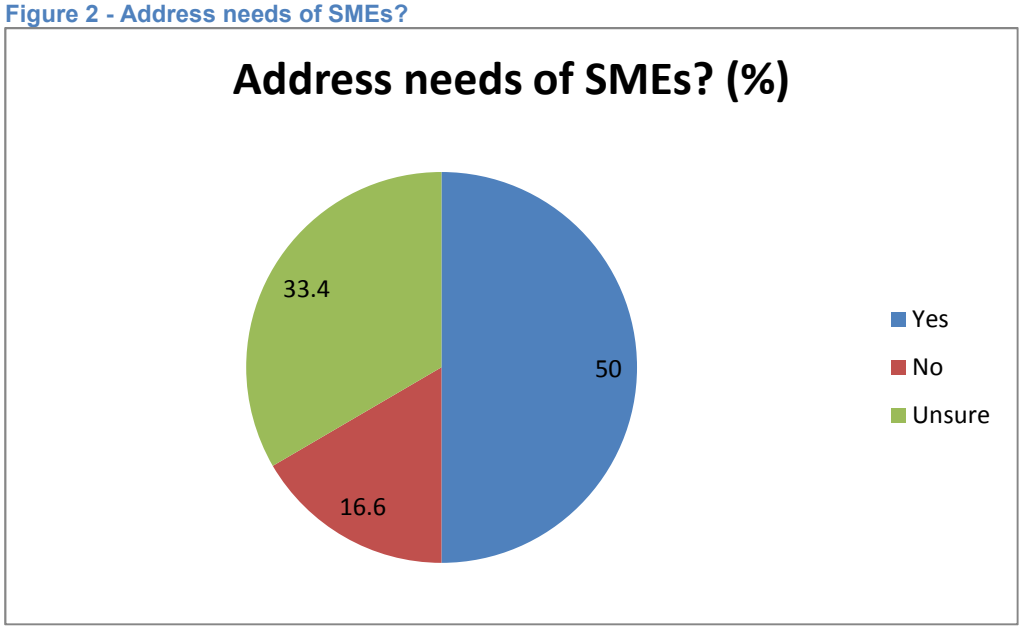
Figure 1 – Do governance, IP and other practices support or inhibit commercialisation?



Needs of small and medium enterprises

The survey asked the question "In your view, does the program address the needs of small and medium (SME) enterprises?" Views were mixed with 50 per cent of respondents saying they thought it did, 16.6 per cent saying it did not and 16.6 per cent unsure.

Figure 2 - Address needs of SMEs?

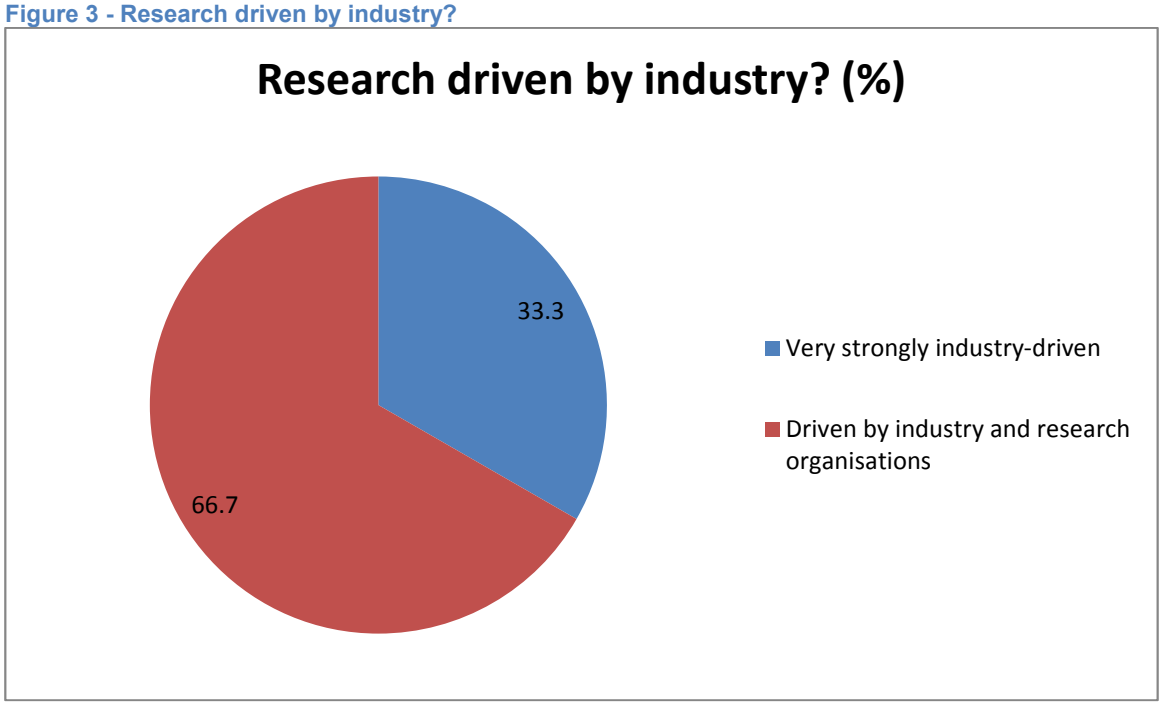


Comments suggested a need for stronger SME engagement strategies.

Extent to which research activities are driven by industry as opposed to research organisations

In response to the question "To what extent are research activities driven by industry?", respondents held the view that research activities were very strongly industry-driven (33.3 per cent) or driven by both industry and research organisations (66.7 per cent).

Figure 3 - Research driven by industry?



Outcomes for industry - other factors

The survey asked respondents to detail any other factors they saw as relevant in considering how the CRC Program delivered outcomes for industry. Comments were as follows:

Table 6 - Outcomes for industry - other factors

How can commercialisation of research be funded? CRCs generally concentrate funding on the

research phase?
Better techniques for evaluation. If a particular program is not deliver, we need to know – how else can we improve?

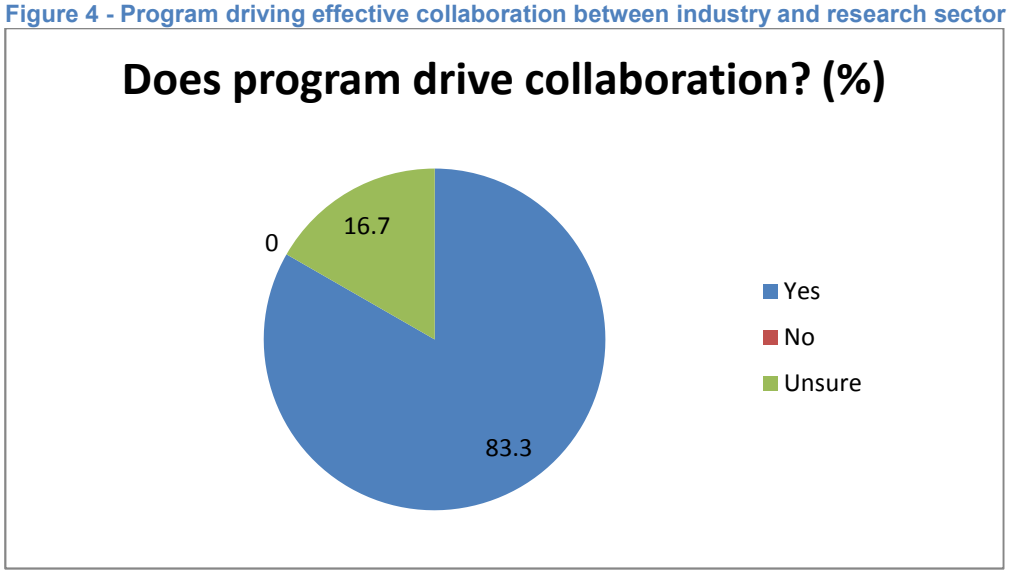
Collaboration between industry and the research sector

The survey asked a series of questions about whether the CRC Program has driven effective collaboration and how the government's investment could be used to build more effective linkages between industry and the research sector.

Driving collaboration

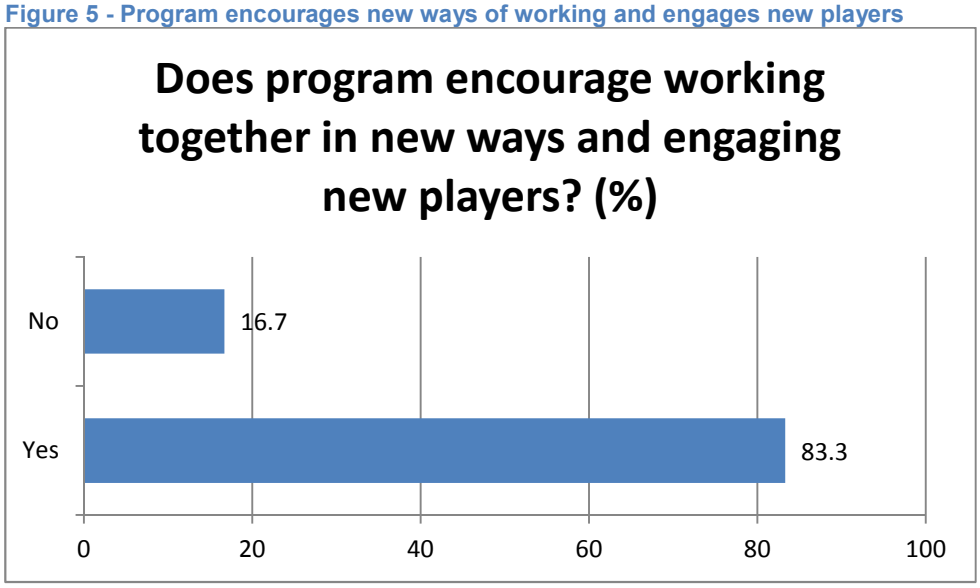
Respondents overwhelmingly saw the CRC Program as effective with 83.3 per cent saying government investment in the program drove effective collaboration between industry and the research sector (16.7 per cent unsure) (see Figure 4 below), while 83.3 per cent saw the program as encouraging industry and the research sector to work together in news and/or engage new players (see Figure 5 below).

Figure 4 - Program driving effective collaboration between industry and research sector



Working together in new ways and engaging new players

Figure 5 - Program encourages new ways of working and engages new players

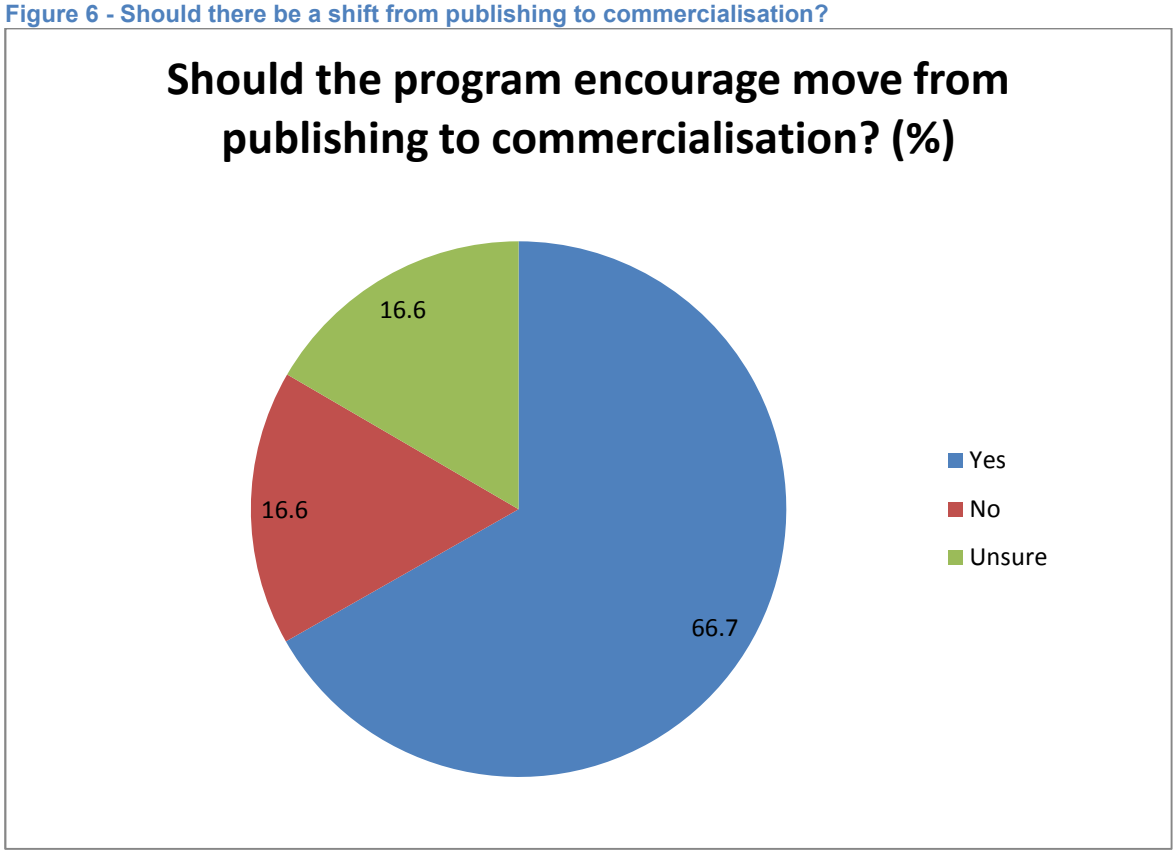


Comments from participants included the suggestion that evaluating this aspect of CRCs would further improve engagement.

Cultural shift from publishing to commercialisation

As set out in Figure 6 below, in response to the question "Should the CRC program encourage universities to make a shift from focusing on publishing to focusing on collaboration and commercialisation?, 66.7 per cent of respondents said 'yes', 16.6 said 'no' and 16.6 per cent were 'unsure'. This suggests that while respondents saw a focus on commercialisation of research findings and end-user benefits as critical but also that this needs to be balanced with the traditional academic imperative to publish.

Figure 6 - Should there be a shift from publishing to commercialisation?



The following additional comments were indicative of those made by respondents:

Table 7 - Comments on move from publishing to commercialisation

But research quality mechanisms such as ERA should be modified to take into account real industry impact, end-user benefits and commercialisation of research findings, not just patents.
Publishing is fundamental to the academic environment, but research translation/outcomes should always be the aim.
I now work with a university but I originally came from industry. The pressure to publish is enormous – yet this is not as important to commercial partners.
I don't think a complete shift in focus is needed – but a balance of focus should be encouraged.

Intellectual property protocols

Scientists were asked whether or not ensuring protocols for handling IP were developed early in the life of a CRC was critical to their success. 83.3 per cent saw this as critical while 16.7 per cent were unsure. Comments suggested that protocols for dealing with IP were likely to vary depending on the nature and lifespan of the CRC, and included the following:

Table 8 - Handling intellectual property upfront

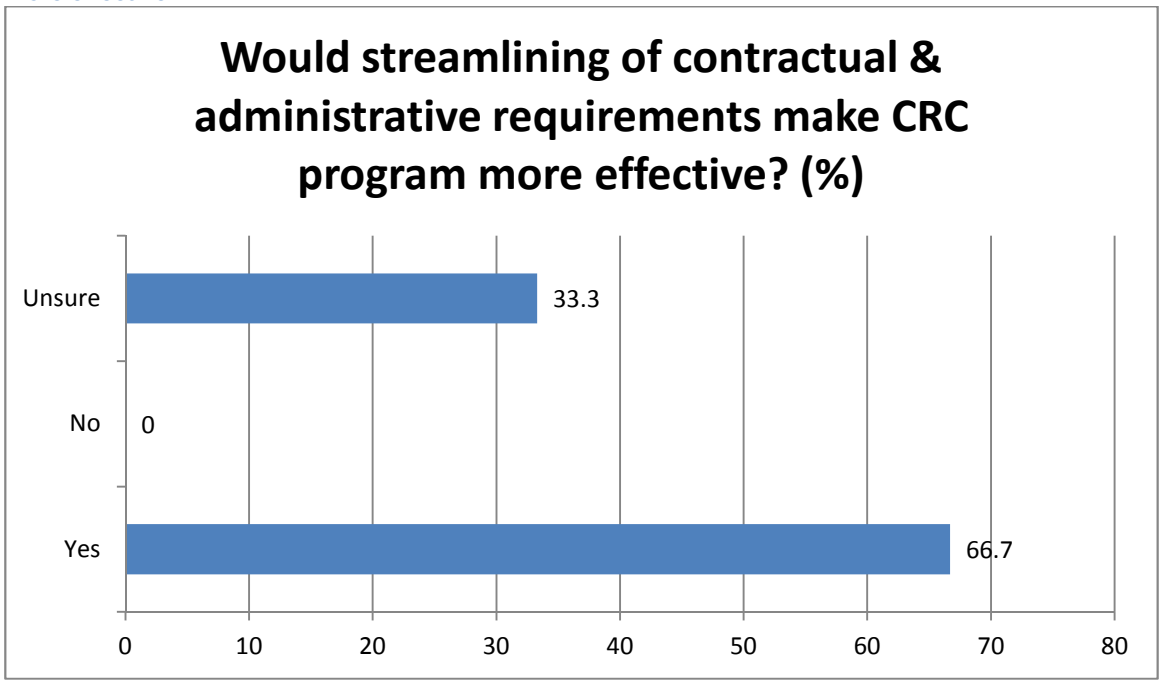
Depends if it is a commercial outcome or public good CRC (or sometimes can be both).
These issues are better discussed at the start and negotiated later if needed.

Contractual and administrative efficiency

Contractual and administrative requirements

As set out in Figure 7 below, 66.7 per cent of respondents indicated that they thought the streamlining of contractual and administrative requirements would make the CRC Program more effective, while 33.3 per cent were unsure.

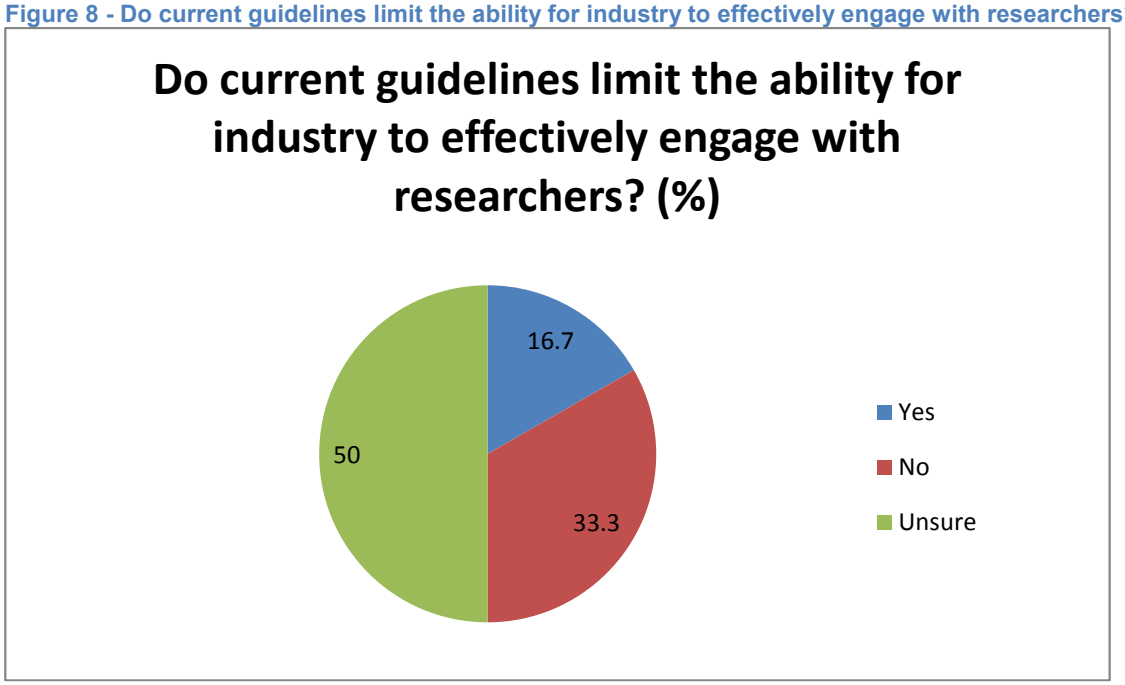
Figure 7 - Would streamlining of contractual and administrative requirements make the CRC program more effective?



Limitations and disincentives in current contractual and administrative arrangements

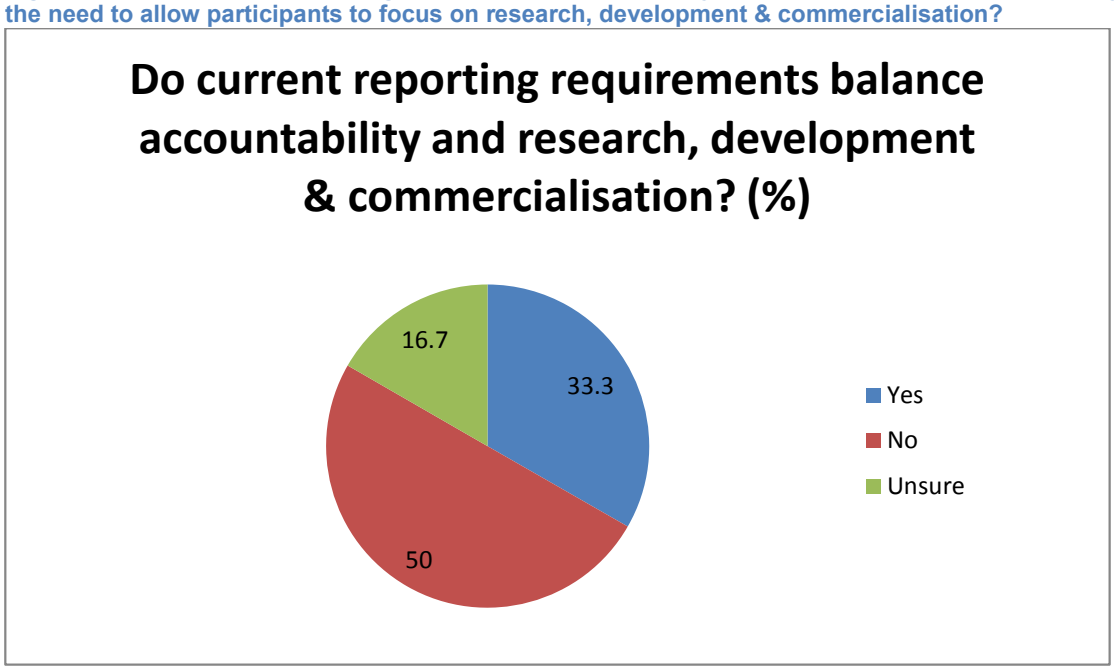
As set out in Figure 8 below, 16.7 per cent of respondents saw limitations in the current arrangements in relation to program guidelines – 50 per cent were unsure.

Figure 8 - Do current guidelines limit the ability for industry to effectively engage with researchers?



As set out in Figure 9, 16.7 per cent of respondents saw a lack of balance between taxpayer value and the need to allow participants to focus on research, development and commercialisation.

Figure 9 - Do the current reporting requirements appropriately balance the need for accountability and the need to allow participants to focus on research, development & commercialisation?



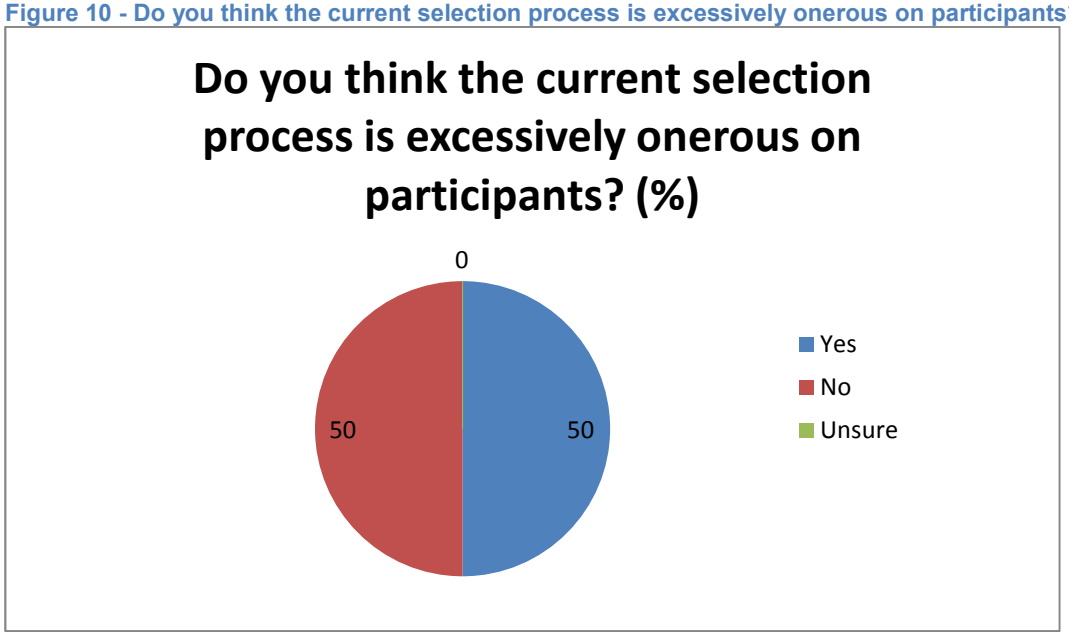
These comments were indicative of those more generally:

Table 9 - Lack of balance between accountability and research, development & commercialisation

Much of the reporting is repetition of information previously submitted – this isn't value to the taxpayer – it's inefficiency.
The current evaluation is skewed – it focuses on research outcomes, not whether impacts are actually occurring as planned.

As set out in Figure 10, responses were evenly split on whether or not the current selection process was excessively onerous. The split of responses and comments suggest that a tension between an onerous and rigorous process could suggest that the selection process is operating effectively.

Figure 10 - Do you think the current selection process is excessively onerous on participants?



The comments set out in Table 10 were indicative of those from respondents on this question generally:

Table 10 - Comments on value of selection process

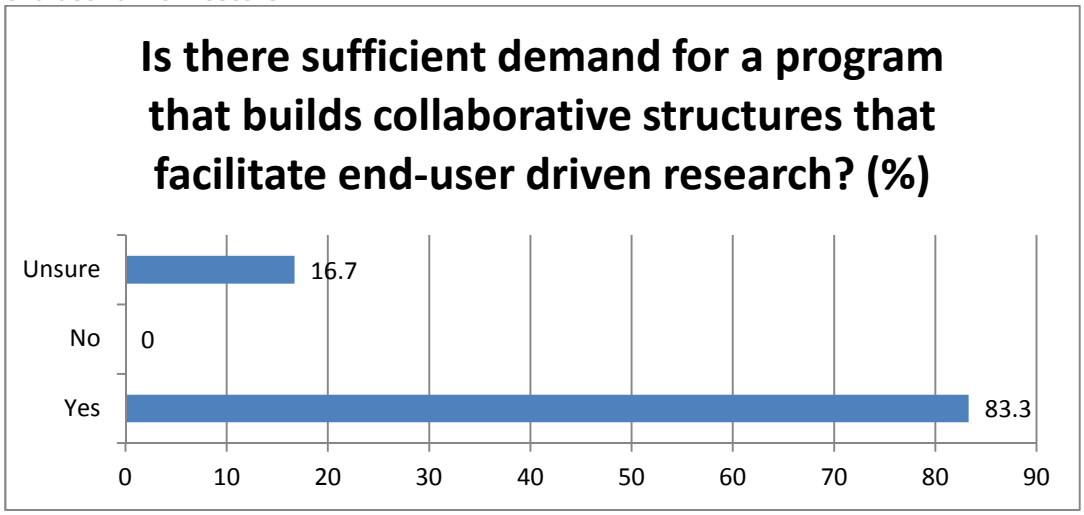
While a little onerous, I believe the process enables government to effectively discriminate between applicants. It is a valuable learning experience.
It is onerous but the application forces participants to consider the chains of events from funding through to the expected impacts.

Use of and demand for CRC Program

The survey included a series of questions on demand for and factors affecting engagement with the CRC Program. Respondents held the views that there was demand for a program that builds collaboration structures that facilitate end-user-driven research (see Figure 11), and that there were specific industries that had not engaged in the CRC program (see Figure 12).

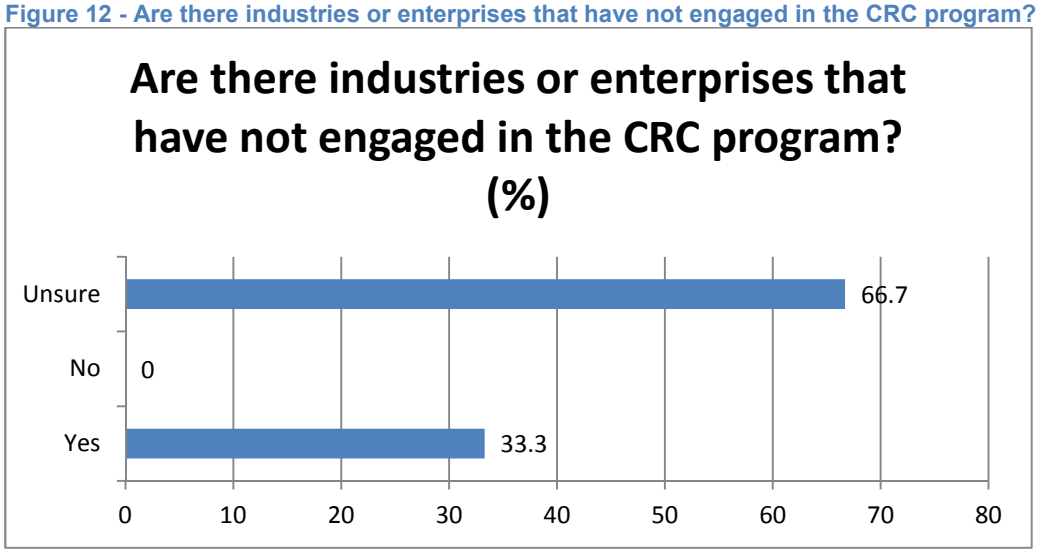
Demand for program that builds collaboration structures that facilitate end-user-driven research

Figure 11 - Is there sufficient demand for a program that builds collaborative structures that facilitate end-user-driven research?



Industries or enterprises that have not engaged in CRC program

Figure 12 - Are there industries or enterprises that have not engaged in the CRC program?



Comments on use and demand for CRC Program

Comments on the use of and demand for the CRC Program are set out in Table 11:

Table 11 - Use and demand for CRC Program

All research should consider end-users.
The CRC funding opportunities are not as widely known as NHMRC or ARC. Many researchers don't know what the CRC is. This is a communication issue.
Perceived difficulty of applications and low success rate mean that some enterprises won't apply, and some won't apply for renewal.
More assistance with transition models is required.

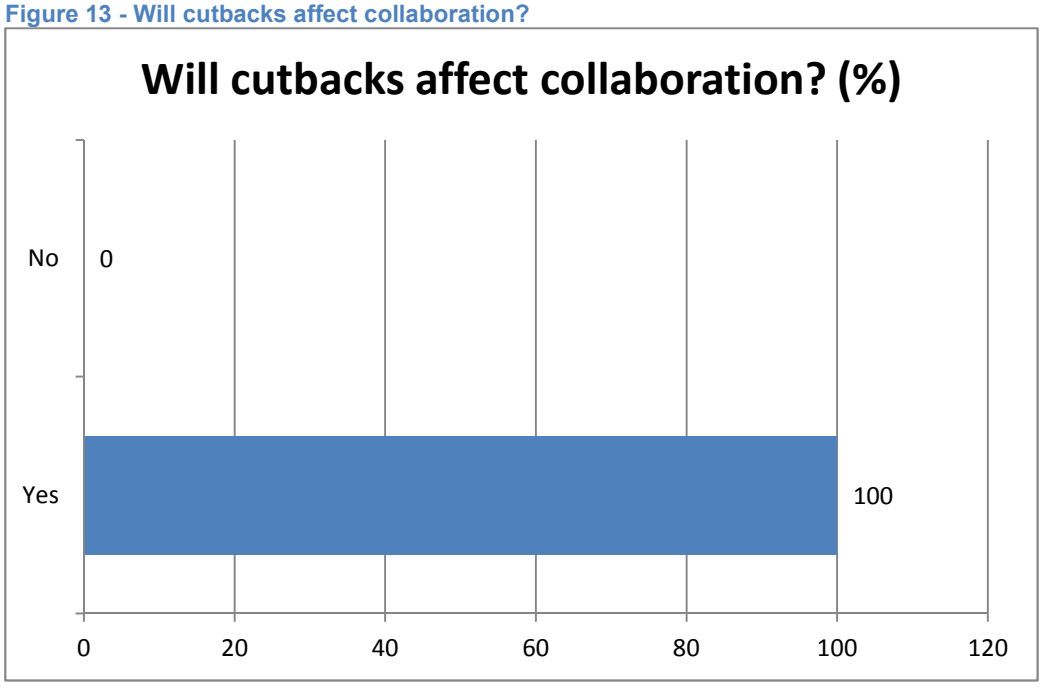
Other issues of concern to members

Cuts to CRC program funding

Respondents were generally critical of the recent cuts to funding for the CRC Program.

The survey asked the question "In your view, will cutbacks to the CRC Program diminish the program's capability to fix entrenched cultural problems of poor collaboration between industry and research institutions?" All respondents held the view that the cutbacks would affect collaboration as set out in Figure 13 below:

Figure 13 - Will cutbacks affect collaboration?



The following comment was indicative of those made more generally by respondents:

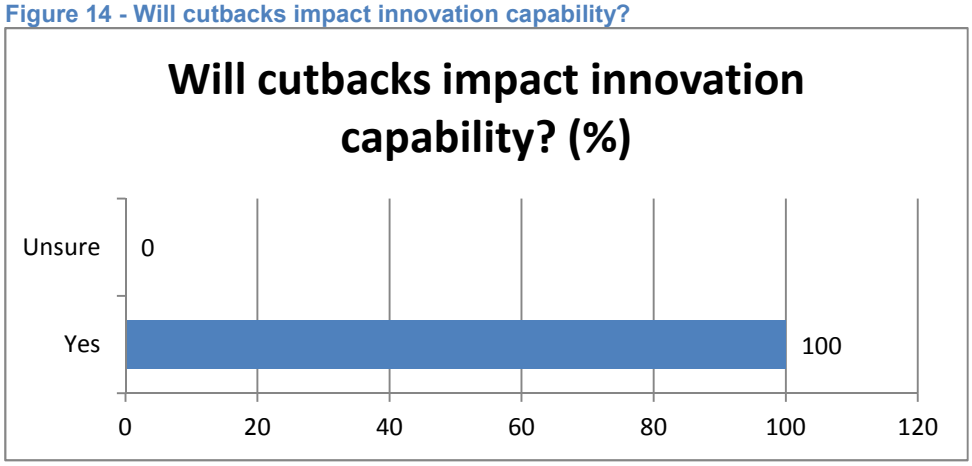
Table 12 - Capacity of CRC Program to address cultural problems with collaboration

The CRC Program is one of the few that truly focuses on research translation. Without it, I fear innovation will falter in Australia.

Impact of cutbacks on Australia's innovation capability

The survey asked the question "In your view, will cutbacks to the collaboration between industry and research organisations via the CRC program impact innovation capability?" All respondents held the view that cutbacks would impact innovation capability as set out in Figure 14 below:

Figure 14 - Will cutbacks impact innovation capability?



The comments set out in Table 13 below are indicative of those made by respondents more generally:

Table 13 - Comments on CRC Program funding cuts

The cuts were not in the national interest.
Appalling ...
I will still continue to work in research translation. However considerable money, resources and time were lost in 2013/14 when the round was cancelled. Appalling decision on the part of government and a bitter pill to swallow. So backward looking ...
We need innovation and the CRC Program supports and enables that. Long-term commitment and funding would demonstrate that government wants to see Australia at the forefront and on the world stage.

Scientists leaving the profession or program

60 per cent of respondents said the uncertainty around funding and the future of the CRC Program made them consider leaving the program or profession. Of those 40 per cent said that security of funding and a long-term commitment to the CRC Program would alter their intention. These figures are of significant concern as they suggest that lack of funding security and a failure to provide long-term commitment to the CRC Program may result in the loss of professional scientists from the program and the profession with the potential to impact the sustainability of the science and R&D workforce and, in turn, the capacity of the workforce to support innovation and productivity improvement.

Extent to which work is valued

Another of the more significant findings of the survey was the extent to which the professional scientists surveyed felt undervalued by government and the community. As set out in Figure 15, a total of 80 per cent of respondents indicated that they felt they were valued only somewhat or not at all by government, while only 20 per cent reported that they felt their work was valued highly or very highly by government. As set out in Figure 16, a total of 60 per cent felt they were valued only moderately, somewhat or not at all by the community, while 40 per cent reported that they felt their work was valued highly or very highly by the community. The figures suggest that respondents felt their work as part of the CRC Program was more highly valued by the community than government.

Figure 15 - Extent to which CRC program work is valued by government

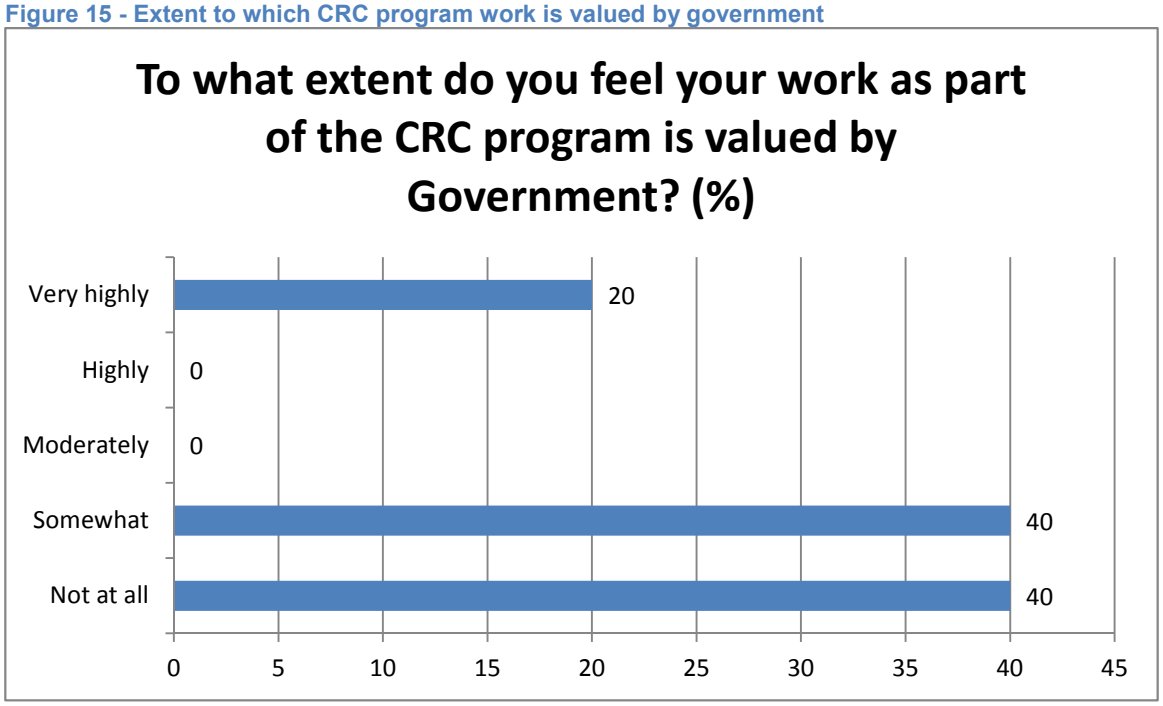
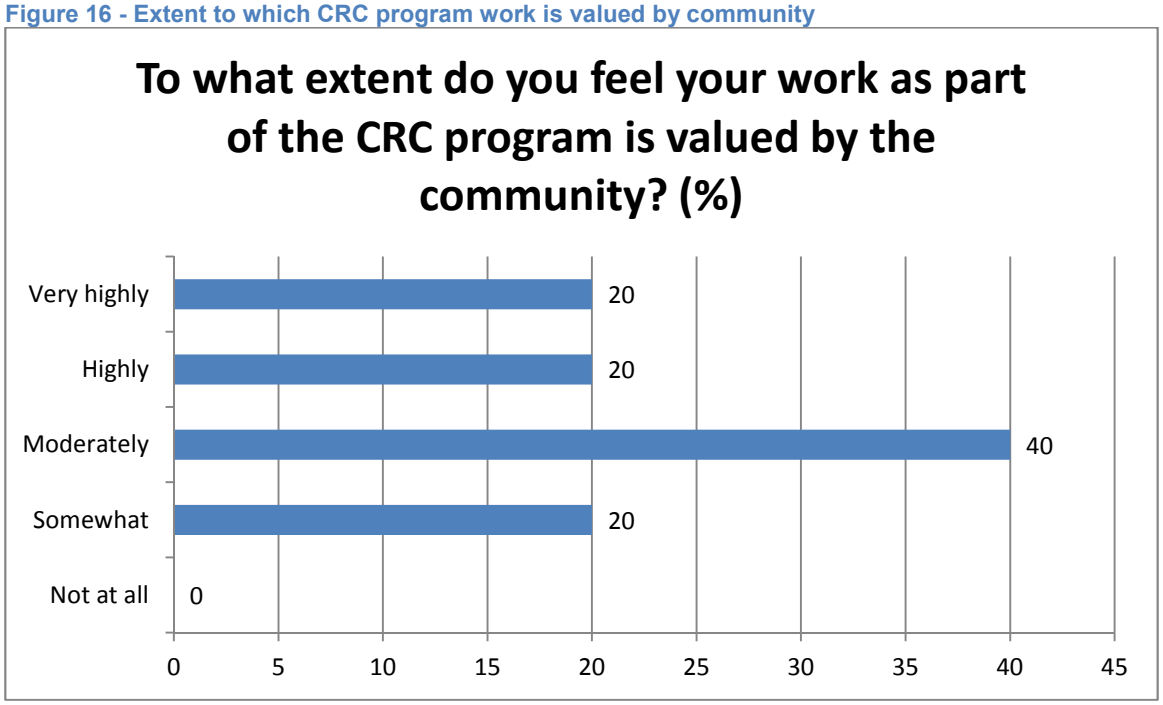


Figure 16 - Extent to which CRC program work is valued by community

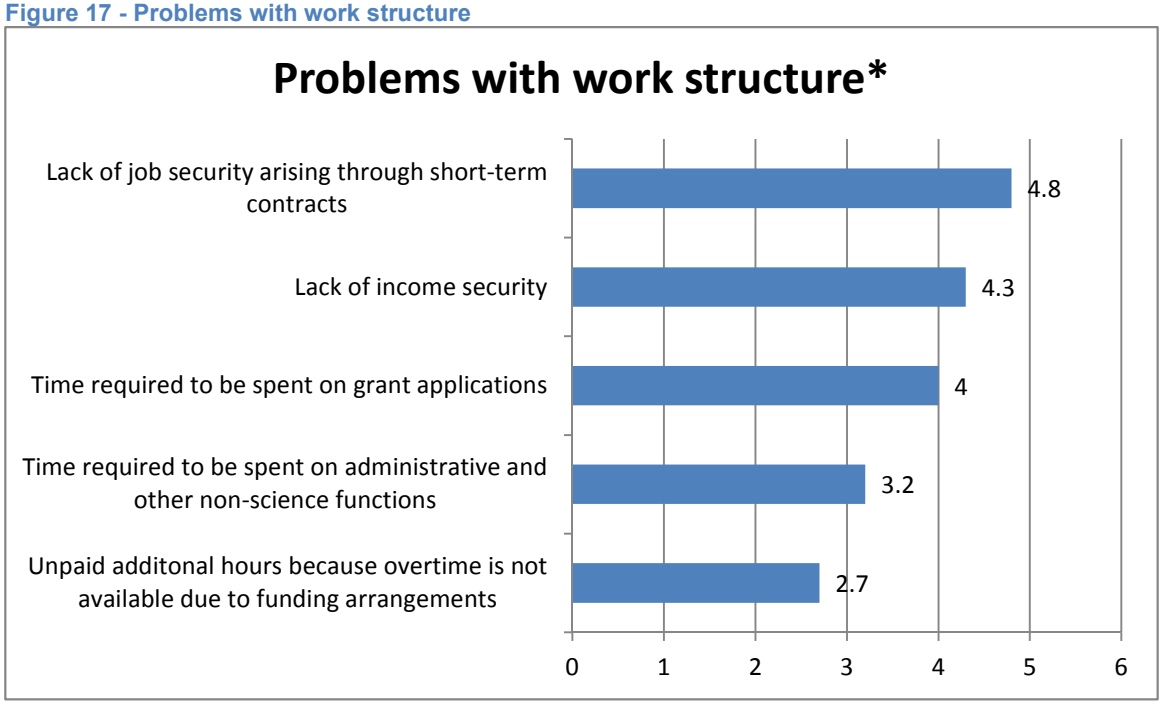


Work structure

Respondents were asked to rank the main problems with the way their work was currently structured.

As set out in Figure 17, the main issues of concern were lack of job security arising through short-term contracts and lack of income security with average rankings of 4.83 and 4.33 out of 5 respectively.

Figure 17 - Problems with work structure



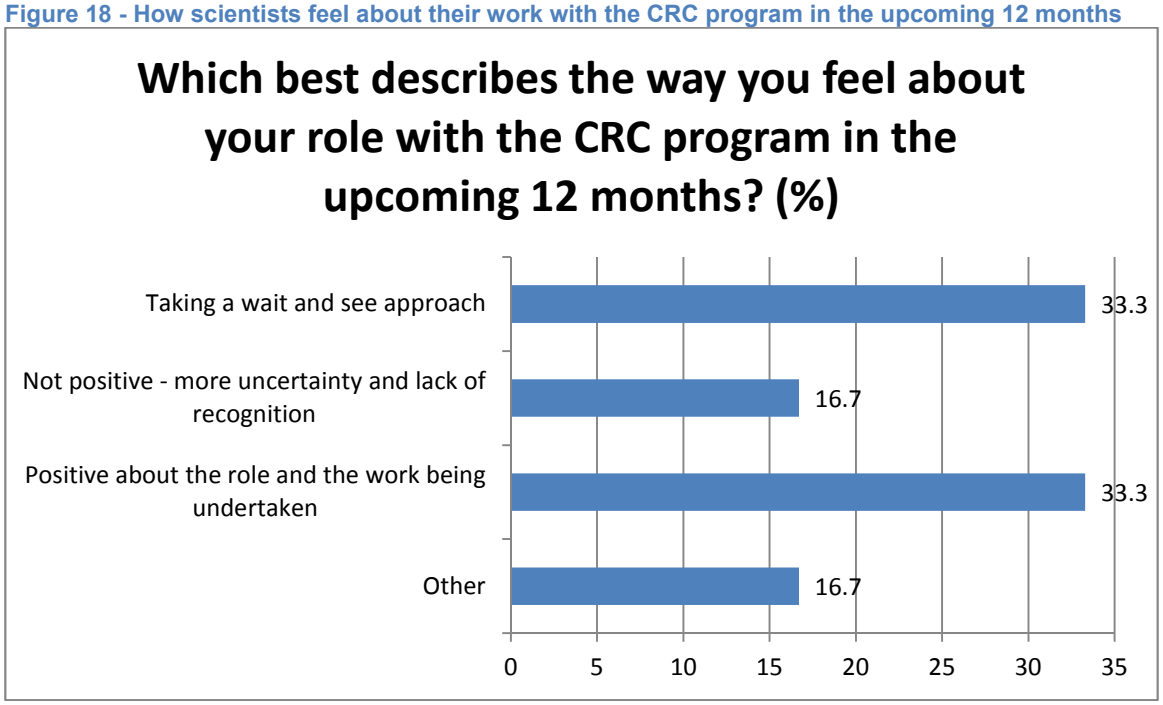
** Note: Rating out of 5 where 5 is major problem and 0 is no problem*

The future

How scientists feel about their work with the CRC Program in the next 12 months

Respondents were asked to detail how they felt about their role with the CRC Program in the upcoming 12 months. As set out in Figure 18, responses were mixed across 'feeling positive about the role and the work being undertaken', to 'not positive with more uncertainty and lack of recognition' and those taking a "wait and see" approach.

Figure 18 - How scientists feel about their work with the CRC program in the upcoming 12 months

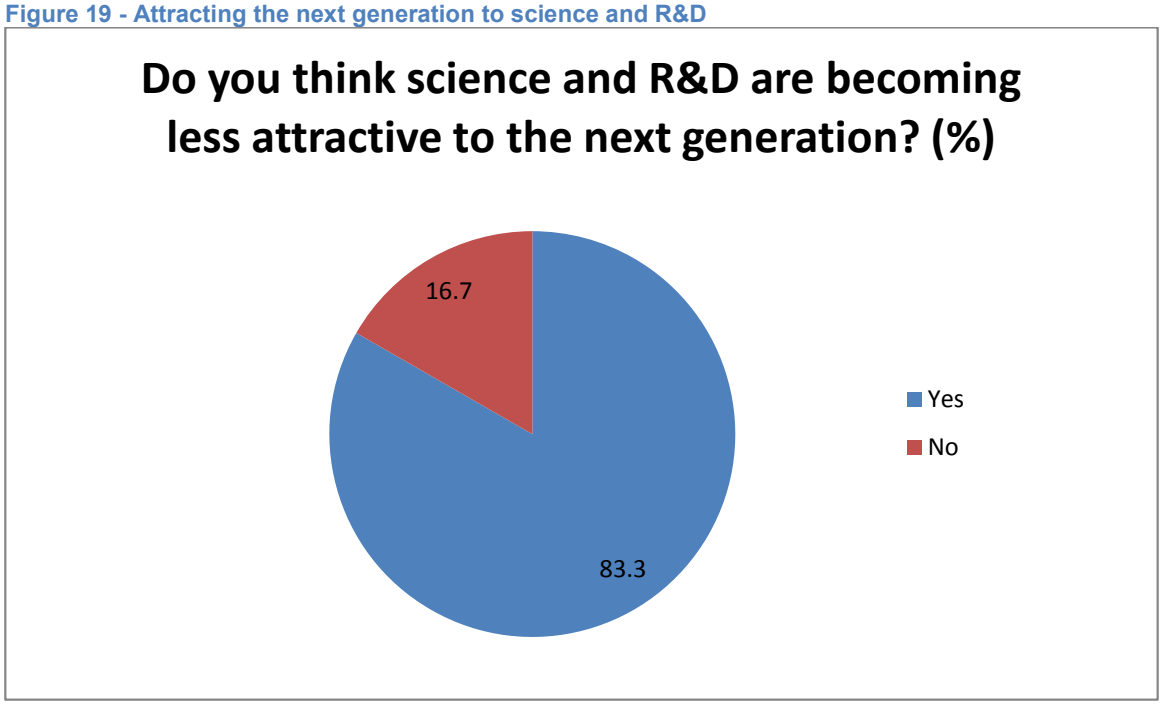


Attracting the next generation of scientists

With the question of whether or not the supply of STEM graduates will be sufficient for our science and technology needs into the future currently being considered, survey respondents were asked about their views on attracting the next generation science and R&D professionals.

As set out in Figure 19, over 80 per cent felt that science and R&D was becoming less attractive to the next generation. This suggests widespread concern that attracting the next generation of science graduates may be a key demographic challenge as we move to a knowledge-based economy reliant on a skilled and sustainable STEM workforce.

Figure 19 - Attracting the next generation to science and R&D



Summary and recommendations

Professional Scientists Australia believes that the federal government must play a leading role in supporting innovation through science and R&D. Support for industry/research sector collaboration will be a key predictor of national innovative capability and, in turn, of Australia's economic growth and global competitiveness going forward. A vision for Australia as a science and innovation leader will depend on correct policy settings, a balanced regulatory environment and a skilled and engaged science and R&D workforce.

On the basis of our member consultation and understanding of the existing innovation system, and in addition to the recommendations set out in Appendix 1, Professionals Australia recommends the following as a broad basis for getting science and industry working more closely together and gaining greater commercial returns from research.

In general:

- support broadranging mechanisms which actively encourage the diffusion and transmission of knowledge throughout industry;
- provide sustained public funding support for basic science and blue skies research;
- provide policy frameworks and regulatory settings which encourage industry-led and translational research in areas of strategic priority, including removal of red tape and overburden of compliance and reporting;
- frame industry policy, a regulatory environment and business support initiatives that foster the role of the private sector and encourage broadbased business investment in science and R&D-driven innovation;
- support industry/researcher collaboration programs which address cultural and structural barriers to collaboration;

- develop workforce strategies at both the structural and enterprise levels to foster a skilled, agile, engaged and inquisitive STEM workforce; and
- acknowledge the value of a co-investment and collaborative funding model in relation to science and R&D over a model which regards government support and investment as encouraging a culture of 'dependence';

More specifically:

- support initiatives which encourage and incentivise buy-in from industries or enterprises that do not currently engage with the CRC Program;
- support international collaboration by a range of mechanisms including funding basic science, lead-up funding, research scholarships, allowing researchers the chance to travel and spend time working with and developing effective working relationships and the development of world-class research infrastructure;
- extend initiatives which further support stronger engagement of small to medium enterprises in whatever future collaborative arrangements are put in place;
- expand entrepreneurship education, in particular entrepreneurship upskilling of researchers;
- consider supporting university commercialisation companies which would provide research commercialisation services including assisting with commercialising IP created at universities and providing pre-seed and seed venture funds to help bridge the gap between research organisations and venture capital;
- develop/amend and utilise the Impact Tool for evaluation;
- extend support for angel investment and the venture capital industry in Australia (through schemes such as the Industry Innovation Fund);
- provide funding for translational research;
- expand startup incentives such as tax incentives for startups (such as the R&D tax credit), ongoing support for grants schemes (such as those from Commercialisation Australia), co-investment schemes (with government investing alongside private investors), business startup incubators and incentives such as the recent changes to taxation of employee share schemes;
- ensure a responsive and robust intellectual property regulatory environment;
- ensure maintenance of extended funding cycles;
- encourage a balance in focus between publishing and commercialisation in universities;
- consider streamlining contractual and administrative requirements including program guidelines;
- ensure the community and government are made aware of the value of the work undertaken as part of the CRC Program (and/or successor programs); and
- consider ways to provide job and income security for those working as part of the CRC Program and ways to reduce time spent on grant applications.

We note that a key policy challenge for the government following the announcement of the Industry Innovation and Competiveness Agenda will be to align the creation of Industry Growth Centres with the existing CRC Program. Professionals Australia believes that this process must involve a transitional phase sufficient to ensure that existing linkages, work in progress and outcomes are not compromised and existing contracts honoured.

We hope you find our input to this important review a useful contribution.

About the survey

The survey was set up in Survey Monkey and members generally as well as those involved with the CRC Program directly or in related Medical Research Institutes invited to complete the survey online.

Contact us

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Related documents

Other Professional Scientists Australia publications that include content relevant to this submission include:

Still the Clever Country?

Available at
(http://www.professionalsaustralia.org.au/groups/scientists/Still_the_Clever_Country_web.pdf)

Realising Innovation Through Science and R&D

Available at
(http://www.professionalsaustralia.org.au/groups/scientists/Realising_Innovation_Through_Science_and_Innovation_web.pdf)

Appendix 1 – Key recommendations from Realising Innovation through Science and R&D

Invest in the science and R&D workforce

- increase scientific research funding to 2.4 per cent of GDP and maintain a position in the top half of the OECD table;
- adopt a longer-term planning focus for funding (including a mix of long and short to medium term grants to ensure researchers spend more time on research and less time on grant applications, but also that early career scientists are not disadvantaged by locking in funding for longer terms); and
- place a hold on cutbacks or funding freezes in conjunction with a commitment to consultation with scientific research organisations and key stakeholders about the threats to organisational capabilities and risks to industry and community arising out of funding cutbacks.

Deal with deprofessionalisation

Professional Scientists Australia recommends that organisations that engage professional scientists must demonstrate a commitment to maintaining sufficient levels of appropriately qualified and experienced staff and offering career path structures which will underpin rewarding and fulfilling careers. This will ensure high-quality service standards, independent and rigorous scientific inquiry, appropriate reward, respect and recognition and a sustainable science and R&D workforce. Operating from a cost base which protects this position is critical to countering deprofessionalisation which is a fundamental threat to a viable science and R&D workforce and therefore to Australia's innovative capability.

Enhance Australia's STEM capability

Professional Scientists Australia calls on key stakeholders to work towards the development of a range of education/industry STEM skills initiatives.

More specifically, we recommend initiatives which will:

- enhance the attractiveness of science careers;
- support early and mid-career scientists;
- support retention of mature-aged scientists as the ageing of the science workforce reflects ageing of the general workforce;
- expand the pool from which tertiary students and graduates are drawn, provide incentives and remove impediments to attract and retain high-quality professionals in/to science;
- ensure that while skilled migration plays an important role in meeting Australia's science skills needs in the face of modest or declining university enrolments and completions that firstly, there are mechanisms in place to ensure migrant workers are subject to protections in the workplace, secondly, that importing skills is not a means for driving down market rates and conditions of employment, and thirdly, that skilled and temporary migration in science occurs in the context of interventions which assist with reducing attrition rates from tertiary science courses, adequate professional development for Australian-based science professionals and enterprise-based strategies to ensure optimal retention of scientists in the profession;
- adopt a long-term focus to build capacity in key areas, especially in newly-emerging disciplines noting the long lead time to produce high-quality well-trained work-ready scientists in emerging areas; and
- deal with the underrepresentation of women in science and R&D and work with key stakeholders on initiatives to address barriers to the attraction, development and retention of women in science courses, academia, workplaces and the profession generally.

Encourage effective reward and recognition strategies, flexible workplace relations and sound management practices

Professional Scientists Australia recommends that employers adopt workplace initiatives which address professionals' career aspirations and flexibility in employment conditions in line with their organisation's strategic objectives.

This will mean a range of things depending on the workplace but fundamentally sound workplace practices such as offering salaries which keep pace with the market, regular and well-conducted performance management and staff feedback, security of employment, payment of penalty rates or

adequate compensation for additional hours worked in lieu of overtime, payment of on-call allowances where appropriate, appropriate standards of office accommodation, access to study leave, availability of part-time work, professional development opportunities, working hours flexibility and opportunities for phased retirement where desired.

It should also include maintaining adequate staffing levels, maintaining a culture of work/life balance, ensuring appropriate numbers of experienced degree-qualified scientists are engaged and retained, ensuring early career scientists are mentored and supported and recognising the work of senior staff undertaking these mentoring roles, seeing that senior scientists are included in management decision-making around the organisation's science and R&D workforce, ensuring that scientists have career path options as technical specialists as well as in management roles and generally challenging and fulfilling careers.

We also see encouraging flexible and consultative management practices as critical because of their potential to operate as barriers to workplace productivity.

Address workforce development issues
Professional Scientists Australia would welcome the involvement of a wide range of stakeholders in developing a workforce development plan to take the science and R&D workforce into the next decade.

Such a plan would include:
- ensuring an effective science and R&D skills pipeline from schools;
- strategies to enhance quality and fit of STEM skills supply from universities ;
- effective communication and structuring of career pathways into and within the science and R&D workforce;
- broadening the mix of workers in the science and R&D workforce by improving participation and diversity; and
- supporting and enabling continuing skills development across careers.

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[12] The Industry Innovation Fund program was a venture capital program that supported new innovation funds and fund managers with expertise in early-stage venture capital investing. It co-invested with private sector investors in venture capital funds to grow early-stage companies to commercialise the outcomes of Australia's strong research capability. As part of the 2014-15 Federal Budget, the government decided not to proceed with the fourth round of the Innovation Investment Fund program.

[13] StartupAUS (2014). Crossroads: an action plan to develop a vibrant tech startup ecosystem in Australia, p.47. Available at http://startupaus.org/crossroads/.

[14] StartupAUS (2014), p.46

[15] Startup AUS (2014) p.i

[16] The Commercialisation Australia Program was established in 2009 to support companies and innovators during the commercialisation phase of developing their products and ideas. The Commercialisation Australia Program's governance arrangements included the Commercialisation Australia Board. The Board which was established to provide expert advice and merit rank applications for grant funding –was revoked on 25 October 2014. The Program was suspended on 21 March 2014 pending the outcome of the 2014–15 Commonwealth Budget process. Subsequently, as part of the 2014-15 Budget, the Government announced cessation of the Program from 1 January 2015 (Thomson Reuters Weekly Tax Bulletin, Issue 46, 31 October, 2014.)