



**Australian Government**  
**Department of Education,  
Science and Training**



**COOPERATIVE RESEARCH CENTRES COMMITTEE** Submission No. ....11.....

The Secretary  
Standing Committee on Science and Innovation  
House of Representatives  
Parliament House  
Canberra ACT 2600

Submission to the Inquiry into Pathways to Technological Innovation  
(by e-mail)

Introduction

This submission is made in my capacity as the Chair of the Cooperative Research Centres (CRC) Committee. Unfortunately because of the timing for your deadline it is not possible for the CRC Committee to endorse this submission as the next meeting of the Committee will not take place until June 2005. The submission will be included in the agenda for the next meeting and you will be advised of any extra points or comments the Committee wishes to add to my contribution.

The CRC Committee is an independent committee giving advice and recommendations to the Minister for Education, Science, and Training on all matters related to the CRC programme. The committee meets three or four times a year to review the programme, to review the activities of individual Centres, to develop policies and procedures for the programme and to advise the Minister on the outcomes of selection rounds.

The CRC Programme

The CRC Programme was launched in 1990 with 15 Centres commencing activities in 1991 following the first selection round. There have now been nine selection rounds through which there have been a total of 158 successful applications. Some existing Centres apply for renewal. There have been some Centres which have been successful in applying for two funding periods (ie one renewal), and some which have been successful for three funding periods (ie two renewals).

The normal funding period is seven years. In the case of centres which are 'renewed' for a second life the seventh (final) year of their existing grant becomes the first year of their renewed grant resulting in a total grant period of 13 years. When a Centre has been renewed twice for three lives their funding period extends over 19 years.

Since the inception of the program, allowing for renewals, the number of Centres which have been in operation is:

- Number of Centres with one funding period: 54
- Number of Centres with two funding periods: 31
- Number of Centres with three funding periods: 14

Seventy Centres are presently in operation. This number will fall to 59 in July 2005 when the new Centres from the 9<sup>th</sup> selection round commence activities and with the closure of Centres from previous rounds when they complete their existing Commonwealth Agreements.

CRCs are classified against six innovation and technology categories:

- Manufacturing Technology
- Information and Communication Technology
- Mining and Energy
- Agriculture and Rural Based Manufacture
- Environment
- Medical Science and Technology

The objectives of the CRC programme over the years have catered for both commercial and public-good outcomes. However in recent selection rounds there has been greater emphasis placed on commercial outcomes and economic growth.

The selection criteria for the 8<sup>th</sup> (2002) selection round were based on the following objectives:

1. "To enhance the contribution of long-term scientific and technological research and innovation to Australia's sustainable economic and social development.
2. To enhance the transfer of research outputs into commercial or other outcomes of economic, environmental or social benefit to Australia.
3. To enhance the value to Australia of graduate researchers.
4. To enhance collaboration among researchers, between researchers and industry or other users, and to improve efficiency in the use of intellectual and other research resources".

In meeting these objectives, and the related selection criteria, successful applications resulted in mainly commercially oriented Centres but also some public-good Centres.

For the 9<sup>th</sup> (2004) selection round the CRC programme objectives were condensed into a single all-embracing one to place an even greater emphasis on commercialisation and economic growth. The current objective for the programme is:

"To enhance Australia's industrial, commercial and economic growth through the development of sustained, user-driven, cooperative public-private research centres that achieve high levels of outcomes in adoption and commercialisation".

The new objective and the related selection criteria meant that the 14 successful 9<sup>th</sup> round Centres all had commercial strengths and the capacity to add economic growth to the nation. There were no new Centres that could be classified as solely 'public-good'.

All Centres must submit a Commercialisation Plan to the Science Programme Branch in the Department of Education, Science and Training (DEST) within the first two years of operation.

### The CRC Committee and Commercialisation

The CRC Committee has often had agenda items related to commercialisation for discussion at meetings. Attachment 1 lists the agenda items, and a brief description of each item, considered at committee meetings over the last two years. The Committee also received a number of reports dealing with commercialisation. These reports, with a summary for each report, are also listed in Attachment 1.

The major activities in the area of commercialisation have been the development of guidelines for each Centre's commercialisation plan; the development of performance measures and indicators for Centres to use to measure the extent of commercialisation activity undertaken by CRCs, and the outcomes of these activities; and a range of discussions related to the engagement of industry, and particularly SMEs, in CRCs.

A key element of the programme is the heavy involvement of research users in CRCs which in turn means that the strategies and priorities for CRCs are user driven with a focus on innovation and commercialisation.

I should like to add comments against a number of the headings suggested in your letter of invitation for submissions.

### Pathways to commercialisation

The success of the CRC programme is heavily related to governance. Centres are set up as incorporated companies or as unincorporated joint ventures. Each centre has a skills-based board of directors which operates as if it were the board of an incorporated company even in the case of joint ventures. Since the 9<sup>th</sup> selection round it is required that every Centre be an incorporated entity. Boards are required to have an independent Chair and a majority of independent or research-user members and a minority membership from research providers. Boards set the strategies, policies and priorities for each CRC. The commercial and business skills on CRC Boards establish a commitment for commercial outcomes.

Most CRCs have the equivalent of a Research and Commercialisation Committee advising and reporting to the Board. These Committees invariably have a membership of industry representatives, sometimes venture capitalists, and other members with commercialisation expertise. This in itself creates a strong emphasis on commercialisation.

Generally the research projects across CRCs must have a commercial focus with each project having its own commercial plan and a proposed path to market.

### Intellectual property and patents

CRCs use a range of procedures to manage intellectual property (IP). IP can be managed directly by the CRC or through a trust company set up by the CRC. Centres take out Australian and international patents where appropriate and report these activities in their Annual Reports to DEST.

IP, whether it is covered by patent or not, can be commercialised through spin-off companies, through direct transfer to participants within the CRC, through exclusive and non-exclusive licensing, or sale. All mechanisms have been used across the CRC programme. Commercial returns can come from the direct marketing of products and services by the CRC or a spin-off company, through the sale of IP, from licence payments, and from royalties as a return on investment. All licence agreements must be reported to DEST.

### Skills and business knowledge

As indicated above the commercial skills within CRCs can rely on the skill-base of the Board, the commercial background of the CEO, the involvement of users and particularly the industry participants in a CRC, the involvement of commercialisation committees, and the appointment of commercial managers with the appropriate qualifications and experience.

Most CRCs also conduct training programmes in commercialisation for their research staff, administration staff, and post graduate students. Programmes such as the “boot camp” run by the Australian Institute for Commercialisation (AIC) have become popular.

### Research and market linkages

As indicated above market linkages for CRCs rely very much on their governance structure and the support of their industry participants. This is one of the special features of “cooperative” research where all members in a CRC work in collaboration to achieve the vision, mission and objectives of the CRC. This also allows for outcomes which are greater than the sum of the parts.

This is the key factor in determining success in innovation and commercialisation in CRCs, as well as the other objectives of the CRC programme.

### Examples of CRC commercialisation and innovation

There are many examples of success stories and case studies in commercialisation of products and services coming from CRCs. Centres have also been directly responsible for the transfer of technology which has led to increased productivity, increased efficiency, the maintenance of competitive advantage, increased exports, and increased employment.

Some examples are:

- The establishment of successful spin-off and start-up companies. For example the listing of the company Ambri which has developed technologies in ‘molecular engineering’.
- The use of CRC technology in composite structures by Melbourne-based Hawker de Havilland in the manufacture and export of aircraft parts supplied to Boeing and Airbus.
- The use of CRC technology in Australia’s shipbuilding industry.
- Industrial applications involving ‘intelligent manufacture’.
- The development of a plastic which turns into a fireproof ceramic material in a fire. This technology has been taken up by a multinational electric cable manufacturer.
- New printing technologies transferred to the printing industry.
- The adoption of innovations in the manufacture of cardboard from recycled materials.
- Large savings in the processing of gold using CRC technology, thus helping to make gold one of Australia’s biggest exports.
- New technologies adopted in mineral discovery, ore processing and refining, and metal fabrication.
- CRCs introducing new technologies in the mining and extraction of coal (eg dragline management) thus helping to make Australia’s coal exporters internationally competitive.
- The development of new products, the improvement of productivity and farming practices, and the improvement of stock and cereals in key areas of agriculture (beef, sheep, wheat, other grains, cotton, dairy products, aquaculture, forestry, rice, viticulture).
- The transfer of new technology to the farm gate through high quality extension courses.
- The increased productivity on farms through CRC research applications in weed control, pest control, and soil and water management.
- The adoption of research findings by Australia’s tourist industry.

- The manufacture and successful product launch of a 'long wear' contact lens.
- The development of new biocompatible plastics.
- The manufacture and commercialisation of diagnostic aids.
- Improvements in the Cochlear implant.

### Conclusion

CRCs are a successful model for cooperative and collaborative research leading to innovation and commercialisation. In a period of 15 years they have brought about a change in research culture in Australia. Because of the success of the programme it has been responsible in part for the introduction of collaborative research with industry partners being undertaken through collaborative and partnership grants sponsored by the Australian Research Council and the NHMRC, in a number of AusIndustry programmes, within CSIRO, as a model for Centres of Excellence and in the Major National Research Facilities (MNRF) programme.

The key to the success of all of these programmes relies on the involvement of industry and user participants working in partnership with research providers.

I would be very happy to add further information or provide further details on request. I would be pleased to attend any briefing sessions, seminars, or public hearings if that was helpful to the Standing Committee on Science and Innovation. A signed copy of this submission has been posted in hard-copy to the Secretary to the Inquiry.

(Dr) Geoffrey Vaughan  
Chair, CRC Committee

Date 28 April 2005

**Reports and papers presented to the CRC Committee on Research Commercialisation over the period 2003-05**

CRC Committee agenda items dealing with commercialisation:

Meeting	Agenda Item	Brief Description
19 Nov 2003	7: Draft Commercialisation Plan Guidelines	This agenda item presented draft commercialisation plan guidelines for the Committee's consideration. The guidelines were published subsequently, and the 2002 round CRCs used the guidelines to develop commercialisation plans for approval by the Commonwealth.
10 Feb 2004	6: Draft Communication Strategy	The Committee considered a paper, Draft 2003-04 Communications Strategy, which discussed ways to "promote greater uptake of CRC research outcomes by end-users" by increasing awareness of the cutting-edge research undertaken by CRCs and encouraging end-users to participate actively in CRCs.
22-23 April 2004	9: Performance Measurement Framework and Scorecard	The agenda item presented a draft performance management framework for consideration by the Committee, and in particular, a list of indicators to measure the extent of commercialisation activity undertaken by the CRCs and the outcomes of these activities.
14 July 2004	5: Performance Management Framework	The Committee was briefed on a number of exercises aimed at developing commercialisation metrics (details are provided below).
14 July 2004	8.1: Engagement of Industry in CRCs	This agenda item discussed the activities planned by the Department to increase industry awareness of the CRCs' activities and achievements, and provided details of a workshop planned for 22 July to bring industry peak bodies and CRCs together to discuss communication strategies aimed at better engaging small and medium scale industries in CRC activities.
22 Oct 2004		The Committee was provided with the report, <i>Measuring the Impact of Publicly Funded Research</i> .

The CRC Committee considered, in relation to the development of a revised performance management framework for the CRCs, reports arising from a number of exercises funded under the *Backing Australia's Ability – Building our Future* to develop metrics to measure the extent of research commercialisation. The Committee was briefed on these reports at its meeting in July 2004. A few presentations were also made to the Committee on similar exercises.

**(1) Coordination Committee on Science and Technology (CCST) Working Group on Commercialisation Metrics**

The interim report tabled by the CCST Working Group at a meeting in November 2004 aimed to propose a definition of research commercialisation for performance monitoring and reporting purposes and metrics for immediate adoption/further development. The report included a table of potential metrics collated from 22 submissions, other concurrent exercises and the UK Science and Technology Policy Research Group (SPRU) report, *Measuring Third Stream Activities*.

**2) *The Emerging Business of Knowledge Transfer: Creating Value from Intellectual Products and Services*, Howard Partners**

The consultancy report *The Emerging Business of Knowledge Transfer: Creating Value from Intellectual Products and Services* by Howard Partners proposed a framework for identifying, tracking and understanding the economic impact of research produced by universities and research organisations. It recommended the measurement of:

- Knowledge diffusion – communication, capacity building, extension and education, standard setting;
- Knowledge production – academic publications, patenting and licensing, income streams, spin-off companies
- Knowledge relationships – contract research and consultancies, staff and students working with industry
- Knowledge engagement

The proposed CRC performance management framework is consistent with this approach.

### **(3) *Measuring the Impact of Publicly Funded Research, Allen Consulting Group***

*Measuring the Impact of Publicly Funded Research* report published in September 2004 sought to produce a classification of benefits of publicly funded research and to propose ways to systematically and cost-effectively measure these benefits. The report recommended first and second order metrics to measure outcomes in material, human, environmental and social dimensions.

The report recognised a number of inherent difficulties in measuring the impact of research:

- the difficulty in establishing causality due to the time-lag in translating a research output into a product/process of value to the public and the impact of external factors;
- current emphasis in Australia on measuring academic impact rather than the extent of knowledge diffusion by other means; and
- the need for different sets of indicators to measure the impact of research in different types (basic or applied) and fields of research.

The report notes that:

- indicators of impact should measure both the quality of research and extent to which knowledge is diffused to end-users;
- relative levels of impact of different (types/fields of) research is more accurate and useful than absolute rate of return on investment in research;
- output data must be indicative of the final outcomes;
- data on interim/transitional outcomes may be more accurate and useful;
- longer term trend analysis and better utilisation of data should be planned; and
- key indicators of commercialisation would be: number of spin-off companies; employment, turn-over and production value added of spin-off companies.

Dr Vaughan was consulted by the study.

### **(4) *National Survey of Research Commercialisation – Years 2001 & 2002***

The *National Survey of Research Commercialisation – Years 2001 & 2002* report updates the findings of an earlier exercise, Year 2000 Survey conducted by ARC, NH&MRC and CSIRO on selected measures of commercialisation activity in universities and publicly funded research agencies. The report was published in September 2004, and included CRCs for the first time.

The survey included questions relating to:

- research expenditure;
- research commercialisation staff (involved in commercialisation/licensing and support activities);
- patent activity (inventions disclosed, patent applications filed/maintained in Australia, US and other countries, patents issued);
  - expenditure on IP protection;
- licensing activity (licences executed, % of exclusive licences, number of licences yielding income, licence income);
  - licences executed with start-up, small, medium and large companies
  - research areas yielding licences

- o inventor involvement in commercialisation/licensing activities
- start up companies
  - o number of companies formed;
  - o % of companies with headquarters in Australia;
  - o companies operational at the end of the year; and
  - o % of companies in which equity was held at the end of the year; and
- value of equity holdings.

#### **(5) CSIRO's performance management framework**

At the Committee meeting on 14 July 2004, Mr Bob Garrett, CSIRO made a presentation to the Committee on CSIRO's performance management framework, *Bench to Board*. The presentation focussed on commercialisation strategies and metrics used by CSIRO.

CSIRO proposes to measure:

- innovative and competitive industries – more competitive production costs, new or improved products, services and businesses;
- health environment and lifestyles – improved health, safety and wellbeing and improved environmental health;
- a technologically advanced society – reduced economic, environmental and social risk, enhanced human capital.

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