

CSIRO Partnering with Industry

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Abstract:

CSIRO was established in 1949 to provide research for industry and government to enhance Australia's economic development and international competitiveness. Over a period of almost 60 years CSIRO has undergone a process of evolution and change. A substantial proportion of the organisation's research revenue is now derived from external sources and there is a greater commitment to partnering and collaboration with other public research agencies, universities, industry and government. More recently CSIRO has adopted a much greater strategic focus in nine key areas of research through the Flagships Program. The research programme focus of the collaboration through cooperative research centres has given way to a more project oriented approach through specific and targeted collaborations and joint ventures. These changes are re-stating the role and focus of CSIRO in Australia's national innovation system.

Keywords: Innovation. Collaboration. Partnering. Joint Ventures. Cooperative Research Centres. Commercialisation.

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CSIRO was established in 1949 with a major responsibility to carry out scientific research that would assist Australian industry and encourage the application and use of the results of its own or any other scientific research. The application and use of research is intended, among other things, to increase the competitiveness and sustainability of Australian industry through both transformative and incremental research. CSIRO sees its success being dependent on delivering results with relevance and impact for Australia. This is, in turn, highly dependent on building and maintaining strong relationships with customers, industry partners, staff and other stakeholders (CSIRO 2007a).

CSIRO identifies four product and service categories: national research flagships; core research; science outreach (education and scientific publishing); and national research infrastructure (national facilities and collections). The national flagships programme was initiated in 2003 with an initial commitment of \$305m over seven years for the purpose of bringing focus and scale to research in areas that have been identified as representing some of Australia's most important and complex challenges and opportunities in a number of areas (CSIRO 2006). Flagships have become an important vehicle for partnership and collaboration and provide a platform for CSIRO to take a greater leadership role in Australia's innovation system.

The initial six flagships were Water for a Healthy Country; Food Futures; Light Metals; Preventative Health; Wealth from Oceans; and Energy Transformed. Three new flagships have been added in 2007–08 with an additional commitment of \$174m. The new flagships are Climate Adaptation; Minerals Downunder; and Niche Manufacturing.

CSIRO's core research activities, undertaken through CSIRO Divisions, collaborations, joint ventures and other entities, are directed towards delivery of new and improved technologies, management systems, intermediate and final products, catalyst services for business, advice relevant for policy development and new knowledge and skills. Science outreach covers science education programmes for school students and their teachers, and the CSIRO Discovery Centre in Canberra. CSIRO also hosts three major national research facilities: the Australian Animal Health Laboratory; the Australia Telescope; and the Marine Research Vessel.

The 2007–08 CSIRO budget estimates that total revenue will be \$1,031.4 billion in 2007–08 (compared to \$972.9m in 2006–07), of which \$664.5m (64.4 percent) will be sourced from government and \$366.9m (35.6 percent) will be earned from other sources including co-investments, consulting and services provided to the private sector, governments, rural research and development corporations, cooperative research centres, and overseas entities, as well as sale and/or licensing of intellectual property. This income reflects the results of CSIRO's commercialisation and business development activities and are reported in more detail in the Annual Research Commercialisation Report (CSIRO 2003; 2004; 2005) and more recently in the Annual Report (CSIRO 2006)

In 2007-08 CSIRO will allocate \$330.4m to its research flagships programme of which \$249.1m (75 percent) is sourced from government. Funding for core research will amount to \$616.5m, of which \$356.5m (57.8 percent) will be sourced from government and \$260.0m (42.2 percent) will be funded from external sources. The other two product and service categories account for a total of \$85m or eight percent of CSIRO revenue.

The distribution income between parliamentary appropriation and external income sources is illustrated in Figure 1.

FIGURE 1 ABOUT HERE

The distribution of revenue points to the success of CSIRO in putting a case to government for ongoing and increased investment in its flagships programme. Total flagships funding amounted to \$80m in 2003–04, increasing to \$170m in 2005–06 and \$249m in 2007–08. The data in Table 1 indicate that in 2007–08, the government will provide 75.4 percent of the funding for research flagships, compared to 57.8 percent for core research. This means that CSIRO will fund 42.2 percent of its core research activities from external sources.

The combination of new government funding, redirected CSIRO funding and external revenue will take the total investment in the flagships programme to close to \$1.5 billion. According to CSIRO this makes the flagships initiative one of the largest targeted scientific research programmes in Australia's history. This, together with the increase in 'earned revenue' is changing the way CSIRO approaches its national interest obligations as well as the way it works with industry and government in its core research activities in the context of its role in the Australian innovation system.

The increased proportions of external funding for core CSIRO research reflects a growing commitment to engaging with external clients through business development opportunities. This commercialisation activity, covering intellectual property licensing and research contracts and consultancy sits alongside collaboration and joint venture relationships with industry and government through the flagships programme and other vehicles. The remainder of this paper will comment on the scope and scale of these interactions with industry and external clients. A description of commercialisation and business development activities will be provided followed by comment on collaborations through the flagships programme and other partnering arrangements.

1 Commercialisation and business development activities

For 2005–06, the latest year for which data are available, CSIRO reported a total of \$353m in external revenue (CSIRO 2006). This represents an increase of more than a third over the total of \$264m reported for 2000–01. The most significant revenue category is 'co-investment, consulting and services' which generated a total of \$272m in 2005–06—amounting to 77 percent of the total. Revenue from intellectual property licenses and royalties amounted to \$37m in 2005–06, or approximately 10.5 percent of the total.

Within the 'co-investment, consulting and services category' the major sources of revenue are: the Australian private sector, (which contributed \$67.6m in 2005–06); the Australian government (\$96.5m); research and development corporations (\$44.3m); cooperative research centres (\$35.2m); and overseas entities (\$36.4m). In 2005–06 the top five client contract accounts accounted for 18 percent of total research and services revenue. CSIRO has been working towards eliminating the subsidization of its consulting services, which in June 2003 amounted to \$3.9m. The subsidy is now close to zero—which may account for a decline in revenue from private sector clients from 2003–04.

The trend in revenue sources over the period 2000–01 to 2005–06 in each of the major categories is represented in Figure 2.

FIGURE 2 ABOUT HERE

Intellectual property revenue, covering income from licence, option, and assignment (LOA) agreements, has increased significantly over the period 2000–01 to 2005–06. This is a reflection of a more focussed and committed effort by CSIRO towards management of its intellectual property

portfolio. Licence income from intellectual property in cotton alone exceeded \$10m in 2005–06. A profile of CSIRO’s intellectual property portfolio is summarised in Table 1.

TABLE 1 ABOUT HERE

CSIRO technologies are made available to industry through a variety of licensing and equity arrangements. More than 160 companies are founded on CSIRO technology and many others utilise technologies in their business. CSIRO currently holds an equity shareholding in more than 20 companies.

The increase in external income has come with a view that research users are in fact ‘customers’. CSIRO is developing a more commercial and business-like approach to the way it works in this area. It is having an impact on the culture of the organisation—and is enhancing its contribution and its relevance in the Australian innovation system.

PARTNERING ACTIVITIES

CSIRO enters into partnerships with universities and industry to achieve impact where its efforts alone are insufficient and to reach a much broader constituency of communities. It places a high value on partnerships and taking what it refers to as a ‘Team Australia’ approach to creating impact. CSIRO’s current strategy is to concentrate on increasing the impact of selective partnerships with cooperative research centres (CRCs) and universities, increasing its engagement with government to impact on policy, partnering with agencies to contribute to the global agenda, and continuing to encourage an informed community through interactions with the public. The flagships programme is emerging as a major vehicle for building this capability.

Cooperative research centres

The CRC programme was established in 1990 with the first CRCs announced in 1991. Initially the CRC model was intended to build bridges between the CSIRO and universities. Industry involvement came later in the development of the model. The vision for CRCs was a ‘one stop shop’ for innovation, consisting of a cooperative team of researchers and research users, drawn from various organisations and of adequate size and composition to have a real and continuing impact in the sector where it was located.

The driving forces for the CRC programme were perceived weaknesses in the institutional framework for Australia’s R&D effort as analysed by Professor Ralph Slatyer, Australia’s first Chief Scientist (Slatyer 2000). Australia’s combined scientific and technological resources were seen as quite substantial but they too dispersed both geographically and institutionally. This separation made it hard to build strong research teams, led to unnecessary duplication of facilities, and caused difficulty in ensuring that they were world class. Existing research funding arrangements were seen as contributors to the problem. As most research funding in Australia was from institutional sources and distributed via administrative channels to operational units and individual researchers, it was difficult to build large integrated research groupings with critical mass. Competitive funding sources, such as the Australian Research Council, the National Health and Medical Research Council and the Rural R& D Corporations had, with few exceptions, difficulty in building such teams as they focused on project funding which was usually relatively short term and small scale.

The case for CRCs was also based on a view that corporate R&D was not well developed in most Australian industry sectors which meant limited capacity for corporate and other research users to benefit fully from the skills and information inhering in the universities and government research

organisations, notably CSIRO. It was appreciated that information and technology are transferred most effectively when there is a similar level of knowledge in both parties, and the lack of in-house R&D capability was seen as an important liability. Moreover, graduate programmes in Australian universities provided mainly traditional academic training, involving research only and a single supervisor. This did not prepare students well for jobs outside the academic world in corporate R&D laboratories, for example, where staff are required to work in teams and across a number of projects, as well as effectively denying students access to the skills and experience of many of Australia's best researchers and researchers the stimulus of interaction with advanced students.

The CRC model was based on the principle that research organisation participants would undertake mainly long term strategic research (work at the 'R' end of the R&D spectrum) and research users would work mainly at the 'D' end. All user participants would have access to the research in the Centre so the competitive challenge for individual firms, that contributed cash and time to the CRCs would be able to utilise the research results in-house, ahead of others. It was also expected that more than one firm would be associated with each Centre so that it would not become the research arm of a particular firm and opportunities for commercial joint ventures would be more likely to arise. Embedded in the concept was also the objective that the Centres would demonstrate the benefits of greater cooperation to the whole Australian research and research user community and thus enhance the overall national R&D effort.

It was also envisaged that a combination of location, funding and leadership would achieve a higher level of cooperation than in the past. Centres were to be located on, or adjacent to, university campuses wherever possible so as to encourage 'precinct' development around each campus, with innovative, R&D-intensive firms coming to regard universities as the logical place to locate part of their R&D effort. Given the geographical dispersion of Australian research groups, however, it was evident that the degree of co-location would seldom be achieved in the new programme. It was therefore hoped that funding flexibility would lead to imaginative building programmes and that effective networking would do much to overcome the 'tyranny of distance'.

The CRC programme is now the government's major vehicle for promoting collaborative research links between industry, research organisations, education institutions and government agencies. The programme supports research and development and education activities that achieve outcomes of national economic, environmental and social significance. They are seen to reflect the appropriate balance between longer-term strategic research programs and short term, market-oriented projects essential to forging links between science and industry. CRCs also play an important role in training in science and engineering research – and are accredited for doctoral supervision - providing skilled people for internal R&D capability.

The objectives of the CRC programme have evolved over time following a number of reviews and a growing interest by government in the commercialisation of research as reflected in a number of key industry statements. The current objective of 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.'*

This focus on commercialisation represents a major departure from the original purposes of the CRC programme. Many CRCs have taken this objective to mean generating a revenue stream from the commercialisation of research through sale and/or licensing of intellectual property or the creation of research-based spinoff companies. This form of adoption and application of research findings is relatively easy to measure but, as the 2003 Review pointed out, national and industry benefits that follow from broad take up and adoption can be significantly greater, if much harder to measure (Howard Partners 2003).

CSIRO has been active in the programme since its inception and remains a strong supporter. It has participated in 95 of the 123 CRCs which have commenced or renewed since 1990. CSIRO has indicated that in CRCs where it is a major player, its commitments have comprised, on average, 27 percent of the equity in the CRC, amounting altogether to 11 per cent of CSIRO resources. CSIRO considers that many CRC collaborations between universities, CSIRO, industry and other organisations have significantly improved the coordination of Australia's national research effort in particular fields and helped achieve very significant research and commercial outcomes. CSIRO is still the largest single participant in the CRC programme and during 2005–06 was a participant in 47 of the 71 currently active CRCs. Of these 47, CSIRO was a core participant in 44, a supporting participant in two and an affiliate participant in the other. CSIRO's lifetime involvement in the CRC programme equates to participation in 120 CRCs and over \$1 billion in total CSIRO investment.

There is a growing expectation among some parties that CRCs should be sustainable over the longer term, without the need for government support. However, CSIRO has suggested that the aim of some CRCs to become self-sustaining through commercialisation revenue is probably unrealistic and can become counter-productive when attempting to reach the goal could give rise to protracted IP negotiations, as well as wasting staff time and increasing administrative costs.

In assessing the CRC program more generally, CSIRO takes the view that Australia does not need an additional set of permanent R&D institutions which compete with the 40 universities and six federal research agencies. It considers that more flexible collaborative arrangements would help provide the dynamic element in the national innovation system, leaving the universities and the research agencies to provide the base support.

The recent Productivity Commission Report (2007) on support for public science and innovation in Australia took a similar view and concluded that the CRC programme is best suited to longer-term collaborative research arrangements. The Commission identified a suite of complementary options for business collaboration with public sector research agencies and universities that could provide more nimble, less management-intensive, arrangements. The Commission was also concerned about the level of public subsidy provided for industry partners. CSIRO supported the option to develop a programme complementary to that of the CRC programme to support shorter, more flexible collaboration, especially given the administrative costs incurred by CRCs. CSIRO has suggested that models, such as the Industrial Affiliate Programme of Belgium's IMEC research centre might provide a more flexible type of programme which could be run out of CSIRO and research intensive universities (<http://www.imec.be/wwwinter/business/IAPbrochure.pdf>).

Along with the Group of Eight Research intensive universities and some of the State Departments of Primary Industries, CSIRO is becoming much more circumspect about involvement in CRCs. The Organisation is concerned that CRCs have become too complex and overhead-intensive and are now too focussed on commercial development rather than strategic research. When CRCs are used as vehicles for commercialisation rather than strategic research, a range of competitive, commercial and freedom to operate issues arise which are not really soluble in a multiparty joint venture, incorporated or otherwise. The CSIRO supports the Productivity Commission's view for the CRCs to return to their initial objectives of longer term strategic research with broad national and industry benefit research outcomes.

An emerging view within CSIRO is that partnerships with industry have on the whole been much more effective outside the CRC context. The terms of collaboration with industry are far better when developed directly rather than via CRCs, a point also brought out clearly by the Productivity Commission which noted the 'excessive' subsidy to industry partners in the CRC programme. CSIRO believes that collaboration on a large scale can be effective in realising synergies in strategic research endeavours but that these must be more effectively guided by industry and

community needs. More direct collaborations make it easier to manage intellectual property arrangements. It is also relevant to note that most CRCs have very few industry partners and private sector membership is often arranged through industry associations or research and development corporations—adding another layer of complexity to intellectual property management.

Flagships

The Flagships research programme is the new major form of collaboration between CSIRO scientists and researchers elsewhere. It was developed by CSIRO through extensive consultation with Government, with CSIRO partners in other science organisations and industry and with opinion leaders in the community. Each Flagship involves collaboration between leading Australian scientists, research institutions, commercial companies and CSIRO. According to CSIRO, the greater scale, longer time-frames and clear focus on delivery and adoption of research outputs designed into the Flagships are intended to maximise their impact in key areas of economic and community need (CSIRO 2007b).

Flagships draw multidisciplinary research capabilities from across CSIRO and supplement them with research and delivery skills from many partners in universities, the other two publicly-funded research agencies (PFRAs) and industry. Across Australia there are now more than 250 industry partners and research collaborators involved in the Flagships. Partner categories include: universities; research organisations, public and private; private companies and corporations; government departments and agencies (Federal, State or Local); venture capital and other technology investors; cooperative research centres (CRCs); industry research bodies; resource managers and public utilities; small businesses with a technology and innovation focus; consultancy firms specialising in technology; professional organisations involved in science and technology; research foundations and trusts; community groups and non-government organisations (NGOs); technology professionals (eg doctors, farmers, engineers, IT specialists); international research organisations whose work is relevant to Flagship goals.

CSIRO reported that in 2004-2005 the Flagships lodged applications for 30 patents, signed 95 formal agreements with industry partners, including nine major contracts each worth over \$500,000. Over the same year, \$16 million was received in partner contributions and more than 200 scientific reports and publications were produced.

The Flagships programme was reviewed during 2006 by a Panel consisting of eminent research scientists, a senior university researcher, a CSIRO senior executive, and two science consultants. The Review Panel strongly endorsed the model and concluded that the Flagships are delivering powerful scientific solutions to national problems (Batterham 2006). The Panel concluded that the model has provided a compelling framework within which broad ranges of research capabilities, from both within CSIRO and externally through partnerships and collaborations, are assembled to focus on national outcomes for Australia. The model was also seen to have had a profound impact on the culture and processes of CSIRO. Finally, the model is seen not only to facilitate high quality research ‘but perhaps more importantly, define a route from R&D through to national impact’, (Batterham 2006).

A central platform of the Flagships program is the development of strong, ongoing, industry-based relationships that will result in beneficial and practical outcomes for Australia. Industry partners play a major role in setting the direction of flagships research. There is an overriding expectation that research users and the researcher will work together to ensure that technologies are successfully applied and adopted. It is intended that within the day-to-day workings of the Flagships, CSIRO scientists and researchers provide ongoing guidance to their industry partners to ensure that the companies, industry bodies and research organisations that have invested in

research programmes are ultimately better equipped to utilise and apply the outcomes of joint research projects.

Flagship partners constitute many of the largest and most innovative companies currently in business in Australia and overseas. These firms are leaders in areas as diverse as mining and metals, the agrifood industry, defence and security, health and medicine, energy generation and utilities and infrastructure management (CSIRO 2007c). Senior executives from the companies, along with leaders from Australian business, science, government and the community, are also contributing to the program by being members of one of the six Flagship Advisory Committees (FACs). The role of each FAC is to provide expert strategic advice to the Flagship, relating, for instance, to options for additions to the research portfolio, potential partnerships and investments, or commercialisation and technology transfer issues. Leaders and senior executives from more than 45 major companies and organisations are involved currently with the FACs.

A special pot of money \$96.8million over 7 years, the Flagships Collaboration Fund, was provided by the federal government in 2005 to boost collaboration with universities and other publicly-funded research agencies. The Fund is a contestable funding pool that has three elements: a collaborative research program, consisting of projects and ‘clusters’ that support a larger scale of activity; visiting fellowships and postgraduate scholarships.

Flagships collaborative projects are funded up to \$100,000 a year (to a maximum of \$200,000 over two years) to support a specific research project which has outcomes and deliverables relevant to a specific Flagship objective. Projects can stem from ideas generated from within CSIRO where outside expertise is needed to meet the Flagship objective (solicited projects) or from outside organisations that have the potential to further the objectives of the Flagship (unsolicited projects). Solicited expertise may come in the form of intellectual capital, comprising people and intellectual property, or physical capital and infrastructure, including facilities and equipment. Flagship projects are restricted to Australian universities and applications may be submitted by a single university or a number of universities.

Flagship clusters are funded to support a larger scale of activity, at around \$1 million a year, over approximately three years with an emphasis on people and partnerships working on a stream of research relevant to the home Flagship. Each cluster must have at least one university member. Equivalent co-investment of cash and/or in kind is expected. A flagship cluster may involve the co-location of staff of CSIRO and partner institutions/organisations to enhance the exchange of ideas and complementary expertise between the two groups. Joint projects are proposed and initiated by CSIRO and/or external partner(s) staff and located in the flagship cluster during its life. Clusters of projects are expected to deliver outcomes relevant to a major Flagship theme or stream objective, with co-investment by each organisation a key factor.

During 2005–06, the first two of seven round one cluster agreements were executed. They were the Food Futures Cluster, a partnership between the Australian National University and Monash University, and the Light Metals Cluster, a partnership between the CRC for Cast Metals Manufacturing (CAST CRC) and the Australian Research Council (ARC) Centre of Excellence for Design in Light Metals.

The instigation and evolution of the Flagships program, the level of support from government, and the interest of industry, particularly Australia’s larger corporations, suggests a move away by CSIRO from the more complex administrative arrangements involved in the CRC programme. The Energy Transformed and the Light Metals Flagships involves a large number of partners and collaborators from the private sector including some of Australia’s largest mining, manufacturing and energy companies as well as international research organisations and Australian universities. By contrast, The Food Futures Flagship involves a large number of industry associations and research and development corporations as well as Australian and overseas universities. A number

of wine producers are also members. The Preventative Health and the Water for a Health Country Flagships have a strong representation of public sector partners reflecting the importance of innovations in the health services and water utilities sectors. There are very few private sector partners in these Flagships. This lack of support from industry in the food, health and water Flagships points the important leadership role currently being provided by CSIRO is addressing national research issues and the adoption of research. The challenge is to lift private sector commitment through the greater involvement of businesses in the food, health and water industries and stimulate adoption and application of research outcomes.

Other Research Partnering Arrangements

In addition to the arrangements embedded in the CRC and Flagship programs, the CSIRO also partners with industry, research organisations and government through more specific project initiatives. These include funding for research projects, such as through the CSIRO/Monash Collaborative Research Support Scheme and the University of Melbourne-CSIRO Collaborative Research Support Scheme and support for the construction and operation of research facilities located adjacent to, or within, university campuses. Many of these initiatives include a substantial contribution from State governments.

CSIRO is currently engaged in a select number of long-term, strategic joint ventures that bring together organisations with similar capabilities and enable greater scale, efficiency and impact than either party could achieve alone. They thus enhance the opportunity for innovation and impact. CSIRO has recently engaged, for example, in a number of commercially-oriented joint venture arrangements with universities and State governments. Partners include the Waterford Minerals Chemistry Precinct in Perth, the Western Australian Marine Science Institution, a \$400m Ecoscience Precinct and Health and Food Science Precinct in Brisbane, and an Australian Tropical Science and Innovation Precinct in Townsville. CSIRO and ANSTO have signed an MOU to jointly explore and better understand food structure at the molecular level with a view to producing food products that have enhanced taste, texture and health improving qualities.

Other examples include, Ensis, established as a joint venture between CSIRO and New Zealand-based Scion, an organisation focussed on applying deep knowledge of plantation forestry, wood and fibre to the development of biomaterials from renewable plant resources. The \$55m venture operates to eight sites in Australia and New Zealand and has enhanced both countries' ability to deliver optimum outcomes for their governments across the entire forestry products cycle. Food Science Australia also continues as a joint venture between CSIRO and the Victorian government and is now one of the world's largest and most diverse food research organisations, consolidating research in food and nutrition and consumer behaviour into a single agency. In the health field, e-Health Research Centre is a \$15m joint venture between CSIRO and the Queensland Government, and is the largest single-funded e-health research and development facility in the southern hemisphere.

Through its Research Divisions, CSIRO collaborates with a wide range of research organisations, industry bodies and companies. It has a long track record of collaboration with the primary industries, minerals and energy sectors through research centres, rural research and development corporations and industry-owned research and market development companies. Partners in these include Australian Wool International and the AWB where CSIRO's long-term partnership has provided the scientific expertise to support the growth in Australia's A\$5.8 billion wheat export market. Australia has built an international reputation through the CSIRO's Stored Grain Research Laboratory (SGRL) for supplying a quality product that is insect-free.

A strong collaboration between CSIRO and Australian Wool International (AWI) also drives a portfolio of research projects that have had the aim of building demand, reducing processing costs,

eliminating contamination and improving the comfort factor of wool. CSIRO's investment in cotton textile research has involved a partnership with the Australian cotton industry through the Cotton Research and Development Corporation, the Cotton Catchment Communities CRC, and the Australian Cotton Shippers' Association; the International Textile Manufacturer's Federation; Cotton Incorporated; the United States Department of Agriculture, Southern Regional Research Laboratory in New Orleans.

CONCLUSION

The introduction of the Flagships program in 2003 represented a shift in the allocation of government resources to the CSIRO towards identified research challenges and opportunities. The 'core' research activities of CSIRO are relying on a greater commitment from industry through co-investment, consulting and services as well as through a greater commitment to joint venture and partnering arrangements. There are also indications that the CSIRO is moving away from its commitment to involvement in the CRC program, preferring to enter into more direct and strategic collaborations and partnerships with universities, other research organisations and State governments. With this move to more focussed and strategic approaches to partnering, a major rationale for the CRCs has become less compelling. CSIRO has initiated many and various joint venture arrangements with universities and State governments without going through the CRC long and expensive application process. The Productivity Commission's suggesting that a number of changes to the CRC program, including a return to the original objectives, the time may be opportune for government to re-address the way it supports industry–university collaborative partnerships and support for industry-focussed research and development in sectors that are not within the priority framework of the CSIRO.

The Flagships initiative has been an important strategy on the part of CSIRO to lead Australia's innovation effort in industries that have had a relatively low commitment to research and development (food), or where there has been a relatively low commitment to adoption of research in industry (health and water). The performance of these industries is, of course, vital to Australia's economic, social and environmental future. The underlying agenda issue is to lift the commitment and the capacity of businesses to adopt and utilise the outcomes of research in a collaborative and partnership culture. Unlike CRCs, the Flagships bring together a larger number of partners and collaborators, in fewer organisations, thus allowing for greater scale and scope in research direction and commitment. This provides for another level of diversity, as well as a different form of collaboration in the Australian innovation system and supports the dynamic and interactive nature of innovation.

Although there is a tendency when thinking of innovation systems to see them as self-organising and adaptive, the reality is that they require leadership and some element of structure. The CSIRO Flagships initiative has been an important innovation in providing that leadership and structure. As that role develops and evolves it should become embedded in the mission and culture of CSIRO. This is associated with a growing acceptance of the commercial rationale for CSIRO to recover the costs of its research and development services provided to both government and industry.

Flagships and a commercial approach should give governments some confidence that CSIRO is 'on track' and reduce the inclination to embark on yet another review of the organisation.

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Figure 1: CSIRO Revenue Sources

Figure 2: CSIRO Revenue Sources

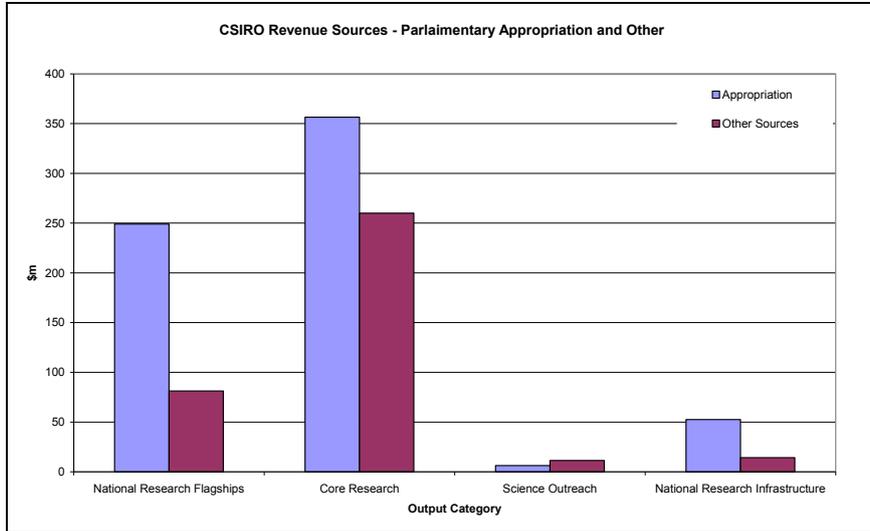


Figure 3: CSIRO External Revenues by Source

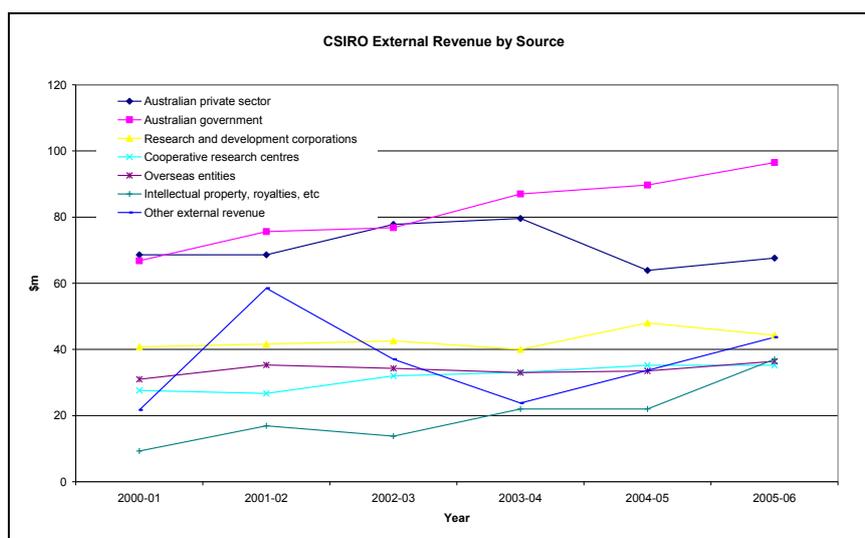


Table 1: CSIRO intellectual property portfolio (number as at 30 June each year)

Patent category	2002	2003	2004	2005	2006
Inventions (patent families)	733	779	754	745	780
New inventions ³	80	92	89	79	90
Current PCT applications	104	90	92	95	74
Granted patents	1 801	2 002	2 079	2 048	2 113
Live patent cases	3 537	3 965	3 961	3 919	4 084
Australian trade marks	262	287	290	306	281
Foreign trade marks	84	93	92	100	91
Australian plant breeder's rights	65	62	77	80	113
Foreign plant breeder's rights	17	17	17	21	17
Australian registered designs	8	5	3	3	2
Foreign registered designs	9	12	12	12	12

Source: CSIRO, Annual Report, 2005-06