Australia's National
Science Agency

# CSIRO Submission 20/714

## Research and Development Inquiry

## South Australian Productivity Commission

**June 2020**

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# 1 Introduction

South Australia is recognised internationally and nationally for its contributions and strengths in several key sectors. CSIRO notes that the State is developing growth strategies to further expand and support industry innovation and research capacity particularly in the areas of Defence, Space, Agribusiness, Energy & Mining, and Hi-tech. Facilitating the growth of the State's key areas is of mutual interest to CSIRO as a national science agency. Our partnerships with State governments are important in our ability to deliver on the CSIRO purpose: *To solve the greatest challenges using innovative science and technology*.

CSIRO's national footprint includes an active presence in South Australia employing almost 400 staff located across four sites (Waite Campus, Urrbrae, the South Australian Health and Medical Research Institute Lot Fourteen and Kintore Avenue, Adelaide CBD). Our staff in South Australia are engaged in research and development, business development and innovation in key sectors such as health & nutrition, environment & agriculture, digital technologies and energy & minerals.

CSIRO invests approximately $100 million in South Australia each year to maintain staff, infrastructure and local service agreements. In addition to 400 staff we have 42 students and significant collaborative relationships with the Goyder Institute and Wine Australia and we have a Strategic Relationship Agreement with the South Australian Government. We consider ourselves part of the South Australian ecosystem and value the opportunity for comment to the Commission.

We would like to specifically address the information requests relating to company innovation and collaboration (5.5, 5.7, 5.10, 5.11) and particularly how government can facilitate the collaboration process to drive economic and job growth.

# 2 CSIRO response to information requests

## 2.1 Effective collaboration

The benefits of businesses collaborating with research organisations are well understood. High levels of connectivity between businesses, governments and research organisations facilitates the stocks and flows of knowledge. However, the Australian innovation ecosystem is operating in a challenging environment where Australia is ranked amongst Organisation for Economic Co-operation and Development (OECD) nations as having the lowest Collaboration participation rate (2-3%[1]). In addition, Australian business expenditure on research and development (R&D) (BERD) peaked in 2008-09 as a share of Gross Domestic Product (GDP) at 1.37 per cent, and has since declined by over 30 per cent, to 0.94 per cent of GDP[2], low by OECD standards. The Australian innovation system produces world class research, but these outputs are distributed across more than 30 universities, several publicly funded research agencies and multiple medical institutes that are geographically distributed. Their activities are – looked at from the outside – opaque. This represents a significant threshold problem for experienced industries and can thwart many small firms from accessing public sector research.

One of CSIRO's roles as the national science agency is to help bridge the gap between the innovation system and industry. As part of its response to addressing the complex set of issues that underpins this downward trend in collaboration. CSIRO has developed or participated in several initiatives to boost ecosystem collaboration and Small to Medium Enterprises (SME) engagement with research, government and industry. These initiatives and their impact are elaborated on below.

## 2.2 Network creation

Networks help connect and focus a national narrative and ensure different organisations are aware of each other's capabilities nationally and locally. This in turn informs R&D, innovation and helps to target government funding.

**Example 1:** The Australian Robotics Network (ARN) and Queensland Robotics. National and State based networks representing educational & research institutions, government bodies plus several SMEs and large companies. The purpose of these networks is to drive uptake of robotic technology and accelerate the growth of the industry but also to develop and foster a positive social narrative in Australia around robotics and raise the profile with government.

**Example 2:** The benefits of a network are difficult to quantify from an economic perspective, but an indication of impact can be derived from the number and quality of events, advocacy and communications, helping create a critical mass within a community. AusBiotech represents member organisations from the life sciences sector ranging from academia and service providers to multi-national companies. The organisation provides advocacy, networks and services to members but also promote the commercialisation of Australian life sciences industry on a global stage. In a 12 month period AusBiotech has hosted 78 events, attracting 6,600 delegates; Made more than 24 submissions to governments and attended more than 100 meetings with various government departments and Parliamentarians; Attended 42 consultation meetings on a range of topics including clinical trials, regulatory burden and tax reform; Published 104 newsletters; Attracted more than 240 media articles; Facilitated 2,465 partnering meetings, through business matching program and international delegations.

CSIRO suggests that key South Australian sectors and growth areas would benefit from support through local networks that connect with larger national networks to inform, collaborate, and map out areas of speciality, hence avoiding duplication and maximising funding opportunities. CSIRO appreciates that this

may already occur in several instances and would welcome further opportunities for coordination with its networks.

## 2.3 Businesses investing in R&D

According to a recent report commissioned by the Office of Innovation and Science Australia, approximately a third of Australian firms invest in innovation, however only 5.8 per cent of firms invest in R&D. This innovation includes infrastructure purchase, training, acquisition of intellectual property (IP), re-organisation or other technologies[2]. Australia tends to adopt technologies rather than innovate technologies. This is evident through our predominantly incremental innovation for the domestic market rather than radical innovation for an export market[3].

To encourage business spending on R&D and increase radical innovation for export, CSIRO has developed initiatives such as SME Connect which connects Australian SMEs with Australia's research sector. The objective is to facilitate and enable innovation-driven partnerships through funding, support and resources. Over 40 South Australian companies have been through the program with an aggregate program value of more than $6 million. The below example, whilst not South Australian, illustrates the potential economic impact of facilitating business expenditure on research.

**Example 3:** OptoTech Pty Ltd specialises in the development of laser-based systems for the semiconductor, and medical industries, exporting to Asia and Europe. OptoTech's laser systems are used for inspection, trimming, and cutting of specific materials such as titanium, silicone, stainless steel, aluminium, glass, and a variety of polymers. OptoTech developed a novel, innovative solution for detecting sub-micronic defects on these surfaces.

To speed-up automation of the defect identification technology, OptoTech commenced a research project facilitated by the STEM+ Business program (through SME Connect) in collaboration with RMIT. A RMIT post-doctoral research fellow with a PhD in Nanotechnology worked with OptoTech enabling the business to benefit from cutting edge research and the post doc to gain experience in all stages of commercial development. Development of the technology allowed lowering of the manufacturing costs of hard disk drives, and the recognition of OptoTech as a provider of innovative solutions to the challenges facing the industry.

The economic impact of the research and development associated with the technology is valued at $16.8 million, and it's estimated that $4.2 million (or 25 per cent) of the total economic gain accrues to Australia.

CSIRO programs of this nature are offered nationally. We would welcome the opportunity to work with more South Australian companies and researchers and co-design a program to better utilise the innovative R&D in SA and to drive SME growth.

## 2.4 Industries for rapid growth

Scientists and engineers can now unlock unprecedented capabilities to isolate, control and sense individual quantum particles (such as electrons and photons). Commercialising these technologies will create a new high growth industry with the potential to create economic growth and jobs across a range of sectors.

The global industry for quantum technologies could reach $86 billion by 2040[4]. Australia has world-class quantum research capabilities and an emerging quantum technology industry underpinned by expertise and IP. Australia can play a valuable role in this global industry but we will need to act quickly to remain a key player in this global opportunity. Several opportunities exist, for example quantum-enhanced precision sensing, metrology, navigation and timing technologies. This capability can be applied in diverse industries including resource management, infrastructure, defence, engineering, medical research and healthcare.

CSIRO is well placed to assist universities in building their quantum capabilities in sensors and non-quantum computing. At this early stage of development, accelerated, targeted innovation is important. Therefore, there needs to be coordination between the universities focus and the state priority areas. This ensures targeted funding, grants, and collaboration.

**Example 4:** The NSW government is assisting to create a long-term focus for universities and targeted priority areas with the creation of The Sydney Quantum Academy (SQA). SQA aims to support the evolution of a quantum economy, leveraging the capabilities of four universities (The University of Sydney, UNSW Sydney, University of Technology Sydney and Macquarie University), to develop talent, attract investment and actively develop the quantum industry. Early initiatives like this will develop the ecosystem and enable a first mover advantage.

**Example 5:** CSIRO Challenges and Missions. CSIRO's purpose as Australia's national science agency is to solve Australia's greatest challenges through innovative science and technology. We are focusing on the issues that matter the most: for our quality of life, for the economy and for our environment

There are six challenges we are assisting the nation to overcome focused on for our quality of life, for the economy and for our environment. These challenges are Food security and quality, Health and wellbeing, Resilient and valuable environments, Sustainable energy and resources, Future industries, and A secure Australia and region. Each of these challenges also presents an opportunity for Australia to develop new sources of economic growth, protect its landscapes and marine ecosystems, and allow future generations of Australians to enjoy an even higher standard of living than today.

To help solve each challenge we are developing missions – large scale major scientific and collaborative research programs aimed at making significant breakthroughs. There are currently 12 missions including Navigating Climate change, Net Zero Emissions, Hydrogen, Infectious Disease Resilience, SME Collaboration Nation.

CSIRO is currently looking for partners and collaborators to co-design Missions and utilise the expertise of state governments and industry to leverage existing programs. Our aim is to facilitate and add to the critical mass of resources in areas of national concern. We are currently in discussion with SA government departments in relation to Missions but would welcome further ideas on how we could best leverage each other's capabilities e.g. pilot locations, programs, facilities collaborative investment.

## 2.5 Collaboration between State governments and CSIRO

Both CSIRO and state governments have capabilities, infrastructure, funding and policy frameworks that can assist and leverage each other's objectives, boost R&D and innovation and lead to productivity improvements for states and territories.

**Example 6:** CSIRO and the Australian Institute for Bioengineering and Nanotechnology at the University of Queensland established a National Biologics Facility (NBF). The Facility received its original funding through NCRIS from 2006. Subsequently, the Victorian Government contributed $1 million to establish the CSIRO-based pilot-scale Protein Production Facility, which is the Victorian Node of the NBF. A case study was undertaken to determine the benefits derived from the facility. Quantifiable benefits totalled $36.65 million per annum which is 8.5 times the average annual cost of the Facility. In addition, CSIRO earned approximately $8 million in direct external income. Additional benefits were also derived from industry engagement, international collaborations, attraction of funding, development of IP and licensing revenue.

**Example 7:** In order to fuel fast growing and high potential industries, the appropriate skills, know-how and talent is required. STEM skills are already in high demand and growing at 1.5 times faster than other jobs. The NSW State Government has made a ten year $25 million endowment to the Science and Industry Endowment Fund (SIEF) to establish the Generation STEM initiative to attract, support, retain and train NSW students in STEM at school and into further education and employment. Generation STEM will deliver programs that attract more diverse, high-potential high school students into NSW-based STEM educational pathways (higher education and vocational education and training).

**Example 8:** In 2019, a Strategic Relationship Agreement (SRA) between CSIRO and the SA Government was approved. The objective being to develop collaborative partnerships between CSIRO, the SA government and third parties to support: investment in improving, up scaling or developing new facilities and industries; and encouraging collaboration with SA including universities, research institutes, industry and government.

While continuing to mature, currently there are three health and medical related projects underway and strong opportunities evolving in several other sectors including minerals, energy and innovation.

CSIRO suggests using this agreement as a platform to launch further in-depth discussions with SA government. CSIRO has an interest and capacity to collaborate on growth in key sectors using partnerships and matched contributions. Whilst a dedicated funding pool or quantifiable commitment does not currently exist for the SRA, defined targets in this area could help to drive further collaborations.

## 2.6 Government and University Collaboration

Australian universities generate world-class innovative research however the IP created is not always translated into commercial outcomes. This can be for several reasons including access to capital, networks and supply chains. CSIRO has a role to play in facilitating this translation and has developed specific programs to identify and capture university IP.

**Example 9:** ON Accelerate is a structured full-time accelerator for research teams to validate and develop high potential innovative new ventures. ON Prime is targeted program for Australian researchers to attract the resources they need to create impact and navigate the changing research landscape.

ON has trained over 1440 researchers from 40 Australian universities and research institutes in addition to 600 CSIRO staff. Nearly 200 additional participants have come from outside of research, including industry, government and the community.

In total, 52 new companies have been created resulting in 226 new jobs. Over $30.4 million in commercialisation grants has been attracted by ON participants and 13 of the 52 new companies formed have raised a total of over $36 million of investment capital.

## 2.7 Industry Clusters and Hubs

The Lindfield Collaboration Hub is based in NSW and supported by the State government's Boosting Business Innovation Program. The Hub is based on CSIRO's Lindfield campus. Early stage and established companies can move to the Hub and access CSIRO facilities, science know-how, experience, business networks and commercialisation knowledge.

The Lindfield Collaboration Hub has successfully established an open, vibrant community of deep-tech start-ups. The additional objective to revitalise the Lindfield site has been achieved through inclusion and operating with integrity and a genuine desire to assist start-ups. CSIRO is constantly receiving requests from the Lindfield start-up community - ranging from seeking access to equipment or expertise, introductions through CSIRO's substantial networks through to specific technical questions.

CSIRO recognised early on the requirement for a more systematic way to select companies. Companies are assessed based on the criteria for a strong development curve and critically, their articulation of why and how co-location at Lindfield will accelerate their journey. The ability to pay the commercial rental for their on-site footprint is a (low) hurdle to entry.

**Example 10:** Baraja Pty Ltd. is the most successful start-up (partly funded by Main Sequence Ventures) and has utilised the Hub to access optical expertise (research contracts with CSIRO), electromagnetic actuator expertise (research contracts with CSIRO), mechanical prototyping services (ongoing supply contract with CSIRO), access to the cleanroom, characterisation facilities, and optical ranges. Baraja has grown from 2 to 104 people in 3 years, but they have also become very active in the Lindfield community coordinating networking events and most recently organising a celebration showcase for the launch their product. Their

staff also operate a Meetup for tech device start-ups and. In addition, Baraja staff have become first aiders and wardens, volunteers and active participants in site activities. Baraja has recently graduated from the Hub to their own premises.

Key to the Hubs success has been State government support, a lead site manager to drive strategy and operation (CSIRO), a key tenant to inspire as well as lead community engagement (Baraja), responsiveness to start up requests, and strategic selection criteria for tenants.

CSIRO recognises that South Australia has several Hubs/Precincts and would welcome the opportunity to investigate Precinct collaborations and exchanges. In addition, discussions relating to the re-invigoration of the Waite Precinct would also be of interest.

# 3 Closing remarks

CSIRO looks forward to working with the South Australian government to further facilitate collaboration, technology translation and entrepreneurship in the State. South Australia is home to world leading research and technology in health, agritech, space, energy and defence. Interstate borders need not prevent South Australia leveraging CSIRO's technology and facilities to complement existing activities and projects.

Collaboration avenues may include: facilitating the creation and connection of networks; improving awareness of existing CSIRO programs accessible to SMEs and researchers; customising pilot programs to facilitate SME and researcher collaboration; evaluating the benefit of CSIRO collaborating with or developing a presence at innovation precincts; supporting infrastructure development in key growth sectors and industries such as space and quantum technologies; and determining additional channels through which both the SA government and CSIRO could share insights and proposals across our various agencies e.g. committees, boards, think tanks, and workshops.

It is crucial that these collaborative opportunities are based on South Australia's current and emerging priorities to maximise the benefits of economic and productivity gains to the State.

# References

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3. Adapted from Bloch, C and V. Lopez-Bassols (2009) Chapter 1: Innovation Indicators. In, Innovation in Firms: A microeconomic perspective OECD, Paris.

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**As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.**

CSIRO. Unlocking a better future for everyone.


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