National Research Infrastructure and Industry Engagement

Purpose of this paper

The issues raised in this paper are to help stimulate discussion in preparation for a public Ideas Jam on industry engagement with National Research Infrastructure (NRI). It is part of the broader stakeholder consultation process to inform development of the 2021 NRI Roadmap.

The 2021 Roadmap will identify Australia's research infrastructure needs and priorities for the next five to 10 years taking into account new and emerging research trends, national priorities and initiatives. The Government has recently consulted with the research and industry sector on the establishment of a University Research Commercialisation Scheme (URCS) to better translate and commercialise university research outputs. The work of the NRI Roadmap complements this work by further discussing the opportunity to improve research sector and industry collaboration through our suite of national research infrastructures.

NRI is a critical enabler in our research and innovation system providing foundational capability for leading-edge research and innovation at all stages of the innovation pipeline. It is particularly supportive of the earlier stages of the pipeline, enabling high-quality research outcomes.

What is an ideas jam and what do we want to get out of it?

An Ideas Jam is a collaborative online brainstorming activity that takes place over a period of days, so the public can participate and have time to consider and discuss ideas. Each Ideas Jam will focus on a specific question, scenario or theme. These are collectively referred to as 'challenges'.

The aim of this challenge is to crowdsource ideas from stakeholders, especially from the industry sector, on how the government's investment in NRI can be leveraged to:

- improve industry sector visibility of NRI and understanding of how NRI can support industry
- increase industry access to NRI, with a focus on small to medium sized enterprises (SMEs)
- improve integration and standardisation of NRI to increase industry engagement; and
- support research and industry sector collaboration and partnerships that can solve real world problems and advance research translation and commercialisation outcomes.

Definitions

Industry access to NRI is broader than just access to equipment at the facilities, it also includes industry using and sharing NRI driven data and knowledge, technical advice, and services. It can also mean industry accessing NRI indirectly through research partners or NRI fostering research-industry partnerships.

Research translation, in this context, can be broader than commercialisation, referring to practical research outcomes and outputs of national interest that may not have a direct and immediate commercial return. For example, this could include outcomes that improve business processes or bring societal benefits that are harder to quantify like climate change mitigation or integration of Indigenous knowledge into science.

Why is NRI and industry engagement important?

NRI plays an important role in encouraging strong long-term industry and research partnerships, both domestically and internationally, by providing access to nationally significant research assets, facilities, expert advice and services for research and innovation that can benefit Australia's economy and society.

NRI is well placed to enhance and catalyse research and industry sector engagement to support advancement of innovation and research translation outcomes. NRI provides the tools and the environment for researchers and industry professionals to work together on practical solutions to shared problems, fostering industry innovation and research translation.

The industry sector, and particularly SMEs[1], have a lot to gain from engagement with the research sector. For example, SMEs that collaborate with the research sector experience higher innovation and economic performance. As SMEs collaborate with researchers, they gain in the short-term through problem-solving capabilities, knowledge access and R&D solutions [2], and gain long-term competencies of in-house staff[3] through tacit and informal exchange of learning and knowledge[4].

Why is now the time to talk about NRI and industry engagement?

Every five years, the Australian Government reviews its policy approach to NRI investment by engaging the research community and its stakeholders in the development of a strategic roadmap. Every two years the Government releases a Research Infrastructure Investment Plan to support the Roadmap's vision and ensure investment reflects ongoing technological developments and strategic priorities. The 2021 Roadmap will inform the 2022 and 2024 investment plans. The National Collaborative Research Infrastructure Strategy (NCRIS) program implements the investment plans.

The Terms of Reference for the 2021 NRI Roadmap tasks the Expert Working Group with *"identifying opportunities to improve levels of collaboration between the research and industry sectors, particularly for small to medium sized enterprises"*. In driving research excellence, the NCRIS guidelines highlight the need to maximise opportunities for industry engagement.

Thus, the opportunity exists through the Roadmap to consider how to make NRI more visible and accessible to industry, and to better integrate NRI and enhance quality frameworks to foster more industry engagement and research translation.

Current state of NRI and problem identification

Currently, NRI facilities support all stages of the innovation pipeline but are most active in the earlier stages of research. Examples include providing researchers with Tier 1 High Performance Computing capability, environmental monitoring datasets, or data visualisation tools. In the final stage of the commercialisation value chain, NRI can assist development of prototypes, testing and manufacturing of components.

---

[1] Verreynne M., Torres de Oliveira R., Mention A.-L. (with contributions from Lay J., Nguyen T., Ferraro S. and Machirori, T.L.) (2021) Enablers and barriers to industry-research collaboration: A small and medium sized enterprise perspective. CSIRO, Australia.

[2] Xu, D. (2013). Research on improving the technological innovation capability of SMEs by university-industry collaboration. *Journal of Engineering Science and Technology Review*, 6(2), 100–104.

[3] Oduro, S. (2019). Examining open innovation practices in low-tech SMEs: Insights from an emerging market. *Journal of Science and Technology Policy Management,* 10, 509–532.

[4] Bellini, E., Piroli, G., and Pennacchio, L. (2019). Collaborative know-how and trust in university–industry collaborations: Empirical evidence from ICT firms. *Journal of Technology Transfer,* 44(6), 1939–1963.

Collaboration and strong partnerships with research agencies and the industry sector are a key element of the NCRIS facilities, and help demonstrate the impact and outcomes of research through translation and commercialisation. This has been highlighted by the success of NCRIS facilities in pivoting their operations to meet the challenges and opportunities presented by COVID-19. This ranges from the development and testing of vaccines to designing treatment drugs and manufacturing personal protective equipment. Some examples of industry collaboration and partnerships include:

- The Australian National Fabrication Facility, Microscopy Australia and Phenomics Australia have been working with WearOptimo, a company based in Queensland, to develop a wearable sticker that monitors the immune system, including tracking which COVID-19 patients are on the path to severe respiratory distress.
- Astronomy Australia Limited are supporting researchers at the University of Sydney and Australian Astronomical Observatory in the development of a "photonic lantern" to filter out unwanted light from signals. This photonic lantern technology can be added to existing fibreoptic cables to increase their bandwidth and has already been taken up by companies such as Nokia, Phoenix photonics and Optoscribe.
- The National Deuteration Facility has been investigating how skin cells could replace animal testing in the cosmetics industry. Deuteration means to replace the hydrogen atoms in a molecule with deuterium, a heavy isotope of hydrogen. Doing this helps researchers better understand those molecules and how they interact with other molecules. The detailed understanding that deuteration gives us could replace animal testing – a key issue for the cosmetics industry – and create new cosmetic products as well.

However, there are still areas of improvement to fully realise the potential of NRI to foster and enable greater collaboration between the research and industry sectors in Australia.

- Business and industry researchers comprise only 2 per cent of NCRIS facility users despite performing approximately 42 per cent of Australia's R&D.
- Nearly 45 per cent of businesses innovate, and 18 per cent collaborate with other parties, but only 5 per cent of that collaboration is with universities and research institutes (URI).[5]
- Small to medium enterprises (SME) make up more than 99 per cent of businesses[6] in Australia, but SME/ URI collaboration is even lower, and Australian SMEs rank particularly poorly for URI collaboration.
- Australia is ranked the lowest among the OECD countries for collaboration between the research and industry sector[7].

Translation and commercialisation of research delivers productivity gains and competitive advantage. Australia performs strongly in research excellence (10th largest contributor to publications) but performs poorly by international standards in translating publicly funded research into commercial outcomes (ranked 31st).[8] No Australian university is ranked in the top 100 innovative universities worldwide – pointing to a deficit in collaborative research translation.[9]

[5] NCRIS census 2018 – 2019 Unpublished.

[6] ABS Research and Experimental Development Australia, Higher Education Organisations, Businesses, Government and Private Non-Profit Organisations, Australia. https://www.abs.gov.au/statistics/industry/technology-and-innovation

ABS (2019) Counts of Australian businesses, including entries and exits. Australian Bureau of Statistics.

[7] OECD (2017). Science, Technology and Industry Scoreboard 2017: The Digital Transformation, OECD Publishing, Paris

[8] 2020 Global Innovation Index (GII)

[9] RMIT and CSIRO, *Industry-university and research institute collaboration: A small and medium sized enterprise perspective, 2021.*

Through various stakeholder consultation exercises undertaken as part of the process for the development of the 2021 NRI Roadmap, including a recently conducted survey, meetings and other discussion forums, industry engagement was identified as an important issue to be addressed.

Barriers impacting on industry engagement with NRI

Some common barriers to industry engagement reported include:[10]

- Difficulty accessing NRI due to cost, availability, time constraints, perception of preference given to researchers, not knowing how to navigate the process, issues with data management and quality
- Poor industry visibility and understanding of NRI and how it can help them
- Uncertainty about value vs cost of engagement
- Lack of technical capability and expertise to engage
- Differing priorities and approaches between the research and industry sector
- Concerns about intellectual property and commercial sensitivities
- Not enough standardisation and integration among NRI facilities, and between the facilities and the industry sector, including for data management and sharing.

Some ideas that could be explored to initiate discussions and thinking around solutions

The Department of Education, Skills and Employment had crowd sourced ideas on improving the connection with industry and NRI earlier this year and a number of ideas are referenced below:

- Providing industry voucher programs to access NRI and visit facilities to increase visibility, and relationship to similar initiatives supported by state and territory governments.
- Establishing a "broker/facilitator" role, either inside each facility or as a separate structure representing all NRI, to be the point of contact for industry and partners engagement with NRI, as well as promotion and communication strategies.
- Creating online platforms like a "research capability/facility navigator" to help industry to get information and connect with research sector (e.g. Canadian model Research Facilities Navigator (innovation.ca))
- Creating frameworks to better integrate and standardise NRI to make it easier and safer for industry to engage.

Greater connection and consultation for innovation

"We should establish regular NRI-wide virtual drop-in sessions to engage industry. NCRIS could help enable innovation by facilitating a greater connection between NRI, industry and start-ups with regular NRI-wide virtual drop-in sessions where industry people of all levels can pop in to consult with, and be directed to, infrastructure that can help them grow their business. This would also be a tool of communication and engagement to help to increase translation and commercialisation of

[10] 2021 NRI Roadmap Survey

Verreynne M., Torres de Oliveira R., Mention A.-L. (with contributions from Lay J., Nguyen T., Ferraro S. and Machirori, T.L.) (2021) Enablers and barriers to industry-research collaboration: A small and medium sized enterprise perspective. CSIRO, Australia.

Australian Government, Department of Industry, Science, Energy and Resources (2017) *Business Research Collaboration User Centred Design Project*, Discovery and Create reports, published at https://www.industry.gov.au/data-and-publications/business-research-collaboration-user-centred-design-project

research. Concerted joint promotion to Industry Growth Centres, Industrial Transformation Research Hubs and other industry bodies could be targeted, along with accelerators and other bodies assisting spin-offs and start-ups."

Pipeline Experts, fostering a culture of collaboration by enabling product development advice to early-stage researchers

"Proposes to develop co-ordinated project coaching and development advice frameworks ("Pipeline Experts"), that offer free time with experienced and expert consultants and/or successfully commercialising researchers, with the aim of adding value to development projects towards better translation and commercialisation. Such an initiative would strongly complement the work of university technology transfer offices as well as MTPConnect-managed support schemes by providing advice and mentoring at an earlier stage than TTOs or MTPConnect would usually examine projects."

Quality Management Systems

"More industry would engage with NCRIS if we had better quality management frameworks in place. Many of the industries that we currently work with are happy with the levels of service and research service being offered. However, there are more segments of the market that would engage with NCRIS if some form of Quality Framework was in place."

Enabling Remote Access to Instruments

'Models of access are still primarily based on operation at the instrument's location, however, changing technology can support improvements in remote access with courier delivery of samples, remote operation of the instrument and data management processes. Enabling remote access to instruments can increase efficiencies, reduce travelling costs, and increase access for multiple parties. It can also increase sovereign capability in times of crisis.'