Strategic Examination of Research and Development (SERD)

Response by the Australian Mathematical Sciences Institute

April 2025

AMSI welcomes the opportunity to respond to the Australian Government's Strategic Examination of Research and Development, led by the Department of Industry, Science and Resources. AMSI is a peak body representing the mathematical sciences (which includes mathematics, statistics and data science) in Australia, across the pipeline from school education, university and the workforce. As such, we are well placed to provide comment on Australia's R&D ecosystem and our core science and innovation capabilities.

2. *What government, university and business policy settings inhibit R&D and innovation why?*

   There is a view held in some parts of industry that universities are difficult to work with and lack the commercial focus and agility needed for effective engagement. Universities and businesses often operate on different timescales and priorities, which makes collaboration challenging. This perception is likely due to a disconnect between university KPI's (e.g. publications and research student completions) and those of industry, which typically works in agile sprints toward a minimum viable product, depending on available funding.

   Changes to the Australian government's research block grants now provide additional funding when a PhD student completes a 60-day industry internship arranged within the first 18 months of candidature. However, this requirement could be relaxed, as it does not reflect the reality that internships toward the end of candidature are often more appropriate. Only 16% of internships facilitated through APR.Intern occur in the first 18 months of candidature (see response to Q.4. for details on APR.Intern).

   Later in candidature, students have stronger technical and professional skills, and engaging with industry at thesis submission is a natural transition point with minimal impact on completion. It also aligns with students' active job search and allows for employment by the host organisation.

   Previous policy proposals have suggested standardised commercialisation agreements between universities and industry. Additionally, standardising engagement terms for collaborative or contract-based R&D would help reduce the time and administrative burden required to initiate projects. While some universities already perform well in this area, it is far from universal.

   Establishing clear and fair commercial terms gives industry confidence in IP ownership and the freedom to commercialise or further develop R&D outcomes. University researchers, in turn, benefit

from systems that recognise their time and expertise and allow them to continue teaching or conducting research, provided it doesn't conflict with the industry partner's objectives.

4. *What types of funding sources, models and/or infrastructure are currently missing or should be expanded for Australian R&D?*

   The Australian Mathematical Sciences Institute, based at the University of Melbourne, operates the Australian Postgraduate Research (APR) Intern program. As Australia's only broad-based national research internship program, APR.Intern works across all research disciplines and industry sectors, linking industry with university researchers. It enables companies to access top research talent and provides interns with experience in the contrasting demands of commercial versus academic R&D.

   APR.Intern has successfully facilitated over 1,000 research internships and delivered the National Research Internship Program (NRIP) on behalf of the Department of Education. This program provided a subsidy of between 50-90% subsidy to Australian businesses engaging in R&D through APR.Intern. APR.Intern currently holds a Women in STEM and Entrepreneurship (WiSE) grant from the Department of Industry, Science and Resources, which supports the placement of female STEM interns.

   Both NRIP and WISE offer vouchers to companies hosting interns, substantially subsidising the upfront costs. This support is especially critical for SMEs, which often lack the funds to host an intern or wait for a rebate through the R&D Tax Incentive.

   Long-term government subsidy support for SMEs placing research interns is essential to ensure that they can access Australia's emerging research talent and contribute to building a national culture of innovation excellence. This support would complement with R&D Tax Incentive scheme.

5. *What changes are needed to enhance the role of research institutions and businesses (including startups, small businesses, medium businesses and large organisations) in Australia's R&D system?*

   Developing a cohort of Australian researchers who can move seamlessly between industry and academia will strengthen Australia's ability to retain research talent through economic cycles. Achieving this requires both equipping researchers with industry-relevant skills and revisiting academic KPIs to ensure industry collaboration is recognised and encouraged.

   Without this shift, the transition from academia to industry remains a 'one-way door', as noted in the discussion paper. APR.Intern is uniquely placed to support this transition, having facilitated over 1,000 internships across Australia and across diverse research disciplines.

6. *How should Australia support basic or 'discovery' research?*

   Basic research is a long-term investment that often delivers high-impact outcomes well into the future. Commercial applications from basic research can take decades to materialise, which underscores the importance of sustained investment in discover research. Underinvestment today

will hinder Australia's resilience, innovation capacity, and productivity in the long term, leading to missed opportunities and a slower pace of technological advancement.

The higher education sector plays a vital role in building foundational knowledge, fostering deep insights, and driving innovation. Universities must remain central to both basic and applied research. They are uniquely positioned to explore new ideas and theories that form the bedrock for future technological and industrial breakthroughs.

The Australian Research Council is the only national agency dedicated to funding basic research. ARC funding should increase over time to secure Australia's future innovation pipeline.

7. *What should we do to attract, develop and retain an R&D workforce suitable for Australia's future needs?*

Australia's economic future depends on a strong pipeline of STEM graduates. Emerging technologies will reshape our economy and daily lives, yet industries are already facing STEM workforce shortages. Labour market forecasts identify that STEM jobs of the future are expected to grow by 2.5% per year.

This shortage begins at school, where declining interest in mathematics is shrinking the pool of mathematically capable university graduates. The proportion of Year 12 students studying *Specialist Mathematics* or *Mathematical Methods* (subjects that underpin STEM degrees) is at an all-time low. Women remain underrepresented, accounting for just 37% of enrolments in university STEM courses.

Targeted government programs and interventions are needed to inspire young women and other underrepresented groups to pursue exciting STEM career opportunities and to encourage continued studying of higher-level mathematics in school.

The transition from university to industry is another critical juncture. The following APR.Intern data from NRIP exit surveys highlights the importance of research internships in preparing graduates for industry careers:

- 88% of interns said their internship was very important or important for their future employment.
- 36% of industry supervisors reported making a hire directly following the internship.
- 29% of those hires were for newly created roles.

These outcomes demonstrate the value of research internships for both students and businesses.

9. *What incentives do business leaders need to recognise the value of R&D investment, and to build R&D activities in Australia?*

Government programs such as the R&D Tax Incentive provide essential support to companies undertaking R&D. However, as these benefits are delivered retrospectively via the company tax return, they require businesses to first outlay funds and wait to receive the subsidy. This time lag can discourage SMEs from investing in R&D due to cash-flow constraints.

To address this, upfront R&D support schemes, such as voucher subsidies, are needed, particularly for SME's, to enable their participation in R&D activities without significant financial strain.

Survey responses from APR.Intern industry partners highlight this need. The two most frequently cited contributors to internship success were the relevance of a students' PhD to the internship project (85%) and the availability of a voucher subsidy (78%). This underscores how critical funding support is to successful R&D outcomes.

APR.Intern has had significant success enabling SMEs to participate in R&D through voucher-based programs such as National Research Internship Program (NRIP) (Department of Education), MTPConnect, Defence Science Institute, Defence Science Centre, and the WiSE grant (Department of Industry, Science and Resources). However, these grants have now expired or are nearing their end.

While SMEs increasingly recognise the value of R&D investment, a new long-term voucher subsidy program is needed to incentivise and support their continues participation. Such as program would enable more SMEs to engage a postgraduate research intern and help build R&D activity across the sector.

10. What should be measured to assess the value and impact of R&D investments?

In addition to traditional economic indicators such as revenue generated from R&D, employment related to R&D, and capital investment following commercialisation, it is critical to measure the collaborative value and broader ecosystem benefits generated by R&D investment.

APR.Intern internships create partnerships between academia and industry that have an impact beyond individual projects. These internships often result in employment opportunities for recent PhD graduates, ongoing collaborations between universities and businesses, and new grant applications, scholarships or further research activities.

Post-internship surveys from APR.Intern found that 58% of industry partners continued collaborating with their academic partner after the internship, 80% reported an increase in collaborations, and 72% said the internship helped sustain existing collaborations.

These results reflect the long-term impact of R&D investments in building a connected, trusted innovation ecosystem. R&D is, by nature, a risky and uncertain endeavour that does not always lead to a desired technical outcome. Nonetheless, collaboration creates an ecosystem that promotes knowledge exchange and builds relationships between industry and academia that can lead to future investment.

Economic spillover benefits to the wider economy from R&D investments should also be considered when assessing the value and impact of R&D investment. While not an explicit objective of the APR.Intern program, an independent survey reported that the Commonwealth's $19.2 million investment in NRIP contributed to a total increased organisational R&D expenditure of $24.7 million.

Furthermore, according to a recent report by CSIRO, each dollar invested in R&D earns an average of $3.50 in economy-wide benefits for Australia. These ratios suggest that the increase in

organisational R&D expenditure of $24.7 million would result in at least $86.5 million in national benefit, or $4.50 in benefit for every dollar of Commonwealth investment in NRIP.

These figures capture only the economic benefits of R&D. The total return is even greater when factoring in the social and environmental benefits, as well as the long-term value created through sustained collaboration, skills development, and innovation capabilities. The APR.Intern program continues to deliver this value by leveraging its established networks and proven internship systems.