SCIENCE & TECHNOLOGY AUSTRALIA POLICY SUBMISSION

RESPONSE TO THE AUSTRALIAN UNIVERSITIES ACCORD INTERIM REPORT

1 SEPTEMBER 2023

Science & Technology Australia thanks the Accord Panel and the Department of Education for the opportunity to respond to the Australian Universities Accord Interim Report. Science & Technology Australia is the peak body for the nation's science and technology sectors, representing 144 member organisations and a vast network of more than 115,000 scientists, technologists, engineers and mathematicians.

Science & Technology Australia asks the Accord Panel to make two top priority recommendations to the Australian Government:

1. **Set an R&D investment target for Australia of 3% of GDP by 2035 (and an interim target of 2.4% by 2030) and develop an investment roadmap to reach the targets.**
2. **Start a major scale up in university research investments from 2024 – by doubling Australia's investments in the ARC and NHMRC's competitive grants budgets and in university Research Block Grants.**

These two key actions will seize Australia's share of the new jobs, income and industries that will be generated by major economy-powering research breakthroughs over the next decade. Without a clear recommendation from the Accord Panel on a bold R&D uplift, the Australian Government won't have the policy and Budget levers it needs to deepen Australia's R&D investment.

To achieve these two priority goals, the Panel should recommend the Australian Government:

3. Double the competitive grants budgets for the ARC and the NHMRC and recommend the agencies:
    a. Create longer-term grants and fellowships of 5, 7, or 10 years to stem the loss of Australian research talent.
    b. Place funding conditions on research grants to require researcher contracts to span the full grant length.
    c. Add 'next-stage' funding options to ensure Australia's most promising research breakthroughs don't stall.
4. Create ARC and NHMRC funding streams to deepen partnerships with First Nations communities: back Indigenous-led, community-driven research; protect Indigenous IP; and develop business and employment opportunities.
5. Double the current funding for Research Block Grants:
    a. Most new resourcing should be allocated to the Research Support Program.
    b. Lift the rate of minimum PhD stipends in the Research Training Program to a liveable amount.
6. Model the impact of restructuring Australia's PhD funding system to classify PhD candidates as junior research employees – and recommend policy action based on that modelling.
7. Renew a ten-year investment commitment to Australia's large-scale research infrastructure in NCRIS and lift base funding for each NCRIS facility to combine operational and capital expenditure.
8. Secure funding for the individual NCRIS facilities to prevent the loss of highly skilled specialist talent by renewing funding agreements at least two years from the end of their funding contracts.

The Panel should also recommend the Australian Government:

9. Develop a research infrastructure workforce plan that articulates the specialist nature of the roles of research infrastructure operators and technicians, creating commensurate role classifications and pay scales.
10. Reject a new tax on international students that would risk Australia's income, reputation and global influence in an era of shifting geostrategic complexity.

Securing Australian jobs, income and living standards

Recommendations 1, 2

Australia faces an existential economic challenge to save Australian jobs, incomes and living standards amid a fierce new global science and technology race. Our economic competitors are rapidly scaling up their strategic investments in research and development to be first to new bold breakthroughs to seize new jobs, income and industries. **If we don't make our own bold boost to R&D investment, Australia's economy risks dwindling into a technological backwater.**

China, the US, the UK and most advanced economies are ramping up their R&D outlays (Attachment 1). Yet **Australian R&D investment is dangerously low and in free fall.** In August 2023, it slumped to 1.68% of GDP – well below the current OECD average of 2.74% and a country mile from the 3% target Australia needs.

One-third of Australia's R&D investment is in universities – so **to meet its brief to recommend a transformational blueprint, the Accord Panel should recommend a bold uplift in R&D and university research**. New modelling on ARC funded research delivers the powerful evidence-base the panel needs to make this recommendation – with a return on investment of more than $3 on every dollar.

These figures also show the cost of under-investment in Australian research. **Every dollar not spent on research is $3 in economic activity lost.** Imagine how many jobs could be created, how much wealth generated, and how many life-improving advancements could be invented through a powerful boost to the nation's research funding.

Further **evidence shows the bottleneck on economic growth posed by the lack of investment in research** - Australia's universities have begun to slide in global rankings, and new commercialisation grants have been overrun by demand.

Australia must be every bit as bold in our R&D ambitions as our global competitors. If not, we will erode our security and sovereign capability in an era of escalating geostrategic risk. We will consign our country to be a consumer, not a creator, of future technologies. And we will dangerously deepen our reliance on other nations.

University research creates new Australian jobs and tackles complex disadvantage

University researchers drive Australia's bold breakthrough research. They make the big new discoveries that the private sector can't and won't create on its own. These discoveries are crucial to solving every major complex public policy challenge faced by Australia's society, economy and environment.

Doubling Australia's investments in university research would generate more breakthroughs like:

- *Generating $1 billion in licensing fees for Australia, UNSW engineer and scientist Professor Martin Green's team developed a world-first revolutionary new solar cell – key to Australia's goal to be a clean energy superpower. Their PERC technology is now used in 90% of the world's solar panels. Climate Change Minister Chris Bowen hails him as a rock star whose work is key to avert climate disaster for our children's generation.*

- *Australia faces a crisis with a sharp slide of our children's basic literacy and numeracy skills. With powerful testimonials from parents and students on its strong evidence base, the Multilit program from Macquarie University researchers is a gamechanger. Making up for lost literacy, students make gains of 15 months in reading accuracy and comprehension after just two terms in the program.*

- *Australia has a devastating and costly challenge with family breakdown and child neglect, abuse and harm. With a proven cost-benefit return of US$9.20, the research-driven Triple P parenting program created by UQ is curbing social, emotional and behavioural problems in children, strengthening parenting skills, lowering stress and depression among parents, and reducing harsh, inconsistent and coercive parenting.*

- *With strong evidence of its success from teachers and principals, the Fair Go program at Western Sydney University has boosted school attendance rates, cut student suspension rates and improved student behaviour in 70 low-SES schools in western Sydney and rural NSW. Teachers also reported "taking part… saved my career".*

- *The ARC Centre of Excellence in Exciton Science's new semi-transparent perovskite solar cells can be printed as thin films on building windows. Installing them on a fully-glazed skyscraper could supply 100% of the building's energy needs – powering major city skyscrapers with zero emissions and saving vast energy generation costs.*

- *Tackling Indigenous disadvantage and closing the gaps in maths education, resources developed through research by the Aboriginal and Torres Strait Islander Mathematics Alliance chaired by Professor Chris Matthews equips teachers and schools to strengthen Indigenous students' maths skills by connecting maths and culture.*

University research: a smart investment with threefold returns

To reap the benefits of great university research, we have to fund it. Securing our future R&D capability and national wellbeing is a whole-of-government imperative – and the Accord Panel should recommend a seismic uplift for university research to solve complex challenges in every Ministerial portfolio across Government (Attachment 2).

The heavy lifting – nearly one third (29%) of Commonwealth Government direct investment[1] in Australia's R&D effort – comes through the education portfolio[2] as investment in university research. This emphasises the education portfolio's critical role to power breakthroughs that help every Cabinet Minister and all Government Departments.

Boosting research investment will generate threefold returns to taxpayers. The new evaluation of ARC-funded research found **every $1 invested in ARC research generates $3.32, cumulatively growing Australia's economy by $152.5 billion over the past 20 years and creating 6570 jobs each year.** CSIRO research finds every $1 in overall R&D generates $3.50 for the economy, with a 10% annual return on investment from R&D. (Attachment 3).

Australian business agrees. The Business Council of Australia's Seize the Moment report says "9 in 10 Australians agree that spending on research and development is vital to give us a competitive edge". The BCA advocates an ARC injection to "increase resources for **basic research**" and continued funding for university–industry collaboration.

Australia needs the Accord Panel to make clear recommendations to the Government for a transformative uplift in university research investment that will secure the country's economic future. We must not miss this moment.

A plan to structure a transformative uplift in university research investment

Australian Research Council and National Health and Medical Research Council grant funding

Recommendation 3, 4

The ARC and NHMRC competitive grant schemes – the linchpins of university research funding – fund Australian discovery research. This is the wellspring of new knowledge that leads to translation and commercialisation. Doubling both the ARC and NHMRC grants budgets would supercharge Australia's R&D heft. An uplift should be tied to creating more long-term fellowships and grants of 5, 7 or 10 years – to stop a brain drain of Australian researchers being lured overseas, and to give Australia's best researchers job security to pursue major breakthroughs.

The ARC and NHMRC should develop funding streams that support medium- to long-term priority-driven work, with longer-term grants. They should also create iterative funding that supports Australia's best researchers to develop and test ideas, then be funded to advance the most promising of those research breakthroughs. As ARC and NHMRC

[1] Excluding the R&D Tax Incentive expenditure in the Industry and Science portfolio

[2] Programs: Australian Research Council funding, Research Support Program, Research Training Program, National Collaborative Research Infrastructure Strategy

grants do not cover the full cost of research, a boost to ARC and NHMRC grants funding must be matched with a commensurate increase in the Research Block Grant funding.

Respect Indigenous Knowledges and expand support for Aboriginal & Torres Strait Islander researchers

Recommendation 4

Indigenous knowledge is the impressive foundation of Australia's knowledge base. It incorporates vast Indigenous expertise in science, engineering, technology and maths across the continent. The Universities Accord should reflect the role of these knowledges in Australia's unique national identity, and set out a bold vision to elevate and invest in First Nations people, leadership and knowledge systems – including forging stronger First Nations STEM education and career pathways grounded in First Nations priorities connected to community, culture and country.

The Accord should recommend stronger support for Aboriginal and Torres Strait Islander researchers, and a policy direction to draw more deeply on Indigenous Knowledges. It should recommend the ARC and NHMRC develop funding streams to support partnerships with First Nations communities. Such funding would promote Indigenous-led and community-driven research, protect Indigenous intellectual property and develop business and employment opportunities. This model would complement the ARC Discovery Indigenous program that already invests in individual researchers.

Research Block Grants

Recommendations 5, 6

Doubling the overall budget allocation for Research Block Grants would powerfully strengthen the foundations of Australian university research. While the two funds within the RBG – the Research Support Program (RSP) and the Research Training Program (RTP) are currently of roughly equal size[3], such a funding boost should not be split evenly between the two programs. A boost in overall RBG funding should be weighted toward the Research Support Program, but also drive an urgent rise in the minimum PhD stipend amount set by the Research Training Program to make it a liveable wage. The current low stipend levels deter people from diverse and disadvantaged groups from pursuing a PhD and research careers - and are a barrier to diversifying Australia's research workforce.

A boost in the RSP would enable universities to double down on research in areas of excellence and the research priorities of their local industries and communities. An increase to the RSP should also include conditions that require universities to hire researchers on longer employment instruments – 5 to 7 years – to tackle chronic job insecurity in research careers and maximise Australia's returns on research investment.

The Panel should undertake modelling for the final report to examine the impact of restructuring Australia's PhD funding system to classify PhD candidates as junior research employees, with employee benefits and conditions.

Securing Australia's National Collaborative Research Infrastructure Strategy

Recommendations 7, 8, 9

The Accord must secure the precarious funding of Australia's essential large-scale research infrastructure facilities. Without these shared high-tech facilities that power research breakthroughs by both universities and industry, Australian R&D would stall. The scheme desperately needs funding security and certainty.

[3] The 2022–23 budget allocation for the Research Support Program was $951 million, and the Research Training Program budget allocation was $1093 million.

Critical to maintaining our research infrastructure is securing the talent and expertise to run the specialist infrastructure and equipment. These staff are highly skilled, and highly specialised, but current employment classifications in universities constrain NCRIS facilities' ability to keep these specialist staff. The Accord should recommend a research infrastructure workforce plan be developed to recognise the specialist nature of research infrastructure staff and nurture the careers of this highly skilled workforce.

Reject a new tax on international students

Recommendation 10

The interim report sought feedback on the idea of imposing a new tax on international students. The idea is short-sighted and damaging – and would easily be weaponized by our competitors. This would not shift Australia's university research dependence from the vagaries of international student income – it would entrench it.

Charging an additional levy on top of international student fees to go into a central fund – whether to support research or other university business – is not a sustainable way to fund anything. It does not provide certainty, nor ongoing security of funding. Funding university research in such a way leaves it vulnerable to the ever-changing geopolitical context and the potential volatility of the international student market. International education enriches our campuses, builds personal ties and deepens our connections with global neighbours – a new levy would damage Australia's reputation and kill off our income.

Attachment 1 – International R&D investment comparators

- In the US, the CHIPS and Science Act will supercharge outlays on science and semiconductor manufacturing – and other R&D – by a massive $52 billion. US President Joe Biden calls it a "once in a generation investment in America itself".
- The UK is dramatically ramping up public investment in R&D towards a 2.4% of GDP target.
- China's research and development budget tripled from 2012 to 2022, firmly establishing it as the world's second-largest R&D investor after the US and hitting a record high in 2022.
- Japan's Government recently announced a ¥10-trillion (US$75-billion) fund to support university research.
- South Korea has identified 11 critical areas of science and technology that will have 70% of annual R&D to research allocated to them – with plans to invest 13.5 trillion won (US$10.2 billion) by 2030.
- Canada's national investment in R&D has grown in each of the past 5 years – primarily driven by increases in government spending. The Canadian Government invested an additional CA$1.2 billion in 2020 across all R&D sectors, reaching CA$8.3 billion.
- Germany has a plan to invest EUR3 billion in quantum technology – with the ambitious goal to build a quantum computer of around 100 qubits by 2026.
- In 2021, France announced the France 2030 Plan, which commits EUR30 billion in subsidies and funding schemes to support 10 objectives spanning the science and technology sector.

Attachment 2 – Case studies of university research delivering strong ROI

Uni research is helping endometriosis sufferers, productivity and workforce participation

An international collaboration including researchers from the University of Adelaide, the University of Sydney, University of South Australia, University of New South Wales

Endometriosis affects one in nine Australian women. It takes an average of 7 to 12 years to get a diagnosis - leaving women with years of needless pain and suffering - at a cost to them, their families, their workplaces, employers and the economy. The only way to properly diagnose endometriosis has been through surgery.

A new technology created by university research - IMAGENDO - now pairs artificial intelligence with MRI and ultrasound technology to allow rapid, non-invasive diagnosis of endometriosis. Earlier diagnosis is also key to reducing infertility for endometriosis patients, allowing them to freeze their eggs at a younger age.

This game-changing invention was only possible through university research.

Uni research has changed the law to protect survivors of domestic and family violence

Professor Heather Douglas at the University of Queensland led much of this work with researchers across the globe, including colleagues at UQ and collaborators at the University of Sydney and the University of Kent (UK).

750,000 Australian women report domestic and family violence each year. On average, one woman a week is murdered by her current or former partner. 1 in 3 women have experienced physical violence since the age of 15 – and this violence against women and their children in Australia costs lives, inflicts trauma and costs the nation $26 billion a year. Those costs include trauma and medical support, policing and courts, lost workforce participation, complex care for children who witness violence, child protective services, and higher rates of youth and adult crime rates.

University research has generated a robust evidence base on domestic and family violence in Australia to inform two new state-based laws on non-fatal strangulation. Queensland judges now better recognise the dangers of non-fatal strangulation and highlight these in their judgements.

This research is cited in state and national policies and strategies and reports, and provided information that is included in the National Domestic and Family Violence Bench Book, which has 60,000 users. It has also informed training materials for 240 judiciary magistrates and tribunal members, and law students.

This game changing reform only happened because of university research.

Uni research is saving Tasmania's agricultural industry from climate change and crop disease

A collaboration between University of Tasmania and the Tasmanian Government

Research from the Tasmanian Institute of Agriculture is transforming farm profitability through better irrigation, sustainable soil management, increased pasture productivity and optimised use of fertilisers. And research to support the wine industry includes disease prevention and new technology to improve the commercial value of cool climate wines.

The boost to Tasmania's agricultural industry in the 5 years from 2011 and 2016 included a jump from:

- $312 to 386 million for the dairy industry
- $184 to 217 million for the vegetable industry
- $40 to 96 million for the wine industry

This game changing support for Tasmanian farmers only happened because of university research.

Uni research is driving deadly improvements in maths teaching and learning in schools

A suite of projects led by the Queensland University of Technology (QUT) with collaborators at Griffith University

The YuMi Deadly Maths (YDM) project strengthened the skills and content knowledge of Aboriginal and Torres Strait Islander students in mathematics, designing an array of high quality new teaching materials.

Underpinned by high-quality research, the partnership with over 270 schools with relatively high Indigenous student populations boosted student mathematics understanding and teacher capacity to teach Indigenous students. An impact evaluation (2010–2016) showed improvements across teaching, student engagement, understanding and performance, and schools achievement in mathematics. Non-indigenous students also benefited from this teaching practice.

The most recent assessment in the OECD's Programme for International Student Assessment (PISA) from 2019 showed Australia's maths scores have been declining since 2003. Mathematics education is critical to ensuring equity to create opportunities and enrich the lives of all Australians.

The impact of low mathematics understanding in society leads to higher rates of unemployment, low wages, poor financial literacy, and poor health. Incarcerated Australians are more likely to have lower numeracy literacy than the general population. Boosting maths skills can transform employment, healthcare and crime, resulting in profound economic benefits to Australia.

This game-changing teaching resource to Close the Gap was created by university research.

Uni research is shaping bushfire management and saving Australia's biodiversity

A collaboration between La Trobe and Deakin Universities

Australia is the most fire-prone continent on the planet. Across millennia, Australia's ecosystems have been shaped by fire. But fire today ravages communities, homes, farms and livestock, and takes human lives.

Following the 'Black Saturday' bushfires, the Bushfire Royal Commission recommended a dramatic increase in controlled burning, setting an annual target of 5% of public land in Victoria, which would have cost $114 million in 2014–2015 alone. The impact of such burns on the long-term status of the ecosystem had not been considered fully at that point. Such a target would have meant that few areas of native vegetation would have remained unburned after a 20 year period.

Subsequent research by La Trobe and Deakin Universities found such vigorous burning would have profound consequences for native fauna, and modelling showed that many favoured 'older' vegetation only reach peak occurrence at 20–40 years post-fire or more.

This solid evidence played a key role in the Victorian government changing from an 'area-based' burning target to one based on reducing fire risk by carrying out burns strategically. The project was described as "an excellent example of research thinking going straight into policy development," by Dr Gordon Friend, Strategic Bushfire Risk Assessment Unit in the Victorian Department of Environment, Land, Water and Planning.

This crucial work to save Australia's unique biodiversity only happened because of university research.

Uni research is driving down Aboriginal and Torres Strait Islander suicide rates

University of Western Australia

Australian Institute of Health and Welfare statistics report that in 2021, suicide accounted for 5.3% of all deaths of Aboriginal and Torres Strait Islander people. The comparable proportion for non-Indigenous Australians was 1.8%. Almost one third of deaths by suicide in Indigenous people were women. The comparable proportion for the non-Indigenous population is one quarter.

Working directly with communities, researchers from the University of Western Australia built an evidence base for Aboriginal cultural, social and emotional wellbeing. Through two projects – the National Empowerment Project (NEP) and The Aboriginal and Torres Strait Islander Suicide Prevention Evaluation Project (ATSISPEP) – this research has changed government policies and proved that solutions to address Indigenous social and emotional wellbeing and reduce suicide can be found – by drawing from Indigenous knowledge and using culturally appropriate tools.

This life-saving intervention was made possible by university research.

Uni research is protecting our rivers and waterways

University of Technology Sydney

Healthy rivers are vital. They sustain communities by providing clean water for drinking, agriculture and recreation. Since the early 2000s, the Australian Government has prioritised water reform to save the environment by increasing water flows. University of Technology Sydney research, including digital simulation modelling of ecosystem responses to water extraction, has shown how the timing, quantity and quality of water flows are critical to preventing toxic algae blooms and improving river health.

This research is key to Australian water policy and has been a lifeline for our rivers and environment. This game-changing evidence was only possible because of university research.

Uni research is powerfully supporting mental health

The Australian National University

Depression affects over one million Australians and is the second leading cause of disability worldwide. Too many people face significant barriers to treatment access, such as stigma, geographical location, and lack of services.

MoodGYM is an online automated self-help program based on evidence and research in cognitive behavioural therapy (CBT) – taking therapies traditionally delivered face-to-face to an online platform. MoodGYM prevents and manages symptoms of depression – and is accessed by more than one million people worldwide.

The multi-media MoodGYM program provides training in CBT using five modules, interactive exercises, automated feedback to the user and amusing fictitious characters to communicate the principles of cognitive behaviour therapy. It's provided help and treatment to thousands of people who would otherwise never have received help.

This powerful mental health initiative was created by university research.

Uni research is keeping our kids safe from harm

University of New South Wales

Research from the University of New South Wales used psychological evidence, digital technologies and storytelling to create the Climate Schools program – scalable evidence-based programs to connect with students and prevent the harm caused by drug and alcohol abuse.

The Climate Schools program has been proven effective in improving alcohol, cannabis and psycho-stimulant-related knowledge, decreasing alcohol use and binge drinking, decreasing frequency of cannabis use, decreasing intentions to use ecstasy, and reducing truancy rates and psychological distress, up to three years following the interventions.

The Climate Schools work complements other research by UNSW on Positive Choices, a national drug prevention online portal developed to help schools and other communities access evidence-based information and drug prevention programs.

This powerful child safety initiative was created by university research.

Attachment 3 – ROI studies for the Panel's evidence base

- Deloitte modelling for Universities Australia finds each $1 invested in university research grew Australia's GDP by $5 over the past 30 years - and estimates a 1% permanent increase in investment in university research and development can generate an annual $2.4 billion increase in GDP.
- The Impact Assessment of ARC-funded research report found that for the period 2002–2021:
    - each $1 invested in Australian Research Council research delivers $3.32 in return – or $184.3 billion in economic growth
    - generated 6570 jobs per year across the country
    - each $1 of ARC funding leveraged $1.23 from other funding sources
    - 82% of the researchers surveyed said their work would probably not have happened without their ARC research grant.
- A report from CSIRO found that each dollar invested in research and development earns an average of $3.50 in economy-wide benefits for Australia.
- A series of studies analysing the benefits of medical research in the UK finds returns of:
    - 40p every year for a one-time £1 in research investment in cancer
    - 25p every year, forever for every one-time £1 of research investment in musculoskeletal research

    - 39p every year for every one-time £1 of research investment in cardiovascular disease

- Strong benefits to Japan of investing in a new antibiotic discovery program with global partners to create 18 new antibiotics. Over 30 years, the program is projected to save 270,000 lives and generate U$106.2 billion for Japan, with an ROI of 28:1. Globally, 9.9 million lives would be saved, with an ROI 125:1.

- An analysis of investment in biomedical research in the UK finds every extra £1 of government investment leverages an additional £0.83 – £1.07 of private investment. This demonstrates the strong role of government investment in leveraging R&D investment from the private sector.

Attachment 4. Further points on access and inclusion

Science & Technology Australia reiterates the recommendations made in our initial submission to the Accord process regarding access and inclusion.

The HECS-HELP loan scheme is the bedrock of equity in Australia's university system. To give graduates paying off loans protection in times of unusually high CPI increases, cap the indexation rate applied to HECS-HELP loan debts at no more than 3%. Alternatively, link HELP indexation to the wage price index rather than CPI.

The single biggest deterrent to university for students from low SES backgrounds is the cost of supporting themselves through their study years. The Accord should recommend more generous student income support that is better targeted to those who need it most.

Science & Technology Australia strongly supports the Interim Report's immediate recommendation to uncap the number of university places available to Aboriginal and Torres Strait Islander people nationwide.

The Accord should make a commitment to more generous Indigenous Student Success Program (ISSP) payments with clearer objectives and accountability in return.

To create a meaningful STEM future with Aboriginal and Torres Strait Islander people, we recommend the Accord adopts the following design principles:

- **Show first Nations youth a future in STEM:** invest in pre-service and in-service teacher professional training that connects the teaching and learning of STEM with First Nations knowledges
- **Invest in First Nations people to become STEM teachers**
- **Ensure bilingual education in First Nations languages** is an integral part of the Australian education system and ensure national education initiatives like NAPLAN can cater for students in this type of education;
- **Develop clear educational pathways for all First Nations students to go to university** regardless of where they come from i.e. rural, remote and urban
- **Invest in the development of a National First Nations STEM Network** for First Nations people who are working or being educated in STEM
- **Require universities to develop relationships with Indigenous communities** to develop programs in Indigenous-led, community-driven research where benefits of the research flow back to community
- **Create dedicated funding streams:** The ARC and NHMRC should create funding streams to forge meaningful relationships with First Nations communities, promote Indigenous-led and community-driven research, protect Indigenous intellectual property and develop potential business/employment opportunities on Country to strengthen Country
- **Create First Nations STEM careers:** that support the values of First Nations Communities and work towards a sustainable future for all Australians.