

Senate Inquiry into Australia's Innovation System

Submission by Australian Institute for Bioengineering and Nanotechnology (AIBN)

Introduction

AIBN is Australia's premier multidisciplinary institute focused on the development of technologies and products arising from the exploitation of nanotechnologies and biotechnologies. The institute is located in a purpose-built, state-of-the-art facility at the University of Queensland. It is a translational research institute, with a strong focus on engagement and collaboration with industry. In addition to collaborative research and development projects with industry, the institute runs an active Industrial Affiliates Program (IAP), which provides project-independent opportunities for AIBN researchers to engage with representatives from industry. AIBN therefore has a strong vested interest, and a significant role to play, in Australia's innovation system.

"Innovation is the central issue in economic prosperity" (Professor Michael Porter, Harvard Business School) and the uptake of research by industry is a key component of the innovation process. According to the 2014 Insead Global Innovation Index (GII) [\[LINK\]](#) Australia ranks 17th out of 143 countries in the world in its overall innovation index. It is stronger on innovation inputs (Input sub-index ranking 10/143) than outputs (Output sub-index ranking 22/143) and has a very poor Innovation Efficiency Ratio (ranking 81/143). Contributing to this low efficiency in converting inputs to outputs are factors such as relatively low rankings on business sophistication (26/143), Venture Capital (VC) deals (23/143) and innovation linkages (48/143). These low rankings (compared to other developed countries) reflect deficiencies in Australia's innovation system and AIBN welcomes the opportunity to comment on these deficiencies and suggest ways in which they might be addressed.

Submission

This submission addresses in some detail several of the key issues noted in the inquiry terms of reference:

(a) The need to attract new investment in innovation to secure high skill, high wage jobs and industries in Australia, as well as the role of public policy in nurturing a culture of innovation and a healthy innovation ecosystem;

Culture, capital and experience are critical factors in defining the health of the innovation system. Challenges faced by Australia include:

- Shortage of risk capital for early stage commercialisation.
- Small domestic market.
- Small pool of experienced employees and entrepreneurs.
- Short-term focus and conservatism of established companies.

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- Limited flow of scientists and engineers between academia and industry.
 - ~30% of Australian researchers are located in industry, compared with 75-80% for US, Korea, Japan (figures from Australian Technology Network) [\[LINK\]](#).

Public policy, both at a federal and state level, has a major role to play in overcoming these challenges and creating an environment that is conducive to innovation and nurtures the formation, growth and success of innovative companies. Without supportive public policies, these challenges are impeding the creation of sunrise industries in Australia and forcing innovative companies to move offshore.

Of the issues listed above, access to risk capital is the most important. It is well recognized that creation of start-up companies funded via patient, high risk capital is a core component of a healthy and vibrant innovation system. Start-up companies have the flexibility, desire and need to translate research into new products and services in a way that is not possible for established companies. According to AVCAL [\[LINK\]](#), Australian VC backed companies spend 200x more per employee on R&D than other businesses. However, such companies are absolutely dependent on access to risk capital to fund their activities. According to the AVCAL 2013 Year Book [\[LINK\]](#), VC investment in Australia in 2013 amounted to \$111million invested in 124 deals involving 69 Australian start-up and early stage companies. By comparison, according to a study conducted by PricewaterhouseCoopers (PwC) and the National Venture Capital Association (NVCA) [\[LINK\]](#), in 2013 in the US there were 3,995 VC investments totaling US\$29.4billion into early stage companies. Annualising the Australian data (and ignoring exchange rates), this means that US venture capital investment was ~260x greater in dollars and ~30x greater in number of investments. On a per capita basis, this means that Australia's VC industry is ~20x smaller than that in the US on the basis of dollars invested. In its Australian Innovation System Report 2013 [\[LINK\]](#), the Department of Industry noted that Australia ranked 13th of OECD countries in terms of "Venture capital availability".

The lack of risk capital and the immaturity of the Australian VC industry have been widely recognised. Until the most recent federal budget, the Australian government attempted to (partially) redress this issue through the Industry Innovation Fund (IIF). The IIF was a public-private partnership structure that created a number of new venture funds managed by professional investors. The size of the IIF was too small to address Australia's VC deficiency in and of itself, however it was widely viewed as a successful mechanism for expanding the pool of venture capital in Australia. Despite the program's success, and the fact that it ultimately generated a return to the government rather than an expense, the IIF was cut from the budget.

In addition to the shortage of high-risk growth capital, Australia's innovation system is deficient in very early stage "proof-of-concept" (pre-seed) capital. Currently, the only substantial source of such capital is the Medical Research Commercialisation Fund (MRCF), which is widely viewed as a successful model. However, MRCF funding is only available for medical research projects from member institutes. Small university-based funds, such as Uniseed, also provide pre-seed financing but they have very limited investment capability. The recent McKeon review [\[LINK\]](#) highlighted the shortage of pre-seed funding in Australia and proposed two initiatives: (i) creation of a Matching Development Grants scheme of 20x \$0.5million p.a. for the most successful NH&MRC

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grant recipient organisations and (ii) creation of a \$250million Translational Biotech Fund. We support both proposals but, to date, there has been no government response.

The ecosystem required to support a healthy innovation sector requires a strong community of VC and angel investors with access to sources of capital. However, high-risk investment capital is necessary but not sufficient on its own. Other forms of financial support have been used to great positive effect in countries with healthy innovation systems. To highlight just two successful initiatives in the US: (i) the SBIR grant program that provides meaningful non-dilutive finance to start-up companies and (ii) the beneficial taxation treatment of employee stock options. These two initiatives are integral components of a financial structure that actively supports start-ups and encourages venture investment into those companies. In contrast, the Australian environment is largely discouraging of innovative start-up companies.

Specific initiatives that could be implemented by the Australian Government to encourage new investment in innovation and help create a healthy innovation ecosystem include:

- Reintroducing an (expanded and improved) IIF program.
- Introducing additional taxation benefits for investors in early stage, high-risk companies. For example, reducing or waiving capital gains tax for investors who support these companies over the medium to long term.
- Ensuring that some of Australia's ~\$2.3trillion in retirement funds are invested in innovative companies. This could be achieved by mandating a very small portion of Australia's retirement funds be directed towards creation and support of "sunrise industries" (noting that an allocation of less than 1% of Australia's current retirement funds into venture funds would completely address the VC shortfall).
- Introducing an SBIR-type grant program. This could be achieved at no net cost to the federal budget by redeploying the funds from the poorly designed Entrepreneur Infrastructure Program (EIP), which is not even available to start-up companies.
- Addressing the punitive and illogical taxation treatment of stock options (at least for small technology companies). Not only would this provide a cash management benefit for early stage companies, it would also align company and employee interests. In addition, according to the July 2014 report compiled by Employee Ownership Australia and New Zealand (EOA), Link Market Services and Computershare [\[LINK\]](#), it could increase taxation revenue by >\$215million p.a. and potentially drive \$1.4billion growth in GDP over 10 years.
- Maintaining the critically-important R&D tax rebate scheme for small companies, restoring the full benefit to 45% for companies that don't yet pay tax, and implementing the quarterly rebate payments which were foreshadowed in the original scheme but axed by the current federal government. Note that quarterly R&D rebate payments for new ventures are supported in the Financial System Inquiry Interim Report (15 July 2014, page 2-68) [\[LINK\]](#).

In addition to the financial initiatives described above, the Australian government could

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boost the Australian innovation system by encouraging, mandating or otherwise facilitating other features that are essential for a healthy innovation ecosystem, including:

- Creating innovation precincts in close proximity to customers and end users. For example, governments could require company “incubators” to be incorporated into any new hospitals, research institutes or technology facilities that receive public funding. Also, the federal government could offer taxation or other incentives for established companies to offer incubator space and access to facilities and equipment to start-up companies. The recent initiative by the NH&MRC for the recognition of Advanced Health Research and Translation Centres [\[LINK\]](#) is a step in the right direction.
- Providing incentives and removing disincentives for two-way movement between industry and academia. This could be achieved in part by expanding the researchers-in-business program to allow eligibility for start-up companies and to allow for personnel exchange from business to research. In parallel there needs to be a revised / expanded framework for recognizing academic achievement in order to encourage academic researchers to ‘take time out’ in industry.
- Providing recognition for innovation and entrepreneurship in the form of awards, prizes, public visibility, etc.

One matter that cannot be overemphasized is that the ecosystems required to nurture and support sunrise industries develop over time and are underpinned by stable, long-term government policies. Australia's innovation system has suffered (and continues to suffer) from a lack of stability due to the highly partisan nature of Australian politics. If investors are going to make long-term, high-risk investments they need to know that government policies are not going to change every few years (as has been the case in Australia, at both a federal and a state level). A specific point of contrast is the US SBIR program, which has been embraced by both Republican and Democratic federal governments over a period of more than 30 years.

(b) The Australian Government's approach to innovation, especially with respect to the funding of education and research, the allocation of investment in industries, and the maintenance of capabilities across the economy;

The Australian Government's support of research and development falls into several broad categories: (i) support of academic (largely basic) research, primarily through the NH&MRC, ARC and block grants to tertiary institutes; (ii) infrastructure support through programs such as NCRIS; (iii) support of corporate R&D primarily through the R&D tax rebate and concession; and (iv) support of government research agencies, such as CSIRO. Each of these areas is critical to Australia's innovation system; however each could be improved.

In the case of NH&MRC, ARC, block grants and other R&D funding, the >\$3billion p.a. invested by the Australian Government (i.e. the Australian taxpayer) should be seen as something more than just supporting fundamental research. These schemes provide very limited funding for applied and translational research, creating a pool of research for which there very limited capital for subsequent development and commercialisation. In the absence of mechanisms to fund translational research and drive it into new companies, Australia risks becoming the ‘research supermarket of the world’, where high quality research funded by Australian taxpayers is picked over and yields products,

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technologies and industries to the benefit of foreign interests. In other words, the current situation may well drive another iteration of lost opportunities under the traditional mentality of 'dig it up, ship it out, buy it back'.

Ongoing support to infrastructure programs by the Australian Government is essential to a healthy innovation system. Research, development and commercialisation of science-based products requires access to state-of-the-art facilities and equipment. High technology equipment can cost tens to hundreds of millions of dollars, well beyond the reach of single institutions or companies (particularly small companies). Without schemes such as NCRIS to provide centralised access to high cost instruments and capabilities, the Australian research community (both public and private) would be forced to access these facilities overseas. This would provide a further inducement for Australian researchers and research-intensive companies to consider relocating overseas (in addition to access to capital and other considerations). The inclusion of \$150million for NCRIS in the 2014/15 federal budget was a positive step, however this is another program that requires long-term, bipartisan support.

In the case of Australian government support to business R&D, the R&D tax rebate scheme is a world-leading program that is critical to the local innovation system. It is one of the few programs that seems to have bipartisan support, although recent changes to the program are concerning. Hopefully they don't foreshadow future (and larger) changes. As noted above, long-term stability is essential for a program like this. Even if no further changes are actually planned, just the perception of potential changes will act as a deterrent to investment. It is essential that both the government and opposition provide clear, outspoken and long-term commitment to the R&D tax rebate. Improvements to the program would be reversing the recent drop in the rebate from 45% to 43.5% (for companies that don't pay tax) and reinstating the planned quarterly rebate payments. This latter feature would be extremely beneficial to small companies where cash flow management is a constant issue and distracts from the focus on technology development.

In the case of investment into Australian research agencies such as CSIRO, years of short-term budget decisions have forced contractions in scope and flexibility that run counter to the support of new, innovative companies. Cost structures are such that Australian start-up companies and SMEs are virtually excluded from accessing CSIRO technology, expertise and infrastructure. Large companies (and particular large multinational companies) seem to have become the core customers for CSIRO, since they are able to execute long-term contracts incorporating CSIRO cost structures and full cost recovery requirements. The same is not true for small, cash-poor companies. Therefore, the public's investment into CSIRO, at least in areas outside mining and agriculture, does not fundamentally support the emergence of Australian sunrise industries, either by transferring technology to SMEs or by creating CSIRO spin-out companies. This latter situation is highlighted by the dearth of start-up companies out of CSIRO in recent years. CSIRO's mission and budgetary drivers need to be modified, so that success is measured less in terms of 'researchers for hire' by big (overseas) business and more in terms of supporting the creation of sunrise industries.

(c) The importance of translating research output into social and economic benefits for Australians, and mechanisms by which it can be promoted;

Publicly funded research represents a significant investment by the Australian taxpayer.

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Currently the primary beneficiaries of this investment are academic researchers, whose careers fundamentally depend on government grants; the research institutes, government organisations and tertiary institutions where the research is conducted; and the suppliers of materials, equipment and services to the academic research sector. While it is appropriate and important for the government to support basic research, it should require more than just academic outcomes for this investment. Tangible support for translational research in addition to basic research, along with better integration of research with end users, would facilitate greater societal and economic benefits from publicly funded research.

One way to help drive these changes would be to involve a broader range of expertise and experience into the administration of funding programs. This is not to advocate any reduction in academic excellence; rather to highlight that while programs are run by academics for academics, the singular focus on academic outcomes is unlikely to change.

It is also necessary to expand the recognition, reward and promotion systems for academic researchers. The primary outcome metric of scientific publications, while readily quantifiable, is a very poor indicator of societal and economic benefit. Indeed, by being forced to focus on publications, academic researchers are discouraged from undertaking activities that will lead to societal and economic benefit to the extent that time and effort devoted to the latter is at the expense of the former. There is a real need for development and commercialization outcomes to research projects to be valued as highly as (if not more highly than) academic outcomes. The ERA assessment needs to be expanded (or complemented by another assessment index) to recognise outcomes that have societal or economic benefit.

(d) The relationship between advanced manufacturing and a dynamic innovation culture;

Advanced manufacturing is absolutely dependent on a dynamic innovation culture and, to be and remain efficient, it should be embedded within the innovation system. However, there are other efficiencies that must be taken into consideration when companies decide where to locate their manufacturing facilities. Issues such as labour costs, taxation, supporting infrastructure, proximity to major markets, currency exchange rates, etc., come into play. In regard to these and other issues, Australia is at a serious disadvantage as a manufacturing nation.

It is worth noting that local manufacturing it is not absolutely essential for a healthy innovation system. A case in point is the US electronics industry, where most value is captured in local design, and manufacturing is outsourced to countries with lower cost structures. However, in view of job creation and integration of research with customers, local manufacturing is an important and desirable component of the innovation system. If Australian sunrise companies are going to manufacture locally, then they there must be inducements that offset, at least to some degree, the disadvantages of manufacturing in Australia noted above.

One such inducement that has been instituted in a number of overseas countries is the 'patent box' system, where a company's tax rate is reduced with respect to patented inventions that are manufactured locally. A patent box type scheme could readily be adapted to address some of the challenges facing Australian companies. Without some 'leveling of the playing field' Australian companies in sunrise industries will have no

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financial option but to manufacture overseas. A recent example is Mesoblast Ltd's decision to manufacture its stem cell products in Singapore.

(e) Current policies, funding and procedures of Australia's publicly-funded research agencies, universities, and other actors in the innovation system;

Covered under point (b) above.

(f) Potential governance and funding models for Australia's research infrastructure and agencies, and policy options to diversify science and research financing;

Covered under point (b) above.

(g) The effectiveness of mechanisms within Australian universities and industry for developing research pathways, particularly in regards to early and mid-career researchers;

As noted in the comments under point (a), career pathways for researchers in industry are poorly developed in Australia. One reason for this is the relative shortage of companies in research-intensive industries. A vibrant innovation system would be characterised as incorporating a core of established, research-based companies that employ (and train) new graduates, surrounded by start-up companies and service providers that provide ongoing and diversified career opportunities. Such innovation precincts (as proposed in point (a) above), are characteristic of successful innovation ecosystems (e.g. Boston and San Francisco for life sciences, Silicon Valley for IT).

Another aspect of the problem in Australia (unlike the US and elsewhere) is that there are limited opportunities for back and forward flow between industry and academia. Any significant time out of academia is seen by Australian academics as being detrimental to their academic career, particularly with respect to their publication track record and its resultant negative effect on grant success. Changes to the systems for reward, recognition and promotion of academic scientists, as proposed in points (a) and (c) above, are needed to encourage academics to at least consider spending time in industry. In addition, programs such as researcher-in-business (and the reciprocal) are required to provide financial inducements for two-way flow between industry and academia. This is particularly important for early and mid-stage researchers who are unlikely to receive encouragement to explore career options in industry from their academic supervisors in the absence of supporting government programs.

(h) Policy actions to attract, train and retain a healthy research and innovation workforce;

Covered under point (g) above.

(i) Policy actions to ensure strategic international engagement in science, research and innovation; and

By virtue of its research excellence and strong scientific base, Australia's engagement in science at an international level is not at issue. What is at issue is Australia's ability to reap economic and societal benefit from its scientific endeavours. Introduction of policies and programs consistent with those proposed above will help create an

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ecosystem that encourages, facilitates and rewards innovation arising from Australian and international research. With such an ecosystem in place, international innovators will want and need to engage with Australian science and research, both in academia and industry. Without it, Australia risks engagement with international innovators more as a 'research supermarket' than as equal players.

(j) Policy options to create a seamless innovation pipeline, including support for emerging industries, with a view to identifying key areas of future competitive advantage.

Covered under point (a) above.

Summary and Conclusions

Long term, supportive government policies are essential for creating and maintaining a healthy innovation system. The positive benefits of such policies can be seen in world leading innovation centres, such as those in Massachusetts and California in the US and the Cambridge region in the UK. Australia's innovation system is much less developed and, in the absence of supportive and consistent federal and state government policies, it will not deliver societal and economic benefits reflective of the country's substantial investment in scientific research.

There are a range of initiatives that could be undertaken by the Australian Government to help create a vibrant innovation system. Many of the proposed initiatives are focused on the key issue – the shortage of patient risk capital. However, these need to be complemented with non-financial initiatives.

We recommend that the Australian Government takes the following actions:

- Expand the pool of venture capital through public/private programs such as the IIF.
- Provide capital gains tax breaks for investors in sunrise companies.
- Mandate that a small fraction of Australia's retirement fund pool be invested in sunrise industries.
- Introduce an SBIR-type grant program.
- Redress the punitive and illogical treatment of employee stock options for sunrise companies.
- Maintain the R&D tax rebate scheme (in its original form).
- Facilitate the creation of innovation precincts.
- Expand programs for personnel exchange between industry and academia.
- Expand the reward and recognition criteria for academic researchers to appropriately value involvement in tangible outcomes.
- Provide prizes, awards and other forms of recognition to innovators.
- Maintain infrastructure programs such as NCRIS and make commitments long-term (rather than year-to-year).
- Revise the mission and financial structures for government research agencies such as CSIRO to drive engagement with SMEs.
- Incorporate non-academic input into the management of federal granting schemes.

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- Introduce a patent box type scheme to encourage local manufacturing of sunrise industry products.

We recognise that some of the proposed initiatives come at a short-term cost. However, unless they are implemented, Australia's considerable investment in research may well flow mainly to the benefit of foreign interests. In addition, the standard of living of future generations of Australians will be put at risk. Again to quote Michael Porter, "innovation is the central issue in economic prosperity".

Finally, to reiterate one critical point: creation and maintenance of a healthy innovation ecosystem is not a 'once off' activity. The initiatives outlined above need to be part of a long term, consistent, bipartisan commitment to innovation.

We would welcome the opportunity to discuss this submission in person with members of the Senate Committee responsible for the inquiry.

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