Cutler Review of the National Innovation System

Submission from Science Industry Australia, Inc. (SIA)

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SUBMISSION TO THE
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Introduction

On 22 January 2008, the Minister for Innovation, Industry, Science and Research, Senator Kim Carr, announced a wide ranging review of Australia's national innovation system to be conducted by an expert panel chaired by Dr Terry Cutler.

The establishment of the review recognises the vital role innovation plays in boosting productivity and international competitiveness, and re-iterates the Rudd Government's commitment to fostering innovation across the economy.

Our submission addresses itself to the following four (4) hyperlinked Terms Of Reference (TOR) only.

1. Identify a set of principles to underpin the role and participation of the public sector in innovation.
2. Develop a set of national innovation priorities to complement the national research priorities, ensuring the objectives of research programs and other innovation initiatives are complementary.
3. Identify regulatory and other barriers to innovation and recommend ways to minimise these.
4. Examine the scope for simplifying and reducing program duplication and ensuring that any support provided is well-targeted and easy to access.
5. Consider the appropriateness, effectiveness and efficiency of the Research and Development (R&D) Tax Concession Scheme in promoting innovation and make recommendations to improve innovation outcomes.
6. Consider ways to improve the governance of the national innovation system to support higher expectations of government agencies and industry.
7. Assess the appropriateness, effectiveness and efficiency of the Cooperative Research Centres (CRC) Program and make recommendations to improve innovation outcomes.

A supplementary submission addressing Term Of Reference 5: *"Consider the appropriateness, effectiveness and efficiency of the Research and Development (R&D) Tax Concession Scheme in promoting innovation and make recommendations to improve innovation outcomes"* will be submitted as an addendum to this submission within a week.

Declaration of Interest and Affiliation

The views, opinions and recommendations contained herein are those of Australia's professional science industry (qv.) as promulgated by its peak industrial body, Science Industry Australia, Inc. (SIA).

SIA was instrumental in producing this submission.

Executive Summary

In SIA's opinion the National Innovation system as it currently exists in Australia is broken. It exists in a disparate mess of poorly connected pieces.

Unlike most of our key international competitors, there exists no continuum of information flow from innovation developer/inventor through to a business partner developing a potential commercial outcome.

Instead of promoting their institution's intellectual property (IP), the commercial arms of publicly funded research agencies (PFRAs) jealously and closely guard the innovation, wrapping it up in many layers of red tape, both legal and contractual.

This protectionist stance serves to drive potential partners and investors away to overseas markets where innovation is more readily and easily accessed via far less onerous processes.

SIA's recommendations reflect this current malaise and seek to redress the root causes of the "technology gap" between the public innovator and business partner.

In summary this submission's key recommendations are:

Recommendation 1:

Prior to seeking a commercial outcome, all intellectual property and other forms of innovation developed by public monies should be quantified and qualified using a business case analysis modeled on the Proof of Concept (PoC) checklist and guidelines as developed by Science Industry Australia in collaboration with its PoC Advisory Committee (see Appendices A & B)

Recommendation 2:

All commercially based research that is not published in peer reviewed journals be evaluated by the PoC checklist and the results:

a. appear on academic CVs as certified "proof of concept" activity along with their publication record; and
b. be used as an important outcome-based commercialisation metric in conjunction with currently used standard metrics such as number of patents and licensing revenue.

Recommendation 3:

Suitably registered, Australian-owned or majority Australian-owned companies be given open and unencumbered access to all intellectual property (IP) developed by publicly funded research agencies for a period of 12 months after the IP is placed on the public record.

Such companies have the right to develop products and services from the IP and to enter into licensing, royalty and contractual negotiations once a commercial outcome has been defined for the IP.
If no Australian-owned or majority Australian-owned company picks up the IP within 12 months, then the IP is open to development by international companies.

Recommendation 4:

The Government develop an SBIR-like fund that is aligned with the Government's National Research Priorities.

Recommendation 5:

Determination and dissemination of these National Research Priorities should be the responsibility of the full time Chief Scientist's role.

Recommendation 6:

To address the "Innovation Gap" as represented by a lack of suitable government assistance and commitment to locally produced innovation, we propose the immediate adoption of a SBIR-like competitive funding program financed by an amount of money representing 3.25% of the combined R&D budget of all Australian PFRAs.
Money should be set aside and the fund be introduced in the 2009/10 federal budget.

Australia's science industry

Science Industry Australia Inc is the peak body for the Australian science industry. Its members are responsible for more than half the science industry's exports and a significant proportion of science-related imports.

The science industry is defined as research and development, design, production, sale and distribution of laboratory-related goods, services and intellectual capital used for measurement, analysis and diagnosis.

Australia’s science industry comprises manufacturers and importer/distributors of scientific equipment, laboratory and technical service companies and the scientific research community.

Australia's science industry is a key enabler of many other industries. Its equipment and laboratory services provide for the measurement and identification of very low quantities of substances to ensure the quality of our food, water, air, environment, health and many other aspects of our daily lives. Its products and services are used by industries such as agri-food; resources; environmental monitoring; manufacturing; medical and health care; research and development and education.

Australia’s domestic market for scientific equipment and laboratory-related services was estimated to be $9.9 billion in 2006/07. Australia's market represents an estimated 2 per cent of the global market, compared with Australia's gross domestic product (GDP) being around 1 per cent of global GDP. Australia's production of science services is estimated to be one-half of its production of science goods and services. Employment, including researchers and laboratory and technology service providers, was approximately 42,250.

Science services production was $5,566 million, of which exports were $167 million (3%). Australia’s publicly-funded researchers also provided significant services to the industry. Manufacturing production was $1,033 million of which $950 million was exported (92%). Imports were $3,317. Australia’s scientific product manufacturers produce $260 million of the $3 billion domestic market for scientific products. The rest of the domestic market is serviced by the specialist importers and distributors of scientific consumables, equipment and instrumentation. Over 98% of these importer and distributor companies supply product into 3 or more states in Australia.

Australia's science industry is outperforming many other industries in terms of its growth, innovation, exports and workplace excellence.

The industry is growing at an annual rate of 10 per cent. Its laboratory and technical services companies invest 5.9 per cent of their turnover in R&D. Its manufacturers invest 7.9 per cent of their turnover in R&D, which is 10 times Australia's manufacturing industry average. This is consistent with high performing manufacturers in Canada and United Kingdom. The larger science manufacturing companies export up to 95 per cent of their production. Almost 50 per cent of the industry's workforce has a university degree, and the industry spends more than 5 per cent of its turnover on training.

1. **Identify a set of principles to underpin the role and participation of the public sector in innovation, and**
6. **Consider ways to improve the governance of the national innovation system to support higher expectations of government agencies and industry.**

Principles that underpin the role and participation of the public sector in innovation are:

- Strategic alignment. The objectives and activities of the research, commercial and government communities in the national innovation system (NIS) should be aligned with national priorities to enable improved coordination and focus of research activities to achieve economic, social and environmental outcomes.

- Property rights. A realistic market valuation of intellectual property from public sector research is required to facilitate the commercial application of publicly funded research.

- Integration. The NIS should have mechanisms that enable improved communication between the key stakeholder in the research, commercial and government communities. This is aimed at ensuring that the needs of stakeholders are better understood by one another, and that emerging market needs inform applied research better.

- Measurement. Innovation metrics should be employed to monitor the performance of the NIS. A key element of a strategy to change the culture of researchers is to encourage greater recognition of applied research is the use of the proof of concept metric as a career metric for researchers.

These principles link with the governance of the NIS.

The science industry that Science Industry Australia, Inc. (SIA) represents has long held the view that the Publicly Funded Research Agencies (PFRAs) in Australia are the engine room of innovation and know-how that drives ours and other industry.

This is especially true of CSIRO, due to this organisation's greater focus on applied outcomes rather than "blue sky" research.

An ongoing example of this different focus of CSIRO is the CSIRO SME Engagement Centre http://www.csiro.au/sme which, among other things, seeks to achieve a greater alignment between the research that is actually done (in general area) and Australian industry and of course to provide a mechanism to help companies navigate the complexity of the system. Note that the SME Engagement Centre is about connectivity, not commercialisation per se; although commercialisation is one of the possible outcomes of better connectivity.

To be most effective, PFRA sector research should be aligned with national priorities and emerging market needs. If this occurs, then the outcomes from the PFRA generated innovation and IP stand the best chance of a commercial future.

The 1950s to 1980s saw a pretty good level of communication and cooperation occur between the science industry and the PFRAs. This is evidenced by the establishment of the

science industry manufacturing strength in the eastern suburbs of Melbourne based primarily around the commercialisation by Techtron P/L of Dr Alan Walsh's (later Sir Alan Walsh) research into atomic absorption spectroscopy and the invention of the atomic absorption spectrophotometer. Alan at the time was at the CSIRO Division of Industrial Chemistry.

We do not expect fundamental discoveries like that of Alan's to occur more than once in a lifetime here in Australia, but we do need as an industry access to those academics and researchers to understand their strengths, skills, know-how and research directions and outcomes.

This information used to be readily available albeit in rather an ad hoc, unstructured fashion during this period.

The early 1980s saw various directives arrive from government, principally to CSIRO, about how much funding PFRAs should source from commercial partners. In CSIRO's case the bar was set at 30%

Unfortunately, for everyone involved, these directives encouraged all sorts of "wrong" behaviours. Instead of PFRAs seeking closer ties and greater levels of cooperation and communication with business, the exact opposite occurred – barriers were erected in the form of commercialisation arms of PFRAs being establish to protect (rather that promote) the Intellectual Property (IP) being generated by their institutions.

Whereas in the past business could conduct an informal, no strings attached conversation with researchers, now nothing happened until you went through the commercialisation arms, signed Non-Disclosure Agreements (NDAs) and negotiated with expensive legal personnel over rights of first refusal and licensing fees and ongoing royalties.

Business is more than happy to pay for access to IP and know how, but business also understands that 990 out of 1000 good ideas generated by PFRAs do not have a viable commercial outcome and future.

On the other side of the coin 990 out of 1000 academics and researchers think that their ideas do have a bright commercial future.

So we have two major communication problems here. The first is just establishing a no strings attached dialog and opening communication channels in the first instance and the second is the setting of appropriate and commercially feasible expectations levels if and when this communication occurs.

In summary:

1. Industry relies on a constant flow of innovation for new products and development of existing products
2. Publicly Funded Research Agencies (PFRAs) are major innovation developers
3. Currently, a poor job is being done to connect the research side and commercial side of Australia's innovation system – the "innovation gap"
4. Both academia and business acknowledge the existence of this "Innovation Gap"[1]
5. The commercialisation arms of PFRAs are largely ineffective
6. Newly developed IP and innovation needs to be developed quickly & efficiently, and

[1] see Parliamentary Enquiry – Pathways to Technological Innovation

7. The Australian public deserves to see the maximum return on public funds being invested in PFRA based R&D (major outcome from the recent Productivity Commission (PC) review on the public support for science and research)

Flowing on from the communication problems described above and adding to them, innovative, ground breaking, class leading innovation developed by PFRAs is not being satisfactorily commercialised because:

1. not even the most basic checks are performed on the commercial viability of the innovation, the innovation is not "investment ready" – industry sees the innovation as too risky
2. unrealistic expectations of the value and importance of the innovation arise due to the absence of any commercial due diligence being performed – industry put off immediately
3. these expectations lead to unnecessary involvement of the legal industry at too early a stage – costly and cumbersome – industry loses interest and patience – industry is happy to pay to develop commercially viable innovation
4. poor communication between industry and innovation developers – commercialisation arms prevent access, industry does not know what is being developed

Proof: in FY 2004/5 140 VC managers reviewed 10,199 investment proposals and funded 176 – a 1.7% success rate

Australia has 39 universities, 27 medical research institutes, DSTO, ANSTO, AIMS and CSIRO collectively employing 487 dedicated commercialisation staff in 2005 costing $56M in salaries:

1. in 2004 859 patent applications were created at 1.75 per commercialisation staff headcount vs. the US in 2006 at 8.8 per head (a 502% difference)
2. 31 start up companies were formed at 0.06 per head vs. the US in 2006 at 0.3 per head (a 500% difference)[2]
3. 225 start ups were being supported by licensing revenue vs 5,724 in the US – this represents a 688% per head difference
4. The Bottom Line: US commercialisation staff generated $1.15M per head in licensing revenue in 2006; in Australia in 2004 this figure was $0.12M – ***a 948% difference……***[3]

I use the USA as a stark contrast but a similar analysis could be made comparing our commercialisation of innovation versus the results obtained in England[4], Scotland[5], Canada, Belgium, Sweden, Denmark[6], Ireland[7] and others.

The difference between the commercialisation cultures currently in force in these countries and Australia is that these constituencies subject their IP and innovation that has a potential

[2] Association of University Technical Managers (AUTM) U.S. Licensing Survey 2006
[3] DEST – A National Survey of Research Commercialisation 2003 & 2004 (released August 2007)
[4] UK Department for Innovation, Universities & Skills – White Paper "Innovation Nation" 2008
[5] http://www.scottish-enterprise.com/proofofconcept
[6] http://www.au.dk/invent/poc
[7] http://www.enterprise-ireland.com/ResearchInnovate/Research+Commercialisation/Proof_of_Concept_Phase.htm

commercial outcome to a simple business test, universally known as Proof of Concept (PoC)[8,9].

As an industry we are not asking for a single extra dollar to be diverted to producing research that has a distinct commercial bent. All we are asking for is if publicly funded research in a PFRA results in IP or innovation that has a potential commercial outcome that a simple business case (PoC) be developed to help couch the innovation/IP in terms that business understands and, most importantly, can act upon.

This act of subjecting IP/innovation to a series of simple, business based questions; that is - **P**roving The **C**oncept being put before potential commercial partners, is the fundamental difference between how we are currently trying to commercialise innovation and the world's best practice (and world's best results) being implemented overseas.

One of the major, additional benefits of implementing a PoC regime is that the group tasked with its implementation would be the 487 commercialisation staff identified above.

The PoC would give clarity and focus to the work of this group thus making them effective and an invaluable resource to their two major stakeholders: academia and business.

The PoC would give clarity and focus to the work of this group thus making them effective and an invaluable resource to their two major stakeholders: academia and business.

Recommendation 1:

Prior to seeking a commercial outcome, all intellectual property and other forms of innovation developed by public monies should be quantified and qualified using a business case analysis modeled on the Proof of Concept (PoC) checklist and guidelines as developed by Science Industry Australia in collaboration with its PoC Advisory Committee (see Appendices A & B).

Proof of Concept aids not just the commercialisation process…….

Commercial research needs to be managed differently to academic research. Commercial research typically cannot be submitted to peer review by the editorial boards of journals. This means that for commercial research universities need to establish their own internal quality control processes that mimic those established by the editorial boards of journals. In surveying Australian university commercialisation, the Science Industry found few commercialisation bodies with established processes to guide academics undertaking commercial research. Most major overseas research universities use their PoC checklist to guide researchers on commercial research.

As well as reducing the number of poor quality commercial prospects put to industry, use of the checklist would facilitate development of some useful commercialisation metrics. For example, commercialisation bodies could publish information on the number of 'proofs of

[8] http://www.investorwords.com/3899/proof_of_concept.html
[9] http://www.labonline.com.au/feature_article/article.asp?item=1237

concepts' undertaken in their university and in what field. This would be an important indicator for industry. It could also be used by universities. For example, certified 'proof of concept activity' could be listed on an academic's CV. Proof of concept activities fill a role in commercially oriented research analogous to 'papers' in academic research, with dollars earned, patents, etc being a measure of impact analogous to citations. The proof of concept metric is an intermediate measure of the conversion rate of ideas into marketable products, processes and services.

An assessment body appointed by the university and drawn from its commercial arm would assess applications for proof of concept using criteria based on the dot points above. The assessment system would be self-moderating in the same way that bibliographic metrics became collectively self-moderated by universities a year or so after that system commenced operation.

Adoption of these uses of a PoC checklist would have the effect of encouraging research on commercially oriented research that hitherto held little attraction to the researcher because of the lack of a publishable outcome.

Better innovation metrics offer the government a major opportunity to cut expenditure, shift the focus towards evidence-based policy and to achieve better exports and economic growth.[10]

The widespread adoption of the PoC checklist will go a long way towards answering the question on how research and infrastructure funding should be structured to effectively facilitate investment (by both government and business) and accelerate business and economic growth.

PoC Summary

1. PoC will facilitate all of the following to happen more often and more easily:
    i. awarding of innovation licenses, or options to licence
    ii. determination of market based milestones to guide further development and attract a suitable business partner
    iii. sale of the technology to an established company
    iv. establishment of a spin-off company from the research institute
    v. formation of a new high growth start up company to commercialise the innovation
2. Current comparisons with countries operating under PoC regimes show we are doing a poor job in achieving the above outcomes
3. PoC will not require extra funding to implement. The resources to implement it are already in place
4. PoC is not prescriptive and can easily be adapted and extended by an institution to suit their needs, experience and the nature of their research
5. A "Proof of Concept" in its simplest form will contain the following information:
    i. a clear description of the concept/innovation/IP to be proven
    ii. comprehensive review of the current state of the concept and the field in which it seeks to operate in
    iii. cost – benefit analysis

[10] Darryl Bubner – Aust. Financial Review, Thursday March 6, 2008

iv. novelty, intellectual property, freedom to operate in the market niche/s identified, potential market size, current competition, potential partners needed etc. etc.
v. likely commercial prospects of the proposal
vi. comprehensive risk assessment
vii. further resourcing and funding required

6. Fundamentally a Proof of Concept is a business plan

Recommendation 2:

All commercially based research that is not published in peer reviewed journals be evaluated by the PoC checklist and the results:

a. appear on academic CVs as certified "proof of concept" activity along with their publication record; and
b. be used as an important outcome-based commercialisation metric in conjunction with currently used standard metrics such as number of patents and licensing revenue.

Treatment of IP generated by PFRAs

One of the "wrong" behaviours currently in vogue that has a major impact on the level and quality of communication between business and PFRAs is the upfront barriers established by entering into licensing, royalty, milestone payments conversations before any assessment of the potential commercial worth of the IP has been undertaken.

Only one in a hundred or even one in a thousand good ideas/innovation will achieve a viable commercial outcome but each idea/innovation is being subjected to seemingly endless, protracted and expensive processes designed to protect the PFRA's investment in the IP generated and maximise the revenue flow back to the PFRA in the event of successful commercialisation of the IP.

These are understandable and laudable aspirations but the way they are currently being pursued and prosecuted is crippling the chances of any of the innovation being commercialised.

The predilection to involve interested commercial partners in contract and patent law issues upfront ensures that these selfsame companies eschew any involvement with local PFRAs as being "in the too hard basket."

As a result Australian companies often seek their innovation from overseas jurisdictions that offer a far more enlightened approach to IP commercialisation.

Just as one of the key competitive advantages any company can have is reducing the time to market for innovative new products and services, this paradigm also holds true for Australia as a nation.

If we do not adopt this time to market attitude we risk being left even further behind by competitive economies not just in our region: Korea, China, Taiwan, Japan and Singapore but by the established economies of North America and Europe.

Whilst we sit here agonising over the correct wording of a licensing agreement for an innovation that has little chance of achieving a commercial outcome, other enlightened economies are bombarding the world's markets with their new and innovative products and services.

Ninety nine times out of a hundred or even nine hundred and ninety nine times out of a thousand all this work and effort is a waste of time as the IP does not have a viable commercial future.

Of course we must protect the Intellectual Property Rights (IPR) of the inventor/institution but let's do this at an appropriate time in the life cycle of the product development/commercialisation process rather than impose it as a barrier, upfront before any assessment of the IP's worth can occur.

This assessment can be made all the more easier if the commercial partner is armed with the innovation's Proof of Concept statement (see above).

Therefore, we must foster cooperative links between business and PFRAs to ***promote*** the IP that might have a commercial future rather than the current paradigm of ***protecting*** the IP by erecting legal and contractual barriers as well limiting access to the developers of the IP.

The solution to this problem is to have the legal and contractual conversations but later, after a product or service has been developed and marketed from the original IP.

Irrespective of the opinion of the inventor and their legal and/or commercial advice regarding the potential worth of their innovation: **left on the shelf with no route to market, innovation is worthless in monetary terms**

Recommendation 3:

Suitably registered, Australian-owned or majority Australian-owned companies be given open and unencumbered access to all IP developed by PFRAs for a period of 12 months after the IP is placed on the public record.
Such companies have the right to develop products and services from the IP and to enter into licensing, royalty and contractual negotiations once a commercial outcome has been defined for the IP.
If no Australian-owned or majority Australian-owned company picks up the IP within 12 months, then the IP is open to development by international companies.

3. Identify regulatory and other barriers to innovation and recommend ways to minimise these.

Apart from simplifying and reducing program/s aimed at fostering innovation (TOR #4) the previously described Proof of Concept and the "cherry picking" approach to IP (see recommendations 1, 2 & 3) go a long way towards breaking down access and communication barriers to development of innovation.

There does however remain another aspect to the previously described "Innovation Gap" that has not been canvassed thus far and that is the gap in the innovation development cycle created by a lack of suitable government assistance and commitment to locally produced innovation.

Successive Australian governments have repeatedly demonstrated a lack of commitment to and understanding of the role SMEs play in innovation.

How many times has our government placed procurement contracts with overseas vendors for products/services/R & D that could be sourced locally, often at a fraction of the cost….??

The excuse offered by bureaucrats for the decision is often that no local organisation could demonstrate a track record of supplying the required goods and services going back (often) decades. This is the classic "chicken and the egg" dilemma. If government does not provide the impetus and driving force to kick start technological development and innovation in specific industries, then of course no Australian company is going to develop the required products/services etc. and have a track record of doing so lasting decades.

The track record of procurement by government instrumentalities is incredibly conservative and backward thinking preferring 99 times out a 100 to buy in turnkey solutions from overseas rather than foster and develop the same technology here in Australia.

The US government has for years and years, clearly understood the pivotal role US SMEs play in innovation. It has been described by many observers as "being in the government's blood." Spending is very large by the US Federal administration and a lot of this money is spent with large industrial conglomerates and SMEs.

The US government established the Small Business Innovation Research (SBIR) grants in 1982 to help foster industry based innovation and the adoption of that innovation by government.

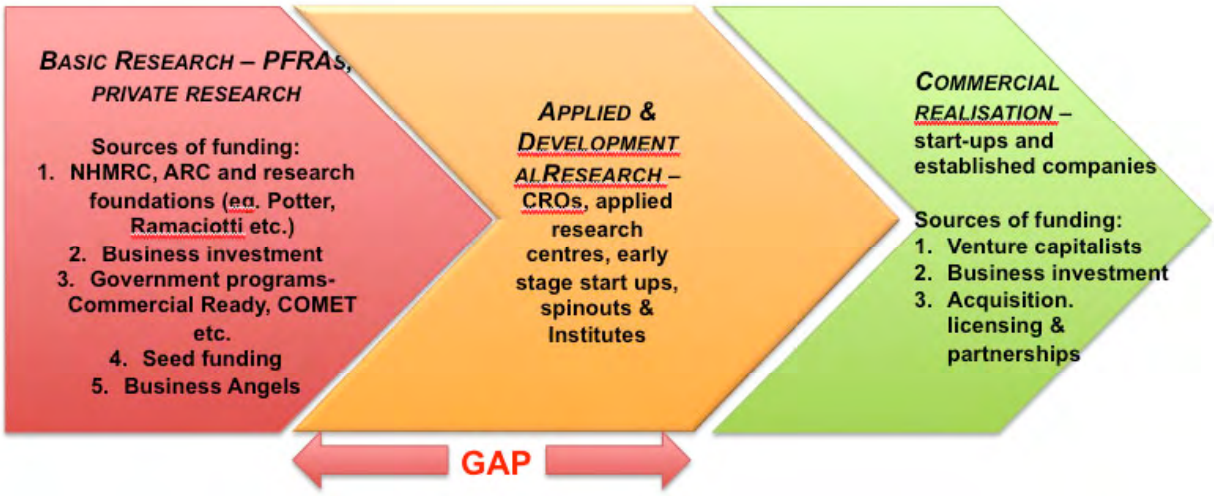
A measure of the success of this program is that the administering body (the US Small Business Administration - SBA) claims that via the application of these competitively won SBIR grants, they (the SBA) generate 13 to 14 times as many patents as large US companies and are the generators of 60 to 80% of all new jobs[11].

Apart from ensuring that the US government locks into its procurement programs US SMEs the application of the SBIR grants also fills an important funding gap in the development of innovation from idea to product.

This gap can be best illustrated as follows[12]:

[11] Proceedings of Innovation Leadership Forum, Canberra, October 3, 2007

[12] Adapted from illustration found in Proceedings of Innovation Leadership Forum, Canberra, October 3, 2007



There is an important funding gap for the "exploratory stage" of the development of innovation. New technologies must go through this phase in order to shake out the "bugs", develop key applications/markets and start to plan how to transition the technology from concept/breadboard through to production. Private sector investors like venture capitalists are unwilling to invest in early stage companies with long development timelines and formative business plans.

David Connell in Proceedings of Innovation Leadership Forum, Canberra, October 3, 2007 states, *"If Government does encourage venture capital firms to play the prime role in funding this stage, which I'm afraid is what successive UK governments have done, it will just help ensure that VC fund managers don't make good enough returns to attract further investment."*

Additionally, as this stage takes place in a business, it's too late to attract the interest of business "Angels" and the like.

With the background of the putative Enterprise Connect Centres being established combined with the already in place capabilities of the Industry Capability Network there exists the capability and potential infrastructure to adapt, adopt and implement a SBIR-like funding and procurement regime across all jurisdictions in Australia.

Recommendation 6:

To address the "Innovation Gap" as represented by a lack of suitable government assistance and commitment to locally produced innovation, we propose the immediate adoption of a SBIR-like competitive funding program financed by an amount of money representing 3.25% of the combined R&D budget of all Australian PFRAs.
Money should be set aside and the fund be introduced in the 2009/10 federal budget.

In 2005/6 funding terms, this 3.25% would mean an extra $89.3M to be put into the SBIR "seed" fund.

We cannot afford not to do this. The UK adopted a similar program in 2001 called the Small

Business Research Initiative[13] (SBRI) that set out to *"stimulate and increase the demand for R&D from high-technology SMEs and give them the opportunity to demonstrate that they have the ability to undertake and deliver high quality R&D to the public sector."*

By their own admission the UK Department of Industry, University & Science (DIUS) state that the results of their SBRI program do not measure up to that achieved by the US SBIR regime (as reported in the Sainsbury review of Science and Innovation).

However, DIUS recognises the imperative of implementing such a scheme and getting it to function such that in their Innovation Nation White Paper they state that *"DIUS will reform the SBRI, refocused on technology based research, prototyping this with the Ministry of Defence and the Department of Health and will extend the revised SBRI to all participating Departments by April 2009."*

Are we going to content ourselves as a nation as importers of someone else's technology or are we going to take concrete steps towards developing key capabilities and technologies ourselves…..??

To illustrate and reinforce the need for action, here's a quote from Lord Sainsbury made after he tabled his report on UK Science and Innovation in October, 2007, *"Twenty-five years ago it would not have been possible to imagine the UK as a global leader in science and innovation in the world economy, but today it looks like an attainable goal. We can be one of the winners in 'the race to the top'* ***but only if we run fast****"*

[13] UK Department for Innovation, Universities & Skills – White Paper "Innovation Nation" 2008

2. Develop a set of national innovation priorities to complement the national research priorities, ensuring the objectives of research programs and other innovation initiatives are complementary.

The U.S. Government's Small Business Innovation Research program (see www.sbir.gov) has a number of features that would be advantageous to Australian industry. A program modeled on SBIR would lend itself to alignment with the Australian Government's national research priorities and contribute to achieving their outcomes.

The US Federal Government implemented the Small Business Innovation Development Act of 1982. The fundamental aims of the SBIR program are:

- Stimulation of technological innovation.
- Use of small to medium businesses (SMEs) to meet federal R&D needs.
- Increasing private sector commercialization innovations derived from federal R&D.

At its simplest the SBIR funding regime can be broken down into a three (3) level process where each level of funding is characterised by the stage of the innovation, duration of funding and the amount of total funding available:

Phase I

- Feasibility
- US$70-$100K
- 6 to 9 months

Phase II

- Prototype
- Up to US$750K
- Usually 2 years

Phase III

- Commercialization
- No SBIR funds
- Sole-source procurement

In comparison with funding sources like NHMRC and ARC, the proposed SBIR-like fund is a small pot of money, but it will have a big influence on the nature of the R&D undertaken in SMEs as these other funds do not directly address and therefore have limited effect upon SME derived R&D.

Science Industry Australia has for the past 18 months acted as the secretariat for the administration of a Stream A Industry Cooperative Innovation (ICIP) grant.

As part of the ICIP grant Australian companies from across the spectrum of the science industry came together to develop a technology roadmap for the industry.

The focus of the roadmap was on those technologies/applications that access to was deemed essential to the future growth and prosperity of the science industry in Australia.

These technologies/applications were:

Biological Sensors (antibodies, peptides etc)
Optical Sensors
Microfluidics
MEMs
Biological matrix simulation
Image Processing & Bioinformatics
Catalysts
Microelectronics (DSP)
High Speed DSP
Automation of Sample Preparation
Solvent management
Sensor Multiplexing and Multi Analyte
Consumables recycling
Design Technologies
High energy light sources
Femto pulse lasers
High energy transmission systems
Secure Telemetry
Chromatography Packings
Metal & Plastic Components
Tooling

This list is prioritised with the most attractive to the science industry manufacturers and exporters at the top of the list.

Arguably all of these areas of focus for the science industry would be easily capable of alignment with National Research Priorities.

Recommendation 4:

The Government develop an SBIR-like fund that is aligned with the Government's National Research Priorities.

Recommendation 5:

Determination and dissemination of these National Research Priorities should be the responsibility of the full time Chief Scientist's role.

5. Consider the appropriateness, effectiveness and efficiency of the Research and Development (R&D) Tax Concession Scheme in promoting innovation and make recommendations to improve innovation outcomes.

To come separately…….

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Appendix A – PoC Checklist & Guidelines

'PROOF OF CONCEPT' CHECKLIST

Developed by the Proof of Concept Advisory Group in collaboration with Science Industry Australia

Most of the approximately $2.2 billion spent per year in Australian universities on science and innovation is aimed at contributing generally to the advancement of human knowledge through the academic literature. However, there is also some commercial research undertaken within universities, enough to have around 450 staff working on its commercialisation. There is debate about whether the amount of commercial research should be more or perhaps less. This paper is not aimed at THAT debate – what it aims to do is help improve the governance of the existing level of commercial research by universities.

Commercial research needs to be managed differently to academic research. Commercial research typically cannot be submitted to peer review by the editorial boards of journals. This means that for commercial research universities need to establish their own internal quality control processes that mimic those established by the editorial boards of journals. In surveying Australian university commercialisation, the Science Industry found few commercialisation bodies with established processes to guide academics undertaking commercial research. CSIRO and most major overseas research universities have a 'proof of concept' checklist to guide researchers on commercial research.

The SIAA formed a Proof of Concept Advisory Committee to develop a 'proof of concept' checklist for universities. The Committee comprised senior staff from the Australian Research Council, Australian Vice Chancellors Committee; CSIRO, the Australian Proteome Analysis Facility; ATP-Innovations, Australian Institute of Commercialisation, InnovationXchange, Monash Commercial, UniQuest; GBS Ventures and Starfish Ventures as well as representatives from science industry companies. The checklist is based on best practice experience across research agencies, universities, commercialisation intermediaries and venture capital companies.

The 'proof of concept' checklist contains:

- Clear description of the concept to be proven;
- Statement of cost – benefit analysis for the concept which may take the form of a business case, including the novelty of the technology, intellectual property, freedom to operate in the market niche satisfied, and the market prospects;
- A comprehensive review of the current state of the concept and the field of endeavour;
- The likely commercial benefits of the proposal;
- A comprehensive risk assessment; and
- The resourcing and funding requisites.

As well as reducing the number of poor quality commercial prospects put to industry, use of the checklist would facilitate development of some useful commercialisation metrics. For example, commercialisation bodies could publish information on the number of 'proofs of concepts' undertaken in their university and in what field. This would be an important indicator for industry. It could also be used by universities. For example, certified 'proof of concept activity' could be listed on an academic's CV. Proof of concept activities fill a role in commercially oriented research analogous to 'papers' in academic research, with dollars earned, patents, etc being a measure of impact analogous to citations. The proof of concept metric is an intermediate measure of the conversion rate of ideas into marketable products, processes and services.

Appendix A – PoC Checklist & Guidelines

An assessment body appointed by the university and drawn from its commercial arm would assess applications for proof of concept using criteria based on the dot points above. The assessment system would be self-moderating in the same way that bibliographic metrics became collectively self-moderated by universities a year or so after that system commenced operation.

Appendix B – Examples of Proof of Concept in action

AIC Australian Institute for Commercialisation

ideas → opportunities → outcomes

Advanced Technology Systems Australia

Exploring and monitoring below sea level

Advanced Technology Systems Australia Defence Services Pty Ltd (ATSA), located in the Hunter Region of NSW, joined the TechFast Program in September 2005. ATSA is a defence services company that supplies maintenance services and develops new components for the Royal Australian Navy's (RAN) 14 remotely operated vehicles (ROV) used for military mine clearing operations. Using its spacious testing facilities, electronics laboratory and systems workshop, *ATSA* can manage a high quality maintenance repair and development program close to the ROV's base of operations in Waterhaven, Sydney.

ATSA's superior understanding of the ROV units and its commitment to quality in the development of a comprehensive systems maintenance program for the ROVs, has enabled it to sell its maintenance service product to the Original Equipment Manufacturer – SAAB of Sweden.

The IDEA

ATSA's extensive experience with the requirements of operating miniature, unmanned submarines has led them to seek new niche technology opportunities in ocean going technology for use in the commercial sphere. Through the TechFast Program *ATSA* has secured intellectual property (IP) from the Australian National University (ANU) for miniature Autonomous Underwater Vehicles (AUV). These mini-AUVs can be used in a wide variety of underwater applications. The SeaSwarm AUV will operate in co-operative swarms as platform vehicles for a range of different sensing equipment. These small vehicles, about 400mm long, will provide cost effective, easily deployable platforms for organisations that are interested in gaining wide area information about underwater environments.

TechFast Case Study

The Australian Institute for Commercialisation (AIC) is a leading services organisation helping innovators achieve commercial success. Around Australia, the AIC helps business, research organisations and governments convert their ideas into successful outcomes. We address market gaps and accelerate the commercialisation of know-how and technology that our clients have created.

Appendix B – Examples of Proof of Concept in action

Exploring and monitoring below sea level

The OPPORTUNITY

The aim of the AIC's TechFast Program is to understand the technology needs of SME's, match these with emerging technologies from the R&D sector and facilitate technology transfer and commercialisation.

With the SeaSwarm, *ATSA* is using the TechFast Program to assist with the introduction of a new product line complementary to its existing operations and sales network. While the company has developed and produced new types of componentry in the past, the mini-AUV will be a departure from this activity in that it will be an independent product line. *ATSA* envisions the SeaSwarm to be useful in the petrochemical, defence and academic markets.

The OUTCOMES

With the assistance of the AIC's TechFast Program, *ATSA* has concluded a signed technology transfer agreement with the ANU and is currently undertaking the transfer of IP related to the Mark I SeaSwarm. The development of the Mark II SeaSwarm is also underway. At the recent Pacific 2006 naval technology expo in Sydney the mini-AUV was well received by visitors to *ATSA's* stand, with favourable comments from a number of larger multi-nationals that were also exhibiting.

Further development of market information is also a key part of the TechFast Program for *ATSA*. *ATSA's* Director of Engineering, Darren Burrowes, noted that it is vital for *ATSA* to have a strong understanding of potential markets to best target leading edge AUV products.

"TechFast has been of invaluable assistance to ATSA in supporting our project for commercialisation of swarming small Autonomous Underwater Vehicle technology. We would strongly recommend the TechFast program to other small businesses with a technology-centred approach to the market. In our opinion the services of TechFast should be more widely advertised to the business community."

TECH FAST

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Appendix B – Examples of Proof of Concept in action

AIC Australian Institute for Commercialisation

ideas → opportunities → outcomes

Adelaide Hills Vineyard Contractors
Increasing vineyard yields

AHVC's core business is the establishment and management of vineyards. They were formed in the early 1990's and offer a comprehensive range of services to the viticulture industry throughout the Adelaide Hills and surrounding districts. Over the years, they have developed and managed hundreds of vineyard projects varying in size from one or two hectares up to several hundred.

The IDEA

AHVC, while primarily a service provider and consultancy to the viticulture sector, desire to expand their interests by providing advanced equipment and sensor products to effectively monitor and manage vineyards. To date this has been in the form of weather stations used to collect remote weather data from vineyards and communicate this information via mobile phone technology, as well as training other viticulture management enterprises by drawing on their extensive experience. Primarily *AHVC* wish to leverage this experience and knowledge through the provision of products nationally and internationally.

Three key technology areas were identified by TechFast: (1) Viticulture Management Systems, (2) Advanced Equipment and (3) Utilisation of Waste and Recycling. Of these the primary interest is in the development of a yield measurement system which, from the early stage of development through to final harvest, is able to make accurate predictions of grape yield potential. In addition, *AHVC* has developed a method and device for spooling out wire at high speed during the construction of a vineyard. An extension of their weather station system would be to create an integrated weather and condition monitor with a chemical spraying process to minimise wastage and recycle unused chemicals.

The OPPORTUNITY

The commercial impact of these opportunities is likely to be significant. Currently yield predictions are within approximately 30% of the actual yield; however it should be possible to estimate these to within 5% - 10% of actual yield. The result of more accurate yield estimates would mean better deployment of resources for harvesting and production of wine, resulting in a significant cost saving potential. A yield predication

TechFast Case Study

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Appendix B – Examples of Proof of Concept in action

Increasing vineyard yields

has the potential to be utilised in all vineyards both nationally and internationally, hence having strong export potential. TechFast has identified a number of potential research organisations who could provide technology solutions for this product. In addition to this *AHVC* and TechFast have been working together to identify the most critical aspects of yield measurement, those which will provide the biggest gain in yield prediction.

The OUTCOMES

Desired outcomes of the TechFast program for *AHVC* are:

- Identification and commercialisation of a land-based yield measurement technology which could be deployed on a vehicle used throughout the vineyard management process, and exported to international markets
- Refinement and embellishment of their current wire spooler to create a novel patent product, which could be utilised throughout the viticulture sector both nationally and internationally. Additionally, develop this product for other applications, possibly non-viticulture, most likely through a joint venture with a company who manufactures wire or a manufacturer of vehicles used in the agriculture sector
- Identification of a recycling spray system that dramatically reduces the utilisation of chemicals by either monitoring of current conditions or chemical recycling, or both.

Tom Ayers, managing director of *AHVC*, firmly believes that the TechFast program has the potential to significantly assist his company to grow and develop in line with their goals and aims.

"My experience with TechFast so far has been very good. Many great concepts, processes and products that could have wide commercialisation potential have been discussed within the company over the years. But time and resources to follow up and see them through has been overshadowed by the day to day demands to run and manage a growing and agile SME. These potential ideas may have been destined to stay within our company without the structure of TechFast to facilitate and drive the commercialisation process," said Mr Ayers.

"To date there has been the initiation of a well-structured and organised program to explore a number of commercialisation ideas, which have now been consolidated to one or two with the strongest potential. The motivation and focus to follow this through is due to the AIC's TechFast program."

TECH FAST

Desired Outcomes

- Transfer of IP for the development of a more accurate yield determination system
- Additional IP or technology to commercialise wire spooler
- Reduction of chemicals and identification of recycling spray

ADELAIDE HILLS VINEYARD CONTRACTORS

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Appendix C