



National Innovation Policy: Time to Step Up

Submission to the Review of the National Innovation System
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Executive Summary

A recent Economist Intelligence Unit white paper ranked Australia 21st on its current and forecast innovation index¹. In many other international surveys and reports, Australia consistently ranks well below world leaders in this area².

Australian innovation policy development has been on a par with its innovation performance – somewhat average.

Whilst many of our competitors have broadened their approach to innovation policy we have remained wedded to a “**linear**” or “**pipeline**” view of the innovation process. Despite rhetoric to the contrary, innovation policy is synonymous with science and technology R&D policy. Consequently, the scope of our innovation policy has remained extremely narrow in comparison to OECD leaders.

The persistence of R&D expenditure and patent numbers as key metrics for worldwide innovation is a major culprit in the narrowness of our perspectives. The problem with these metrics is that they only capture a limited aspect of innovation. When policy makers benchmark to these metrics, other important areas of innovation become invisible. We are not the only country to have fallen down the policy hole created by the “pipeline” view of innovation that these metrics relate to. One hopes that we aren’t going to be the last to climb out of it.

In this submission, we outline the major innovation gaps in Australia, drawing upon our own expertise along with the experiences of many of the innovation policy leaders.

Australia’s policy blind spots

Section 1: Australia’s limited view on the **drivers of innovation** - *what makes us innovate*.

Innovation policy in Australia has focussed on R&D as if it were the sole driver of innovation. In this section we question this limited view. We discuss two other drivers of innovation:

- Cost-drivers
- User-drivers

We refer to policy initiatives from the US, UK, Denmark, the Nordic Council, and other European organisations.

Section 2: Australia’s limited view on the **sources of innovation** - *how we innovate*.

Australian innovation policy reflects an outdated “pipeline” view of innovation, which holds that internal R&D is the source of innovation. We discuss two other sources of innovation which we consider to be of greater importance in this economy:

¹ Economic Intelligence Unit, Innovation: Transforming the way business creates. White paper, May 2007

² For example, the World Economic Forum, Global Competitiveness Report, 2005-06 and the European Commission’s, European Innovation Scoreboard, 2007.

- Open sources of innovation
- Non R&D sources of innovation

We further segment non-R&D sources of innovation into:

- Medium and low technology innovation
- Public Sector and Social innovation

Again, we refer to a number of overseas models and policy initiatives.



Section 1: Australia's limited view on the drivers of innovation - what makes us innovate?

1. Introduction

For too long Australian policy has been based on a limited and incorrect view on the drivers of innovation.

Policy has focussed on science and technology R&D as if it were the sole driver.

Consequently, innovation spending has been directed to publicly funded research, and firms that have formal R&D programs.

We argue that there are at least two other key drivers:

- Cost-drivers
- User-drivers

We present policy initiatives from countries that either rank well above Australia in the innovation stakes, or in the case of the UK, have made significant progress in addressing their problems.

In terms of the Review of the National Innovation System, the neglect of Cost- and User-drivers exposes major gaps in innovation policy.

Policy needs to recognise other drivers of innovation. To do this effectively we need a much greater understanding of **how** Australian firms innovate, **at an industry by industry level**. It is only in this way can we hope to improve policy and its implementation.

2. Australia's blinkered view

Innovation policy in Australia is underpinned by the assumption that innovation is driven by science and technology R&D. Despite policy rhetoric to the contrary, there is overwhelming evidence for this. Take for example, the following key summary points taken from the Productivity Commission's Report on Public Support for Science and Innovation³.

- "Direct government support for science and innovation has been concentrated on research funding undertaken by universities, CSIRO and other public agencies, rather than business."
- "Where business support is provided by the Australian Government, it is overwhelmingly aimed at stimulating R&D, rather than commercialisation or diffusion of ideas"

³ Productivity Commission, Public Support for Science and Innovation, Research Report, Productivity Commission Canberra. March 2007. Page 21

- “The main areas to which the Australian Government directs its support are industrial production and technology, followed by human health”

Naturally, these aren’t just assertions, in 875 pages, they have the data to prove it. For example, approximately 97% of the \$6billion spent on public support for business innovation in 2006-07, was directed towards science and technology R&D, with only \$160mil (2.7%) spent on commercialisation and diffusion programs⁴.

In effect, current policy assumes:

$$\begin{array}{l} \text{SCIENCE \&} \\ \text{TECHNOLOGY} \\ \text{R\&D (\sim\$6bn)} \end{array} + \begin{array}{l} \text{commercialisation} \\ \text{incentives (\sim\$0.16bn)} \end{array} = \text{INNOVATION}$$

We’ve become stuck within this paradigm, in particular because of the metrics traditionally used to measure innovation:

- R&D expenditure; and
- Patent output

It is important to remember that these metrics are useful proxies **not** causal factors⁵.

We recommend that:

- We revise our national innovation paradigm, bringing it into line with contemporary thought in the field of innovation
- Australia develops/uses more relevant innovation metrics

⁴ Table 2.1, Page 24

⁵ For discussions on the usefulness of these metrics see; the review by P. Norling. International Benchmarking of Science, Technology and Innovation: How Useful? 2004. Chapter 2 of the Productivity Commission’s Report on Public Support for Science and Innovation, 2007. Also, the UK’s Sainsbury Review, which recommended a shift from use of these as the dominant metrics in innovation performance in recognition of the importance of innovation in the service sector.

3. Other drivers/other policy levers

Whilst there's no doubt that R&D spending is a critical policy lever in promoting innovation, the assumption that if we keep on pulling on that lever alone, we'll somehow fix our innovation problem, is fundamentally and incontestably flawed.

In their recent submissions to Government, reviewing modern innovation research, Smith and West⁶ reiterate that innovation, by and large, is **not**:

- A linear process which depends on an initial science or R&D 'discovery' and then subsequent technological development into a product
- Just the domain of high technology industries
- Just driven by R&D

Innovation occurs **in all industries**, including the dominant **mid/low tech and service industries** in our economy. There is extensive international cross-industry evidence that many in these sectors rely very little on R&D for innovation⁷.

Innovation within the **public sector** and **social innovation** have also been neglected by policy makers.

A useful framework for thinking about drivers of innovation **in all sectors** has been provided by Nyholm and Langkilde. They described three main categories: price-driven, research-driven and user-driven (see Table 1.2). Their model was adopted in a briefing paper to develop the policy rationale on user-driven innovation for the Nordic Council⁸.

Table 1.2 Innovation Drivers

| Drivers: | Focus areas for action: | Examples: |
|----------|--|--|
| Research | Knowledge intensity, linkages between research and industry, commercialisation of research | Ericsson mobile systems New pharmaceuticals |
| Cost | Cost efficiency | Implementation of ERP or logistical systems Outsourcing |
| User | Better understanding and meeting both explicit and later consumer demands; strategic usage of design processes; commercialising solutions already developed by users | Swiffer mop (Procter and Gamble) Lego Mindstorms |

Adapted from: Understanding User-Driven Innovation, Nordic Council of Ministers, Copenhagen, 2006.

⁶ K. Smith and J. West. Australia's Innovation Challenges: The Key Policy Issues. Submission to House of Representatives Standing Committee on Science and Innovation, Inquiry into Pathways of Technological Innovation. April 2005. K. Smith and J. West. Innovation Policy, Productivity and the Reform Agenda in Australia: A Framework for Analysis. January, 2007

⁷ See PILOT Consortium Report: Peculiarities and Relevance of Non-Research-Intensive Industries in the Knowledge-Based Economy. January 2006. www.pilot-project.org; and the UK's National Endowment for Science, Technology and the Arts (NESTA) Report: Hidden Innovation: How innovation happens in six 'low innovation' sectors, June 2007. www.nesta.org.uk

⁸ Reproduced in English in: Understanding User-Driven Innovation, Nordic Council of Ministers, Copenhagen, 2006. Available at: <http://www.norden.org/pub/velfaerd/naering/sk/TN2006522.pdf>

Cost-Driven Innovation

Not all drivers are constant. Cost obviously becomes more important in an inflationary environment and/or periods of economic downturn. Just because R&D spend may drop in such periods, it doesn't necessarily mean that there is a similar drop in innovation. One could argue that it actually becomes a greater imperative. However the kind of innovation it produces may be largely 'hidden' or 'invisible' to current metrics⁹.

We recommend that:

- Australia develops better metrics to capture 'hidden' innovation
- The Government examines the full range of regulatory and financial measures that would impose cost incentives to promote innovation in key areas.
- Industry associations are supported by Government to collect and disseminate information on innovations relevant to their sectors.

User-Driven Innovation

*"To sustain a competitive edge, more focus must be given to meeting user's needs...and not simply those explicitly stated in market research- but rather those latent user needs which can be revealed by alternative analytical methods, and by users themselves. This is what user-driven innovation is all about - determining a more systematic way to understand and develop solutions that respond to user needs"*¹⁰

The distinguishing features of user-driven innovation include:

- A focus on consumer (or user) **pull** rather than producer **push**. Producing products with a ready made market rather than trying to create one.
- **Revenue enhancing** activities rather than **cost cutting**, by developing products that better meet consumer needs. This is achieved by investing resources in understanding user needs and then developing products tailored to meet them that can command higher margins.
- Use of multi-disciplinary teams in the innovation process. Ethnologists, anthropologists, designers, human factors psychologists combine with scientists, engineers and business specialists in the product development process. An approach pioneered by the likes of the Palo Alto Research Centre (PARC), IDEO design consultancy, and taught at MIT and Stanford d. School.
- **Direct** involvement of users in the innovation process

⁹ See NESTA, UK for discussion of 'hidden' innovation, a discussion alternative metrics. NESTA is due to develop a pilot system of alternative innovation metrics in 2009, to be in operation by 2010 in the UK.

¹⁰ Understanding User-Driven Innovation, Nordic Council of Ministers, Copenhagen, 2006.

- Innovation is often an **open** and collaborative process. Web 2.0 particularly, has opened up opportunities for innovators to seek input from potential, and established users to create and refine their products¹¹. Open source software and Wikipedia are prominent examples.

Surveys on the drivers of innovation in Danish companies in 2004, found that most innovation was market driven rather than research driven.

This opened the debate as to whether the policy setting in Denmark was too focused on supporting research driven innovation. Like Australia, Denmark's economy is characterized by many SMEs, and very few (in international terms) large firms. In 2005, the Danish government established the goal of developing a national program for user-driven innovation.

Policy initiatives have included:

- Commissioning of research into the importance of user-driven innovation in key Danish industries.
- The establishment of the Danish User Centered Innovation (DUCI) Lab, a center focused on identifying and diffusing best practice in user innovation in a collaborative project between faculty at Copenhagen Business School, Aarhus School of Business, Massachusetts Institute of Technology and six major Danish companies¹².
- Development of a user-driven innovation policy framework for Denmark and the Nordic Region.

We recommend that:

- Similar user-driven innovation initiatives to those of Denmark.

What do we know about drivers of innovation in Australia?

The Australian Bureau of Statistics Report, Innovation in Australian Business (2005) collected data on profit related drivers, market related drivers and legal related drivers. Unfortunately respondents were not asked to rank the relative importance of these drivers. The most commonly selected drivers were the profit related drivers of 'improve productivity' (71%), and 'increase revenue' (72%), followed by the market related driver of 'increase responsiveness to customer needs' (65%). Industry breakdown was available, but standard errors were too large for confident use. Other figures reported included that innovating companies on average spent 35.2% of their innovation expenditure on *marketing activities aimed at market introduction of new goods or services*. Given the nature of the data, it's difficult to say much more about this research, other than user-driven innovation may well be important in this country to varying degrees across sectors.

¹¹ Reviewed by D. Sharp and M. Salomon. User-Led Innovation: A new Framework for Co-creating Business and Social Value. Smart Internet Technology CRC. January 2008.

¹² See http://duci.dk/index.php?category_id=1 Austria has also established a user driven innovation research centre: <http://www.wu-wien.ac.at/wuw/institute/entrep/forschung/userinnovation/leaduser/index>

The shift to an annual rather than biannual survey of innovation activity is to be welcomed. We recommend a review of the usefulness of the data collection and the development of new metrics, perhaps in collaboration with the UK NESTA, may assist future policy formulation.

We also recommend greater Government support for industry association-led research and knowledge dissemination.

Governments as users that can drive innovation.

As a major buyer of goods and services, governments can drive demand for innovative goods and services. The US Government has led the way with initiatives such as the Small Business Innovation Research Program (SBIR) which supports high technology firms. In the UK, the Sainsbury Review recommended a similar program, the Small Business Research Initiative¹³. A similar program has long been advocated here.

We recommend that:

- Initiatives such as the American SBIR be adopted here
- Such initiatives be broadened to include other innovation activities, not just R&D

For example, the provision of training related to new goods, services or processes and marketing activities aimed at improving government services and processes. In this way initiatives will:

- strengthen small businesses who are dedicated to working collaboratively in providing innovative goods and services
- encourage other small businesses to invest in these capacities
- create opportunities for starting new technology-based or knowledge based businesses.

¹³ Sainsbury, The Race to the Top, A Review of the Government's Science and Innovation Policies (UK), October 2007.

Section 2: Australia's limited view on the sources of innovation - how we innovate

Our innovation policy has been based on an outdated view about the sources of innovation, which has led to a functionally narrow definition of our national innovation system.

Sources of Innovation: Internal v Open

Traditionally, innovation has been viewed as a linear process **internal** to an organisation. According to this 'pipeline' model, firms develop new products through internally generated R&D.

If, at a national level, firms aren't doing enough R&D compared with other OECD economies, as is the case in Australia, then the rationale is that by addressing this metric, we will improve innovation performance.

Hence, our \$6 billion policy spend has focussed overwhelmingly on broadly based R&D tax concessions, government subsidy of business R&D¹⁴ and compensating for a lack of business investment with more Government investment in public sector R&D¹⁵ (Public Research Organisations - PROs).

PROs have then been pushed to 'commercialise', an endeavour that has been of limited success - for glaringly obvious reasons (although beyond the scope of this submission).

PROs have nonetheless taken centre-stage in Government's R&D mindscape. And it has been but one short step, for Government to seek advice on commercialisation and indeed innovation from these "central" players.

In reality innovations rarely arise through an exclusively internal process. The diverse and often highly specialised skill sets and competencies required in determining the usability, desirability, feasibility and viability of an innovation, mean that the process is best optimised, by seeking collaboration, advice and information **externally**. This is true for organisations of all sizes. As a wider understanding of how we innovate has been disseminated, organisations are no longer relying on generating all their own ideas, thus, innovation is increasingly an **open** process¹⁶.

*Open innovation: 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively'*¹⁶

As discussed in Section 1, collaboration with users has become an increasingly important part of the innovation process for many organisations over the past 20

¹⁴ Predominantly through funding of R&D in the automotive industry and the CRCs

¹⁵ See Fig 1. Productivity Commission Research Report, Public Support for Science and Innovation, March 2007.

¹⁶ See, H. Chesborough, W. Vanhaverbeke and J. West. Open Innovation: Researching a New Paradigm. Oxford University Press, 2006.

years¹⁷. Indeed many of the most hyped and exciting recent innovations, such as online blogs, wikis and social and professional networking communities are almost entirely user-generated collaborations¹⁸.

Multinationals are viewing the world as a global innovation system, conducting innovation activities across national boundaries, often to benefit from particular national advantages, such as skilled workers and favourable tax and regulatory frameworks.

Of course academic networks have long been international. The importance of being 'in the loop' is as critical as ever to the generation of knowledge. The need for multi-disciplinary and cross-sector connection is also fundamental.

The need for collaboration and networking has given rise to online communities and marketplaces such as InnoCentive and the USA National Innovation Marketplace where organisations with an innovation problem can seek others who may offer a solution. InnoCentive is used by organisations as diverse as Eli Lilly, the US Government and the Rockefeller Foundation and lists over 140,000 'solvers' from all over the world¹⁹. The USA National Innovation Marketplace is a new government funded initiative which seeks to promote collaborative activity by innovating SMEs²⁰.

Worryingly for Australia, in the ABS 2005 innovation survey, only 13.2% of businesses reported some form of collaboration. The figure for innovating businesses was twice as high at 26%. The question is:

Do we collaborate because we innovate, or do we innovate because we collaborate?

Although this question merits further investigation, we suspect the latter to be the case.

How we innovate has changed. It is questionable whether the **internal** R&D model still applies to *even* high technology industries²¹. This aside, these industries make up less than 3% of any OECD economy, and whilst they are important component of the innovation system, they are not central to the economy.

¹⁷ See, for example, E. Von Hippel. *Democratising Innovation*. The MIT Press. 2005

¹⁸ See the review by D. Sharp and M. Salomon. *User-Led Innovation: A Framework for Co-creating Business and Social Value*. Smart Internet Technology CRC. January 2008.

¹⁹ See B. Walsh. How Many People Does it Take to Make a Light Bulb? *Time* magazine. March 10, 2008. <http://www.time.com/time/health/article/0,8599,1721082,00.html> and <http://www.innocentive.com/>

²⁰ See <http://planeteureka.com/>

²¹ H. Chesborough. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press, 2003.

We recommend that:

- The forthcoming Green Paper recognizes the importance of open innovation, including its international dimensions.
- Policy initiatives that promote collaborative interactions in and between the public, private and not-for-profit sectors be assessed for suitability to the Australian context.
- The development of the White Paper embraces a more open approach to policy making in the style of the UK Department for Innovation, Universities and Skills (DIUS).

Sources of Innovation: R&D v Non R&D

1. Medium and low tech innovation

It is the medium and low tech industries that are Australia's economic powerhouse, and it is they that have received too little policy attention²². Like their European counterparts, these industries probably innovate without engaging in R&D to any great extent²³. The ABS figures would appear to confirm this with less than 12% of all businesses reporting expenditure on R&D, but 34.9% reporting innovation activity in 2005²⁴. Of the 12% reporting R&D expenditure nearly 3% report acquiring R&D. Over two thirds of expenditure on innovation is spent on activities other than R&D. In service businesses, that figure is closer to 70%²⁵.

More than half of all firms reporting innovation activity do not innovate through R&D

Clearly Australian innovation policy needs to reflect this reality.

In recent policy developments in the UK, they have termed this 'hidden' innovation: "the innovation activities that are not reflected in traditional indicators such as investments in formal R&D or patents awarded". They have made, and are making, considerable efforts to understand the innovation systems of six key 'low innovation' sectors as well as develop new metrics and policies to support 'hidden' innovation²⁶.

²² K. Smith and J. West. Australia's Innovation Challenges: The Key Policy Issues. Submission to House of Representatives Standing Committee on Science and Innovation, Inquiry into Pathways of Technological Innovation. April 2005.

²³ PILOT Consortium, Peculiarities and Relevance on Non-Research Intensive Industries in the Knowledge-Based Economy, January 2006. www.pilot-project.org

²⁴ Australian Bureau of Statistics. Innovation in Australian Business, 2005.

²⁵ See the Business Council of Australia Discussion Paper, Underserved: Why Australia's Economy Deserves More Attention. July 2007.

²⁶ See The UK National Endowment for Science Technology and the Arts (NESTA) Research Report. Hidden Innovation: How Innovation Happens in Six 'Low Innovation' Sectors. June 2007.

2. Public sector and Social Innovation

Public sector and social innovation have also been neglected in innovation policy and now need to be included. The entire knowledge infrastructure of our public research institutions, not just science and technology but all forms of research, including the arts and social sciences²⁷, as well as teaching, consulting and contract research, also need to be acknowledged. We need to learn how to measure innovation in all of these areas in a way that will uncover their value, revealing their economic, social and environmental benefits.

More recent moves to broaden the metrics to measure collaboration between PROs and the private sector is to be welcomed as it captures all forms of knowledge transfer it will enable an incentive scheme to further encourage links which in turn will have a broader impact on innovation²⁸.

There are many other countries that have led policy in these areas²⁹. We can already learn much from their successes and failures. It is important however, to apply these as they relate to our own national context³⁰.

Overseas policy examples also demonstrate that government has an important role in stimulating innovation, for example through **procurement policies**³¹, and in benchmarking its own innovation performance in service delivery and in absorption and dissemination of new knowledge and technologies.

Design and innovation

In 2005-06 a British Design Council research report demonstrated that design-intensive companies outperformed the FTSE 100 by more than 200 percent over a 10-year period.

A subsequent budget 2006-07 review proposed a comprehensive review of how SMEs could develop their creativity. It also allocated £6mil in funding for the Design Council in order to provide businesses and public services access to creative talent and design skills. In addition, the UK Arts Council budget was expanded to develop commercial and business leadership skills in cultural organizations and to create new opportunities for business-arts collaborations.

²⁷ Apart from a mention of The Australia Council' 2005 report on 'The Role of Creativity in the Innovation Policy' there was no other mention of the importance of creativity in national innovation policy in the last Commonwealth, State and Territory Advisory Council on Innovation Report (July 2007)

²⁸ The ABS reported only 2.7% of innovating businesses reported collaboration with PROs. It will be important to benchmark that figure against other countries when the European Union comparative report becomes available.

²⁹ See the Nordic Innovation Centre report: A Creative Economy Green Paper for the Nordic Region, November 2007 www.nordicinnovation.net/_img/a_creative_economy_green_paper_for_the_nordic_region3.pdf. The UK NESTA, Technology and the Arts Policy Briefing: Beyond the creative industries: making policy for the creative economy, Feb 2008. http://www.nesta.org.uk/assets/pdf/beyond_creative_industries_policy_briefing_NESTA.pdf. Also see Chapter 5. Capturing Design: Lessons from United Kingdom and Canada, in the OECD report: Science Technology and Innovation Indicators in a Changing World: Responding to Policy Needs, Sep 2007. http://www.oecd.org/document/12/0,3343,en_2649_37417_39369868_1_1_1_37417,00.html Some US policy commentators have questioned whether they are lagging in this regard, see for example: J P Jarboe, UK Leads; US Lags, Manufacturing & Technology News, July 2005. Available at: <http://www.athenaalliance.org/pdf/UKleads.pdf>

³⁰ Discussed by Smith and West in Innovation Policy, Productivity, and the Reform Agenda in Australia: A framework for Analysis.

³¹ A fact long recognised in US policy through programs such as the Small Business Innovation Research Program

We recommend that:

- Research is commissioned to provide a better understanding of innovation in key low R&D sectors
- Universities should be incentivised to promote knowledge transfer across all disciplines through teaching, consulting, contract research and IP transfer.
- A working group of the Australian Government Procurement Forum is set up to implement reforms along lines recommended in the Sainsbury Review. They include:
 - Embedding innovation in all Departmental Strategic Objectives
 - DIISR should produce an annual innovation report on its own innovation activities and collating those of all Government Departments



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Declaration of Interest

Interface Innovation provides independent management consultancy services to public, private and not-for-profit organisations in the Australian science and technology sector. It has no direct conflicts, interests or affiliations in relation to this Review process.

