Science and Technology Based Entrepreneurial Support in Australia’s “Second Tier Innovator Economy”

Kevin Hindle and John Yencken

Background and Introduction

The chapter starts with some relevant history and an overview of Australia’s science and technology investment pattern and its innovation performance. This is followed by analysis of a range of support initiatives at various regional levels. First, however, some consideration has to be given to the interpretation of the word ‘regional’. Australia is a Federation consisting of a Commonwealth government and six State and two self-governing Territory governments, which still have a high degree of political independence, even if most taxes are collected and distributed by the Commonwealth government either directly or through the State and Territory governments. The entrepreneurship support provided by the State governments is mainly process support and expert advice provided by subsidized private consultants and Departmental advisory staff and as science and technology infrastructure funding, including in some States incubators and technology parks usually but not always associated with universities. Local government in most States also supports incubator programs but these focus more on commercial innovation and new retail and service businesses rather than science and technology based start-ups.

Throughout its short history, Australia has shown a high level of innovation performance in agriculture and mining, but less in manufacture, unless (such as the stump jump plough, mechanical harvester and manufacture of fine paper from semi-hardwoods) the innovation was directly related to agriculture (including food) or mining and to a lesser extent textiles and
clothing. After World War II the Australian government embarked on a major effort to attract overseas manufacturers to establish in Australia, in the process offering them very high levels of tariff protection. Industrial research at this time was less about innovation than about converting processes and plant developed for large markets to operate on the small plant scale justified by supplying the local Australian market. Not only were the plants small by world standards but every competitor realized that they had to have even a very small plant operating in Australia to obtain tariff protection. The Whitlam Government in 1972 started the process of import tariff reduction and today only a few tariffs (such as on motor vehicles) remain. Australia has always had a high level of investment in medical research and more recently biotechnology.

Almost all the new high growth companies in the various lists of such companies published recently (BRW magazine, Touche Ross and Tomatsu) are service companies, not manufacturers. The new areas involving manufacturing innovation are small but financially significant (software such as Look Smart, medical devices such as Cochlear, Resmed, pharmaceuticals CSL). Clusters of S&T based innovation are starting to develop—involving biomedical technology in Melbourne and Brisbane, electronics in Sydney and micro/nano manufacturing at Scoresby, an outer Melbourne suburb. Matthews (2000) noted that Australia is not exploiting the potential benefits of its situation globally of strong basic and cost effective research capabilities due to weaker industrial-technological capabilities. A potential contribution here of new spin-off ventures may be to keep control of the new IP through the technology development (TD) and early manufacturing stages despite an inadequate local industrial base.

In a report to the US Council on Competitiveness, Porter and Stern (1999) developed an Innovation Index to facilitate comparisons between national innovation performances. Comparative historical Innovation Indices for selected countries (Porter and Stern 1999. 82-83)
showed Australia as having improved its innovation capacity but with some evidence of having reached a plateau in the period 1992-95. Its performance has been much below that of Canada and Finland, Norway and Sweden. These innovation indices have been further updated for Australia by Gans and Hayes (2006). The data showed that Australia’s innovation index rose slightly from 1998 but has in recent years fallen back. Thus there have been no gains in the nation’s innovative capacity since 1996 (Gans and Hayes: 2006).

In late 2007, the Australian people elected a new Labor government, headed by Kevin Rudd. It replaced the long-running government (11 years) of Prime Minister John Howard. The Howard government’s May 2008 Budget announced a major review of Australia’s national innovation system. Pending the outcome of this review the Government suspended the Commercial Ready small business research funding program. This resulted from a suggestion by the 2007 Australian Productivity Commission Review of the impact of research funding policies and program that some of the research funded by the Commercial Ready program would still have been undertaken without such funding support.

Among many promised initiatives, the Rudd government promised a thorough revamping of Australia’s innovation policy with a program to be called ‘enterprise connect’. This paper examines the development of important aspects of the emerging innovation policy in Australia in supporting the science and technology based regional entrepreneurship.

Support for new technology based firms

In Australia there are six groups of research providers that have generated spin-off companies as entrepreneurial events: universities (by far the largest number), publicly funded research agencies (CSIRO, ANSTO, DSTO), medical research institutes, State government
research agencies, rural research and development corporations, Cooperative Research Centres (CRC) (corporate partnerships of universities and other research providers research users), industry and utilities.

There is no one source of the data on the number of new technology based firms that can provide an indication of the total number of entrepreneurial events that originated from new science and technology outcomes as opposed for example to those based on filling market gaps or from the exploitation of an innovative business model. The first completed survey of research providers, published in a doctoral thesis (Yencken 2005:31), indicated that as at 1999 there were estimated to be 192 science and technology based spin-offs from publicly funded research providers. In FY 2000 and every two years subsequently the Commonwealth Department of Education, Science and Training (DEST) has published a National Survey of Commercialisation in Australia (DEST 2007). The DEST survey covers with only small gaps the generation of spin-off start-ups by publicly funded research providers: public research agencies (including CSIRO, ANSTO), universities, Cooperative Research Centres and medical research units. However, it does not cover spin-offs from private sector companies or those generated by individuals and therefore will underestimate the number of science and technology based entrepreneurial events by an unknown factor. Over five years to 2004/5: invention disclosures increased by 77 per cent. Patents and plant breeder rights issued worldwide increased by 79 per cent, licenses, options and assignments yielding income per year increased by 36 per cent and start-up companies operational at the end of each year nearly tripled to 255, with the value of institutional equity in start ups increasing by 41 per cent (DEST 2007;Gilmore 2007). Table 1 shows the very high proportion of spin-offs, 76 per cent, generated by the metropolitan universities and particularly those in Brisbane, Melbourne and Sydney. Only four spin-offs were generated by provincial
universities. The University of Queensland had on its own generated 44 spin-off companies by FY2004 (DEST 2007) and the CRC program 34 companies (CRCA 2002; DEST 2007). The CRC Program has had a successful history of generating profitable spin-off companies (CRCA 2005). In 2004–05, CRCs maintained a total of 305 patents in Australia and 634 overseas. During 2003–04 and 2004–05 CRCs: earned a total of A$18.6 million from licences, options and assignments; formed a total of 34 start-up companies, and generated income of over A$3.5 million from start-up companies (DEST 2007:54). The success of CRCs in generating spin-offs (CRCA 2005) links back to their commercially oriented boards who ensure careful selection, good planning and adequate initial resources before the new venture is cut loose.

The performance of the Building on IT Strengths (BITS) incubator program is discussed later in the section on incubators. No data are available for spin-offs from State government research organizations or rural research and development corporations. A recent review of Business R&D in Australia concluded:

‘…much of the R&D being carried out in Australian firms is short term (months not years) to meet the needs of customers and to face the challenge of immediate competition and that frequently this R&D may be associated with the integration of new plant and/or equipment for existing activities.’ (Jones 2007: 12-13).

This is unlikely to lead to R&D based entrepreneurial events.

Latest data from the various sources quoted earlier have produced various estimates of new technology based firms. Generously aggregating all the projections of the three most credible agencies in this regard (see table 2) would project a population of about 600 science and technology based new companies in Australia (Table 2). As to survival, an argued estimate is that 70 per cent of the well planned and adequately resourced start-up companies will survive.
for five years (Yencken and Gillin 2006). On this basis there are likely to be at least four hundred science and technology based start-up companies actively operating in Australia with the possibility of others generated by the private sector. Historically the sectors in which the most New Technology Based Firms (NTBFs have been generated are: pharmacology, medical devices, instruments (both for medical and other applications), mining services and equipment, agriculture including food technology and transport (particularly safety).

Table 1 Start-up companies operational dependent on licensing/assignment of technologies

<table>
<thead>
<tr>
<th>State/Region</th>
<th>Universities in large city locations (firms)</th>
<th>Universities in other locations (firms)</th>
<th>CSIRO</th>
<th>Medical research institutes (firms)</th>
<th>Other public research providers</th>
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<td>New South Wales</td>
<td>Sydney (41)</td>
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<td>Victoria</td>
<td>Melbourne (50)</td>
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<td>South Australia</td>
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<td>Queensland</td>
<td>Brisbane (41)</td>
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<td>Australian Capital Territory</td>
<td>Canberra (13)</td>
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<td>Western Australia</td>
<td>Perth (13)</td>
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<td>Northern Territory</td>
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<td>Total</td>
<td>174</td>
<td>11</td>
<td>15</td>
<td>26</td>
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Table 2 Estimated population of new technology based small firms in Australia

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimated no. of new (baby)/start-up companies</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Global Entrepreneurship Monitor 2006</td>
<td>500,000</td>
<td>Only a small percentage of these are S&amp;T based firms</td>
</tr>
<tr>
<td>DEST Commercialisation Survey</td>
<td>255</td>
<td>Most of these are S&amp;T based firms</td>
</tr>
<tr>
<td>BITS incubator program</td>
<td>344</td>
<td>A significant portion of these firms are S&amp;T based</td>
</tr>
<tr>
<td>CRC Program</td>
<td>34</td>
<td>Not available</td>
</tr>
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Federal and State Government program initiatives

Historically the Commonwealth Government has supported new technology development through universities, its publicly funded research agencies (CSIRO, the Defence Science and Technology Organisation and the Australian Nuclear Science and Technology Organisation) and through research grants and tax concessions to the private sector. Until recently the emphasis has been on supporting small business but with limited concern for entrepreneurship and new technology-based firms (NTBFs). The common interpretation of innovation tended to focus on newness rather than on the total process of innovation leading to wealth creation (Hindle 2002). There however have been two important initiatives that will be discussed in more detail later:

1. the Building on Information Technology Strengths (BITS) Incubator Program set up by the Commonwealth Department of Communications.

2. the Commercialising Emerging Technologies Program (COMET)

Both of these were strongly supportive of S&T based entrepreneurial activity. Government policy development has been supported by a series of policy related consultancies (Allen Consulting Group 2000 and 2003a, PMSEIC 2001, Phillips KPA 2006).
Commonwealth Government initiatives

The change in the attitudes of the Commonwealth government started with an Innovation Summit Conference in February 2000 with very wide participation from government at all levels, research providers and industry and other research users. This was followed by the report of the Innovation Summit Implementation Group, which recommended under the heading *Acting on Ideas*:

- establishing a national technology incubator program, based on the Building on Information Technology Strengths Program (BITS) and international best practice models
- establishing a competitive pre-seed fund for universities and other research organisations
- doubling funding for the COMET program
- encouraging a review of the remuneration arrangements and incentive structures governing the research activities of staff, to maximise incentives for effective commercialisation (ISIG 2000: xiii).

This in turn was followed by the policy launch *Backing Australia's Ability*, the strategy document, in January 2001 and an annual series of Innovation Reports. The *Backing Australia's Ability* initiative was introduced by the Australian Government in 2001, to promote science and innovation. The initiative is the largest (A$3 billion over the 5 years 2001-02 to 2005-06) and most comprehensive set of measures ever put in place by any Australian Government in support of science and innovation. The initiative is an all-of-Government approach, the implementation of which is overseen by a Science and Innovation Ministerial Council chaired by the Prime Minister and advised by the Chief Scientist. *Backing Australia's Ability* funding is phased, with A$193 million in 2001-02, and A$419 million in 2002-03.
A$634 million is provided for the 2003-04 financial year and A$1 billion for 2005-06 (DEST 2001). The Innovation Reports have had as their themes: *Developing and retaining skills* and *The public face of innovation – Fostering entrepreneurship and awareness of science and innovation, Research and development, Commercial application of research*. Under this last theme the report had as its headings: *Providing capital for commercialisation*: (Innovation Investment Fund, Pooled Development Fund, Venture Capital Partnership, Renewable Energy Equity Fund), and *Research to Investment Ready Stage*: (Pre-seed Fund, Commercialising Emerging Technologies, Biotechnology Innovation Fund, Building Information Technology Strengths (BITS)).

The only government program in Australia that includes entrepreneurship in its title and in its objectives is the Commonwealth Government Building Entrepreneurship in Small Business Program (BESBP). The various State programs have their objectives either in the R&D infrastructure support or small business areas. The BPSBP has as its objective:

Foster entrepreneurship, including maximising the growth potential and sustainability of small business through improving business skills of small business owners and/or managers; providing incubation services to maximise small business growth potential and/or business sustainability; and enhancing the capacity of small business owners and/or managers to access information on government programs and initiatives throughout Australia (DITR 2007).

The program comprises four initiatives: Training and Mentoring Projects, Succession Planning, Small Business Incubators, Small Business Field Officers.
AusIndustry’s new small business programs

AusIndustry² in the Commonwealth Department of Industry, Tourism and Resources is the Australian Commonwealth government’s agency for delivering products, services and information that support industry research and innovation. Its relevant programs are listed in the textbox. We have also included the Co-operative Research Centres (CRC) Program which used to be administered by Department of Industry Tourism and Resources. Although the administrative arrangements of the CRC program have changed, it is desirable to consider it as part of a structured portfolio as intended by its AusIndustry progenitors. Importantly, about six hundred SMEs are or have been involved with CRCs. The CRC Programme was established in 1990 to improve the effectiveness of Australia’s research and development effort. It links researchers with industry to focus R&D efforts on progress towards utilization and commercialization. The close interaction between researchers and the users of research is a key feature of the program. There are 69 CRCs³ operating in six sectors: environment, agriculture, information and communications technology, mining, medical science and technology and manufacturing.⁴ Over the past 12 years, participants have committed more than A$7 billion (cash and in-kind) to CRCs. This includes A$1.8 billion by the Australian Government, A$1.8 billion by universities, A$1.3 billion by industry and almost A$1 billion by CSIRO⁵.
We next assess the current Australian programs independently and against each other in their contribution to the various phases of development of new technology-based firms with the specific focus upon just one possible output of the entrepreneurial-innovation process, the generation of new technology based firms (NTBFs). We apply a multiple-framework analysis using three perspectives: Financial, Management and Environmental.

Most government programs provide financial assistance and therefore, a financially-oriented framework is useful for defining where businesses are in the growth cycle. The stages in this framework are illustrated in simplified form in Figure 1. For a few companies, the ability to
generate sales revenue almost immediately will avoid the need to dilute equity to obtain the resources needed. The pattern of finance resource application may differ. Some are new ventures developing new drugs with the need for mezzanine finance to fund clinical trials.

**Insert here Figure 1**

As a venture progresses through the five phases illustrated in Figure 1 it generates progressively increasing demands for market understanding, management and people with specific skills and experience. A managerially-oriented framework, is used to assess available Australian government initiatives on their ability to provide assistance from a management and human capital perspective. An aspect of marketing and distribution development will be the need to go global. Assistance with export market entry will be needed by almost all Australian NTBFs and is well provided. The availability of experienced managers with experience of high expectation, high growth (HEHG) companies and specialist advisers is a critical constraint.

The environment in which NTBFs operate has important implications for their development:

- labor market flexibility: new ventures need to be able offer varying levels of employment conditions (full time, part time, casual) to suit their particular stage of development without penalties such as redundancy payments
- taxation: there are in Australia specific problems about the taxation issues involved with the licensing of intellectual property and valuation of a new business and with the granting of share purchase options to inventors and others
- intellectual property regimes.

These environmental factors derive mainly from government and related regulatory activities.
A Multiple Framework Critique of Policy and Programs has been then used to assess the various Commonwealth programs against the multiple frameworks described above. From the financial framework perspective, nearly all the selected programs provide support. Pre-seed finance is essentially needed to reduce risk, whether it be technology, IP or market risk. Most start-up NTBFs are reluctant to give away equity at the pre-seed stage, because of the high level of risk that leads to low valuations. Recent Australian case studies of university spin-offs have shown that several of the larger research profile Australian universities have established their own, usually small, internal pre-seed funds, often drawing on past commercialization earnings as the source of finance (Yencken and Ralston 2005). The findings of a recent Australian Institute of Commercialization survey for DITR are relevant here (AIC, 2004).

From the results of this survey the existence of a gap in funding at the very early stage is verified by 87% of investors and 88% of clients. Respondents believe there is a demand for finance below A$2.0M that is unmet by the current financial market.

The Pre-seed, IIF and PDF venture capital support programs fit very well onto this model, but all involve significant dilution of equity. They can be helpful in providing capital and assisting with the formation of the management team. The Pre-Seed Fund program has established four early-stage venture capital funds to invest in projects or companies spinning out from universities or government agencies. The funds are managed by venture capitalists experienced in research commercialization and the development of sustainable businesses. These funds have investment horizons (that is number of years before implementing an effective exit strategy for fund investors) of ten years in most cases. IIF and PDF are clearly focused on the later market development stages. For biotechnology and other companies developing new drugs, this source of funding is needed to finance Phase 1 clinical trials. Except for COMET, CRCs and
the Pre-seed Funds, the programs selected show a big gap in support for the initial phases of opportunity identification and assessment and for initial IP protection—essentially the entrepreneurship or act of new entry phase (Lumpkin and Dess, 1996). Provision of a competitive pre-seed fund for universities was a recommendation of the Innovation Summit Implementation Group. Pre-seed Fund managers however have experienced difficulty in finding investible projects in Australia and some universities have been reluctant to be sufficiently flexible in their acceptance of staged funding commitments with milestones. As a result, while the funds are likely to be able to commit all their investment funds, this will take five to six years rather than the initially planned three years to achieve, effectively reducing what is left of their ten year life to achieve a profitable exit strategy.

CRCs with commercially experienced Chairs and Board members—and now more focused on generating economic benefit—can and do cover both the Research and the Development stages and even the start of the Commercialization stage, including the technology development and opportunity identification and assessment activities, and IP protection. (Yencken 2005). For new ventures that are not generated out of CRCs, the Pre-seed Fund is the only program of the ones selected that helps to fund the that area of the technology development stage that includes proof of concept and working prototype development.

From a market understanding point of view, the program that clearly shines here is COMET. This is a relatively new program introduced by AusIndustry in November 1999. It has been directed at very early stage ventures and is the only program to evaluate the potential of applicants with regard to their perceived entrepreneurial abilities. COMET was substantially expanded under Backing Australia’s Ability and it’s later version entitled ‘Backing Australia’s Ability – Building Our Future through Science and Innovation’. A 2002 survey of firms assisted
by COMET showed that the program was very successful in encouraging entrepreneurs and enabling firms to achieve their business goals. The network of business advisers is a unique and valuable feature of COMET. The Australian Government is providing a further A$100 million over the next seven years to continue and expand this highly successful program.

The Commercial Ready program (the successor to START) supports both applied research in new ventures and applied research leading to innovations by established companies. The tax deduction (125 per cent plus of R&D expenditure) provides support at all levels with the exception of the founder stage as does R&D Start (now called Commercial Ready). However, in practice the tax concession is really only effective for companies that have sufficient earnings to pay company tax. We would also assess that R&D Start really only benefits companies from the Product Development phase onwards as a new venture is unlikely to have adequate initial capitalization to be able to support a START or Commercial Ready grant or loan. Tax concessions (with the option to obtain additional tax deductions for increases in R&D investment) have been most effective for established companies that have taxable profit streams.

An important factor that affects both the financial and management perspectives is the relatively small number of experienced serial business angels who in Australia regularly go trawling through universities looking for new knowledge-based commercial opportunities. As a result of this shortage, university technology transfer staff have a much greater role in identifying and assessing new business opportunities.

**Other sources of support**

For new ventures which have been started by individual entrepreneur(s) or spin-offs by university staff or students with no parent research provider IP or equity, the available sources of
financial support again lie outside the ambit of the DITR pre-seed focused programs considered earlier. Some of them, such as software companies, have access to incubator programs such as the Commonwealth Government *Building on IT strengths* (BITS) Incubator Centres program. They also have access to State government initiatives such as the Victorian Government Technology Commercialisation Program (TCP)—now succeeded by the *Building Innovative Businesses Program*—under which selected consultants were subsidised as TCP Partners to provide intensive management assistance, internationally focused market support and access to private sector equity” Similar programs operate in other States. However, history has shown the lack of success in Australia of external consultants (as opposed to business angels or venture capitalists) in finding IP based opportunities in universities. (DIIRD, 2004: 10).

Interviews with venture capitalists and people in government agencies have stressed the importance of human capital and access to specialist skills and experience. One experienced venture capitalist pointed to the shortage of people in Australia (outside the minerals exploration industry) who had experience and were competent to manage young technology based high-expectation/high-growth (HEHG) firms. He also drew attention to the lack of people in Australia with the specialist skills that a venture capitalist needs at various stages in a NTBF’s development through to its exit strategy. The Australian Institute of Commercialisation in its boot camps for academic researchers and related programs for small technology companies has started to make a contribution here.

Governments in recent years in Australia have initiated significant improvements in labor market flexibility. Labour market regulation is no longer a significant obstacle to new HEHG development. Australian taxation policies and regulations still contain problem issues for inventors and venture capitalist and other investors (Rider et al. 2006):
(a) Contribution of intellectual property assets…to a spin-off company may trigger an immediate large tax liability for the intellectual property contributors…

(b) Grant of options may trigger immediate taxation on the value of shares and options grante.

(c) Start-up losses are trapped in the spin-off company and cannot be flowed through to the investors.

(d) Commercialisation profits in a spin-off company are taxed at the 30% company tax rate, so exempt investors cannot benefit fully from their exempt status (Rider et al., 2006:103).

Small business programs

Alongside these initiatives concerned with research commercialization, there are a number of Commonwealth Government small business specific initiatives. Overall the Commonwealth government’s industry statement provided A$1.4 million over 10 years for these.

Clusters, incubators and technology parks

Clusters

The two important Australian clusters are Melbourne’s Parkville based Bio21 (covering medical, agricultural and environmental related biotechnology) and a similarly focused activity at Brisbane based on the University of Queensland. Both clusters have received strong infrastructure support from their State governments: Melbourne A$500 million by 2005 (State
Government of Victoria Australia 2004) and Brisbane A$600 million since 1988 (Queensland Biotechnology Strategic Plan 2005-2015: Biotechnology-Setting New Horizons). There are other smaller but important clusters based on mining technology in Brisbane and Perth in Western Australia, on micro and nano technology at Scoresby, a suburb of Melbourne, and on forestry and wood products at Creswick in country Victoria, all supported heavily by the State governments.

**Incubators**

Business Innovation & Incubation Australia (BIIA) is the Australian Association of Business Incubators and people interested in Business Incubation. It sets Best Practice standards for the Business Incubator Industry, provides advice on Incubator feasibility studies, business plans and networking, maintains a register of consultants qualified to undertake Incubator work, and supports its members and the Incubator industry with promotion, information and attracting external sponsors. The BIIA currently lists 82 business incubators that it supports and approximately 80 of these are sponsored in one form or the other by the Australian Government. It is estimated that these incubators house approximately 1200 start-up businesses (Burnett and McMurray (2008:62).

While the number of funded incubators looks impressive, most operate with local government support and are more concerned with retail and service industry start-ups. Of these about five to seven have a prime focus on science and technology based start-ups. These are almost all associated with universities.
A more relevant Commonwealth government initiative, already substantially featured in this chapter, has been the Building on Information Technology Strengths (BITS) to support information and communications technology based start-ups. In 1999 the Australian Government announced that A$158 million from the partial sale of Telstra, Australia’s major national telecommunications provider, would be allocated to the Building on IT Strengths (BITS) Program over five years to promote innovation and commercial success in the information industries, by encouraging new, high-technology firms’ creation and growth. A core element of the BITS program was the A$78 million BITS Incubator Program. In 2003–04, eighty-one ICT start-ups were accepted into the program as incubatees, from 656 applications. The total for the four years of the BITS Incubator Program was 344 incubatees selected from a total of 4209 applications. An independent evaluation, by the Allen Consulting Group (2003b) concluded that the incubators had performed well by international standards but that without a period of further funding most of the incubators would not be financially viable (Allen Consulting Group 2003b). In May 2004, the Australian Government announced as part of the Backing Australia’s Ability initiative that it would provide A$36 million (including A$1.87 million Departmental running costs) to extend funding to the better-performing BITS incubators to 2007–08. Eight of the previous 11 BITS incubators were selected in September 2004 to receive extension funding under the ICT Incubators Program (ICTIP).  

In addition, the important roles of Cooperative Research Centres and CSIRO, the Australian government funded research agency, in generating and supporting in their early stages new science and technology based companies might be considered as performing as virtual incubators for most of these new ventures.
Technology parks

The Australian Technology Park and Innovator Movement website lists technology parks in all States. All except two, one in Ballarat and the Grains Innovation Park at Horsham in Victoria, are located in the State capitals. The proposed Desert Knowledge Business and Innovation Centre will also be in a regional non-urban location.

An earlier study of Australian university research commercialization conclude that most technology parks were essentially ‘real estate deals’ and contributed little to research commercialization through spin-off companies (Cripps et al. 1999). At that time the exceptions as genuine contributors were the Australian Technology Park in Sydney and the University of Adelaide University Research Park at Thebarton (Cripps et. al.1999). There has been a significant expansion of technology park activity in Australia since then. It has however not been possible to assess the extent to which these parks have contributed to the research commercialization process and how well they are managed. The management role of the private sector partner, the Dutch company Zernike Group BV, in the Brisbane technology park merits attention. It has been active in the commercialization of technology since 1992 and manages science parks and incubators all over the world and a growing number of seed funds that amount to over €150 million in total.

Impact of new government’s policy

After its election in 2007, the new Labour government commissioned a major review of innovation policies and practice in Australia, including a separate review of the CRC Program (CDIISR, 2008). This was followed by an innovation policy statement. (CDIISR 2009). Underlying this approach was the traditional mindset of all Australian Labour centre-left
governments—that are heavily dependent financially on the trade union movement and many of whose Ministers are former trade union leaders—that favours larger established companies that are more likely to be unionised and there is less underlying political commitment to new small companies that are never likely to be unionised. Thus the main reinforcements to innovation policy by the new government related to promoting innovation in established companies.

At the same time, the new government initially maintained all except one of the previous government’s research commercialisation programs (Comet, IIFF, Pre-seed). The one program, the Commercial Ready program, that was cancelled was probably the most important; it provided grants and loans particularly but not solely to small companies to support research and early stage commercialisation. It was this latter area that was so critical as the only remaining program in this area was than Comet program which had different access criteria. There was particular concern about the way the program was terminated. At the time of the program’s cancellation, several Commercial Ready applicants had had their applications approved but not yet signed by the Minister responsible. The grant funding did not take place. In at least one situation this decision was terminal for the company concerned. The reason given for the cancellation of the program was a comment in the earlier Productivity Commission review of research funding in Australia (Productivity Commissssion, 2007) that a number of firms had been successful in obtaining Commercial Ready loans/grants when they would (in the views of the Commission) have had little or no difficulty in obtaining the funds needed from their usual sources of finance and/or the projects themselves had little research value.

In November 2009, the Commonwealth Government announced a new program, Commercialisation Australia to replace COMET as a new, simpler form of assistance to companies seeking to take their ideas to market from early January 2010.
“Government assistance for commercialising Australian innovation will be simplified through Commercialisation Australia,” Senator Kim Carr, Minister for Innovation, Industry, Science and Research said. Commercialisation Australia will open early in 2010 and ensure assistance is adjusted to meet each applicant’s needs rather than trying to make their application fit the program. This is a radical new approach to government commercialisation assistance through a single program, Commercialisation Australia. Case managers will guide applicants through commercialisation, helping them to build their skills and knowledge and, depending on their needs, link them to volunteer business mentors and specialist advice. Applicants at the proof of concept stage may be eligible for funding of up to A$250,000 and additional, repayable assistance of up to A$2 million will be available for early stage commercialisation activities.12

“As Commercialisation Australia comes into operation, the services and assistance it offers will supersede those currently available under the Commercialising Emerging Technologies (COMET) program. Commercialisation Australia will become the primary source for Australian Government assistance in helping to get ideas into the market place. With the commencement of Commercialisation Australia, the COMET program will be closed to new applications from 1 January 2010. It will continue to be available to customers who lodge completed applications prior to closure and customers with ongoing COMET grants.13

Discussions with venture capitalists have shown that the two programs most relevant to them (IIFF and Pre Seed) have been continued but that the level of funding is “minuscule”, i.e. not adequate. They also commented that the process of obtaining access to these funds was “hopelessly bureaucratic”.

In summary, the new Government has continued with most of the funding and support programs related to technological innovation by entrepreneurs setting up new companies, but the
total funding is inadequate. This situation has of course been hugely aggravated by the lack of finance available from traditional commercial finance sources due to the 2008 world financial crisis.

**Conclusion and Lessons**

By late 2007, Australian public sector research expenditure had demonstrated significant increase since the advent of the Howard Government in 1996 but remained and remains still low (particularly business R&D expenditure) by comparison with other leading developed nations. International comparisons show that only a few of the top Australian universities are comparable to overseas universities in their commercialization performance in relation to their research expenditure adjusted for purchasing power parity (Yencken and Gillin 2006).

The conclusions from the previous survey and analysis of Australian government policy initiatives with impacts on new business growth rates are discussed against the final three phases of new venture development shown in Figure 1; *Entrepreneurship and Incorporation, Market Entry* and *Achieving Market Share*. This analysis was undertaken from three different perspectives: *Financial, Management* and *Environment*. All programs have been subject to regular independent external reviews, often leading to adjustments before commitment to ongoing funding.

The most critical gaps in the suite of programs offered by the Australian Commonwealth Government to the beginning of 2008 (except for CRCs and Pre-seed Funds) lie in those supporting the Entrepreneurship and Incorporation phase (Figure 1). The programs selected show a big gap in support for the initial phases of opportunity identification and assessment and for initial IP protection—essentially the entrepreneurship or act of new entry phase. At the same
time the rate of investment in the Pre-seed Funds has been slower than expected, suggesting the need to develop more investible opportunities and more flexibility from university and other research providers in progressive funding arrangements. This in turn suggests the importance of the Australian Institute of Commercialisation boot camps for academic researchers to improve their abilities in the identification of more investible opportunities.

A number of the government initiatives discussed are clearly supportive of new high growth ventures in the Market Entry phase, particularly COMET, CRCs, Pre-seed funds and Commercial Ready for companies with adequate financial resources such as spin-offs from well established companies. It is in this phase that issues raised in the earlier discussion of the Management Perspective start to become more important. The transition from R&D to first product development is never easy and entrepreneurs and managers with good product development experience are often hard to find. Similarly, the need for access to a variety of skills (product development, industrial design, communications, regulatory) at every level of the value chain arises—not just scientists and engineers. These specialist skills are in short supply in Australia and often not fundable under commercial research funding arrangements. Several respondents to the GEM Australia studies (conducted from 2000 to 2006) stressed the importance of education and training in all aspects of new high growth venture development and management as the most critical need——above financial subsidies and grants. In this phase also some of the environment perspective issues start to be constraints: taxation issues relating to intellectual property, availability of adequately experienced specialist resources.

Achieving market share is essential to the survival of startups and requires far greater financial resources than those usually accorded to this area in Australian business practice to finance market expansion, manufacturing and distribution and ongoing product development—
both customization and Mark II and Mark III products. By this time the venture will usually have obtained additional equity possibly via second and third tranches from venture capitalists (possibly involved in an Innovation Investment Fund or a Pooled Development Fund). This will allow access to Commercial Ready and other Industrial Research and Development Board (IDRB) programs where various levels of matching contributions by the grant or concessional loan recipient may be required. One Australian institution/program, the Industrial Research and Development Board (IRDB) provides finance focussed on second or later product development via activities such as research related to achieving market share or enhancing product customization. This is otherwise hard to fund when all resources have been used up for the initial product market entry. The human capital needs generated by the management perspective will have become much more critical, both for employees and outsourced specialist people. Similarly the environment perspective issues will continue to be concerns if appropriate actions in the development of financial and organizational structures have not been resolved.

From the analysis it is clear that AusIndustry's programs as at the beginning of 2008 seemed to be working well and meeting genuinely entrepreneurial objectives if they are considered solely within the context of the financial and innovation frameworks at the market entry and achieving market share phases of firm development. However the program suite can be seen to be working less effectively from the perspective of the management/start-up and entrepreneurial frameworks. Interview respondents have suggested that more emphasis was needed on the adequacy of human capital resources and on environmental issues such as intellectual property taxation.

Dr. Owen Gilmore, CEO of the Australian Institute of Commercialisation, in his comments in the National Survey of Research Commercialisation in Australia 2004 has
attributed the fact that patenting activity, licensing income, and invention disclosures are all at less than half of US levels (when measured against research expenditure) to three key factors:

- **Research Culture** – a distrust of researcher interface with commercial entities;
- **Industry disinterest in technological innovation**;
- **Limited funding for proof of concept development**.

This study has gone into greater detail and demonstrated that many of the right preconditions exist for Australia to reap much greater value from its research investment. It is greatly to be hoped that Australia’s incoming government will not ‘throw out the baby with the bathwater’ but will recognise those areas where the Howard years have produced productive programs as well as gaps and shortcomings in the innovation program suite. If there is to be a ‘punchline’ to this study it is this: skills development remains central (Gilmour 2007). The biggest opportunities for a new regime of Australian innovation policy with respect to enhancing the creation and development of high technology lies not with the technical aspects of research but with the human aspects of development. We need to focus on the human aspects; helping people to develop new venturing skills. We are not short of inventions we are short of the entrepreneurial skills needed to translate those inventions into valuable products and services and the new innovation policies of the new government should focus its initial endeavours on programs that increase the entrepreneurial capacity of Australians.
Glossary of terms and abbreviations used

(Note most abbreviations refer to Australian Government Programs)

COMET  Commercializing Emerging Technologies
PDF    Pooled Development Funds
IIF    Innovation Investment Fund
BITS   Building on IT Strengths
IT     Information Technology
IP     Intellectual Property
TD     Technological Development
DITR   Department of Innovation Technology and Resources
BRW    Business Review Weekly (a business sector newspaper)
TCP    Technology Commercialization Program
BIIA   Business Innovation and Incubation Australia
CSIRO  Commonwealth Scientific and Industrial Research Organization
ANSTO  Australian Nuclear Science research Organization
DSTO   Defence Science and Technology Organization
CRC    Cooperative Research Centre
DEST   Department of Education Science and Technology
IRDB   Industrial Research and Development Board
References


Australian Institute for Commercialisation (2004). Investigating the existence of anecdotally reported innovation funding gap FINAL REPORT: Survey commissioned by the Commonwealth Department of Industry, Tourism and Resources. Canberra: Department of Industry, Tourism and Resources.


Commonwealth Department of Innovation, Industry, Science and Research (CDIISR), 2008. Review of the Cooperative Research Centres Program
Commonwealth Department of Innovation, Industry, Science and Research (CDIISR) 2009.

*Powering Ideas: an innovation agenda for the 21st century*.


Venturous Australia: Building Strengths in Innovation


Figure 1 New venture development phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Financial Resources</th>
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<tr>
<td><strong>Idea</strong></td>
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<tr>
<td><strong>Opportunity</strong></td>
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<tr>
<td><strong>Entrepreneurship incorporation</strong></td>
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<td><strong>Market entry</strong></td>
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<tr>
<td><strong>Achieving market share</strong></td>
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**Needs**  
- IP Protection  
- Proof of concept  
- Competitor/market analysis  
- Product development  
- Market credibility  
- Production and distribution  
- Product customisation  
- Additional products

**Sources**  
- Parent  
- First investor (FFF/angel)  
- Sales revenue  
- Venture capital  
- IPO/ trade sale
End notes: Internet references

2 <www.industry.gov.au>
3 <www.crc.gov.au>
4 <www.crc.gov.au>
6 <www.auscom.com.au>