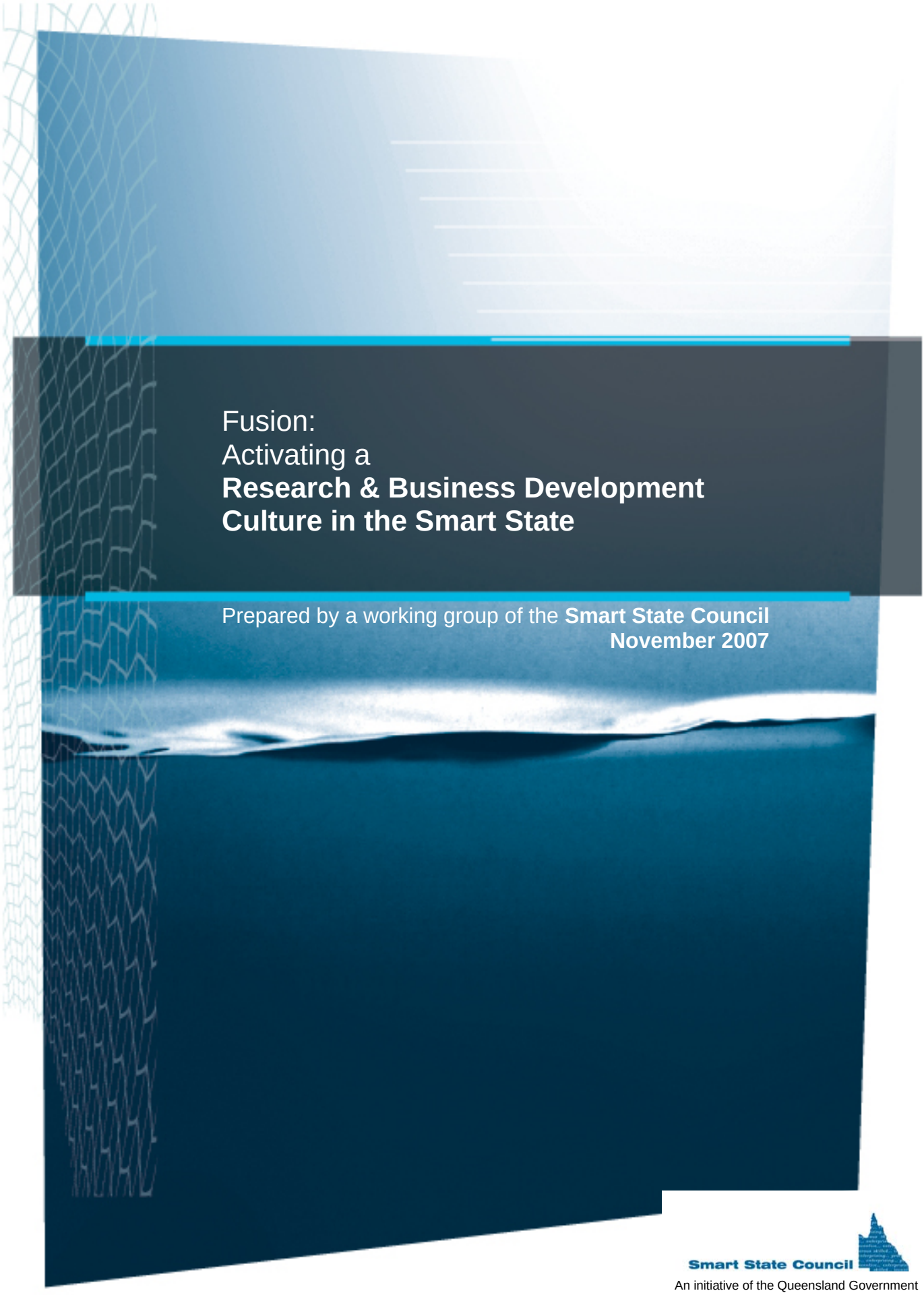
Fusion:
Activating a
Research & Business Development Culture in the Smart State

Prepared by a working group of the **Smart State Council**
November 2007



Smart State Council

An initiative of the Queensland Government

Smart State Council

Dear Premier

Please find attached the Smart State Council working party report *Fusion: Activating a Research and Business Development Culture in the Smart State*.

The report addresses the imbalance between Queensland's public sector research effort, which is highly competitive but to a large degree unfocused on pursuing the development of research towards its ultimate application, and the business sector, which is also highly competitive but not taking full advantage of R&D opportunities. The report suggests that drawing these two cultures closer together will result in substantial increases in knowledge-intensive industry, with consequent economic and employment benefits for Queenslanders.

I commend it to you.

Professor Peter Andrews
Queensland Chief Scientist and
Chair, Standing Committee
Smart State Council

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There has also been a contribution from other Council members and we thank those members of the business community for their input.

SMART STATE COUNCIL

The Smart State Council was established in June 2005 as a central advisory body to provide high-level advice to the Queensland Government on emerging Smart State issues and trends, and to propose measures to position Queensland to respond to challenges and opportunities.

The Smart State Council is chaired by the Premier of Queensland and comprises Government Ministers, the Queensland Chief Scientist and representatives from Queensland's business and research communities.

This paper was prepared by an independent working group for the Smart State Council. The views expressed in this paper are those of the group and do not represent Queensland Government policy.

EXECUTIVE SUMMARY

Queensland is competing in a new world: a world where economic orthodoxies are being questioned and the nature and understanding of 'the economy' is being redefined; a world where most OECD countries have 'innovation', 'knowledge' and 'technology' high on their agendas.

Queensland's public sector research organisations are central to this competition. The Smart State needs to harness the strength of our public research sector to unlock the enormous economic potential bound up in research and knowledge, and transfer it to our industry.

Queensland's businesses and research institutions are built on very different foundations. The dominant culture of business is one of fierce competition coupled with under-investment in research and development (R&D). In research and academia, the dominant culture is based on the 'publish or perish' dictum necessary in the pursuit of academic careers.

Yet there are those in both sectors who want more.

Queensland needs to 'draw out' people in the business and research communities who are receptive to creating a third hybrid culture: a research and business development culture. Just as the fusion of blue and yellow produces green, a fusion of the right business and R&D experts can activate a new culture of creative innovation and development in Queensland industry.

To facilitate this transition, we need to provide mechanisms to allow Queensland's researchers and universities to demonstrate the commercial potential of their discoveries and to maximise the economic outcomes of Queensland's university research.

Conversely, we need to boost the research awareness and capacity of our industries, on a sector-by-sector basis, to allow all Queensland industries to develop new, innovative products and services drawing on the knowledge created within public sector research institutes.

Finally, we need people. Researchers and industries require access to people with solid experience in growing new, knowledge-based businesses. We need to create a critical mass of people with the skills to transform research brilliance into commercial success: researchers with business skills, and CEOs and managers who value that research.

Fusing a hybrid: towards a **research and business development** culture.

The status quo, two cultures in stasis, needs to be surmounted. These two cultures, business and research, are long established, indeed each pre-existed the nation state of Australia. Shifting these cultures therefore seems a mammoth task, one possibly beyond the scope of a state government. But it can be done. When talking about culture, it is useful to borrow the language and ideas from an expert in the manipulation and creation of new and innovative contemporary culture: the music industry. Musicians talk about the 'fusion' of different musical cultures to create a hybrid of the originals. In this instance, Queensland needs to 'draw out' those elements in the business and research communities who are open to creating a third hybrid culture. Like the fusion of blue and yellow produces green, a fusion of the right business and R&D experts can produce a **research and business development** culture.

Universities – Key Finding	Research and Business Development – Key Finding	Industry – Key Finding
There is a critical funding gap impacting upon the commercialisation continuum in Queensland at the 'Proof of Concept' stage. Since the inception of the Smart State, with its ambitions to create a knowledge economy in Queensland, there have been a range of initiatives set up which are now beginning to bear fruit. These initiatives have been strategic, providing a full spectrum of support for knowledge based research and start-ups.	**There is a lack of experienced start-up managers and commercialisation skills in Queensland.** Queensland has made significant investments to 'push' commercially viable research out of universities. However a lack of experienced managers of start-up knowledge based companies, who have themselves successfully guided start-up companies into successful businesses - and learnt from their mistakes along the way, has significantly hindered the commercialisation of ideas in the Smart State.	**Research capabilities of the university sector are under-utilised by Queensland business and industry.** There is a cultural divide between Queensland's business and university sectors. There is significant scope for a market mechanism to draw out and engage that portion of the business community who are willing to engage with the research sector.

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1.0 FUSION: ACTIVATING A RESEARCH AND BUSINESS DEVELOPMENT CULTURE IN THE SMART STATE

> *Growing Queensland as a Smart State relies on smart systems and networks to create the linkages between education, research, innovation and business activity. Smart systems foster innovation and encourage entrepreneurship and collaboration.*[1]

Queensland needs to create and nurture a research and business development culture to facilitate the commercialisation of public sector research. Generating such a culture will:

- increase the economic benefit of the considerable research undertaken at public institutions in the Smart State
- help Queensland's businesses become more competitive in an increasingly global environment
- generate large numbers of high-value jobs for Queenslanders.

Importantly, a research and business development culture will contribute greatly to the long-term sustainability and critical mass required in a viable knowledge-based economy.

KEY FINDINGS

Key Finding 1

Significant research is still being carried out by the university sector that will not be either commercialised or transferred to the public or private sectors.

Key Finding 2

A critical funding gap is impeding the rate of commercialisation in Queensland at the 'proof-of-concept' stage.

Key Finding 3

There is a lack of experienced start-up managers and commercialisation skills in Queensland.

Key finding 4

The research capabilities of the university sector are under-utilised by Queensland business and industry.

1 Queensland Government (2007), Smart State 2006/07 Progress Report, p.6.

2.0 THE SCOPE OF THE REPORT

There are fundamental differences between the drivers and operational environments of organisations across the public sector research engine, which comprises:

1. universities
2. Co-operative Research Centres
3. medical research institutes, for example the Queensland Medical Research Institute, the Mater Medical Research Institute and Diamantina
4. state and local government departments
5. federally funded organisations such as the Commonwealth Scientific and Industrial Research Organisation, the Australian Institute of Marine Science, the Australian Nuclear Science and Technology Organisation and the Defence, Science and Technology Organisation.

This paper addresses the research conducted by Queensland universities. This approach has been adopted for the following reasons:

- The higher education sector accounts for the largest proportion of public sector expenditure on R&D.
- Research conducted in state and federal government departments has its own complex environment of IP management and policy issues.
- Co-operative Research Centres already have a mandate to commercialise as part of their funding agreements negotiated with the Commonwealth Government.
- The optimisation of Queensland's health and medical research is the topic of a forthcoming Smart State Council paper and therefore has not been specifically considered. However, the recommendations in this report, are also broadly applicable to the medical research sector.

2.1 A Note About the RQF

As part of a suite of programs announced in 2004, the Commonwealth Government announced major changes to the funding of universities via the introduction of a Research Quality Framework (RQF). The stated aim of the RQF is to '*develop the basis for an improved assessment of the quality and impact of publicly funded research and an effective process to achieve this*.' [2]

The findings of this report are considered appropriate whether or not the RQF is implemented. In either scenario, they demonstrate that Queensland is taking a lead role in providing incentives for universities and industry to accelerate their commercialisation activities and interactions for the broader benefit.

2 http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues accessed 9 August 2007.

3.0 KEY FINDING 1

Queensland's research and business cultures are still poles apart, despite progress in many industries

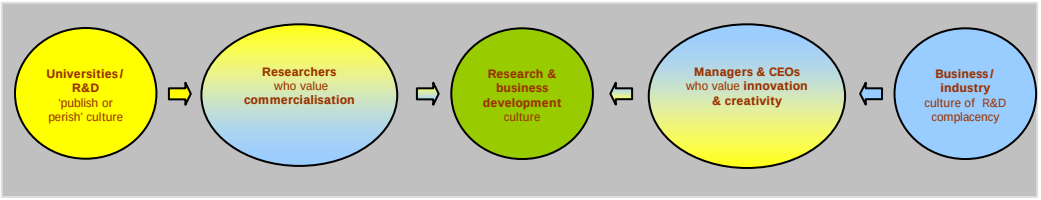

Figure 1 - Fusion: activating a research & business development culture in Queensland

Queensland needs a new way to connect research and industry. Queensland's research and business communities have much to gain from effective partnerships which will, in turn, strengthen the Queensland economy and provide ongoing opportunities for the future.

Collaboration is an essential component of an innovative knowledge-based economy.

> *Good ideas emerge from an environment that supports collaboration: shared aims, camaraderie and rapport are just some of the features of 'collaboration at work.'*[3]

To achieve true collaboration between research and industry in Queensland, the status quo - two cultures in stasis - needs to be surmounted. However, shifting these cultures is a mammoth task, seemingly beyond the scope of a state government. But it can be done.

When talking about culture, it is useful to borrow the language and ideas from the music industry in the manipulation and creation of new and innovative contemporary cultures. Musicians talk about the 'fusion' of different musical cultures to create a hybrid of the originals.[4] In this instance, Queensland needs to 'draw out' those elements in the business and research communities that are receptive to creating a third hybrid culture. Just as the fusion of blue and yellow produces green, a fusion of the right business and R&D experts can produce a research and business development culture in Queensland.

The challenge embraced by this report is how to facilitate the formation of such a productive new culture.

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3 Queensland Government (2005), Smart Queensland – Smart State Strategy 2005-2015.

4 Jazz, for example, was fused from '*elements drawn from European-American and tribal African musics*' Stanley Sadie (ed) (1988), Grove Concise Dictionary of Music MacMillan Press, London.

3.1 Acknowledging the Different Cultures (and Roles) of Research and Industry - Moving Forward

Business and research are built upon very different foundations. Both can lay claim to old traditions and cultures. Both are long-established, resting on foundations which pre-existed the nation state of Australia.[5] These cultures are strong and independent, resilient and inter-generational. That these very different cultures share such robust qualities partly explains why it is difficult to shift the patterns of behaviour of Queensland's universities and businesses. Many barriers to cross-sectoral collaboration exist[6] and the innate influence of culture cannot be overestimated.

Universities, in collaboration with business and the State, can be powerful drivers of knowledge-based economic development in a region. However, Queensland's public sector research engine is largely disengaged from the State's business communities.

3.2 The Dominant Research Culture: Publish or Perish…

Academia is routinely criticised for having an 'ivory tower' mentality. The culture in academia and research institutions is better described as one of 'publish or perish'. This is because, in most Australian universities, career advancement and funding is tied to research output. Moreover, the culture of blue-sky 'research for research's sake' is tied to traditions of academic freedom. This culture resonates strongly in the academic community.

The other key role of Australian universities is the education of students. The university sector fulfils its traditional roles of teaching and research especially well. Commercialisation is a different story. Queensland universities have no imperative to commercialise research. Attention is not strongly focused on the commercial potential of new knowledge, nor on partnering with industry to achieve innovative outcomes to solve the business community's scientific, technical and creative needs. This situation is not unique to Queensland, and indeed is a challenge for knowledge economies globally.[7]

5 Academic culture emerged with the first universities early in the last millennium, with the culture of business and industry evolving since the industrial revolution.

6 Smart State Council Report (2006) *Business Investment in Research and Development in Queensland, Including Access to Capital.*

7 State Science and Technology Institute (2006) Resource Guide to Technology-based Economic Development (2006), SSTI, Prepared for the US Dept of Commerce, pp 26-27.

Nevertheless, there is evidence of change. Between 1994 and 2000, payments from Australian businesses to universities for research undertaken more than doubled.[8] Many Queensland universities are already experiencing significant success in collaborating with industry. In 2002 The University of Queensland's performance across a range of commercialisation statistics including licence income, number of start up companies formed, value of equity holdings and invention disclosures exceeded most, if not all, other Australian universities.

IMBcom, a commercialisation company within The University of Queensland's Institute for Molecular Bioscience, is creating spin-out companies at a rate six times faster than the national average for similar organisations.[9]

The challenge is not insurmountable. Queensland's universities are uniquely positioned to unlock the enormous economic potential bound up in research and knowledge as they spend a greater proportion of their R&D budgets on applied and experimental research than universities in any other state (Figure 2). Queensland's universities spent $556M on research and development in 2004 alone.[10] Because of this, the Smart State is well positioned to translate more of its public sector research into economic outcomes that benefit the State.

> *Spending lots of state money on research doesn't translate automatically into economic benefits – but smart spending optimises the chance of success.*[11]

8 Commonwealth of Australia. Mapping Australian Science and Innovation. Department of Education, Science and Training, Canberra, November 2003..

9 Heading, B., Eye to Eye - Interview with Dr Jane Wilson (Chair IMBcom), McCullough Robertson Lawyers, Business Intelligence 2006 (http://www.imbcom.com.au).

10 DEST (2007), National Survey of Research Commercialisation Years 2003 and 2004 .

11 National Governors Association (2007), Innovation America: Investing in Innovation, op cit.

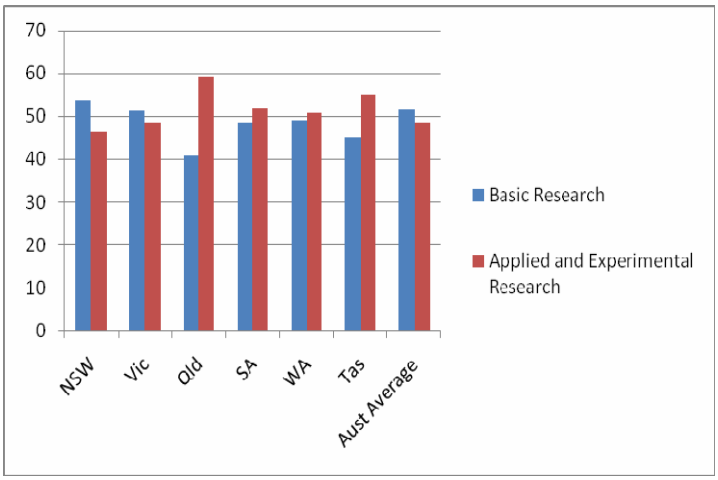


Figure 2 - Queensland's universities are better suited to partnering business than other states' universities: applied and experimental research as a percentage of higher education expenditure on R&D, 2004[12]

This is not a task for our research sector alone. The Smart State also needs to build a culture amongst Queensland companies which sees the business community actively seeking out researchers with innovative ideas and solutions.

3.3 The Dominant Business Culture: Competition and R&D Under-investment

The dominant business culture is one of competition; business best-sellers often proclaim the similarity of business and war. The cooperative and open business model, vital to building a knowledge-based economy,[13] is very different to the traditional, and historically successful, business model of competitive secrecy. The mission statement of the National Competition Council recognises that competition is inherent to business culture.

> *To improve the well being of all Australians through growth, innovation and rising productivity, by promoting competition that is in the public interest.*[14]

Queensland's business community also under-invests when it comes to seeking R&D solutions from the public sector. As demonstrated in the figure below, Queensland's

12 Australian Bureau of Statistics (2004) Research and Experimental Development, Higher Education Organisations, Australia 2004, 8111.0.

13 Steve Hamm (2007), 'When the chips are down, start sharing', in Australian Financial Review, Tuesday 4 September.

14 National Competition Council website. http://www.ncc.gov.au/ Last assessed October, 2007.

business expenditure on R&D as a percentage of gross state product (GSP) is well below the Australian average.[15]

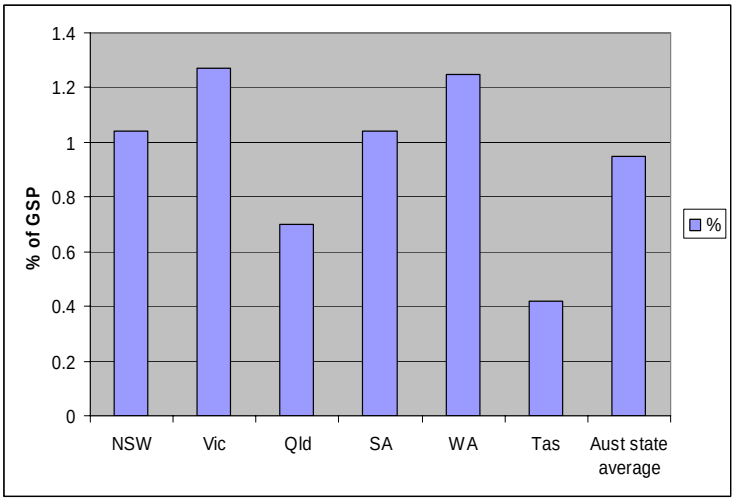


Figure 3 - Business commitment to R&D by state:
Business expenditure on R&D as % of gross state product 2005-06[16]

There is a roadblock between business and research which needs to be overcome. Few regular interactions occur between Australian small and medium sized enterprises (SMEs) and research organisations, and most Australian SMEs cannot afford to employ or train a specialist familiar with tapping into – and understanding - the knowledge within the public research sector.

However, there are examples of success. The partnership between the Queensland University of Technology and the Brisbane Airport Corporation (BAC) involves a three year commitment of funding and in-kind support from BAC to deliver tangible outcomes for both organisations. Griffith University has enjoyed a long-term and productive association with global pharmaceutical giant AstraZeneca, while Central Queensland University holds regular networking events across regional Queensland to strengthen the connections between local industry and the research sector.

A lot can be learned from these types of activities. But more can still be done to foster and develop new relationships with industry - particularly given the disparity in the 'commercialisation' successes of universities across the State.

15 Australian Bureau of Statistics (2006), Research and Experimental Development, Businesses Australia 2005-06, 8104.0.
16 Ibid.

3.4 Building on Smart State Initiatives to Realise a Research and Business Development Culture in Queensland

The State Government deserves congratulations for its strategic effort to broaden the economic base of Queensland into knowledge economy areas. Building a strong research and business development culture will enable Queensland to consolidate the considerable investments made in the previous decade in R&D.

> *Simply put, the components for innovation can be had by nearly any state with the necessary will and focus.*[17]

The Queensland Government invests heavily in R&D. As shown in Figure 4, the Queensland Government spends a greater proportion of GSP on R&D than any state except South Australia. In 2004-05 the Queensland Government (at $234.9M) was second only to NSW (at $298.9M) in dollars spent on R&D.[18]

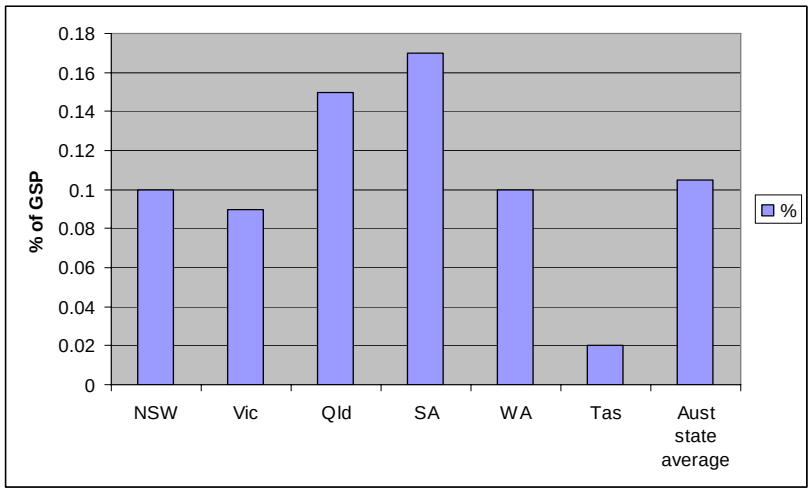


Figure 4 - The Queensland Government's commitment to R&D: State government expenditure on R&D as % of gross state product 2004-05[19]

The amounts in Figure 4 do not include the significant research infrastructure commitment made by the Queensland Government through the Smart State Innovation Fund.

17 National Governors Association (2007), Innovation America: Investing in Innovation, op cit, p-15.
18 Australian Bureau of Statistics (2006), Research and Experimental Development, Businesses Australia 2005-06, 8104.0.
19 Ibid.

Many existing government and private programs are already part of the effort to build a research and business development culture in Queensland. Yet changes on such a scale require a degree of trial and error, in the true tradition of 'innovation'. Above all they require commitment and patience, combined with a willingness to assess the worth of existing programs and build on their successes to create an ever-increasing momentum.

Through many Smart State initiatives Queensland has shown direction and leadership within Australia, and this can continue by fusing research and business development. The increasing engagement of universities with industry will help to leverage more economic benefits from Queensland's initiatives.

3.5 The Importance of Increasing Commercialisation from Queensland's Public Sector Research

Queensland universities are achieving noteworthy successes in the generation of start-ups. This is due in part to the increasingly important role of university commercialisation offices and the support provided through a range of Smart State initiatives. Figure 5 shows that Queensland's universities perform well above the Australian state average.

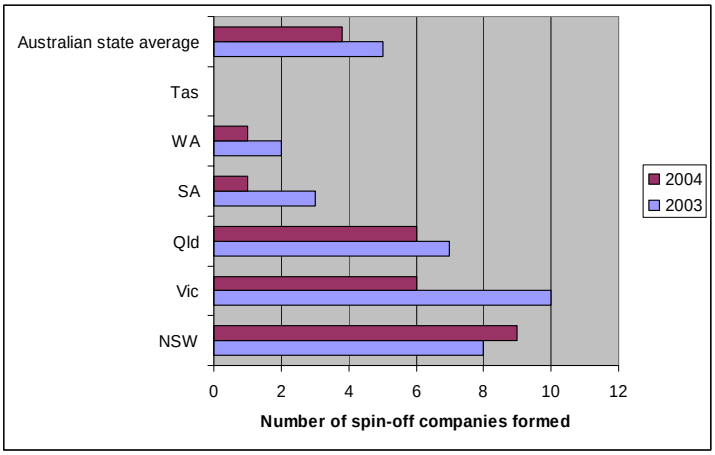


Figure 5 - Commercialisation outcomes: spin-off companies from universities formed, by state, 2003-04[20]

20 DEST (2007), National Survey of Research Commercialisation Years 2003 and 2004 http://www.dest.gov.au/sectors/research_sector/publications_resources/profiles/National_Survey_of_Research_Commercialisation.htm. Last accessed September 2007.

Queensland's university commercialisation offices and incubators such as Uniquest, IMBcom, Bluebox, i.lab and the Innovation Centre Sunshine Coast have an essential role to play in the transfer of research to the broader community.

University technology transfer activities are impacting local, state, and national economies. Stanford University alone filed more than 300 patents last year and it has spun off some familiar companies such as Google, Sun Microsystems, Silicon Graphics, Netscape, Cisco Systems, and Yahoo. Each year, the Massachusetts Institute of Technology (MIT) executes almost 100 licenses and launches about 20 new technology firms. Moreover, about 150 new businesses every year are associated with MIT faculty, students and alumni.[21]

Whether it is through the *Creating an Innovative Europe* report for the European Commission,[22] the *Innovation America: Investing in Innovation* report for the National Governors Association,[23] or the Canadian Government's report *Mobilising Science and Technology to Canada's Advantage*,[24] nations and regions are seeking to position themselves strategically in the new economy. A major force in the Smart State's knowledge economy in the future will be Queensland's ability to 'translate' ideas into innovative business outcomes – and have them picked up by Queensland's industry.

In the competitive world of the 21st century, a world where traditional economic orthodoxies are being questioned and the nature and understanding of 'the economy' is being redefined, OECD countries have 'innovation' and 'knowledge' and 'technology' on the agenda.

3.6 Harnessing Research and Business Development as an Economic Driver in Regional Queensland

> *The commercialising activities of local entrepreneurs are necessary to convert a region's innovation assets into long-term economic gain.*[25]

By adopting a research and business development culture, universities can act as economic drivers in their local communities. Queensland's universities attract

21 Diane Palmintera, 'Accelerating Economic Development through University Technological Transfer', in United States Department of Commerce, Economic Development America, Winter 2005, p-18.
22 http://ec.europa.eu/invest-in-research/pdf/download_en/aho_report.pdf last accessed October 2007.
23 National Governors Association (2007), Innovation America: Investing in Innovation, op cit.
24 http://www.ic.gc.ca/cmb/welcomeic.nsf/vRTF/PublicationST/$file/S&Tstrategy.pdf.
25 Advanced Research Technologies (2005), The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development, http://www.sba.gov/advo/research/rs256tot.pdf p-8. Study commissioned by the US Government's Small Business Administration.

significant funding from many sources, but predominantly from the Commonwealth and State Governments. Figure 6 shows the total income (2006) of Queensland's universities.

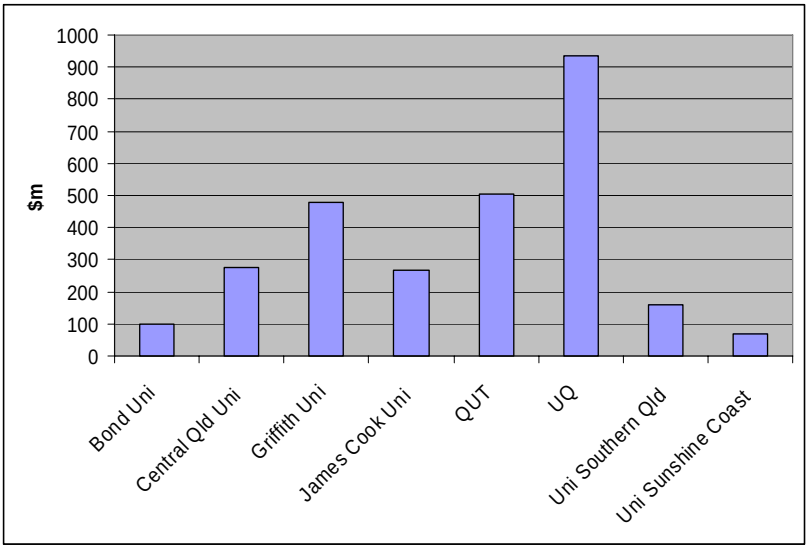


Figure 6 - Universities are important to regional economies: Total operating revenue of Queensland universities from all sources 2006[26]

Given these substantial sums, universities are well positioned to exert positive influences on these local economies. Significant opportunities exist too, in regional Queensland, despite the concentration of university activity in the south-east corner. University campuses in regional Queensland, including Cairns, Townsville, Rockhampton, Gladstone and Mackay, have the potential to become centres of knowledge-intensive industrial activity.

> *The best-performing Australian universities are achieving research commercialisation outcomes broadly compatible with the best in the US and Europe, and way above their average. However there is considerable variability in performance, with a considerable gap in small and regional universities on the whole.*[27]

26 Sourced from the respective university's annual report.

27 'Best Practice Processes for University Research Commercialisation' *http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/reviews/previous_reviews/university_research_commercialisation.*

A report commissioned by the Economic Development Administration (US Department of Commerce) lists four strategies to 'position universities to drive knowledge-based economic growth:[28]

1. building research excellence in key strategic areas
2. attracting and retaining a world class faculty
3. linking academic researchers and industry
4. capturing intellectual property to create new companies, products and processes.

Queensland's universities are well on their way to achieving the first two of these criteria. The second two will be greatly enhanced through the adoption of a research and business development culture across the Smart State.

3.7 What will a Research and Business Development Culture Look like?

A research and business development culture will be made up of people who:

- welcome and encourage the interchange of ideas and opportunities between research and industry
- are comfortable in academia and business, talking research as well as business plans and profit margins
- are dedicated to translating ideas and research into economic benefits for the organisations and businesses involved, as well as economic and social benefits for Queensland.

3.8 How will a Research and Business Development Culture be Achieved?

A research and business development culture can be achieved in the Smart State by:

28 Resource Guide for Technology-based Economic Development (SSTI), op cit.

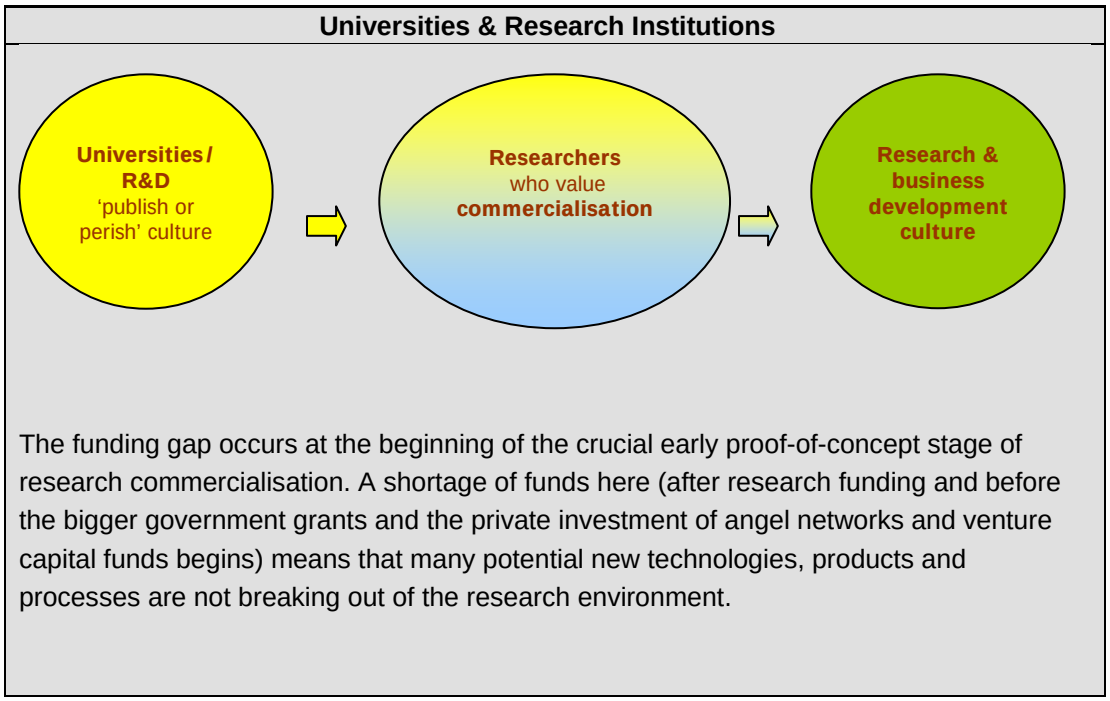
- facilitating greater commercialisation outcomes from university research and increasing collaboration by 'pushing' researchers to increase links with industry (research 'push')

- increasing the supply of Queenslanders with entrepreneurial and early-stage (start-up company) managerial skills

- increasing the research commissioned by Queensland's industrial sectors (industry 'pull' - pulling research from the industry side).

4.0 KEY FINDING 2

There is a critical funding gap impeding the rate of commercialisation in Queensland at the 'proof-of-concept' stage. This is constraining our research organisations' ability to demonstrate investment readiness.



The funding gap occurs at the beginning of the crucial early proof-of-concept stage of research commercialisation. A shortage of funds here (after research funding and before the bigger government grants and the private investment of angel networks and venture capital funds begins) means that many potential new technologies, products and processes are not breaking out of the research environment.

The enormous contribution to public life made by the research sector is beyond question and highly valued. While researchers and academics are often described as having an 'ivory tower' or 'publish or perish' culture, the research community, like the business community, is not homogenous. Many are justifiably committed to 'blue-sky' research. Others will become part of the new research and business development culture of Queensland. But first, they need help to demonstrate the commercial potential of their ideas.

4.1 The Proof-Of-Concept Co-investment Fund

A proof-of-concept co-investment fund will allow our researchers to demonstrate the commercial potential of their ideas.[29] As part of its Science Industry Action Agenda, the Commonwealth Government set up a working group to analyse the benefits of a proof-of-concept co-investment fund in Australia. They found that:

> *One of the impediments to realising better commercial outcomes and national benefits from government investment in research is that universities and PFRAs [publicly funded research agencies] are not as strong as they could be at identifying and developing commercial opportunities to the next step, namely proof-of-concept.*[30]

Such a position was reinforced by the Group of Eight in its 2007-08 Pre-Budget Submission:

> *Australian universities currently receive very limited dedicated funding to support their research commercialisation activities. Yet governments increasingly expect them to be improving their performance in this area. A key obstacle to improved research commercialisation outcomes remains access to investment capital, particularly at the proof-of-concept stage.*[31]

A proof-of-concept co-investment fund will 'push' research out of Queensland's institutions into industry. Queensland's public sector research institutions could use it to create a working prototype to test whether a new product will work as planned, or run a new process to test its effectiveness. Implementing a proof-of-concept co-investment fund will help activate a research and business development culture in Queensland by:

1. closing the funding gap at the critical 'proof-of-concept' stage of the commercialisation process, allowing researchers and research institutions to present their ideas to potential investors

2. enhancing commercialisation skills across all of Queensland's research institutions

3. providing an incentive for the public research sector, and individual institutions, to focus attention on the possibility of research as a commercially valuable resource

29 Duncan Jones, Australian R&D Review, July 2007.
30 Proof-of-concept Working Group, 'Developing the proof-of-concept metric', Science Industry Action Agenda, op cit, p1.
31 Group of Eight, 2007-2008 Pre-Budget Submission, pp 5-6.

4. encouraging those researchers with an interest in industry, or who feel that their ideas may have commercial value, to engage in the early stages of the commercialisation process. These people in turn may encourage their 'research-only' colleagues, who may be doing commercially viable research, to engage in the early stage translation process

5. positioning research institutions to leverage Commonwealth funds and private investments aimed further down the commercialisation pipeline.

Having made significant efforts in innovation capacity with relatively little local economic impact to show, some regions are just now realising that commercialisation is key to capturing the economic value embedded in innovation and that the processes for generating innovations are not the same as those required for their commercialisation.[32]

4.2 Proving the Commercial Viability of the Research

A Queensland proof-of-concept co-investment fund would place Queensland university start-ups in a very strong position to apply for follow-on Commonwealth funding and secure seed, business angel or venture capital finance. While management of a start-up has been identified as the most important factor behind investment decisions for business angels in Australia, the second most important factor is the commercial product of the business.[33] Proof-of-concept investment substantially minimises the risk for later stage investors by enabling projects with potential to progress towards a point where an informed decision can be made regarding their viability.

For research to be sufficiently attractive to prospective investors, the concept must be adequately tested and proven.

Funding needs to be given without the expectation of a financial return and on the understanding that for some projects the State's investment will provide certainty that the technology does not actually have a market value. This would prevent the inevitable losses associated with the establishment of numerous unviable start-ups.

It is noted that the University of Queensland recognised the proof-of-concept finance gap and in 2005 established a proof-of-concept fund called Pathfinder to provide a

32 Advanced Research Technologies (2005) *The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development*, op cit, p.5.
33 Michael Vitale et al (2007), *A Study of the Business Angel Market in Australia*, Commonwealth of Australia.

maximum of $50,000 in support for research projects with strong commercial potential. Pathfinder has provided approximately $800,000 to 30 research groups to date. Of the 13 recipients of funding in 2005, four have since secured venture capital funding and formed start-up companies.

However, there are a number of projects with great potential that have not been funded due to the limited availability of requisite proof-of-concept finance.

4.3 Comparing the Proof-of-Concept with Existing Grant Programs

Three limited proof-of-concept funds are available to Queensland businesses. However, these programs do not fulfill the requirements of proof-of concept funds as highlighted in this report. Figure 7 sets out the commercialisation continuum, while Figure 8 maps the existing State and Commonwealth proof-of-concept programs.

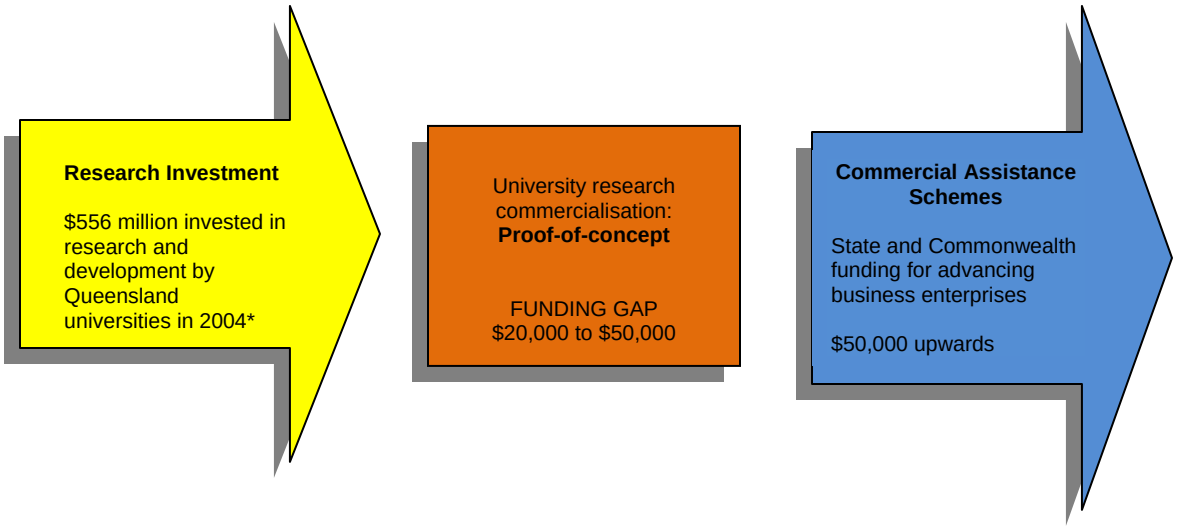


Figure 7 – The commercialisation continuum (early stage)

*Source: DEST (2007) National survey of Research commercialisation Years 2003 and 2004

Commercialisation grants available to Queensland research and industry		Public/private sector	Comparison with proof-of-concept
Innovation Start Up Scheme (Qld)[34]	Funding assists in prototype and product development and testing. Provides limited funding for the commercialisation of new technologies. $50,000 - $85,000 matched on an 80:20 (govt:bus) basis.	Private sector only (researchers can commit to forming a company and retain eligibility)	Limited proof-of-concept. Funds are only granted on the strong expectation of success, undermining one of the central aspects of the proof-of-concept rationale: that a proof-of-concept fund be used to determine the commercial viability or non-viability of a product, process or idea. Funding only begins at $50,000.
Commercial Ready Plus (C'wealth)[35]	For R&D, proof-of-concept and 'early commercialisation support' Matched grants are for $50,000 to $250,000 One aim of Commercial Ready is to foster collaboration and cooperation between businesses and/or researchers through collaborative projects. Collaborative projects may involve any number of entities participating in the project.	Private sector only (public sector spin-off companies are accepted)	Limited proof-of-concept. In the case of Commercial Ready Plus, as the funds are only available to companies (including public sector spin-offs), researchers and research institutions must create their company prior to undertaking the task of ensuring that the company will be commercially viable. Funding only begins at $50,000.
ARC Linkage Grants (C'wealth) [36]	The Linkage Projects scheme supports collaborative research and development projects between higher education organisations and other organisations, including within industry, to enable the application of advanced knowledge to problems. The ARC offers postgraduate awards and fellowships to provide industry-oriented research training and enable postdoctoral researchers to pursue internationally-competitive research opportunities in collaboration with industry.	Collaborative	Proof-of-concept is a valid basis for Linkage grants however there must be a collaborating partner contributing funding to the project. This is often unrealistic for early stage university-based projects.

Figure 8 – Existing proof-of-concept programs

34 http://www.qld.gov.au/grants accessed October 2007.

35 http://www.ausindustry.gov.au/content/azindex.cfm accessed October 2007.

36 http://www.arc.gov.au/ncgp/lp/lp_default.htm accessed October 2007.

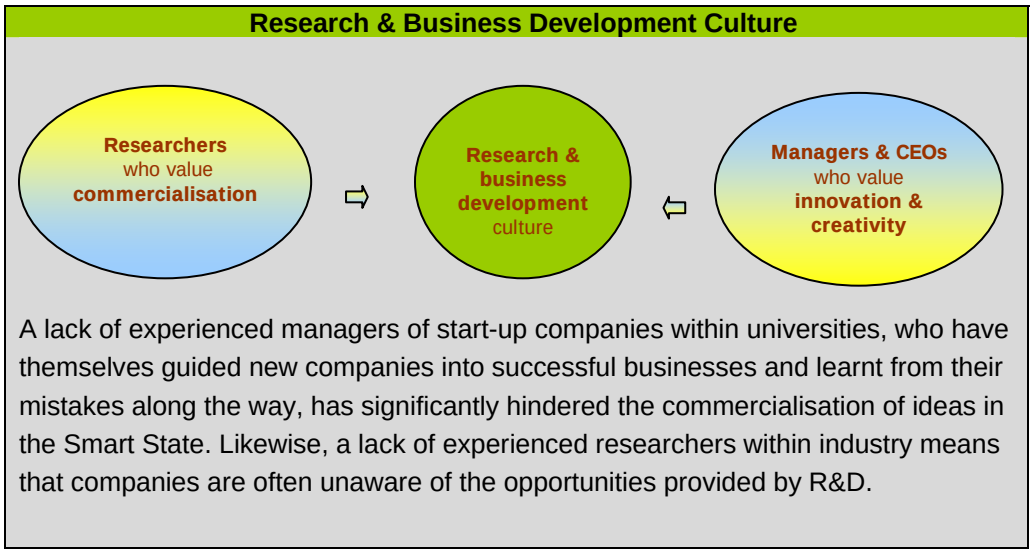
4.4 Conclusion

A critical gap impacts the commercialisation rate in Queensland at the 'proof-of-concept' stage, preventing research organisations from demonstrating investment readiness to potential investors.

A proof-of-concept co-investment fund will help create the synergies necessary for a new research and business development culture in Queensland. Proof-of-concept co-investments will also facilitate the fusion of a new research and business development culture by 'pushing' more commercially viable research out of the higher education sector.

5.0 KEY FINDING 3

Queensland lacks experienced start-up managers and commercialisation skills.



A lack of experienced managers of start-up companies within universities, who have themselves guided new companies into successful businesses and learnt from their mistakes along the way, has significantly hindered the commercialisation of ideas in the Smart State. Likewise, a lack of experienced researchers within industry means that companies are often unaware of the opportunities provided by R&D.

Queensland needs a critical mass of people with the skills to nurture research brilliance into commercial success because, more than anything, a research and business development culture requires the active participation of skilled people. It needs willing researchers who value commercialisation and representatives from industry who understand the benefits of innovation and creativity for their businesses. Individuals with the skills and experience to turn knowledge and ideas into viable products and processes are also required.

4.1 Commercialisation Fellows

The Queensland Government offers Smart State Fellowships under the existing Innovation Skills Fund. Fellowships provide funding for outstanding early and mid career researchers to undertake innovative research in a Queensland university, research institute, government agency or industry research facility.[37]

Currently, there are 'Level 1' and 'Level 2' categories:

37 http://www.dtrdi.qld.gov.au/dsdweb/v3/guis/templates/content/gui_cue_cntnhtml.cfm?id=41172

- Level 1 Fellowships - $100,000 per annum for three years for mid-career researchers
- Level 2 Fellowships - $50,000 per annum for three years for early career researchers.

Queensland needs researchers who also connect with business skills. Entrepreneurs-in-Residence based at a Queensland research institution could act as the CEO for one or more start-ups on campus or within an Institute providing hands-on courses for graduate students and staff on how to use their knowledge to establish commercial ventures.

> *Innovations are highly portable, whereas entrepreneurship is place-based. Whether they are building new firms or reinventing existing ones, entrepreneurs, through application of new ideas to products and services, capture locally the economic benefits of innovation.*[38]

Queensland needs businesses that value research. Researchers-in-Residence based within an industry could help firms appreciate the benefits to be derived from undertaking or contracting research. Co-investments from industry could be used to buy-out the teaching time of the researcher, or allow the researcher to work on a project within the industry on a full-time or part-time basis.

Commercialisation fellows would help activate a research and business development culture in Queensland by:

- building and nurturing the necessary cross-cultural skill base across industry and research
- building collaborative networks and strategic links between research and industry
- placing experienced entrepreneurs in the heart of research institutions to inform and mentor research and commercialisation staff
- placing business-savvy researchers in the heart of business to inform industry of the benefits of research, and of ongoing relationships with research institutions

38 Advanced Research Technologies (2005) *The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development*, op cit, p.5.

- communicating to industry and the general public the importance of industry-relevant research outcomes as a central platform of the Smart State's research agenda.

The Smart State Council report *Business investment in research and development in Queensland- including access to capital* noted that:

> *Awareness, understanding and access to R&D management skills is a critical issue for firms in both existing and emerging industries.….Generally, firms in existing or mature industries have commercial and managerial skills but lack R&D receptiveness. This refers to the capacity of firms to understand and use R&D to strengthen firm and industry competitiveness….In emerging industries, the situation is reversed, with firms possessing strong R&D skills but limited managerial and business development abilities.*[39]

4.2 Cross-Fertilising Research and Industry

A research and business development culture requires mechanisms to teach, train and transfer knowledge and expertise to kindred spirits and the next generation; the importance of networking cannot be exaggerated.[40]

> *Entrepreneurs seem most open to learning from others who have encountered, or are encountering, similar obstacles.*[41]

Queensland needs to give our researchers and industries access to the people who know, and who have travelled the road of commercialisation. The commercialisation fellowships will give Queensland's up-and-coming entrepreneurs access to the experience and mentoring they need. Placing experienced entrepreneurs in research institutions, and business-savvy researchers in industry, will create the critical mass of skilled people to underpin a rich new research and business development culture.

4.3 The Importance of Management in the Investment Cycle

Start-up companies need the management skills of experienced CEOs but cannot find, or cannot afford, them. These skills are especially important because start-ups need to have a good management team in order to secure the private-sector funding needed to take them out of the grants cycle.

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39 Smart State Council Report: *Business investment in research and development in Queensland- including access to capital.* http://www.smartstate.qld.gov.au/partnerships/ss_councilreports.shtm

40 Resource Guide to Technology-based Economic Development, op cit, p.7.

41 ibid.

Once a company has a good idea, and has proven the commercial potential of that idea, it needs to attract investment. Experienced management that knows how to grow early stage companies through the unique challenges of the start-up phase is cited widely as critical in attracting capital investment from venture capitalists and angel networks. A report commissioned by the US Department of Commerce which 'tapped the experiences of practitioners who have designed and managed successful programs', noted:

> *the most critical need cited by most officials interviewed for this report was experienced management talent. Given the availability of technology and capital, management talent is seen by many of the practitioners as the most important single, determining factor to successful commercialisation and enterprise creation.*[42]

Investors in start-up companies need to know that the money they invest is in experienced hands. Investment decisions at the very early stages of company development are high-risk because of the large failure rate of start-up companies. Experienced management gives investors the confidence needed to buy into such early stage companies. In a recent study commissioned by the Federal Department of Industry, Tourism and Resources, 67% of angel investors surveyed stated that management was the '*most important factor in assessing an investment*'.[43]

42 Resource Guide to Technology-based Economic Development, op cit, pp 32-33

43 Michael Vitale et al (2007) *A Study of the Business Angel Market in Australia,* op cit. p.30.

4.4 Comparing the Smart State Commercialisation Fellows with Existing Grant Programs

There are no comparable programs to the commercialisation fellows on offer; see Figure 9.

Grant detail		Research or industry focus	Comparison with commercialisation fellowships
Innovation Skills Funds (Qld) [44]	An investment by the Queensland Government to attract and retain top researchers and PhD students in strategic priority areas to Queensland.	Research	These funds are targeted at the attraction of quality researchers to Queensland only.
Intermediaries Access Program (C'wealth)[45]	Trusted third parties to bring together researchers and small/medium enterprises. Aims to increase the number of companies collaborating to access the skills/technology/knowledge needed to innovate and sustain business growth.	Industry - focus on connecting SMEs to intermediaries, who will then connect to researchers or other businesses	These funds are primarily focused on company collaborations.
Building Entrepreneurship in Small Business Program (C'wealth)[46]	Includes training and mentoring projects to deliver entrepreneurially-focused business skills development. For the purposes of Building Entrepreneurship in Small Business, a mentor is an experienced and successful businessperson who is willing to share his/her expertise and contacts with less experienced businesspeople. Mentoring may involve the provision of one-to-one support or group mentoring, or the use of novel approaches to applying mentoring techniques to assist small business owners and/or managers in applying skills learnt to their personal business situation, particularly in developing capacity for entrepreneurial growth of the business.	Industry – small business	These funds are only accessible by small business, or for organisations that deliver services to small business.

Figure 9 – available grants compared to commercialisation fellowships

44 http://www.dtrdi.qld.gov.au/dsdweb/v3/guis/templates/content/gui_cue_cntnhtml.cfm?id=41172 accessed October 2007.

45 http://www.ausindustry.gov.au accessed October 2007.

46 http://www.ausindustry.gov.au accessed October 2007.

4.5 Conclusion

Queensland has a critical lack of people who have the necessary commercialisation skills to nurture ideas into companies, and companies into successful businesses. Introducing commercialisation fellows would help to activate a research and business development culture in the Smart State by giving those Queenslanders who want to take their research or business to the next level access to the people who can help them achieve their goals.

6.0 KEY FINDING 4

Research capabilities of the university sector are under-utilised by Queensland business and industry

Business & Industry

A cultural divide exists between Queensland's business and university sectors. Anecdotal evidence suggests that most businesses are yet to approach researchers for innovative solutions to their business needs; there is a cultural disconnect between the two.

A mechanism is needed to provide an incentive to that portion of the business community willing to engage with the research sector.

Firms do not innovate or make money in isolation.[47]

Queensland industries need to better engage our research sector. Through the *Smart Queensland: Smart State Strategy 2005 – 2015* the Queensland Government has committed itself to '*stimulating industry inventiveness and commercial capacity to deliver new products, services and processes for Queenslanders and to achieve greater success in the global marketplace*'.[48] One mechanism to help achieve this goal is to focus the attention of business on the benefits to be gained from forming ongoing relationships with Queensland's public research sector.

47 Scott-Kemis, D. et al (2005) *No Simple Solutions: How Sectoral Innovation Systems can be Transformed*, Australian National University, p.4.

48 Queensland Government (2005) *Smart Queensland – Smart State Strategy 2005-2015*, p.22.

5.1 Queensland Sectoral R&D Booster

The Queensland Government needs to boost sectoral R&D in industries considered critical to the future prosperity of Queensland.

> *Globalisation means sectoral transformation in Australia is increasingly determined by international events.*[49]

It is important that any measures in this area leverage co-investments from other sources. Boosting Queensland industries' R&D spend, by sector, could be achieved, for example, by funding a full-time 'Industry Research Facilitator' to:

- liaise across the industry to plan and 'project manage' R&D projects
- leverage R&D funds spent across the industry to maximise research outcomes and reduce duplication by coordinating with other Industry Research Facilitators
- ensure R&D is market-driven and industry managed
- build the value chain
- develop a mid-term technology roadmap that charts generic science and technology needs that the firms share.

Boosting Queensland's sectoral R&D spending in these ways would 'pull' research out of Queensland's institutions into industry and help activate a research and business development culture in Queensland by:

- building collaborative networks and strategic links between industry on a sector-by-sector basis, and between industry and research on a contractual basis
- ensuring a good 'research experience' for industry by requiring that the research conducted is industry-relevant, placing management of the research in the hands of industry-appointed project managers, and payment for contracted research on the achievement of industry-set milestones
- creating research facilitation skills in Queensland's priority industry sectors

49 Scott-Kemis, D. et al, op cit, p.5.

- providing an incentive for Queensland's industry sectors to think strategically for the good of the sector and to collaborate on strategic research on a (government priority) sector-by-sector basis

- encouraging recognition within Queensland's industry sectors that there can be collaboration by sector on broad strategic issues in the face of active competition on other levels

- helping Queensland's industries to remain competitive in an increasingly globalised economy by working more efficiently together.

5.2 A Sectoral Strategy

> *The literature on innovation makes it clear that the characteristics of innovation vary substantially from one industry sector to another.*[50]

Queensland's industries will be at different stages of innovation adoption or diffusion at any given time. Sectors will also have differing research needs. Adopting a sectoral strategy in this environment means that industries can use the booster to help them with their unique needs at whatever stage of the innovation–adoption process. This will maximise the benefits of the policy for business and will help to increase the capacity of industry to drive Queensland's economy.

A sectoral approach will also help business to remain competitive. The pressures of globalisation mean that Queensland's industries are facing new challenges and needing innovative solutions, at an ever-increasing rate. Businesses increasingly need to interact with suppliers, customers and competitors outside their traditional markets.[51]

Companies are also under increasing pressure to specialise, to find their niche. This means increasing their 'depth of knowledge' and also, importantly, their sectoral collaboration.

> *This ongoing pressure to innovate and specialise means innovation policy is increasingly important for the future economic wellbeing of a nation. Public policy on innovation should maintain such pressure.*[52]

Real value can be gained by increased sectoral research collaboration. Programs such as the Rural Research and Development Corporations, which have successfully

50 Scott-Kemis, D. (2005), op cit, p.27.
51 ibid, p. 4.
52 ibid, p. 27.

operated federally since the 1980s, demonstrate the value of business working together on a strategic sectoral level to solve industry-wide issues, even while competing in the open marketplace.[53]

5.3 Industry Owned and Managed Research

To maximise the development of a research and business development culture in Queensland, industry groups should be encouraged to invest in collaborative research through Queensland research institutions. This research should be facilitated through a program that provides the industry group with the responsibility to manage the research program. Payments for research undertaken should be authorised by the industry group, ensuring that the project is completed to their satisfaction prior to payment. The industry needs to manage and 'own' the research.

5.4 Existing Programs in this Space

Grant detail		Research is driven by:	Comparison
Innovation Projects Funds (Qld): National & international research alliances[54]	Intended to fund collaborative projects that build on Queensland's national and international alliances.	Collaborative: Queensland-based entity and a national or international partner.	Not intended to boost industry sector productivity or innovation. Not intended for industry to drive research agenda.
Innovation Projects Funds (Qld): Research-industry partnerships program[55]	Will fund collaborative 'near to market' research programs between research and industry.	Collaborative: Must include a research organisation and a industry/private sector organisation.	Not intended to boost industry sector productivity or innovation. Not intended for industry to drive research agenda.

53 http://www.rirdc.gov.au accessed October 2007.
54 http://www.sd.qld.gov.au accessed October 2007.
55 ibid.

Industry Cooperative Innovation Program (C'wealth): Stream A[56]	Small-scale cooperative projects aimed at identifying the strategic planning of future innovation in an industry, such as project scoping or innovation mapping. Stream A projects can be used by an industry to determine broad industry needs and specific strategies that might then lead to a Stream B strategic cooperative innovation project. It is intended that some Stream A projects will provide a basis for developing a quality Stream B project. Stream A projects should have beneficial outcomes for an industry, independent of a Stream B project. $50,000-$150,000.	Collaborative: Three entities including at least two Australian businesses.	Aimed at a national industries. Projects must show national benefits such as improvements in national productivity and economic growth and enhanced international cooperation. Projects need to scope the Australian industry including its international context. Applications must canvas the views of the industry Australia-wide prior to funding approval.
Industry Cooperative Innovation Program (C'wealth): Stream B[57]	For more extensive cooperative projects aimed at progressing strategic innovation and achieving significant benefits for an industry, such as research and development (R&D), proof-of-concept, implementation activities and demonstration and adaptation. $50,000-$3M.	Collaborative: Three entities including at least two Australian businesses.	Aimed at a national industries. Projects must show national benefits such as improvements in national productivity and economic growth and enhanced international cooperation. Projects need to scope the Australian industry including its international context. Applications must canvas the views of the industry Australia-wide prior to funding approval.
Techfast (Qld; C'wealth)[58]	Helps companies identify new partners that can provide access to useful technologies, processes and knowledge to improve business performance and productivity Helps assess the potential value of projects, develop project plans, formalise partnerships, access direct funding support and project manage collaborative endeavours. Provision of funding support of up to $50,000 per company.	Collaborative: coordinated by the Australian Institute for Technology.	Not designed for industry sector-wide programs.

Figure 10 – Available grants

56 http://www.ausindustry.gov.au accessed October 2007.

57 Ibid accessed October 2007.

58 http://www.ausicom.com accessed September 2007.

5.5 Conclusion

Queensland's businesses under-utilise the skills, knowledge and abilities of our public research sector. In order to help Queensland's industries stay competitive, the Smart State needs to boost business research and development on a sectoral basis.