



Group of Eight

AUSTRALIA'S LEADING UNIVERSITIES

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Group of Eight submission to the House of Representatives Standing Committee on Science and Innovation inquiry into pathways to technological innovation

Introduction

The Group of Eight (Go8) is pleased to be able to provide the committee with a brief submission to its inquiry into pathways to technological innovation. This submission provides:

- background information about the commercialisation of knowledge by Australian universities
- information about R&D commercialisation trends across the Go8 and examples of successful commercial outcomes from member universities
- opinions about the key factors to successful commercialisation and technology transfer outcomes from university research and
- suggestions about policy approaches likely to enhance the impact of the innovative ideas and inventions being developed in Australian universities.

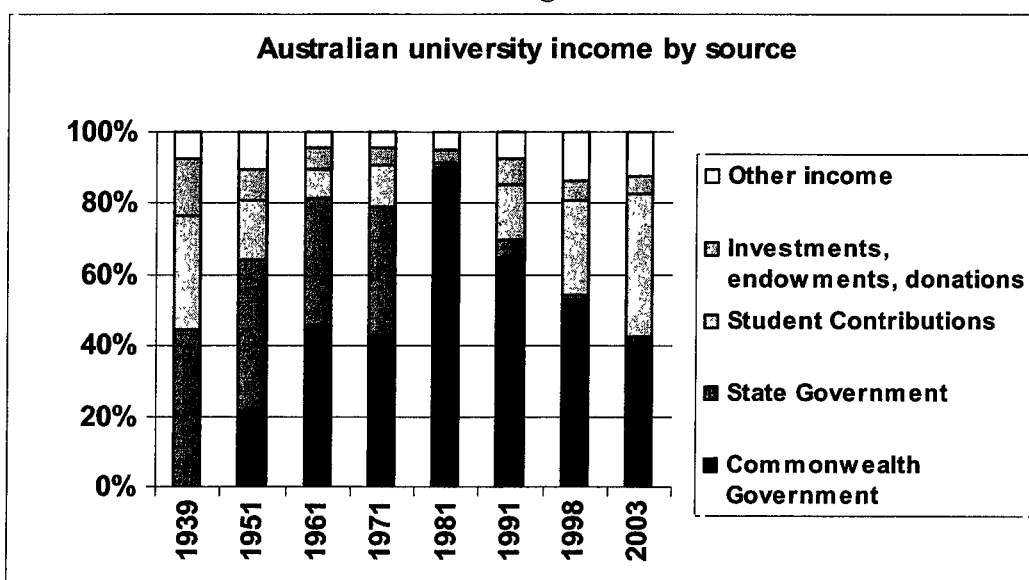
The Go8 universities are keenly aware of the evolving expectations of governments and the public about the role universities should play in an increasingly global knowledge-based economy. While Go8 universities retain their traditional roles as centres of quality teaching and research, they are playing increasingly important roles in transferring technological knowledge, skills and innovations for public and private benefit. If the committee would like further input from the Go8 about the specific issues raised in this submission we would be happy to arrange for senior representatives of our member universities to appear before the committee.

Background

A fact often overlooked in discussions about the funding of Australia's universities is just how 'commercial' they now are compared to twenty five years ago. As **Figure 1** below demonstrates, in 1981 Australian universities received almost 90 per cent of their income from government sources, yet by 2003 this figure had declined to less than 43 per cent. This rapid shift has been largely due to the introduction of the Higher Education Contribution Scheme (HECS) in 1989, a relative decline in government investment and increased income received by universities from international students, commercial activities and endowments. The Productivity Commission has recently predicted that the shift from 'public' to 'private' funding of Australia's universities is set to continue and has estimated that by 2044-45 they will receive only 34 per cent of total revenue from government sources. (Productivity Commission 2004:9.11) Some Go8 universities already derive

less than 40 per cent of their income from public sources.

Figure 1



(Gallagher 2000:5) & (DEST: 2003)

Table 1 below summarises the recent revenue trends for Australia’s universities between 2001 and 2003 and provides a context for discussion about the commercialisation of university R&D activities. In 2003 Australian universities declared \$2.7 billion in revenue from fee-paying domestic and international students and \$635 million from consultancy and contract activities. These revenues compared to just under \$35 million in income declared from activities directly related to the commercialisation of research. These figures are provided to illustrate that there are a variety of areas from which universities receive significant commercial income streams. Many of these carry less financial risk for universities, promise better return-on-investment outcomes and are aligned more closely to the ‘traditional’ or ‘core’ missions of universities than the commercialisation of research.

It is important, therefore, that discussions about pathways to technological innovation in the university context do not rely on too narrow a definition of ‘commercialisation’. The plurality and complexity of the mechanisms through which universities generate economic benefits are issues which have been the subject of a recent consultancy commissioned by the Department of Education Science and Training (DEST). The study, undertaken by public policy consultants Howard Partners and released in April 2005, proposed a more comprehensive and realistic framework for understanding research commercialisation and knowledge transfer. Based on an examination of the full range of knowledge diffusion, production, relationship building and engagement activities of universities, the study concludes that recognition by policy-makers of the diversity of ways by which universities contribute to the economy will: ‘create the conditions for richer and more powerful economic (and social) impacts.’ (Howard 2005) Another DEST study undertaken by in 2003 concluded that even the world’s leading commercialising universities only generate between 3 and 5 per cent of total revenues from research commercialisation activities. (Australian Centre for Innovation et al 2003:4)

Table 1
Total revenue from ordinary activities for Higher Education

Revenue source	2001		2002		2003	
	(\$'000)	%	(\$'000)	%	(\$'000)	%
Cth funding	4,470,211	43.7	4,734,416	42.18	4,898,860	40.91
State Gov. funding	177,981	1.73	219,611	1.96	201,694	1.68
HECS	1,771,162	17.4	1,833,589	16.34	1,917,206	16.01
PELS + BOTPELS	-	-	106,061	0.94	178,950	1.49
Student Fees & Charges	2,020,661	19.7	2,364,705	21.07	2,704,667	22.59
Investment Income	302,641	3.0	205,486	1.83	321,786	2.69
Consultancy and Contract Research	494,455	4.7	456,805	4.07	635,541	5.31
Other income	964,989	9.5	1,303,036	11.61	1,114,926	9.31

(DEST 2001–2003)

Leading the way in the commercialisation of R&D

To place the Go8 universities in context within the sector, in 2003 member universities accounted for:

- 46 per cent of overall Commonwealth Funding but around 70 per cent of competitive research grant funding
- 31 per cent of HECS income
- 41 per cent of income from student fees and charges
- 63 per cent of the consultancy and contract research earned by Australian universities
- 73 per cent of income from investments and
- 56 per cent of income from royalties, trademarks and licences. (DEST 2003)

A greater emphasis on technology transfer over the last 5-10 years has resulted in positive trends in commercial outcomes from R&D across the Go8. For example, analysis of the National Survey of Research Commercialisation shows that over the period 2000 to 2002 inclusive, Go8 universities:

- almost doubled the number of staff employed in dedicated commercialisation roles
- saw licence income double from \$16.5 million in 2000 to \$37.25 million 2002
- executed over 400 commercial agreements based on their research activities
- announced more than 300 inventions a year
- filed over 300 patent applications a year in Australia and the United States
- had on average 100 patents issued a year
- established more than 20 start-up or spin-off companies each year. (DEST 2004)

This improving performance was highlighted in a report on best practice processes for university research commercialisation completed for DEST in 2003 which concluded, among other things that:

Australian universities have significantly strengthened their research commercialisation capabilities and performance in the past five years. The research-intensive universities (predominantly the Go8) display a level of performance well above the average of American universities, and approaching that of the highest performers in America and Europe. However there is great

variability in performance. (Australian Centre for Innovation et al 2003:4)

In terms of performance against the specific indicators reported in the commercialisation survey, in 2002 Go8 universities accounted for:

- 65 per cent of research expenditure in the sector
- 47 per cent of commercialisation staff employed
- 67 per cent of invention disclosures
- 75 per cent of patent applications filed
- 75 per cent of patents issued
- 78 per cent of licence income and
- 67 per cent of start-up companies formed. (DEST 2004)

One of the problems in analysing trends in research commercialisation is that what data are available are highly dated. The Go8 is confident, however, that its member universities have continued to build on these successes over the last two and half years.

Attachment A provides brief details of a selection of companies actively commercialising technologies developed in Go8 universities. Further details about the strategies for success being implemented by these companies may be obtained directly from them.

Key factors and challenges to successful commercial outcomes from university R&D

Funding for research commercialisation activities

Australian universities currently receive public funding to support their traditional responsibilities of teaching, learning, research and research training. They do not receive dedicated funding to support research commercialisation activities. This means that funding for commercialisation activities must be sourced from discretionary revenues and judged against other spending priorities. While some funding targeted at research commercialisation is available under the Commonwealth's Commercial Ready Program, the focus of this scheme is on assisting the private sector. Universities and their commercial companies are ineligible for assistance under the Commercial Ready Program.

As demonstrated above, despite a lack of funding dedicated to support research commercialisation activities, Go8 universities are achieving solid results. Current commercialisation performance indicators do, however, suggest that in some areas the average performance of Australian universities lags behind that of universities in the United States, Canada and the United Kingdom. Establishing a separate source of public funding to support the commercial activities of universities would enable Australian universities to more quickly bridge the gap. One example of this type of 'third-stream' funding at work is the United Kingdom's Higher Education Innovation Fund which provides \$270 million annually for universities to build their capacities for knowledge transfer.

Time & risk of failure

While there are exceptions, as a general rule the research commercialisation process is long, costly and slow. It can take ten to fifteen years or more to get a new discovery or invention to the stage where it produces commercial returns. For every success story there will inevitably be many failures. For example, of the 850 invention disclosures Yale University made between 1982 and 1996, 1 per cent produced 70 per cent of revenue, 4 per cent accounted for 90 per cent of revenue, while 88 per cent of disclosures failed to cover their management costs. (Australian Centre for

Innovation 2003:14)

Just as it takes time for individual discoveries or inventions to deliver results, it takes time for research commercialisation offices to build up expertise, expand their patent portfolios, develop links with the financial markets and industry and manage projects through the commercialisation process. The length of time between discovery and commercial return is particularly lengthy in the pharmaceutical field where clinical trials and other regulatory hurdles are mandatory. It is therefore essential that policy and funding settings for promoting the commercialisation of publicly funded R&D take a long-term view.

It is also important to note that investment in commercial activities by universities must comply with strict internal and external financial management and reporting requirement. These processes are designed to assure funding agencies and the public that resources are being allocated responsibly and in accordance with the guidelines for each particular program. The high-risk nature of investing in commercial activities means that there is often conflict between the expectations governments have about the commercialisation of university R&D and the prudential environment in which universities operate. This conflict would be removed if governments matched their enthusiasm for improved commercial outcomes with funding targeted for this purpose.

Scale

As the Yale University example demonstrates, hugely profitably research commercialisation ventures are few and far between. Effective commercialisation of research, therefore, depends on the existence of a large portfolio of research, coupled with adequately resourced and sufficiently skilled commercial operations. Many smaller Australian universities do not have the critical mass of research upon which to base a successful commercial operation and examples of collaboration between institutions to build critical mass and share expertise are increasing. For example, some Go8 universities are already partnering with smaller universities to assist with their commercialisation operations. Measures to further encourage this sort of collaboration would be welcomed.

Culture of entrepreneurialism

Recent years have seen an increasing awareness within Australian universities of the importance of entrepreneurship to technological innovation. There has been particularly strong growth in subjects in entrepreneurship directed at students in science, technology and engineering as well as management. The great majority of university researchers are keenly interested in seeing the full potential of their research realised. However, researchers face many demands on their time ranging from teaching, supervising students, managing staff and finances, communicating the results of their work through publications and other mechanisms and applying for funding to support their research activities. Programs designed to enhance researchers' commercial skills and tax and other policies offering incentives that encourage researchers to pursue commercial outcomes do have positive results and should be encouraged.

Resources to attract and keep appropriately experienced commercial staff

This issue is directly linked to the overall financing of university commercialisation offices. Commercialising research is complex and demanding process, the management of which requires highly skilled staff with strong commercial backgrounds. Skilled commercial managers are highly sought after internationally and are expensive to both attract and keep. Unless adequately resourced, university commercial offices will struggle to employ the calibre of staff required to deliver on the commercial potential of their patent portfolios. The pool of available talent in

Australia is relatively small so superannuation, tax and immigration policies that make it easier to attract top talent from overseas are desirable.

Incentives for business to invest in R&D

As the committee confirmed in its 2003 Report *Riding the Innovation Wave: The Case for Increasing Business Investment in R&D*, the level of business investment in R&D in Australia remains significantly below the OECD average. In most other OECD countries business investment represents a far greater proportion of overall investment in R&D than in Australia and has been growing at a faster rate. Fiscal incentives for private R&D are provided by all leading R&D nations. Policies to encourage greater private sector investment in R&D will have positive flow-on effects for commercially focused R&D in Australian universities and inevitably lead to enhanced linkages between the sectors.

Stable Intellectual Property laws and policies that promote technology diffusion

The ownership, protection and exploitation of intellectual property (IP) rights is vital to successful research commercialisation, but it is also important that there is legal clarity about what level of experimentation can be conducted on and around ideas and inventions without infringing on patented rights. Through the Australian Research Council a set of National Principles of IP Management for Publicly Funded Research has been adopted to ensure publicly funded research organisations have access to the best practices for the management of IP. Nevertheless, many different models of IP management are being applied by Australian research organisations with varying results. There may be value in investigating more uniformed approaches to IP ownership, transactions and licensing in Australia to encourage greater technology diffusion.

Collaboration between universities, business and industry

Improving links with business and industry remain ongoing priorities for Go8 universities. For example, in June 2004 the Go8, together with the Business Council of Australia sponsored a visit to Australia by Richard Lambert, author of a landmark review of Business/University Collaboration for the UK Government in 2003. The Go8 would strongly support programs designed to further improve engagement between universities and business and particularly small and medium enterprises which are typically the drivers of economic growth in the Australian economy.

Support for international engagement and networking on commercialisation policy and practice

In 2004 the Go8 established the Group of Eight Australian Centre Europe in Berlin. The purpose of the Centre is to maintain a network of strategic alliances between Go8 universities and European universities, research organisations, governments and commerce by:

- delivering direct benefits to Go8 universities in terms of new research, educational, commercial and cultural opportunities in Europe
- strengthening the Australian national relationship with European countries through high-quality educational, research and cultural activities
- serving the interests of all Australian universities by developing a strong presence for Australian education in Europe
- working with the international offices of Go8 universities to facilitate the marketing of courses and study opportunities to European undergraduate and postgraduate students
- developing Go8 Alumni networks in Europe.

Publicly funded research organisations in developed countries around the world are grappling with the same challenges in commercialising the outcomes of their research as those in Australia. The Go8 sees much to be gained through resources being made available for Australian researchers and

commercial managers to engage regularly with commercialisation experts from overseas and particularly in the United States and Europe. The Go8 Centre in Berlin is well placed to play an active role in developing such linkages in Europe.

Conclusion

Australian universities are highly commercial entities, deriving income from a variety of public and private sources in a highly competitive environment. It is important that discussions about technology transfer consider the full range of ways by which universities transfer knowledge for economic and community benefit. Work recently undertaken for the Department of Education Science and Training by public policy consultants, Howard Partners, makes a useful contribution to the debate in this regard. While there is considerable variability in the research commercialisation performances of Australian universities, the outcomes are improving with Australia's leading commercial universities (predominantly within the Go8) already achieving outcomes approaching those of the highest performers in America and Europe. The Go8 is confident that the commercialisation strategies member universities are implementing will continue to build on the many successes achieved so far.

This submission has provided brief details about a number of start-up companies currently commercialising research originating in Go8 universities. Each of these could provide the committee with valuable information about the key ingredients to commercial success and the committee is encouraged to conduct them directly. While the Go8 is proud of the commercial outcomes already achieved by member universities, the scale and speed of these results could be significantly enhanced if greater government support was provided for the research commercialisation functions of Australia's universities. Under current funding arrangements many universities are unable to resource their commercialisation functions at internationally competitive levels. The UK's Higher Education Innovation Fund is a good example of this type of 'third stream' funding at work. Policies targeted at addressing the other key factors and challenges to success identified are also likely to deliver improved commercial outcomes.

Attachment A

A selection of start-up and spin-off companies actively commercialising research and discoveries that originated in Group of Eight universities.

Australian Grain Technologies Pty Ltd, <http://www.agwine.adelaide.edu.au/research/agt/> (Adelaide)

An innovative grain breeding company focused on the breeding of agricultural plant varieties. AGT is committed to releasing only well-adapted varieties offering superior combinations of agronomic yield and grain quality characteristics.

Australian Centre for Plant Functional Genomics Pty Ltd, <http://www.acpfg.com.au> (Adelaide)

Combines genetic, physiological and developmental information with functional genomics to identify the genes in plants such as wheat and barley which control their adaptation to stresses such as salinity, drought and mineral deficiencies.

Reproductive Health Sciences Pty Ltd (Adelaide)

Established to develop and commercialise a diagnostic tool for determining chromosomal make up of single cells with applications in pre-implantation genetic diagnosis of embryos for IVF and prenatal diagnosis of chromosomal disorders such as Downs Syndrome.

Seeing Machines, www.seeingmachines.com.au (ANU)

An award winning technology company with a focus on vision based human machine interfaces. Formed in 2000, Seeing Machines' purpose is to commercialise its computer-vision IP across a range of industries and applications.

Dynamic Hearing Pty Ltd, www.dynamichearing.com.au/index.html (UniMelb)

Based in Melbourne, Dynamic Hearing is a spin-off company from the highly regarded Cooperative Research Centre (CRC) for Cochlear Implant and Hearing Aid Innovation. The company specialises in digital solutions for the aural world.

Prana Biotechnology Ltd, <http://www.pranabio.com> (UniMelb)

Is developing therapies for a broad spectrum of age-related diseases, based on technology arising from a series of discoveries about the causes of major age-related diseases. Its mission is to develop therapeutic drugs to treat the central disease pathways that cause degeneration of the brain and the eye as we age.

Chirogen Pty Ltd, www.chirogen.com (UniMelb)

A chiral chemistry technology company providing the pharmaceutical and fine chemicals industries with a novel, efficient and cost-effective alternative for the synthesis of pharmaceutical compounds.

Acrux Ltd, www.acrux.com.au (Monash)

Its core business is the development and commercialisation of its through-the-skin drug delivery technology originally discovered at Monash University.

Cortical Pty Ltd, www.cortical.com.au (Monash)

Develops small-molecule solutions to therapeutic targets in inflammation. Diseases as diverse as arthritis, psoriasis, asthma, multiple sclerosis and colitis are characterised by inflammation, and may be targeted with drugs from Cortical's R&D.

Metabolic Pharmaceuticals Ltd, www.metabolic.com.au (Monash)

Focuses on developing therapies for metabolic diseases with applications to large markets worldwide, including obesity and obesity-related diseases such as type 2 diabetes. The company is currently in the final phase of Stage II clinical trials on its anti-obesity drug, AOD9604, developed at Monash University.

Biosignal Pty Ltd, www.biosignal.com.au (UNSW)

Established to commercialise a proprietary technology based on antibacterial and antifouling compounds called furanones found in a seaweed indigenous to Australia's east coast. Biosignal furanones are naturally derived compounds that reduce a bacteria's ability to attach to innate surfaces such as pipes, ship hulls, membranes and medical transplants) and animate surfaces (such as lungs, skin and teeth).

Acyte Pty Ltd, www.acyte.com (UNSW)

A Sydney-based biotechnology company providing specialised development services for the international biopharmaceutical industry.

CBIO Limited, www.cbio.com.au (UQ)

A Queensland biopharmaceutical company established in 2000 to develop and commercialise treatments for inflammatory and autoimmune disorders.

Fultec Pty Ltd, www.fultec.com (UQ)

Has developed and patented the Transient Blocking Unit, or TBU, to protect communication system interfaces from voltage and current surges in telephone and data lines.

Xenome Pty Ltd, <http://www.xenome.com/> (UQ)

Xenome focuses on the discovery and development of new pharmaceuticals from the venom of Australian animals.

Nephrogenix Pty Ltd, <http://www.nephrogenix.com/> (UQ and Monash)

Is developing cell based therapies for kidney disease. Nephrogenix draws on Australia's research expertise in the fields of renal disease and cell and tissue based therapies.

Accumine Pty Ltd (Sydney)

Formed in 2002 to develop and manufacture devices for use in the mining industry using radar and laser technologies. With support and interest from major mining companies, Accumine seeks to add value through increasing production and levels of quality control in mines.

Glycemic Index Limited, <http://www.gisymbol.com.au/pages/index.asp> (Sydney)

A non-profit company established to run the GI Symbol Program. The Glycemic Index (GI) Symbol Program is a food labelling program that aims to help people make informed food choices by the use of an easily recognisable symbol on foods. The Glycemic Index is a ranking of carbohydrates based on their immediate effect on blood glucose (blood sugar) levels.

Medsaic Pty Ltd, email info@medsaic.com (Sydney)

Uses a protein nanoarray platform for the rapid diagnosis and discrimination of treatment selections for identified diseases. The first product is for the diagnosis of Leukaemia.

Advanced Powder Technology, www.apt-powders.com (UWA)

Has developed a new, low cost commercial process for the manufacture of 'nanopowders' which it claims are the finest powders in the world. APT's powders have many applications in the cosmetics and industrial coatings industries.

Inner Vision Biometrics Pty Ltd, www.ferriscan.com (UWA)

IVB's key asset is the FerriScan technology, an award winning magnetic resonance imaging (MRI) related technology for the quantitative measurement of liver iron levels. The FerriScan technology is non-invasive and machine independent and operates 'off-line' from the magnetic resonance imager. This allows it to be used on a global scale from a single analysis centre.

Cortec Systems Pty Ltd, <http://www.cortecsystems.com> (UWA)

An early stage telecommunications software solution provider that designs, develops and markets quality of service solutions for real time internet applications such as Voice over IP ('VoIP'). These solutions enable enterprises to enjoy the benefits of applications such as VoIP, without the associated problems and costs of poor voice quality and excessively complex network administration.

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