

Submission No. 34.....

**The Australian Science, Innovation and
Knowledge Commercialisation
Environment**

**A Background Paper for House of
Representatives Standing Committee on
Science and Innovation**

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THE SCIENCE, INNOVATION AND KNOWLEDGE COMMERCIALISATION ENVIRONMENT IN AUSTRALIA

Overview

The pressures for change towards increasing interaction between industry, universities and public research organisations is being driven by the emerging knowledge economy and related globalisation forces.

A number of recent government reports, policies and programs recognise this (see for example a selection of summaries at APPENDIX A).

For Australian universities and research organisations the pressures on funding that occurred from the early 1980's led to a greater awareness of the possibilities for commercial exploitation of invention through, firstly technology licensing, and more recently, spin-off companies. It has led to a greater focus on the outcomes of research.

This is a worldwide phenomenon.

For business, the shortening of the product development life-cycle and the competitive pressures of globalisation, meant that it had to look more broadly for new technologies. Few companies now retain in-house all of the necessary capacity and capability for innovation in their product areas.

Increasingly businesses are seeking linkages with publicly funded research, for access to well trained human resources and to new scientific knowledge to complement their own R&D efforts.

The development of clusters or networks of skilled people necessary to guide the individual business opportunity across the commercialisation gap is critical. The supply side based business intermediaries associated with research organisations must work diligently and closely with the demand side experts drawn from all facets of business, finance and industry to achieve improved commercialisation outcomes.

Commercialisation and venture formation are most vulnerable at the early stages during the transition from discovery (focus is on creativity) to establishing a business opportunity (focus is on cash flow and markets). Building the social capital and the trust between the individuals involved in effecting this transition is vital.

The main challenges faced by Australian research organisations and their business intermediary, commercial arms arise from the need to:

- effectively manage an extremely broad portfolio of opportunities and matching them to the needs of the next round of 'investors' along the value chain.
- source experienced management teams to meet the needs of commercialisation offices as well as a growing number of start-ups.

Thus commercial outcomes are likely to be enhanced across both public and private sectors by initiatives that focus upon:

- building business intermediary professionalism
- developing skilled management teams for new ventures
- expanding the investible deal flow at all stages from feasibility up to IPO
- accessing early stage investors
- developing strategic alliances that deliver market access

The output of new ventures and technology licensing from the public research sector will be assisted as its R&D programs progressively become more strategically aligned with the needs of industry sectors that reflect the economic strengths of Australia. Mechanisms like the CRC program, Rural Research Development Corporations, Commercial Ready Start Grants and Linkage Grants are excellent examples.

Better linkages with business professionals, investors and industry experts can help align new opportunities with global market access points. This is particularly important in Australia, where the local market for new services and products is small in relation to their global potential.

The overall challenge for governments at federal, state and local levels in Australia is to increase wealth and employment generation. Facilitation of effective engagement and closure of the commercialisation gap by encouraging productive collaborative activities that support sustainable networks across the commercialisation gap will help achieve that outcome.

In terms of building the national commercialisation and venture formation chain, what is required is encouragement of value adding initiate on a regional basis that create a critical mass of inter-linked professionals competent in commercialisation. The growth of regional commercialisation clusters that are inter-connected will provide the base for more efficient regional and national innovation system development. The development of a national long-term vision for the development of knowledge intensive industries based upon national bipartisan commitment at government level is required to facilitate this outcome.

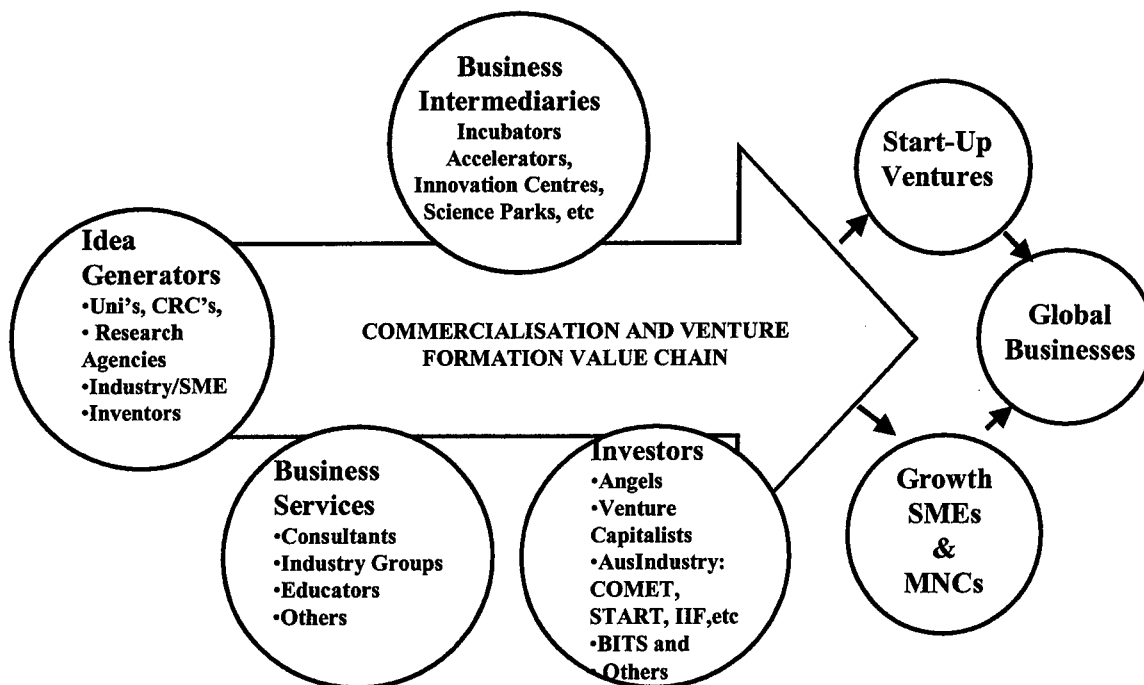
The Knowledge Commercialisation Value Chain

The knowledge commercialisation value chain serves as a platform for identifying and mapping the various organisations that represent the interests of groups involved in commercialisation. This provides a means of indicating their respective proximity and complementarity of their activities and where useful interventions to exploit synergies could be targeted.

This is demonstrated in Figure 1, which identifies the major groupings of:

- research/knowledge suppliers
- intermediaries and service suppliers
- business and industry
- investors

Figure 1: Commercialisation and Venture Formation Value Chain



The main participants within each group are:

Idea Generators - The research and development organisations including universities that create new knowledge through research programs. It also includes innovative SMEs and larger companies as well as individual inventors and entrepreneurs.

Business Intermediaries - The organisations that assist entrepreneurs take their ideas (relating to products, processes or methods) to market; via existing businesses or new ventures. They include business managers operating within accelerators, incubators and state and federal business support agencies, industry bodies, industry cluster groups, universities and research organisations.

Business Services - The knowledge base infrastructure of the education and training suppliers, specialist consultants, existing supply chains and channels to market. The suppliers of physical infrastructure that underpin industry and commercial development are also in this group.

Investors - The group of high net worth individuals, angel financiers, venture capital providers, banks and public funding organisations, as well as R&D funding and tax concession programs that may provide finance to support R&D, proof-of-concept and commercialisation.

The Commercialisation Gap

The complementary business opportunity development framework (see Figure 2) indicates the key phases in the transition of an R&D outcome through to a successful product introduction. It highlights the need for parallel development of the core elements of management, marketing, product/technology, finance and infrastructure/culture whatever the commercialisation pathway.

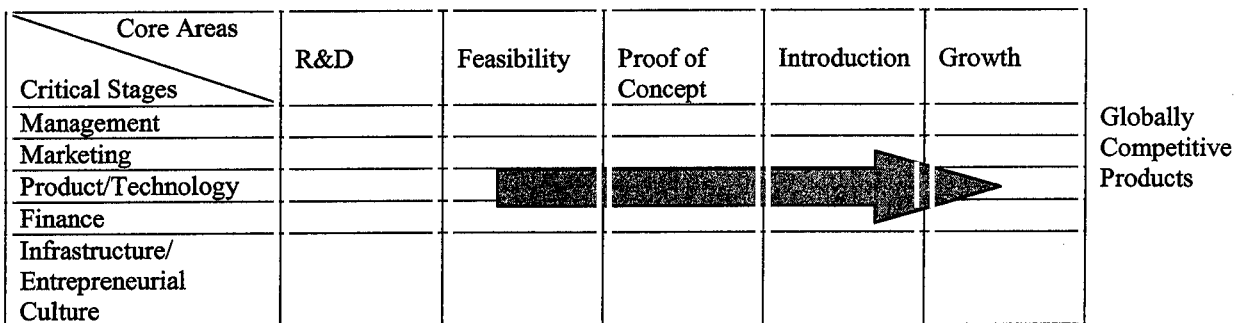


Figure 2: Business Opportunity Development Framework

Each new business opportunity progresses by being continually groomed for the successive rounds of investment, whether it be from corporates, angels, strategic allies, venture capitalists, trade sale or IPO.

On the supply side members of Knowledge Commercialisation Australasia (KCA) are central to the achievement of effective knowledge commercialisation outcomes from the university and public research sector in Australia.

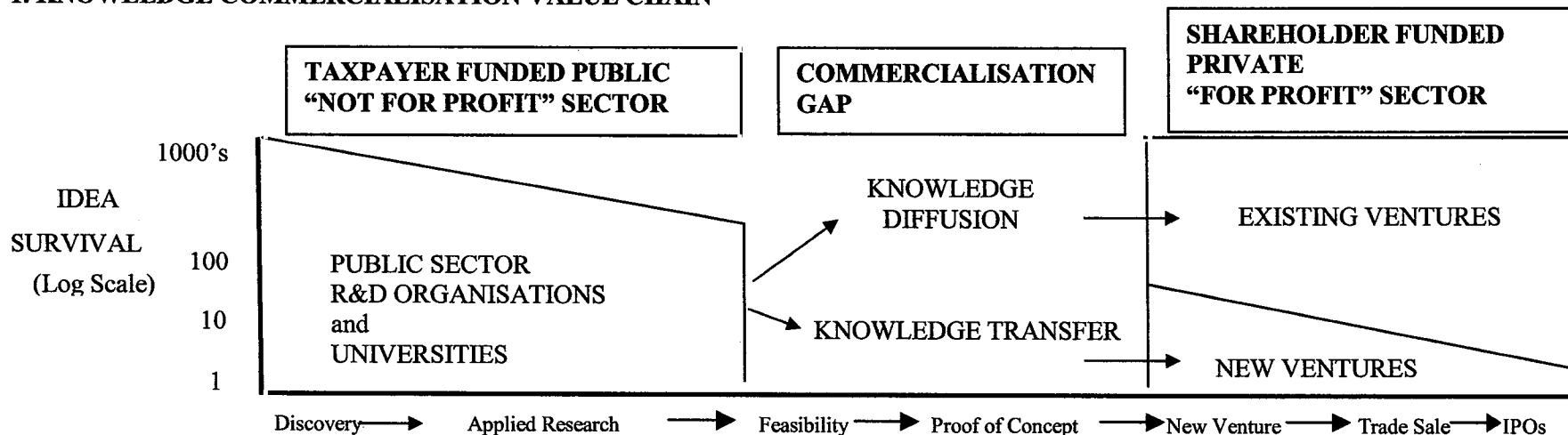
Members operate as deal makers and facilitators between the knowledge supply side and multiple groups of potential customers and service providers locally, nationally and internationally. KCA as an organisation therefore maintains an awareness of a large number of industry, professional, and government organisations and has already established communications and strategic alliances with a number of them.

In terms of KCA and its core activities at the knowledge commercialisation interface between researchers and business representatives – the so called “commercialisation gap” – the following map (Figure 3) provides an overview of the more important existing and some relatively new network organisations and their foci.

FIGURE 3: IMPORTANT COMMERCIALISATION NETWORKS/ORGANISATIONS

* Acronyms supplied at APPENDIX B, Section 4.

1. KNOWLEDGE COMMERCIALISATION VALUE CHAIN



2. EXISTING NETWORK/ORGANISATION POSITIONING FOCUS

Focus							
Management	ARMS	BHERT	CRCA KCA		TPIA, ANZABI		
	IMC, LES, AICD						
Technology	FASTS, AVCC, IE Aust, IMS, CSIRO, DSTO				IPA		
	GOS, ATN						
Market	AusBiotech AIIA						
Finance					BA	AVCAL	
	Discovery	Applied Research	Feasibility	Proof of Concept	New Venture	Trade Sale	IPOs

3. NEW NETWORK/ORGANISATION POSITIONING FOCUS

Focus							
Management	KCA, AIC, Venture Link, Warren Centre						
Technology	Innovation X Change, TechLink/AusIndustry, IPRIA						
Market	Triton Foundation, ANZATECH, AUSTRADE, AIF						
Finance	Pre-Seed Funds						
	Discovery	Applied Research	Feasibility	Proof of Concept	New Venture	Trade Sale	IPOs

Active Commercialisation Groups

The major existing organisations and their representative bodies from the public and private sectors along the value chain have some overlapping commercialisation interests as indicated below.

Segments	Organisations*	Benefits
Universities and Public Research Organisation	AVCC, CSIRO, DSTO	Commercialisation awareness Improved relations with private sector Alignment with economic development Greater returns of R&D and knowledge transfer
Private Sector	BCA, AVCAL, ACCI, AiG, AEEMA, AIIA, AusBiotech, ABL	Member access to technology services and R&D infrastructure Investment opportunities Skill/Knowledge formation alignment Increased relevance to members
Professional Bodies	AICD, LES, IMC, IEAust, FASTS	Introduction to new clients Technology access for clients Mentor opportunities for members
Government Sector and Other	IPA, IPRIA	Increased awareness of IP value and strategy
	BHERT	Achieve closer relations between Universities and Corporate sector

On the other hand, the network organisations that are located in the general proximity of the “commercialisation gap” are small and generally under resourced. These are the organisations whose members are most directly in contact with the majority of R&D conducted in Australia and responsible for achieving knowledge commercialisation outcomes.

They include:

- Knowledge Commercialisation Australia
- Cooperative Research Centres Association
- Australian Research Managers Society
- Business and Higher Education Round Table
- Australia and New Zealand Business Incubators Association
- Technology Parks and Incubators Association
- Australian Institute for Commercialisation
- Australian Innovation Exchange
- TechLink/AusIndustry
- Triton Foundation
- Warren Centre
- Australian Industry Research Group
- Group of Eight Universities
- Australian Technology Network
- Intellectual Property Research Institute Australia

These organisations and others are summarised at APPENDIX B to provide further insights into their operations and activity focus under the following headings:

- a) Organisation overview

- b) Activity Focus
- c) Value Chain Position
- d) Acronyms

Because knowledge commercialisation is a global industry with many of KCA's members involved in or seeking international business opportunities, it is also forging links with complementary offshore organisations. A number of these are listed in APPENDIX C with a general description of their activities.

Marketing Our Innovations – how can we do it better?

In a competitive global environment robust regional economies depend upon their ability to remain differentiated. Increasingly competitiveness is built on the strength of the interdependencies between key elements within the private, government and R&D/education sectors because they are not easily reproducible elsewhere. This provides the foundation for the regional innovation system.

R&D Strengths

Leading edge, world competitive R&D drives leading edge education and training which then attracts high calibre students and staff. This is further enhanced from an economic development perspective when private sector resources are intimately connected as suppliers and customers of that sector.

The R&D and higher education sector can operate to a degree independently of its regional location. Whilst it may supply graduate training, employment opportunities and consume local services, its total value is captured when productive interdependencies are developed within the community that build regional competitive advantage.

Co-location and concentration of science and technology infrastructure develops knowledge precincts. These are of great advantage and can provide the basis for significant connectivity benefits to the R&D and higher education providers.

Proximity factors in relation to access to unique facilities and to experts are also critically important to many early stage start-ups that have a strong technology base. This can be achieved by creating business start-up hatchery and incubator environments within the R&D institutions or the knowledge precincts.

Growing companies develop their own internal intellectual capital and asset base, but ongoing local relationships with leading centres of scientific excellence continue to provide a strategic advantage to them and to the regional innovation system. These growth companies also frequently spawn further business spin-offs that can be captured locally.

R&D supply side strengths are characterised by world competitive scientific leadership, leading edge equipment and facilities, integration with the higher education system, long-term participation in government program funding, balanced staff profile (expertise and age distribution) and strong industry support.

Groups are strengthened further through the development of interdependencies that grow from sharing core facilities, complementarity of strengths, co-location, joint appointments and shared customer. A common post-graduate population provides the extremely important glue and open communication channels within a collaborative environment.

R&D Sector Linkage Opportunities

The Cooperative Research Centre structures have a positive impact on the creation of strategic alignment between the R&D/education sector and economic growth. The training environment of a CRC is more business/managerial in orientation and therefore more likely to produce graduates seeking opportunities to establish new companies.

A further critical aspect of these structures is the development of a sustainable exit pathway. Each represents an important economic opportunity for the state. The investment in these structures over

their life-time is between \$30M to \$50M minimum. In any terms this is a significant start up capital base. Accordingly a commitment is needed to foster plans for CRCs so that they do in fact become sustainable.

R&D Sector Linkages with Industry

Large export oriented companies and technology based spin-offs and start-ups maintain good science and technology networks, but this is not the case with SMEs.

This creates significant challenges in relation to long term survival of the more innovative SME companies that are competing in global markets.

Technology literacy within these companies is critical if they are to effectively develop relationships with the R&D and university sector. Introduction of more science and technology graduates into SMEs is therefore important in terms of developing the total health of the economy.

A networked approach to technology diffusion would assist significantly. Government client manager resources and program support invested in assisting growth companies could be linked to the business manager resources within the R&D and the education sector. A number of overseas models exist that could be modified for introduction into Australia e.g. the Ben Franklin program, the Scottish Enterprise program, the Steinbeis program, the Wales Technology Centre, the UCSD CONNECT program, the European Innovation Relay Centres, etc.

Commercialisation

Commercialisation is widely regarded as the weak link in the chain from R&D idea to market. In this process there is no substitute for experience. This involves investment, risk and the development of inter-locking networks that can be accessed to provide key inputs and undertake tasks along the commercialisation pathway. Each business opportunity needs evaluation. This can be facilitated by access to a common pool of pre-qualified mentors, consultants, coaches, capital sources, training, and so on that have a demonstrated ability to assist in the process.

Networked hatcheries, start up accelerators, commercialisation and technology diffusion support services within each of the knowledge precincts identified earlier could strengthen the innovation system. This would also establish a focal point for aspiring graduates and postgraduates to more easily participate in wealth creation for themselves.

Entrepreneurial propensity is important to the development of any business opportunity and to the growth of the new economy. Business and management skill development, capital supply, access to mentoring and coaching and all areas of business expertise are extremely important within the overall web that forms the regional innovation system.

Conclusion

Regionally integrated, healthy R&D and higher education sectors can add significantly to the effective marketing of innovation to produce the following:

- R&D and education leadership and excellence;
- Outstanding graduates;
- Cooperative and collaborative linkages with industry and business;
- Knowledge diffusion;
- Technology transfer and commercialisation;
- Customers and networks, locally, nationally and internationally;
- Active alumni; and
- Community philanthropy.

The performance and competitiveness of groupings within this sector (e.g. centres and institutes) can be measured by:

- R&D excellence;
- R&D leadership;
- Interdependence between R&D and education representatives;
- Post-graduate population;
- Age and skill profile of science and technology professionals;
- Stakeholder support;
- Industry participation in decision making;
- Financial strength;
- Growth rate (revenues, employment, infrastructure, etc);
- Collaborative R&D programs;
- Retained customers;
- Value added services;
- Spin-offs;
- Licensing income;
- Commercialisation support.

Economic development initiatives are then required to develop and capitalise on these knowledge resources that encourage and support:

- Linkages between R&D suppliers and individual companies;
- Regional participation in innovation;
- Technology diffusion into and technology literacy within SMEs;
- Employment and placement opportunities for graduates in companies;
- Staff exchange between the sectors;
- Concentrations of leading edge facilities;
- Multi-use of facilities between R&D, education and industry;
- Industry dominated advisory boards in R&D groups;
- Attraction of new R&D performing TNCs to growth technology sectors;
- Early stage commercialisation;
- Skill development in R&D and technology business management.

The innovation system needs to be drawn together by a leadership group representing core stakeholders that is empowered and resourced appropriately and that can achieve:

- A shared innovation, science and technology vision and mission;
- An innovation policy framework and a suite of programs that strengthen the innovation system;
- Inter linked technology initiatives in the bio-, nano-, envior- an ICT sectors;
- Industry clusters that integrate with the R&D and higher education base;
- An entrepreneurial; culture;
- Technology diffusion initiatives directed at the growth SME sector.

RECENT GOVERNMENT REPORTS POLICIES AND PROGRAMS IMPACTING ON COMMERCIALISATION

Backing Australia's Ability

The federal government's Backing Australia's Ability (BAA – 2001) strategy encouraged and supported innovation to enhance Australia's international competitiveness, economic prosperity and social well-being.

The Chief Scientist report *The Chance to Change (2002)* made the important point that support for research represented an investment and that a consequence of this is that the community should expect to gain a return upon the investment made. He also noted that:

“If we can grow 200-250 more Australian research-based companies like five of those shown in this report over the next five years, the prize would be around \$20 billion added to our annual export earnings.”¹

The achievement of success in these areas will reflect how well Government, business, education and research institutions can work productively together to realise Australia's knowledge commercialisation potential.

The federal government believes that innovation-developing skills, generating new ideas through research, and turning them into commercial success-is key to Australia's future prosperity.

“The Howard Government is determined to ensure that innovation drives growth and we capitalise on the enormous potential of the new millennium”.

The BAA strategy therefore supported

- strengthening the ability to generate ideas and undertake research;
- accelerating the commercial application of these ideas; and
- developing and retaining Australian skills.

The BAA program is under review and new initiatives are planned to be announced in 2004.

Return on Investment from government funded R&D - Allen Report undertaken for the ARC (2003)

The benefits from government research funding noted in the Allen Report undertaken for the ARC (2003) are significant and delivered through multiple, measurable benefit channels:

- building the basic knowledge stock;
- generation of commercialisable intellectual property;
- improving the skills base;
- improving access to international research; and
- better informed policy making.

According to Allen these returns exceed 50% and are delivered over periods between one and ten years after expenditure.

¹ PMSEIC, (2001), Commercialisation of Public Sector Research, Paper for seventh meeting, 28 June 2001

The report noted that the returns could be further increased as a result of:

‘improvements, future positioning of government R&D funding and in complementary elements of the Australian innovation system which influence “routes to use” and “routes to market”.’

Some examples were suggested as follows:

- greater emphasis on improving knowledge flows and facilitating industry/academic interaction – improving prospects for commercialisation of research and skills formation and transfer;
- greater focus on centres of excellence – improving the critical mass of research in key prospective areas and likely generating scale efficiencies within the research sector;
- greater focus, across a number of grants programs, on identification of possible paths to commercialisation – further improving the prospects for research to be commercialised; and
- greater emphasis on building international linkages and connecting Australian researchers to global research networks.

Effective Interaction is a Process – Howard Partners Best Practise Report for DEST (2001)

University-business interaction is a process.

The most important elements are:

- the progression of innovative ideas;
- appropriate education and training using these ideas and disseminating these skills;
- the application of scientific and technical knowledge to commercial outcomes; and
- application of knowledgeable, expert and competent management.

In the current economic development environment a nation’s potential depends not so much on its location and science, technology and innovation resources but on its human will, skill, energy, values and organisational capabilities, including the capacity to enter into collaborative arrangements and support for the operation of networks.

Knowledge interaction occurs across a spectrum that ranges from information transfer to knowledge enhancement via research, to access to facilities and capability through to commercial knowledge exploitation.

These interactions provide the “channels” through which information and knowledge flows and provide the basis on which formal and informal relationships are developed and maintained.

The business relationships between universities, research organisations and business can also be considered in terms of a spectrum that ranges from unconditional financial flows to highly structured corporate arrangements in the form of joint business ventures.

Alliances are increasingly central to the development and commercialisation of new technologies, so capabilities in building and managing these relationships are critical to the development and application of new and emerging technologies, particularly in product innovation. These capabilities include:

- skills in knowledge sharing;
- evaluating the complementarity of partners;
- creating and managing co-specialised assets;

- the ability to establish trust quickly;
- creating a vision of the collaboration;
- agreeing upon a common set of goals, metrics of success;
- a shared risk/reward agreement; and
- governance.

Australia's Science and Innovation Environment - 'Mapping Australian Science and Innovation Report.' DEST 2003

“Australia possesses a great ability for resourcefulness and achievement. It has only 0.3% of the world's population, dispersed around a vast continent, and is more remote from the rest of the world's gross domestic product (GDP) than almost any other country. Despite this, we have built an economy that accounts for 1% of world trade and represents 1.9% of OECD GDP. Our country has enormous talent and we have always been skilled at capitalising on our vast natural resources. But the future we aspire to – a healthier, sustainable and prosperous community – will depend increasingly on our capacity to develop ideas, to build new high-growth industries, to apply knowledge in new ways to old industries, and to fashion intelligent solutions for the social and environmental problems we face.” (Brendan Nelson).

The main contributors to science and innovation across the public and private sectors in Australia are:

- 39 universities
- Australian, state and territory government research, innovation and science agencies
- more than 60 major research facilities, managed mainly by universities and government research agencies
- private non-profit bodies (including 29 independent medical research institutes)
- some large, and thousands of small, private companies in all industries.

Some of the key observations and findings in the mapping study include:

- Australia has a small population (0.3% of world population) concentrated in a few cities, but distributed over a large land mass. the country's economy is 1.9% of the gross domestic product (GDP) of the OECD, and accounts for about 1% of world trade.
- Approximately 96% of Australia's businesses are characterised as 'small'. Australia is responsible for 1.3% of R&D conducted in OECD countries. Over twenty large multinational companies (MNCs) spend more on R&D individually than do Australian businesses in total.
- Although Australia is well placed to trade with Asia, it is geographically isolated from North America and Europe, and the costs of trading with these major international markets are a key barrier. Scale, visibility and distance also affect Australia's capacity to attract foreign investment, including R&D investment by multinational companies.
- Australia's competitive advantage has traditionally been premised on a scientific and technological leading edge in capitalising on vast reserves of minerals and suitable land to support agricultural industries. New high-profit, high-growth industries will need to draw on strengths in other sectors to ensure that living standards continue to rise.
- Australia's level of government expenditure on R&D is relatively high by international standards, reflecting factors such as our industrial structure, unique biodiversity and the importance of the agricultural sector. Support for, and coordination of, science and innovation has increased and become more strategically focused at all levels of government, signalling strong policy interest and recognition of the links to economic, social and environmental outcomes.

- Business innovation involving R&D and development of new technology remains low by international standards, with only a few Australian businesses strong in the development of innovative new technologies, products and processes, notably exporters in the mining and the agricultural sectors. For a range of reasons specific to our circumstances, such as the size and composition of our manufacturing sector, Australia continues to rank towards the bottom of the OECD in the share of business expenditure on R&D in GDP.
- The Council for Business/Industry/University was created in May 2003 to help foster greater collaboration. Priorities for the council include developing strategies to encourage business and industry to invest more in the higher education sector, facilitating involvement of SMEs in collaborative arrangement with universities and participating in the selection of joint projects for funding.
- Availability of innovation skills and cultural attitudes towards innovation limit Australia's innovation potential. In particular, there is a shortage in the number of Australians with sufficient entrepreneurial skills and experience in management, marketing and business development, especially in high-growth start-ups. There has been increasing recognition of the need for cross-disciplinary courses in higher education but few courses offer integrated development of innovation skills. There are persistent areas of weakness in Australia's innovation culture around attitudes to entrepreneurship, risk aversion and learning from failure.
- Support from national, state and territory governments has largely focused on building R&D capacity rather than on enhancing commercialisation and strengthening skills development. Government support for business R&D is low by international standards, being less than half that of the leading OECD countries.
- Australia's commercialisation record has improved over time, but remains low compared to other countries and is uneven within and across different research sectors. Continuing barriers to commercialisation include lack of access to early stage capital, a shortage of management and entrepreneurial skills and lack of fully effective links between researchers and industry. Data on Australia's commercialisation performance are improving, but are particularly weak in the business sector.

Linkages and Collaboration - House of Representative Standing Committee on Science and Innovation Report (2003)

Linkages between publicly funded researchers and industry could be further enhanced. Impediments to collaboration between higher education and the business sector reported include:

- disincentives for people to cross the boundary between industry and university
- different understanding of suitable intellectual property (IP) arrangements for commercialisation of R&D
- insufficient weight given to commercialisation in university criteria for staff promotion.

Australia's Innovative Capacity - IPRIA Report, Gans & Stern June 2003

Though Australia has enhanced its commitment to innovation policy establishing Australia as a first-tier innovator nation requires a systematic upgrade in the Australian innovation environment. Innovation policy reform in Australia should impact the innovation infrastructure, the cluster innovation environment, and the strength of linkage mechanisms. At the broadest level, policy should be focused on training (and retaining) a world-class innovator workforce, and providing opportunities and incentives for the deployment of risk capital.

The Australian university system is an historic strength and nurturing this asset (as well as other institutions for collaboration) will be crucial for establishing and retaining a higher level of innovative capacity.

As the central driver of productivity over the long term, enhancing the Australian innovation environment is crucial for ensuring long term improvements in national prosperity and welfare.

In a global economy, innovation-based competitiveness provides a more stable foundation for productivity growth than the traditional emphasis on low-cost production. Having secured a position as a leading user of global technology and creating an environment of political stability and regional leadership, Australia has an historic opportunity to pursue policies and investments to establish itself as a leading innovator nation. Australia must build upon a foundation of openness to international competition and the protection of intellectual property rights. However, Australia needs to focus upon the areas that appear to have become neglected over the past two decades. In particular, Australia should significantly increase its investment in order to:

- Ensure a world-class pool of trained innovators by maintaining a high level of university excellence and providing incentives for students to pursue science and engineering careers.
- Provide incentives and opportunities for the deployment of risk capital
- Facilitate innovation as a cumulative step-by-step process.
- Continue to open up Australia to international competition and investment and upgrading the effectiveness of intellectual property protection.
- Maintain a vigorous yet sophisticated approach to antitrust enforcement.
- Reduce barriers to entry and excessive regulation that hinder effective cluster development.
- Build innovation-driven dynamic clusters based on unique strengths and capabilities.
- Enhance the university system so that is responsive to the science and technology requirements of emerging cluster areas.
- Encourage the establishment and growth of institutions for collaboration within and across industrial areas.

IP Guidelines across the Public Sector - DEST Report 2003:

As experience has shown in the United States, Canada and the United Kingdom, the optimal initial owner of a patent for an invention is the research institution in which the invention was created. Research institutions are best placed to implement management structures to identify potentially valuable patents and they are also well positioned to pursue commercialisation of such inventions. The default position should not vest ownership of patents in employee inventors or funding agencies. However, whilst there should not be an automatic devolution of patent rights to employees or funding agencies, research institutions should be allowed the freedom to assign patent rights on a case-by-case basis where the institution believes that such an assignment would lead to an optimal outcome with respect to commercialisation.

The report recommends that, the right to ownership of patents should be coupled with the assumption of responsibility for the effective identification, protection, management and commercialisation of the invention. The following responsibilities should attach to the ownership of patent rights:

- A responsibility to identify, and have systems in place to support the identification of, commercially valuable inventions.
- A responsibility to protect commercially valuable inventions.
- A responsibility to reward employees who create commercially valuable inventions.
- A responsibility to appropriately exploit patented invention.

The above proposal could be implemented through an expansion of the approach already operating in Australia via the National Principles and the Interim Guidelines. This “expanded National Principles approach” would enlarge the content of the responsibilities currently applied to research institutions, as well as the range of funding agencies applying those responsibilities.

1. Organisation Overview

Network Organisation	Web Site	Services Focus	Membership Focus (Members)	Member Customers Focus	Years Operation	Service Delivery	Budget	Membership Fee
Advanced Manufacturing Centre AMC		Enhanced competitiveness through advanced technology and management	Manufacturing companies	Competitive manufacturing	20	Training advice, technology diffusion		
AiG – Tyree Foundation (Australian Industry Innovation Exchange network) (AiX)	www.aignsw.aigroup.asn www.innovationxchange.com.au	Marketing technology transfer and exchange between R&D producers and SMEs	AiG members and R&D generators	Innovative SMEs (~ 10,000)	0	Website linked services and referrals, education and marketing/PR advocacy	\$1m pa (AiG 50%) (Govt. 50%) (sponsors)	Research supplier \$1,000 pa + industry sector sponsors
AusBiotech Ltd (AB)	www.ausbiotech.org	Professional development, commercialisation and lobbying. Peak body	Large and small biotech companies and service providers to the industry	Agricultural and health/medical industries	10	Workshops, newsletters, training		\$500 to \$5000
Ausinvent/NSW Dept State and Regional Development (AI)	www.ausinvent.com	Promotion of inventions	Inventors	Investors	5	Website of inventions and contacts		
Australian and New Zealand Association of Business Incubators (ANZABI)	www.anzabi.com.au	Conferences and information	Incubators (45)	Local and New Ventures	8	Annual Event	\$140k Fed govt. support (8% subs)	\$220 pa
Australian Business Innovation/Australian Business Limited (ABI)	www.abinnovation.com.au	Training, resources and information	Australian Business Ltd - partners (13)	Innovative SMEs	5	Packaged materials, web site	\$900k (Major sponsor ABL 60%)	
Australian Electronic and Electrical Manufacturers Association (AEEMA)	www.aeema.asn.au	Industry lobby group and services	Companies in the ICT, electronics and electrical manufacturing industries (370)	Manufacturing growth	50	Reports and representation	\$1.5m (90% subs)	\$800 to \$30k pa
Australian Industrial Research Group (AIRG)	www.airg.org.au	Improve in R&D management and lobbying. Peak body	Major Australian SERD contributors	Industrial and domestic consumers	38	Conferences		\$500-\$2000 pa
Australian Information Industry Association	www.aiia.com.au	Professional development, business development and lobbying. Peak body	ITC companies large and small and service providers (400)	Diverse across industry, commerce and government	20	Workshops, training, newsletters		
Australian Innovation Festival Pty Ltd (AIF)	www.innovationfestival.com.au	National annual festival of events on innovation and entrepreneurship	Sponsors and service suppliers	Organisations providing business development services and education	2	Events	\$300k (govt. and private sponsors)	
Australian Institute for	www.ausicom.com.au	Education, advocacy and commercialisation	State government agencies and service	New ventures from S&T sector	0	Training, tools, representation, start-	\$2m (govt. and	

Network Organisation	Web Site	Services Focus	Membership Focus (Members)	Member Customers Focus	Years Operation	Service Delivery	Budget	Membership Fee
Commercialisation (proposal) (AIC)		best practice	providers			up services	sponsors)	
Australian Institute of Company Directors (AICD)	www.companydirectors.com.au	Professional development of directors – improved governance, policy development. Peak body.	Existing and new directors, especially entrepreneurs and SMEs (13,000)	Implementation of sound business principles	~50	Training, publications, periodical workshops		\$350 - \$380pa
Australian Microelectronics network (AMN)	www.amn.org.au	Application of advanced micro-electronics technologies	Companies that can provide services or need services (217)	Companies that need to introduce micro-electronics technology	2	Technology advisers and diffusion	\$1.3m (AusIndustry)	\$55pa pp or \$1,000 to \$10,000 pa corporates
Australian Minerals Industry Association International (AMIRA)	www.amira.com.au	Manages collaborative R&D in minerals industry	Minerals industry	Value adding mineral users	42	R&D	\$1m+ R&D contracts	?
Australian Partnership for Advanced Computing (APAC)	www.apac.edu.au	Increase the use of advanced computing by business and industry	APAC centres in each state	Major corporates and research organisations	1	Technology diffusion, events, meetings		
Australian Research Managers Society (ARMS)	www.researchadmin.org.au	Professional development and information	University, research managers (177)	Government and private sector research funds	5	Conferences and website	\$62k (22% subs)	\$55 pp pa \$264 p org pa
Australian Technology Network (ATN)	www.iatn.edu.au	Coalition of 5 Australian universities; Curtin, UniSA, UTS, RMIT, QUT	Fostering interaction with industry		10			
Australian Technology Showcase (ATS)	http://ats.business.gov.au	Export promotion of innovative products	National government supported evaluation panel	Companies producing globally innovative products	5	Website promotion and advice		
Australian Venture Capital Association Limited (AVCAL)	www.avcal.cvom.au	Events and advocacy	Suppliers of venture capital (137)	New investment opportunities	10	Conferences, workshops and introductions	\$1.5m	\$1,000to \$8,000 pa
Australian Vice-Chancellors Committee (AV-CC)	www.avcc.edu.au	Advances higher education	Universities	Students and industry				
B2B Café (Vic)	www.b2bcafe.com	Business networking	Core sponsors	Inventors, entrepreneurs and intermediaries involved in venture formation	3	Monthly meetings		\$25 per p per meeting
Building IT Strengths Incubators (BITS)	www.dcita.gov.au/bits	Seed investment in growth IT ventures	DOCITA accredited investment companies (10)	New ventures based on innovative IT technology applications	3	Investment and mentoring	DOCITA Program funds	
Business and Higher Education Round	www.bhert.com	Links between business and university	Joint venture of BCA and AVCC	Tertiary education or big business	10	Events, training, reports and lobbying		

Network Organisation	Web Site	Services Focus	Membership Focus (Members)	Member Customers Focus	Years Operation	Service Delivery	Budget	Membership Fee
Table (BHERT)		and advocacy						
Business Angels Pty Ltd (BA)	www.businessangels.com.au	Matching business opportunities to investors	Investors	New business opportunities	5	Matching database and some guidance		\$350 fee for listed ideas
Business Enterprise Centres (BEC)	www.bec.com.au (for example)	Support services to start-ups in the community	Not for profit BECS involving local and state government (130) and corporate support	Forming micro businesses	10	Advice, coaching and referrals	\$150k (sponsorship) [Each BEC has budget ~\$200kpa]	\$200 to \$1000 pa
Capital Region Enterprise Employment and Development Association (CREEDA)	www.creeda.com.au	Business development via incubation to create employment	Business incubator network (3) in Canberra	Start-up ventures	15	Full incubator support services, mentors, etc and consultants		
Capstart Pty Ltd (Capstart)	www.capstart.com.au	Matching business opportunities to investors	Investors	New business opportunities	1	Matching database and some guidance		\$1,400 per idea plus success fee
Collaborative Health Informatics Centre (CHIC)	www.chic.org.au	Support research, information and communications in healthcare and IT	Companies and government agencies across the industry (143)	Consumers of health services	5	Information, training, study tours, consulting services	\$1m (40% subs) (support) AusIndustry	\$990 to \$5,500 per org pa
COMET	www.ausindustry.gov.au	Business start-up advice and funds	Appointed private sector managers (15)	New innovation ventures and early stage capital	3	Co-ordination of services and introductions	AusIndustry program	
Co-operative Research Centres Association (CRCA)	www.crca.asn.au	Advocacy, conferences	Cooperative Research Centres (60)	Industry	10	Annual events, and representation		
CSIRO – commercialisation	www.csiro.com.au	Technology services	Internal business development and commercialisation managers (100+)	Licensing and new ventures	50+	Internal systems	\$10m (salaries)	
Enterprise Development Institute Australia (EDIA)	www.edia.org	Development of entrepreneurs and intrapreneurs	Network of licensed delivery agents in each state (5)	Individuals seeking to learn the business planning process (5000 alumni)	20	Promotion of entrepreneurs training program and national competition	\$100k (govt. support)	\$5k per agent
Environment Industry Development network (EIDN)	www.eidn.com.au	Information clearing house and international alliances		Polluters and waste generators	5	Publications and advisory services	AusIndustry support	
Federation of Australian Scientific and Technological	www.fast.org	Policy development in science and technology	Professional science and technology societies (60)	Individual scientists and technologists (60,000)		Meetings, submissions, lobbying		

Network Organisation	Web Site	Services Focus	Membership Focus (Members)	Member Customers Focus	Years Operation	Service Delivery	Budget	Membership Fee
Societies (FASTS)								
First Tuesday SA (FTSA)	www.twoeyes.com.au/FT/	Social Events	Cross section of entrepreneurs, investors and others (500)	Supporting new high growth ventures	5	Monthly Events	(Sponsors)	
Founders Forum (FF)	www.foundersforum.com.au	Early stage investment	High net worth individuals in SEQ	Innovative new ventures	5	Introductions		
Group of 8 universities	www.go8.edu.au	Association of 8 largest Australian Research universities; UWA, VA, UNSW, US, UM, Monash, ANU, UQ			5			
IDC-Hunter (NSW Dept State and Regional Development (IDC))	www.idc-hunter.org.au	Regional network focused on technology/business services	Companies in Hunter Region of NSW	Business improvement and technology access	10	Meetings, consultancies, training	NSW Government support	
Innovative Technology Network (now Dept State and Regional Development) (ITN)	www.uws.edu.au/commerce/itn	Regional network focused on technology/business services	Companies in western Sydney and UWS	Business improvement and technology access	10	Meetings, consultancies, training	NSW Government support	\$550 pa
INNOVIC (Victoria DSRD)	www.innovationcentre.com.au	Services for start-up businesses	Prequalified service providers (100)	Start-up businesses	20	Consulting services, information, training	\$400k Major sponsor DSRD (Vic)	
Institute of Management Consultants (IMC)	www.imc.org.au	Sets and maintains standards of the profession	Accredited management consultants	Organisational development and improvement		Referrals, professional development, information, accreditation		\$130 pa
Institute of Patent and Trade Mark Attorneys (IPTMA)	www.ipta.com.au	Professional development of patent attorneys	Practising attorneys	Producers of IP		Training, conferences, meetings, information		
Intellectual Property Australia (IPA)	www.ipaustralia.gov.au	Strategic use of IP by business	Government delivery	Any developer or owner of IP	50+	Training kits and referrals	DITR	
Intelligent Manufacturing Systems (IMS)	www.ims.org	Advanced manufacturing and process technologies	Major research and private sector organisations (30)	Automated manufacturing systems	10	International R&D programs and technology diffusion	\$500k (AusIndustry)	-
Knowledge Commercialisation Australia (KCA)	www.attica.com	Education and Training	Commercialisation executives in public sector (48)	Universities, Public R&D organisations	20	Annual Events, Newsletters	\$27k (95% subs)	\$2000
Licensing Executives Society (LES ANZ)	www.lesanz.org.au	Professional development in technology licensing	Professionals involved in licensing – legal, patent attorneys, R&D	Producers of IP and businesses exploiting offshore	30	Conferences, meetings, magazine		\$185 pa

Network Organisation	Web Site	Services Focus	Membership Focus (Members)	Member Customers Focus	Years Operation	Service Delivery	Budget	Membership Fee
PD – Net	www.pd-net.net/pdnet	Product development	executives, etc (510) Manufacturing product development centres in Australian states (4)	markets Manufacturing companies	5	Training and consultancy workshops	\$1.5m (AusIndustry, govt. and industry)	-
Software Engineering Australia (SEA)	www.seanational.com.au	Improving the quality and reliability of software	Software developers and resellers	Purchasers of software	10	Information, testing tools, events		\$440 pa
Tech Network (Vic) (TN)	www.technetwork.com.au	Events and information	New venture consultants (12)	New ventures	0	Industry events and web site	DSDR (Vic) support	
Technology Science Parks and Incubators Association (TSPIA)	www.techparksandincubators.com	Conferences and information	Technology incubators, science parks (60) Consultants and tenants	New Ventures and existing businesses	10	Annual events	\$120k (60% subs)	\$55 for tenant companies and \$1100 pa for organisations
Triton Foundation (TF)	www.tritonfoundation.org.au	Support for inventors	Professional service providers	Inventors	1	Information, mentoring, invention assessment, promotion	Sponsors and government	
Venture Link Network and Innovation (VLN)	www.venturelink.net	Educational events	Cross section of entrepreneurs, investors and service suppliers (500)	New high growth ventures	5	Bi-monthly events, newsletter web-site matching	\$60k (50% sponsors)	\$70 pa
Warren Centre Mentoring	www.warren.usyd.edu.au	Innovation services	Cross section of industry and public sector	New high growth ventures	0	To be determined website support		
Yellow Pages Business Ideas Grants (PA-BIG)	www.yellowpages.com.au/big/	Support of innovative SMEs	Business intermediaries and government initiatives	Highly innovative SMEs with real potential	10	Mentoring and some funds	\$250k (Yellow Pages)	

2. Organisation Member Activity Focus

Idea Generators	Business Intermediaries	Business Services		Investors	Others	
		Business	Knowledge Technology			
Ausinvent	ANZABI	AEEMA	INNOVIC	AMC	AVCAL	AIF*
ARMS	AIC*	ABI	IMC	AMIRA	BITS	BHERT
AV-CC	BEC	AICD	IPTMA	AIX*	BA	EDIA
FASTS	CREEDA	AIIA	IPA	AMN	Capstart	
CRCA	TPIA	AIRG	LESANZ	APAC	FF	
KCA	TF*	ATS	SEA	EIDN		
CSIRO		AusBiotech	TN*	PD-Net		
Big 8		BCA	VL*	IMS		
ATN		COMET	B2B	TechLink*		
		FTSA	Warren*	ATN		
		IDC	PA-BIG	Group of 8		
		ITN		IPRIA		

* New Networks or Proposals

+ Acronyms attached

3. Commercialisation Value Chain Position+

Global Businesses



Growth and IPO	AEEMA AICD AIIA AIRG AMC AusBiotech BCA IPTM LESANZ	ATS EIDN	IMS APAC IPRIA	AVCAL
SME	PA-BIG	TN* B2B FTSA VL*	AH* SEA AMN PD-Net TechLink*	
Start-up Business	AIF AIC* BEC MSP* ABI TPIA ANZABI CREEDA IDC ITN	TF	AI IPA IPRIA	COMET BITS BA FF Capstart
Proof of Concept	KCA*			
Feasibility Assessment	EDIA			
Applied R&D	AV-CC ARMS BHERT		CRCA CSIRO FASTS DSTO AMIRA AIMS ATN RDCs Big 8	
	Management	Marketing	Technology	Finance
Foundations	IDEAS: Corporates, Unis, R&D Labs, CRCs, Mentors, INFRASTRUCTURE: Capital, ICT, Logistics, Business Systems, etc. GOVERNMENT: Policy, Programs, Regulations			

- New Networks or Proposals

+ Acronyms attached

4. Organisation Acronyms

ABI	Australian Business Innovation/Australian Business Limited
AEEMA	Australian Electronic and Electrical Manufacturers Association
AI	Ausinvent/NSW Dept State and Regional Development
AIC	Australian Institute for Commercialisation
AICD	Australian Institute of Company Directors
AIF	Australian Innovation Festival P/L
AIIA	Australian Information Industry Association
AIRG	Australian Industrial Research Group
AIX	Australian Industry Group Innovation Exchange
AMC	Advanced Manufacturing Centre
AMIRA	Australian Mineral Industry Research Association
AMN	Australian Microelectronics Network
ANZABI	Australia and New Zealand Association of Business Incubators
APAC	Australian Partnership for Advanced Computing
ARMS	Australian Research Managers Society
ATN	Australian Technology Network; University of SA, Curtin, University of Technology Sydney, RMIT and Queensland University of Technology
ATS	Australian Technology Showcase
AusBiotech	Biotechnology Australia Association
AVCAL	Australian Venture Capital Association Limited
AVCC	Australian Vice-Chancellors Committee
B2B	Café B2B Café
BA	Business Angels Pty. Ltd.
BCA	Business Council of Australia
BEC	Business Enterprise Centres
BHERT	Business and Higher Education Round Table
Group of 8	The Universities of Adelaide, Melbourne, Monash, Queensland, Sydney, NSW, ANU and WA
BITS	Building IT Strengths Investment Funds
Capstart Pty. Ltd.	Private company. Investor/idea matching.
CIC	CEBUSNET Information Centre
COMET	Commercialising Emerging Technologies
CRCA	Co-operative Research Centres Association
CREEDA	Capital Region Enterprise Employment and Development Association
CSIRO	Commonwealth Scientific Industry Research Organisation
EDIA	Enterprise Development Institute Australia
EIDN	Environment Industry Development network
FASTS	Federation of Australian Scientific and Technological Societies
FF	Founders Forum
FTSA	First Tuesday SA
IDC	IDC-hunter (NSW Dept State and Regional Development)
IMC	Institute of Management Consultants
IMS	Intelligent Manufacturing Systems Network
INNOVIC	Innovation Centre Victoria Department of State and Regional Development
IPA	Intellectual Property Australia
IPRIA	Intellectual Property Research Institute of Australia
IPTMA	Institute of Patent and Trade Mark Attorneys
ITN	Innovative Technology Network (now Dept State & Reg Development)
KCA	Knowledge Commercialisation Australia
LES-ANZ	Licensing Executives Society
PA-BIG	Pacific Access: Yellow Pages Business Ideas Grants
PD-Net	Product Development Network
SEA	Software Engineering Australia
SMART-LINK	National Institute of Manufacturing Management
TechLink	Technology Advisory Service/AusIndustry
TF	Triton Foundation
TN	Tech Network (Victoria) proposed
TPIA	Technology Parks and Incubators Association
VL	Venture Link Network
Warren	Warren Centre Mentoring & Innovation

Some International Organisations

1 Association of University Technology Managers (AUTM) – USA

“AUTM is dedicated to helping members manage innovation for the benefit of the academic technology transfer profession – and the public.”

AUTM® is a non-profit association with membership of more than 3,200 technology managers and business executives who manage intellectual property-one of the most active growth sectors of the US economy. AUTM’s members represent over 300 universities, research institutions, teaching hospitals and a similar number of companies and government organisations.

Universities transfer technology to:

- Facilitate the commercialisation of research results for the public good
- Reward, retain, and recruit faculty
- Induce closer ties to industry
- Generate income and promote economic growth

AUTM membership offers:

- Annual licensing survey and results of other research activities
- Membership directory
- Annual and regional meetings
- Professional development courses and meetings
- AUTM publications
- Public education

2 Unico – The University Companies Association – United Kingdom

“Creating bridges between Universities and the Commercial Worlds”

Unico was founded in 1994 to represent the Technology Exploitation companies of UK Universities. It provides a forum for exchange and development of best practice. Member companies transfer technology and expertise through the formation of Spin-out companies, licensing, consultancy, training, design and development projects, contract research, testing and evaluation, and problem solving.

3 Association for University Research and Industry – United Kingdom

“Serving the needs of knowledge transfer professionals”.

AURIL supports its member universities in the United Kingdom and Republic of Ireland in the development of mutually beneficial partnerships with industry and other sectors in the fields of research, technology and knowledge transfer, consultancy and related activities to enhance wealth creation and quality of life.

4 National Technology Transfer Centre - USA

The Robert C. Byrd National Technology Transfer Centre is a full service technology management centre that helps organisations identify commercially promising discoveries, market them to American industry, and build partnerships turning inventions into products.

Guided by a mission to aid economic development through matching federally funded research with US private industry, the NTTC offers a complete line of products and services enabling American businesses to find technologies, facilities and world-class researchers within the federal labs and universities needed to remain on the cutting edge of innovation.

5 Global-CONNECT – USA Global

University of California (San Diego) has launched global CONNECT to promote technology enterprises and regional innovation worldwide. It's an international network supporting high technology and life science companies. It provides entrepreneurs and start-ups with access to global capital providers, financial markets, research opportunities, corporate partners, and new customer channels. It's specifically about sharing best practice, resources, improved assessments of innovation capacity and strengthening university/industry interaction.

6 Innovation Relay Centres (IRC) Network – European Union

The mission of the IRCs is to support innovation and transnational technological co-operation in Europe with a range of specialised business support services. IRC services are primarily targeted at technology-oriented small and medium sized enterprises (SMEs) but are also available to large companies, research institutes, universities, technology centres and innovation agencies.

The first Innovation Relay Centres were established in 1995 with the support of the European Commission. The aim was to create a pan-European platform to stimulate transnational technology transfer and promote innovation services.

Over the past five years the IRCs, working together in close cooperation, have been of assistance in over 5,000 technology transfer negotiations, and have helped 65,000 client companies to meet their technology needs and to exploit their research results.

IRC staff (a total of nearly 1,000) are experienced specialists with backgrounds in business, industry and research. To date, they have facilitated 800 transnational transfers of technology, signed agreements for the sale, licensing, distribution or joint development of new technologies.

Today, 68 regional IRCs span 30 countries, all the EU Member States, the newly associated countries (Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia), Iceland, Israel, Norway and Switzerland.

Most IRCs are operated by a consortia of qualified regional organisation such as Chambers of Commerce, Regional Development Agencies and university Technology Centres. Altogether, almost 250 partner organisations are involved, ensuring wide geographic coverage.