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Department of Industry, Tourism and Resources

Study of the Role of Intermediaries in Support of Innovation

April 2007

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Executive summary

This is a Report of a Study undertaken to assess the role of and benefits created by intermediaries in the Australian innovation system. The main focus of the Study was to understand the way in which intermediaries assisted companies in accessing knowledge and technologies available in universities, research organisations and other businesses.

The Study draws on an analysis of the activities and performance results of two pilot programs that operated over the past two years. In addition, the Study undertook a review of the literature on intermediaries, both in Australia and overseas, and took into account international experience with intermediaries.

Innovation intermediaries are seen as generally independent third parties that play an integral part in collaborative activities supporting any aspect of the innovation process. They can play a key role in the ‘market for knowledge’ in relation to the transfer and translation of knowledge and technologies from creators to users in a business (commercial) context. In this sense creators include universities, other research organisations and other businesses.

A recent survey article on the issue of intermediation and the role of intermediaries in the innovation process, defines an intermediary as:

An organisation or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include:

- helping to provide information about potential collaborators.
- brokering a transaction between two or more parties.
- acting as a mediator, or ‘go-between’, between bodies or organizations that are already collaborating.
- helping to find advice, funding and support for the innovation outcomes of such collaborations (Howells 2006).

Based on the case studies and research undertaken for this Study, this definition can be developed to identify four quite distinct intermediary roles:

- That of a *consultant*—covering assistance through providing information and advice in the recognition, acquisition and utilisation of relevant intellectual property or knowledge and technology capability.
- That of a *broker*—covering ‘brokering a transaction between two or more parties’.
- That of a *mediator*—being an independent ‘third party’ who assists two organisations form a mutually beneficial collaboration.
- That of a *resource provider*—being an agent who secures access to *funding* as well as other material support for the innovation outcomes of such collaborations.

Each role has different characteristics in terms of knowledge and skills, responsibilities and accountabilities and the way in which intermediary work is undertaken. Taken together, the two intermediary organisations covered by the pilot program performed all of these roles.

Intermediaries address a number of gaps in the innovation system. These can be categorised as follows:

- *Information gaps*—gaps encountered by firms in identifying relevant, useful and applicable techniques for product and service development.
- *Access gaps*—difficulties encountered by firms in accessing technologies and knowledge which they know to exist but are unsure about how to go about acquiring it.

- *Transfer* gaps—negotiation of licence and consultancy/contract agreements, as well as project management. may be beyond the capability of businesses, particularly small to medium businesses.
- *Translation* gaps—developing and transforming knowledge embedded in a technology into a form and format that can be used in product, service and/or business development.

As part of the Study a survey was undertaken and interviews were held with intermediary service providers and companies assisted by intermediaries. The survey involved interviews and consultations with 16 companies and twelve intermediaries who worked for the two intermediary service providers. Twelve interviews were held with research organisations and a small number of interviews were held with state government departments with responsibilities for innovation, regional development organisations, business mentors and business incubator managers.

The survey indicated that the two intermediary organisations have provided valuable contributions in addressing the first three gaps identified above. The intermediaries did not, however, perform a translation role—a function undertaken by Research and Technology Organisations (RTOs) in other countries.

There are also a range of ‘institutional gaps’ that are addressed by intermediaries. These include: gaps in university technology transfer capability; researcher orientation in industry-academic collaborations; and, limited funding for research organisation—SME collaborations. The Study demonstrated that intermediaries had been particularly valuable in addressing these institutional gaps.

The survey found that companies rated as ‘important’ or ‘very important’ the following reasons for accessing intermediary services:

- Technology acquisition—all companies.
- Accessing funding and support for innovation projects—63 per cent of companies.
- Product testing and scale up—50 per cent of companies.
- Product development—38 per cent of companies.
- A mediator with bodies already collaborating—25 per cent of companies.
- Brokering a transaction between two parties—19 per cent of companies.

The survey and interviews also found that three quarters of companies had been contacted directly by the intermediary organisation to offer intermediary support. This finding reflects a lack of knowledge within companies of intermediary organisations and what they can do.

Surveyed companies did not identify any immediate benefits from intermediaries in terms of *realised* increases in profitability, productivity, employment or new products entering the market. Several companies advised of *expected* increases in these performance metrics over the next few years as a result of intermediary services.

Surveyed companies reported a number of indirect and intangible benefits of intermediary services, including enhanced strategic management capabilities and business culture (five companies), enhanced innovation capability (11 companies) enhanced collaboration and networking capabilities (14 companies) and increased access to know how and best practice (10 companies).

These findings point to the importance of the *personal/professional contribution* of intermediary services and intermediary staff to building business capability. The extent to which this enhanced capability will be reflected in future economic outcomes is uncertain at this stage. However, the

strategic management and innovation literature points to the close association between investment in capability and business success.

A major finding emerging from the interviews undertaken as part of the Study was that intermediaries need to have excellent communication skills and be exceptionally well networked across industry and the research sector, as well as possessing reputation, integrity, and credibility with business, research organisations, and government program managers. They must also understand how a research organisation works—in terms of its mission, its structure, systems, and processes, and the way it measures its achievements and rewards success.

The survey and interviews found that the ability of an intermediary to provide funding for small collaborations is highly regarded by participating companies and other stakeholders. The funding arrangement provides flexibility and speed in responding to collaboration opportunities.

The Study reviewed some intermediary support programs in Europe and North America. The range of programs varies in structure and in the form of support provided:

- A number of programs provide support for brokering roles, such as the Canadian IRAP program and the European Innovation Relay Centre (IRC) program.
- Several programs provide funding for collaborations, such as the UK Knowledge Transfer Partnerships (KTP) program.
- There are also many networking support programs that operate at the state/regional level in Federal systems (or at the ‘national’ level in small EU states).

It was not possible to identify any overseas programs that offer the range of services covered in the pilot programs reviewed in this Study. The InnovationXchange has recently commenced a service in the UK.

It is clear that a great deal has been learned from the pilot programs and there is an opportunity to go to a next stage in providing support for intermediary roles that meet the technology and knowledge access needs and requirements of Australian companies, particularly SMEs. Such support could consider the following possible actions and initiatives:

- Selection, through competitive tender, of a panel of accredited intermediary organisations, to provide the range of intermediary services currently provided in the pilots. Selection should be made on the basis of knowledge of technologies, their *national and international* networks, their communication skills, and their ability to work with SMEs and research organisations.
- Funding SMEs to acquire intermediary services from accredited intermediary organisations on the basis of an identified need to access and/or acquire business relevant and applicable technologies/and or knowledge capabilities through collaboration arrangements. The funding decision should be made by an independent third party.
- Access to knowledge not being limited to *scientific and technical knowledge*—it should also include knowledge related to *industrial design capabilities*.
- Intermediary services should focus on: articulating technology need; finding Australian and international partners; advising on sources of innovation financing; management of intellectual property rights; marketing; and providing assistance with contract negotiations.
- Support for the formation of an *intermediary information and knowledge network* to enable regionally based intermediary organisations to share and access technologies and knowledge.

As the Study was oriented towards the role of intermediaries in the Australian innovation system, it did not look in detail at the role of Research and Technology Organisations—a feature of the British and European systems. These organisations have been formed by *industry/trade associations* and have been closely involved in the establishment and operation of an ‘interface’ between research organisations and business.

RTOs exhibit a wide variation in their genesis, longevity, modes of governance, and sources of finance (European Research Advisory Board). However, this form of organisation has been the main focus of scholarly research on intermediaries in these countries (Howells 2006; Howells et al. 1998; Howells and James 2001).

In Australia, few industry associations have taken an active role in national innovation systems. Associations such as AEEMA stand out but most industry associations take on a lobbying role in relation to innovation and focus more on industrial relations agendas.

Further research in Australia should be directed towards *encouraging industry*, through industry and trade associations, to take a more active role as intermediaries in knowledge and technology transfer.

1 Introduction

This is a report from Howard Partners Pty Ltd on a Study of the *Role of Intermediaries in Support of Innovation*. The report is presented in a way that specifically addresses the matters identified in a detailed *Statement of Requirement* attached to the Request for Tender.

1.1 Project requirements

This report addresses that part of the *Statement of Requirement* which requires a report that highlights the following:

- (a) The scope and nature of intermediary activity in Australia through
 - Identification of the roles and functions of innovation intermediaries in Australia
 - Identification of the main performers in these roles
 - How do intermediaries function
 - what skills sets are required
 - what are the range of services required/offered
 - what conditions allow them to function effectively
 - what are the barriers to intermediaries operating effectively
- (b) The scope and nature of overseas intermediary activities, including:
 - The scope and nature of those activities
 - Examples of government programs that assist intermediary activities
 - The impact of those activities on the companies involved
 - Comparison of intermediary activities in Australia with overseas examples
- (c) Measurement of the benefit and cost of intermediaries in relation to building innovation outcomes in companies
- (d) The identification of any barriers to the use of intermediaries, including:
 - Availability of, and access to, intermediaries
 - Cost
- (e) Identification of different intermediary models, their costs and benefits and the relative merit of different models in terms of providing service to Australian small business innovation capability.

A Report of a survey and interviews with intermediaries and companies that have used intermediary services undertaken in accordance with other specifications set out in the *Statement of Requirement* is included as an Appendix to this Report.

1.2 Definition of an intermediary

The Project Brief identifies intermediaries as generally independent third parties that play an integral part in collaborative activities supporting any aspect of the innovation process for the mutual benefit of two or more parties. Such intermediary activities include:

- Assistance in the recognition, acquisition and utilisation of relevant intellectual property or technology.
- Identifying potential collaborators.
- Brokering a transaction between two or more parties.
- Acting as a mediator, or go-between, with bodies or organisations that are already collaborating.
- Identifying and tailoring advice, funding and support for the innovation outcomes of such collaborations.

The RFT notes that there is broad agreement on the important role that intermediaries can play in assisting companies to identify and acquire relevant knowledge, and/or in identifying potential partners for collaboration. It notes that:

- Pilot projects have indicated the effectiveness of intermediaries in bridging cultural and commercial gaps.
- Establishing beneficial partnerships
- Introduced multinational enterprises to small Australian firms and research organisations where there is mutual benefit.

Australian government support has focussed on innovation intermediary activity to assist in the identification of, collaboration for, and use of technology.

The RFT points out, however, that despite the potential role intermediaries can play in the broader innovation system (including non-R&D innovation), there is a need for stronger evidence on the nature, role, function, and impact of intermediaries in building innovation capability in Australian companies and research organisations.

1.3 Approach to the Study

This Study involved the following tasks:

- Survey of intermediary organisations and companies participating in two pilot programs.
- Review of available literature on overseas intermediary models.
- Interpretation of results and findings in a broader intermediary framework.
- Report drafting and presentation.

1.4 Structure of this report

This report is written in a way that specifically addresses the reporting requirements in the *Statement of Requirement*.

- Section 2 provides some background material relating to the context of the Study, the role of intermediaries in network, market and organisational based forms of interaction, and the gaps that are addressed by intermediary services arrangements.
- Section 3 provides information about intermediary services in Australia, drawing on material from the survey and interviews with companies that had participated in intermediary programs as well as assimilation of research material.
- Section 4 provides information about the scope and nature of overseas intermediary services, drawing on documentary research.
- Section 5 provides information on the benefit and cost of intermediaries in relation to innovation outcomes. The material draws on information assembled during the survey and interview process.
- Section 6 provides information about the barriers to using intermediaries.
- Section 7 provides some suggestions for possible intermediary models for Australia, as required under the *Statement of Requirement*.

2 Background and issues

2.1 Context

Intermediaries are seen to play a key role in the ‘market for knowledge’ in relation to the transfer and translation of knowledge and technologies from creators, which are generally, but not always, located in research organisations, to application and use in a business (commercial) context.

Previous Howard Partners research and analysis for government and industry organisations on innovation, entrepreneurship, and new business development provides some important background in relation to the role and contribution of intermediaries in the innovation system¹. This work includes the following:

- *Recipes for Success: Case Studies Illustrating Successful Innovations by Agri-Food Businesses*. Canberra: Department of Agriculture, Fisheries and Forestry, 2001.
- *Securing Our Manufacturing Future: A Study of the Outlook for Small Business Manufacturing to 2015 and Beyond*. Sydney: NSW Small Business Development Corporation, 2001.
- *A Study of the Feasibility and Efficacy of Commercialising Research Outcomes from Australian Research Council Funded Research*. Canberra: Australian Research Council, 2001, Report to the Australian Research Council.
- *Study of the Interactions between Research Organisations and SMEs in the ICT Sector*. Canberra: Department of Communications, Information Technology and the Arts, 2004.
- *Knowledge Exchange Networks in Australia's Innovation System: Overview and Strategic Analysis*. Canberra: Department of Education, Science and Training, 2005.
- *Evaluation of the Agenda for New Manufacturing*. Melbourne: Department of Innovation, Industry, and Regional Development, 2006.
- *Review of the ACT Government's Knowledge Fund*. Canberra: Chief Minister's Department, 2006.

The key points that arise from this research include the following:

- Successful SMEs actively seek out advice from a range of sources and ‘trusted advisers’. These advisers may be family and friends, ‘people who know people’, their accountants, lawyers and professional business advisers.
- Successful SME managers participate in a wide range of networks and networking events organised by government, industry, innovation and regional development agencies, industry and professional services organisations – for example, Australian Business Limited, VECCI, AEEMA, AIIA, and the State Chambers of Commerce.
- Sustainable businesses grow slowly – the fast growing business that forms the basis of the venture capital model of business growth is a ‘special case’ in the overall pattern of business development.
- Universities seek to commercialise the results of research through spinout companies, licensing technologies to existing businesses, and transfer through industrially relevant knowledge through collaborations, joint ventures and research contracts and consultancies.²

¹ See: (Howard, Johnston, and Fowler 2001; Howard Partners 2001, 2001, 2002, 2005, 2004, 2006)

² University Financial Statistics indicate that universities earn far more from contract research and consultancies than from technology licensing and spinout companies. More detailed data has been collected in the recent *National Survey of Research Commercialisation*.

- The commitment of universities to this role, and the resources allocated varies widely
- There is also wide variety in performance.
- Businesses are concerned about ‘multiple entry points’ to tap into university and public research capability.
- There are many intermediaries and agents in the innovation system—some are supported through public programs, some are commercially oriented, and others work on a not-for-profit basis as NGOs.
- Intermediary roles can be performed by people and/or organisations.
- Intermediaries have a key role in addressing market *and* institutional failures in the innovation system.

2.2 Networks, markets, organisations and intermediaries

Research indicates that businesses that do not participate in networks or other forms of non-market based interaction along the value chain are unlikely to succeed. There is a growing recognition that markets are *social* as well as economic institutions (Fligstein 2001; Kay 1995, 2003), and that businesses, or more particularly business owners and managers, do business on the basis of personal contacts and relationships established through a range of formal and semi-formal organisations and ‘communities’.

These organisations and communities include trade, industry, and business associations, and research and technology organisations (RTOs). Involvement in external networks and communities also exposes business owners and managers to ideas and technologies from outside their businesses and their industries. Innovation in product development, production processes and customer service is often drawn from insights obtained from a complementary business—or from another industry entirely.

Paradoxically, with the growth in the scope and scale of markets, social and trust-based relationships established through networks and ‘communities of practice’, have become increasingly important as a basis for doing business. These relationships often underpin a commercial transaction. However, many new and emerging businesses may not have access to network forms of interaction due to lack of awareness, resources, and time. They might also be ‘new’ to the industry—or in a new industry, or in an industry that is poorly structured. This might be referred to as a ‘network failure’.

Where a network failure can be demonstrated, a case can be made for public support for intermediary services. A network failure would be reflected in observed market and institutional failures. These failures arise from ‘information asymmetries’—where a supplier knows more about the attributes of a product than a purchaser does—and ‘frictions’ in transfer arrangements which give rise to high transactions costs.

Even in market oriented frameworks, transactions take place between people—as either individuals or representatives of businesses. *Where transactions involve an element of uncertainty or risk people like to do business with people they know and trust.* Trust is created through the reputation, integrity and credibility of parties to a transaction (Maister, Green, and Galford 2000; Lewis 1999; Gupta 2002; Bibb and Kourdi 2004). Trust may take many years to establish—and can be easily dissipated.

For new and emerging businesses, particularly new technology businesses, owners and managers may not know many people in other businesses (or research organisations). Intermediaries can perform a critical role in establishing trust based relationships: they make referrals, provide references and make recommendations about who to do business with. Cooperation and collaboration with businesses and research organisations along the value chain inevitably involves high levels of trust. This applies in particular to the practice of external sourcing of innovation.

Trust cannot be engendered through formal contracts and legal agreements: these instruments are more often the *outcome* of a trust based relationship being established. Trusted advisers and intermediaries have a key role in building trust in market based transactions.

Organisational economists argue that high transaction costs can also justify the creation of organisations to ‘manage’ interactions between buyers and sellers. Where networks and markets are seen to be ‘failing’, intermediaries are often established as organisations to build relationships and facilitate knowledge and technology transfer (Williamson and Winter 1993).

Network oriented intermediaries act as leaders in regional innovation systems and facilitate cooperation and collaboration between businesses and research organisations on a voluntary or not-for-profit basis. They include:

- Electronic Technology Networks, such as the NSW Technology Showcase.
- ‘Leaders’ in regional innovation systems—people in business, research organisations and the finance sector who take on a role of bringing people together for the purpose of collaboration.
- Program staff in Australian, state and local government business enterprise development programs—for example, AusIndustry regional managers and client managers, NIDP staff (Department of Agriculture, Fisheries and Forestry), Austrade staff.
- User groups who identify new and/or improved products and services – reflecting the practice of customer driven innovation (Von Hippel 1988, 2005).

Organisationally oriented intermediaries are people located in formal organisation structures and provide an intermediary role as part of their formal responsibilities and accountabilities. They include:

- Staff with formal roles and responsibilities in Regional Business Councils and Economic Development Boards.
- People who take on roles as non-executive directors on boards of start-up companies and take on networking, counselling and business introduction roles.
- COMET Business Advisers in both their COMET role and roles as business advisers, counsellors and mentors.
- Staff managing export development programs and R&D programs—for example, Austrade and AusIndustry staff and counterparts in state government agencies.
- Cooperative Research Centre initiatives, including Knowledge Brokers and Extension Officers.
- Organisations like the Warren Centre based in the Faculty of Engineering at The University of Sydney.

Market oriented intermediaries include:

- Technology consultants, advisers and brokers who work on a fee-for-service or a commission/success fee basis.
- Business Development Managers employed at Universities with strong Technology Transfer Offices, and Research Development Officers employed in University Research Offices (this capability is uneven across the higher education sector).

There is also a category of intermediaries that provide specialised ‘knowledge intensive services’. These intermediaries, working principally on a consulting basis, bring innovation capability to firms by virtue of specialised knowledge and skills in areas such as design, architecture, engineering, ICT, finance, marketing and distribution, and R&D services including scale-up and prototyping. These intermediaries act as ‘innovation carriers and sources of knowledge that influence the performance of individual organisations, value chains, and clusters across industries’ (OECD 2006).

Professionals in knowledge intensive services businesses may also act as *integrators* and *carriers* in the innovation system as well as intermediaries (Hargadon 2003). That is, they drive innovation agendas—as well as facilitate and enable them—and in this way become a *source* of value creation in the economy. This is an important entrepreneurial and executive management capability in the knowledge economy³. The extent to which intermediary organisations supported by the Australian government and other relevant Australian intermediary systems act as integrators as well as intermediaries is an issue for consideration.

The Productivity Commission in its recent draft report on *Public Support for Science and Innovation* identified a role for intermediaries in the innovation system (Australia. Productivity Commission 2006).

Productivity Commission: Public Support for Science and Innovation - Draft Report (p 6.33)

Intermediaries are seen as playing a useful role in facilitating the transfer of knowledge and technology in the context of a market that has become increasingly sophisticated. A report by Howard Partners observed:

Business models for knowledge exchange networks based on advertising, marketing and hopefully selling technologies without the involvement of intermediaries are unlikely to succeed. People do not acquire technologies like they purchase a book. They want to know how it works and ask questions (and expect answers) in relation to issues such as scalability, security of IP and its relationship to a company's own IP suite, cost of development, safety and other business related matters. (p. 42)

Some participants were concerned about the availability of intermediary services in Australia and argued that the development of this market niche should be supported. For example, AEEMA contended that:

The weak link in the innovation chain is often the piece of infrastructure that can link technology with business and capital. By strengthening these links, then we can deliver the assured, secure path for commercialising and potentially industrialising the initial creative concept. There exist a few ‘facilitators’ in Australia for welding the combination of technology, business and capital through linking appropriate strategic partners. This industry niche needs fostering in a way that delivers fast, efficient and economic outcomes. (sub. 51, p. 5)

The report by Howard Partners argued there was a strong case for supporting the development of technology brokers, who are knowledgeable about university and business research and can work with business in an independent intermediary role.

The report argued that this should not displace the market oriented role of a growing industry of professional technology advisers (p. 30).

The Commission considers that intermediaries can play a useful role in the market for knowledge and technology. However, any public support for intermediaries would need to be based on evidence that there are regulatory or other market failures to justify policy intervention.

2.3 The roles and functions of intermediaries in innovation

Innovation intermediaries are *people* who bring buyers and sellers of technology and other knowledge products and services together. These intermediaries address and resolve information asymmetries in the knowledge market as a result of incomplete understanding of availability, source, quality, and efficacy of the products and services (on the part of the buyer) and incomplete understanding of buyer needs and requirements on the part of the seller.

Interest in intermediaries has arisen from two distinct perspectives:

- Knowledge transfer (which covers and extends the concept of technology transfer), between research organisations and businesses is considered a crucial means to foster innovation and build engagement between research organisations and business. It is recognised that intermediaries (and “institutions for engagement”) have a critical role in facilitating that transfer⁴.

³ In this regard many manufacturing companies are in fact services companies: they act as integrators across a value chain. More value is created by *managing a brand* for example than producing a physical product. The observation applies to small businesses (eg Billabong clothing, as well as large businesses.) This point was explored in the recent Howard Partners report for the Business Council of Australia. ((Howard Partners 2006))

⁴ See for example: (Goktepe and Etzkowitz 2005; Howard 2004, 2005; Howard Partners 2005, 2005; Howells 2006; Phan and Seigal 2006)

- Companies are increasingly looking outside their boundaries for ideas and innovation on the premise that they will not be able to build internal capabilities and competencies in all areas for sustained business development and growth. Strategies of innovation sourcing and technology acquisition, including the idea of open innovation have received attention⁵.

Both perspectives see a role for intermediaries, or go-betweens, connecting the providers and users of technologies in the market for knowledge. While intermediaries from the demand and the supply sides might be seen to represent differing interests, effective intermediation involves a capacity and capability to match and shape both supply and demand side issues. This requires a set of unique skills and capabilities.

The first perspective is often referred to as the *supply side* or *technology push*, and is associated with public policy and business interest in achieving commercial outcomes from investments in publicly funded research. The role involves a selling, consulting and engagement marketing strategy and is undertaken predominantly by technology transfer offices within or attached to research organisations.

The second perspective is often termed *business driven* or *demand pull*, and is associated with the technology acquisition and sourcing strategies of businesses. This involves a procurement and integration strategy—quite often bringing together several technologies from a number of diverse sources. These intermediaries may also perform the role of *technology scouts* to let businesses know what's out there, what's coming up, and what people are up to. More often than not initial approaches and preliminary negotiations between businesses need to be made discreetly and anonymously.

The role of supply side intermediaries has been studied extensively⁶ and surveys point to the importance of their contributions to effective knowledge transfer between research organisations and industry⁷. Over the five years 2000–2004 the number of people employed as supply side intermediaries in Australia's research organisations has increased dramatically—in universities it has doubled. There is, however, a great deal of scope for performance improvement (Howard Partners 2006).

The main focus of this Study is on demand side intermediaries in the market for knowledge. The Study sets out to identify the services they provide, the way they operate, their performance and areas where further policy interventions could be made.

2.4 Demand side issues

Less is known about the role of demand side intermediaries in Australia. This is due in large part to their comparatively recent emergence as key players in external technology sourcing and the growing interactions and interdependencies between large and small firms and research organisations in industries such as automobiles, aerospace, chemicals and pharmaceuticals, medical equipment and devices, consumer electronics, computers and telecommunications⁸.

Demand side intermediaries have a role in identifying and 'procuring' technologies for application and use in business contexts. All demand-driven models of technology and knowledge

⁵ See for example: (Linder, Jarvenpaa, and Davenport 2003; Quinn 2002; Howard Partners 2006; Dodgson, Gann, and Salter 2005; Chesbrough 2003)

⁶ See for example: (Feller, Feldman, and Bercovitz 2002; Bercovitz and Feldman 2003; Bercovitz et al. 2002; Johnston, Howard, and Grigg 2003)

⁷ See for example: (DeVol and Bedroussian 2006; Australia. Department of Education Science and Training 2004, 2006; Great Britain. Higher Education Funding Council 2003)

⁸ See (Malone, Laubacher, and Scott-Morton 2003). This issue was addressed in a recent project for the Department of Industry, Tourism and Resources. See: (Howard Partners 2005)

transfer identify a role for intermediaries—whether as employees, agents, brokers or independent technology scouts.

Demand driven models arise from the concepts of innovation sourcing (Linder, Jarvenpaa, and Davenport 2003), technology acquisition strategies, (Quinn 2002) partnering with suppliers and customers (Miller and Morris 1999; Von Hippel 1988, 2005) as companies look outside their boundaries for innovation. These models reflect an understanding that businesses will not be able to build all internal capabilities and competencies in aspects of research, development and design that is necessary for business development and growth. *Business driven research and development* is also an expression of the way that companies manage their research and development portfolios (Ganguly 1999).

As neither the source of the technology (a research organisation, or another business, small or large), or the adopter, are likely to initiate a fully demand-driven approach, an intermediary becomes the person who identifies, and expresses, a demand in relation to the technological possibilities that are available from discoveries, inventions and capabilities identified in research organisations and innovative businesses.

In some situations businesses may be aware of the technological possibilities (from reading articles in the science press, or seeing prototypes) but are unsure of how to access them or do not have the time or resources to establish a relationship.

Under a demand driven arrangement, innovation intermediaries work closely with businesses to analyse current and future technology needs. They use assessment tools to identify gaps that tie directly to corporate objectives. They then search externally for available technologies from one or more organisations: these organisations might be research organisations or other technology companies. Often, simply mapping out technology capabilities internally, and knowing how technologies can be shared or used within an organisation stimulates insight. This is essentially a management consulting role.

Technology integrators perform the role of ‘knowledge scouts’. Large businesses often have substantial investments in this capability. They often engage external intermediaries to provide an anonymous service. This is becoming increasingly important as companies look outside for sources of innovation.

Small businesses generally do not have the resources to undertake technology searches and manage the technology acquisition process. Independent and third party intermediaries can add substantial value in sourcing technology externally. Technology integrators can also perform ‘honest broker’ roles—acting independently and objectively to both parties to a technology transaction. This may be particularly important for small technology based firms.

2.5 Gaps that can be addressed by intermediary services

Intermediaries address the following ‘gaps’ in the market for knowledge:

- Information gaps.
- Access gaps.
- Transfer gaps.
- Translation gaps.

There are also a number of ‘institutional’ gaps in the Australian intermediary system which can be summarised under three headings:

- Technology research office capacity and capability.
- Researcher orientation in existing collaboration arrangements.
- Funding support for SME–research organisation collaborations.

Each of these gaps is addressed in turn.

A background discussion of market and institutional failures relating to policy support for intermediaries is provided at Attachment 3.

2.5.1 Market oriented gaps

Information gaps

Information gaps arise due to difficulties encountered by small firms in identifying relevant, useful, and applicable technologies/knowledge. In the current business environment, most firms will need to acquire some aspect of technology/knowledge externally either through the market (purchase) or through collaboration and joint venturing.

Few firms can own all of the technologies and create all of the knowledge they require for the core business functions of: research and development; manufacture and production; marketing and sales; distribution and logistics; and service and customer relationships. However, the cost of locating and accessing applicable knowledge and technologies can be resource and time intensive and beyond the capacity and capability of new and emerging SMEs.

Intermediaries support information search through interpretation and analysis of electronic and other databases (in the case of explicit knowledge) as well as providing support and assistance in finding people with sought after skills and experience (in the case of tacit and contextual knowledge).

Access gaps

Small firms might find it difficult to access technologies/knowledge even when they know where to find it. Working through a research organisation or corporate bureaucracy to find the person who has the authority and accountability to make a decision can also be time and resource intensive.

Even where an access point is identified, it may be necessary for an SME to establish credibility and *bona fides* about the way in which the knowledge/technology is to be used. Technology/knowledge suppliers may rely on an intermediary to attest to the integrity of a new and emerging SME.

The Study supported findings from other research that small businesses are not generally in the market to ‘purchase’ or acquire intellectual property (IP) rights to inventions and discoveries already made. Businesses, and particularly SMEs, want access to *capability* and expertise within a research organisation or another business⁹. As indicated above, SMEs often know that a capability exists in a research organisation, but they are unsure about how to access it efficiently and effectively. Research organisations are very complex bureaucracies.

Transfer gaps

Negotiation of knowledge/technology transfer, including license agreements and memoranda relating to collaboration may be beyond the skills and resources of an SME. Agreements might involve complex terms and conditions—some justified by the nature of the transaction, and some not. This is an area where substantial risks may be encountered for SMEs due to uncertainties about transfer agreement costs and longer term implications.

⁹ The value of research contracts and consultancies undertaken by research organisations for industry exceeds revenue from IP licensing by a factor of about 20 (Howard Partners 2005; Australia. Department of Education Science and Training 2006)

Negotiation of transfer agreements can require expert professional services input (legal, contract, tax, etc). SMEs may not know of the need to acquire these services or be uninformed about the quality and value for money of services on offer.

It is also the case that research organisations may set prices and charge for their involvement in contract research and consultancies, and seek to negotiate collaborations with industry on a full cost recovery basis. However, most SMEs cannot afford to pay the full cost of contract research and consultancy and find it difficult to commit to long term collaborations. This has the effect of providing a limitation on the potential to transfer capability. Intermediaries can perform a role in identifying funding pools and programs to offset these costs.

The Study demonstrated quite clearly that independent intermediaries can play a valuable role in assisting an SME in its dealings with a research organisation, from navigating their way through the multiplicity of administrative units to understanding the basic rules of the game.

▪ **Translation gaps**

Knowledge and technologies, particularly when created by research organisations, are rarely in a form or format that can be immediately adopted and applied in a business/commercial situation. To ensure that knowledge generated through research can be brought into practice it may be necessary for significant investments to be made in *translation*—to put information and knowledge in a form and format that practitioners can receive and apply.

There is a fundamental difference between *technology development*, based on research, and *product development*, oriented towards satisfying a customer want. A *product development* decision is made when a *business* defines expectations about a product's performance (what it will do and how), its cost, its "price point", and its scaled up manufacturability. The decision may also involve large investments in human capital, facilities, and materials.

USA research shows that only seven per cent of technologies licensed to business were ready for practical or commercial use and that licensed-in technologies have a high failure rate (Thursby and Thursby 2000). It follows that, if results were similar in Australia, SMEs may need some help in working with research organisations to translate technologies into useful products and services.

In Australia, organisations such as the Australian Mineral Industries Research Association (AMIRA), AMRAD (in the biotechnology sector), MinFab (ICT sector) and QMI Solutions (manufacturing sector) sit at the interface between technology development and product development. They have been established to test and develop technologies in business and commercial situations. These organisations parallel in some way the industry supported Research and Development Organisations that operate in the UK and formed the subject matter of recent work on intermediaries in the UK (Howells 2006).

About QMI Solutions

QMI Solutions is a not-for-profit organisation dedicated to helping industry on the journey to manufacturing excellence through research, education, and implementation of world class practices and technologies. QMI Solutions, formerly known as the Queensland Manufacturing Institute, has a \$20 million facility located at the Brisbane Technology Park. It was established in 1993 as a joint venture between the Queensland Department of State Development (DBIRD as it was then known), CSIRO, DET and QUT.

2.5.2 Institutional gaps

▪ **Gaps in university technology transfer capability**

The capacities and capabilities in research organisation technology transfer offices and research offices to support knowledge and technology transfer is uneven. Many have taken steps to

increase their capabilities in knowledge transfer, particularly in the light of commitments to third mission, industry outreach and community engagement. Others have formed alliances with larger technology transfer offices (TTOs) to market their technologies and knowledge assets. For example, University of Wollongong and University of Western Sydney have an alliance with UniQuest—the technology transfer office at the University of Queensland.

Technology transfer offices and research offices have a strong commitment to marketing the knowledge assets they have created and own. However, these assets are rarely in a form that specifically addresses a business need. Intermediary organisations can play an important role in working with these research organisations offices to encourage, and recommend for funding, projects that will support technology and knowledge transfer. It is critical, however, that intermediary organisations work with, and complement the work of these offices.

In work recently completed by the Business Council of Australia it has been observed that:

At the operational level . . . innovation agencies in Australia do not have the support or funding linkages that would allow them to emulate the role of their counterparts in other countries, such as the Fraunhofer institutes in Germany, the Finnish Funding Agency for Technology and Innovation (Tekes) and the highly effective Enterprise Ireland. These agencies work with business and public research organisations to identify and evaluate opportunities and then to exploit them in a systematic way, from 'proof of concept' stage to commercial application, including opportunities for business and technology integration.

In some cases, these agencies also support technology transfer and commercialisation to ensure research funding is used for public benefit, either individually or on a 'shared services' basis as in Switzerland, Israel, Midlands UK and the University of California system (Cunningham and Harney 2006), and to encourage universities to become 'innovation hubs' for business networks and clusters. Public agencies of this kind are part of the new emerging technology and innovation infrastructure of 'innovation intermediaries' (Dodgson, Gann and Salter 2005).

This Study has not specifically addressed the need for intermediary support for institutionally oriented technology transfer organisations. It is understood that this issue is being canvassed by the Department of Education, Science and Training in the context of third stream funding initiatives.

Notwithstanding the merits of a case for third stream funding to build capability in technology transfer/research offices it is still the case that for effective knowledge and technology transfer to occur there must be robust receptor capacity and absorptive capability in industry. From the available overseas material it is apparent that there are intermediary organisations that specifically address this issue.

▪ **Researcher orientation in existing industry-academic knowledge and technology transfer programs**

The Department of Education, Science and Training funds a number of programs aimed at the transfer of technology and knowledge transfer from research organisations to business. These include:

- ARC Programs—in 2005–06 the Australian Research Council has allocated over \$260 million for Linkage programs – including Centres of Excellence, Infrastructure, and Linkage Projects.
- The Cooperative Research Centres Program, to which the Australian government has directed more than \$2.6 billion over 15 years, supports collaborations between the research sector and Australian industry.

These programs tend to be researcher and research organisation initiated with a strong focus on research outputs and assessment strongly weighted to academic criteria. There is quite a long cycle time from the time of application to the award of a grant. As the programs are administered by research organisations they are easily 'captured' by researcher interest—at the expense of business and industry interests.

The levels of funding involved are quite often substantially in excess of what is required for the transfer of existing knowledge and technologies. The programs are geared more towards the creation of new knowledge rather than the transfer of existing knowledge through *translational research*. Small to medium enterprise participation in these programs is very limited due to the level of contribution required and the long time commitment—although CRCs such as the Smart Internet Technology CRC have developed arrangements to facilitate the participation of, and technology transfer to, SMEs.

The Department of Education, Science and Training also manages the Collaboration and Structural Reform Fund which, between 2005 and 2009, will provide around \$46m (\$9.2m annually) to promote collaborative activity between universities, business, other tertiary education providers and the wider community.

▪ **Funding support for research organisation–SME collaborations**

A major gap in support for technology transfer and knowledge collaboration relationships between research organisations and small businesses relates to projects that involve translational research—that is, the translation of knowledge derived from laboratory work into practical applications. Very few technological inventions or discoveries are presented in a way that there is an immediate commercial application. Translational research moves the focus of attention from technology development to product/service development.

One company that had received support from an intermediary organisations included in the pilot program was involved in undertaking translational research for small businesses. While the intermediary organisation has performed an important ‘pre-qualifying’ role, this funding should be available to a much broader range of potential small-business–research organisation collaborations.

With a wider spectrum of intermediary organisations recognised as providing an intermediary service, these organisations could perform a role of recommending collaborations for funding support. In the interests of probity, transparency and accountability, funds should be administered at arms length from the intermediary organisation. Given the experience of AusIndustry in these matters, it would seem appropriate that AusIndustry administer the fund.

3 Intermediary services in Australia

This Section of the Report addresses that part of the *Statement of Requirement* which requires a report on:

The scope and nature of intermediary activity in Australia through:

- Identification of the roles and functions of innovation intermediaries in Australia
- Identification of the main performers in these roles
- How do intermediaries function
- What skills sets are required
- What are the range of services required/offered
- What conditions allow them to function effectively
- What are the barriers to intermediaries operating effectively

Information drawn from the pilot projects funded by the Department of Industry, Tourism and Resources as well as from our understanding of the role and operations of demand side intermediary services in Australia is provided below.

3.1 The roles and functions of innovation intermediaries

The Project Brief identifies intermediaries as generally independent third parties that play an integral part in collaborative activities supporting any aspect of the innovation process for the mutual benefit of two or more parties. Such intermediary activities include:

- Assistance in the recognition, acquisition, and utilisation of relevant intellectual property or technology
- Identifying potential collaborators
- Brokering a transaction between two or more parties
- Acting as a mediator, or go-between, with bodies or organisations that are already collaborating
- Identifying and tailoring advice, funding, and support for the innovation outcomes of such collaborations

This definition of intermediary activities combines four quite distinct roles:

- That of a *consultant*—covering assistance through providing information and advice in the recognition, acquisition and utilisation of relevant intellectual property or knowledge and technology capability.
- That of a *broker*—covering ‘brokering a transaction between two or more parties’.
- That of a *mediator*—being an independent ‘third party’ who assists two organisations form a mutually beneficial collaboration.
- That of a *resource provider*—being an agent who secures access to *funding* as well as other material support for the innovation outcomes of such collaborations.

Each role has different characteristics in terms of knowledge and skills, responsibilities and accountabilities, rules of professional and ethical conduct, incentives, rewards, and remuneration. These roles are provided by people separately, in specialist organisations, or in combination.

Whilst these roles are not mutually exclusive, classification is an important tool for research, investigation, and analysis. Classification provides the basis for discovery (or more simply, finding out what is going on), for consideration of the merit and worth of policy and program interventions, reporting results and developing recommendations for further action and initiatives. In this Study, classification has assisted in ‘untangling’ the various roles and contributions provided by intermediary organisations.

The nature and business characteristics of intermediary roles is summarised below.

Figure 1: Nature and characteristics of intermediary business models

Intermediary role	Nature of role	Nature of the Business Model	Nature of the 'value proposition'
Consultant	Expert professional advice based on the knowledge, skill and experience of the consultant In an Innovation context, advice might relate to due diligence, strategic marketing and IP management and technology acquisition	A professional services firm model—providing and selling knowledge-based <i>capabilities</i> . These are reflected in a person's or a firm's reputation and track record, their integrity and their credibility in providing solutions for business and government A highly contested market with freedom of entry—often a lot of effort goes into marketing capabilities. Consultants are typically paid on a fee for service basis, calculated by salary cost, recovery of direct and indirect costs, and a profit margin	Creates value through provision of advice that may not have been available or difficult to obtain. Value is reflected in the solution that is provided—which is the total cost of the service Buyers often have difficulty in identifying and capturing value. Implementation is often more difficult and costly SMEs are reluctant to pay full cost of consulting services – might not be able to afford them, or cannot see the value, or both
Broker	Agent acting for a creator and/or acquirer of sought after knowledge and/or technology. Interprets business needs and 'translates' available capabilities to meet that need Brokers can also perform an integration role bringing multiple parties together into a collaboration 'deal'. Roles may involve assistance in negotiating contracts, purchases, or sales	An agency model—people acting for either buyers or sellers of knowledge (rarely both) on the basis of their capacity to meet needs through their networks and ability to initiate and negotiate deals (Acting for both gives rise to conflicts of interest—a reason why brokers are often regulated) An example would be a technology broker, acting on behalf of a client, who identifies/seeks out a technology and works towards creating a deal Supplements the role of electronic knowledge exchanges Brokers are typically paid a commission on the value of a transaction or a success fee. They may also be paid on a retainer basis. Government grants may also be paid	Creates value to parties through a deal being negotiated, or a transaction being completed Commissions reflect payment for the track record of the broker, a premium for risk (if the deal fails) as well as the overall cost of doing business Value is reflected in perceptions about the benefits and returns to the party paying the commission in relation to potential longer term returns
Mediator	Introduction, engagement and representation services A go-between who acts as a link between parties Assists in forming collaborations between two or more parties Facilitator in a knowledge network	A network or association model—where people become members and in turn gain access to other people, knowledge and technologies they would not otherwise encounter Members may also have opportunity to meet and communicate in areas of shared and common interest Industry and professional associations perform important mediation roles. Some have specifically tasked mediators There may be one or more mediators In some 'clubs', membership may not be widely known—except to the mediator Mediator organisations are financed by subscription and/or membership fees Governments may provide support/assistance for SMEs to join	Creates value by people getting to know each other—which may not have occurred Value is in the opportunity and potential to collaborate—which is reflected in the perception about what members are getting from their membership fee Free membership can cause free-rider problems Value is also placed on the high level of trust established between and among members. Confidences are respected and preserved
Resource provider	Provision of resources, such as funds to secure market research, management strategy advice, facilities, and access to knowledge in the form of IP or contract research services	Grants based model—people and organisations make applications from funding programs in accordance with assessment and selection criteria For public programs, grants are usually awarded on a competitive basis Public accountability and probity requires separation of responsibilities between people recommending the grant and people authorizing payment	Grants provide ability to acquire new capability (knowledge, people, assets), and offset costs, to achieve innovation outcomes

The Department of Industry, Tourism and Resources has supported a pilot/experimental program that combines these roles in a single organisation/service delivery framework, but with a strong consulting focus. It has also supported a pilot program in the mediator roles. These pilot programs have provided a great deal of evidence about the benefits of intermediary services. These benefits include:

- Introduction of new technology to firms.
- Workshopping exercises that helped companies gain confidence in their value propositions.
- Gaining contacts to companies and people who a company might need to meet with; gaining greater understanding of what companies are up to; approaching a problem in a confidential manner.
- As a supplement to a company's its own sales and marketing team.

The key issues for consideration from the pilots are:

- The extent to which an integrated approach creates more (or less) value than the market providing individual services through separate organisations.
- Whether the mediator model is self sustaining.
- What aspects of intermediary roles should be supported in the future and under what arrangements.

3.2 The main performers in intermediary roles

3.2.1 Consultants

Most large professional services firms perform an intermediary function as part of their suite of service offerings for small, medium, and large businesses. Strategic management and marketing and business development consultants as well as corporate finance advisers bring skills, knowledge, and experience in relation to innovation practice and performance. Smaller, specialised technology and innovation advisory consultancies are also an important segment of the market for professional services and advice.

Patent Attorney firms and corporate legal firms also perform important intermediary roles by providing specialised advice in relation to IP and structures for collaborations. Most importantly, they bring networks of people and organisations that can be brought into collaborations.

An important part of a business consulting assignment might involve locating and accessing capacities and capabilities for innovation—including knowledgeable people, with skills and fresh ideas, and technologies. These people and technologies may be located in other companies or within a university or research organisation. In providing advice in these areas a consultant would be expected to undertake due diligence and inform clients of the reputation of the people, the originality of ideas and the efficacy of the technologies being examined.

For most SMEs their first port of call in finding an intermediary is their banker and accountant—who performs an intermediary role in their dealings with compliance agencies—such as the ATO, ASIC and Workcover. Many SMEs also deal with insurance brokers to manage their insurance affairs and lawyers to manage their contracts and patent attorneys to manage their IP affairs. Accountants and lawyers, through their client bases, contacts, and networks can provide other intermediary services with other companies in relation to technology acquisition and advice.

3.2.2 Brokers

In commerce, a broker is a party that acts on behalf of another party in negotiating a transaction and consummating a deal. Only rarely does a broker represent both parties to a transaction. A broker who also acts as a seller or as a buyer becomes a party to the deal.

In the innovation context, the concept of a knowledge broker has emerged. In addition, firms have emerged that specialise in brokering deals between acquirers and suppliers of technologies.

▪ Knowledge brokers

A knowledge broker is a person who facilitates the creation, sharing and use of knowledge in an organisation or between organisations. The term knowledge broker is also used to describe companies or individuals that operate commercially as knowledge traders or provide knowledge-related services.

The knowledge brokering concept arose because professionals, such as managers, prefer to seek information from people they know and trust. They prefer face-to-face exchange; often only want to find out answers to particular problems; and want accurate integrated information. Knowledge brokers satisfy these needs.

The e-Water Cooperative Research Centre (CRC) uses 'Knowledge Brokers' to tailor responses to their research users' questions.

e-Water CRC Knowledge Brokers

In the CRC, knowledge brokers, with postgraduate scientific research training and communications experience, first interact with CRC stakeholders to really understand their needs. Then they analyse and assemble the required knowledge from a number of research projects to satisfy the stakeholder needs. In these two ways, these knowledge brokers have a somewhat different role and professional background than science communicators in many research organisations.

Knowledge brokers at the CRC provide advice on a range of issues on request. They manage consultancies, act as the contact point for both the stakeholders who want a problem solved and the researchers who can solve it. Knowing the needs of stakeholders, they can advise researchers who are formulating and choosing the scope of relevant research projects.

Knowledge brokers run workshops for problem solving, and expert panels for training; and they produce communication projects that synthesise knowledge for various audiences. Apart from the workshops, typical knowledge-exchange products are talks, face-to-face briefings, reports, brochures, booklets and articles in appropriate print media.

▪ Technology brokers

There are a number of organisations that have been established to perform technology brokerage roles. BioLink, for example, has been established with the support of the NSW government to broker transactions between research organisations and biotechnology companies.

Bio-Link

Bio-Link is a business development company that provides international biotechnology and pharmaceutical companies with access to emerging Australian technologies.

Bio-Link adds value to the commercialisation process through: critical assessment of patent protected, early stage technologies; packaging of data; and identification and engagement with potential collaborators, licensees, or investors.

Bio-Link consults to research institutions and to biotech companies providing services in business planning and the implementation of licensing and partnering strategies for therapeutic and diagnostic technologies.

Bio-Link works for its clients on the basis of a retainer plus a success fee.

▪ **Integrators**

Brokers, as intermediaries, also undertake *integration* roles—that is, bringing together people and organisations with diverse skills and capabilities into strategic alliances, collaborations, and joint ventures in order to capture market opportunities and provide solutions to business problems. This is, for example, a feature of the ICT, construction, film production industries and some aspects of manufacturing: it is very rare to find a manufacturer these days who owns and operates all aspects of a manufacturing business.

3.2.3 *Mediators and intermediation*

Mediators as intermediaries act as ‘go-betweens’ among the acquirers and suppliers of knowledge. Their activities can range from arranging introductions through to active representation and lobbying for the application and use of, or access to, a particular technology. A knowledge mediator may also have integrated enough fragments of knowledge into something that provides the basis for making the selections, and knowing how to render that selection in its most meaningful way (John Seely Brown).

The critical contribution of intermediation is in building and sustaining networks of people, companies, and research organisations. Regional innovation networks, or clusters, are usually associated with leadership and mediation roles. Regional networks and clusters work when there is a high level of trust and shared strategic intent among participants.

From a national and international perspective a more intensive and expert approach to mediation is often required. Companies, particularly SMEs, have little knowledge of the people and technologies in organisations with which they could potentially collaborate. Experience has demonstrated that businesses do not acquire technologies ‘sight unseen’ from a website or electronic knowledge exchange. Electronic postings might provide an indication of what is available, but access and translation of the technology into application and use usually requires a ‘human interface’.

The consultations undertaken for this Study indicated that some businesses liked to have an intermediary engaged to identify technologies, on an anonymous, confidential and non-attributable basis. Having made the connection, companies considered that they were in the best position to negotiate a deal. Other businesses wanted an intermediary to negotiate access to a technology and/or contract research on their behalf.

▪ **‘Trusted intermediaries’**

The Department of Industry, Tourism and Resources has supported a pilot for a Knowledge Exchange based on the mediation of ‘trusted intermediaries’. The pilot was based on the idea of Dr John Wolpert from IBM (Wolpert 2002).

IXC Australia Limited

The IXC, in its original formulation, was an intermediary service established to provide an online 'open network' to enhance Australian innovation by improving communication across the boundaries of industry, government, academic and research.

In May 2004, the IXC began to trial the use of 'trusted intermediaries' to facilitate the secure, managed exchange of sensitive knowledge between entities. On 1 July 2006, IXC Australia Limited was officially formed as a fully independent, not-for-profit company, limited by guarantee.

IXC Australia is now headquartered in Melbourne where strong Victorian government support will see IXC Intermediaries working in Victorian medical research institutes, and in the food and agriculture, 'small technologies' and smart manufacturing sectors.

Organisations (including small and large companies as well as universities and research organisations) pay an annual subscription for membership of IXC. For some SMEs this is subsidised with government funding.

During the pilot, the IXC model began to attract international interest. Today, technology, information and people are globally mobile. IXC has the ability to cross national boundaries to help organisations work together.

The model for deploying IXC Intermediaries internationally is through the licensing of locally-sponsored, independent, not-for-profit IXC organisations forming the InnovationXchange Network. Under the IXC banner, these nationally-based IXCs are supported by IXC Australia with its associated ethics, methodologies and standards and provide unprecedented opportunities for international linkages.

The IXC has concentrated on providing mediation services—it *does not* provide brokerage, business advice, or funding to participating businesses.

Feedback obtained in the Study regarding the IXC was, in general, very positive. Many participants valued being 'in the club' even if they had not yet received tangible benefits. In particular, they valued being made aware of technologies that might have value, and more generally, of what is happening in the market.

Not every company expected the arrangement to deliver collaborations—but if it did then 'well and good'. The main value of the matching organisation for these companies appears to be in enabling medium to large businesses to better understand the competition, as well as understand what research organisations are up to, and what small companies are doing—and with whom they might want to collaborate. It is essentially a business intelligence and 'technology scouting' role within a strict code of ethics framework. People know, trust and have confidence in the arrangement and in the individual intermediaries involved.

▪ Networking organisations

Innovation has regional, national and international dimensions. Most discussions of innovation, entrepreneurship and business-research organisations emphasise a regional dimension—proximity of new technology based businesses to research organisations as a source of graduates, post-doctoral researchers, senior faculty, and facilities and equipment. These discussions point to the roles of networks and networking in knowledge transfer¹⁰.

Networking organisations that might provide an intermediary role cover:

- Regional business councils, chambers of commerce, industry associations, professional associations and learned societies—where people from research and business backgrounds are likely to meet.
- Science parks and incubators—home for knowledge intensive and early stage ventures, particularly where these are established on, or adjacent to, a research organisation.
- Early stage seed and venture capital funds—where fund managers are expected to have good connections to research organisations and businesses along a value chain.

¹⁰ See for example: (Fritsch and Schwirten 1999; Walshok et al. 2002; Bryant, Dalitz, and Scott-Kemmis 2003; Gunasekara 2006; Cooke 2006)

- Professional services providers—legal, banking, intellectual property, and accounting services tailored to the needs of early technology ventures.
- University business development offices—and increasingly, university ‘outreach and/or engagement’ offices (many of these have a focus on community service rather than knowledge transfer).

Invariably in these organisations there are *people* who perform an intermediary role. These individuals have unique skills in being ‘well connected’ and are known, respected and trusted. They perform important leadership roles in innovation networks and regional innovation systems. Importantly, those connections can be made outside the region – nationally and internationally.

A recent review undertaken for the ACT government identified five or six people who performed critical networking and intermediary roles in the regional innovation system (Howard Partners 2006).

▪ **Industry and professional association outreach activities**

Industry associations that have taken on leadership roles in the development of their industries, and moved beyond industrial relations agendas, such as AEEMA and AIIA provide important mediation roles among their members.

Australian Business Limited and Chambers of Commerce also provide important mediation roles through their various networking and information dissemination responsibilities.

▪ **Business incubators**

Business and technology incubators perform mediation roles in supporting business development and growth through facilitating contacts and relationships with other small businesses, larger businesses and research organisations. Incubators that perform this role include, for example, Epicorp in the ACT, and ATP–Innovations at the Australian Technology Park in Sydney.

ATP Innovations, a business incubator, is owned jointly by The University of Sydney, the University of NSW, the ANU, and the University of Technology Sydney. It is a technology commercialisation hub that supports emerging businesses in the biotechnology, ICT and electronics sectors.

ATP Innovations
<p>Located within the Australian Technology Park (ATP), on the fringe of the Sydney CBD, ATP Innovations supports one of Australia's largest clusters of emerging technology businesses. Programs focus on value-added services to accelerate business growth, and whilst many clients are located at the ATP, the program supports businesses regardless of location.</p>
<p>ATP Innovations facilitates business commercialisation through the following programs and services:</p>
<ul style="list-style-type: none"> ▪ bizStart maximises the business opportunity for a promising technology or business concept through the development and validation of a realistic business plan ▪ bizConnect provides continued non executive support to accelerate business development; ATP Innovations acts as a service provider, mentor and advocate for its clients ▪ bizNetClub allows those interested in technology commercialisation to participate in a vibrant community. Through its seminars and Intranet, it facilitates strategic thinking, linkages, deal-making and professional skills development ▪ bizCapital allows ATP Innovations to “seed” qualifying businesses with investment and helps to close the early stage funding gap

The direct and immediate 'value add' to a business of introductions can be small. Not every introduction will result in collaboration.

The value added of introductions occurs at the next step, where there is a role in project managing the collaboration on which an introduction was based. Project management is essentially a consulting service.

3.2.4 *Resource providers*

There are a large number of technology consultants and advisers who are involved in putting together collaborations to submit proposals for Australian government collaborative funding programs such as ARC Linkage Grants, and the Cooperative Research Centres (CRC) Program. Both of these programs involve long lead times, require detailed submissions to be prepared, and are directed towards longer term collaborations.

An important aspect of the grants administration process involves calling for applications, providing advice to people and organisations submitting applications, assessment and due diligence, ongoing performance monitoring and evaluation. There is, however, a clear separation of responsibility for making recommendations for the award of a grant, and final authorisation of payment to a grantee. Moreover, organisations providing the funding rarely provide the service being paid for.

There are very few government programs that provide resources for small collaborations. This Study found that demand by SMEs for funding to assist them to enter into contract/collaborative research arrangements with universities and research organisations is high, particularly if there was a short, one month, turnaround time from application to approval.

3.2.5 *Combined intermediary roles*

Investigations for this Study indicated that there is only one organisation, the Australian Institute for Commercialisation (AIC), which has been funded on a pilot basis to undertake all intermediary roles identified above. The AIC delivers these roles through its TechFast program.

TechFast
<p>TechFast is a pilot program that operated from February 2005 to June 2006. It aimed to encourage established and technology receptive SMEs to adopt commercially viable technologies and know-how from Australian research organisations. Its objectives are:</p> <ul style="list-style-type: none"> ▪ To help established, well performing technology-based SMEs accelerate into larger, sustainable, fast growing and innovative businesses that will make a significant contribution to economic growth and development in Australia. This will be achieved through fast tracking the adoption of external technologies by such SMEs ▪ Improve the scale and speed at which SMEs are able to successfully expand and grow their businesses through the accelerated take-up of leading edge technologies. This will ensure that such businesses are more investment-ready, market-ready and technology-ready to compete at both national and international levels ▪ Provide greater opportunities for participating research institutions to commercialise their research as well as to enhance their overall commercialisation capability and grassroots links with industry <p>The program provides funding, hands-on assistance and 'de-risks' the transfer and commercialisation of new technology by:</p> <ul style="list-style-type: none"> ▪ Identifying established, technology-receptive SMEs that are pre-qualified by TechFast and have a track record in their sector and are ready to grow. ▪ Linking these SMEs with relevant innovative technologies or know-how developed by research organisations ▪ Providing the 'hands-on' advice, funding and support to facilitate the transfer of technology between research organisations and SMEs to benefit all parties. The TechFast program supports companies by providing consulting services such as detailed IP searches, detailed market research, technical assessments of IP, conducting financial modelling, developing commercialisation strategies, providing legal and IP advice and services, and assistance with capital sourcing <p>Potential SME candidates are assessed and selected according to specific criteria.</p> <p>The KPI for the pilot was to accelerate growth in 20 SMEs from around Australia by assisting these firms to transfer technology, IP and knowledge from the Australian research sector. This key performance indicator (KPI) has largely been met. There do not appear to be any other KPIs.</p>

A feature of the TechFast program is that the AIC is, first and foremost a consultancy organisation that is in a position to provide grants for consultancy services which it in turn may deliver. TechFast acts as an intermediary broker on the demand side—but also acts a broker for knowledge providers.

The pilot project has indicated that businesses place a high value on what are seen as grants, provided by the Australian government for consulting services, and delivered by the 'intermediary' consulting organisation.

3.3 The way in which intermediaries function

A classification representing the way intermediaries operate and function in Australia and overseas is provided below. This classification draws on the findings from the Study as well as more general observations about the functions of intermediaries in various roles. Not all attributes are mutually exclusive.

Figure 2: The way intermediaries function

	Consultant	Broker	Mediator	Resource provider
Skill sets required	<ul style="list-style-type: none"> High level knowledge, skills, and experience in relevant consulting areas Established track record Skills recognised through reputation and preferably accreditation Respect among peers Evidence of ongoing learning and professional development 	<ul style="list-style-type: none"> Strong 'sales' skills Highly networked Relevant industry knowledge Knowledge of legal and IP advice and strategies High level communication and negotiation skills Ability to see 'big picture' and opportunity Ability to follow through on leads and opportunities 	<ul style="list-style-type: none"> Skills in capacity to 'engage' with parties. Highly networked with business and research organisations Leadership, initiative and capacity for lateral thinking Excellent people skills High level facilitation and communication skills Capacity to engender confidence and trust 	<ul style="list-style-type: none"> Understanding of terms, conditions and expectations of collaboration funding programs Capacity to identify and form collaboration teams for joint ventures Capacity to develop and articulate a compelling 'business case' Ability to provide value added to the collaboration team
Range of services provided	<ul style="list-style-type: none"> Identification of knowledge and technologies that will assist in developing products and services that meet a market need Access to database services Knowledge of R&D grants Workshops, seminars and other networking events Participation in competitions, awards 	<ul style="list-style-type: none"> Seek out new knowledge and potential opportunities for client Communicator/translator of technology and opportunities Advice on IP, capital raising, and potential partners Independent broker or facilitator – assistance in negotiating contracts, purchases or sales 	<ul style="list-style-type: none"> Anonymous and independent matching of technology possibilities In-company placement of personnel Provides introductions to potential strategic partners Networking events and other informal and formal arrangements for people to establish contact 	<ul style="list-style-type: none"> Forming and structuring collaborations to submit applications for funding under government funding programs. Funding intermediary may also administer the grants program.

	Consultant	Broker	Mediator	Resource provider
Conditions that allow them to operate effectively	<p>Awareness</p> <p>Ability to cross subsidise intermediary roles from value added consulting services</p> <p>Client appreciation of the value of consultants</p> <p>Ability of clients to pay fees</p>	<p>Receptor and 'absorptive' capacity among business</p> <p>Deal flow</p>	<p>Reputation, track record, integrity</p> <p>Willingness of people and organisations to share technologies and capabilities</p> <p>Capacity for reciprocation</p>	<p>Availability of funding programs</p>
Barriers to operating effectively	<p>Willingness of SMEs to commit financial resources</p> <p>SME confidence in credibility, independence, competency, and value add.</p>	<p>'Not invented here' mentality. Absence of absorptive capacity</p> <p>Suppliers having unrealistic expectations about the value of their technologies/knowledge</p>	<p>Ambivalence to open innovation and innovation sourcing as a business strategy</p> <p>Uncertainty and lack of clarity about the process</p>	<p>Limited availability of funding programs</p> <p>Perception of 'spin' on part of the funding organisation</p>

4 The scope and nature of overseas intermediary activities

This Section of the Report provides information in relation to the following matters set out in the *Statement of Requirement*.

- The scope and nature of overseas intermediary activities, including:
- The scope and nature of those activities
 - Examples of government programs that assist intermediary activities
 - The impact of those activities on the companies involved
 - Comparison of intermediary activities in Australia with overseas examples

Care must be taken in learning from overseas experience. Most countries cited as examples are unitary States where responsibilities are held centrally, by a national government. Australia, like Canada and the United States, are federations with responsibilities shared between the national and state governments.

Many of the programs in place in unitary states such as Finland and Ireland are appropriate to individual Australian States—they are about the size of NSW and Victoria respectively. Intermediation roles that have developed in those countries are particularly relevant to regional innovation systems and ‘clusters’ and Australian state governments should be encouraged to look closely at some of those initiatives. What is important in the Australian context are truly national initiatives that encourage and facilitate intermediation on a national, and international, basis.

The nature and scope of overseas initiatives covers the categories of intermediary organisations canvassed in earlier parts of this report. They focus particularly on technology brokerage, mediation, and provision of grants for collaborations.

It is important to note that the examples provided in the remainder of this Section do not correspond exactly to the intermediary services delivered through the Australian pilot programs.

4.1 Examples of government programs

4.1.1 European Union (EU)—Innovation Relay Centres

Innovation Relay Centres (IRCs) were established to stimulate transnational technology transfer and promote innovation services. They provide specialised business support services for technology-oriented small and medium-sized enterprises (SMEs). The services are also available to large companies, research institutes, universities, technology centres and innovation agencies.

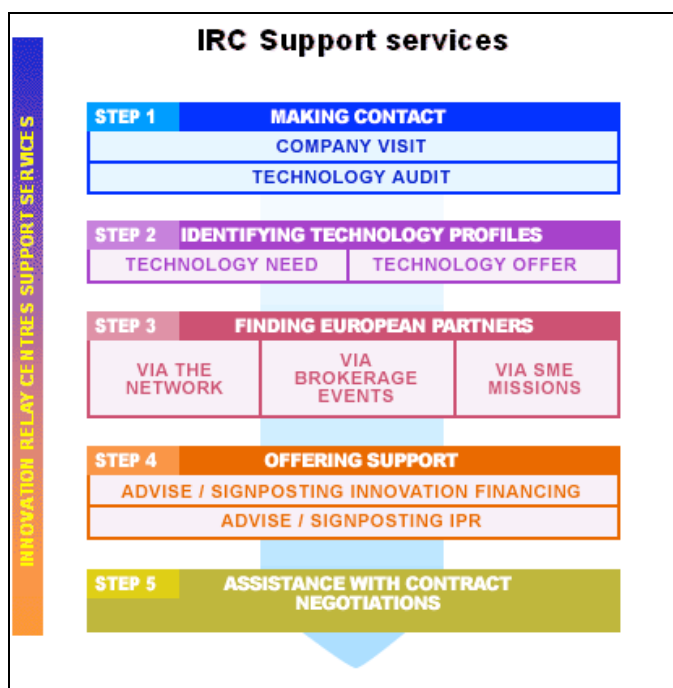
The main tasks of the IRCs are reported to be to:

- Promote the transnational transfer of technologies and knowledge.
- Stimulate transnational co-operation and partnerships.
- Promote the transnational dissemination and exploitation of the results of EU Community research.
- Pursue possible synergies between the IRCs and the Innovating Regions in Europe (IRE) network.
- Develop new methods, eg. for the promotion of transnational clusters and/or measures to facilitate the development of the European Research Area.

There are 71 regional IRCs that span 33 countries—25 EU Member States, as well as Bulgaria, Romania, Iceland, Israel, Norway, Switzerland, Turkey and Chile. IRC staff (a total of nearly 1,000) are specialists with backgrounds in business, industry and research. Most IRCs are operated by consortia of qualified regional organisations such as Chambers of Commerce, Regional Development Agencies and University Technology Centres. Some are small offices, staffed by three or four specialists and run along similar lines to typical consulting companies. Altogether, almost 220 partner organisations are involved, ensuring wide geographic coverage.

The common thread is that IRCs are all technology advisory centres providing transnational technology co-operation services, and each Centre is staffed by personnel who have an intimate knowledge of the technological and economic profile of the companies and regions it serves.

Innovation Relay Centres adopt a one-to-one approach with local companies. The advisory and assistance process is depicted below:



An IRC can use a company's technology profile to match with other companies in Europe and visits can be arranged. These visits are generally sectoral in nature and based upon a series of pre-arranged meetings. Social events, travel and accommodation can be provided as part of the package. The 71 IRCs are connected by intranet which allows rapid diffusion of technology profiles across Europe. These profiles are also stored in a searchable database.

The Relay Centre can also:

- Promote technologies at exhibitions, trade fairs, partnering events and through the day to day interaction it has with the rest of the IRC network.
- Help with the selection and identification of projects, which are suitable for innovative financing.
- Organise meetings with business angels and venture capital funds operators, organise transnational innovation financing brokerage events.
- Assist with the preparation of the technical part of the business plan for investors.
- Provide advice on how best to protect innovative technologies—advice may also be provided by a third party, a patent lawyer, employed by the Relay Centre or this service may even be delivered by Relay Centre staff themselves.

- Provide assistance during the negotiation phase of the contract. The Relay Centre may bring in third parties with relevant expertise (even if the service is delivered by Relay Centre staff). This assistance may include:
 - The drafting of a confidentiality agreement.
 - The organisation of the first meeting with provision of a venue and if necessary a translator.
 - The organisation of the visit to the partner.
 - The provision of model technology transfer agreements.

Some IRCs also help in the complex process of valuing never-before-seen technologies, in unfamiliar industries. They can direct companies to specialists who can advise on the value of different types of agreement and so ensure that companies pay or receive a fair price for a technology.

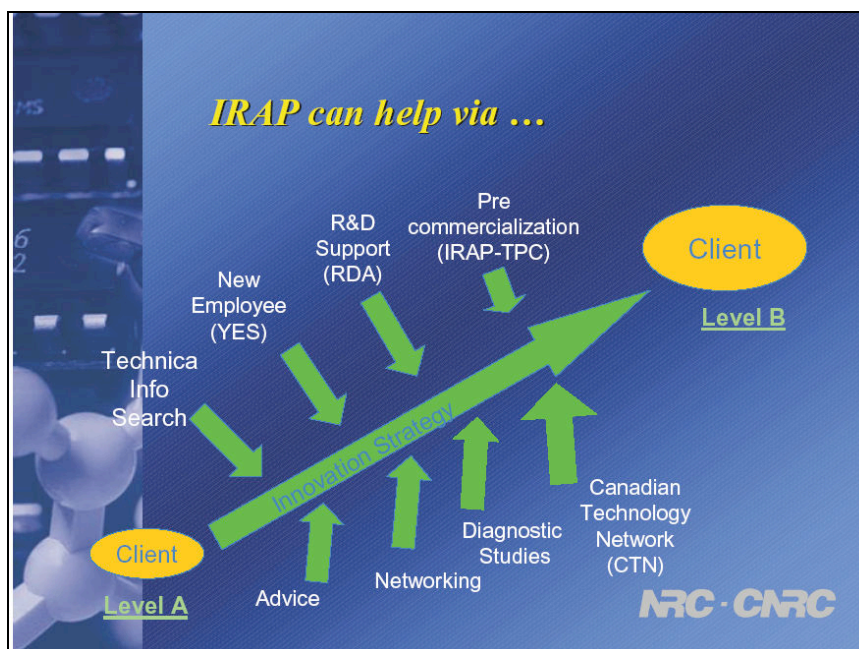
The total indicative budget for IRCs is €74m over the four years 2004—2008. Services provided by IRCs are free to businesses in the region where the service is located.

4.1.2 Canada—Industrial Research Assistance Program (IRAP)

IRAP's mandate is to stimulate wealth creation for Canada through technological innovation. Administered by the National Research Council of Canada, the program's core competencies are in technology and innovation management, which can be divided into three categories:

- Technical advice.
- Network facilitator.
- Shared funder of innovation projects.

A framework for IRAP services is represented below.



IRAP's Technological and Advisory Services and Non-Repayable Contributions for R&D Activities are delivered by 256 Industrial Technology Advisors (ITAs) located in 90 communities across Canada. Approximately 70 per cent of ITAs are employed in over 100 public and private sector organisations known as IRAP Network Members. IRAP is also supported by operational staff (approximately 140 FTEs in 2002) located at IRAP's national and regional offices.

IRAP partners with over 100 Network Member (NM) organisations at the regional level, and has close to 1,000 public and private sector innovation service providers within its Canadian Technology Network (CTN)—all providing advice and assistance to SMEs. The Network is the key facilitator of exchanges and collaborative agreements among the major players in the Canadian Innovation System. The CTN links federal and provincial government labs and agencies, universities, community colleges, industry associations, technology centres and economic development agencies.

A CTN Advisory Member is the first point of contact for SMEs. Each Advisory Member provides a Network Advisor who is prepared to work with a company to help identify needs and find solutions to technology and related business challenges. An advisor is employed by a CTN member organisation known for its technology or related business competence. *The Network Advisor acts as a pathfinder, defining needs and identifying potential sources of assistance both from the network of CTN Affiliate Members and elsewhere.*

Network advisors are linked together to optimize identification and referral to delivery of the right advice or expertise needed to meet interactive business needs. An advisor will help assess a company's needs, working with it on a confidential basis to quickly identify the most appropriate and cost-effective solution.

IRAP's annual budget is approximately \$C150M:

- 43 per cent for Non-Repayable Contributions for R&D Activities.
- 20 per cent for IRAP-Technology Partnership Canada (Pre-commercialisation Assistance).
- 16 per cent for Contributions to IRAP Network Members.
- 15 per cent for operations and salaries.
- 3 per cent for Canadian Technology Network.
- 3 per cent for Youth Initiatives.

Support provided under the Research and Development Adaptation component covers:

- Up to 50 per cent of the approved project costs applicable to:
 - In-house technical salaries.
 - Contract/consultant costs.
- The maximum IRAP contribution is \$C500,000.

Support under the TPC (Pre-commercialisation) Support component covers:

- Conditionally repayable contribution for engineering work
- Up to one third of eligible project costs
- The maximum support is \$C1,000,000.

Support is available for manufacturing materials, information technology, biotechnology, aerospace, and defence technologies.

There is no charge for the initial assessment and diagnosis. The company chooses whether to proceed.

4.1.3 UK—Knowledge Transfer Partnerships (KTPs)

A Knowledge Transfer Partnership (KTP) enables companies to obtain knowledge, technology and or skills, which they consider to be of strategic importance to them, competitively, from the further/higher education sector or from a research and technology organisation. The knowledge sought is embedded into the company via a project or projects undertaken by an individual recruited for the purpose and who works for the company.

A KTP allows a company to choose a partner from the 'UK knowledge base' (a university or college for example) with the required knowledge, and they jointly prepare a proposal for a project or projects to enhance the business. The Partnership submits an application for funding to the KTP Central Office, which is then considered by the Partnerships Approvals Group. The Department of Trade and Industry (DTI), as a member of that Group, approves the proposals acting on behalf of all the funding organisations.

The KTP program supports the employment of a KTP Associate (a high-calibre graduate holding a 2.1 Honours degree or above) within the host company working full-time for a period of between 12 and 36 months. The program must be involved with the development of a component or process that is of strategic significance to the company and one that the company does not have the capability or capacity to undertake alone.

The program also provides access to a dedicated team of University academics who advise and guide the project from day one in conjunction with the Industrial Supervisor based at the host company. This three-way partnership (Academic Supervisor – Associate – Industrial Supervisor) ensures that all three partners get the most out of the KTP scheme.

Up to 60 per cent of the project costs are paid by a government grant with the Company contributing the remainder. This typically means an outlay of between £16,000 and £18,000 per year representing great value. Included in the funding allowance is a generous budget for training and development of the Associate to develop any skills required for the particular program. An equipment budget is also included to fully equip the Associate with the necessary tools to do their job (e.g. a laptop PC, software, etc.).

The budget for 2006-07 is in the region of £22m.

The KTP program has parallels with the Australian ARC Linkage program—with the important difference that a company initiates and takes responsibility for the application and funding.

4.1.4 United States—Cooperative Research and Development Agreements (CRADAs)

A CRADA is a partnering tool that allows federal laboratories to work with US industries, academia and other organisations on cooperative R&D projects. The CRADA provides flexibility in structuring project contributions, intellectual property rights, and in protecting proprietary information and CRADA research results.

CRADAs originate with the specific National Institutes of Science and Technology (NIST) supported scientist(s) that would be involved in the collaboration. If the NIST scientist(s) agrees that collaboration would be in the best interests of both parties, a NIST Principal Investigator is designated to work on developing a Statement of Work.

According to the Department of Commerce, between FY1999 and FY2003, approximately 2,800–3,000 traditional CRADAs were active each year. During this time frame, between 700 and 950 new, traditional agreements were initiated yearly (including NASA Space Act Agreements).

4.2 Impacts and outcomes of programs

4.2.1 Innovation Relay Centres (IRC)

Over the past five years IRCs have assisted in over 12,500 technology transfer negotiations throughout the EU, and have helped more than 55,000 client companies meet their technology needs and to exploit their research results.

To date IRCs have facilitated more than 1000 transnational transfers of technology—indicated by signed agreements for the sale, licensing, distribution or joint development of new technologies. An evaluation report has been completed but does not appear to be publicly available.

4.2.2 Canadian IRAP program

Through a mix of services and support, the Canadian IRAP program provides innovation assistance to 12,000 firms each year, sharing the financial risk with 3,300 of R&D projects and pre-commercialisation activities. The National Research Council (NRC) carried out an evaluation of IRAP in 2001-2002 in accordance with the Canada Treasury Board Secretariat's evaluation policy and with endorsement by NRC's Governing Council. The evaluation involved:

- In-person and telephone interviews with 120 key IRAP stakeholders.
- A survey with 684 IRAP clients who received IRAP funding for projects during the period of 1996-2001 (extrapolated to 9,158 unique IRAP clients and 14,564 unique projects over 1996-2001 period).
- A socio-economic analysis study of 26 IRAP client projects.
- An innovation impact analysis and a comparison of innovative characteristics (with Statistics Canada's 1999 Innovation Survey).
- Surveys with 145 CTN clients (CTN Member Organisations and SMEs).
- A national and regional delivery analysis.

Key evaluation findings are as follows:

IRAP Evaluation findings (2001-02)			
▪	Approximately 12,364 IRAP funded projects culminated in 39,186 new/ significantly improved products/ services or processes over 1996-2001—approximately 3.2 innovations per IRAP funded project.		
▪	Approximately \$11.3B actual sales revenues are linked to IRAP-assisted innovations—\$4.2B attributable to IRAP over 1996-2001 and equivalent to 11 times IRAP's total contributions to client projects during this period.		
▪	Approximately \$37.6B forecasted future sales revenues are linked to IRAP-assisted innovations—\$14B attributable to IRAP during the remainder of clients' innovation life cycles.		
▪	Approximately 32,600 actual additional jobs are linked to IRAP-assisted innovations—12,025 jobs attributable to IRAP over 1996-2001 and equivalent to \$32,000 of IRAP contributions per job created during this period.		
▪	Approximately 37 per cent of IRAP client innovations are considered—World Firsts', 66 per cent—Firsts in Canada', and 96 per cent—Firsts in the Firm.		
▪	IRAP contributions to client projects are associated with total investments for all phases of the clients' innovation projects equivalent to approximately 12.5 times IRAP's contributions—firms' own equity make up almost 50 per cent of these investments.		
▪	Estimates from the evaluation's socio-economic analysis study indicate that IRAP provides a return to the federal government in the form of present and future corporate income taxes valued at approximately 11 times the value of IRAP's contributions.		
▪	IRAP is recognized by clients as the top government technology support program and the top external source of information (outside of firms' supply chain and publicly available information).		

4.2.3 UK Knowledge Transfer Partnerships

Economic Consultants SQW Ltd, in their TCS Evaluation Report in 2002, reported that, based on the experience of TCS (an earlier program) for a direct financial contribution of around £32,000 over two years, the average benefits that a company can expect from a Knowledge Transfer Partnership include a one-off profit before tax of £47,000 and recurring annual profits before tax of £156,000. Evaluation data are reported below.

Effect of the KTP Program on business performance (to date and expected future effects)			
Output or effect (multiple responses possible)	Up to August 2001	Additional companies expecting impact but not yet realised	To date plus expected
Increased overall sales	46%	13%	59%
Increase in overall value	52%	5%	57%
Increased profitability	42%	15%	57%

Effect of the KTP Program on business performance (to date and expected future effects)			
Increased sales in existing domestic markets	41%	15%	56%
Increase in value of assets	41%	5%	46%
Started exporting or increased export sales	31%	13%	44%
Opened up new domestic markets	30%	12%	42%
Increase in the number of employees	34%	7%	41%
Reduced operating costs	29%	6%	35%
Increase in income from Intellectual Property	23%	5%	28%

SQW noted that business performance outputs vary considerably from case to case, but noted that the most widely reported effect was an increase in the overall value of the company (52 per cent), closely followed by increased overall sales (46 per cent), sales in existing domestic markets (41 per cent), and increased profitability (42 per cent).

4.2.4 Other programs

There is limited publicly available and accessible material in relation to the impact of the US STTR and CRADA programs.

4.3 University-industry “interface” organisations¹¹

In some countries, such as the United Kingdom, *industry/trade associations* have been closely involved in the establishment and operation of interface organisations and capabilities. Indeed, the extent to which industry associations seek to play an active role in national innovation systems varies markedly between countries.

The UK *industry research and training organisations* (RTOs) provide an important interface between industry and the university sector. This role goes back to the 1920s and 1930s period in which university-industry interactions were far lower than they are today. These organisations exhibit a wide variation in their genesis, longevity, modes of governance, and sources of finance.

There is now a substantial body of academic research that highlights the key role played by interface organisations that mediate university-industry interactions.¹² As Dodgson and Bessant observe:

“... research and technology organisations (RTOs) working on a sectoral basis are playing an increasingly important role, not just in generating technology or providing technical services to members but also in identifying, understanding and articulating user needs, and tailoring suitable solutions to these needs.” (Dodgson and Bessant 1996) p183.

These interface, or buffer, organisations have evolved as a means of reconciling the incompatibilities between universities (and other essentially academic organisations) and profit-driven industry. As such, they help to absorb the ‘stresses and strains’ that occur in university-industry interactions which arise from the different missions of each type of organisation.

Some RTOs have their roots in professional and trade associations, others in regional economic development initiatives, others stem from central government initiatives. Indeed, some of these interface capabilities are provided by universities themselves.¹³ Although there is this wide diversity in the type of organisation involved, they share the characteristic that they provide a

¹¹ This section draws on an unpublished report for the Australian Research Council: “The Nature and Extent of University Industry Interactions in Australia: A Preliminary Study for the Australian Research Council” (Howard and Matthews 1999)

¹² See (Dodgson and Bessant 1996) for a discussion of the role played by this type of organisation.

¹³ For example, the Warwick Manufacturing Group (WMG), part of the University of Warwick, is a very large and financially successful interface organisation that receives large amounts of industry funding, partly to act as this sort of buffer. The WMG provides executive short courses, M.Sc level teaching in engineering management, etc. and acts as an infrastructure for collaborative research both between universities and industry and intra-industry,

bridge between the distinctive objectives of universities and industry. They often have a sectoral focus.

In Europe the RTO sector accounts for about 14 per cent of total R&D expenditure, and for about 40 per cent of total government expenditure on R&D in EU-15 (and probably more in EU-25). It is heterogeneous in organisation: public research centres, private non-profit associations, arms-length managed agencies. It is also variable in the functions which individual RTOs perform: basic research, applied research, policy support, big infrastructures, and certification. The RTO framework is also continually evolving with the privatisation of public laboratories, joint ventures with universities, and growing commercialisation of services to industry (European Research Advisory Board).

Scholarly research concerning the roles of intermediaries in innovation has focussed on these research and technology “interface” organisations (Howells 2006; Howells et al. 1998).

4.4 Comparisons with Australian initiatives

The overseas intermediary arrangements have some similarities with Australian services, although there are significant differences. There are also overseas services that are not provided in Australia. Points of similarity and difference are noted below:

- The IRC and IRAP services are similar to the Australian intermediary pilots but their services do not appear to extend beyond technology advice to also providing general business services advice as in Australia.
- The IRC and IRAP services are delivered through regional organisations and other agents.
- The IRC and IRAP adopt a ‘distributed’ organisational approach, with service delivery organised and managed on a regional basis through separate regionally based organisations. This differs from the national organisational models of the Australian intermediary pilots—albeit with regional presence and representation.
- Canadian ITAs have a key role in tailoring and brokering agreement between SMEs and research organisations. They do not appear to become involved in the delivery of the service
- IRC and IRAP have a strong focus on building networks and linkages.
- There is no equivalent in Australia of the UK Knowledge Transfer Partnerships—which are designed to support lower cost and shorter term collaborations *initiated by businesses*. Otherwise the program has close similarities with the ARC linkage program.
- CRADAs appear to represent a straightforward and time efficient vehicle for initiating collaborations compared to CRCs and ARC–Linkage.

There are few organisations that parallel the industry association initiated research and technology organisations that have emerged in the UK and Europe. Industry Associations such as AEEMA and AIIA perform important roles as intermediary organisations, supporting research and are actively engaged in technology transfer initiatives. Most other industry associations are still focussed on employer related industrial relations matters.

5 The benefits and cost of intermediaries in relation to innovation outcomes

This Section of the Report provides information in relation to the following matters set out in the *Statement of Requirement*.

Measurement of the benefit and cost of intermediaries in relation to building innovation outcomes in companies

5.1 Issues to consider

The task of identifying the benefits of intermediary services to companies is problematic. Intermediaries, by their very nature, are *intermediate inputs* into the value creation processes of a business. While it is relatively easy to identify the cost of an input, calculation of the value contributed (the benefit) is dependent on a whole range of complementary activities.

Like ICT, and other infrastructure type inputs, the ‘value’ of intermediary inputs will depend on how they are used—on their own or in combination with other inputs—rather than their own intrinsic value. Moreover, benefits might be delivered in a non-financial context, such as building confidence, providing a sounding board for ideas, gathering information about business and industry trends, and general mentoring.

As indicated earlier in this report, intermediary services can be provided as a consulting, brokerage, mediation, and/or resource providing service. One reason for the value of those services is reflected in their price—how much businesses are prepared to pay for the services and the expected return on investment in those services. In most situations businesses consider cost and value in relation to the alternatives—such as doing the work themselves.

5.2 The nature of benefits

Individual intermediary organisations vary quite significantly in the extent of benefits they produce. Benefits identified through the survey and interviews for the Study, and drawing on material provided by the intermediary organisations, are identified below.

- **Process benefits**

Process benefits are reflected in the extent to which the transfer process happens, or happens faster. The benefit will be reflected in a transfer agreement being negotiated and signed. An intermediary can assist in making a collaboration come together more quickly and expeditiously, which is important when time to market is a critical issue in product development.

- **Outcome and impact benefits**

Outcome benefits occur when wealth is created as a result of the knowledge/technology transfer. That is, the process that an intermediary has facilitated has an *impact* in terms of benefits for the creators and users of knowledge, as well as for the broader economy, for example, jobs, sales, exports, profits, and additional R&D.

The data assembled during the Study suggests that there are potentially significant wealth creating impacts. However, it is important to express a note of caution, as in many cases the economic benefits have not been realised: they are represented as expected and potential benefits. Moreover, the wealth creating effect might be due more to *marketing* of the product and service rather than the knowledge or technology that is embedded in them.

It is also important to note that some of the benefits reported in the Study relate to *sustaining* a business through innovation—rather than growing it at a pace that is faster than businesses that did not receive intermediary support. This effect is hard to isolate as business growth can be attributed to a variety of factors—for example, more intensive marketing efforts and greater attention to quality in product and service.

Most firm owners and shareholders *expect* businesses to grow (as reflected in top line sales and bottom line profits) in the normal course of events. In many cases, however, an intermediary has been important for growing a business through acquisition and application of technology for new product development and business ventures that would not have otherwise occurred. This additionality factor represents the major benefit of an intermediary service.

Nonetheless, attributing with any precision the contribution of an intermediary service to an overall increase (or decrease) in business value would be a complex econometric task. Isolating the contribution of an intermediary service from all other inputs that go towards the creation of business value would create both conceptual and mathematical challenges. It would also require a much larger sample of firms and intermediary services as well as a control group.

The Study has provided evidence of important non-financial benefits, such as innovation capability building, culture development and collaboration and networking capacities.

5.3 Estimating costs

The cost of intermediary services can be calculated in several ways:

- On a time and materials basis—as used in the professions and represented as an hourly rate.
- On a commission basis—as used in brokerage organisations, and represented as a percentage of the value of the deal.
- On a subscription basis—as used in calculating the cost of joining a network and having access to the services provided by network mediators.
- As a shared cost on the basis of terms and conditions for eligibility for a government grant.

Comments on benefits and costs are made in respect of each of the intermediary roles identified in the Study.

5.4 Evidence of benefits

Evidence of benefits from intermediary services was obtained through the consultation processes of the Study. The benefits are presented according to the intermediary categories identified earlier. It is emphasised, however, that there is some overlap in the way in which intermediary services have been delivered, and the benefits that have accrued.

5.4.1 *Intermediary consulting*

Consultants provide important intermediary roles to SMEs as an ‘add-on’ to their basic business value propositions. A substantial proportion of intermediary services are performed through the delivery of consulting services. At the same time, consultant initiated intermediary activities may lead to the provision of consulting services. For many consulting organisations, participation in networking events and the organisations that provide them is an important strategy for generating business.

The market for consulting services is highly contested. However, locating and accessing appropriately skilled, qualified and experienced consultants to assist in business planning, marketing, financial management, ICT services, IP management and project management, can be difficult, particularly for SMEs. ‘Signposting’ and referral roles are performed by regional development organisations, business councils, industry associations and professional associations and institutes representing various categories of consultants. Other businesses in networks are also important in attesting to quality and performance.

Research and development services and design services are also provided on a consulting fee for service basis by a range of businesses. This market segment has emerged as large and small companies outsource their R&D and design activity to specialist providers. Research organisations and universities—including both the research intensive and non-research intensive institutions, make up a significant segment of this market.

Consulting services can be as much as \$5,000 a day for a global professional services firm partner or as little as \$500 a day for some academics. As discussed earlier, the benefit to a business of a consulting intermediary is reflected in the value they bring to the business through the knowledge, skills and experience they can apply to resolving a problem or exploiting an opportunity—such as in identifying and accessing a technology that will meet a business need. At the very least, the value should be expected to be more than the cost (although this is not always the case).

The Study identified a number of firms that had received marketing, business planning, and financial management advice as well as R&D services from an intermediary organisation. This had been part of a ‘package’ of services related to technology acquisition. These services were provided at a subsidised rate as part of an overall package of services. Consulting intermediaries have provided services in relation to design as well as technical applications.

The survey and interviews identified an important contribution of an intermediary in negotiating an agreement with a research organisation and providing value added advisory services and in project management services in relation to company–research collaborations.

Few businesses calculate the benefit they have received from a consulting organisation (or any other input service for that matter) over and above the cost. They are also often unwilling to attribute benefits to their consultants and advisers—as it is management that has the responsibility and accountability for implementation. As argued earlier in this report, any calculation of benefits of consulting services, over and above the cost of the service provided, must be regarded as speculative.

Most consulting organisations do not report the value of the services they provide—over and above the ‘sales’ revenue from the services they have delivered. But given that consulting is an important component of the services sector, the issue of how and where they create value for business and the economy is one that has not been explored in any great detail. For example, the value of consultants in opening up markets in China for Australian businesses is substantial, but the economic impact has not been measured.

A significant issue for SMEs is knowing when and how to access intermediary consulting services, knowing what might be on offer, how much they should be expected to pay, how to manage the relationship, and how to ensure that value is captured. A stated inability on the part of SMEs to afford the cost of consulting services for the provision of mainstream business services (business planning, marketing, management accounting, for example) does not amount to a case for government support and assistance.

The cost of locating and accessing an intermediary, who might also be a consultant intermediary, who can provide a technology brokerage service, may present a case for government assistance.

5.4.2 *Technology broker*

The technology broker role is important in the context of open innovation and business strategies for innovation sourcing. For a number of years businesses have engaged brokers (executive search firms) to find people with the specified professional, technical and/or management knowledge required for the development and growth of a business.

Similarly, businesses engage knowledge and technology brokers to seek out and acquire technologies and capabilities in research organisations and other businesses to be adopted, applied and used in their businesses for product development, process improvement and new business creation. Brokers might also act for the providers of knowledge in identifying potential users.

Technologies and capabilities might be represented as Intellectual Property assets (patents, particularly) or as opportunities to purchase services in the form of a contract or consultancy. Technology and knowledge acquisition strategies may involve negotiation with several administrative units in a research organisation—a technology transfer office, a research office, and an office of a college/faculty dean, or another firm.

The benefit of the technology and knowledge broker role rests in the access to a technology and/or a capability that is provided to a business. That technology and knowledge becomes an input into the production of a product or service or a new business direction. Only very rarely (such as in biotechnology) does the acquired knowledge or technology represent the totality of the value proposition. Thus, the benefit from acquiring the technology and knowledge lies in the way it is used in combination with other, complementary, assets.

In some cases the collaboration had been entered into between companies and research organisations, but progress had been slow. In other cases SMEs may also find it difficult to make contact and negotiate with research organisations, other SMEs, or larger businesses about acquiring and/or accessing a technology, including licensing that technology for their own use.

Most commercially oriented technology brokers receive remuneration in the form of a commission on the value of a deal negotiated, such as the sale of an asset or the placement of personnel. However, the capacity to generate a sizable commission on the transfer of intellectual property or a small technology based research contract or consultancy, is very limited.

This difficulty in achieving a return from technology brokerage on small projects represents a significant market failure—to the extent that there is a broader economic and social return in ensuring that technologies and knowledge are transferred.

There is a case for public support to be provided to SMEs to access technology brokerage services—but without the need to receive subsidised fee-for-service consulting in areas such as business planning, marketing and financial management. Should these services be required, they can be accessed at market rates.

Technology brokerage services provided in the biotechnology sector for early stage companies are often subsidised by state government initiatives. Knowledge broker services provided by Rural Research and Development Corporations and Cooperative Research Centres are subsidised by the host organisation. Publicly supported pre-seed funds also provide important brokerage services in putting early stage venture capital deals¹⁴.

¹⁴ Similarly, agricultural extension services (now referred to as brokerage services) are subsidised by State Primary Industries Departments—although these services have been cost shifted into RDCs and CRCs and the landcare/bushcare networks.

5.4.3 Intermediary mediation roles

Intermediaries perform the role of facilitators and leaders in knowledge networks. In the era of open innovation and technology sourcing they facilitate ‘matches’ between the providers and potential users of technologies and knowledge. A great deal of experimentation has been undertaken using web-based matching and mediation services, but they have had limited success. Unlike eBay which is a ‘product’ exchange, acquirers of technologies like to know how technologies will work and whether they can be adapted to suit their particular needs.

Mediation roles are important for building relationships between creators and potential users of knowledge and technologies—mediators can act as a go-between between the users and creators. Often this has to be done on a confidential basis. But, unlike web-based ‘matching’ services which are comparatively inexpensive to operate and highly scaleable mediation roles can be very resource intensive.

The Study indicated that people performing a mediation role can effectively only work with a limited number of clients at any given time. Thus the costs of dedicated intermediary services will always be significant for companies, although much will depend upon the actual role played by the individual intermediary. Mediation services have also contributed to building technology links *within* organisations as well as between them.

5.4.4 Intermediary resource providing roles

Intermediaries can perform an important role in accessing funding for collaborative research and development, or for research and development projects. These funds can be sourced from a range of public programs including ARC Linkage Grants and CRC Programs. There are, however, few funding programs that are targeted at supporting collaborations between SMEs, other businesses, and research organisations.

The AIC TechFast program provides funding for small collaborations through assistance for technology acquisition and business development. This funding has resulted in a number of successful collaborations.

The benefit of a funding intermediary lies in the responsiveness and flexibility in taking up collaboration opportunities. These ‘grants’ for small scale collaborations were highly regarded by businesses, and research organisations. They were also seen as important by state governments for leveraging their own funds to support collaborative arrangements.

There is a well established industry of service providers who provide assistance to firms, and groups of firms, in submitting applications for funding and managing the grants administration process. Future arrangements for outsourcing the administration of collaboration grants should be market tested and organisations should be awarded contracts on the basis of competitive tender.

5.4.5 Integrated roles

The Study included an intermediary organisation that provided all intermediary roles referred to above. The main benefit of such an approach is that SMEs have access to a ‘full suite’ of intermediary services at a ‘one-stop-shop’.

In practice, however, an integrated approach to intermediary services mixes up a range of quite separate business models and activities—some that address market failures and others that do not. Moreover, some businesses receiving assistance might not want, or need the full suite of services. In addition, such an approach can be expensive through the generation of coordination costs and overheads.

5.5 Conclusion

The Study has indicated that companies using intermediary services value their roles as consultants, brokers, intelligence gatherers and technology scouts acting on their behalf, as well as the financial resources that can be provided.

Based on overseas experience and the balance of evidence from this Study, it is apparent that intermediaries make a significant contribution to companies in terms of their access to, and utilisation of, knowledge and technologies sourced from outside their organisations.

The pilot programs suggest, however, that there is scope for greater efficiency in the delivery of services, and better targeting of where those services would deliver the most value. This probably reflects the difficulty of networking nationally as well as regionally in the provision of intermediary services.

Consideration of future Australian government funding should be based on intermediary organisations having excellent knowledge of local/regional innovation systems *as well as* capacity to link these systems nationally and internationally. This observation suggests that:

- No single intermediary organisation will have the capacity and capability to deliver a national coverage.
- Intermediary organisations should themselves be networked.
- There is a role for the Department of Industry, Tourism and Resources in building that network.

These contributions could be expanded if there were more organisations providing intermediary services which can be provided through a range of organisational and delivery frameworks.

6 Barriers to the use of intermediaries

This Section of the Report provides information in relation to the following matters set out in the *Statement of Requirement*.

The identification of any barriers to the use of intermediaries, including:

- Availability of, and access to, intermediaries, and
- Cost

6.1 Availability

Intermediary services are based in all locations, particularly in regional centres. There is a high cost of serving all regions through a single organisational entity. A distributed model, using regionally based organisations, could ensure greater coverage.

6.2 Access

The Study has indicated that SMEs find it difficult to access knowledge and technologies from research organisations. As indicated in a previous study, web-based knowledge brokerages and exchanges are important for promoting awareness of technologies, but are of limited value in setting up deals (Howard Partners 2005).

The Study also indicated that SMEs are generally unaware of how to access the services provided by technology brokers. Moreover, consulting organisations that provide brokerage services often seek to provide value added consulting services as a way of building up fee income. These services might be unnecessary or of low priority.

The issue of where to go to get good advice for innovation and collaborations is an important one for SMEs.

6.3 Cost

Many SMEs are often unable to pay the full service cost of qualified and experienced consultants who provide intermediary roles. This arises from a lack of resources as well as uncertainty about value for money.

Lack of resources is not of itself a barrier that should be addressed by a government program, unless it can be demonstrated that there are market failures. These relate principally to the inability of small firms to capture the full benefit of innovation investments and information asymmetries between technology acquirers and providers – providers will tend to know more about the attributes of a technology than acquirers.

Demonstration of value for money rests in the hands of intermediary service providers through their marketing strategies and promotional activities.

6.4 Other barriers

6.4.1 Ability to assess intermediary competencies

A major difficulty for small to medium businesses concerns the gaps in their knowledge about consultant intermediary capabilities and how to go about finding a person and/or organisation that has the skills, qualifications and experience that will deliver value.

There is also an information asymmetry in relation to service requirements and quality expectations, and the promise or offer provided by a consulting intermediary. Checking the reputation of consultant intermediaries and obtaining objective appraisals of past performance can be difficult for a new business.

Difficulties may arise when small accounting and legal firms seek to provide a service outside their competencies and capabilities rather than referring on to more expert advisers and intermediaries. This can be a problem in IP management, for example.

6.4.2 Awareness

SMEs may not be aware that intermediary services exist or can be accessed. This barrier is likely to emerge for SMEs that are not well networked in regional innovation systems or are not members of professional and/or business associations.

7 Intermediary models for Australian small to medium enterprises

This Section of the Report provides information in relation to the following matters set out in the *Statement of Requirement*.

Identification of different intermediary models, their costs and benefits and the relative merit of different models in terms of providing service to Australian small business innovation capability

The *Statement of Requirement* required consideration of different intermediary models, their costs and benefits and the relative merit of different models in terms of providing service to Australian small business innovation capability.

7.1 Overview

The study, research, and examination of overseas experience has looked at a number of intermediary models. These are reflected in current practice as well as in opportunities to further develop existing models, and initiate new ones. Based on overseas experience, and drawing in the information collected through the survey and interviews for this Study, these models can be categorised as:

- An intermediary consulting model.
- A technology brokerage model.
- Mediation organisations.
- Support for collaborations through grants funding arrangements.

The evidence from the Study has indicated that these should be undertaken as separate, but complementary initiatives.

7.2 Intermediary consulting model

As indicated throughout the Report, a wide range of consultants provide intermediary services as an important part of their business service offerings. The market for business services consultants is highly contested—there are well qualified, experienced and knowledgeable service providers who can advise individual clients on all aspects of business development and growth, including the application and use of technology.

Consultants in the normal course of their business may be able to identify and assist in acquiring technologies from research organisations and/or other businesses, particularly new technology based firms (NTBFs). However, on its own, this aspect of consulting is unlikely to generate revenues sufficient to offset the cost: firms are usually not willing to provide ‘introduction’ services without the prospect of generating income from value added services. The cost of these services may be beyond the reach of most SMEs.

The Study indicates that there is a case for supporting organisations to provide intermediary consulting services where they are not in a position to recover the cost through the delivery of value added consulting services.

7.3 Technology brokerage model

The Study has indicated that there is an opportunity to develop a program to support SMEs in their access to technologies and knowledge residing in research organisations and other companies through technology brokers. The business model for providing these services differs from providing value added business consulting services. Such models could work on the following basis:

- A Panel of technology brokers being appointed to provide brokerage services targeted at SMEs.
- Technology brokers being ‘hosted’ by regional development organisations, state/regionally based industry associations or councils, consulting firms, or similar bodies with strong technology networks.
- SMEs seeking to acquire access to a knowledge or a technology—in the form of intellectual property or a capability that could be provided through a research contract or consultancy, would apply for a grant from DITR/AusIndustry for assistance and support.
- The broker would work with the SME and the research organisation to ‘broker’ the transaction, including terms and conditions, and periodically monitor progress.

The key benefit of a technology brokerage would be to fill an important gap for SMEs in relation to their access to and use of technologies and knowledge capabilities in research organisations and larger technology oriented businesses – particularly those with substantial patent portfolios and R&D capabilities.

The cost of the brokerage arrangement would be determined by:

- Establishing and appointing the Panel—at least one for each state/territory located in capital cities, and one appointed in major regional centres (a total of approximately 15). It is not envisaged that these would be full time positions.
- Cost of assessment and authorisation of an access proposal.
- Setting a fixed fee for a brokerage service—in the region of \$20,000–\$30,000.
- Reporting and accountability.

On the basis of the results of the pilot project, it would not be anticipated that there would be more than 100 brokerage projects in any one year. As the brokerage does not support value added consulting services, a budget upper limit of \$3.0m should be set in the first instance.

7.4 A model supporting SME membership of mediated innovation exchanges

The Study has indicated that a successful model of a mediated innovation exchange has been established. The cost of membership varies between \$12,500 and \$120,000 depending on the level of participation. Most SMEs pay between \$12,500 and \$40,000.

The Study has indicated that innovation exchanges involve the sharing and transfer of knowledge between businesses as well as between businesses and research organisations.

SMEs could be supported to become members of accredited Innovation Exchanges on the following basis:

- An SME can demonstrate that it would benefit from being a member of an Innovation Exchange.
- There are national benefits that could be generated through membership.

- State governments should be encouraged to cost share in this initiative—state/territory governments could approve membership with a 50 per cent contribution from the Australian government.
- A membership application is supported by the exchange managers.
- A grant be made to assist the SME in becoming a member—provided that the SME makes a contribution.

A key benefit of a Public Program's support for SME membership of an Innovation Exchange would be to assist SMEs in arranging access to technologies and capabilities in larger firms—as well as vice versa.

The cost of the program would be contained by setting an upper limit on the number of memberships to be granted in any one year. This could be set at 100, giving a program cost to the Australian government of \$2m.

7.5 A model for intermediary supported collaboration grants

The Study has indicated that outcomes have been achieved for SMEs through small collaboration grants provided by an intermediary organisation. A case for small collaboration grants has also been advocated by the Productivity Commission.

As indicated earlier in the Report, principles of probity and transparency, require that there be a clear separation between responsibility for recommending grants, and responsibility for approving them.

A collaboration grants program could pick up on the main features of the UK Knowledge Partnership Agreements in the UK.

A model for small collaboration grants could be developed along the following lines:

- A notional fund be established (appropriated) to provide financing for collaborations between SMEs and publicly funded research organisations for the adoption, application and use of technologies and capabilities in a business context.
- The Fund should be administered by a Manager with the appropriate delegations to approve expenditure (grants) up to a maximum of \$250,000. There should be threshold contributions/commitments from the SME and the research organisation.
- Formal endorsement, commitment and sign-off would be required from the Chief Officer of the collaborating research organisation that the resources are available and forthcoming.
- The Fund Manager would be required to report annually on the performance of the Fund.

A key benefit of such an initiative would be assistance for 'demand driven' collaborations which, at the moment are unfunded and unsupported

From a cost perspective, discussions and consultations undertaken during this Study indicated that an appropriate level of collaboration funding would be in the region of \$100,000–\$150,000.

In order to support 50 collaborations in the first year of operation, the Fund should have an initial budget in the region of \$6m. This is less than average annual government contributions to Cooperative Research Centres.

7.6 Total cost

On the basis of the models outlined above, the total package of intermediary assistance and support for collaborations would amount to \$11m:

- Technology brokerage—\$3m.
- Innovation Exchange memberships—\$2m.
- Collaboration grants—\$6m.

7.7 Options in the absence of an intermediary program

One of the important gaps in the Australian innovation system is an absence of knowledge of available technologies *and capabilities* in Australian and overseas research organisations that could be capable of adoption, application and use in business contexts.

There are many databases in Australia that provide information on discoveries, inventions and capabilities. These were identified and discussed in the Report *Knowledge Exchange Networks in Australia's Innovation System* (Howard Partners 2005). Electronic knowledge exchanges are of limited value without provision for personal contact. People do not purchase technologies 'sight unseen' and inventors are unwilling to risk compromising IP rights by putting too much information on-line.

Moreover, scientific and technological information is rarely presented on-line in a way that can be readily understood and acted upon by a potential user. Some degree of interpretation and 'translation' is usually required. On-line databases do, however, provide a useful electronic yellow pages' function.

Unlike the USA, Canada and the UK, Australia does not have an online, searchable database of research projects funded by Australia's major research funding bodies—the ARC, NH&MRC and the Rural Research and Development Corporations.

In a study for the ARC completed several years ago it was apparent that businesses wanted access not only to completed public funded research projects, and intellectual property information, but they also wanted to know 'who was doing what, where' (Howard, Johnston, and Fowler 2001).

This information would provide a means for easily contacting researchers and research organisations. It would be a very valuable resource for intermediaries in addressing identified technology and knowledge needs of businesses—particularly small businesses. It would also obviate the need for intermediaries to develop their own registries of available Intellectual Property.

Such a project could be funded by research granting agencies as a collaboration between the organisations that coordinate the interests of research organisation technology transfer offices (KCA), research offices (ARMS), industry associations that have an innovation focus (e.g. AusBiotech, AEEMA), and professional societies (eg FASTS).

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