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Innovation, Creativity and Leadership

Report of a Study of the ACT Innovation System

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Executive Summary

This is a study of the ACT innovation system. It is entitled *Innovation, Creativity and Leadership* as it is now very clear that innovation, the successful exploitation of new ideas, does not and cannot occur without two vitally important ingredients: creativity and leadership.

Whilst innovation is the successful exploitation of new ideas, creativity involves the development of original and novel ideas that have a commercial application. Leadership is the capability that ensures the translation of ideas into practical application through management and organisational frameworks.

Innovation is reflected in the introduction of new products, new services and new ways of interacting with suppliers, distributors, customers, and clients. It is a building block for sustaining competitiveness and productivity as well as quality of life.

Innovation contributes to economic outcomes through increased production of goods of services, increased employment, increased investment, and increased exports. It contributes directly to productivity and business performance through process efficiency, process design, branding and marketing (Great Britain. Department of Trade and Industry, 2005).

Governments have a major interest in ensuring that businesses that fall within their jurisdictions are innovative—as business success is reflected in overall economic success as indicated by new business formation, business growth, and longer term business sustainability.

Businesses build innovation capability through interactions and relationships with other businesses along the value chain, with research and teaching organisations, and in the context of the 'creative' economy, with arts and cultural institutions.

Cities and regions provide the frameworks for innovation by being 'hubs of capability' and facilitating 'linkages' between businesses, research and teaching organisations and government organisations. The concept of 'hubs' and 'linkages' provides the basis for the analysis of 'innovation systems'.

Although the focus of this study is on the economic and business aspects of innovation, the adoption and application of new ideas through creativity and leadership processes is also relevant in the social, environmental, and cultural spheres. This study endeavours to draw a link between economic and cultural dimensions by drawing attention to the economic contribution of the creative industries. The link between economic and environmental outcomes is also addressed through innovation to ensure sustainable futures.

Studies of innovation systems have tended to focus on the 'science system' as a foundation for research and development and the creation of new technologically oriented products and services. Studies map and document capability in research institutions, expenditure on research and development, and count patents and start-up companies. There tends to be a focus on discoveries and inventions in the natural and life sciences, engineering, and the enabling technologies of information and communications technologies (ICT), biotechnology, and nanotechnology.

Science and the commercialisation of research and development is a vitally important aspect of the innovation system—but there is another facet of the innovation story.

This study complements the science system approach by documenting capability in what will be referred to as the '*arts and creative practices system*' and drawing attention to the importance of creativity as a major source of innovation. Creativity is linked to innovation through design as well as research, teaching, and experimentation in art and creative practices. Cultural institutions, such as libraries, galleries and museums also have a role in the 'arts and creative practices system'.

The science and the arts and creative practices systems are, of course, linked—through the enabling characteristics of information and communications technologies, covering software, micro processing, digital and wireless communication, and web based tools and techniques. Very little innovation in the science system occurs without an ICT component and innovation in the arts and creative practices system is also enabled by ICT.

Science, art, and information technologies come together in what are referred to as the 'creative industries'—a sector in which Canberra has a particular strength. They include: advertising and marketing; architecture, design and the visual arts; film, television and radio; music and the performing arts; software development and interactive content; writing, publishing and print media.

In 2004-05 a total of $698m was spent on research and development in Canberra—amounting to 10.2 percent of total research and development expenditure in Australia. Almost 90 percent of expenditure in Canberra was performed in the public sector. Business expenditure on research and development

amounted to $99m (1.0 percent of the Australian total). Sixty two percent of this was incurred in the electronic equipment and computer services (ICT) sectors. This compares with 11 per cent for Australia as a whole.

Several research intensive and software development based businesses have grown in Canberra and become sustainable, often on a global basis, on a foundation of relationships developed with Australian Government departments and agencies and the Defence Materiel Organisation. However, the study indicates that contracting with the Australian Government presents particular challenges, particularly in the absence of a demonstrated 'track record'. Unlike the United Kingdom and European countries, the Australian Government does not use its procurement system to source or stimulate innovation. This constitutes lost opportunity.

Within the higher education sector 45.7 percent of research expenditure undertaken is for pure basic research (compared with an Australian average of 28.7 percent) and 27.9 percent was for strategic basic research (22.9 percent). However, income from the commercialisation of research amounted to just $589,000 in 2004—representing 0.18 percent of research expenditure. Whilst research commercialisation is important, and offers much potential, the strengths of the ACT science system are not in this area.

The strengths of the ACT science system relate to its position as *an international centre and global hub for research and teaching excellence* across a number of disciplines, including natural and life sciences, information and communications sciences, economics, the policy sciences and humanities, and curatorial studies. Research excellence attracts top students who in turn provide the human resource base for businesses starting up or relocating in Canberra, for government advice, and for national institutions wishing to tap into world class expertise and capabilities.

Although the science system does not impact through the commercialisation of research, it has a major impact through employment and in direct expenditure on goods and services—universities in the ACT have budgets totalling $700m—and in the flow of educated graduates ('knowledge workers') who establish, or are available to work in, a growing 'knowledge intensive business services' industry and a burgeoning 'creative industries' sector.

The arts and creative practices system reflects the location and activities of the national collecting institutions based in Canberra—including the National Library, the National Gallery of Australia, the National Museum of Australia, the National Film and Sound Archive, the Australian War Memorial and the National Archives—and teaching and research undertaken in the schools of art, music, design and architecture located at the ANU, the University of Canberra and the Canberra Institute of Technology.

A private college, the Academy of Interactive Entertainment (AIE), is a leading educator for the computer game development and 3D digital industries. ScreenACT, the ACT Office of Film, Television and Digital Media, is responsible for implementing industry development initiatives. Canberra has

a developing film and television production industry, with a particular strength in non-fiction and documentary film, and which displays potential to grow. The computer games industry has national and international recognition and is generating significant export earnings.

The emergence and growth of the creative industries reflects the increasing demand for creative products and services by end consumers as well as the use and application of creative output across a wide range of industries—including government and cultural organisations. It also reflects a capacity to capture the opportunities provided by information and communications technologies in relation to digital content and presentation.

In June 2006 there were 3,000 creative businesses in the ACT, representing 10.7 percent of all businesses in the Territory—this data does not include businesses located in Queanbeyan. Creative businesses have a higher propensity to be micro-businesses—with 40 percent of GST registered creative businesses being sole traders compared to 36 percent across all industries. This is reflective of a pattern in other capital cities—particularly London and Berlin.

There is scope for substantial further development of the creative industries through linkages and partnerships between universities and colleges, creative content providers, the substantial computing capacity available in the ACT (through the ANU and NICTA) and optical fibre communications capability. Business development services currently available or planned for technology based businesses should also be available for businesses based on art and creative practices.

The study draws attention to the importance of business and social networks in the innovation system. It also draws attention to the role of conferences, festivals, awards, and prizes in directing attention to innovative capability. Networks are important in all industry sectors and professions and people use them in different ways. Some of the most effective networks are privately created—for example, through schools and sports clubs, or interest groups. Formal business networks work when they have a clear purpose and are focused on delivering outcomes for members.

The important role of technology investors, business support services, business development centres and technology parks is also described and assessed. There is substantial capability in all of these areas in the innovation system, but there is scope for improvement to lift innovation performance.

The study includes an analysis of 'innovation systems dynamics' which sets out the relationships and interactions between the main business players in the system. These include the large government agencies, the vertically integrated or 'concentrated' businesses (for example, computer hardware and software), and the smaller, more agile, start-up and new 'ideas based' businesses.

The study includes an analysis of Canberra's 'distinctive capabilities'. These are seen to lie in the areas of: the City's international outlook and connections through government, diplomacy, and national institutions; an international centre for research and education; a centre for the arts, culture and creative practices; a centre for government and defence procurement; and, combining the previous capabilities, an attractive place to live and work.

The study includes comparisons with other capital cities around the world, including Ottawa, London, Washington, Berlin and Wellington. A common theme for all of these cities is the strength of their cultural institutions and creative industries sectors, the two attributes seem to go hand in hand.

A number of 'emerging trends' have been identified in the study which impact on the opportunities for innovation based development in Canberra. The lesson from overseas city strategies attempting to 'replicate' Silicon Valley, for example, is that they have focussed on information technology *combined with* strategies to develop art and creative practices. There is also more attention being given by higher education institutions to engagement with industry and there is a growing demand for security solutions in government and defence.

The study outlines a number of key issues that need to be addressed in going ahead with an innovation based economic development strategy. These include creating critical mass among smaller businesses through collaborations and networking, the exercise of leadership and building business capacity and capability for expansion and growth.

Consultations and conversations undertaken during the study identified a range of 'visions' for Canberra around an innovation agenda. These related to the theme of technology and creativity, connectedness, positioning as an international city known for design and architecture, a city that focuses on conservation management and practice, and a city built on the principle of sustainability. The study did not indicate any support for a vision for Canberra as 'the bush capital'.

Businesses reported that it is currently difficult to find skilled staff in Canberra—in finance, accounting, computer programming (and many other areas). People are being attracted to Canberra, drawn by private sector demand, but they often shift to the Commonwealth government which can pay higher salaries.

During the study suggestions were made to encourage the Australian Government to change student visa requirements to allow graduates to stay and work in Australia. This is particularly important in sectors such as ICT and commerce which attract large numbers overseas students—and where there are skill shortages and business opportunities.

Experience of successful regional and city based innovation strategies around the world indicate a requirement for strong leadership, commitment and championing by *people*. This leadership most often comes from academic institutions that have close connections with state and/or city government and industry.

The study has suggested that there are a number of initiatives that can be put in place to capture and develop innovation opportunities for the ACT. There was a strong view that government, industry and universities should work in partnership to capture the ICT and creative capabilities of Canberra through investment in an MIT style media laboratory. Aspects of this type of facility are described in Attachment E.

Specific recommendations are listed below together with references to the context in the text where they have been formulated.

Recommendations

On the basis of the analysis undertaken in the course of the study, a number of recommendations are submitted for consideration, these are grouped under the headings of leadership, leverage, supporting innovation, branding and positioning, and promotion.

Leadership

1. An entity, tentatively termed *Innovation Canberra*, be formed to provide leadership and direction in the development and implementation of knowledge based innovation strategies for the ACT and surrounding region—with a particular focus on the ICT and the creative practices sectors.
2. Innovation Canberra consist of members drawn from business, creative, education, and government sectors.
3. Members of Innovation Canberra be required to contribute to overhead and operating costs, with the ACT Government providing seed funding for start-up costs.
4. Innovation Canberra be tasked to develop a strategic agenda of major projects and initiatives and advocate, promote, and seek funding support from industry, higher education and government—locally, nationally and internationally.

Creating and leveraging sector linkages

5. In view of the potential for the creative sector to make a stronger contribution to economic development, the ACT government give consideration to making further investments to build capability. In particular, initiatives to accelerate the bridging of the technology and creative sectors should be examined.

Stimulating and supporting innovation at the enterprise level

6 The ACT Government establish an 'Ideas Fund' to nurture innovative ideas and concepts to a stage of development where they become potentially marketable products and services and are of interest to customers and/or technology investors.

7. The Epicorp incubation and enterprise development model be extended, in partnership with universities, research organisations, and national collecting institutions, into a Canberra Innovation Development Centre directed towards product development and scale up for technology and arts and creative businesses.
8. A program to support innovation strategy development in more developed and mature start-up firms be examined—for example, program support to cover the cost of advice and mentoring to assist firms develop innovation management strategies and the organisational infrastructure pertinent to their business models.

9. The ACT Government be a participant in a collaboration between Government and ACT universities in an ARC Linkage project application for innovation in government procurement. As one of the smaller jurisdictions a pilot study should be undertaken for the ACT public sector.

Branding and positioning of Canberra

10. There is need to develop a more progressive view and brand of Canberra, particularly in the domestic market. The ACT Government, together with industry through the Canberra Business Council, higher and further education institutions, the national collecting institutions, research organisations, and the Australian Government develop a strategy to position Canberra as an international city of design.

Promotion

11. The ACT Government support an annual *Canberra Exhibition* that showcases, celebrates and markets ACT innovation capability across the science, technology, and the cultural and creative sectors

1 Introduction

1.1 Background

Innovation and knowledge supporting the development of new technologies are recognised as key drivers in the performance of modern economies. This recognition has led to the development of new approaches to understanding the performance of regional and national economies, including the concepts of regional, national and global innovation systems.

The ACT Government commissioned this work with a view to further developing a tailored, regionally focused approach to innovation policy within a broader economic development context. This understanding may lead to strategic interventions and activities by government and/or joint initiatives with other players in the innovation system.

An innovation system can be characterised by the interaction, collaboration and competition between the components of the system – i.e. enterprises, institutions and individuals. All innovation systems are unique and are reflective of economic and business structures, governance arrangements, institutional set-up, history and culture of the area they encompass.

Given the characteristics of the ACT economy and region, it was expected that the concept of a 'regional innovation system' would form the basis of this study. However, as the ACT is linked into national and global innovation systems, it was seen as important that the study also examined Canberra's place within national and potentially global environments.

Terms of Reference

Develop an understanding and analysis of the ACT innovation system. This could include:

- Describing and applying a high level conceptual framework to the ACT innovation environment;
- Within the conceptual framework, identifying significant current and potential players, their roles, capabilities, orientation and linkages (these may be enterprises, institutions, government agencies, concentrations of skills and capability, or even key individuals);
- Identifying and describing the nature of linkages between the components of the ACT innovation system;
- Making assessments about perceived deficiencies in the system, overall system and environmental dynamics and limiters;
- Making assessments about system potential and possible actions to accelerate realisation of that potential; and
- Identifying and understanding the linkages to the broader Australian innovation system and the global innovation system.
- Drawing on similar studies of comparable regions, establish comparisons to the ACT 's innovation system and where possible, make observations and recommendations regarding a 'best practice' innovation policy framework for the ACT.
- Use case studies of ACT enterprises with a track record for systemic innovation and identify the local system factors that support innovation in the enterprise.
- Use case studies of particular institutions or other system capabilities (e.g., particular talent pools) that also support innovation in the ACT economy.
- Identify specific recommendations or initiatives (short, medium and long term) that could be implemented by key stakeholders in the ACT innovation system, including the ACT Government.

In undertaking this project, the consultant will be required to engage with appropriate stakeholders to:

- Access qualitative information that can inform the study and validate results;
- Promote a shared understanding of the ACT innovation system and encourage a debate about future opportunities and challenges.

1.2 Innovation and innovation systems

Innovation has a number of dimensions. It can be seen in terms of:

- A type of activity—with a focus on creativity and novelty.
- A management practice—at the firm, or business, level.
- A context—a 'system' at the sector, city, or regional level.

These aspects of innovation are addressed in turn.

1.2.1 Innovation as an activity

Everett Rogers, in a classic work, *The Diffusion of Innovations*, described innovation in the following terms:

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use of discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation (Rogers, 1995).

Thus, innovation is, quite simply, the successful exploitation of new ideas (Great Britain. Department of Trade and Industry, 2003). Innovation occurs in business, government, social and environmental contexts.

Innovation is one of the distinguishing features of a business. The other is marketing—seeking to create and service a customer. If businesses do not innovate or market they very soon cease to exist—unless, of course, they operate as monopolies. Competition and competitive pressures are therefore seen as essential to innovation.

Policy makers have encouraged businesses to invest in research and development (R&D) as a way of increasing the flow of new products to the market, introducing more efficient processes and developing more effective ways of doing business. In this way it is expected that firms will become more productive, profitable and competitive and, in turn, generate higher levels of employment and economic growth.

The commercialisation of research, whether undertaken in business, universities, or public research organisations, has been a major driver of innovation policies since the beginnings of the technology boom in the mid 1990s.

In the emerging global economy, however, it has become more difficult for businesses to compete on technology and cost alone: they must compete on 'non-price' factors such as brand, reputation, product 'look and feel', and the ability to interact with customers. *Design* is now being seen as a key element in the creation of desirable products and services and critical in driving consumer preference and purchase decisions—and ultimately, business success.

That is, innovation is concerned not only with the *functional* appeal of products and processes, sometimes referred to as 'hard' innovation, but also their *sensory* appeal and aesthetics—now being referred to as 'soft' innovation (Stoneman, 2007). These 'softer' aspects of innovation may not involve a significant commitment to research and development but they nonetheless draw on creative capabilities of highly skilled and educated people—people sometimes referred to as 'knowledge workers'.

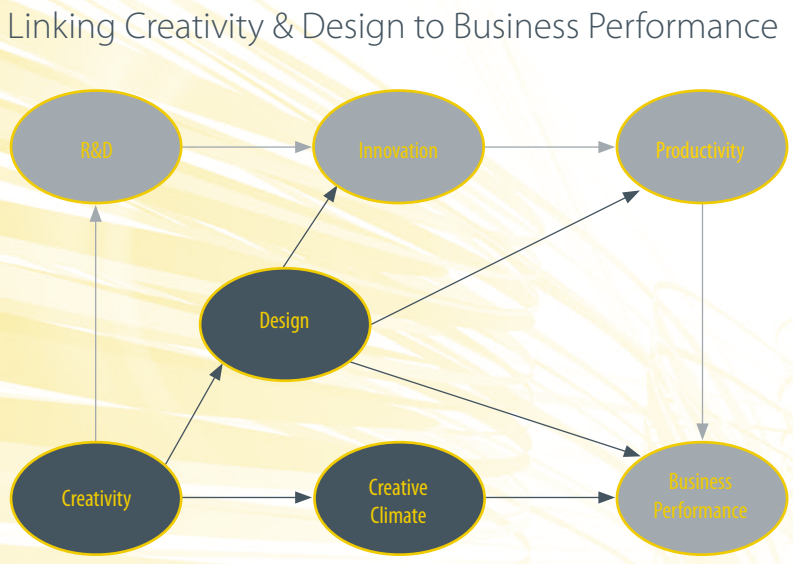
'Hard' innovation' has been at the mainstream of OECD and national policy definitions of innovation. The main emphasis is on functionality, and the potential to increase the volume of goods and services produced at the same or reduced cost. Changes in functionality are thought to emanate from investments in research and development. These are essentially 'supply side' considerations.

It is now being appreciated that the scope for increasing the production of goods and services is related not only to functionality but also to 'demand side' considerations such as product appearance, packaging, placement, and promotion (marketing). This appreciation is reflected in the inclusion of marketing in the most recent OECD manual and guidelines for collecting and interpreting innovation data (OECD, 2005).

In the UK, Europe, China. India, Singapore, Korea and New Zealand policy makers are complementing research and development policies with policies oriented towards enhancing creativity and design. The UK Design Council, and the Cox Review of Design (Cox et al., 2000), have been particularly influential. Creative inventions that combine design and technology, such as the iPod are being increasingly recognised as key drivers of business success and economic development (Mitchell et al., 2003).

A framework for addressing creativity and design in innovation is represented below.

Figure 1: R&D, Creativity and Business Performance



Source: Swann. P and Birke, D (2005) 'How do Creativity and Design Enhance Business Performance? A Framework for Interpreting the Eviidence' DTI Think Piece, University of Nottingham Business School

In this framework the following definitions apply (Great Britain. Treasury, 2005, Great Britain. Department of Trade and Industry, 2005):

- *Creativity* is the generation of new ideas—either new ways of looking at existing problems, or of seeing new opportunities, perhaps by exploiting new technologies or changes in markets.
- *Innovation* is the successful exploitation of new ideas. It is the processes that carry them through to new products, new services, new ways of running the business, or even new ways of doing business.
- *Design* is what links creativity and innovation. It shapes ideas to become practical and attractive propositions for users or customers. Design may be described as *creativity deployed to a specific end.*

Recognition of the importance of creativity is seeing firms, and policy makers, give higher priority to investing in 'talent' and skills as a base for innovation performance.

Discussions and assessments of innovation capability are increasingly making reference to Research, Development and Design (RDD). Design is important in low technology industries such as clothing, furniture, food processing—where new product development gives a great deal of attention to labeling and packaging.

Design contributes to productivity and business performance through process efficiency, branding and marketing by enhancing the aesthetic and symbolic appeal of material, or functional, products. Good design differentiates products and establishes brand premiums. Cities and regions, as well as businesses, set out to create 'brands'. However, successful brands must be backed up by reputations for quality, constancy, reliability—and innovation,

The economic and business significance of design was recognised by Australian Government Ministers in the early 1990s and was articulated in the 'Design Challenge' set out in the National Design Review—completed in 1995:

Australia needs to secure strategic advantage through providing innovative solutions to the needs and desires of customers here and overseas.

Design will be fundamental if Australia is to meet this national trade challenge because, as detailed in this study, it is Design that provides the commercial basis for creating and adding value, for enabling the successful commercialisation of innovations and, ultimately, for providing competitive advantage.

If Australia is to meet this economic challenge, designers and industry need to work together in productive partnership. The integration of Design into every aspect of creation of a product or a service is central to this (National Design Review, 1995).

Excitement over the promises of the 'technology boom' of the late 1990s was probably the reason that this message went largely ignored in Australian policy contexts until very recently. The Victorian and Queensland governments are now developing design related innovation policies.

Available evidence suggests that the demand for design is growing, but it is also changing. It is shifting from a connection to product characteristics, such as packaging, graphics and logos to the actual delivery of innovation, to establish brands and improve systems.

In the services sector designers are working with users to create services that are more flexible and efficient and responsive to critical environmental issues, with sustainable solutions being designed into new products and services (Design Council and Creative and Cultural Skills, 2007).

In Canberra there is a strong capability in research, development and design (RDD) which provides a sound base for innovation in the emerging global competitive environment. Many businesses in Canberra have already responded to the challenge and are meeting with commercial success.

1.2.2 Innovation as a management practice

Innovation is also a term that is used to refer to a management practice or process—where new ideas are generated, selected and formed into new products, services, or ways of doing business. Innovation is sometimes classified according to type—for example, radical or incremental, product or process, technological or organisational. Different sectors of the economy tend to be associated with different types of innovation.

In a business and organisational context, innovation has been described as disciplined and systematic. It is the essence of corporate strategy. Peter Drucker, a recognised authority on management and innovation, pointed out in *Innovation and Entrepreneurship:*

Systematic Innovation consists of the purposeful and organised search for changes, and in the systematic analysis of the opportunities such changes might offer for economic or social innovation (Drucker, 1985).

Drucker observed that innovations generally result from a conscious, purposeful search for opportunities within the company and the industry as well as the larger social and intellectual environment. He argued that successful entrepreneurs do not wait for innovative ideas to strike like a lightning bolt.

Purposeful innovation begins with looking, asking, and listening to suppliers, customers and people in related business, education, research and cultural institutions, and in social and family networks. The information and knowledge intensity established through Canberra's education, research and cultural institutions offers significant advantages for innovators in terms of the capacity to build networks and sustain inter-personal interactions between businesses, researchers, educators and a wide variety of knowledge brokers.

The key innovation task is to work out analytically what the innovation has to be in order to satisfy a particular opportunity. Innovation is hard work, and generally takes time. It is also a process characterised by fundamental uncertainty, since the outcome cannot be specified in advance—if it could it would not be a true innovation. In a commercial context, innovation is a fundamental building block of business strategy. It also involves managing risk.

A key issue for sustained innovation performance is building management capacity and capability to lead the innovation process. Education and training in management and entrepreneurship, and the identification of 'management talent' is critical for innovation success.

Universities in Canberra are offering courses and programs in entrepreneurship either as stand alone qualifications or as part of other degree programs. The ANU offers entrepreneurship training as part of its PhD programs. However, education, training and professional development in management and entrepreneurship should also be available outside academic institutions to cater for people who qualify for enrolment at a tertiary institution.

1.2.3 Innovation systems

The idea of an 'innovation system' stems from a view that innovation and learning are context dependent interactive processes, based in the production structure (Lundvall, 2007). That is, innovation is seen to occur within a wider systematic framework in which firm level management practices take place. It covers the flows of ideas and knowledge between firms between organisations through networks and other forms of interaction.

System 'mapping'

Scholars and students of innovation describe innovation 'systems' in an effort to identify the elements and drivers of innovation. They focus on 'capabilities' and document and describe institutional structures and look for possible connections among businesses (which innovate), research organisations (which create industrially relevant knowledge) and government (which provides assistance and support).

There has been an explosion of studies and analytical work using an innovation systems approach. Most studies are highly descriptive and they map public infrastructure and public policies aimed at stimulating science and technology. But the core system of firms in interaction and the evolution of the human resource base are usually neglected (Lundvall, 2007). Networks of interaction (social capital) are seen to be important, but understanding how networks emerge, operate, and contribute to innovation outcomes is limited.

Innovation systems studies have in large part been an extension of the concept of the 'science system' where research and development, invention, and technology are seen as the heart of industrial and economic progress. However, analysis of the science system tells only part of the story. A great deal of contemporary innovation is based on design and creativity that draws on knowledge, talent and expertise in what can be referred to as the 'art and creative practices' domain. In this study attention is drawn to capacity and capability in this domain in terms of innovation capacity and capability.

A focus on the science as well as the arts and creativity aspects of innovation provides a much more complete picture of innovation capability and potential—particularly in Canberra.

Systems maps, whilst important for providing an understanding of the 'lay of the land' say little about the way in which knowledge actually flows between institutions and organisations that make up the 'system' in a dynamic context. There may be significant cultural, behavioural, and attitudinal barriers that work against effective interactions and collaborations being formed. Effective collaboration often boils down to effective channels and methods of communication being established and maintained. These channels are more often inter-personal rather than electronic.

Human capital dimensions

More recent work in innovation systems has emphasised the contribution of human resources (as shaped by education, labour markets, and learning by doing) and reflected in the internal organisation of firms, relationships with university staff, and access to what are referred to in this study as 'knowledge repositories' or 'collecting institutions'—national, state/territory and regional libraries, galleries, museums and archives.

Richard Florida pointed out that studies of economic growth find a clear connection between economic success and human capital—as measured by the level of education (Florida, 2003).

Studies have found considerable empirical evidence that clustering of human capital is the central factor in regional economic growth. Businesses grow and concentrate to capture the advantages that emerge from common labour pools—not so much to tap into the advantages of linked networks of customers and suppliers, as Porter and others argue.

Florida argues that economic growth will occur in places that have highly educated people and draws on focus group evidence to identify the reasons why:

- Thick labour markets: people move around a lot and want a choice of employment opportunities.
- Diversity: people look for visible signs of diversity—visual cues that a place is open to all and possess "low entry barriers" to human capital.
- Quality of place: the buildings, the neighbourhoods, the physical design, the human energy and what's going on in terms of cafes, restaurants, music venues and active outdoor recreation.

Florida's creative capital theory extends human capital theory by giving a specific focus to human creativity and innovation, and identifies the factors that shape the location decisions of people with creative attributes. Canberra's distinctiveness in this area, as a pleasant place to live, is canvassed later in the study.

Recognition of the important role of human resources, and acknowledgement of the role of 'creativity and talent' in innovation, has drawn attention to the foundational role of universities in providing *education and training* for people who work in industry in applied science and design related vocations as well as in the professions associated with the services industries. The role of universities in producing 'intellectual products', arising from publicly funded research, and making these available for commercialisation is, of course, still of major significance.

Recent research indicates that employees with higher education qualifications are able to contribute to a change in the mode of innovation in small and medium firms, as well as giving them more direct access to the kind of knowledge available at science institutions. On this basis, an argument can be advanced for subsidising the first hiring of university graduates in small to medium businesses (Lundvall, 2007).

These perspectives flow from a very extensive body of literature on 'organisational learning' and 'absorptive capacity'. Thus, crucial to understanding innovation is the ability to understand organisational, regional and even national learning processes. Processes for building learning

competencies have become a focal point in analysis of innovation systems. Learning is, of course, a quintessential human activity.

Skills issues

The Interim Report of the ACT Skills Commission identified skill shortages in a range of occupations, including: accounting, finance and management; building and construction; cleaning; clerks and receptionists; computing and IT; drivers and transport; food, hospitality and tourism; gardening; government and defence; labourers, factory and machine workers; marketing and sales, sales assistants and store persons; social welfare and security.

The skills identified by the Commission are mainly in categories associated with vocational education and training. The Commission does not seem to have focussed on important skill shortages in 'knowledge worker' categories—particularly people educated and trained in a higher education environment, and who are needed to realise the potential of Canberra's technological, cultural and creative base.

For example, The Collections Council of Australia has produced detailed baseline information that draws attention to a shortage of available and suitable conservation/ preservation workers in Australia, including Canberra. In particular, there is a shortage of professional and paraprofessional workers in traditional and emerging specialisations:

- Most workers are required in areas where the item type is a 'carrier of information' (e.g. publications/ manuscripts, film, audio and sound recordings, paper based flat works and records) and also in areas such as collection maintenance, reformatting/copying, archival materials, paper–non archival, electronic media, audio visual, books and photographs.
- Significant numbers of workers are required in the still growing area of preventative conservation.

Skills shortages have also been documented as existing in areas such as linguistics and languages, management, and design.

In an economy approaching full employment skill shortages begin to emerge. The ability of young people to find employment without attending a tertiary institution has meant that the demand for places that lead to expertise and qualification for entry into knowledge intensive occupations has fallen. In this environment tertiary institutions and employers, particularly in the ICT and professional services sectors, are now working collaboratively to combine employment with occupational and academic learning.

In the UK, following the Leitch Review of Skills, the Government has adopted a wide range of measures designed to enhance employer commitment to training and creation of 'world class' skills (Great Britain. Treasury, 2006, Great Britain. Department for Innovation Universities and Skills, 2007).

Indicators

Most innovation system performance indicators focus on simple to measure indicators of innovation such as R&D and patents with some attention to labour market and training of scientific personnel. This has been the track record of the OECD and other international organisations—as well as commentators and commentary about innovation performance. It is very difficult to 'measure' forms and outcomes of learning, although it is well known, for example, that 'less structured forms of interaction are more innovative than 'mechanistic' (structural) forms (Burns and Stalker, 1994).

The OECD and the Australian and other Governments are now recognising the need for broader indicators of innovation and are examining different ways to measure the innovative performance of regional and national economies – however the outcomes of these thoughts are still a distance away

1.2.4 The role of enabling technologies

In addition to the human and social capital dimension, innovation is closely associated with the application of information and communications technologies (ICT)—the 'infrastructure' and enabling technology of the knowledge economy. ICT has the ability to link opportunities generated through scientific discoveries and technological inventions with aesthetic appeal generated through art and creative practices.

ICT provides the software, the processing power, the capacity for information collection, storage and retrieval, the high speed communication (broadband and wireless) and the capacity for universal accessibility through the Internet.

ICT is embedded in almost all industry sectors—agriculture, mining, manufacturing, and services. It is the foundation for the growing economic importance of the creative industries and has effectively re-established the link between 'science' and 'art'—a link that had been recognised in the early stages of the industrial revolution. ICT is also important for the cultural industries where performances, exhibitions and events make extensive use of software and multimedia.

ICT has underpinned the linkage between 'hard' (functional) innovation and 'soft' (aesthetic) innovation and given effect to the growth and increased potential of the 'creative industries' as an economically significant sector.

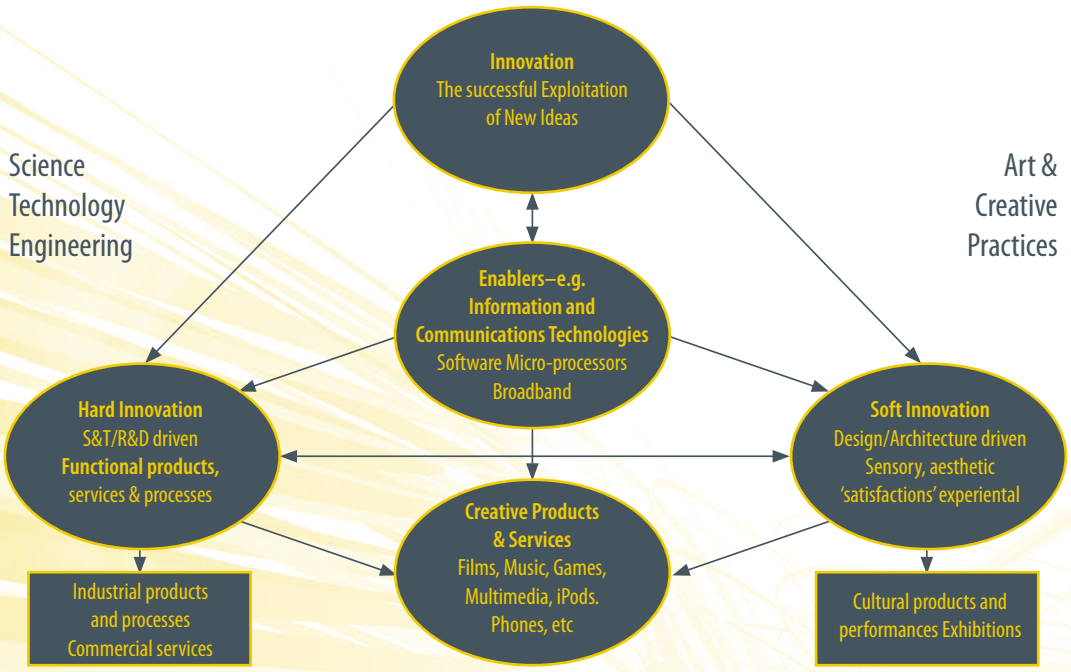
A framework for thinking about the enabling role of ICT in innovation that draws on the foundations of both science and art is represented in Figure 2. For simplicity, the framework does not represent the role and contribution of other enabling technologies in innovation, such as biotechnology, nanotechnology and materials science. Information and communications technology has a particular significance for innovation in Canberra.

Increasingly, where product and service functionality is hard to differentiate, businesses compete on the aesthetic and sensory features of their merchandise—the 'look and feel'. This calls for a substantial commitment to the development of new ideas through customer interaction and an ability to carry them through. *Interactive Design* is becoming and important aspect of new product development (Moggidge, 2007, Kelley and Littman, 2001a, Kelley and Littman, 2001b).

The linking of technological with the artistic and the cultural, together with the enabling features of ICT has given rise to a very wide range of products and services that fall under the heading of 'creative industries'. As will be addressed later in this study, these industries are major employers and are of particular—and increasing—importance in the ACT innovation system.

Figure 2: The Dimensions of innovation

Dimensions of Innovation



Source: Based on P. Stoneman (2007), An Introduction to the Definition and Measurement of Soft Innovation, NESTA Working Paper, London

1.3 The competitive environment

In the modern knowledge based economy, (and recognising 'cluster' based activity built around concentrations of human capital), there is global competition to attract investment and people to build and sustain economic and industrial progress. In the global economy, cities and businesses that are located within them, compete.

Cities, and their surrounding districts, are seen as the building blocks of the national economy. Most knowledge workers live in cities, most patent applications originate from cities and most knowledge intensive businesses are located in cities. Cities offer proximity, which reduces transactions costs, density, which helps labour markets work better, and variety. Cities offer critical mass as well as links between firms, education and research organisations and public organisations (Athey et al., 2007).

Increasingly, cities are seeking to be identified with a 'brand' that provides an image of the attractiveness of their location. Around the world cities endeavour to build a brand around knowledge ('knowledge capital'), creativity ('creative capital'), and design ('city of design'). The latter designation can only be used on the basis of UNESCO accreditation[1].

With the growing appreciation of design as an innovation driver, together with an understanding of the critical role of human capital in innovation systems, cities are positioning themselves to compete on the basis of their capability in design. This is occurring in the UK, Europe, North America and increasingly in India and China.

With Canberra's strong base in research, information technology, cultural institutions, and strength in arts, design and architecture at the ANU, University of Canberra and the Canberra Institute of Technology, as well as in digital content development and users, the city is well placed to be a serious competitor in the global design industry. *'Designed in Canberra'* could become a differentiating brand for the national capital.

This issue is addressed further in later Sections of the study.

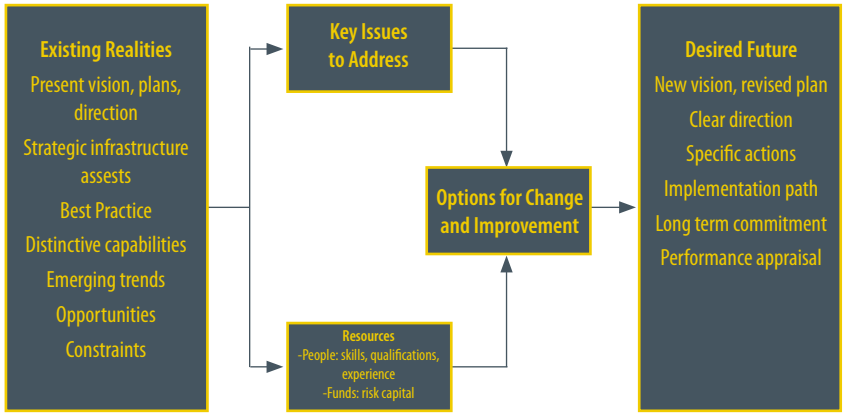
[1] The process for securing UNESCO accreditation is outlined in Attachment A

1.4 Approach to the study

While the terms of reference require a description of the ACT innovation system, the outcome requires recommendations or initiatives that can be taken by key stakeholders in the 'innovation system'. To this end the study has involved following a 'strategic review framework'. This is depicted in Figure 3.

Figure 3: Innovation System Strategic Review Framework

Strategic Review Framework



Analysis of the *existing realities* covers the present policies and plans as well as the capacities and capabilities that constitute the 'innovation system' concept as it applies in Canberra and the trends that will impact on innovation system performance. The analysis identifies a number of important issues that will have to be addressed in order to secure innovation outcomes.

On the basis of feedback during the study, visions for Canberra based on innovation and design are canvassed. The study concludes with a discussion of actions and initiatives that can be taken by stakeholders—including, but not limited to, government.

2 The innovation policy context: vision, plans, and frameworks

2.1 Innovation policy objectives

The principal objective of innovation policy can be formulated in the following terms:

To build economic strength and international and national competitiveness by generating and harnessing the latest developments in science, technology, creativity and design and applying these to real world applications—that is, products, services and processes that people and organisations (private or public) are prepared to purchase and pay for.

To many, innovation is seen as being driven by expenditure on research and development and its commercialisation in new products. However, innovation also occurs in services, new business models and new ways of responding to new and changing customer wants and expectations. The above formulation of innovation policy explicitly recognises the contribution of art, design and creative practices to innovation.

Innovation policy amounts to a major *economic development strategy*. It is a strategy that is adopted and implemented by nations, regions and cities around the world to achieve economic outcomes. Innovation is also linked to broader community development objectives such as sustainability and quality of life.

In the Canberra context, innovation is an important strategy and process for realising the outcomes identified in the Canberra Plan.

Recent policy and official literature, particularly from the European Union and the OECD, has recognised the importance and contribution of regional innovation strategies to national innovation outcomes. This recognition flows from the long held interest of economists, geographers and policy makers in agglomeration effects and 'clusters' (Porter, 1998, Porter, 1999, National Governors Association, 2002).

In Australia, as in the United States and Canada, innovation policy must also recognise the federal constitutional framework and the division of responsibilities between the Commonwealth and the states/territories for regulation, funding and service delivery in relation to industry and innovation policy. States and territories, particularly Victoria and Queensland, have well developed innovation strategies that complement Australian Government policies. Substantial state resources are also invested.

One of the central issues in innovation policy and systems analysis concerns the interactions and relationships at a national and international level. These relationships are developed and maintained by businesses, universities, government agencies, and cultural institutions. Canberra's 'uniqueness' as Australia's national capital with strong international linkages through these agencies provides many strengths and opportunities for innovation,

2.2 The Canberra plan and strategy

The Canberra Plan (ACT Government, 2003) envisages that Canberra will be recognised throughout the world—not only as a beautiful city, uniquely designed in harmony with its environment, the seat of Australia's government and the home of its pre-eminent national institutions but also as a place that represents the best in Australian creativity, community living and sustainable development.

The Canberra Plan has three chapters: the *Economic White Paper*, the *Canberra Social Plan*, and the *Canberra Spatial Plan*. There is also the National Capital Plan that falls within the responsibility of the National Capital Authority (NCA). In addition to these government plans there is also an *Action Agenda Report* prepared by the Canberra Business Council (Canberra Business Council, 2005) and a *Discussion Paper* put forward by the ACT Property Council (Property Council of Australia, 2006).

The *Economic White Paper* sets out measures to support commercial, educational and research activities so as to achieve greater economic opportunity and maintain high employment. The Paper envisions that:

ACT Economic Strategy

The ACT will be the heart of a region known for its dynamic, innovative and growth-oriented economy and its quality of life. It will have a tolerant, creative and socially inclusive community committed to protecting the natural environment. We strive for a society that is cohesive, tolerant and fair, and a society that protects the vulnerable and supports those in need. We aim for a society, place and environment that is truly sustainable.

We understand these aspirations can only be realised in a highly productive and competitive economy. The currency for our community and the Government is jobs and secure jobs.

The *Canberra Plan* envisages establishing a 'culture of creativity' as a distinctive feature in all aspects of community life. It will promote the concept of a 'learning city' and 'encourage people to explore new opportunities'. Individual enterprise in business, science and the arts will be strongly encouraged and work will be directed towards promoting creative synergies across different streams of activity (ACT Government, 2003).

In 2003, the ACT Government identified a number of priority industry sectors based on the strong knowledge based economy. The following sectors are seen to offer great prospects to potential investors and businesses considering a move to Canberra.

- *Biotechnology*: Focuses on the expansion of biotech-related business, the partnerships between local business and the research community and the facilitation of growth and expansion through the knowledge fund.
- *Creative Industries*: Canberra is home to some of Australia's, and the world's, most accomplished and imaginative creative workers.
- *Defence Industry*: There are over 100 defence related companies in Canberra that provide a variety of goods and services to defence companies and the Department of Defence
- *Education and Training*: Focuses on Canberra's educational institutions as internationally recognised centres of excellence.
- *Environmental Management*: Focuses on Canberra's high quality environmental management, and leading urban environmental solutions and capabilities in the environmental industry
- *Information and Communications Technology*: Focuses on Governments spending power, Canberra's advanced broadband network and highly skilled workforce.
- *Space Sciences*: The space sciences industry in Canberra is still relatively small but it is one of huge export potential.
- *Sport Science Management*: Canberra's well-established sporting infrastructure concentrates on an integrated sporting system that encourages sport and physical activity for all Canberrans.

The ACT Government has identified *capabilities* in each of these areas[2] but has not developed specific policies and innovation *strategies*. Like most other states and regions the connections between capabilities and economic outcomes is not well established.

For a relatively small region, it is unrealistic to expect that the ACT can develop *and successfully implement* economic development strategies in all of the above industry sectors. Innovation potential in a newly created single product business does not necessarily form the basis for the creation of an industry.

Targeted investments have been made in a small number of areas—such as support for ScreenACT, the National ICT Centre of Excellence and ANU Connect Ventures. These investments are aimed particularly at leveraging capability in the creative industries, and information and communications technology. They support development where the ACT not only has capability but also a distinctive competency that gives rise to competitive advantage.

2.3 The economic framework

In terms of share of Gross Domestic Product (GDP) the ACT constitutes 2.1 percent of the Australian economy. In 2005-06 the ACT's Gross State Product (GSP) rose by 3.4 per cent in real terms over the previous year, higher than the national GDP growth rate of 2.9 per cent[3].

2.3.1 Industry structure

Canberra was established as Australia's national capital. It is home to the national legislative, judicial and executive arms of government. Thus, from an economic perspective, Canberra is the base for a major industry—*Government Administration and Defence*. The industry is constituted by a large number of parliamentary and executive departments and constitutes about one quarter of the ACT economy. The relative contribution of all major industries to the income components of Gross State Product are listed in Table 1

[2] See http://www.business.act.gov.au/investingincanberra/competitive_industry_sectors
[3] Gross State Product (GSP) is a measure of the value added by economic production in the States and Territories. The Australian Bureau of Statistics considers the concept of GSP to be "experimental" and advises users to "exercise caution when using these estimates for economic analysis" — for this reason, ACT Treasury does not consider GSP to be a reliable measure of economic activity.

Table 1: ACT Industry Percentage Contribution to Total Factor Income

	1995-96	2000-01	2005-06
Agriculture, forestry & fishing	0.2	0.1	0.0
Mining	0.0	0.0	0.0
Manufacturing	2.7	2.1	2.0
Electricity, gas & water supply	2.0	2.4	2.4
Construction	6.5	5.6	7.7
Wholesale trade	2.1	2.0	1.8
Retail trade	5.7	5.3	4.8
Accommodation, cafes & restaurants	2.0	2.4	2.0
Transport & storage	2.5	2.3	2.3
Communication services	2.9	2.6	2.5
Finance & insurance	3.7	4.2	3.6
Property & business services	12.5	14.7	12.7
Government admin. & defence	26.6	25.4	26.7
Education	5.9	5.8	5.7
Health & community services	4.8	6.0	6.3
Cultural & recreation services	2.8	2.7	2.6
Personal & other services	2.7	3.0	2.7
Ownership of dwellings	8.1	7.8	8.7
General government	6.1	5.7	5.4
Total	**100.0**	**100.0**	**100.0**

Source: ABS Cat. no. 5220.0. ACT Department of Treasury, Economics Branch.

Canberra is a national centre for the *education and research industry* through the location of the Australian National University, the Australian Defence Force Academy, the National ICT Centre of Excellence, the national headquarters of the CSIRO, and the Australian Institute of Sport. It is also the centre for Australia's major cultural and knowledge collection institutions including the National Library of Australia, the Australian National Gallery, the Australian War Memorial, and the National Museum of Australia.

These nationally oriented institutions have sustained and stimulated the growth and development in many other industries. These include construction, property and business services (including tourism), education and health. Information and communication technologies, including software development have been major enablers in the development of all sectors of industry in Canberra.

Economic and industry policy in the ACT is directed towards reducing the impact of fluctuations in the public administration industry, influenced by public employment strategies, by building diversity and sustainability across all industries.

The Economic White Paper envisages development and growth being built around Canberra's knowledge based industries with a focus on creativity and innovation.

Canberra's Knowledge Future

Knowledge-based industries will form the base of Canberra's future growth, helping to diversify the economy. The city will build a reputation for commercialising research, innovation and education strengths – as a place that stays ahead of the competition by quite deliberately turning ideas into assets.

We will capitalise on Canberra's research, innovation and educational strengths. This will generate new jobs in leading-edge industries and establish a momentum for Canberra's economic development.

Canberra needs a strong, private sector economy. As a land-locked Territory without the natural resources that drive a traditional heavy industry, a knowledge-based economy is essential. It also allows us to play to Canberra's strengths.

Focusing on creativity and innovation will allow Canberra and the Capital Region to be competitive in the globalised economy.

Our strategies for the knowledge economy will include investment funds and intellectual property management policies to support local commercialisation. Company-to-company partnerships will be supported locally and throughout Australia.

The ACT's strengths will be strongly marketed nationally and internationally. Planning policies will promote the natural clustering of innovation-based industries to support a knowledge economy.

Within Canberra's 'national' industries there are some very large organisations which interact with a very large number of smaller businesses. A number of these businesses are highly creative and innovative—in terms of developing and successfully exploiting new ideas in the form of new products, processes and services. Many of these innovations are generated through a commitment to research, development and design (RD&D).

A key finding of this study is that while Canberra has a very rich base of creative businesses, their small size and diversity means that the 'creative industry sector' is highly fragmented with the result that its full potential is not being realised.

An important theme of this study is the way in which Canberra can enhance the performance of its creative industries and become known as a centre for creativity—by building on its capabilities in

art, architecture, design, and film and strengthening the linkages between these capabilities and information and communications technologies—particularly in the areas of digital media and creative content.

This process is already underway. For example, ScreenACT has been established to 'make Canberra and the surrounding region a centre of creative convergence with a strong and innovative screen industry cluster and a supportive culture of creativity that contributes to the life and vitality of the Nation's Capital'.

About ScreenACT

ScreenACT, the ACT Office of Film, Television and Digital Media, is responsible for implementing industry development initiatives, providing location production support and working with other states on potential partnering projects.

ScreenACT's activities are aimed to assist the Government's commitment to supporting ACT business, understanding and creating opportunity from the ACT's competitive advantages, and leveraging our intellectual assets.

ScreenACT is administered by Canberra Business Council Limited and supported by the ACT Government.

In pursuit of our vision ScreenACT will perform the following functions:

- Promote the ACT and Capital Region as a location for filming and other activities and services provided by the ACT screen industry
- Promote the capabilities of the industry in the ACT and Capital Region
- Maintain liaison and build relationships with organisations and individuals of interest to the industry
- Provide an information service to the industry
- Enhance the sustainability and commercial viability and value of the industry
- Provide advocacy for the screen industry
- Contribute to Government policy development relating to the industry, and
- Develop the capabilities and professionalism of the industry

Film, television and digital media, known collectively as the screen industry, forms part of the Creative Industries sector, identified as one of the ACT Government's nine priority sectors in the Economic White Paper in December 2003.

The process needs to continue, however, with additional commitment and resources to build capability, widen the scope and to ensure longer term sustainability.

2.3.2 Employment

Over the period from 1985 to 2007 ACT employment has increased by almost 70,000 people, or 57.9 per cent. Employment in government administration and defence has increased by 20,100 people (63.6 per cent)—accounting for almost 30 per cent of the employment increase.

While government employment accounts for only 27.6 percent of the work-force in Canberra, government also 'hires' a large number of people under contracts or through outsourced service arrangements. Employees in these categories are included in the property and business services industry—which has had the fastest growth rate (145.4 percent) over the period.

When Parliament is in session, in excess of 2,500 people are engaged in employment in and around the building. This includes 1,300 Parliamentary Services Staff, 450 Ministerial staff and 900 Opposition staff. Numbers of press, lobbyists and public relations practitioners are difficult to estimate.

Some of the Australian Government's executive departments are among the largest employers in the country. They have a high level demand for people with university professional qualifications and skills, particularly in the social sciences, arts and humanities. They also have a high demand for ICT related equipment and services.

Canberra is the base for overseas diplomatic representation, constituted as high commissions and embassies, which employ a large number of overseas and locally engaged staff.

The growth in Canberra's 'lead industry' has had a major flow on impact in employment in most other industries, particularly property and business services, which includes tourism, real estate services and a range of professional services that are increasingly being purchased externally.

Lead industry growth, together with visitors drawn by national institutions and 'the business of government', also translates into growth in the wholesale and retail trade, accommodation, cafes and restaurants, and health and community services industries. The trends are summarised in Table 2 where most industry sectors have recorded employment growth in excess of 20 percent.

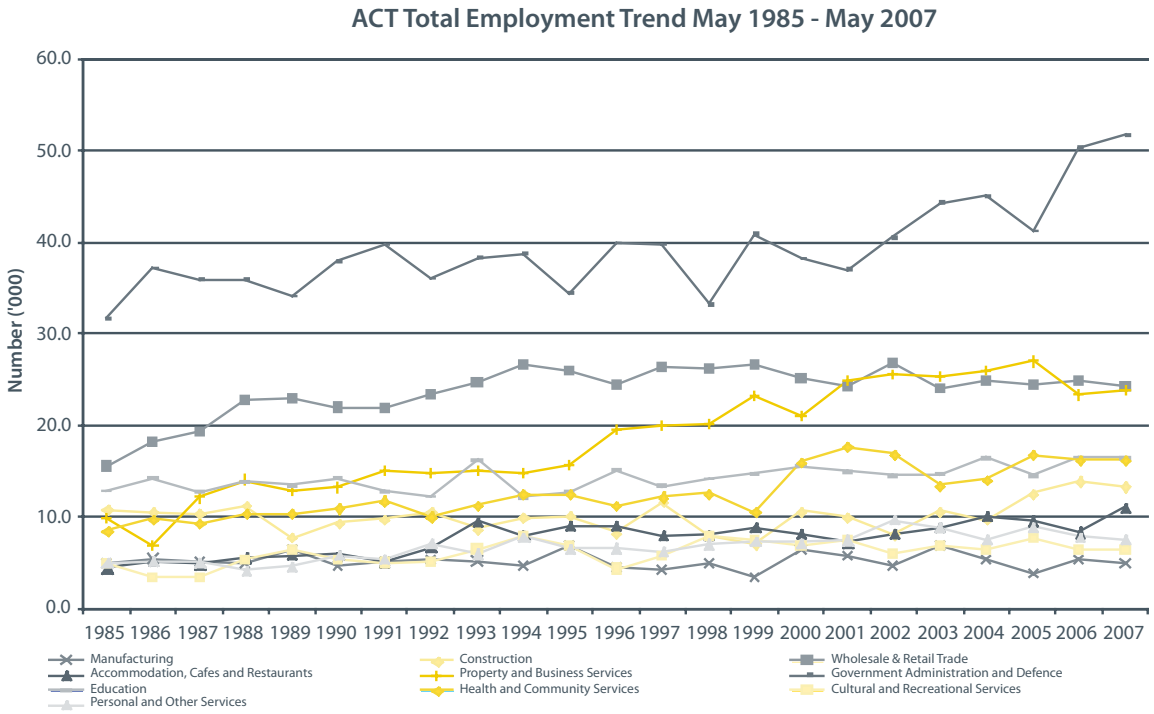
Table 2: ACT Employment by Industry Sector ('000)

	1985	1990	1995	2000	2005	2006	2007	Change 1985-2007	Proportion of Increase
Manufacturing	4.8	4.7	6.7	6.4	3.8	5.2	4.8	1.2%	0.0%
Construction	10.8	9.3	10.0	10.6	12.5	13.9	13.3	23.1%	3.6%
Wholesale & Retail Trade	15.5	21.9	25.9	25.1	24.4	24.9	24.2	56.1%	12.6%
Accommodation, Cafes and Restaurants	4.4	5.8	9.0	8.2	9.6	8.3	11.0	150.0%	9.6%
Transport and Storage	5.1	5.4	4.3	4.6	3.7	3.6	4.1	-19.6%	-1.5%
Communication Services	1.6	2.0	2.9	2.8	3.1	2.9	2.4	50.0%	1.2%
Finance and Insurance	3.2	7.1	4.1	4.3	3.8	3.3	3.7	15.6%	0.7%
Property and Business Services	9.7	13.2	15.6	21.0	26.9	23.3	23.8	145.4%	20.5%
Government Administration and Defence	31.6	37.9	34.4	38.2	41.2	50.3	51.7	63.6%	29.2%
Education	12.8	14.2	12.7	15.5	14.5	16.5	16.4	28.1%	5.2%
Health and Community Services	8.4	10.9	12.4	15.9	16.7	16.2	16.2	92.9%	11.3%
Cultural and Recreational Services	4.9	5.2	6.8	6.7	7.7	6.3	6.3	28.6%	2.0%
Personal and Other Services	4.9	5.7	6.5	7.1	8.8	7.8	7.5	53.1%	3.8%
Other	1.1	2.4	2.0	1.8	2.2	2.1	2.2	93.7%	1.5%
Total (Industry)	**118.8**	**145.7**	**153.3**	**168.2**	**178.9**	**184.6**	**187.6**	**57.9%**	**100.0%**

The data in Table 2 also indicate that the government administration and defence industry has contributed almost 30 percent of the increase in employment over the period 1985–2007, followed by property and business services which contributed 20 percent.

Within this overall trend there have been fluctuations from year to year—reflecting the interaction of fiscal policies, that aim to reduce public expenditure by cuts to staffing levels, and the need to increase staff to implement new expenditure programs and service the growth in existing programs. The fluctuations, which generally have a lagged effect in other industries, particularly construction, are reflected in Figure 4.

Figure 4: ACT Employment Trends 1985-2007



The data points to a comparatively small manufacturing sector and the substantial employment impact of the Australian Government. Over the years the Australian Government has used reductions in staffing numbers as a strategy for meeting its fiscal targets—particularly in 1996. As can be seen in Figure 4, this has impacts on other industries, particularly the construction sector. More recently, the Australian Government has not exercised central control over staffing, leaving it to agencies to manage people within their overall budget allocations.

Moreover, human resource management involves agencies choosing between direct employment, purchasing services from the market, or contracting through the robust staff contracting sector—particularly in accounting, finance and information technology services. This is reflected in the growth in business services employment, but the trends in the last two years suggests that the Government is returning to a policy of employment rather than contracting.

2.4 Australian Government purchasing and procurement

In addition to being major employers, Australian Government departments and agencies are major purchasers of goods and services from businesses and industries located in the ACT.

2.4.1 Scale of government purchasing

In 2006-07 it is estimated that the Australian Government made purchases of goods and services from businesses based in the ACT in excess of $4.1 billion. The departments and agencies with procurement expenditure in excess of $10m are provided in Table 3.

Table 3: Australian Government—purchases of goods and services in the ACT and region exceeding $10m

Agency/Department	Contract Value
Attorney-General's Department	39,402,857
AusAID (Australian Agency for International Development)	35,144,880
Australian Bureau of Statistics	17,985,067
Australian Competition and Consumer Commission	14,380,700
Australian Customs Service	44,447,990
Australian Federal Police	72,810,148
Australian Institute of Family Studies	15,419,901
Australian Taxation Office	83,753,289
Centrelink	132,704,926
Child Support Agency	72,687,169
Civil Aviation Safety Authority	13,382,330
Commissioner for Superannuation (ComSuper)	15,110,111
Department of Agriculture, Fisheries and Forestry	28,645,723
Department of Communications, Information Technology and the Arts	33,233,208
Department of Defence	2,392,009,319
Department of Education, Science and Training	17,581,240
Department of Employment and Workplace Relations	69,568,706
Department of Family and Community Services	29,293,217
Department of Finance and Administration	35,245,511
Department of Foreign Affairs and Trade	138,297,878
Department of Health and Ageing	140,288,632
Department of Immigration and Multicultural Affairs	242,545,584
Department of Industry, Tourism and Resources	35,055,218
Department of Parliamentary Services	23,382,473
Department of the Environment and Water Resouces	91,296,938
Department of the Prime Minister and Cabinet	16,568,077
Department of the Treasury	15,376,893
Department of Transport and Regional Services	36,346,019
IP Australia	35,471,057
Medicare Australia	31,226,270
Other	
	4,114,932,222

A listing of purchases by all agencies is included in Attachment A. Not all of the expenditure reported in Table 3 would be incurred directly in the ACT as it would flow through to purchases elsewhere in Australia and overseas. But the data does serve to indicate the magnitude of purchases from businesses and organisations that report their business location as Canberra.

Procurement of goods and services classified by Australian and New Zealand Standard Classification of Commodities (ANZSCC) with a value in excess of $10m is provided in Table 4. A complete listing is included in Attachment A.

Table 4: Australian Government purchases of goods and services in the ACT region—ANZSCC code

ANZSCC Code	ANZSCC Description	Contact Value
32	Pulp, paper and paper products; printed matter and related articles	31,204,744
38	Furniture; other transportable goods	11,378,556
44	Special purpose machinery	23,619,960
45	Office, accounting and computing machinery	93,152,744
49	Transport equipment	54,240,042
51	Construction work	70,540,414
52	Construction	60,036,913
75	Post and telecommunication services	54,880,664
81	Financial intermediation services and auxiliary services	16,081,742
82	Real estate services	326,834,563
83	Leasing or rental services without operator	1,425,632,414
84	Computer and related services	374,994,534
85	Research and development services	23,214,201
86	Professional services	176,947,318
87	Business services n.e.c.	787,593,761
89	Intangible assets	11,080,284
91	Public administration and other services to the community as a whole	27,939,380
92	Education services - includes training	23,875,253
93	Health and social services	24,930,357
95	Services of membership organisations	68,486,138
97	Other services	375,712,037

The data in Table 4 reflect a very substantial commitment to the purchase of machinery and equipment, particularly ICT related equipment (category 45), telecommunications services (75), leasing and rental services (83), computer, professional, research and other business services (84-87)—which includes advertising and placement and supply of personnel, which adds to $188m. There is also a very substantial commitment to community, social and professional services. The services provided in most of these categories are knowledge intensive and, potentially, are a major source of innovation for the Australian Government.

2.4.2 Contracting with the Australian Government

Australian Government procurement policies are centred on value for money and probity. Government departments and agencies based in Canberra generally do not look to their suppliers for innovation. Attention to probity and accountability in purchasing may actually work against innovation.

In Canberra and the ACT region it is very much up to the supplier to take the initiative in offering innovative approaches through the procurement process. There is no preference for local supply, but more significantly, it is very difficult to develop non purchaser forms of interaction between government and industry and higher education.

All government 'purchases' must go through a time and resource intensive, legally driven, procurement process. This can be expensive and very high risk for suppliers. It also severely limits opportunities for productivity improvement in government services. Arrangements for large suppliers to involve SMEs in tendering are largely ineffective. Panel arrangements set up by corporate units within departments have endeavoured to reduce costs, but program managers are not obliged to use them.

The Department of Finance and Administration advises in its publication *Selling to the Australian Government* that 'Australian Government officials are required to buy goods and services in an ethical, accountable and transparent manner' and that 'they must not seek gifts or other favours from potential suppliers, and should follow procedures and protocols designed to ensure a fair and consistent approach to procurement activities'. The guide also says that 'potential suppliers should not approach agency officials in a way that might be interpreted as an attempt to improperly influence agency purchasing processes' (Australia. Department of Finance and Administration, 2006). However, the Department advises of the importance of *building relationships* with *potential* purchasers.

Selling to the Australian Government: A guide for business
Build Relationships

Just like business development in the private sector, it is important to build relationships and ensure your potential government customers are aware of your capabilities and have confidence in your ability to deliver.

To help get you started, here are some basic tips on marketing to, and doing business with, Australian Government agencies:

- Try to identify the agencies likely to need your goods or services, and within those agencies, identify the specific areas or individual buyers who are most likely to make purchasing decisions;
- Develop your relationships - meet with the relevant people, and provide information such as a corporate profile, track record, testimonials, website address, pricing schedules and contact details (but don't flood agencies with advertising material or constant phone calls);
- Make sure agency buyers know what sets you apart from your competitors;
- Be aware of any regulatory requirements, conditions, pre-qualifications, licences etc that you might need to supply to the agency;
- Maintain contact with agencies to ensure you are aware of future prospects;
- You will need to invest time and resources to enter the government market with success, but if your initial strategy is not working, it may be worth changing your approach;
- Consider the benefits of strategic partnerships with other businesses that sell to the agency you are interested in;
- Build a reputation for providing value for money - bid competitively and wherever possible add extra value.

The Guide notes that "word of mouth" can be an effective way of promoting business services to government.

An important alternative way of accessing the government market is through building relationships with other businesses that are already selling or want to sell to government. These relationships can take a number of forms and can offer substantial benefits.

The more common joint bids are prime/sub-contractor arrangements under which suppliers who are awarded prime contractor status use sub-contractors to perform some or all of the services required by the agency. Developing relationships with these prime contractors can be a relatively simple and attractive way to access the government market.

It is important, however, to understand all aspects of strategic partnerships to make sure they work for everyone's benefit, including a partner's record of supplying to government, their capabilities and key staff. Also important are issues such as payment arrangements, risk sharing and intellectual property.

Many sub-contractor arrangements fail when the prime contractor insists that subcontractors assume all risks and fail to distribute the work after the contract is signed.

2.4.3 Defence contracting

The Department of Defence, through Defence Materiel Organisation (DMO), is a major purchaser of goods and services in Canberra, nationally and internationally. The DMO does not favour local suppliers, but suppliers do locate in Canberra to develop relationships with the Department within the frameworks outlined above.

The DMO looks for capability; it does not have an industry policy that encourages innovation among suppliers. However, Canberra based start-up businesses that are able to address capability requirements in innovative ways have performed well. Australian Government Research and Development Grants have been important in sustaining businesses through the development period.

The Department of Defence receives many 'unsolicited proposals' from industry due to its unique business requirements. These proposals may range from small, off-the-shelf supply items to more complex capability solutions. Defence has therefore established an Unsolicited Proposals Gateway to provide a single entry point for businesses and individuals to submit their proposals.

2.5 Issues and implications

The ACT is essentially a services economy with a predominant industry—public administration and defence. Government procurement practices provide little opportunity for ACT businesses to develop and market innovative supplier solutions to government—notwithstanding the acknowledged need for innovation in services to drive productivity performance.

There is little evidence that the Australian Government has been using outsourcing and procurement policies as an element of a 'services innovation' strategy. Its approach has been associated more with efficiency, productivity and value for money considerations. The management of innovation is more closely associated with the management of risk.

The option for pursing an innovation outcome is largely in the hands of the supplier, rather than as a partnership or collaboration between purchaser and provider as occurs in the private sector. Procurement policy procedures and guidelines make it very difficult to find innovative solutions. This is quite different from the approach being adopted in Europe and in the UK.

Like most large businesses, the Australian Government is pursuing innovation strategies from an internal platform. This is being seen in ICT applications in large agencies such as the ATO, Centrelink, and the Australian Customs Service.

Many ICT companies have been attracted to Canberra to undertake research on account of the quality of 'human capital' as well as a platform to market ICT hardware and software to the Australian Government.

The ACT is a knowledge intensive, 'information rich' economy as well as a centre for national cultural and collecting institutions. These latter organisations provide a strong base for a creative industries sector and offer significant potential for the further development of the knowledge based economy in the ACT.

3 Innovation system capability

The 'capabilities' of the ACT innovation system are identified and described in this Section in terms of:

- Research and development capability
- Creative capability
- Business and entrepreneurial capability

These areas of capability are detailed below.

3.1 Research and development capability

Research and development capability is most often assumed to relate to 'science and technology', or 'science'. In this study, research capability covers *all* aspects of research and development identified in statistical classifications of research fields and disciplines. This includes research in fields covering science and technology a well as the arts, humanities and social sciences—an area where the ACT has particular strengths.

The United States Government, in the *American Competitiveness Initiative*, identified 10 areas for investment to build on successes and remain a leader in science and technology (United States. Office of Science and Technology Policy, 2006). These capabilities can be represented in terms of a framework for building capabilities for innovation. Such a framework is represented in Table 5.

Table 5: Innovation system capability investment framework

Capability	Features
Cutting edge basic research	Fundamental discoveries that produce valuable and marketable technologies, processes and techniques. Research is undertaken in higher education institutions and publicly funded research agencies
The tools of science	Facilities and instruments that enable discovery and development – unique, expensive, large scale, and beyond the reach of a single organization
Private sector R&D	Incentives and encouragement to enable the translation of discoveries and inventions into production of useful and marketable technologies, processes and techniques
Higher education	Universities that provide students with access to world class education and research opportunities in, science, technology, engineering and mathematics—as well as architecture and design. Post graduate education in business and management is also important.
Workforce training systems	Investments in higher education and vocational education and training that provide more workers with the opportunity to pursue training and others services to improve their skills and better compete
A system of education through secondary level	Investments in school based education that equips each new generation with educational foundation for future study and inquiry in technical subjects and inspires and sustains their interest
An efficient system for the protection of IP	Investments that provide a capability to recognise, register and manage IP resources
Expatriate and immigration policies	Investments that to attract and retain the best scientific and creative minds
Encouraging entrepreneurship	Investments in capital and product markets that rapidly diffuse new productive technologies

Comments on these capability areas, insofar as they relate to the ACT, are provided below.

3.1.1 Cutting edge research

Higher education research expenditure

ACT Universities perform 10 percent of total higher education research in Australia. Within this, they perform 16.2 percent of pure basic research and 12.4 per cent of strategic basic research.

Table 6: Higher education expenditure on R&D by type of activity 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Pure basic research	402,982	285,441	130,961	199,801	210,611	1,229,796	16.2
Strategic basic research	235,953	255,164	161,784	121,846	204,062	978,809	12.4
Applied research	441,239	445,916	361,374	96,803	400,267	1,745,599	5.5
Experimental development	112,643	66,089	61,455	18,971	69,420	328,578	5.8
	1,192,817	**1,052,610**	**715,574**	**437,421**	**884,360**	**4,282,782**	**10.2**

Overall, 45.7 of ACT higher education research resources are devoted to pure basic research and a further 27.9 percent to strategic basic research. This commitment to research excellence and quality is a feature of the ANU and a source of competitive advantage for the ACT in attracting world class faculty, scholars and international funding.

Table 7: Higher education expenditure on R&D by type of activity 2004 (proportion)

	NSW	Vic.	Qld	ACT	Australia Total
	%	%	%	%	%
Pure basic research	33.8	27.1	18.3	45.7	28.7
Strategic basic research	19.8	24.2	22.6	27.9	22.9
Applied research	37.0	42.4	50.5	22.1	40.8
Experimental development	9.4	6.3	8.6	4.3	7.7
	100.0	**100.0**	**100.0**	**100.0**	**100.0**

There is, of course, more scope for applied research and experimental development and partnering with industry in this endeavour. The University of Canberra is giving attention to this role.

The relative concentration of research effort across research fields is summarised in Table 8. A complete table is provided in Attachment B.

Table 8: Summary of higher education expenditure on R&D by research fields 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Mathematical sciences	36,057	19,847	9,325	14,857	9,648	89,734	16.6
Physical sciences	40,450	30,897	11,741	42,962	24,753	150,803	28.5
Chemical sciences	46,612	42,508	36,907	21,425	38,398	185,850	11.5
Earth sciences	22,077	29,024	11,428	30,555	35,112	128,196	23.8
Life sciences (Biological sciences)	100,832	77,046	113,946	51,691	107,440	450,955	11.5
Life sciences (Medical & health sciences)	300,093	307,521	161,003	71,279	242,546	1,082,442	6.6
Economics	21,092	34,385	11,746	19,484	16,511	103,218	18.9
Policy & political science	17,459	13,660	8,804	30,456	6,282	76,661	39.7
Studies in human society	38,427	36,091	23,414	19,304	27,289	144,525	13.4
Law, justice and law enforcement	25,269	22,332	11,851	16,319	9,185	84,956	19.2
Journalism, librarianship & curatorial studies	4,329	3,047	5,302	1,895	2,994	17,567	10.8
The arts	31,112	17,512	15,354	10,314	13,084	87,376	11.8
Language and culture	29,456	21,042	12,278	11,291	8,576	82,643	13.7
History and archaeology	19,559	19,971	6,161	16,851	11,700	74,242	22.7
Philosophy and religion	13,043	6,557	3,287	3,939	2,961	29,787	13.2
	1,192,817	**1,052,610**	**715,574**	**437,420**	**884,360**	**4,282,781**	**10.2**

Table 8 indicates a very substantial commitment to research in the physical sciences, chemical sciences and life sciences (biological sciences and medical and health sciences). It also points to a very strong capability in public policy and political science research as well as in the arts and humanities, particularly in history and archaeology.

The ACT is a major centre for research relating to the defence industry. Nearly one third of higher education research undertaken in the ACT relates to the socio-economic category 'defence'. This brings together a range of research fields—covering technology, security and policy research. Research relating to Australia's overall economic framework, social development and community services, and environmental policy frameworks is also important in the ACT.

Major areas of research commitment are summarised in Table 9. More complete details are provided in Attachment B.

Table 9: Summary of higher education expenditure on R&D by socio-economic objective 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Defence	3,780	7,207	3,170	9,494	5,206	28,857	32.9
Energy supply	15,500	7,897	3,553	5,018	8,084	40,052	12.5
Information & communication services	63,780	60,739	37,384	21,683	28,942	212,528	10.2
Economic framework	52,453	69,388	29,129	29,631	35,440	216,041	13.7
Education & training	52,002	47,883	25,944	21,628	47,670	195,127	11.1
Social develop. & community services	158,254	84,254	71,989	82,929	68,620	466,046	17.8
Environ. Policy frameworks & other aspects	13,645	8,930	5,040	6,910	4,918	39,443	17.5
Environmental management	56,549	31,211	54,241	23,314	92,252	257,567	9.1
Other categories							
	1,192,817	1,052,610	715,574	437,420	884,360	4,282,781	10.2

Research commercialisation

Data drawn from the most recent National Survey of Research Commercialisation provides indicators relating to the commercialisation of research undertaken by ACT higher education institutions. A summary of the data is set out in Table 10. The data relates mainly to commercialisation performance at the ANU. In summary, the data indicates:

- Universities held a substantial intellectual property portfolio with 307 active patents and/or plant breeder rights and 21 active licenses, options and assignments (LOAs)—of which 8 yield income. In 2004 LOA income amounted to $589,000. This amounts to 0.18 percent of total university research expenditure.
- The estimated sales of products and services arising form licensed intellectual property amounts to almost $17m.
- At the end of 2004 there were 16 start-up companies operating which had been formed around university licensed technologies and there were 15 companies in which the universities held an equity holding.
- Universities entered into research contracts and consultancies to the value of $105.4m in 2004 and $192.7m in 2003. While over half of these were for amounts less than $50,000. Eight percent were for amounts in excess of $500,000.

Table 10: Higher education research commercialisation indicators

	Unit of Measure	2003	2004
Invention disclosures received	No.	25	30
Patent and/or plant breeder rights applications filed	No.	16	17
Applications for provisional patents	No.	16	17
Patents and plant breeder rights issued			
– in Aus	No.	2	1
– in USA	No.	2	1
– elsewhere	No.	9	5
– total	No.	13	7
Patents and plant breeder rights held			
– patents pending	No.	144	152
– patents issued	No.	164	155
– total	No.	308	307
Licenses, options and assignments (LOAs)			
LOAs executed	No.	4	2
LOAs active	No.	23	21
LOAs yielding income	No.	7	8

	Unit of Measure	2003	2004
LOA income	$'000	437	589
Estimated sales resulting from technologies licensed	$'000	15,024	16,938
Start-up company activity			
Start-up companies formed during year	No.	2	2
Start-up companies operational dependent on licensing/ assignment of technologies	No.	13	16
Start-up companies in which an equity holding	No.	10	15
Gross value of contracts and consultancies entered into	$'000	192,740	105,361
$0-$10,000	No.	162	157
$10,000-$50,000	No.	203	174
$50,000-$200,000	No.	176	126
$200,000-$500,000	No.	151	118
>$500,000	No.	59	51
Total contracts and consultancies	No.	751	626
Contracts and consultancies - repeat business	No.	545	513

Government research expenditure

Government agencies with a research focus also make major commitments to research in the ACT. These agencies include the CSIRO, DSTO and AGSO Australia together with a number of research bureaus attached to Australian Government departments and agencies. Expenditure has been quite substantial, but has declined over the two years between 2003-04 and 2004-05.

Table 11: Government expenditure on research and development

	2002-03		2004-05	
	$'000	Proportion ACT (%)	$'000	Proportion ACT (%)
Australian Government	290,553	19.0	257,319	16.4
State/Territory	6,528	0.7	2,851	0.3
Total	**297,081**	**12.0**	**260,170**	**10.2**

Data from the National Survey of Research Commercialisation provide the following commercialisation indicators for the CSIRO, although it cannot be determined how much of the activity relates to commercialisation of research undertaken in the ACT.

Table 12: CSIRO research commercialisation indicators

		2003	2004
Patent and/or plant breeder rights filed	No.	2,517	2,641
Applications for provisional and PCT patents	No.	185	196
Patents and plant breeder rights issued	No.	317	237
Patents and plant breeder rights held	No.	3,971	4,068
LOAs executed	No.	146	50
LOAs active	No.	594	383
LOAs yielding income	No.	249	226
LOA income total	$'000	15,643	20,263
Estimated sales resulting from technologies licensed	$'000	718,000	1,330,000
Capital raising - total	$'000	22,390	2,875
Value of all equity holdings	$'000	17,612	10,547
Start-up companies formed during year	No.	7	2
Start-up companies operational dependent on licensing/ assignment of technologies	No.	15	17
Start-up companies in which an equity holding	No.	7	9
Contracts and consultancies entered into	No.	2,375	2,111
	$'000	207,506	207,041
Contract and consultancies - repeat business	No.	844	844

3.1.2 The tools of science

Canberra is the location for a number of significant major national research facilities located at the CSIRO, ANU, and the Australian Geological Survey Organisation (AGSO).

Table 13: Major Australian research infrastructure located in the ACT

Name	Host institution (s)	Value/ estimate
Australia Telescope National Facility (ATNF)	CSIRO	$135,000,000
Australian Co-operative Supercomputer Facility	ANU	$4,142,000
Australian National Herbarium (ANH)	CSIRO	$53,000,000
Australian National Insect Collection (ANIC)	CSIRO	$150,000,000
Australian National Seismic Imaging Resource	AGSO	$5,000,000
Australian National Seismic Imaging Resource	ANU, GeoScience Australia	$5,000,000
Australian National University Laser Centre	ANU	$6,000,000
Australian Phenome Bank	ANU, Monash	$1,500,000
Controlled Environment Facility	CSIRO	$18,000,000

Name	Host institution (s)	Value/ estimate
CSIRO Entomology Quarantine Network	CSIRO	$41,000,000
Heavy Ion Accelerator Facility	ANU	$50,000,000
High Bandwidth Research Link with the United States of America	ANU Consortium	$16,400,000
Isotope & Organic Geochemistry Laboratory	AGSO	$6,000,000
Metal Organic Chemical Vapour Deposition Reactor	ANU	$1,100,000
Mount Stromlo & Siding Spring Observatories	ANU, UNSW, Swinburne	$29,579,000
National Plasma Fusion Research Facility (H-1NF)	ANU	$28,935,000
National Rock and Mineral Collection	AGSO	$200,000,000
800 MHz NMR Spectrometer for Molecular Structure-Function Analyses	ANU	$1,584,000
SHRIMP Sensitive High Resolution Ion Microprobe Laboratories	ANU	$10,000,000
Transmission Electron Microscope	ANU	$1,210,000

Many of these facilities are available for access by businesses—and have formed the basis for start-up companies, such as Australian Scientific Instruments (ASI) based on the SHRIMP facility.

3.1.3 Private sector R&D

Businesses in Canberra invested almost $100m on R&D in 2005-06 which is one percent of the total Australian R&D spend. However, businesses in the ACT account for 37.7 percent of Australia's R&D expenditure on computer services, 3.4 percent on electronic equipment and 2.2 percent of the total spend on scientific research. Together, these categories account for almost three quarters of private sector R&D expenditure in the ACT.

Table 14: Business expenditure on R&D, by industry - by location: 2005-06

	NSW	Vic.	Qld	ACT	Other Australia	Australia Total	Prop'n ACT
	$'000	$'000	$'000	$'000	$'000	'000	%
Petroleum, coal, chemical & assoc. product	147,204	367,088	57,541	2,328	133,036	707,197	0.3
Electronic equipment	124,919	66,534	17,087	14,052	188,006	410,598	3.4
Wholesale trade	275,318	293,292	48,738	4,019	81,199	702,566	0.6
Scientific research	140,656	184,888	99,555	11,782	101,113	537,994	2.2
Technical services	83,991	82,615	45,833	3,482	96,579	312,500	1.1
Computer services	250,859	141,581	93,667	47,976	86,016	620,099	7.7
Property & business services n.e.c.	121,020	58,273	33,835	1,624	31,665	246,417	0.7
Other	2,187,367	1,760,168	876,395	13,958	1,705,444	6,543,332	0.2
Total	**3,331,334**	**2,954,439**	**1,272,651**	**99,221**	**2,423,058**	**10,080,703**	**1.0**

3.1.4 Higher education

The ACT has a very strong higher education capability. In 2005 there were almost 28,000 students enrolled in ACT higher education institutions, amounting to approximately eight percent of the ACT population. The distribution of enrolments by institution and field of education is shown in Table 15.

Table 15: All ACT Students by Higher Education Provider and Broad Field of Education, Full Year 2005

Field of education	Australian Defence Force Academy	The Australian National University	University of Canberra	Australian Capital Territory
Agriculture, Environmental and Related	0	327	50	377
Architecture and Building	0	0	505	505
Creative Arts	0	787	986	1,773
Education	0	38	1,760	1,798
Engineering and Related Technologies	635	853	49	1,537
Health	0	245	697	942
Information Technology	173	495	784	1,452
Management and Commerce	338	3,010	4,301	7,649
Natural and Physical Sciences	409	2,376	565	3,350
Society and Culture	467	7,709	2,261	10,437
Non-award courses	62	258	180	500
TOTAL (a)	2,079	14,317	11,498	27,911

The data indicate that just fewer than 3,000 students (10.7 percent) are enrolled in engineering and ICT fields and 12 percent are enrolled in fields covered by the natural and physical science. By far the largest proportions of ACT higher education students are enrolled in fields covered by the arts, humanities and social sciences.

In 2005 there were just over 9,500 post graduate students (23.4 percent of all students) of whom 2,314 were research doctoral students. The enrolment profile is illustrated in Table 16.

Table 16: Students by Higher Education Provider and Broad Level of Course, Full Year 2005

	Australian Defence Force Academy	The Australian National University	University of Canberra	Australian Capital Territory Total
Doctorate by Research	131	1,977	206	2,314
Doctorate by Coursework	13	13	4	30
Master's by Research	36	123	71	230
Master's by Coursework	559	2,097	1,878	4,534
Other Postgraduate	291	1,030	1,108	2,429
	1,030	5,240	3,267	9,537
Bachelor	987	8,754	8,028	17,786
Associate Degree	0	5	0	5
Other Undergraduate	0	60	4	64
	987	8,819	8,032	17,855
Enabling Courses	0	0	19	19
Non-award Courses	62	258	180	500
	2,079	14,317	11,498	27,911

3.1.5 Workforce training systems

The Universities and the Canberra Institute of Technology provide workforce training for students and employees in the ACT. The University of Canberra provides education for a large number of professions including teaching, nursing, architecture, public relations, accounting and the law. Similarly, the ANU provides professional education in medicine, accounting, finance and law.

The Canberra Institute of Technology provides vocational education in the areas of business and information technology, communication and community services, design, science and technology, and tourism and hotel management. There are also a number of private providers, including the Academy of Interactive Entertainment (AIE).

The need for further development of workforce training has been recognised in the Interim Report of the ACT Skills Commission.

3.1.6 Education through to secondary level

The ACT has a highly regarded system of education through kindergarten to Year 12. It is seen to be innovative and has good connections with the higher education and vocational education systems.

The six ACT senior secondary colleges provide an important bridge between school and tertiary education and between school and work. One third of senior college students undertake vocationally oriented programs—not oriented towards tertiary entrance.

Increasingly, schools and colleges are incorporating innovation and entrepreneurship into their curricula.

3.1.7 Protection of IP

Australia's system of Intellectual Property is administered by the Commonwealth through the Australian Intellectual Property Office.

3.1.8 Expatriate and immigration policies

Innovation system capability is enhanced by strategies that seek to attract and retain the best scientific and creative minds.

The Australian Capital Territory (ACT) Government offers a range of sponsorships—under Australian Government programs - for skilled and business migrants who wish to live in Canberra and apply their professional skills by working in a skilled occupation or establishing a business/investing in the ACT.

The Australian Research Council supports the *Federation Fellowships* scheme, under the Council's National Competitive Grants Program, to support excellence in research by attracting world-class researchers to key positions, and creating new rewards and incentives for the application of their talents in Australia.

Many overseas students after completing their PhDs would like to stay in Australia to establish businesses or work with established businesses—particularly in the ICT and commerce sectors. Their linkages and connections to overseas markets provide significant opportunities for business development and growth. However, Australian Government visa conditions require graduating students to leave and apply for residency from overseas.

This is in contrast with US practice which actively seeks to retain the skills and capabilities of graduating students.

3.1.9 Encouraging entrepreneurship

The Australian Government supports and funds a number of programs that support and encourage entrepreneurship.

Programs that are designed to assist Australian businesses to conduct research and development and commercialise the results of R&D include the following.

Table 17: Australian Government Business Support Programs

Program	Description
Commercial Ready	A competitive merit-based grant program supporting innovation and its commercialisation that supports a wide range of project activities extending from initial research and development (R&D), through proof of concept, to early-stage commercialisation activities.
Pharmaceuticals Partnerships Program (P3)	A competitive grants program aimed at increasing the amount of high quality pharmaceutical R&D activity in Australia
R&D Tax Concession	A broad-based, market driven tax concession which allows companies to deduct up to 125% of qualifying expenditure incurred on R&D activities when lodging their corporate tax return. A 175% Incremental (Premium) Tax Concession and R&D Tax Offset is also available in certain circumstances.
Renewable Energy Development Initiative (REDI)	A competitive merit-based grant program supporting Renewable Energy innovation and its commercialisation.
Commercialising Emerging Technologies (COMET)	A competitive, merit based program that supports early-growth stage and spin off companies to successfully commercialise their innovations.
Early Stage Venture Capital Limited Partnership (ESVCLP)	Aimed at stimulating Australia's venture capital sector by allowing a registered venture capital fund to flow-through income tax treatment and complete tax exemption for income received by its partners whether resident or non-resident.
Innovation Investment Fund (IIF)	A venture capital program that invests in private sector venture capital funds that assist small companies in the early stages of development to commercialise the outcomes of Australia's strong research and development capability.
Pooled Development Funds (PDF) Program	PDFs are private sector investment companies established under the PDF Act which raise capital from investors and use it to invest in small to medium Australian companies.
Pre-Seed Fund	A competitive pre-seed fund for universities and public sector research agencies that addresses the gap between promising scientific discoveries and commercialisation. It aims to assist in the commercialisation of public sector R&D activities by further developing the management and entrepreneurial skills of public sector researchers and build links with the finance and business community.
Renewable Energy Equity Fund (REEF)	A specialist renewable energy equity fund based on the Innovation Investment Fund (IIF) model.
Venture Capital Limited Partnerships Program (VCLP)	A program aimed at stimulating the Australian venture capital sector by attracting foreign investors. A registered VCLP fund receives flow-through tax treatment and its eligible foreign investors are exempt from capital gains tax on their share of the funds profits.

Data on the total allocation of funds from these programs to ACT based companies is not readily available. However, ACT companies have been recipients of substantial grants and concessions that have supported and sustained growth, including Aurarya, The Distillery, Perpetual Water, GPSports, CEA Technologies.

The ACT Government supports a number of early stage business development programs. These include:

- The *Canberra Business Development Fund* (CBDF) an early stage venture capital fund managed by Capital Venture Partners
- *Canberra Business Point*—a consultancy that provides business operators with advice and support in the establishment, operation and development of their businesses. It has been developed in partnership with Deloitte—a global professional services firm. Services include business development tools, one-on-one mentoring, online tools, networking events, export, and commercialisation advice.
- ANU Connect Ventures.
- The Knowledge Fund (ceased operations in 2006).

Support is also provided to an early stage venture fund and a business incubator. These are described in more detail in Section 4, *Innovation system institutional framework*.

3.2 Creative capability

In this Section of the study, capability relating to the development and growth of Canberra's creative capability is outlined. A short comment on the growing economic significance of the creative industries is also provided,

3.2.1 The economic significance of the 'creative industries'

Creative industries rely on individual creativity and imagination allied with skill and talent to produce wealth and jobs through the generation and exploitation of new intellectual property and content[4].

United States geographer Richard Florida is credited with establishing a nexus between cultural indicators exhibited by a community and indicators of quality of life and wealth creation (Florida, 2002). Florida's model has received widespread international acclaim, but its assertions are largely unproven. Where they have been tested, the evidence is inconclusive (Craik, 2007).

[4] Creative industries are generally taken to include the following sectors: advertising; architecture; the art and antiques market; crafts, design, designer fashion; film and video; interactive leisure software (such as computer games); music; the performing arts; publishing; software and computer services; television and radio.

Florida's contribution is pointing out the wider economic significance of creative human capital by correlating population diversity, high technology output, innovation and human capital. According to Florida's index, "Global Sydney", "Inner Melbourne" and the "Australian Capital Territory" are the most creative and internationally competitive locales in Australia (Cunningham, 2006, Craik, 2007).

A major issue, however, is to see creativity as extending beyond art and craft to a capability that can yield commercial returns through production, sale, and export of value added goods and services.

The Australian Centre of Excellence for Creative Industries has developed a concept of the "creative trident" that provides a measure of: creative occupations within specialist creative industries; embedded creative occupations employed in other industries; and support occupations employed in creative industries.

On this metric, the contribution of creative activity to the Australian economy, and by inference, to the ACT economy is considered to be much greater than official statistics show, suggesting that there is greater potential for creative work to be recognised as part of the overall economy than is currently the case (Craik, 2007).

Policymakers are now recognising the importance of creative industries in terms of economic performance and are thinking about new ways of providing support for arts and culture beyond subsidies and grants.

Many creative industries are driven by cultural entrepreneurs, who draw together the talent and creativity of others, as well as by large organisations that provide market access through retailing and distribution (Green et al., 2007). There are important parallels here with the more familiar science and technology entrepreneurs and the role of incubators, venture capital investors and interaction with global science and technology based businesses.

The emergence of the 'creative industries' as an industrial force has been enabled by digital technologies. Of course, the creative industries involve much more than digital technology, but establishing the link between design and commercial opportunity remains a major challenge—and an opportunity. The challenge for many is to see creativity as both art and a commercially oriented activity.

It is of interest that, in recent times, US venture capital investors have been turning their attention to supporting 'creative ideas' rather than patentable scientific discoveries and technological inventions. In many situations, such as Web 2.0 based developments, technology has become a commodity and a 'big idea can go a long way provided there is a rapidly growing audience' (Knowledge at Wharton, 2007). When technologies can be 'acquired off the shelf' the main focus of investor attention is growth through network effects, potential to sell advertising and transaction revenue.

Technology is no longer seen as a differentiator—differentiation is seen in content and the ability to gain an audience as a basis for gaining advertising and transaction revenues. Innovation through imagination and ingenuity drawn from the creative industries are central to business development and growth. The burgeoning creative industries are founded in a range of skills and professions that link the creative arts, including design, art and architecture, to digital technologies.

The creative industries are defined to cover those industries 'that have their origin in creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property' (Great Britain. Department of Trade and Industry, 2006).

3.2.2 Creative employment in the ACT

Canberra has world leading artisans and crafts people in design in a number of mediums including glassware, ceramics, furniture, textiles, jewellery and metal smithing. Canberra can also claim leading expertise in art and museum display, and exhibition delivery and management. Successful publishers, interior designers, environmental designers, musicians, performing artists, visual artists and other creative enterprises also call Canberra home. Many of the artists have created successful businesses on the basis of their talent.

Analysing 2001 census data, the ARC Centre of Excellence for Creative Industries (CCI) has reported that the ACT has the highest proportion of employment (8.6 percent) in creative industries than any other Australian state or territory. The proportion for Australia as a whole is 5.4 percent (CCI, 2007).

Table 18: Employment in Creative Industry Segments, 2001 census

Segment	Employment (Number)
Advertising and marketing	588
Architecture, design and visual arts	3,019
Film, television and radio	627
Music and performing arts	408
Software development and interactive content	6,042
Writing, publishing and print media	2,948
	13,632

Using Australian Taxation Office business activity data the CCI also reported that in 2006 there were 2,993 creative businesses in the ACT, which represented 10.7 percent of all businesses in the Territory—the proportion for Australia as a whole was 6.6 percent (CCI, 2007). According to the CCI, creative businesses have a higher propensity to be micro businesses than businesses in the economy as a whole: 40 percent of GST registered creative businesses are sole traders compared to 35 percent across all industries.

These data confirm the strength of the creative industries in Canberra and indicate their contribution to the ACT economy.

Of the creative businesses identified, 55.7 percent are involved in software development and interactive content. This represents 2.7 percent of all businesses in that segment in Australia. The other significant concentration of businesses is in architecture, design and the visual arts—making up 28.6 percent of all creative businesses in the ACT.

Table 19: Number of creative businesses in the ACT by segment—2006

Segment	ACT	Australia	Prop'n ACT (%)
Advertising and marketing	155	14,885	1.0
Architecture, design and visual arts	855	54,157	1.6
Film, television and radio	95	8,472	1.1
Music and performing arts	135	11,874	1.1
Software development and interactive content	1,667	61,845	2.7
Writing, publishing and print media	86	4,182	2.0
	2,993	155,415	1.9

The concentration of businesses involved in software development and interactive content points to the way in which information technology is forming a powerful alliance with creative practices in the arts and design to establish the 'exciting new domain of *information technology and creative practices* (ITCP). The United States National Academy of Sciences argues that there are major benefits to be gained from encouraging, supporting and strategically investing in this domain (Mitchell et al., 2003).

3.2.3 Capability in creative industry sectors

Advertising and marketing

Government departments and agencies are major purchasers of advertising material. There are potential opportunities for creative innovation in campaigns.

There are a number of businesses that specialise in advertising for government departments and agencies, although the larger campaigns are tendered on a national basis. National firms have a location in Canberra in order to market to the Australian Government.

ZOO group, an ACT based business which specialises in design, advertising, interactive media, public relations and events management has had major success with the Australian Government.

ZOO Group

ZOO Communications Group is a leading design and communications company, currently servicing some of Australia's premier companies and corporations. Since 1993, the team has provided services in corporate identity, brand image, marketing and communications. This was followed in 1995 with a move incorporating the growing industry of website development and interactive multi-media project planning and design and management consulting.

Since the inception of the Internet marketing and communications, ZOO has been instrumental in innovative support for the industry. The company developed the brand identity and corporate image of OzEmail (Australia's Largest Internet Service Provider).We are also responsible for setting up Australia's first online advertising media placement for Web Wide Media (now Softbank Interactive) and for launching the world's first coin operated Internet Public Access Terminals (IPATs).

Architecture, design and the visual arts

There is a strong and growing demand for artistic works and creative practice output. An eminent design teacher and practitioner has recently observed:

We live in a world saturated by design. Society is becoming design conscious and many people actively pursue 'good design'. Design has become more sophisticated and attuned to the needs and ambitions of the society it serves. It plays an important part in modern culture and the way we relate to the world and to ourselves. This means that designers are assured of having a future (McCormack, 2005).

Canberra is base for a number of organisations that contribute to building creative capability in art and design. They include:

- The ANU School of Art
- The University of Canberra's School of Design and Architecture
- The Design School at CIT

These organisations collaborate and complement each other across the various areas. Work is exhibited and marketed at numerous local art galleries throughout the ACT and sold to clients in the government and private sectors. However, apart from the Design Gallery at the University of Canberra (hidden away in Building 7), the ACT does not have a venue that is specifically focussed on exhibiting *design* output.

There is a tendency for many to draw a distinction between the 'non-commercial' and craft focus of art and the more commercial focus of 'design'. But many artists want to sell their work and designers want to have their work regarded as art.

Many businesses in the design and arts industry are craft oriented and find it difficult to focus on commercial and business issues. The recently opened Glassworks provides an indication of the way in which art can be practised as a craft as well as being undertaken for commercial return.

Canberra Glassworks

Built and funded by the ACT Government, Canberra Glassworks is Australia's only cultural centre that is wholly dedicated to contemporary glass art.

At its core Canberra Glassworks is a working Glassworks that provides access to glassmaking facilities for glass artists.

Australia has developed an enviable reputation nationally and internationally for the quality and skill of its glass artists. By providing essential equipment, space and development opportunities through the Canberra Glassworks the ACT Government is giving these artists, and those that follow, opportunities to grow and further develop their glass practice, and to further contribute to this very special local industry.

Canberra Glassworks provides artists with state-of-the-art equipment; intensive workshops taught by leading glass artists; studios and mentorship programs; and a unique context to explore, develop and realise new work.

Canberra Glassworks also provides diverse opportunities for visitors to interact with and learn about glass making and the heritage of Canberra's Kingston Powerhouse. Visitors can meet artists, see glassmaking as it happens, view exhibitions, take tours and have a hands-on experience working with glass.

The ACT Government is providing the majority of the funding for the Canberra Glassworks, and the Government anticipates that significant benefit will accrue to the broader Canberra community from the centre. It will provide an opportunity for Canberra to establish itself as a world leader in high quality glass art, bringing to the city an enhanced cultural profile as well as providing employment and economic return.

ArtsACT implements ACT Government policies and priorities, and facilitates development and community participation in the arts. Its roles are to:

- provide administrative and professional support to the ACT Cultural Council, the ACT Government's principal advisory body on the arts;
- deliver the ACT Arts Fund;
- manage the Public Art Program;
- oversee the management and development of ACT Government Arts Facilities; and
- maintain links with other arts and cultural organisations and agencies.

Its major focus appears to be on the craft aspects of art rather than the commercial aspects which are reflected in design. Like the Australian Government, there is no government entity charged with responsibility for design—notwithstanding its contribution to innovation.

The ACT government has recently introduced a requirement that one percent of all infrastructure works to be allocated to 'public art'. This amounts to a commitment to increase, at the very least, artistic displays within the City and, potentially, encourage ACT artists.

Film, television and digital media

Canberra has a strong non fiction, documentary film industry—which is not well recognised. In the documentary film industry, Canberra has a number of competitive advantages:

- Independent, cutting edge filmmakers with global reputations
- The quality of the academic research at the ANU (for example, the Centre for Cross Cultural Research)
- The source of research, knowledge and artefacts in the national museums and galleries located in Canberra
- Local production companies with infrastructure and facilities capable of producing quality films.

The documentary film industry has room for significant growth.

The industry includes directors, camera operators, DOPs, studios, producers, audio suites, leading-edge editing, grips, make-up, set design, actors, script-writers, location management, high definition digital camera hire, duplication, composers, musicians, animation, computer-generated imaging.

Ronin Films

Ronin is a film distribution company based in Canberra.

Ronin has championed the work of independent Australian producers and directors, often maintaining relationships with filmmakers from their first short films through to their later, internationally successful features. Directors whose early work was distributed by Ronin include Jane Campion, Vincent Ward, David Caesar, Baz Luhrmann, Scott Hicks and Tracey Moffatt.

As well as providing support and succour for many young film-makers and distributing numerous Australian films, Ronin was active as an investor in selected feature film projects and as a guarantor of others. STRICTLY BALLROOM was the fifth feature for which Ronin provided a distribution guarantee for the territories of Australia, New Zealand and Japan, and it went on to be a huge international success.

Ronin also distributed SHINE, directed by Scott Hicks, and produced by Jane Scott, which Ronin picked up at script stage several years before its release in August 1996. Ronin also released the Australian comedy, ROAD TO NHILL, introducing a new feature film team of director Sue Brooks and writer Alison Tilson. ROAD TO NHILL was produced by Sue Maslin with whom Ronin has had a long association through many documentaries that Sue has produced and which were distributed by Ronin.

In 1998, Ronin scaled back its theatrical distribution activity to concentrate on what the film trade calls the "non-theatrical" market. The distribution of documentaries is an area in which Ronin has developed a strong following over the years and the company is without peer as a source of modern educational and non-fiction material for Australian community education. Since 1982 films have been promoted to schools, tertiary institutions, government departments, community, social and solidarity groups as well as to private individuals and collectors.

The documentaries in the Ronin collection are personally selected by the company's founder, Andrew Pike. The criteria for selection are intrinsic quality and educational interest. Ronin has no "output" deals with any supplier, and instead chooses each film individually according to its merit. The company is interested less in instructional films than in documentaries that explore issues of community interest in a creative and stimulating way. The collection as a whole represents a remarkable cross-section of Australian life in the 1980s and 1990s.

In addition to its Australian documentaries, Ronin offers a selection of feature films of educational interest, as well as high quality documentaries from other countries, especially from independent filmmakers in the USA.

The ACT's film, television and digital media industries are supported through the ACT Government funded ScreenACT. ScreenACT aims to assist and develop the local film, television and digital media industry sectors, as well as provide production attraction and liaison services for the region.

Initially established as screenACTion in August 2004, the office was renamed as ScreenACT in August 2005. In July 2007 ScreenACT became an outsourced industry development activity delivered by the Canberra Business Council Limited. This management and delivery model is unique among similar services delivered by state and territory governments in Australia, but is yet to prove its effectiveness.

With a larger budget ScreenACT would be able to build relationships with SBS, the ABC, or possibly a cable channel to participate in documentary film making. The local production community has picked up a lot of the basic documentary production skills though the wealth of corporate work they do. It is another reason why the potential for documentary production is good here.

Moreover, as the film industry becomes more oriented towards digital production techniques, Canberra offers advantage through its computing capacity and optical fibre capabilities.

Music and performing arts

Local infrastructure includes world class educational institutions such as:

- the ANU's School of Music
- the Australian Choreographic Centre.

Canberra also holds a number of public festivals and events throughout the year including:

- Multicultural Festival
- National Folk Festival
- Stonefest
- A number of film festivals.

Software development and interactive content

Canberra has a particular strength in software development and creative content.

The Centre for New Media Arts the ANU provides a unique environment in Australia for the artistic use of computers and a focus on interdisciplinary education for artists interested in exploring the potential of new technologies and new media. The Centre is dedicated to creative application of new technology and artistic practice and offers studies in new digital sound and image technologies at both undergraduate and postgraduate level. The Centre has an agreement with a number of companies for the research and training in digital media.

The ACT is home to an innovative and rapidly developing nationally and internationally focussed games cluster. The region is strongly represented by some of Australia's best game developers and related service providers, supported by nationally recognised education and training institutions.

Academy of Interactive Entertainment (AIE)

Since its establishment in 1996, the Academy of Interactive Entertainment (AIE) has earned much recognition as Australia's leading educator for the Computer Game Development and 3D Digital industries.

AIE continues to contribute to the development of the Games and interactive industries in Australia, as an active founding member of the Australian Game Developers Association, and is involved in consulting both government and other education institutions on policy and content. In 1999, AIE initiated the Australian Games Developers Conference and in 2005, organised Australia's first academic and secondary schools summits on games education.

From Certificate II through to Advanced Diploma qualifications, AIE provides cutting edge, hands-on training, that is nationally accredited and recognised through the Australian Qualifications Framework. Graduates continue to be instrumental in building the games, interactive entertainment and related industries in Australia and can be found working in some of the world's fastest growing CGI industries.

Depending on their desired career path, students at AIE can enrol in introductory courses through to a variety of specialised courses in Computer Game Development (both in 3D Animation and Programming) or 3D Animation for Film and other Screen industries to. AIE also offers online and flexible delivery courses so students can access training whilst maintaining their employment, living in rural or remote areas, or overseas.

Customised training is also available to meet the needs of individuals or small groups. Courses can be developed using a variety of software packages including 3D Studio Max, Alias Maya, Microsoft Visual Studio, Adobe Photoshop, Bijou Bullet, Discreet Combustion and many more

AIE's partnership with the Canberra Institute of Technology (CIT) ensures that courses are accessible and enables students access to a range of resources including extensive libraries, student accommodation and other support services.

Recommendation

In view of the potential for the creative sector to make a stronger contribution to economic development, the ACT Government give consideration to making further investments to build capability. In particular, initiatives to accelerate the bridging of the creative and technology sectors should be examined.

3.3 Business and entrepreneurial capability

Business and entrepreneurial capabilities are essentially human traits. People are often described as 'having a good head for business' and knowing how and where to make money through the creation and selling of 'an idea' or business concept.

Entrepreneurship in an innovation systems context requires a supportive social context that can stimulate and nurture creativity. According to Florida, the 'typical formula' in this realm revolves around a combination of entrepreneurial assistance, business incubation, technology transfer, and support for local venture capital funds (Florida, 2003).

The concept of human capital is important in explaining what is sometimes perceived as an "innovation gap". Research indicates that the most critical fixed factor in support of technology entrepreneurs is not so much financial capital, but human capital, and time—the time of those few individuals with the skills to assess both technological possibilities and market opportunities (Auerswald and Branscomb, 2003).

This skills issue is recognised in the ACT as attention turns to the skills shortage. The shortage is across the board—not only in technical and trade skills but also in professional and para-professional skills.

It is important that government, industry and education institutions work together to identify skills needs to avoid potential capacity constraints and bottlenecks that would limit the potential for industry development and growth.

The capacity for entrepreneurship is also influenced by cultural considerations—society's attitudes and beliefs relating to business and making profits from business ventures. There are also views about what might constitute an acceptable return on investment and reward for risk.

With a very high level of public service employment, the ACT has provided career structures that have involved no commercial risk to employees. Public service employment was seen to provide job security and a regular flow of remuneration. People have been educated in an environment where they would end up working for someone else.

Changes in the public sector employment and procurement environment have changed this. There is now a preference for acquiring goods and services from the market rather than manufacture in-house. However, government agencies, unlike large private businesses, do not source innovation through procurement strategies. New approaches to public sector management actually work *against* innovation in government.

With government acquisition strategies focussing on the legal and probity aspects of procurement a contracting culture has emerged in Canberra—based on the principle of 'value for money'. Selling to the government requires meeting detailed tender specifications rather than offering innovative solutions built around partnerships and collaborations—and a sharing of risk. Government contracting seeks to transfer risk.

Contracting goods and services to the Australian Government provides only limited opportunities to create entrepreneurial businesses and generate returns on investment in physical assets, knowledge, and time. There are numerous 'contracting' businesses in Canberra, but very few are entrepreneurial in the sense that they commit to innovation and confront market risk and manage uncertainty.

Successful entrepreneurial businesses in Canberra have been built on the basis of hard work, a distinctive product and or service, a willingness to incur early stage losses and forego income (or find government subsidies). Canberra's successful entrepreneurial businesses have taken a great deal of time, commitment and resources to create. Only a few have had venture capital investment[5].

In the many areas of arts and culture there is a tradition of grants dependency. There is a view that it is not possible, or even appropriate, to make money from art or cultural activity. Thus, the film industry, theatre and other performing arts tend to be heavily subsidised. However, with growing demand for art and cultural consumption and the availability of digital technologies, art and creative content are emerging as economically significant 'creative industries'.

With the growing significance of the creative industries, Canberra is now seeing the emergence of many entrepreneurial businesses based on the exploitation of ideas developed through the convergence of information technology, art and creative practices. The nature of art and creative practice supports experimentation and the exploration of ideas—the essence of an entrepreneurial culture.

Many of the successful entrepreneurial businesses in Canberra have not received substantial government grants or subsidies. They stay and flourish in Canberra on account of the attractiveness of Canberra as a place to live and the possibility of delivering products and services on-line. With the Internet, fast broadband, and optical fibre links, physical proximity to customers in many of the creative industries is not a business constraint.

[5]A note on financing start-up businesses is provided in Attachment C.

3.4 Conclusions

Development of *science and technology capability* in the ACT innovation system reflects the influence of Australian Government policies and investments in research and development and the demand for products and services in the ICT and electronics sectors.

Development of *creative capability* reflects demand for creative output together with a substantial commitment to teaching and research in the arts, humanities and social sciences. Canberra has a strength, but often unacknowledged, in the businesses formed on the basis of creativity and which combine to form a strong creative industries sector.

Capability for entrepreneurship is emerging as the demand for goods and services becomes less concentrated in a government contracting framework.

From the consultations and research undertaken for this study it is clearly apparent that there is a commercially focussed 'ideas–based' digitally oriented creative industries sector emerging. This has the potential to become a major contributor to economic development as well as to national and international profiling of Canberra as a City of Art and Design.

There is not an Australian equivalent of the UK Design Council which has had a major impact on building the innovation and competitive focus of the British design industry. The *Cox Review of Creativity in Business*, led by Sir George Cox, President of the Council, has had a major impact on policy relating to the creative industries (Great Britain. Treasury, 2005).

In addition to the business dimensions, creative output is a drawcard for visitors—beyond the 'attractions' of the national museums and galleries that provide a foundation for the tourist industry. The potential to attract visitors can be enhanced by building locations to exhibit creative output and festivals and events that celebrate achievement.

4 Innovation system institution framework

This Section identifies the organisations and relationships that anchor the ACT innovation system. The major institutional categories are summarised in Table 20.

Table 20: Innovation system institutional framework

Institutional attribute	Role
Institutions for teaching and research	Knowledge creation and translation through teaching, demonstration, brokerage, and outreach.
Cultural institutions	Libraries, museums, galleries involved in knowledge and creative capture, storage, dissemination and exhibition. Translational research.
Lead businesses	Perform research and development; establish collaborations with research organisations; develop sourcing contracts with small businesses.
Networks	Organisations whose activities are targeted at the needs of particular business interests.
Conferences and events	International and national innovation related events that bring together private, public and educational sectors.
Science parks, incubators and seed funds	Home for knowledge intensive and early stage ventures.
Investors	Managers of seed and venture capital funds as well as later stage private equity funds.
Support Services	Agencies that deliver support for new entrepreneurs and established businesses – covering business planning, financial counselling, market research, management and work force development, and business liaison.
Technology providers and consultants	Technology consultants, universities with facilities and equipment for hire, research organisations with 'embedded' laboratories (often funded by corporations) and corporate R&D Centres.
Professional services providers	Legal, banking, intellectual property, and accounting services tailored to the needs of early technology ventures (e.g. deferred payments, reduced payments, specialist staff).
Policy and strategy	Bodies responsible for ensuring that development is linked to broader economic, industry and business policies.

4.1 Institutions for teaching and research

Canberra has strength in terms of location of institutions for teaching and research. They include:

- A strong university sector—comprising the Australian National University, the University of Canberra, the Australian Defence Force Academy, the Australian Catholic University, and the Canberra Institute of Technology.
- The CSIRO—Divisions of Plant Industry, Entomology, Land and Water, Marine and Atmospheric Research, Mathematical and Information Sciences and Sustainable Ecosystems.
- National ICT Centre of Excellence Australia (NICTA).
- Geosciences Australia.
- Defence Science and Technology Organisation (DSTO).
- Cooperative Research Centres (CRCs)—Greenhouse Accounting, Landscape Evolution & Mineral Exploration, E-Water, and Invasive Animals.
- Major government research bureaus—including the Australian Bureau of Agriculture and Resources Economics, the Bureau of Tourism Research, Bureau of Rural Sciences.

National ICT Australia (NICTA)

National ICT Australia (NICTA) was established in 2002 as a national organisation with five laboratories in four cities: Melbourne, Sydney, Canberra and Brisbane. It is funded under the Australian Government's Backing Australia's Ability program through the Department of Communications, Information Technology and the Arts (DCITA) and the Australian Research Council (ARC). The ACT Government and the Australian National University are partners in NICTA.

NICTA has an objective to become a world-class Research Institute and Centre-of-Excellence in science and innovation. NICTA brings together many of Australia's and the world's top researchers in ICT. It uniquely combines excellence in research, education, commercialisation and collaboration.

NICTA is an important part of Australia's innovation system and seeks to generate new opportunities for Australian industry. Its focus is on use–inspired basic research to address the technology challenges facing industry, community, and the national interest.

NICTA works in close collaboration with industry and other research institutions to solve problems and make breakthroughs in ICT which can be put to use for public benefit.

NICTA's Research are: Embedded Systems; Networked Systems; Making Sense of Data; Managing Complexity.

Key business areas are: Biomedical and Life Sciences; Intelligent Transport System; Safety and Security; Environmental Management; Mobile Systems and Services; Software Infrastructure.

There are also a number of privately owned economic and social research organisations that are important for the ACT innovation system. They include:

- Access Economics
- Allen Consulting
- Centre for International Economics
- ACIL–Tasman

4.2 Cultural institutions

Canberra is the location for Australia's major national cultural institutions. These fuel creativity through their collecting, exhibiting and outreach activities.

- Australian War Memorial
- National Archives of Australia
- National Film and Sound Archive
- National Gallery of Australia
- Australian Institute of Sport
- National Library of Australia
- National Museum of Australia
- National Portrait Gallery
- National Science and Technology Centre (Questacon)
- Old Parliament House
- Parliament House

The institutions are the nucleus of Canberra's creative industries. Being centres of national cultural significance, the institutions have a very strong national and international focus, which in turn, requires them to seek out suppliers of an exceptionally high standard.

The institutions source services from all over Australia, however, they also reported that they source a great deal of their graphic design and exhibition expertise from local ACT based creative companies because the quality and expertise is world class. Their purchasing needs have stimulated growth in ACT based companies and encouraged creative businesses to locate in Canberra.

Design for Galleries and Exhibitions

Locally based prosthetics and special effects make up company, Sharp FX, produces life like human bodies, realistic and stylized animals, fantasy creatures and puppets in collaboration with a number of larger enterprises for exhibitions and film.

Sharp FX collaborates with ACT based advertising companies and local animation and visual effects specialists, and local audio production companies to produce advertisements for a range of government and corporate clients as well as design and digitally enhanced exhibition spaces,

Sharp FX moved to Canberra from Queensland in October 2006.

The institutions also form relationships with Australian research organisations to conduct specific research, and will also form formal relationships to gain Australian Research Council Linkage grants. The Australian War Memorial, for example, has formed linkages with the Australian National University and the Department of Defence in a five year project.

These institutions are also major contributors to the ACT economy through tourism, employment, and through purchasing services from ACT businesses.

4.3 Lead businesses

Canberra is home to a number of multi-national ICT companies such as Raytheon and Computer Sciences Corporation. Most other global computer software, hardware and services companies have representative offices in Canberra. IBM and Unisys have research facilities in Canberra.

Several lead businesses have grown in Canberra through innovation and entrepreneurship in meeting the specific requirements of defence and government purchasers. These businesses are particularly important in building and sustaining networks with research organisations and new technology based businesses forming in Canberra.

Electronics industry

A Study of the Electronics sector in the ACT for the Electronics Industry Cluster Study (Advance Consulting Pty Ltd, 2003) identified 385 firms in the ACT and region which could be grouped into the electronics industry. Of these, about 61 percent were services firms and 29 percent were specialist wholesalers or retailers, with the remainder (nine firms) being manufacturers.

The 'electronics industry' was defined as the group of companies which design, produce, service, install, and distribute products and systems made from electronic and photonic components and which may contain embedded or loaded software to provide an operational device or network. It also includes companies which provide services to support the production of electronic of electronic and photonic components (including microchips and optical fibre) and products.

Many of these firms also identify with product and service industry classifications, such as defence, ICT hardware and applications, scientific instruments, and security services. Lead businesses in these industries are described below.

Defence industry

The defence industry has driven the growth of many companies in the ACT. Businesses such as Electro Optic Systems (EOS) and CEA Technologies have grown in response to Defence's need for specific capability requirements.

This requirement applies to all aspects of military activity, from software to enhanced stores and inventory control, to enhanced weapon systems which do not require the presence of a soldier to engage the enemy. The latter device, long a feature of science fiction, has been under development by EOS over the past seven years.

EOS

EOS is a key company in the emerging market for autonomous military surveillance and combat systems. Market demand for these new technology systems is growing very rapidly. The key business considerations supporting this EOS activity are smart weapons, surveillance and sensors, mine replacement and upgrades.

The Company's military product family is a series of products, all based on a common module set. These modules include high resolution day/night cameras, thermal vision systems, image processing systems, computer systems, laser systems, sensor systems and power management systems, all qualified for the harsh military environment.

The EOS product typically finds application as the central element in the upgrade of a surveillance platform (e.g. cavalry vehicle) or a combat weapon system (e.g. armoured turret). It is a small but high value-added product which the Company believes is indispensable for the achievement of enhanced productivity. Product configurations sold have been for naval weapon systems (US Navy), armoured vehicle turrets (Australia, NATO, Singapore) and remote controlled highly mobile weapon systems.

The marketing cycle for military products is typically five years and EOS is only now beginning to make strong sales of this product family, after four years of active marketing.

Meanwhile the product has been marketed as a remote controlled system, and as such is achieving strong market acceptance. The Company's existing customers represent the highest value sector of the market for advanced military products of this type, and each customer is prepared to work with the Company to achieve greater productivity through EOS product enhancements.

The Company believes that the role of autonomous ballistic weapons systems will increase very sharply over the next few years and that its advanced technology systems will continue to dominate this emerging field. It intends to build on its early program successes with US, NATO and other advanced western-aligned military organisations, to capture a significant share of this market

CEA Technologies has built a reputation as a world-class designer and developer of leading-edge radar and communications solutions. CEA has successfully exported a range of advanced radar and communications systems to countries throughout the world, with systems operating across the Asia-Pacific, the United States and the Middle East.

The US Navy currently uses CEA conventional radar surveillance systems for border protection and the company also supplies a range of surveillance systems for other overseas defence and government organisations. A similar system is also installed and used to provide vessel traffic management in the ports of Sydney and Newcastle here in Australia.

CEA Technologies: Growing in the Global Market

Canberra based company, CEA Technologies Pty Limited, provides innovative solutions to the evolving technical requirements in the civil and military sectors. The company's commitment to customer service and its continuing focus on research and development, ensure high quality solutions and support for both current and new customers. A high percentage of CEA's resources are committed to research and development, ensuring its products remain cutting edge and competitive in world markets.

The company has developed an active phased array radar, called CEAFAR, which represents the next generation of multi function surveillance radars. It is suitable for a wide range of applications including, air to surface surveillance, littoral surveillance radar, fire control, precision approach, air traffic control and weather radar applications.

CEA is currently negotiating the contract to install the CEAFAR Active Phased Array Radar and CEAMOUNT Active Phased Array Target Illuminator on the Royal Australian Navy's (RAN) eight ANZAC Class frigates as part of the SEA 1448 Anti-Ship Missile Defence (ASMD) program. This project follows on from the successful completion of land based tests and at sea trials aboard HMAS ARRUNTA, which clearly demonstrated the capabilities of the system and its potential for future applications.

Additionally, the company has a contract with the Australian Government for the development of a high powered version of CEAFAR for the Australian and United States governments. This new family of scalable radar, called AUSPAR, provides capabilities well beyond those currently available in modern radar systems, and will provide Australian technology capable of meeting the government's planned theatre ballistic missile defence requirements.

CEA's communications expertise has been used in the 14 ARMIDALE Class Patrol Boats built for the Royal Australian Navy by the Defence Maritime Services/Austal Ships team, which have been equipped with CEA's integrated communications and direction finding systems. The same system has also been installed in the RAN's six HUON class mine hunters.

The company's founders have been recognised for excellence in their individual fields with Ian Croser winning the 1998 Clunies Ross Foundation National Science & Technology Award for Excellence in the Application and Commercialisation of Australian Technology, and CEA's former President David Gaul named the Ernst and Young Australian Entrepreneur of the Year in 2003 in the field of technology, communication, e-commerce and life sciences. In 2005 CEA was awarded the ACT Chief Minister's Export Award for Information and Communications technology, and in 2006 was inducted to the ACT Exporters' Hall of Fame.

CEA's workforce of over 230 people is representative of its accomplishments over the past 24 years. With offices in Canberra, Melbourne, Adelaide and San Diego the company thrives in both domestic and international markets. Its success creates flow on work benefits for other ACT and regional companies and further emphasises the Territory as a designer and supplier of competitive leading edge technologies to defence, government and industry on the national and international stages.

ICT industry

The Australian Government is the largest single purchaser of information and communication technology products and services in Australia—estimated at around $2 billion per annum. The sheer size of this market, and the trend towards public sector outsourcing of ICT services, has encouraged many national and international ICT businesses to establish a presence in Canberra.

Many companies that have grown and developed in Canberra and have found success in the world arena still use Canberra as the base for serving a global market.

Tower Software, is the world's leading enterprise content management (ECM) provider to government and regulated industries. It delivers award-winning electronic document and records management (EDRM) solutions. Tower Software's TRIM Context 6 solution is a single, integrated platform that manages business information throughout its complete lifecycle.

Tower Software

By relying on its proven domain expertise, strong strategic partnerships, and powerful solutions, TOWER Software enables organisations to improve the accuracy of information on which business decisions are made; maximize efficiency by finding business critical information more quickly and easily; and achieve and maintain standards compliance across industries, resulting in sustained competitive advantage. TOWER Software is a privately held company with operations in North America, Europe and Asia-Pacific.

TRIM Context 6 is an integrated suite of ECM solutions capable of managing and securing the full range of corporate information assets. In a single suite of applications, TRIM Context incorporates: document management, e-mail management, web content management, collaboration, process management and records management. Our new zero footprint web interface, ice, enables rapid enterprise deployment to support information capture, sharing and reuse across the organization whilst supporting organizational compliance to regulations.

TOWER Software's TRIM Context 6 solution maintains strict compliance with international legislative and corporate standards, including; US DoD 5015.2-STD, ISO 2788, ISO 15489.1-2002, ISO 15489.2-2002 and AS 4390-1996. The company maintains strategic partnerships with the world's foremost technology and information management leaders, including Microsoft, Hewlett Packard, Adobe Systems, and Kofax. These partnerships combined with our extensive industry expertise, Value-Added Reseller network, and powerful software make TOWER Software the world's leading ECM solution provider.

Intelligence and security

The public administration industry has a major demand for security related products and systems. Current security concerns in government are providing major business opportunities. Several companies have grown up in Canberra in response to this demand.

The Distillery has grown in response to needs and opportunities in the area of intelligence and security.

The Distillery

The Distillery designs and builds software solutions for intelligence-driven organisations. It is now an international leader in intelligence and investigations management applications. Its leading-edge agile technology is underpinned by expertise and experience in law enforcement, national security, defence and commercial fraud.

Its research and development into world class 'best-practice' technology enables security and intelligence bodies to maintain a competitive advantage over criminal and terrorist enterprises. In the corporate sector, its intelligence-gathering methodologies are helping to reduce fraud, improving the bottom line and providing a competitive advantage.

Clients include organisations at the forefront of criminal and security intelligence, defence, law enforcement, compliance and counter-terrorism. The Distillery's flagship application development product InterQuest Intelligence Server has a key role in several Australian Government Departments. It was, for example, used extensively during the Sydney 2000 Olympics by agencies responsible for national security and protection of Australia's borders.

During 2004 The Distillery began operating out of the UK, New Zealand and Singapore. We have also established a strong partner presence in South Africa.

The Distillery has relationships with many industry-leading system integrators and solution providers, and differing partnership arrangements bring a range of mutual benefits. For example, research can be enhanced and extended by the sharing domain, technical and product expertise. Other partners apply their own expertise and specialised knowledge to help customers maximise their investment in our solutions.

These Canberra based lead businesses have developed strong relationships with Canberra based research organisations for research and development work.

Scientific instruments

Australian Scientific Instruments (ASI) markets a range of instruments throughout the world and has established a reputation as a first class manufacturer in this very competitive marketplace. The company has access to the SHRIMP (Sensitive High Resolution Microprobe Laboratories) research infrastructure at the ANU.

ASI is a subsidiary of ANU Enterprises (ANUE), the commercial arm of the Australian National University (ANU). It has been able to commercialise products not only from the ANU but also from other Australian scientific organisations. ASI's success is built on quality instrumentation with technical and scientific support.

ASI has built international scientific and manufacturing credibility through its emphasis on testing, working directly with scientists, customer service and warranties. This is a major achievement given the physical distances from its marketplaces and the specialised nature of the products.

ASI's close relationship with university scientists also confers an advantage over many of its competitors because new concepts can be evaluated in a research environment recognised in academic circles as world class, and the results are communicated widely by scientists to their scientific counterparts via journal articles and conferences, reinforcing the equipment's scientific credibility.

Remote Operation of SHRIMP IIe/MC at Goldschmidt 07

August 28, 2007

ASI again demonstrated the reliability and versatility of the SHRIMP IIe at the recent Goldschmidt 07 conference in Cologne, Germany. The SHRIMP IIe with multicollector operated via a web interface flawlessly over the period of the conference. A mount with 400 Jack Hills zircons was loaded in the machine, and conference attendees were invited to drive the SHRIMP for themselves.

The age of the zircons was determined in real time, though lead ratio dating with common lead correction. This method is used at the ANU to automatically survey 400 zircons per night, to find those older than 4 billion years. Each age determination takes less than a minute, and the SHRIMP can be programmed to operate automatically.

4.4 Networks

A core element of an innovation system concept is interactive learning. In this regard networks and personal interactions are being seen as an important aspect of regional innovation in terms of their ability to share and transfer knowledge and ideas.

Social interactions are thought to provide the substance of observed 'clustering' of firms in a geographical area. Without social interactions groupings of similarly oriented firms are merely agglomerations—a topic that has interested geographers since the work of Alfred Marshall.

For the purposes of this study, networks have been identified in two categories—business and social.

Business

There are many business associations in Canberra that have been established for the purposes of lobbying and policy advocacy. Most of these associations also arrange events that aim to facilitate networking among members, and to establish contacts with government and people in government and related industries.

The *Canberra Business Council* is the biggest business organisation in the ACT region with a membership base of 700 businesses and associates. The Council is focused on policy advocacy and lobbying as well as providing membership entitlements and products for members.

With a subsidy from the ACT Government, the Business Council supports the *ACT Exporters' Network,* an initiative that is contributing to putting Canberra and the region on both the national and international map as an innovative business centre. The network has strong support from ACT businesses.

The ACT and Region Chamber of Commerce and Industry also represents local business. With a diverse membership, and involvement from a wide variety of business types and sizes across the Canberra region, the Chamber provides a business perspective and advocates for local and regional businesses on current and emerging issues affecting them.

In 1998 the Commonwealth Government established the *Australian Industry & Defence Network*. The Government nominated AIDN as the peak organisation to represent defence-related SMEs with the Department of Defence, the Defence Export Council and the Department of Industry. AIDN-ACT is affiliated with the ACT & Region Chamber of Commerce and Industry and the Australian Chamber of Commerce and Industry (ACCI).

The *Canberra Region Advanced Technology Manufacturing Association* (CRATMA) was established in 1992 with funding from the ACT Government as a group of company CEOs to discuss and work on common issues. It reached a membership of 25 businesses with a combined turnover of $100m, but when government funding ended the Association ceased to be active.

Canberra.Net promotes the ACT as a centre of excellence for ICT web services and assists local software developers market their IP nationally as well as internationally. It is hosted by the Australian Information Industries Association (AIIA).

Canberra.NET

Canberra.NET is an ICT cluster dedicated to "Innovation through Collaboration". After an intensive primarily E-mail member recruitment, Canberra.NET has 52 member companies comprising small, medium and multinational organizations which have joined to achieve collective competitiveness and develop new .NET commercial software opportunities. Canberra.NET's objective is to be a sustainable and dynamic ICT cluster in the ACT. The ACT Chief Minister, Mr. Jon Stanhope MLA officially launched Canberra.NET on 14 September 2006 during the ICT Showcase at Focus on Business (FOB).

Canberra.NET has a website where members are able to register their company giving details on how many .NET solutions and specialists they have as well as provide relevant information on .NET projects and revenue which allows tracking of specific metrics for the ACT. Among other things, the website offers members a 50% discount on their AIIA membership, free software, a schedule of exporting classes plus a detailed summary of all Canberra.NET breakfasts including speaker contact information. A capability register will be created to not only help customers identify the companies that can solve their ICT problem but also to help members identify partnering opportunities.

Networking & Partnering, Industry Relations and Capability and Capacity Building combined with ongoing Market Awareness are Canberra.NET's four strategies in its 2007 Business Plan. Canberra. NET's sees success in these areas as achieving its goals of maximizing revenue in the ACT software industry, promoting IP creation and establishing Canberra as a centre of excellence for .NET.

The Australian Industry Group (Ai Group) is a leading industry body representing Australia's information and communication technology (ICT), electronics and electrical manufacturing industries. It has a strong representation in Canberra. Ai Group has a robust infrastructure for networking among members on industry issues.

Other associations in the electronics and ICT area include the *Australian Information Industries Association* and the *Australian Computer Society.* The *Royal Australian Institute of Architects* provides networking for architects and there are associations that represent and network among professional specialities in creative practices.

Canberra Arts Marketing (CAM) is a consortium, with more than 100 members from the arts and cultural sector, from artists' studios to the national attractions that was established in 1993 to assist in developing new audiences, improve the marketing and business skills of those working in the creative industries, and promote the value of the arts.

About Canberra Arts Marketing

Canberra Arts Marketing is an arts and cultural consortium including members big and small from the ACT and Region. It is recognised as a leading arts marketing consortium locally, nationally and internationally.

It aims to support members through collaborative and cost effective, best practice marketing services, advocacy on behalf of the arts and the development of productive partnerships to support the arts.

Canberra Arts Marketing carries out a range of activities to develop new audiences, build on existing ones and to improve the marketing and business skills of those working in the creative industries.

A unique brand, Arts Around Canberra, has been developed to communicate and promote the diversity and value of its members' offerings.

Canberra Arts Marketing is supported by the Australian Government through the Australia Council, its arts funding and advisory body and from the ACT Government through its arts funding program. Income is also generated from annual membership fees and sponsorship.

Notwithstanding the number of organisations that have networking roles, Canberra does not have an association or organisation that represents the industry development and policy issues relating specifically to the arts and creative industries. Such representation that exists tends to be fragmented and only partial in its coverage. This is a major gap in innovation capacity and capability in the ACT

Representation of the creative industries, for example, tends to have a strong focus on digital content and the ICT component, overlooking the artistic and design aspects. A recommendation for a new broad based body to provide leadership for the ICT, arts and creative industries, tentatively called *innovation Canberra* is included in Section 11 below.

Associations and their network events and forums provide important vehicles for sharing knowledge about *industry* trends and issues. Business networks do not, however, always provide a framework for sharing information and knowledge about *business* issues and forming collaborations, particularly where members operate in a highly competitive environment. Collaborations tend to form between businesses along different parts of a value chain (horizontal integration). Social networking performs an important role in this regard.

Social networks

The social aspect of innovation has been recognised in the discussion and analysis of innovation systems. Much that is written about networking revolves around creating trust and confidence among potential buyers, suppliers and financiers. These relationships take time to build and are often linked to common social, educational or cultural experiences. Connections and contacts made through friendships and family are also important. It is difficult to 'create' social networks.

People experienced in business know *not* to share or give away knowledge about their business, customers, suppliers or processes. To do so risks losing competitive advantage. Employment conditions usually specify confidentiality and 'need to know'. Much of what is written about 'clusters' comes from a community development perspective and reflects a collectivist view of business.

Businesses like to have a location near to their suppliers and customers for the purpose of engagement marketing and developing contacts with potential suppliers and businesses with which they might form supplier collaborations—particularly if a business has a strategy of external innovation sourcing. They might also like to be close to an education institution for the purpose of recruiting graduates and participating in collaborative research and teaching ventures.

The relatively small size of Canberra provides major opportunities, and challenges, for social networking and interaction in a cluster context. People meet socially through schools, sporting and service clubs, other community associations, and even at local shopping centres.

The Church and the Lodge (freemasons) are probably becoming less important as ways of building and sustaining networks. Conferences and professional symposia that are generally open to the public provide opportunities for interaction—although they are less useful for marketing and sales.

Creating the opportunities for collaboration through networking and conferencing

People will collaborate in a growing market where there is strong demand for skills and capability—and plenty of work to go round. With shrinking markets, people will adopt the 'prisoner's dilemma' approach—that is, take the risk and go it alone.

Lundvall, one of the originators of the 'innovation systems' idea has pointed out recently that much of the relevant interaction between firms and research organisations takes place at a national/international rather than the regional level.

Collaborations with business and between suppliers and customers can be generated through national and international conferences and events that aim to build awareness and understanding of capacities and capabilities. These events are particularly important in the ICT and creative industries arena.

Positioning Canberra as an international City of Design, as discussed in Section 10, would be an important element in this awareness and creating business opportunities.

Lundvall adds that other more 'systemic' mechanisms may be more important when it comes to the formation and evolution of regional clusters. These systemic factors include a local workforce with skills reflecting local and tacit knowledge, the local knowledge and service infrastructure, and spin-offs from local firms. Interactions in the workforce may flow from contacts and friendships formed at school or university.

University Alumni networks are an important 'systemic' mechanism. These seem to be as important, or more important, as compared with constellations of inter-firm interaction (Lundvall, 2007). Both the ANU and the University of Canberra are devoting attention to building their Alumni bases as a way of encouraging philanthropy. Business development is, however, an important benefit of Alumni communication and events—and to many people in business represents the 'value proposition' that elicits a philanthropic gesture.

4.5 Conferences, awards and prizes

Conferences and events organised by government agencies and industry associations are critically important for creating interactions.

A particular challenge is organising conferences and events that are attractive to industry, government and teaching and research organisations. The annual ABARE Outlook conference is a major event in Canberra and widely supported. It is a key networking event for government, rural research bodies and businesses in the primary industries sector.

Business awards and prizes, frequently announced at conferences, are an important institutional aspect of innovation systems. It is often said that the award is of less significance than the process that businesses have to go through to prepare for assessment.

Businesses enter award events as a way of publicising their businesses and adding awards to their profiles and capability statements. Award ceremonies and events are also important for social networking and establishing contacts.

Cre8ive—Entrepreneur of the Year Finalist

James Willson, Managing Director of CRE8IVE, has been named an Eastern Region finalist for the Ernst & Young, Young Entrepreneur of the Year 2007 Awards.

James is one of 16 Eastern Region finalists and over the past three months has been through a rigorous judging process. Each finalist is considered by a panel of judges against six criteria including entrepreneurial spirit, innovation, personal integrity and influence, financial performance, strategic direction and national / global impact.

The Entrepreneur of the Year awards are one of the leading business awards programs in Australia and the only program of its kind with an international platform. Founded and produced by Ernst & Young, and launched in Australia in 2001, the awards celebrate entrepreneurs who build and lead successful, growing and dynamic businesses.

http://www.cre8ivecommunications.com.au/pages/index.asp

Each year exporters from the ACT and Region enter and compete to be winners in the Chief Minister's Export Awards in the various industry categories and for the coveted ACT Exporter of the Year Award. The Awards identify, recognise and reward Canberra Region businesses for their innovation, excellence and achievement in exporting.

The award categories cover: Agribusiness; Arts, Entertainment and Design; Education; Emerging Exporter; Information and Communication Technology; Regional Exporter; Services; Small Business; Small to Medium Manufacturer; and, Events and Tourism.

There are a number of awards events in Canberra organised by business associations to celebrate entrepreneurship and achievement in various industry sectors. There are also events in Sydney.

CeBIT.AU Business Awards provide global recognition

A fast-growing eCommerce payments company from Canberra shared top honours in the inaugural CeBIT.AU Business Awards.

Payment company eWAY was awarded the CeBIT.AU Platinum Award for Export Excellence "CeBIT helped pave the way for eWAY to get into the Europe market by assisting us with key partnerships," said eWAY Founder and Chief Executive Officer Matt Bullock.

"Taking our internet payment technology to a new region has been a complex and intense learning process for us, however we are now looking to expand into similar markets in Asia and USA," he said.

The launch of the CeBIT.AU awards represented a milestone for the local industry, according to Hannover Fairs Australia managing director, Jackie Taranto. "Our industry produces some of the most impressive creative talent and best business brains in the country, and yet these people often don't get the recognition they've earned," Ms Taranto said.

Canberra does not currently host an event that showcases the commercial aspects of science, technology and the creative industries. Moreover, Canberra does not celebrate its achievements in architecture, design and creativity through a high profile festival. Exhibitions are left up to individual galleries as well as universities, the CIT and Schools.

In May 2006 the 'ICAN' innovation festival showcased a diverse program that encouraged Canberra's business, education and the arts communities as well as the general public to place a future-driven focus on creativity which the organisers saw as an important basis of a city's vitality and potential for economic growth.

There is a major opportunity to 'join the dots' in creative capability with a greater focus on recognising achievements and performance in addition to the exporter awards initiative. A long term commitment to an annual 'festival' around all aspects of innovation linked to the National Australian Innovation Festival would also profile Canberra's innovation capability and performance. This is addressed later in the study.

4.6 Technology parks and seed funds

Epicorp was established as an information and communication technology commercialisation centre committed to turning great science into profitable business. It is owned by The Australian National University (ANU), The Commonwealth Scientific and Industrial Research Organisation (CSIRO), The National ICT Australia (NICTA) and the University of Canberra (UC).

Epicorp

Epicorp is an information and communication technology commercialisation centre committed to turning great science into profitable business. The fund's experienced managers help connect great ideas to market opportunities through the provision of seed funding and on-going business support.

From its inception in 2001, Epicorp has established its credentials as a successful centre of commercialisation excellence. Its high-value portfolio includes a number of investments spun out from quality Australian centres of research. Epicorp's portfolio encompasses areas within ICT as diverse as media editing and wind resource assessment to broadband telecommunication and highly-precise global positioning.

Epicorp has a particular interest in the early-stage commercialisation of research from the country's pre-eminent centres of innovation. Epicorp works closely with Australian's major research institutions.

Epicorp has been supported by a $4.57m ITC incubator program (ICTIP) grant from the Department of Communications, Information Technology and The Arts (DCITA), a supporting grant from the ACT Government, and the provision of buildings by CSIRO. Its overall objectives are to:

- Create a strong high technology commercialisation system for the Australian Capital Region, under common ownership and management, involving the Region's research institutions and supported by Government and the private sector.
- Draw together the relevant resources and players in the Region.
- Foster and support the commercialisation of technology and knowledge from ANU, CSIRO, UC, NICTA and industry within the broader Australian Capital Region community.
- Complement other commercialisation initiatives.

Epicorp delivers assistance to new-start and spin-off ventures in two ways:

- Through the implementation of a tailored Incubator Program designed to assist businesses to commercialise IP; and
- Through the provision of seed funding to suitable Epicorp incubator businesses.

Epicorp has alliances with DCITA, the ACT Government, KAZ Technology Services, TransACT, Itchybrain Productions.

Companies that Epicorp has supported include: GPSports Systems; Epitactix; Amethon Solutions; Locata Corporation; Simmersion Holdings; Cohda Wireless; Windlab Systems; Mediaware International; Hatrix; Edentiti; and Newton. Many of these companies have developed into strong, sustainable businesses.

Canberra Technology Park (CTP) has been established as a private sector initiative to facilitate the growth of the computer game development, 3D animation multimedia, film, TV and sound production, computer animation, telecommunications, software development, hardware manufacture, integration and systems management, e-business, web development and the Internet.

Current tenants include: The Academy of Interactive Entertainment Ltd; ACT Film Makers Network – ACTFMN; Alacrity; Beacon IT; BigWorld Pty Ltd; Canberra Makeup Academy; Decideware; DotNET Solutions; Earthinsite.com Pty Ltd; Freebott; Hub Communications; IE Events; Kihote Network; Link Web Services; Megalo Access Arts; mHITs; Micro Forté; Nimic Productions; Security Solutions Australia; Sigma Infotech Pty Ltd; Starfire Computing; Tarakan Consulting; and Technology Global Trading.

4.7 Investors

Australian early stage venture capital investors are active in the ACT. In addition to Australian Capital Ventures Ltd (the venture capital arm of the Hindmarsh group), early stage investors include GBS biosciences, Australian Ethical Investments, and Canberra Business Angels. National and Overseas venture investors are also active in the Canberra market.

In February 2005, the ACT Government invested $10m in a $30 million venture capital fund, ANU–Connect which aimed at commercialising the results of Canberra-based researchers and develop them into new businesses and jobs.

ANU Connect evaluates commercialisation opportunities, makes funding recommendations, forms new companies, and provides funding for selected proof-of-concept research. It also funds the development of business plans, oversees the growth of its investment companies, and markets these companies or their Intellectual Property to international business.

New Partnership to turn ACT Ideas into Jobs

The ANU/MTAA Super Venture Capital Partnership (the Partnership) is an innovative joint venture between the Australian National University (ANU) the Motor Trades Association of Australia Superannuation Fund (MTAA Super) and the ACT Government. MTAA Super will invest $20 million in the Partnership, as part of its alternative asset portfolio, and the ACT Government will provide a repayable grant of $10 million.

The Partnership will provide the first dedicated ACT-based commercialisation fund for pre-seed and seed capital investment, and represents an outstanding investment for the people of Canberra.

The major reason for investing in the Partnership is to increase the commercialisation skill level in Canberra, as well as the level of funding available for early-stage investment. This new Partnership uses the government's new venture capital legislation and continues the delivery on the Economic White Paper priority of fostering innovation in the ACT.

The Partnership would be a model for future venture capital partnerships around Australia, and provides a unique opportunity to turn world-class research into world-class businesses.

The Partnership is great news both for researchers and the ACT community, creating jobs, enhancing Canberra's reputation as Australia's entrepreneurial capital, and strengthening the future of both research and business in Australia.

The ANU works closely with ANU Connect to focus on the opportunities that provide the greatest prospects for successful commercialisation. It was envisaged that ANU Connect would open up new opportunities for ANU researchers to collaborate with potential industry partners, by providing early-stage funding. However, it is likely that many research projects with commercial potential will be developed following the 'traditional' approach of research contracts with particular industry partners (perhaps with government support, as in an ARC Linkage Project).

There are approximately 100 active commercialisation projects at ANU, mostly being managed by ANU Innovation staff. As ANU Connect gets under way, ANU's technology managers will review the

project portfolio. Many projects will continue to progress as previously planned, while some may be selected for presentation to ANU Connect.

4.8 Support services

Business support services

Canberra BusinessPoint is an ACT Government initiative presented by Deloitte. It provides a free business information mentoring and advisory service designed to deliver end-to-end services for start-up businesses, young businesses, entrepreneurs, exporters and established enterprises.

The program assists businesses from a diverse cross-section of industries within the ACT, with particular respect to: growth plans, commercialisation of ideas and concepts and mentoring owners and operators in the effective running of their business.

The BusinessPoint initiative built on the earlier ACT Government funded CANBAS—which ran successfully for a number of years. BusinessPoint builds on the work done by CANBAS and extends the range of services to include a greater focus on entrepreneurship, commercialisation and export. The additional resources and expansion of the program were also informed by a review of CANBAS undertaken in 2005.

A Message from the Chief Minister – Jon Stanhope MLA

With more than 20,000 private sector businesses, ranging from multinationals to micro-businesses and everything in between, Canberra has emerged as a unique and powerful regional economy.

Businesses are always looking to improve the way they operate, particularly smaller companies and start-ups that don't have access to the networks, information and professional services that larger businesses systematically tap into. That's why the ACT Government has put in place a new service to bridge this gap.

Canberra BusinessPoint, which the ACT Government has contracted with Deloitte Growth Solutions to deliver, is a new initiative and the ACT Government's primary assistance initiative for the Canberra business community.

The service contains a comprehensive suite of activities, including business development resources, one-on-one mentoring, a range of online tools and a series of networking events. The service will also provide advice and assistance to companies looking to expand their export focus, commercialise new and emerging technologies and encourage the development of entrepreneurs.

But the service isn't just available for micro businesses and start-ups. It has been designed to support companies at all stages of their development, particularly high growth firms and Canberra's many technology-based companies that have grown from our extraordinary research base.

What's more, the services available through Canberra BusinessPoint are all free of charge!

The 'big four' professional services firms have a presence in Canberra, aimed at sourcing work from the government market and providing services to what is referred to as the 'middle market'—essentially medium sized businesses.

There are also a number of professional services firms that provide contract accounting and financial management services as well as providing contract staff.

Technology and professional services providers and consultants

Canberra is well endowed with accountants, lawyers and other professional services businesses that provide advice and consulting services for emerging and established businesses.

As part of their business development strategies most firms organise breakfasts, symposia and other events to market their capabilities and present 'think pieces' relating to innovation.

4.9 Policy and strategic framework

Policy responsibilities and accountabilities for innovation in the ACT are located within the Business and Industry Development Branch of the Chief Minister's Department. There are, however, a number of other agencies that administer policies and programs that have an impact on innovation outcomes. These include ArtsACT and a number of boards and councils associated with the arts and creative content sectors.

The ACT has made a number of strategic investments to build innovation capability—such as in ScreenACT, NICTA and ANU Connect. It has supported the Epicorp business development centre and has in the past provided funding for the nurturing of promising business ideas through the Knowledge Fund.

These interventions are not so much directed towards addressing 'market failures' as they are to addressing 'system failures'—areas where regional innovation capability is either non-existent or under-developed. Australian Government programs that support research and development have more of a market failure focus.

The Government can also strengthen interactions and linkages within the innovation system by continuing to support conferences and events that showcase Canberra's creative industries base. It could also consider supporting higher education institutions to extend their teaching and research capabilities in the ICT-creative practices sector.

At the end of the day, however, there is only so much that Government can do. Economic development built around an innovation agenda should build system strength through a *committed partnership* between industry, education and government. In regions around the world where regional successes are associated with innovation, leadership comes from industry and higher education, with government taking a supporting role.

5 Innovation system dynamics

5.1 Framework

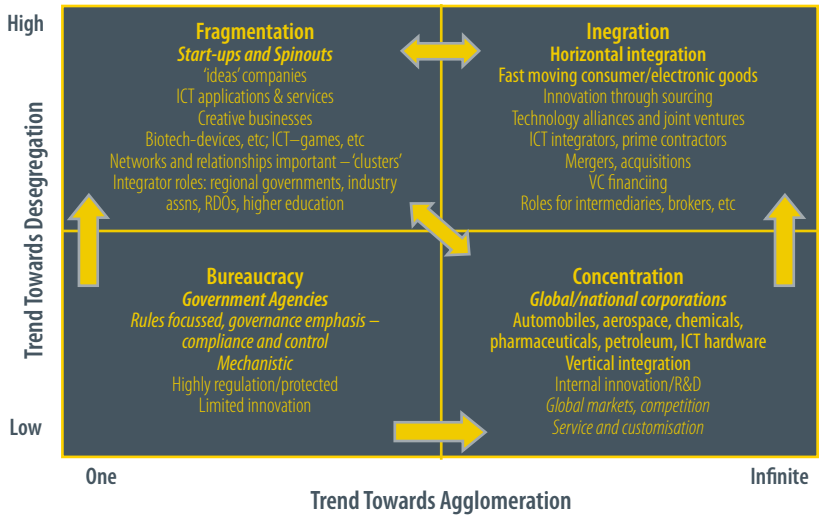
Recent research in industrial innovation reflects the influence of two trends in industrial organisation (Malone et al., 2003):

- A trend towards agglomeration—large businesses getting larger, more diversified, and global in their production, marketing and distribution activities. However, these large businesses are expected by their investors to generate continuous returns, comply with increasingly stringent corporate governance standards, and take minimal risks. Accordingly they are continually looking for new ways to innovate – and stay in business.
- A trend towards disaggregation—bureaucratically organised businesses 'spinning out' non-core activities and developing partnerships, joint venture and strategic alliance relationships with smaller, specialized technology based companies. Companies may also be technology based spinouts of research organisations or newly formed businesses experimenting with the application of an idea.

This gives rise to four broad categories' of business organisation, illustrated in Figure 6.

Figure 6: Innovation system dynamics

Trends in Industrial Structures



MALONE, T.W., LAUBACHER, R. & SCOTT-MORTON, M.S. (2003) Investing the Organisations of the 21st Century, Cambridge, Mass., MIT Press

Source. Howard Partners. Based on: Malone, Thomas W, Robert Laubacher, and Michael S Scott-Morton. 2003. *Investing the Organizations of the 21st Century*. Cambridge, Mass.: MIT Press.

The framework depicted in Figure 6 provides a representation of the ACT innovation system. The key characteristics are:

- A large number of government bureaucracies which are *not* geared to innovation. There has been a trend among bureaucratic organisations to 'corporatise' or 'privatise' a range of what are seen as non-core corporate functions. At the same time many bureaucracies are becoming more concentrated in Canberra and/or building systems for high levels of vertical integration. Such innovative activity as exists is undertaken 'in house' or sourced through supplier contracts.
- A relatively small number of 'concentrated' vertically integrated global corporations that have established a Canberra presence. They include mainframe suppliers, such as IBM, and major software houses, such as SAP. These businesses are the major source of supply for very large purchasers of ICT equipment in Canberra.
- Business that build relationships with other businesses along a value chain. This is a characteristic of ICT application and development where government requirements cannot be met by a single supplier. They include systems integrators, such as Accenture as well as the businesses that have grown and developed in the ACT.
- A relatively large number of small innovative businesses established to commercialise a technology or exploit an idea.

The framework does not specifically acknowledge a large number of businesses that do not have an innovation focus—such as personnel contracting organisations. These are essentially 'outsourced' government activities and an extension of bureaucratic structures.

5.2 System attributes

Bureaucratic organisations

The Canberra business environment is characterised by a large number of bureaucratic organisations—organisations that are heavily structured (have tall hierarchies), are rules driven and process oriented. This is the general characteristic of a government department. These organisations are not regarded as innovative—however they are major purchasers of goods and services.

Government departments and agencies often corporatise or privatise functions as a way of achieving innovative approaches to management, organisation and service delivery. They do not actively set out to source innovation. They more generally want a 'capability' or to resolve a problem. Innovation can be a 'by-product' of the sourcing processes.

Their focus is on *contracting* and procurement, that is, a contracting relationship.

Concentrated businesses

Concentrated businesses are those which are 'vertically integrated' in terms of having most business functions captured within a corporate structure. These functions relate to research, development and design, production and manufacture, sales and marketing, customer relationship management, and enterprise resource management.

These companies are characteristic of the pharmaceutical, computer hardware and software, and minerals and energy companies. Their size reflects the economies of scale that can be achieved in most if not all of the related business functions. These companies are continually on the look out for discoveries and inventions that have industrial application—and the ANU and other research organisations have commercialised research to meet new and emerging market opportunities.

The professional services industry is also characterised by increasing concentration as firms become globally oriented and offer a broader range of services but see opportunities for scale in developing services around 'products'. In Canberra, advertising companies such as ZOO Communications, a member of the Singleton Group, reflect vertical integration.

Coupled with custom built and proprietary software designs, equipment vendors compete intensely in terms of technology, reliability, and cost. This provides opportunities for smaller, more agile businesses with specialised/single products and applications. Smaller businesses may grow, over time, into larger businesses as their capability and reputation develops.

In this environment concentrated businesses often work in strategic alliances with smaller, more specialised businesses, as a way of sourcing capability. Some have developed collaborative arrangements with research organisations.

Start-up and spinout businesses

The ACT innovation system is also characterised by a large number of small, 'knowledge' or 'ideas' based businesses. They are established to develop and market a technology or a novel idea. These businesses often grow and transform into larger businesses on the basis of successful business models. Their role as lead business has been discussed in Section 4.3 above.

Small and growing start-up companies are a major source of innovation. Often the technology has an origin in academic research, but the way in which it leaves the research environment and becomes adopted is complex. More often, a business starts on the basis of an idea, an opportunity and a gap in the market. If a company makes good progress, both in product development and in the market (eg getting standards adopted) it becomes a target for a larger company seeking to strengthen its technology or product line.

Simmersion has developed and grown in response to an opportunity and need for 3D simulation in urban contexts.

Simmersion

SIMMERSION is the proprietary developer of the SIMURBAN®™ software suite; a simulation solution that allows users to simulate real or imagined world environments with incredible realism, context and geometric accuracy.

The software enables users to quickly create highly detailed real-time simulated models of any environment in the world by manipulating commercial inputs like aerial photography, survey data and CAD models using desktop tools. The results are highly accurate and realistic 3D simulation models of unlimited scope and scale with widespread application across a number of market segments including urban planning, military simulation and entertainment.

SIMMERSION has established simulation models of areas over hundreds of kilometres with millions of trees, thousands of buildings and other features. Once established, users can interact and analyse the simulated environment in unprecedented ways with incredible realism.

The SIMURBAN software suite has a wide range of applications across diverse industries with first successes being in the Urban Planning sector. SIMMERSION has enjoyed commercial success in penetrating and leading this sector in the provision of 3D simulation products and services.

In December 2005, SIMMERSION introduced its "Simulated City" business concept, to establish real-time 3D simulation models of major cities and conurbations across the world. SIMMERSION is dedicated to continuous R&D to further develop and extend its simulation technology to ensure that SIMURBAN simulations are the best and most realistic immersive experience possible for the user.

In 2006 SIMMERSION was contracted by Microsoft Virtual Earth to create a specific quality assurance visualisation application for in-house use by the Virtual Earth Team at Vexcel (CO, USA).

In June 2006, SIMMERSION completed a capital raising of $1 million dollars to help fund national and international expansion. In August 2006, SIMMERSION was a winner of Red Herring Magazine's top 100 technology start-ups in Asia for 2006.

ACT start-up businesses are gaining reputations for creativity and innovation both nationally and internationally. For example, Canberra based game developer, Irrational Games Studios has been described as one of the most innovative development studios in the world with the release of BioShock in August 2007, while veteran game developer Micro Forté which has studios in Canberra and Sydney has played an integral part in creating the high standard of game development in Canberra.

Micro Forté Pty Ltd

Micro Forté is a veteran game development studio founded by passionate game developers who have a strong desire to develop game titles for third party game publishers, as well as creating its own intellectual properties and working with publishing partners. These include US Gold, Panasonic/ Ripcord, Electronic Arts, Interplay, THQ, Universal Interactive and Microsoft.

Micro Forté have dedicated the last few years to focusing on building the BigWorld Technology platform for MMOG game development. Micro Forté have successfully completed this technology and spun it out as a separate middleware company named BigWorld Pty Ltd.

"Not many game studios have done this sort of thing before, however, we felt that our unique focus and combined experiences would allow us to successfully develop this cutting edge technology, and in doing so, create a new group of people focused on an area we identified as needing attention - namely highly scalable and well integrated MMOG middleware".

Micro Forté's major studio is in Sydney and it has a smaller development studio in Canberra. It also has a "related party" - an animation and modelling studio in China that some of Micro Forté's founders are invested in. Micro Forté is currently developing some exciting new MMOG properties and is constantly recruiting the very best talent.

Micro Forté is really well known in Australia. It has taken an active Australian industry development role over the last 10 years. The CEO founded the Academy of Interactive Entertainment Ltd (AIE), Australia's leading educational institution for computer game developers, as well as founding the Australian Game Developers Conference and the Game Developers Association Australia. Both have been key players in Australia's ever-growing interactive entertainment industry.

Integration businesses

Integration businesses are built around a strategy of cooperation and collaboration with other businesses in the value chain. They source some, and even all, business functions through collaborations, joint ventures and partnerships. These arrangements are given effect through contractual rather than organisational relationships.

Horizontal integration is a feature of the creative industries with many SMEs working in collaboration with a few large enterprises (lead businesses). That is, numerous suppliers undertake research, make parts and components that other companies assemble in sub-assemblies that are then assembled again into final products by competing original equipment manufacturers.

The multiplicity of companies at each step in an industry value chain ensures intense competition throughout the value creation process—not only on price, but also on performance characteristics such as quality and, increasingly, innovation.

Smaller companies also approach larger companies to tap into their product development, marketing and distribution infrastructure. This is evidenced in the ACT with companies such as CEA Technologies working with specialist providers, and Australian Scientific Instruments (ASI) which is an example of a business which spun out of the ANU and markets its range of specialist scientific instruments for geochemistry and geomechanics throughout the world.

5.3 Interactions and connections

Between businesses

Large pharmaceutical companies rely on biotechnology start-ups to undertake initial concept development, drug design and testing with a view to the larger company creating value from manufacture, product sales and distribution further along the value chain.

Biotron Limited, began in 1999 to fund, manage and commercialise biomedical projects resulting from research in a number of programs at the John Curtin School of Medical Research (JCSMR) at the Australian National University (ANU). It has collaborations with global pharmaceutical companies.

In this emerging process both public research and early stage venture capital have important roles—particularly in shifting costs and risks out of the corporate entity. This keeps shareholders and industry analysts comfortable, and allows a corporation to have access to a broader range of innovation opportunities and options. Larger defence contractors, for example, often shift risks to smaller collaboration partners.

The ACT has many technology based start-ups that fit this pattern. Small ICT companies partner with large vendors to meet procurement requirements of the large ICT purchasers.

The Defence Materiel Organisation (DMO) is a major purchaser of defence equipment. Many start-up businesses in Canberra have grown in response to opportunities from defence contracting—either directly or in collaborations with research organisations and larger businesses.

Australian Government departments and agencies are major purchasers of ICT hardware, software and services. A number of Canberra based companies have grown on the basis of this demand, whilst others have developed through collaborations.

National collecting institutions and government agencies have stimulated the growth of new start-up companies through demand for a wide variety of digitally oriented creative content.

Between business, research, and government organisations

A feature of innovation in knowledge regions is a high level of collaboration between businesses, research organisations and government in both teaching and research activities. Much of the collaboration is centred in the principles of *knowledge transfer and knowledge translation*.

Canberra offers particular advantages in collaboration between businesses that were formed and developed in the ACT and with research organisations. NICTA, for example, finds it much easier to develop collaborations with ICT businesses grown in the ACT than with the global ICT corporations.

There are, however, important collaborations between the global ICT corporations and universities in areas where universities have developed a strong research capability. The Unisys Security Innovation Centre at the University of Canberra, for example, is a working laboratory and high-tech demonstration facility where research and development is done on the latest security initiatives—like fingerprint and iris scanning, facial mapping, and vascular-recognition technology.

The Centre has been established by Unisys in partnership with the University of Canberra and the Department of Immigration and Citizenship (DIAC) a founding member.

University of Canberra collaboration delivers robust biometric solutions

Canberra, September 3, 2007
On the eve of the Asia-Pacific Economic Co-operation meeting in Sydney, Unisys has today unveiled seven cutting-edge biometric security technologies developed overseas and with partners at the Unisys Security Innovation Centre at the University of Canberra.

"The Unisys Security Innovation Centre is all about bringing together the best minds from the private sector with the best minds from the University of Canberra and DIAC – and the outcome from that will be better security for Australia," said Vice President and General Manager Unisys Asia Pacific, Andrew Barkla. "Security is the biggest issue of this decade and for any organisation to maintain the confidence of its customers, it needs to stay abreast of the latest security trends from around the world.

The Unisys Security Innovation Centre is supported by alliance partner EMC and technology suppliers 3SH, Alacrity Technologies, Daon and Tyco Electronics, and is located on campus at the University of Canberra.

Cooperation and collaboration is also apparent in urban and regional development around issues relating to sustainable communities.

CSIRO ACT Government Partnership To Create Sustainable Communities

Chief Minister Jon Stanhope said the 2007-08 ACT Budget contains $350,000 for a partnership with the CSIRO to showcase low environmental impact development in the East Lake area. The CSIRO will partner with the ACT Government in making the East Lake area a national example of best practice in sustainable urban development.

"East Lake presents unique opportunities to showcase the incorporation of leading-edge sustainability principles at demonstration project sites," Mr Stanhope said.

"The East Lake area was identified in the 2004 Canberra Spatial Plan for future redevelopment as its location provides an opportunity for shorter journeys to work and recreational activities in the nearby suburbs of Griffith, Kingston, Parkes, Barton and Fyshwick.

"Studies to date have confirmed there is considerable potential for increased residential and mixed-use development in this area that would create comparatively less greenhouse gas emissions and improved quality of life. Achieving low emissions development requires the use of leading-edge science, innovative thinking and partnership with nationally recognised organisations with strong track records in sustainability.

"The CSIRO, ACT Planning and Land Authority and Office of Sustainability have been discussing ways for the CSIRO to collaborate through its Sustainable Communities Initiative with the overarching objective of making the best use of national and local expertise to achieve an Australian showcase sustainability project.

"This project will embrace social, economic and environmental sustainability principles, technologies, and practices. It is a whole-of-system approach where community challenges and opportunities are addressed through identifying and understanding the drivers and levers for change within the community and developing appropriate pathways and investments in response."

Mr Stanhope said the CSIRO's contribution to the project would primarily be in the early phases of the planning and development by identifying "stretch targets" and testing current standards and processes against benchmarks, while maintaining probity, equity and transparency.

ACT Budget 2007-08, Media Release No. 11, 5 June 2007

5.4 Issues and implications

The ACT innovation system is much broader than a science and technology or a 'science' system. Innovation is also very much associated with the design and creative practices sectors. In combination with information and communication technologies, Canberra has a very rich ICT, arts, and creative practices sector. This is underwritten by a strong base in culture, architecture and design.

These attributes set the scene for outlining Canberra's distinctive capabilities in the globally competitive market innovation and knowledge based economic development.

6 Canberra's distinctive capabilities

Cities *compete* to attract investment, tourism, and population. They do this through marketing and promoting *distinctiveness*—attributes that a city has that others do not, or have on the same scale.

Canberra is unique in Australia in that it is a 'city-state' and combines in a regional setting roles and responsibilities associated with both state and regional/local government. This and other distinctive capabilities of Canberra which are a foundation for innovation to drive economic development and social progress are outlined below.

6.1 A City with an international outlook and connections

Canberra is a city with a strong international outlook. As the nation's capital it has international connections through the Australian Government's responsibilities for foreign affairs and international trade, defence, and immigration.

Canberra is also the centre of Australia's diplomatic community and home to Australia's 'National' university and pre-eminent national cultural institutions recognised for their world class standing. These characteristics give Canberra an important international focus.

Almost 40 percent of Australia's research on policy and political science is undertaken in Canberra—much of which is focussed on international relations and defence studies.

The Floriade Festival has grown into an international event, attracting substantial overseas visitors.

Although it is an important regional centre in the south east of New South Wales, and this is important for the delivery of a wide range of health, education and community services, Canberra, is much more than just 'the bush capital'.

6.2 An international centre for research and teaching

Canberra universities and research organisations undertake 10.2 percent of Australia's publicly funded research and development.

While there is not a great deal of this research that is commercialised or transferred into the Canberra regional economy, the institutions have a major impact by virtue of the economic impact of the institutions themselves (employment, purchasing, overseas students) as well as their socio-cultural impact in terms of facilities, services and lifestyle.

The ANU and CSIRO attract world class researchers which in turn attract some of nation's and world's best students as well as being an attractive location for post-doctoral students. These connections are important in terms of the human capital aspects of the innovation system, particularly in terms of establishing international connections.

Canberra's status as an education capital can go un-noticed and unrecognised.

6.3 Centre for culture, arts, and creative practices

Canberra is a major Australian centre for the arts and culture, covering art, music, and literature. This forms the basis for the development of cultural and creative industries.

Australia's major national museums, libraries and galleries located in Canberra, which together with the higher education and research institutions, contribute to making Canberra an information and 'knowledge rich' community. The economic and social opportunities that flow from this information society are not fully realised, particularly in terms of building connections and relationships with overseas institutions.

Cultural institutions are not often seen as major contributors to Australia's research capability. While there are several ARC Linkage Grants with the ANU and University of Canberra, the national collecting institutions are not funded for research in their own right.

People contacted in the cultural organisations were keen to develop the information management aspect of Canberra's innovation system.

Creative industries also form around arts and cultural institutions together with the application of knowledge, skills and capability in art, music, architecture, design and technology. There has always been a link between art and technology but the link has become more pronounced with the development of digital technologies.

Canberra is one of the very few cities in the world that came into existence via design. As the nation's capital, Canberra is home to the national institutions built to celebrate Australia's past, present and future, and via the Embassies and High Commissions Canberra hosts the nation's international connections and relationships.

6.4 A Centre for defence procurement

Canberra is the location for the Defence Materiel Organisation—an organisation focussed on acquiring capability for the Australian Defence Force.

Defence procurement has stimulated the development of a number of electronics and ICT companies from a Canberra base. These companies include:

- CEA technologies
- Electro Optic Systems (EOS) which also operates Fire Control Systems.

Whilst location in Canberra is not essential for securing defence contracts, it has helped companies learn about the special needs and requirements of working with the Defence Department.

Location in Canberra is important for companies wanting to recruit former Defence staff to work on marketing and relationship building with the DMO and other units in the Defence Department.

6.5 An attractive place to live and work

Above all, Canberra has distinctiveness in being a pleasant place to live and work. It has distinctiveness and competitive advantage in the areas of:

- Infrastructure facilities, including education, health, sport, and culture
- Opportunities for jobs, business, and leisure
- Safety, prosperity, superior living conditions
- Space—room to live and move
- Access to a rural environment

Canberra has clear strengths and distinctiveness in these areas compared with other Australian and international cities.

In addition Canberra has distinctive capabilities in relation to the general criteria for attracting senior management staff:

- High quality educational options for children (top colleges and universities)
- High quality and variety of recreational facilities (access to snow, sea, sports facilities, including the AIS)

- Vibrant cultural life reflected in the cultural connections offered through the national museums and galleries, the Schools of Art, Music and Design, theatre and music festivals.
- High quality restaurants—Canberra has some award winning restaurants. For example, the Ottoman has recently opened a Sydney branch.

Senior managers newly appointed to the city almost universally express surprise and delight at what Canberra has to offer. Aspen Medical, which grew from a Canberra base, to an international company, stays located in Canberra because of the attractiveness of the city.

Aspen Medical

Aspen Medical is an Australian-based company with international experience in the delivery of health care solutions in Australia, South East Asia and Europe. Aspen grew out of a need to provide the highest quality surgical care in areas of high medical demand. This was satisfied through a unique combination of extremely flexible teams of health practitioners, including paramedics, nurses and doctors, combined with mobile medical facilities and highly refined medical processes and procedures. This combination has allowed Aspen to provide an expanding number of health services around the world. With headquarters in Canberra, Australia, Aspen Medical is a leader in innovative, cost-effective healthcare solutions supporting an international market.

Aspen delivers two main type of healthcare; operational healthcare (complete range of medical and environmental health services to support operations in a remote or difficult environment) and project based healthcare (provision of a range of possible services to deal with a specific issue or set of issues). The company also delivers strategic, clinical, operational, and disaster planning services to hospitals and health systems, nursing homes, physicians, and other healthcare providers and a range of e-health tools to suit a range of customers from single users to State-based health services.

6.6 Implications

For a regional centre with a population of 350,000 people Canberra punches well above its weight in opportunities for innovation. Unfortunately, Canberra suffers from a reputation of being an industrial 'public service' town. The popular image of Federal politicians does not assist in establishing the distinctiveness of Canberra as an innovation hub as well as an attractive place to live. Few people outside Canberra appreciate that employment in the public administration and defence industry accounts for only a little over a quarter of total employment (27.6 percent).

There is a need to shed the image of Canberra as the place where politicians come to play out the theatre of Parliamentary proceedings. Canberra is much more than political show business.

Canberra is important for being the home of the nation's *Executive* Government and national institutions. Unlike Washington, the Parliament does not sit often enough for Members and Senators to be regarded as important contributors to the life and vitality of the City. Few members remain in Canberra when the Parliament is not in session.

7 Best practice

The project terms of reference required examination of innovation systems and best practice innovation policy in other cities. Appropriate comparisons between Canberra and other capital cities occur in the areas of:

- National capitals in federal systems
- Capital cities that have strong capacities in research
- Capital cities that are locations for national and international cultural institutions
- Capital cities known for their creative industries.

7.1 Berlin

Capital of Germany, Berlin is also considered to be the designer capital of Germany with design contributing €1.4 billion in annual turnover to the capital's economy. Berlin is Germany's largest city with a population of approximately 3.4 million people.

UNESCO recently named Berlin a City of Design in its Global Alliance for Cultural Diversity. Berlin is a hub for the creative professions including designers, fashion creators, photographers and architects and offers a large variety of educational and career training opportunities. The city also attracts creative crowds from all over the world.

In addition, Berlin is seeing synergetic developments and the merging of product design with fashion design, graphic design and media design. The city is connecting design and manufacturing of products with the development of marketing strategies, the discovery of niches and trendsetting

innovations. Even large enterprises such as Volkswagen AG are beginning to transfer their design departments to the region to take advantage of the creative environment.

Berlin recognises however that economic success demands that designers have strong business and networking skills to attract clients outside of Berlin who are located in other cities and other countries, working virtually across time zones to build their businesses.

Berlin is similar to Canberra in that it attracts a very high proportion of funding in research and development, however it registers fewer patents than other states and very little is commercialised.

A recently released study by the Berlin Institute for Population and Development has found that Germany is changing from an industrial society to a creative knowledge society and that Berlin has the best starting conditions in the entire country based on talent, technology and tolerance.

7.2 Ottawa

Canada's capital, Ottawa, is very similar to Canberra in that it is home to the Government of Canada, Parliament, the Senate, and the Supreme Court of Canada, federal government enterprises, national institutions, and foreign embassies which provide links to their own domestic businesses.

Ottawa, like Canberra, is also a recognised centre for both academic and professional training. Ottawa's population of 1.2 million people is highly educated with more engineers, scientists and PhDs per capita than any other city in Canada.

Ottawa is seen to be a global technology and business centre with more than 1500 companies involved in key growth sectors such as telecommunications, software, photonics, semiconductors, defence and security, life sciences, tourism, wireless technologies, film and video, multimedia, professional services and contact centres. The region also benefits from the entry of new seed industry sectors such as biophotonics, environmental technologies, electronic pay systems, and micro electromechanical systems (MEMS).

7.3 Washington, DC

Washington, like Canberra, is a planned city with open spaces and parliamentary triangles. It is the seat of the US Federal government, home to national and international organisations such as the World Bank headquarters, and the International Monetary Fund. Washington is also home to a very large association industry with more than 6,600 associations and 1,500 non-profit foundations.

Greater Washington (which takes in Washington, DC, Suburban Maryland, and Northern Virginia) is also a centre for higher education, the law, medical research, and government-related research and publishing. It has a vibrant education and research sector, particularly in the biotechnology and biodefence industries, with 33,000 bioscience professionals, 933 R&D facilities, 70 federal government research labs, and hundreds of bioscience companies in the region.

Washington's strong R&D base receives a higher level of government research funding than elsewhere in the country, however much of the R&D funding is heavily skewed towards federal labs that have focused missions and less incentive for technology commercialisation, and less patenting and licensing programs.

In 2006, the estimated population of the District of Columbia was 581,530. The population of the Greater Washington region however is more than 6.1 million people. The region has a disproportionately high number of educated workers, with almost half of the region's adult population having a bachelor's degree or higher.

From 2000-2005, Greater Washington led the US in jobs growth, with 80 per cent of the workforce employed in the private sector. The federal government employs only 20 per cent of the workforce (approximately 350,000 people), however, like Canberra, Washington is viewed as a government town. The fastest growing local industry is professional and business services.

The US government spent $116.5 billion in Greater Washington 2006, with government procurement in the region amounting to approximately $54 billion. According to the *Greater Washington Initiative* report, local Greater Washington companies have gained from increases in US government spending, particularly on homeland security and defence.

The US government trends toward contracting, as opposed to hiring staff, has had a major impact on the region's economy. At the same time, the US government has simplified its procurement process to create a more commercial environment in which companies can compete to provide goods and services for federal agencies.

Businesses located in the region see one of their biggest advantages as proximity to a wealth of federal resources and the opportunity to meet with their potential government clients at a moment's notice[6].

[6] Roxby Media, *American British Business* 2007, third edition

Doing Business in Washington

It seems the US government also sees proximity as an advantage, since 40-50% of all government contracts are awarded to companies with a presence in Greater Washington. British companies such as BAE Systems, BNFL, BSI Group, Cobham, De La Rue Global Services, Dedicated Micros, FDM Group, Qinetiq, Halcrow, Memex, Rolls Royce, Smiths Group, Strategic Thought, Tessella, Ultra Electronics, and hundreds more have made Greater Washington their North American home.[6]

"There is no other single place in the US where a company can tap into such a highly-educated employment base and a high concentration of decision-makers in both the public and private sectors. This region is now home to nearly 50 of the major Fortune 500 companies, 9,000 technology companies, 700 internationally-owned businesses, and 180 embassies. Uncle Sam, the world's largest buyer, continues to be the primary magnet for companies, but access to commercial clients, a global network, and research and development resources makes Greater Washington the number one destination for firms around the world.[7]

Major Washington industries include bioscience and biosecurity, aerospace and IT. Greater Washington's life science workforce is second only to Boston with the National Institutes of health (NIH), the Howard Hughes Medical Institute, the Army's Medical Research Institute of infectious Diseases, and the National Centre for Biodefense. Venture capital investment in the region is increasing and exceeded $1.1 billion in 2006.

Washington also has a major aerospace industry with over 800 companies located in Greater Washington employing more than 45,000 highly skilled workers, including aerospace engineers. In addition, the top five aerospace associations are based in the region, together with 33 research and development facilities that conduct aerospace-related research.

The region's information and telecommunications industry is growing twice as fast as San Francisco-San Jose. Reflecting Federal Government demand, Greater Washington has the country's highest concentration of network and computer system administers, database administrators, and computer programmers.

Washington is also a centre of American history and culture, and is a popular tourist destination. It houses numerous national monuments and memorials, as well as the National Portrait Gallery, and the Smithsonian Institution, the largest museum complex and research organisation in the world with 19 museums and nine research centres.

According to the *Creative Industries* report produced by Americans for the Arts, there are 103 collection museums, 308 performing arts centres, 508 visual arts including advertising and with a heavy emphasis on photography, 473 film, radio and television organisations, 583 design and publishing businesses including architecture, and 60 arts schools in Greater Washington. It is home to 2,111 arts related businesses that employ 17,741 people. According to the report, these arts centric businesses play an important role in building and sustaining economic vibrancy.

[6] ibid
[7] ibid

7.4 London

London is a global financial capital, international transport hub and major tourist destination. London also hosts some of the world's most significant historical buildings, museums and art galleries, theatres, music venues and shopping. Greater London has a population of approximately 7.5 million people and is one of the most multi-cultural and multi-lingual workforces in the world.

London also has been proactive in developing, promoting and capturing the value of the creative industries sector. According to GLA Economics, the creative industries - from architecture and advertising to the performing arts and publishing - add £21 billion annually to London's output, more than all the production industries combined and second only to Business Services at £32 Billion.

In addition, the creative industries employ 525,000 people working either directly in the creative industries or in creative occupations in other industries. It is London's third largest sector of employment. The sector also offers London's second biggest source of job growth, contributing roughly one in every five new jobs.

Creativity London's Core Business

The growth of the Creative Industries is at the cutting edge of a fundamental transformation in London's economy that has been happening for the last three decades. Planning for London's Growth showed how Business Services have become the dominant sector within the city over this period, but alongside this a second process has been going on, which is now poised to take centre stage. The growth of the Creative Industries is the outcome of this second process, creating a major new source of economic expansion for the capital (Mayor of London, 2002).

London was one of the first cities to acknowledge the changes in consumer preferences and the resulting rise in demand for the outputs from the creative industries and played an active role in assisting the creative industries to flourish. In 2004, the Mayor of London launched *Creative London* led by the London Development Agency, which aims to boost the capital's reputation and performance as a leading world centre of creativity.

At the same time, other initiatives were introduced such as a series of free workshops targeting young creative entrepreneurs held at schools, colleges and community halls around London. The workshops were aimed at developing an awareness and understanding of business skills needed in the creative industries.

Partnerships and collaborations have also been used effectively to produce outcomes such as the Rich Mix development, a dynamic new cross-cultural arts and media centre designed to bridge cultures and disciplines. The centre provides a three-screen cinema, exhibition and event spaces, café, broadcasting centre for the BBC London, as well as recording and music training studios, a 200 seat performance venue, and education and workspaces for new creative businesses.

7.5 Wellington

Wellington is a harbour city that is home to the country's seat of government, 39 foreign embassies and high commissions, and numerous industry associations. It also houses the Te Papa, New Zealand's National Museum, National Archives, National Film Archives, the National Library, School of Music, Symphony Orchestra, Chamber Music New Zealand, National Opera Company, Royal Ballet and other sites of national cultural and historical significance.

Although the city of Wellington has a population of fewer than 180,000, the greater Wellington region is home to approximately 450,000 people. The qualification level of working age people in Wellington tends to be higher than for New Zealand as a whole with more people having a Bachelor degree or higher leading to employment growth being recorded in highly skilled occupations such as legislators, managers, professionals and technicians.

Wellington is known for its research and development capability in the sciences, medicine, and technology. Wellington is also known for its creative research, which is focused on music and literary arts. The University of Victoria in Wellington, for example, has the only branch of the International Institute of Modern Letters outside of the United States.

Wellington has identified a number of key high growth industries, namely Creative and Film, Manufacturing. Education, Biotechnology, Professional Services, and Information Communication Technology.

Wellington is considered to be the cultural and creative capital of the country. It provides world class film production facilities and infrastructure and is seeing a growing demand from overseas and locally, with the film and television industry playing a vital role in the city's economy. The organisation Film Wellington New Zealand has been established as a one-stop-shop for people wishing to make movies, commercials or television shows. Hundreds of jobs have been created and the region attracts thousands of tourists each year.

In 2005 a new sound stage studio space was added to the local industry's infrastructure with estimates that between $250 and $650 million will be injected into the Wellington region's economy over the next 10 years.

Wellington Creative Manufacturing Cluster is a relatively new network of engineering, design, manufacturing and related companies which aims to take a leadership role in promoting the region's creative manufacturing sector and advocate on its behalf to assist member companies to grow in size, capability and wealth. A key focus is to increase export volumes by encouraging members to specialise and identify business niches in the local market and internationally.

Two business incubators (Creative HQ and Fashion HQ) have been established to support start-up companies with high-growth potential to become successful in the national and global economies by providing best practice business support and quality infrastructure. Creative HQ currently houses companies specialising in animation, mobile technologies, software development, design, publishing and graphics.

7.6 Observations and implications

A common theme running through these cities is a realisation by government, industry and academic leaders that the creative sector is a major source of employment and economic growth.

These cities have a strong foundational base for the creative industries on account of their selection as the home for national arts and cultural institutions, international festivals and cultural events, theatres, opera, orchestras and other music facilities, and research and teaching organisations. In addition, the cities are a base for foreign embassies which provide links to their own countries in trade and cultural understanding and thus place these cities on the international radar.

These cities have invested in transport and communications infrastructure and are also tourist destinations. They also have working populations with relatively high education levels and skills training. These attributes provide a demand for artistic and creative practices.

Many cities celebrate their capabilities in these areas through annual and biannual festivals and events that promote creative practices and businesses that in turn generate substantial tourism and trade.

8 Some emerging trends

The trend towards greater collaboration between industry, research organisations and government, has been recognised for many years. In this section, attention is drawn to some more recent trends on the technological, creative and institutional landscape that has implications for innovation in the ACT.

8.1 The 'democratisation' of information technology

The technology boom of the 1990s had a major impact on state and regional policy as policy makers sought to secure growth by encouraging development of information and communications (ICT) and biotechnology 'industries'. In particular, policy makers have sought to replicate the vitality, creativity and success of Silicon Valley as a vibrant ICT 'cluster'.

Those regions that have attempted to replicate the Silicon Valley experience have met with varied and often limited success. It has been easy to identify some of the necessary elements in the 'magic mix' but it is a lot more difficult to combine enough of the ingredients in such a way to produce a Silicon Valley clone (Mitchell et al., 2003).

There is an emerging question whether Silicon Valley itself can sustain its 'hotspot' status as conditions evolve and change over time. In particular, the development of the Internet and digitally distributed news, entertainment, education and other content produced a need to engage with graphic designers, artists, writers and others with information technology.

In the age of the Internet and advanced technological communications, having all people in the one place is less necessary for corporate organisation than was previously the case. Connectivity through digital mediums together with high speed access and high bandwidth has reduced the need for centralised operations.

Arguably, professionals with creative skills have not found the engineering culture and suburban ambiance of Silicon Valley particularly attractive—preferring more urban settings and different forms of cultural connections (Mitchell et al., 2003).

City strategies to 'replicate' Silicon Valley on a smaller scale have focussed on information technology combined with creative practices. Such strategies are less capital intensive than some forms of ICT production and involve a broader skill mix.

Increasingly ICT is seen as *infrastructure and an enabler* for the innovation related development and growth of other industries and businesses. It is seen as a major driver of productivity growth. This has been recognised in manufacturing (Howard Partners, 2005) and now is capturing attention in the services sector where opportunities for national productivity growth are the most promising, and urgent. The defence industry is a major user of ICT in building defence capability.

Software is now ubiquitous—it is everywhere. It is embedded in products, services and processes. It has the capacity to transform business models—from R&D and design, through manufacture and marketing, to client service. Through the Internet and now Web 2.0 technologies, software allows for interaction with suppliers, business partners and customers in new ways. In the service oriented economy the capacity to interact with customers is a major source of innovation (Von Hippel, 2005).

Software development is no longer the preserve of information technology specialists. Across disciplines in the sciences, engineering and now the arts, humanities and social sciences, software is being developed and applied in research, teaching and practice.

With Canberra's high concentration of ICT businesses, these developments provide opportunities—and challenges.

8.2 The convergence of information technology and creative practices

Innovation thrives in a creative environment. With the development of closer alliances between ICT and creative practices in art and design, particularly in new and emerging businesses, new opportunities are emerging for the creative industries. This has particular relevance for Canberra.

The ACT innovation system has a particular strength in the creative industries—enabled in large part by the high standards of ICT and creative education and training in ACT schools, the CIT and the universities, as well as the courses and programs in art and design at the CIT and the University of Canberra and the Academy of Interactive Entertainment.

It seems therefore, that Canberra has a major opportunity to integrate its vibrant layer of creativity and design with its ICT capability to become a major centre for ICT and creative practices. Canberra provides that cultural setting.

There is now a considerable body of evidence that points to the economic significance of the cultural and creative industries. This flows from both demand and supply side factors.

Increasing concentrations of people in growing urban areas is associated with an increasing demand for cultural consumption—and entrepreneurs who invest to organise the supply.

8.3 Higher education engagement

Several years ago state governments and regional economic development agencies saw opportunities for knowledge based economic development based on the commercialisation of university research, particularly in biotechnology and information technology. Universities and research organisations with strong capabilities in these areas were seen as drivers of economic growth through technology licensing and start-up companies.

Experience has demonstrated that research commercialisation is a global, rather than a local, phenomenon and that local employment and income impacts are small.

Studies of the Cambridge 'cluster', for example, point to little economic benefit being realised locally—except direct and multiplier effects associated with investment in facilities and employment of staff. There are, of course, substantial economic and social benefits from being a global centre for research. A similar conclusion applies to Australian biotechnology cluster initiatives (Howard Partners, 2004, Howard Partners, 2006).

When (and if) Australian biotechnology and ICT start-up companies mature they often 'migrate' to North America where they can benefit from interactions with other companies and be close to a mass market. This is the strategy followed by venture capital investors. Moreover, universities seeking to license technologies do so on a global rather than a local basis. Any returns through royalties and sale of equity tend to be invested in building research capability.

It is now being appreciated that the importance of higher education to regional development through knowledge transfer is in research cooperation and collaboration and in education and training of *human capital* in partnership with businesses. Addressing the 'skills crisis' through employer engagement strategies is regarded as a high priority in the UK (Great Britain. Treasury, 2006). Universities are becoming much more interested in engaging with industry and the community to support their teaching and research missions.

8.4 Biotechnology

Biotechnology is an enabling technology that has substantial application in a wide range of industries – but specifically in animal and plant production, food, pharmaceuticals and health services. Biotechnology needs to be seen in terms of its contribution to commercial and economic outcomes across industries (as reflected in employment growth, sales, and wealth creation generally) and to human health outcomes (reflected in change in clinical practice and improvement in clinical outcomes). Application of biotechnology-based discoveries in the treatment of diseases and medical conditions also provides scope for reduction in health care costs[9].

A biotechnology cluster is a 'geographical concentration of actors in vertical and horizontal relationships, showing a clear tendency for cooperating and of sharing their competencies, all involved in a localised infrastructure support' (Chiesa and Chiaroni, 2005). Within this framework the key features of a biotechnology cluster have been defined as:

- Formal input-output relationships along an industry value chain.
- Buyer seller linkages in a 'market' for knowledge.
- Geographic concentration of firms.
- Shared specialised infrastructures.

Not all of these relationships and linkages occur in the ACT Region—or anywhere else in Australia for that matter.

More than 100 cities in the world are pursuing biotechnology related economic development agendas. However, the experience of the last several years is that 'even successful biotechnology industry clusters have produced only modest returns to their regional economies'. In the United States for example, in the two largest concentrations of biotechnology activity (Boston and San Francisco) none of the largest biotechnology firms is among the region's 25 largest employers (Cortright and Mayer, 2002).

[9] It is now understood that stand alone biotechnology companies are not, on average, significant employers and few reach profitability. Many are set up as vehicles to own and/or license a technology to other companies along an industry value chain – or simply to be 'harvested' when they have a realisable value.

Most biotechnology firms are quite small and they typically contract with global pharmaceutical companies to produce, market and distribute successful products rather than attempting to create their own capacity to do so.

Following the end of the technology bubble, there is a realisation that communities and regions are unlikely to create wealth through blockbuster biotechnology related drug discoveries and the rapid growth of a bio-pharmaceutical manufacturing industry.

This context suggests that there might have to be a new way of thinking about the contribution of biotechnology to economic and business development in the ACT.

8.5 Demand for security solutions

Organisations and governments today confront potential security threats that didn't exist a decade ago, or, if they did, were not seen as such a pressing concern. These security threats are global and their effects impact individuals on a daily basis.

There are a broad set of political, economic and consumer forces that impact the security 'ecosystem'. The most effective solutions are going to be those formed through collaboration across interests, sectors, borders and geographies.

They apply across a wide range of industries and relate to biological, chemical and physical risks.

Protocom (now ActivIdentity), like the Distillery, is a Canberra based company that provides identity assurance solutions for business and government worldwide. The company now has its headquarters in the United States, but maintains its Asia Pacific headquarters in Canberra, along with a large research and development capability.

ActivIdentity Corporation

ActivIdentity is now the trusted provider of identity assurance solutions for the enterprise, government, healthcare, and financial services markets worldwide. The company provides the only fully-integrated platform enabling organizations to issue, manage and use identity devices and credentials for secure access, secure communications, legally binding digital transactions, as well as smart citizen services.

ActivIdentity customers experience multiple benefits including increased network security, protection against identity theft and online fraud, enhanced workforce productivity, business process efficiencies, and regulatory compliance.

ActivIdentity® solutions include Smart Employee ID, Enterprise Single Sign On, Strong Authentication, Secure Information and Transactions, and Smart Citizen ID. ActivIdentity products include SecureLogin® SSO, ActivClient™ smart card middleware, ActivID™ Card Management System, 4TRESS™ AAA Server, one-time password (OTP) tokens, and ActivKey™ USB tokens.

More than 15 million users and 4,000 customers worldwide rely on solutions from ActivIdentity. Headquartered in Fremont, Calif., the company has development centres in the United States, Australia, France, and sales and service centres in more than ten countries.

The Australian Government's demand for securing solutions provides major opportunities for business development in Canberra and the ACT Region. As indicated earlier in the study, the University of Canberra has a major focus on security issues and is in a collaboration with Unisys and the Department of Immigration and Citizenship (DIAC).

8.6 Government procurement practices

There are indications from the UK and Europe that governments are looking towards sourcing innovation in their tendering and procurement practices. This follows from practice well established in the corporate sector where companies use purchasing and strategic alliances to source innovation capability (Linder et al., 2003).

In Europe the Aho Report on *Creating an Innovative Europe* suggested that "if Europe cannot offer innovation friendly markets for the creative outputs of its business, then these will go elsewhere". The Report called upon governments to "use public procurement to drive demand for innovative goods while at the same time improving the level of public services".

The EU has stressed the importance of public procurement in driving demand for innovative products and services while raising the quality of public services in markets where the public sector is a significant purchaser. The public procurement Directives are seen to offer scope for innovation-oriented tendering and, properly applied, may allow the purchase of innovative products and services, without compromising competition.

Sourcing innovative products and services would invite suppliers to provide innovative solutions rather than specifying in detail, and at length, what the competing enterprises should supply. A "technical dialogue", would allow contracting authorities to engage—even before launching a procurement procedure—in a dialogue with potential bidders on their needs and the most efficient ways of meeting them.

The possibility of drawing up "technical specifications" in a broad and functional way, rather than prescribing a concrete solution, allows bidders to propose creative service concepts to the problem to be solved.

The "design contest", which is typically service-related and where the procurer can acquire the plan or design selected by a jury, can be a powerful means of developing and testing new ideas giving firms room to develop solutions making optimum use of the market's creativity.

Governments are in a unique position to support service innovation by acting as launch customers. Their challenge is to match innovation objectives, which involves uncertainty and risk, with the current guidelines that focus on accountability and control and prevention of the misuse of public funds.

There are opportunities to address these issues through collaborative research programs between university research centres in Canberra and agencies such as Finance and Administration, the Public Service Commission and the Auditor General's Office. Research should provide the evidence of productivity gain through innovation focussed procurement as well as addressing risk and probity issues.

8.7 Centralisation of government administration in Canberra

Associated with possible developments in procurement practices, and the preference of both sides of politics for greater Commonwealth involvement in all aspects of Government, there will be a progressive growth in Australian Government employment in Canberra.

To the extent that this growth is associated with service delivery, the mere fact of distance will call for innovations in management, organisation and service delivery. The Government may look to suppliers to assist in the innovation process.

Increasing employment in the government sector is likely to further stimulate demand for cultural consumption and provide opportunities for the development of the cultural and creative industries in Canberra.

9 Key issues to address

Canberra's competitive strengths lie in a number of areas:

- In the emerging ICT, art and creative practices sector. There are opportunities to build on this strength and establish a pre-eminent position in Australia and internationally as a centre for art, design and ICT enabled creative businesses.
- In national collections and conservation
- In education and research

Canberra's competitive advantage in this sector flows from a strong local base in creative consumption, driven by the relatively high incomes and educational attainment of its local community. To reach full potential, there are a number of issues that need to be addressed.

9.1 Creating critical mass

Canberra and the ACT is characterised by a few large businesses and a large number of small start-up and emerging businesses, particularly in the ICT and creative content sectors—which together provide a powerful basis for a vibrant knowledge based economy.

Creating the opportunities for growth requires building stronger business networks and addressing, and overcoming, the inherent problems associated with the 'procurement' culture of the Australian Government—a culture that makes building long term business relationships particularly difficult.

Consistent with Canberra's distinctive capability as an international and outward looking city, critical mass will emerge through events and showcase occasions that draw businesses together to market

and engage nationally and internationally with customers and suppliers. As argued earlier, collaboration is likely to emerge in an expanding market rather than a market with thin pickings for a large number of competing players.

The ACT Government, with the support of Austrade, takes an important role in building profile and opportunities for ACT businesses in overseas markets.

Consultations and conversations undertaken during the study indicated that people will not meet and 'network' unless there is a clear purpose and prospective business opportunity—or in some cases, the prospect of receiving a government grant or a subsidy. Leadership rather than structures are more important in this regard.

9.2 Leadership

Leadership needs to come from lead businesses—businesses that have found success in Canberra and whose continuing sustainability and viability in Canberra relies on lifting the performance of all businesses in the region. Companies such as CEA and Tower have been making an important contribution in this regard.

Leadership also needs to come from higher education institutions in building human capital through their research and teaching programs and taking initiatives in cooperative and collaborative ventures with the business community and government. NICTA provides an important example of this collaboration, but there are many more opportunities.

Looking around the world, leadership in knowledge based regional development contexts rarely comes from government, or from industry bodies telling government what it should be doing. Leadership comes from *people* with a vision and a commitment for the future and a willingness to 'get their hands dirty' in guiding the development process.

Leaders may be located in higher education institutions, in business, or in the non-government sector. It is important, however, that they are able to commit the time and resources of their institutions to the development path.

9.3 Building a culture of collaboration

Canberra is a major centre for research and teaching. While it is the case that a great deal of research is of a fundamental nature and has an international focus, there are also opportunities for a much higher level of knowledge transfer not only in the sciences and engineering, but also in the humanities, arts and social sciences (HASS). HASS research forms a major component of the overall publicly funded research effort in Canberra.

It is of interest, and also of relevance, that the European Commission has recently introduced a new theme (Theme 8) into its latest Framework Program designed to provide 'a new knowledge base for policies in these and related fields: that is, a policy-relevant knowledge base informed by the humanities and social sciences (European Commission, 2007). Research carried out under Theme 8 is intended to be collaborative, across countries, and across disciplines.

The arts, humanities and social sciences are being expected to reflect on and offer orientation with regard to values and developments in society and, towards this end, engage in problem oriented research clusters.

Collaboration and interactions between business, government and higher education must recognise the contribution of the HASS sector as well as 'the sciences' and engineering. In many jurisdictions discussion of knowledge based economic development has moved from 'the science base' to the 'research base'.

The challenge is being taken up by universities and research organisations, such as the CSIRO, wishing to take on a greater role in the economic, social and environmental development of Canberra and the ACT region.

Again, collaboration involves people, who in turn, are influenced by their beliefs and attitudes which are in turn influenced by past actions and behaviours built up over time. Changing attitudes means changing and improving channels of communication and understanding the way in which people *receive* communication. This can occur in a variety of ways—but new structures and committees are not necessarily the best way of going.

Existing structures, such as alumni associations can provide environments where people from business, government and the academy meet. Building *trust* between institutions, and respect for divergent mission and purpose, is the foundation of collaboration and partnership.

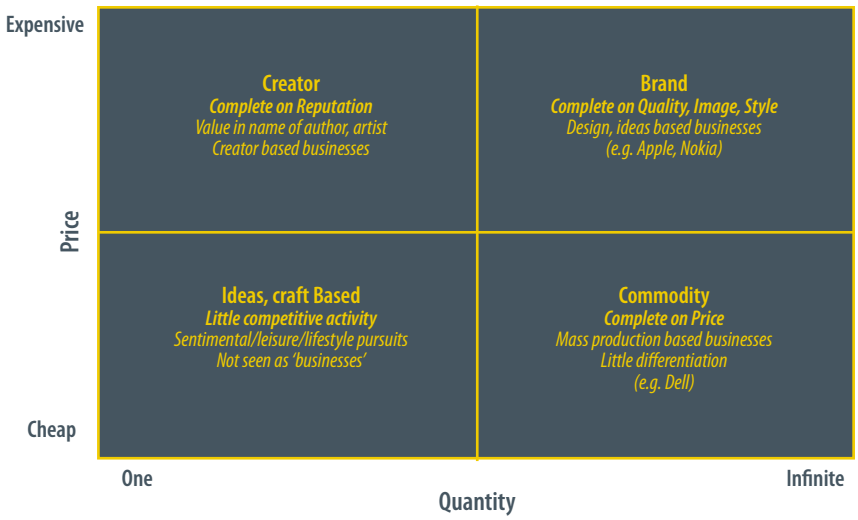
9.4 Building business capability in the creative industries sector

The demand for creative products is local, national and international. However, the market structure is complex, with many craft based businesses relying on government assistance and subsidy for ongoing viability. Many entrepreneurs are not working full time, subsidising their work through part time employment.

Some businesses are able to sell product for a higher price based on a reputation built up over many years. Others seek to mass produce items and sell for a low price. A few businesses commit to creating a brand that is associated with quality and prestige. A representation of the creative industries market structure is provided in Figure 7.

Figure 7: Creative industries market structure

Creative Industries Market Structure



Source: Craig Bremner, school of Design and Architecture, University of Canberra

The challenge for policy and innovation is to transform ideas and craft based businesses into larger, more viable and sustainable businesses built on the basis of brand and/or the reputation of creators and artists. Assistance and support through an innovation centre would provide the foundation for building skills and capabilities in this area. This is discussed in more detail in 11.2 below.

9.5 Support for new business development

As indicated earlier in the study, addressing the 'gap' between invention and innovation requires not only money but also people and time.

In a corporate environment new business/product development is provided at three levels:

- Support for the nurturing of 'ideas'
- Support for turning ideas into 'experiments'
- Support for turning experiments into 'ventures'

At each level there are increases in financial and business support. Progression from one level to another requires a rigorous 'go or no-go' assessment.

There are many articulations of this framework including various 'stage gate' approaches in the innovation literature.

Government, business and higher education institutions should develop a business support model on a portfolio basis around this framework, based on the achievements of the Knowledge Fund, Epicorp, Canberra Business Angels and the Canberra Business Development Fund.

9.6 Resources

Innovation investments require resources. As innovation is essentially a business issue, it does not follow that Government should be the only resource provider.

Resources for innovation investments should be based on partnerships between business, higher education and government except where there is clear evidence of market or 'system' failure. These failures occur in the areas of:

- Small business start-up—based on exploitation of innovative (untested) ideas and technologies
- Skills requirements—technical and professional
- Infrastructure projects—with substantial and external benefits.

9.7 Out-migration of skilled people

According to a 2005 survey undertaken in Canberra by the Institute of Chartered Accountants, 57 percent of people under 30 planned to spend the bulk of their working life outside Canberra.

The Institute reasoned that skilled young people are lured to other centres to follow career opportunities rather than explore local opportunities. This is, of course, a feature of the 'knowledge worker' phenomenon and a highly mobile workforce.

The accounting and other professions have had difficulty in finding and retaining staff. ICT companies have been actively recruiting graduates from universities outside Canberra to meet their requirements.

The issue might not be so much discouraging people to leave, as broader national and international experience is important for professional careers, but to encourage people from other centres to locate—and return to Canberra.

9.8 Policy issues

Many researchers and commentators have commented about the absence of a strategic framework to address innovation in Australia.

The Victorian Government has proposed a National Innovation Agenda (NIA) for a coordinated national approach to boosting Australia's innovation system, productivity and economic growth prospects. The NIA Proposal identifies five key actions areas for Australia:

- increasing business innovation
- providing the infrastructure to enable innovation
- developing skills for the innovation economy
- creating a better regulatory environment for innovation and
- forging better connections and collaborations.

Victoria envisages that the NIA Proposal will form the basis for national consultations that arrive at an agreed way forward for the NIA—ideally through COAG. In order to inform and stimulate debate surrounding the National Innovation Agenda, the Victorian Department of Innovation, Industry and Regional Development will be progressively releasing NIA Discussion Papers through 2007-2008.

Policy frameworks are developing around linking research organisations, government and industry. Governments are thinking about creating appropriate 'institutions for engagement' to build connections and relationships between research and teaching, industrial application and government support and assistance.

The Commonwealth and most States/Territories do not have a coherent policy framework for supporting creative industries. Most jurisdictions provide a great deal of support for the arts—but this is essentially art and craft based. This is good, but it needs to go a step further and link art and creative practices with the more commercial aspects of building a creative industry sector that creates wealth not only for creators, but also the economy.

10 New visions for Canberra

During the discussions and consultations for this study several 'visions' for Canberra going forward into the future were identified. Some of these are well known, whilst others reflect the opportunity to take advantage of the emerging trends identified in earlier parts of this study.

10.1 A centre for a technology, arts and creative practices industry

As the cultural content of digital products and services grows in relative importance to the more purely technical content, Canberra offers a truly distinctive capability.

The National Research Council of the US National Academies has pointed out that if a company is making chips or operating systems then it makes sense to be located in a strong engineering cluster. However, if a company is making digital movies, it may be an advantage to be located in a cluster of artists, actors and musicians (Mitchell et al., 2003).

Canberra has strengths in these areas in addition to substantial computing capability and optical fibre connections. However, giving effect to the vision may require some substantial investments in facilities and in attracting top talent.

During the consultations for the study, suggestions were made for an MIT style Media Laboratory. A focus of such a facility could be on the emerging discipline of *interactive design*.

MIT Media Lab

The MIT Media Lab is in the School of Architecture and Planning at the Massachusetts Institute of Technology. It was founded by MIT Professor Nicholas Negroponte and former MIT President Jerome Wiesner and opened in 1985. It grew out of the work of MIT's Architecture Machine Group, and remains within MIT's School of Architecture and Planning.

A large number of research groups focus on topics related to human computer interaction. This includes traditional user interface design, working on adding sensors and actuators of different sorts to common objects in the environment to create "intelligent objects" that are aware of their surroundings, capable of predicting the user's goals and emotional state, and so can assist the user in a more effective way.

The Media Lab also does research into integrating more computational intelligence into learning activities. This includes software for learning but also "smart" educational toys such as programmable bricks like the PicoCricket. A number of groups are pursuing hybrid art-engineering projects, in developing new tools, media, and instruments for music and other forms of art.

Research at the Media Lab is very creative. There is a great deal of hands-on building of demos and prototypes, which are then tested extensively and put through many iterations to see what happens when they are used.

It is not however, a matter of starting from first base. Canberra is already well connected digitally nationally and internationally through an optical fibre 'pipe' that runs through various parts of the City. This digital connection combines with Canberra's socio-cultural connections through global businesses, new Canberra based exporting businesses, national collecting institutions, diplomatic missions, and the universities.

10.2 A 'connected city'

Canberra is an ICT intensive city. It is the location of Australia's largest mainframe computers—and has the largest installed capacity for any city in the Southern Hemisphere. There is also a high level of national and international connectivity through optical fibre.

ICT installations stimulate the hardware, software and service dimensions of the ICT industry. Global ICT businesses have a presence in Canberra to market products and services and local suppliers have developed and evolved—some also into global businesses.

ICT connectivity provides major opportunities for creative and digital content businesses to distribute and *export* products nationally and internationally. However, on-line distribution makes face-to-face marketing and business development critically important. It is very difficult to build trust based business relationships over the Internet.

Canberra companies in the ICT and digital content businesses spend large amounts of time travelling nationally and internationally for the purpose of marketing, business development and negotiating deals. Once deals are done, however, it makes little difference where the software is developed, distributed from, maintained and serviced. Canberra has particular advantages as a location for innovative software development in business and creative content and service.

A vision for Canberra as the "Connected City" developed by AEEMA is represented below.

Canberra – The Connected City

- Building on the TransACT Communications base, connect with automobiles, public transport, Parliament House, cultural institutes – establish an ICT industry, infrastructure-focused cluster
- Key stakeholders include the Australian and ACT Government, TransACT, Action Buses, ICT service providers, universities, R&D institutes, APAC, TAFE, cultural institutions, schools, the ACT's high tech & other businesses, industry associations such as AEEMA, & the Canberra residents
- Establish a territory-wide standard for broadband, defined as 1.5Mb/s - 4Gb/s, always on, band-width on demand
- Position Canberra as one of the world's best connected cities and attract new investment from elsewhere in australia and overseas
- Utilise building of advanced ICT infrastructure as the principal driver for diversification of the ACT economy

AEEMA

A consortium of partners has combined to come up with a *Canberra Technology City* (CTC) proposal. The consortium includes ActewAGL, Technical Real Estate (a developer and owner of the Data Centres); Galileo Connect (a UK-based world leader in engineering and designer of future-proofed Data Centres) and CB Richard Ellis (global property and leasing services).

The ACT government has allowed ActewAGL to lease a 21 hectare block of land in Hume for the development of a gas-fired power station as an integral element of the initiative. The initiative aims to develop a world-first data centre campus to create a comprehensive, long-term data solution for Australian and international organisations.

Canberra Technology City

Statement by the Chief Minister, 15 October 2007
"Canberra, as the nation's capital and a world leader in the field of information technology, is an ideal location for such a development," Chief Minister Jon Stanhope said today.

"The CTC proposal would deliver many benefits for the ACT, making us leaders in data centre infrastructure, facilities and services and attracting high-value data centre tenants, such as global financial institutions and their skilled workforces."

The gas-fired power station would sell electricity to the 'mission critical' data centres, which would be leased to commercial customers.

A data centre is a facility consisting of large computers that process business transactions and exchange data between companies and customers.

The proposal for a data centre campus in the ACT has been driven by a sudden and dramatic shift in demand in the last two years. This demand has been driven by computer hardware power requirements rapidly exceeding the limits of old data centres, and by data centre tenants demanding secure facilities that are designed and engineered to be upgraded and expanded whilst they remain in full production.

The direct sale option over a 21-hectare site opposite the Mugga Lane landfill, 600m west of the Monaro Highway, will be available for 12 months, during which time ActewAGL will undertake further investigations and obtain any approvals necessary for the development. If agreed, construction of the facility is scheduled to start early in 2009.

10.3 An international city of design

The market to attract investment and tourism is highly competitive. However, Canberra is well placed to build on current facilities to develop a city brand based on the uniqueness of its design and architecture.

Canberra can be positioned as an International City of Design. It is a city internationally known for its unique design and unique cultural infrastructure network through national collecting institutions and its embassies and high commissions. Canberra is also a perfect site for national/international events celebrating contemporary design and architecture.

A strategy to position Canberra as an International City of Design would involve the following actions:

- Seek UNESCO City of Design status
- Lift the profile of the Canberra Biennial

- Establish a graduate school of design
- Advocate for a national design museum
- Encourage the national design industry association to take a higher national profile and locate in Canberra.

Actions that can be put in place to develop this city brand are canvassed in Attachment A.

10.4 An international centre for conservation management and practice

Canberra is Australia's national centre for cultural and collecting institutions. These institutions have an international focus and exchange materials in their collections for exhibition around the world.

Collecting institutions do not have a strong research profile, although they do have substantial research outputs. In the UK, cultural institutions can access research funding through the Arts and Humanities Research Council. In Australia, institutions do not have access to funds from the Australian Research Council—except as an 'industry partner' in ARC Linkage grants.

There is scope to build stronger relationships between the ANU and University of Canberra and the national cultural and collecting institutions with a view to establishing international linkages and positioning Canberra as an international centre for research on cultural and collections management.

10.5 Australia's 'education' capital

Canberra is the exemplary knowledge economy. It has a world class research university that educates and trains researchers who work in knowledge and technology intensive government agencies and businesses.

It has a well established and highly regarded applied research and teaching university that produces graduates educated in the professions, applied sciences, sport and military studies. It is also the location for one of Australia's best vocational education institutions that produces top graduates for the creative industries. The AIE also produces highly regarded graduates.

Canberra has not seriously addressed the international and national market for education services as an economic development strategy. Development and implementation of an education strategy would require the collaboration between universities and research organisations, business and government. It would be a project for the proposed *Innovation Canberra* initiative foreshadowed in Section 11 below.

Canberra's education capability also provides a rich resource for meeting the education and training needs of government agencies and knowledge intensive businesses that are established and can grow in the ACT and region. Strengths in education include the following:

- Fundamental research – global centre of excellence – top faculty and students in areas of existing strength.
- A major centre for research in public policy, public administration and public finance, governance and innovation.
- Art, design and architecture education—at the ANU, University of Canberra and the Canberra Institute of Technology.
- Education and research for international role, particularly in international relations, defence, and languages.

10.6 Sustainable City

Sustainability is integral to the ACT Government's vision for a future Canberra. On 27 March 2003, the Chief Minister launched *People Place Prosperity: a policy for sustainability in the ACT* (ACT Office of Sustainability, 2003). The policy sets out a number of sustainability principles that the ACT Government will incorporate into its systems and operations. These include:

- Embedding sustainability within its decision-making processes.
- Promoting sustainability to the wider community.
- Developing partnerships for sustainability with the ACT community.
- Developing indicators and reporting regularly on progress.

CSIRO, through the Sustainable Communities Initiative is working with the ACT Government in exploring how to create a more sustainable Canberra. Canberra developers have also made commitments to sustainability objectives and outcomes that have also incorporated innovative solutions to energy and emissions.

Inaugural Keep Australia Beautiful ACT Sustainable Cities Awards

12th October 2005

Planning Minister Simon Corbell has congratulated the Canberra International Airport Group on winning the Sustainable Buildings category of the inaugural Keep Australia Beautiful ACT Sustainable Cities Awards.

"The Canberra International Airport Group developed Australia's first Five Green Star rated building at 8 Brindabella Circuit, demonstrating a commitment to innovation and leadership in environmental sustainability," Mr Corbell said.

"8 Brindabella Circuit is a tangible demonstration that environmentally sustainable development is cost effective and commercially viable. It has achieved commercial outcomes while incorporating recycling and innovative environmental systems used to reduce waste and the consumption of finite resources and an impressive list of environmental firsts."

Mr Corbell said the Sustainable Cities awards program recognised the role private sector, government bodies and the community played in environmental improvement, particularly through good planning and design.

"The Sustainable Buildings category encourages builders and developers to seriously consider the benefits of sustainable building practices. These can be through building material selection and by using designs increasing a building's day to day environmental efficiency," Mr Corbell said.

"The ACT Government is pleased to sponsor this category through the ACT Planning and Land Authority as part of its efforts to encourage builders and designers to use ecologically sustainable approaches to development."

Mr Corbell said among the environmental outcomes of 8 Brindabella Circuit included significant reductions in carbon dioxide emissions and energy use, reductions in potable water use, and substantial recycling of building materials—features worthy of replication in other developments within Canberra.

10.7 Issues and implications

Realising a vision for the future needs a champion—otherwise it will remain an aspiration, or simply a mantra. In a strategy and policy sense, a vision is a call to action. It requires leaders and leadership and willingness to be involved.

There has been a tendency in regional and local economic development to 'talk things out'. Great ideas become lost as people and organisations respond by identifying all the problems that would be involved if a particular course of action is adopted. Capturing enthusiasm and commitment is difficult—particularly in Canberra. Leadership is required to build and guide consensus.

In Canberra people do not want to draw attention to themselves because this might be seen adversely, or not taken seriously, by commentators and pundits from outside the City. But, development and growth does not mean thinking up new ways to attract people to live in the city. *Canberra* is the attraction based on its strong architectural and design foundation, its strength in culture and creativity, career opportunities in knowledge based businesses and an excellent education sector. .

Canberra needs to lose its 'inferiority complex' and build on its distinctiveness and place *in the world* as Australia's national capital and a great place to live. It is already internationally connected and can become not only a centre for government but also a centre for the arts and sciences and a leader in creativity.

It cannot expect the ACT Government to invest in building innovative and creative capability on its own. Implementation will necessarily involve partnerships and collaborations with industry, with education institutions and with the Commonwealth. Above all, it will require leadership from Canberra's knowledge businesses and education institutions.

The visions outlined in this Section have been identified during consultations and conversations for the study. They require further development and refinement into strategies and priorities—taking into account commitment and resources. These are tasks for the proposed *Innovation Canberra* initiative outlined in the following Section.

11 Actions and initiatives

This Section of the Report outlines a number of actions and initiatives that could be followed by government, industry, the education sector and the community in pursuing knowledge based economic development opportunities that would build international competitiveness and growth.

11.1 Establish leadership and direction

The study has identified a number of opportunities and directions for Canberra to develop and grow on the basis of innovation. Capturing opportunities and setting directions involves defining strategies and allocating resources to areas where they will deliver the greatest economic, social and cultural benefit to the current and future residents of the ACT.

As argued earlier in this Report, innovation is an activity that businesses should focus on as part of their development and competitive strategies. Businesses, in an industry context, have an interest in ensuring that necessary infrastructure and resources are available to ensure sustainable growth. Universities and further education institutions have a role in providing the education and training for people who will work with existing businesses or start new enterprises. Government can assist where there are innovation 'system failures' such as access to critical areas of expertise, advice, funds to nurture and experiment with ideas and business concepts.

Innovation is a benefit to business, as well as to the economy and the community. It follows that innovation and knowledge based economic development should be approached on a collaborative basis, with government *as a partner* with industry and the education sector. Innovative regions

around the world are associated with strong leadership—but that leadership comes from *people* in industry and/or the education sector.

It is therefore proposed that an entity, tentatively termed *Innovation Canberra* be formed, with the following broad functions:

- Identifying strategies that will lead to the development of the ACT as a national and international centre for innovation.
- Leading, driving and coordinating actions and projects requiring the collaboration of industry, government and research organizations.
- Building high level strategic links domestically and internationally to support the implementation of innovation related strategies.

In the context of the innovation capabilities in the ACT, *Innovation Canberra* should have a focus on a broad range of strategic directions including:

- Arts and creative practices industries;
- Architecture and design;
- Culture, conservation and collections;
- Information industries, including mainframe computing and data centres; and
- Education, research and development—particularly in those areas that relate to Canberra's role as a national capital and centre of government, national collections, and international relations.

There are already forums that focus on the Defence industry in Canberra, such as the Australian Industry Defence Network.

In cooperation with ACT Tourism, *Innovation Canberra* would have a role in profiling Canberra as a tourist destination. *Innovation Canberra* should *not* be seen as a government committee.

Recommendation:
An entity, tentatively termed Innovation Canberra, be formed to provide leadership and direction in the development and implementation of knowledge based innovation strategies for the ACT and surrounding region—with a particular focus on the ICT and the arts and creative practices sectors.

Innovation Canberra should consist of members drawn from all sectors of the innovation economy—including large and small business in the technology and creative sectors, arts and culture organisations, research and teaching organisations, industry and professional associations and government.

Recommendation:
Innovation Canberra would consist of members drawn from business, creative, education and government sectors

A key criterion for membership of the company would be leadership and commitment to the economic, social and cultural development of the ACT.

It is envisaged that members of *Innovation Canberra* would join on the basis of willingness to *become involved* in the activities of the entity and commit time to its work through membership of project committees and steering groups. Reading and commenting on papers prepared for company meetings is not considered to be a sufficient commitment.

Innovation Canberra should be supported by a CEO and staffed by people with knowledge of the ACT economy, its institutional features, and an ability to work effectively with company members. The ACT Government should provide seed funding for the Secretariat.

Members of the company should contribute an annual fee to cover the costs of overheads and basic operations. Additional income should be earned through sponsorship and events.

Recommendation:
Members of Innovation Canberra be required to contribute to overhead and operating costs, with the ACT Government providing seed funding for start-up costs.

Innovation Canberra would have a role in nurturing 'communities of interest' relevant to growing the innovation capability of the ACT. The following areas were identified during consultations:

- Art and creative practice industries;
- Film;
- Games;
- E-government;
- Human performance monitoring; and
- Government contracting.

An initial task for innovation Canberra would be to develop a strategic agenda of projects to advocate and promote. These are canvassed in Section 10 above. Many of these would have an international focus, including the idea for an MIT style media laboratory.

Recommendation:
Innovation Canberra be tasked to develop a strategic agenda of major projects and initiatives and advocate, promote, and seek funding support from industry, higher education and government—locally, nationally and internationally.

11.2 Build a framework for new business support

Innovation occurs through a process of "ideas⇒experiments⇒ventures" (Hamel, 2000). A framework for business support and development will involve a 'portfolio' of arrangements that can provide assistance and support for new and emerging knowledge intensive businesses. This portfolio would cover:

- Support for the nurturing of new ideas through an 'ideas fund';
- Support for taking ideas to practical application through experiments and pilot testing in a business development centre; and
- Providing support for the transition to 'business venture'

Aspects of this portfolio approach are outlined below.

Establish an 'ideas fund'

In a corporate environment, businesses have funds to encourage and support people who have promising ideas to take them to a stage where a concept is developed and articulated. People working outside a corporate environment do not have ready access to this support.

There are many government programs that provide assistance and support for newly established businesses that are trading, or showing potential to trade. However, the Commonwealth does not provide support and assistance for businesses that have not been formed, but where there are promising ideas that could become business ventures with additional thought and review.

Moreover, where ideas emerge outside a corporate environment, such as in universities and the Canberra Institute of Technology, in research organisations, or in other creative contexts, there is limited assistance and support available to develop those ideas to the next stage of commercial realisation.

Developed concepts move to the experimental, or 'proof of concept' stage which may attract the interest of early stage venture capital funds—who take it to the stage of a promising business venture through investment of funds and the expertise of the venture investor. Funds are used at this stage for experimentation, as well as establishing a corporate entity and, if necessary, securing IP.

An Ideas Fund would support 'ideas' businesses to a stage when ideas become products and services that customers might be prepared to purchase and pay for on a 'pilot' basis, or investable 'experiments' that will attract the interest of technology investors for further product development—e.g. ANU Connect, who will take them to the stage of being business ventures. Funds are required at this stage for scale up and meeting quality and reliability standards.

The level of funding to support ideas entities is not large. Funds would go to the person with the idea—not accountants, lawyers, or other business advisers. Fund managers and advisers would have a role in establishing contacts and connections with other businesses (for possible collaboration and partnership) and potential suppliers and distributors.

Recommendation:
The ACT Government establish an 'Ideas Fund' to nurture innovative ideas and concepts to a stage of development where they become potentially marketable products and services and are of interest to customers and/or technology investors.

Establish an innovation development centre

Many new product and service ideas with market potential require further refinement in the form of design and technology development to ensure that they are attractive to potential customers and that they operate in commercial contexts. Access to expertise and mentoring is as important as access to funding to develop products and services for promising start-up companies.

An *Innovation Development Centre* would assist *new and emerging* businesses develop by providing advice and assistance, facilitating connections and collaborations, providing business accommodation, and a meeting place. The Centre would provide a short term base for technology, arts and creative based businesses. Specifically, it would:

- Provide access to expert advice from industry and government sources;
- Strengthen links between businesses, research organisations and designers in making products and services more marketable;
- Promote the development and use of new technologies in new and existing businesses;
- Encourage businesses to expand their focus to national and international markets; and
- Attract new businesses to the ACT.

It would have a key role in taking ideas–based businesses to the next stage of demonstration of commercial potential—that is, to being 'investment ready' by investors (including venture capital investors) or 'market ready', in terms of viability and sustainability, for essentially cash flow businesses. Being market ready applies to businesses being established in the creative industries sector that are focussed on selling creative content.

The Centre would build on the track record established by Epicorp. It would be managed by a Board comprising representatives from industry, government and ACT based universities, research and teaching organisations. It would not, however, have a responsibility for providing early stage start-up or venture capital funding.

There is a strong argument for separating the funds management responsibilities of Epicorp from the 'heavy lifting' tasks involved in business development, and which would be executed in the envisaged Innovation Centre. Moreover, funds management roles are best undertaken at arms length from the institutions that provide the funds.

With a focus on design and creative products, national collecting institutions should be invited to participate in the Centre. Canberra's lead businesses, which potentially benefit from new products developed in start-up businesses, should also be invited to participate.

Recommendation:
The Epicorp incubation and enterprise development model be extended, in partnership with education institutions, research organisations, and national collecting institutions, into a Canberra Innovation Development Centre directed towards product development and scale up for technology and arts and creative businesses.

Support for the transition to a sustainable 'business venture'

Canberra is the base for a number of early stage venture capital funds, including ANU Connect Ventures, the Canberra Business Development Fund, Blue Core Ventures and the 'Business Angels' group. Epicorp has been a provider of seed funding for new ventures.

Venture capital investors, as the name suggests, invest in *business ventures*. They seek propriety products, experienced managers capable of managing rapidly growing firms, minimum investment thresholds and require extensive due diligence. From this perspective there are few individuals and businesses that start with the ideas and human capital necessary to secure venture capital funding.

These are not, of course, the general characteristics of the vast majority of "promising start-ups" – although many of these will develop into robust companies. Nonetheless, one of the most significant capability gaps in growing a business is executive management capacity and capability—and an understanding of how to grow a business through marketing, customer relationships and building the *organisational infrastructure* essential for long term sustainability.

Success does not occur overnight: it takes the typical business many years to develop the assets and the organisational infrastructure that eventually makes them leading players. These observations have been born out in our profiles of ACT businesses. Businesses benefit from expert advice and consultancy provided by experienced general managers, marketing executives, ICT managers, design professionals, architects, engineers, and other business practitioners. Industry experience is also relevant.

There is a strong argument for public program support to assist promising start-up companies grow into sustainable business ventures by facilitating access to the knowledge, skills and experience of people with a track record in business management and organisation. This support could be provided from an accredited panel of business advisers and consultants. The Institute of Management Consultants, and specialised professional associations (e.g. design, architecture, engineering) could be invited to assist in forming the panel.

Recommendation:
A program to support innovation strategy development in more developed and mature start-up firms be examined—for example, program support to cover the cost of advice and mentoring to assist firms develop innovation management strategies and the organisational infrastructure pertinent to their business models

11.3 Advocate for innovation in government procurement

As indicated earlier in this Report, Commonwealth Government Procurement policy is heavily oriented towards compliance, probity and value for money. This is appropriate from a taxpayer viewpoint. However, from an innovation and longer term productivity perspective, procurement policy should be directed towards obtaining the best and freshest ideas for policy, program design and service delivery. Tender documentation and assessment do not encourage suppliers to incorporate new ideas in proposals.

The UK Government has developed policies aimed at finding innovative solutions through procurement. It sees the benefits of such an approach in service delivery and to the economy. The Treasury Report *Transforming Government Procurement* highlights the important role that innovation plays in delivering quality public services at good value for money and the need for Government to work with suppliers to find the best solutions to public needs—even if they are not yet tried and tested (Great Britain. Treasury, 2007)

UK Innovation in public service delivery

Innovation, science and technology have driven businesses' quality and productivity improvements. To bring about the transformation needed to deliver high quality public services at good value for money, the Government will need to harness that innovation. This will require the Government to be more open to adopting an outcome based approach to procurements where appropriate – working with suppliers to solve problems rather than attempting to specify the precise solution at the outset.

It is much easier to evaluate the costs and benefits of a tried and tested product, rather than something that may not have previously been used in practice, or may not even exist at the time the Government first considers using procurement as a means of solving a complex delivery problem. However, if a new and better solution is already developed or could be made available, this might provide better value for money than a tried and tested product.

To be successful at using innovation as a means to improve value for money and public service delivery requires a highly skilled procurement function within Government.

To take full advantage of innovation across public services the UK Treasury acknowledges that a significant step-change in the Government's procurement capability in terms of skills, the framework in which procurement operates, and tools available to purchasers will be required.

There is scope for greater innovation in the procurement process in Australia as indicated by initiatives in Europe and the UK where there had been recognition of the damaging effect of 'new public management' on innovation. However, changes in processes and procedures should be based on evidence of what will work and what will not work. This requires research—and a research project directed towards innovation in government procurement may be of interest for an ARC Linkage grant.

Recommendation:
The ACT Government be a participant in a collaboration between Government and ACT universities in an ARC Linkage project application for innovation in government procurement. As one of the smaller jurisdictions a pilot study should be undertaken for the ACT public sector.

11.4 Position Canberra as an *international* city

Canberra has many of the features of an international city. It is the base for the Australian Government's policy responsibilities in international trade, foreign affairs, defence and law enforcement. It is connected through overseas diplomatic representation and representation of multinational corporations wanting to do business with government.

Canberra also has an international orientation through research and development agreements and collaborations as well as in the commercialisation of research which involves licensing inventions and technologies in an international marketplace. The national museums and galleries have strong connections with overseas collecting institutions.

International connections have also been established through human communication and are supported by strengths in electronic and digital communication.

This international focus will continue to be important in business development and growth in virtual environments—for example, in development of products and services that are software intensive such as digital media.

Actions and initiatives to position Canberra as an international city would include:

- Support for UNESCO City of Design status;
- Joint promotion and marketing of research and education capability.

Recommendation:
There is a need to develop a more progressive view and brand of Canberra, particularly in the domestic market. The ACT Government, together with industry through the Canberra Business Council, higher and further education institutions, the national collecting institutions, research organisations, and the Australian Government, develop a strategy to position Canberra as an international city of design.

Attachment A

Strategies and actions to establish Canberra as an international city of design and architecture

The strategies required to establish Canberra as an international city of design and architecture are outlined below.

Achieve UNESCO 'City of Design' status

This Brand can be capitalised by seeking UNESCO City of Design status—UNESCO accredits an international 'City of Design' brand. This would establish a network with other UNESCO accredited cities, including Berlin, Montreal and Buenos Aires and recognise Canberra and its unique beginning as a "designed city" on a global scale. It would also allow further international collaboration of achievements in the field of design.

UNESCO branding requirements are:

- Established design industry;
- Cultural landscape fuelled by design and the built environment;
- Design schools and design research centres;
- Practicing groups of designers with continuous activity at a national/international level;
- Design-driven creative industries;
- Experience in hosting fairs, events and exhibits dedicated to design.

UNESCO City Of Design Benefits

The goal of the UNESCO designation is to bring together public and private partners as well as civil society to help towards the development of creative industries and generate new forms of international cooperation.

Benefits of designation would include:

- Highlighting Canberra's cultural and design pedigree and assets on a global platform;
- Sharing knowledge across cultural clusters around the world;
- Building local capacity and training of local designers;
- Cultivation of innovation through the exchange of know-how, experiences and technological expertise;
- Promotion of diverse cultural products in national and international markets.

The new economy is quickly taking shape, giving rise to mass production and consumption of unique experiences, and cities that can effectively harness human creativity are at the heart of this evolution. Cities play an integral role in the transition toward a new economy because they harbour clusters that are essentially hubs of creativity with the potential to shape global demand for a city's local offering.

By providing a global platform for a city's local cultural assets, the network of UNESCO designated cities is facilitating access to know-how, information and experiences to all member cities as a means to promote the development of local cultural industries and to foster member cities' worldwide recognition.

Other benefits relating to Canberra as the nation's capital and the 'City of Design' include:

- Profiling the relationship between planning, architecture and urban design;
- Continuing the role of competitions in 'building' Canberra;
- Contributing to Canberra's centenary celebrations via symbolic recognition of the occasion with the creation of a significant new building for Canberra;
- Encouraging corporate support for Canberra's development
- Enhancing the role of the Capital in Australian national life
- Focusing attention on the history of design in the national capital;
- Education of the role and function of design in the Capital;
- Involving the national cultural institutions in exhibitions, debates and seminars on the importance of design in modern life.

Canberra is well placed to pursue designation as a City of Design.

Branding through the Canberra Biennial

Three cities, London, Beijing and Rotterdam, recently started Architecture and Design Biennials for branding purposes. Biennial festivals are innovative ways to attract new audiences, tourists, to animate the City and engage the public.

The Canberra Biennial has been conducted since 2005. It is owned and operated by the University of Canberra through the School of Design and Architecture and the Biennial Director and nucleus of expertise is provided by the University. The ACT and Australian Governments are partners, with other finding coming from diverse sources including sponsorship.

The Theme of the 2007 Biennial, to be held during November, is "Winning by Design: Designing for Sport in the 21st Century". A program has also been developed to coincide with the Centenary of Canberra (2013) and two major projects being considered by Canberra.

The Canberra Biennial aims to:

- Create an exciting and popular program encompassing a variety of issues including contemporary concern for design and architecture;
- Celebrate the contribution to contemporary life by architecture and design from around the world in ways that can be enjoyed by the widest possible audience;
- Present Canberra as the locale of advanced contemporary ideas of design and architecture;
- Promote cultural and economic awareness of the importance of design and architecture.

Canberra Biennial

The Canberra Biennial provides a unique opportunity to combine cultural and educational programs with long-term strategies concerning social, physical and economic developments of the city. It can creatively complement the nation's existing cultural festivals.

Programs include staging of events throughout the city to promote design competitions with the aim of contributing to the enhancement of the city's historic design infrastructure. This will ensure widespread national and local participation in the festival.

The 2007 program will create new partnerships for Canberra with international architecture and design centres. The Canberra Biennial will focus attention on the vitality of the urban design of Canberra and other Australian cities.

Core exhibitions are to be held in selected cultural institutions. Other institutions will be encouraged to mount satellite exhibitions related to the theme of each Biennial.

Specific benefits of the Biennial in the context of a 'City of Design' for the ACT are:

- An international cultural event to promote leadership in architecture and design;
- National and international cultural tourism;
- Promotion of community design and architectural awareness;
- Demonstration of the economic significance of design to Australia's business sectors and institutions;
- New strategies to help position Canberra as a major city of ideas;
- Employment creation, training and inward investment;
- Support for Canberra-based designers with specific projects that will showcase their work nationally and internationally;
- Provision of resources for research projects and design practice – to attract national and international students and researchers;
- Educational opportunities that will make learning from Canberra a means of improving understanding of design and its application to everyday life experience.

The Biennial can highlight Canberra as well as the University of Canberra and the ANU as centres for both design and educational excellence through associated promotions and leveraging opportunities.

The Biennial provides excellent linkages to the diplomatic corps, other universities and both the ACT and Australian Governments. The festival is a perfect vehicle for the University to become engaged with the local community.

At the moment the Biennial is conducted on a relatively small scale. There is an opportunity to scale up the Biennial through a greater commitment to planning, promotion, resourcing, and participation among cultural institutions and professional art, design and architecture associations.

Establish a Graduate School of Design

A Graduate School of Design would focus research and programs on using Canberra as a place to learn from.

Plan for a National Design Museum

Australia does not have a national design museum. This is a major gap.

The ACT Government and the design and architecture community should advocate for the establishment of such a facility in Canberra.

The Museum would be a place for exhibition, conservation, and research.

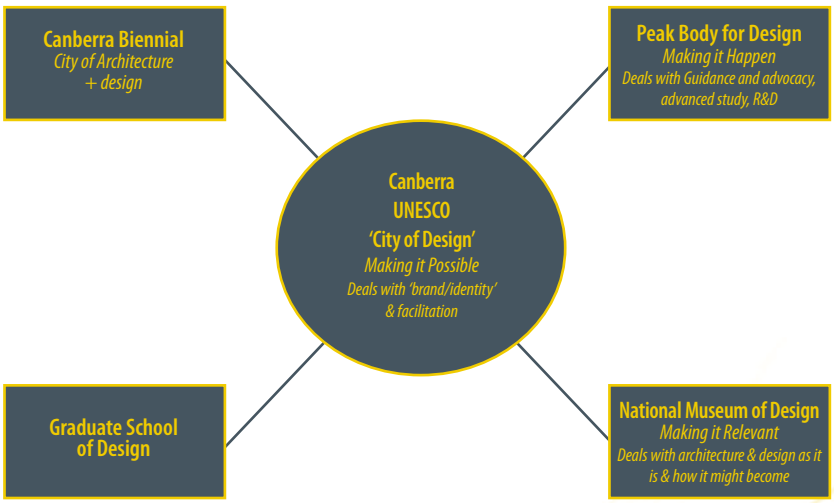
Establishment of a Peak Body for Design

The Australian peak body for Design, the Design Institute of Australia, has an important role to play in lifting design as a key component of Australia's creative capability and potential. It does not, at the moment, have a Canberra presence.

Overall framework

The strategy for establishing Canberra as a City of Design is reflected in the framework below.

Canberra as a City of design



Source: Craig Bremner, School of Design and Architecture, University of Canberra

The framework is very much at the aspirational stage, but with vision, foresight and engagement between institutions and organisations, the stage could be set for establishing Canberra as a global city for art, design, architecture and the creative industries.

Attachment B

Australian Government Contracts Gazetted for Procurement of Goods and Services in the ACT and Region 2006-07

Classified by ANZSCC Code

ANZSCC Code	ANZSCC Description	Contract Value	
0	**Agricultural, Forestry and Fisheries Products**		**267,572**
1	**Ores, minerals, electricity, gas and water**		**1,159,726**
2	**Food products, beverages and tobacco, textiles, apparel and leather products**		**5,418,772**
3	**Other transportable goods, except metal products, machinery and equipment**		**45,170,816**
31	Products of wood, cork, straw and plaiting materials		478,099
32	Pulp, paper and paper products; printed matter and related articles		31,204,744
321	Pulp, paper and paperboard	5,688,570	
322	Books, brochures and leaflets (except advertising material), printed; printed maps; music, printed or in manuscript	9,977,436	
325	Stamps, cheque forms, banknotes, stock certificates, postcards, greeting cards, advertising material, pictures and other printed matter	11,987,788	
326	Registers, account books, note books, letter pads, diaries and similar articles, blotting-pads, binders, file covers, forms and other articles of stationery, of paper or paperboard	614,076	
327	Composed type, prepared printing plates or cylinders, impressed lithographic stones or other impressed media for use in printing	127,834	
328	Newspapers, journals and periodicals	2,809,040	
33	Coke oven products, refined petroleum products		650,000
37	Glass and glass products and other non metallic products	1,369,417	

ANZSCC Code	ANZSCC Description	Contract Value	
371	Glass and glass products	1,369,417	
38	Furniture; other transportable goods		11,378,556
39	Wastes or scraps		90,000
4	**Metal products, machinery and equipment**		**188,706,776**
41	Basic metals		112,024
42	Fabricated metal products, except machinery and equipment		824,567
43	General purpose machinery		418,401
44	Special purpose machinery		23,619,960
45	Office, accounting and computing machinery		93,152,744
46	Electrical machinery and apparatus		4,641,795
47	Radio, television and communication equipment		8,832,134
48	Medical appliances, precision and optical instruments		2,865,109
49	Transport equipment		54,240,042
5	**Construction work and construction**		**133,118,676**
51	Construction work		70,540,414
52	Construction		60,036,913
53	Land		2,541,349
6	**Trade services, hotel and restaurant services**		**5,873,247**
61	Sale, maintenance and repair services of motor vehicles; sales of related parts and accessories		30,955
63	Retail trade services, repair services		77,390
64	Hotel and restaurant services		5,764,902
7	**Transport , storage and communications services**		**64,394,888**
71	Land transport services		1,028,534
73	Air transport srevices		1,269,932
74	Supporting and auxiliary transport services		7,215,758
75	Post and telecommunication services		54,880,664
8	**Business services; agricultural, mining and manufacturing services**		**3,145,667,141**
81	Financial intermediation services and auxiliary services		16,081,742
82	*Real estate services*		326,834,563
821	Real estate services involving own or leased property	308,356,778	
822	Real estate services on a fee or contract basis	18,477,785	
83	Leasing or rental services without operator		1,425,632,414
831	Leasing or rental services concerning machinery and equipment without operator	3,575,598	
832	Leasing or rental services concerning personal and household goods	1,422,056,816	
84	Computer and related services		374,994,534
841	Consultancy services related to the installation of computer hardware	8,822,721	
842	Software implementation services	51,534,441	
843	Data processing services	655,652	
844	Database services	14,613,332	

ANZSCC Code	ANZSCC Description	Contract Value	
845	Maintenance and repair services of office machinery and equipment including computers	4,387,911	
849	Other computer services	294,980,477	
85	Research and development services		23,214,201
851	Research and experimental development services on natural sciences and engineering	1,799,948	
852	Research and experimental development services on social sciences and humanities	21,295,340	
853	Interdisciplinary research and experimental development services	118,913	
86	Professional services		176,947,318
861	Legal services	32,159,736	
862	Accounting, auditing and book-keeping services	13,941,550	
863	Taxation services	349,246	
864	Market research and public opinion polling services	4,234,976	
865	Management consulting services	74,771,979	
866	Services related to management consulting	10,515,767	
867	Architectural, engineering and other technical services	40,974,064	
87	Business services n.e.c.		787,593,761
871	Advertising services	22,289,922	
872	Placement and supply services of personnel	188,024,908	
873	Investigation and security services	8,870,668	
874	Building-cleaning services	804,897	
875	Photographic services	1,192,363	
876	Packaging services	59,021	
879	Other business services	566,351,982	
88	Agricultural, mining and manufacturing services		3,288,324
89	Intangible assets		11,080,284
9	**Community, social and personal services**		**525,154,602**
91	Public administration and other services to the community as a whole		27,939,380
92	Education services - includes training		23,875,253
93	Health and social services		24,930,357
94	Sewage and refuse disposal, sanitation and other environmental protection services		1,342,758
95	Services of membership organisations		68,486,138
951	Services furnished by business, employers and professional organizations	68,322,870	
952	Services furnished by trade unions	163,268	
96	Recreational, cultural and sporting services		2,280,830
97	Other services		375,712,037
99	Services provided by extraterritorial organizations and bodies		587,849
			4,114,932,222

Classified by Agency/Department

Agency/Department	Contract Value
Administrative Appeals Tribunal	1,918,146
Attorney-General's Department	39,402,857
AusAID (Australian Agency for International Development)	35,144,880
Austrade (Australian Trade Commission)	6,157,396
Australia Japan Foundation	99,635
Australian Bureau of Statistics	17,985,067
Australian Centre for International Agricultural Research	743,112
Australian Communications and Media Authority	5,368,746
Australian Competition and Consumer Commission	14,380,700
Australian Crime Commission	9,113,735
Australian Customs Service	44,447,990
Australian Electoral Commission	1,734,365
Australian Fair Pay Commission Secretariat	544,477
Australian Federal Police	72,810,148
Australian Industrial Registry	8,790,599
Australian Institute of Family Studies	15,419,901
Australian National Audit Office	3,201,188
Australian Public Service Commission	6,290,348
Australian Radiation Protection and Nuclear Safety Agency	13,900
Australian Research Council	4,400,011
Australian Sports Anti Doping Authority	80,000
Australian Taxation Office	83,753,289
Australian Transaction Reports and Analysis Centre	489,064
Australian War Memorial	2,486,057
Bureau of Meteorology	790,536
Cancer Australia	243,475
Centrelink	132,704,926
Child Support Agency	72,687,169
Civil Aviation Safety Authority	13,382,330
Commissioner for Superannuation (ComSuper)	15,110,111
Commonwealth Director of Public Prosecutions	970,923
Commonwealth Grants Commission	122,229
Commonwealth Ombudsman Office	586,777
CrimTrac	696,317
CRS Australia	5,469,561
CSIRO	784,800
Department of Agriculture, Fisheries and Forestry	28,645,723
Department of Communications, Information Technology and the Arts	33,233,208
Department of Defence	2,392,009,319
Department of Education, Science and Training	17,581,240
Department of Employment and Workplace Relations	69,568,706
Department of Family and Community Services	29,293,217
Department of Finance and Administration	35,245,511
Department of Foreign Affairs and Trade	138,297,878
Department of Health and Ageing	140,288,632

Agency/Department	Contract Value
Department of Human Services	9,727,467
Department of Immigration and Multicultural Affairs (Retired)	242,545,584
Department of Industry, Tourism and Resources	35,055,218
Department of Parliamentary Services	23,382,473
Department of the Environment and Water Resouces	91,296,938
Department of the House of Representatives	1,599,089
Department of the Prime Minister and Cabinet	16,568,077
Department of the Senate	269,200
Department of the Treasury	15,376,893
Department of Transport and Regional Services	36,346,019
Family Court of Australia	3,508,124
Federal Court of Australia	88,167
Federal Magistrates Service	554,959
Future Fund Management Agency	645,125
Geoscience Australia	9,502,956
Human Rights and Equal Opportunity Commission	55,356
Insolvency and Trustee Service Australia	1,173,600
IP Australia	35,471,057
Medicare Australia	31,226,270
National Archives of Australia	2,343,900
National Blood Authority	1,344,827
National Capital Authority	6,030,343
National Competition Council	45,600
National Library of Australia	6,660,800
National Museum of Australia	3,028,125
National Offshore Petroleum Safety Authority	739,938
National Water Commission	1,507,728
Office of Film and Literature Classification	12,315
Office of National Assessments	7,258,238
Office of Parliamentary Counsel	299,617
Office of the Australian Building and Construction Commissioner	2,838,763
Office of the Official Secretary of the Governor-General	2,844,760
Office of the Renewable Energy Regulator	20,190
Productivity Commission	135,000
Professional Services Review	225,515
Questacon	20,000
Royal Australian Mint	1,088,132
The National Health and Medical Research Council	5,683,074
Therapeutic Goods Administration	6,737,982
Veterans Affairs	9,266,608
	4,114,932,222

Attachment C
Profile of Research and Development Expenditure in the ACT.

Overview

In 2004-05 almost five percent of all Australian R&D expenditure was invested in the ACT. Business expenditure on R&D made up almost 10 percent of the total but it was less than one percent of Australia wide business R&D. By contrast, the Australian Government invested 16.4 percent of its R&D in the Territory—through the CSIRO and other publicly funded research agencies located in the Territory.

The proportion of Australia-wide higher education R&D investment in the Territory amounted to 10.2 percent—mainly through the ANU.

The distribution of R&D expenditures among States and Territories is profiled in Table 21.

Table 21: Expenditure on R&D, by industry - by location: 2004-05

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Business	3,156,963	2,405,046	1,037,227	75,979	1,771,029	8,446,244	0.9
Australian Government	261,648	406,158	159,426	257,319	488,836	1,573,387	16.4
State/Territory Government	298,996	201,924	234,938	2,851	258,617	997,326	0.3
Higher education	1,192,817	1,052,611	715,574	437,420	884,359	4,282,781	10.2
Private/non profit	137,072	271,987	13,052	3,199	67,850	493,160	0.6
Total	**5,047,496**	**4,337,726**	**2,160,217**	**776,768**	**3,470,691**	**15,792,898**	**4.9**
Total publicly funded	1,753,461	1,660,693	1,109,938	697,590	1,631,812	6,853,494	10.2
Proportion publicly funded (%)	34.7	38.3	51.4	89.8	47.0	43.4	
Proportion business funded (%)	62.5	55.4	48.0	9.8	51.0	53.5	

Higher education

In the higher education sector, the ACT is established as a major centre of research excellence. Universities in the ACT receive just over 10 percent of the total Australian funding for research.

Table 22: Higher education expenditure on R&D by source of funds 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Australian competitive grants	197,378	190,629	96,702	65,292	189,636	739,637	8.8
General university funds	842,047	689,471	511,917	353,822	567,362	2,964,619	11.9
State and local government	24,757	37,950	31,038	3,432	50,947	148,124	2.3
Business	65,552	84,926	44,756	4,003	43,932	243,169	1.6
Donations, bequests & foundations	12,837	16,777	14,461	863	9,247	54,185	1.6
Other Australian	262	4,114	2	264	7	4,679	5.6
Overseas	49,984	28,744	16,698	9,745	23,197	128,368	7.6
Total	**1,192,817**	**1,052,611**	**715,574**	**437,421**	**884,328**	**4,282,781**	**10.2**

Most funding for research is sourced from general university funds. In the ACT in 2004 this proportion was over 80 percent, reflecting the role and structure of the Institute of Advanced Studies at the ANU. By contrast, support from state and local government amounted to 0.8 percent of research funds for ACT universities (compared to a national average of 3.5 percent) and support from business amounted to less 0.9 percent (compared to a national average of 5.7 percent)[10].

Table 23: Higher education expenditure on R&D by source of funds 2004 (proportions)

	NSW	Vic.	Qld	ACT	Australia Total
	%	%	%	%	%
Australian competitive grants	16.5	18.1	13.5	14.9	17.3
General university funds	70.6	65.5	71.5	80.9	69.2
State and local government	2.1	3.6	4.3	0.8	3.5
Business	5.5	8.1	6.3	0.9	5.7
Donations, bequests & foundations	1.1	1.6	2.0	0.2	1.3
Other Australian	-	0.4	--	0.1	0.1
Overseas	4.2	2.7	2.3	2.2	3.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

[10] Dat6a for 2002 indicate that business support for ACT universities amounted to $7.2m, representing 2.1 percent of total research funding)

While ACT Universities perform 10 percent of total higher education research in Australia, they perform 16.2 percent of pure basic research and 12.4 per cent of strategic basic research.

Table 24: Higher education expenditure on R&D by type of activity 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Pure basic research	402,982	285,441	130,961	199,801	210,611	1,229,796	16.2
Strategic basic research	235,953	255,164	161,784	121,846	204,062	978,809	12.4
Applied research	441,239	445,916	361,374	96,803	400,267	1,745,599	5.5
Experimental development	112,643	66,089	61,455	18,971	69,420	328,578	5.8
	1,192,817	**1,052,610**	**715,574**	**437,421**	**884,360**	**4,282,782**	**10.2**

Overall, 45.7 of research resources are devoted to pure basic research and a further 27.9 percent to strategic basic research. This commitment to research excellence and quality is a feature of the ANU and a source of competitive advantage for the ACT in attracting world class faculty, scholars and international funding.

Table 25: Higher education expenditure on R&D by type of activity 2004 (proportion)

	NSW	Vic.	Qld	ACT	Australia Total
	%	%	%	%	%
Pure basic research	33.8	27.1	18.3	45.7	28.7
Strategic basic research	19.8	24.2	22.6	27.9	22.9
Applied research	37.0	42.4	50.5	22.1	40.8
Experimental development	9.4	6.3	8.6	4.3	7.7
	100.0	**100.0**	**100.0**	**100.0**	**100.0**

There is, of course, more scope for applied research and experimental development and partnering with industry in this endeavour. The University of Canberra is giving attention to this role.

Reflecting the orientation towards basic research, a relatively large proportion of research in the ACT is undertaken in the natural sciences, and a relatively low proportion is undertaken in the technological sciences and engineering. This is reflected in Table 26.

Table 26: Higher education expenditure on R&D by research fields 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Mathematical sciences	36,057	19,847	9,325	14,857	9,648	89,734	16.6
Physical sciences	40,450	30,897	11,741	42,962	24,753	150,803	28.5
Chemical sciences	46,612	42,508	36,907	21,425	38,398	185,850	11.5
Earth sciences	22,077	29,024	11,428	30,555	35,112	128,196	23.8
Biological sciences	100,832	77,046	113,946	51,691	107,440	450,955	11.5
Info. Computing & communication sciences	58,750	60,611	31,527	18,198	34,956	204,042	8.9
Engineering and technology	149,940	120,750	93,003	19,893	90,284	473,870	4.2
Agricultural, veterinary & environ. sciences	71,211	51,245	54,537	11,518	103,336	291,847	3.9
Architecture, urban environment and building	11,353	10,552	2,718	419	7,349	32,391	1.3
Medical & health sciences	300,093	307,521	161,003	71,279	242,546	1,082,442	6.6
Education	46,794	37,902	23,713	2,835	39,179	150,423	1.9
Economics	21,092	34,385	11,746	19,484	16,511	103,218	18.9
Commerce, management, tourism & services	56,761	54,537	39,715	11,659	30,293	192,965	6.0
Policy & political science	17,459	13,660	8,804	30,456	6,282	76,661	39.7
Studies in human society	38,427	36,091	23,414	19,304	27,289	144,525	13.4
Behavioural and cognitive sciences	52,050	35,573	27,814	10,275	22,573	148,285	6.9
Law, justice and law enforcement	25,269	22,332	11,851	16,319	9,185	84,956	19.2
Journalism, librarianship & curatorial studies	4,329	3,047	5,302	1,895	2,994	17,567	10.8
The arts	31,112	17,512	15,354	10,314	13,084	87,376	11.8
Language and culture	29,456	21,042	12,278	11,291	8,576	82,643	13.7
History and archaeology	19,559	19,971	6,161	16,851	11,700	74,242	22.7
Philosophy and religion	13,043	6,557	3,287	3,939	2,961	29,787	13.2
	1,192,817	1,052,610	715,574	437,420	884,360	4,282,781	10.2

Table 26 also indicates a very substantial commitment to research in the life sciences (biological sciences and medical and health sciences) and the strength of the overall research commitment in the social sciences, the arts, and humanities, particularly in history and archaeology.

The most significant concentration of research effort are in the fields of policy and political science, where Canberra accounts for almost 40 percent of the nation's research effort, and in law, justice and law enforcement where it accounts for 19.2 percent of total research expenditure in that field. This research is international in focus and established Canberra as a global centre for research and teaching in these fields.

The ACT accounts for 8.9 percent of research into computing and communication sciences. The ACT Government's support for NICTA provides an important opportunity to leverage this capability and establish Canberra as a major centre for research and teaching in information sciences, particularly as Canberra has the largest mainframe computer installations in the southern hemisphere.

But, notwithstanding the importance of the national capital as a centre of architecture and design, only 1.3 percent of research in architecture, urban environment and building is undertaken at ACT universities. It would appear that there is an opportunity to build this capability in collaboration with higher universities and national institutions.

The research commitment given to these disciplines is contrasted to the relatively lower levels of research commitment to engineering and technology, education, agricultural, veterinary & environmental sciences and to commerce, management, tourism and services. This is reflected in the calculations in Table 27.

Table 27: Higher education expenditure on R&D by research fields 2004 (proportion)

	NSW	Vic.	Qld	ACT	Australia Total
	%	%	%	%	%
Mathematical sciences	3.0	1.9	1.3	3.4	2.1
Physical sciences	3.4	2.9	1.6	9.8	3.5
Chemical sciences	3.9	4.0	5.2	4.9	4.3
Earth sciences	1.9	2.8	1.6	7.0	3.0
Biological sciences	8.5	7.3	15.9	11.8	10.5
Info. Computing & communication sciences	4.9	5.8	4.4	4.2	4.8
Engineering and technology	12.6	11.5	13.0	4.5	11.1
Agricultural, veterinary & environ. sciences	6.0	4.9	7.6	2.6	6.8
Architecture, urban environment and building	1.0	1.0	0.4	0.1	0.8
Medical & health sciences	25.2	29.2	22.5	16.3	25.3
Education	3.9	3.6	3.3	0.6	3.5
Economics	1.8	3.3	1.6	4.5	2.4
Commerce, management, tourism & services	4.8	5.2	5.6	2.7	4.5
Policy & political science	1.5	1.3	1.2	7.0	1.8
Studies in human society	3.2	3.4	3.3	4.4	3.4
Behavioural and cognitive sciences	4.4	3.4	3.9	2.3	3.5
Law, justice and law enforcement	2.1	2.1	1.7	3.7	2.0
Journalism, librarianship & curatorial studies	0.4	0.3	0.7	0.4	0.4
The arts	2.6	1.7	2.1	2.4	2.0
Language and culture	2.5	2.0	1.7	2.6	1.9
History and archaeology	1.6	1.9	0.9	3.9	1.7
Philosophy and religion	1.1	0.6	0.5	0.9	0.7
	100.0	100.0	100.0	100.0	100.0

The ACT is a major centre for research relating to the defence industry. Nearly one third of higher education research undertaken in the ACT relates to defence purposes (socio-economic objective). This brings together a range of research fields – covering technology, security and policy research. Research relating to Australia's overall economic framework, social development and community services, and environmental policy frameworks is also important in the ACT. This is reflected in Table 28.

Table 28: Higher education expenditure on R&D by socio-economic objective 2004 ($'000)

	NSW	Vic.	Qld	ACT	Other States/ Territories	Australia Total	Proportion ACT
	'000	'000	'000	'000	'000	'000	%
Defence	3,780	7,207	3,170	9,494	5,206	28,857	32.9
Economic development							
Plant prod. & Primary products	37,516	9,767	26,143	12,770	59,498	145,694	8.8
Animal prod. & animal primary products	24,936	20,714	13,351	775	28,344	88,120	0.9
Mineral resources (excl. energy)	7,018	3,328	22,988	4,873	23,898	62,105	7.8
Energy resources	8,199	12,405	2,881	595	17,028	41,108	1.4
Energy supply	15,500	7,897	3,553	5,018	8,084	40,052	12.5
Manufacturing	89,064	68,992	44,107	15,233	45,412	262,808	5.8
Construction	26,321	21,834	9,320	1,135	8,950	67,560	1.7
Transport	4,806	9,158	12,536	1,064	8,111	35,675	3.0
Info. & communication services	63,780	60,739	37,384	21,683	28,942	212,528	10.2
Commercial services & tourism	23,567	18,514	14,445	2,849	12,446	71,821	4.0
Economic framework	52,453	69,388	29,129	29,631	35,440	216,041	13.7
Total	353,160	302,737	216,137	95,626	275,825	1,243,485	7.7
Society							
Health	323,152	335,133	185,402	95,559	257,749	1,196,995	8.0
Education & training	52,002	47,883	25,944	21,628	47,670	195,127	11.1
Social develop. & community services	158,254	84,254	71,989	82,929	68,620	466,046	17.8
Total	533,408	467,270	283,336	200,116	374,038	1,858,168	10.8
Environment							
Environ. Policy frameworks & other aspects	13,645	8,930	5,040	6,910	4,918	39,443	17.5
Environmental management	56,549	31,211	54,241	23,314	92,252	257,567	9.1
Total	70,193	40,141	59,281	30,224	97,171	297,010	10.2
Non oriented research	232,275	235,257	153,650	101,959	132,119	855,260	11.9
	1,192,817	1,052,610	715,574	437,420	884,360	4,282,781	10.2

The relative commitment to research relating to defence, economic, social and environmental frameworks is highlighted in Table 29. Taken together, these purposes amount to one third of higher education research – compared to 22.6 percent for Australia as a whole.

Table 29: Higher education expenditure on R&D by socio-economic objective 2004 (proportion)

	NSW	Vic.	Qld	ACT	Australia Total
	'000	'000	'000	'000	'000
Defence	0.3	0.7	0.4	2.2	0.7
Economic development					
Plant prod. & Primary products	3.1	0.9	3.7	2.9	3.4
Animal prod. & animal primary products	2.1	2.0	1.9	0.2	2.1
Mineral resources (excl. energy)	0.6	0.3	3.2	1.1	1.5
Energy resources	0.7	1.2	0.4	0.1	1.0
Energy supply	1.3	0.8	0.5	1.1	0.9
Manufacturing	7.5	6.6	6.2	3.5	6.1
Construction	2.2	2.1	1.3	0.3	1.6
Transport	0.4	0.9	1.8	0.2	0.8
Info. & communication services	5.3	5.8	5.2	5.0	5.0
Commercial services & tourism	2.0	1.8	2.0	0.7	1.7
Economic framework	4.4	6.6	4.1	6.8	5.0
Total	29.6	28.8	30.2	21.9	29.0
Society					
Health	27.1	31.8	25.9	21.8	27.9
Education & training	4.4	4.5	3.6	4.9	4.6
Social develop. & community services	13.3	8.0	10.1	19.0	10.9
Total	44.7	44.4	39.6	45.7	43.4
Environment					
Environ. Policy frameworks & other aspects	1.1	0.8	0.7	1.6	0.9
Environmental management	4.7	3.0	7.6	5.3	6.0
Total	5.9	3.8	8.3	6.9	6.9
Non oriented research	19.5	22.3	21.5	23.3	20.0
	100.0	100.0	100.0	100.0	100.0

Government

Government expenditure on R&D in the ACT is quite substantial, but has declined over the two years between 2003-04 and 2004-05.

	2002-03		2004-05	
	$'000	Proportion (%)	$'000	Proportion (%)
Australian Government	290,553	19.0	257,319	16.4
State/Territory	6,528	0.7	2,851	0.3
Total	297,081	12.0	260,170	10.2

Government funded research in Canberra is undertaken by publicly funded research agencies located in Canberra, including the CSIRO, DSTO and Geo-science Australia and a number of research bureaus attached to Australian Government departments and agencies. These include:

- ABARE
- Bureau of Rural Sciences
- Bureau of Tourism Research
- Bureau of Transport and Regional Economics

Attachment D
A note on financing start-up business

Apart from short term credit, the most common form of business growth is customers. That is, businesses grow on the basis of making sales and collecting funds from people and organisations that value their product and service offerings.

Many businesses are formed on the basis of receiving government grants and have gone on for many years undertaking 'market oriented' research. But over time, even technology based businesses that have survived for many years on R&D and commercialisation grants will have to become sustainable by selling products and/or services to customers without a subsidy.

Many new and growing businesses look to venture capital as a way to finance business growth. This form of finance is available to 'an elite group of entrepreneurs' after very careful due diligence and research. These venture-backed start-ups have a number of characteristics:

- The venture capitalist provides counsel and connections in addition to funds
- There is a high level of quality and depth in the founding team
- There is a unique technology or concept
- There is a verifiable record of business achievement in previous endeavours.

The businesses that start out in a space that others take years to reach. Microsoft took nine years to reach $50m in sales; venture capital backed Lotus shipped $53m of Lotus 1-2-3 in its first year (even Lotus was not the inventor of the spreadsheet).

These start-ups have some specific characteristics:

- Their founders have exceptional qualifications and ideas, which allows them to raise more capital than the typical promising start-up – between $2m and $5m compared to the typical *Inc* company that starts with $30,000 or less
- Venture capital backed enterprises face extensive scrutiny of plans and monitoring of performance
- These initial conditions mean that they pursue opportunities with greater investment and less uncertainty, rely more on anticipation and planning and less on improvisation and adaptation and use different strategies for securing resources.[11]

Venture capital investors are after big winners. They seek propriety products, experienced managers capable of managing rapidly growing firms, minimum investment thresholds and require extensive due diligence. From this perspective there are few individuals that start with the ideas and human capital necessary to secure venture capital funding.

These are not the general characteristics of the vast majority of "promising start-ups" – although many of these will develop into robust companies. Most noteworthy businesses have quite unremarkable beginnings. Most of the *Inc* 500 companies bootstrapped their ventures with modest funds provided from credit cards, mortgages and other loans. The median amount was $10,000.

Only five percent of companies raised funds from professional venture capitalists. Their ventures were improvised[12]. The founders of non-venture backed businesses like Hewlett Packard -

- Replicated or modified an idea they encountered through previous employment – or by accident
- Did not spend much time searching for opportunities, doing market research, or writing business plans
- Adapted to unexpected opportunities and problems – in the absence of a strategy, or even a goal
- Undertook most of the critical functions and recruited whomever they could for the tasks – if they were too stretched to do it themselves
- Were enthusiastic but inexperienced in business and management practice.

Success does not occur overnight: it takes *Inc* 500 companies many years to develop the assets and the organisations that eventually make them leading players. These observations have been born out in our profiles of ACT businesses.

Nonetheless, venture capital backed start-up companies have had a significant increase in shaping popular beliefs, and the direction of formal research, about new business ventures. These firms have made significantly greater contributions to certain high technology fields such as semi-conductors and

[11] Bhidé, A V (2000) *The Origin and Evolution of New Businesses,* New York, Oxford University Press., p. 142
[12] Ibid., p. 15. Se also United States. National Commission on Entrepreneurship (2001) *Five Myths About Entrepreneurs: Understanding How Businesses Start and Grow,* Washington., United States. Small Business Administration, O o A (1998) *The New American Evolution: The Role and Impact of Small Firms,* Washington.

genetic engineering and are geographically concentrated – notably in California and Massachusetts. It is relatively easy to document their strategies and performance.[13]

But—approximately one third of the world's venture capital goes to nurturing innovation in Silicon Valley: most of the money is raised there, more entrepreneurs have moved there and most of the wealth created stays there[14].

The US National Commission on Entrepreneurship has commented that

Of all the myths and misunderstandings surrounding entrepreneurship, the role of venture capital is perhaps the most exaggerated. The venture capital phenomenon has received so much attention that it often appears to those looking in from outside that most decent business ideas would receive venture backing. The media lavishes coverage on venture backed start-ups, and has highlighted the massive growth in business "incubators" around the country.[15]

Venture capital is dominant in only two industry sectors—ICT and biotech. These sectors require companies to move quickly through the early growth stages. The conditions imposed by venture capital investors accelerate and enforce the transformation of initially successful start-ups into later stage growth companies. There is evidence that venture capital financed companies perform better through the early growth stages than entrepreneurial companies without such investments[16].

The aggressive profiling of professional venture capital has created a number of problems:

- An unrealistic expectation in the entrepreneurial economy about access to this sort of finance
- A skewing in public policy towards support for "venture backed start-ups"
- A lack of focus on support for business development in addressing "market risk" for established technology based companies

In this context, it might be expected that public policy would move away from an emphasis on venture-backed start-ups towards supporting those *businesses* that have made the initial commitment to growing a technology-based enterprise but who need to develop and/or source the necessary skills to build a sustainable business.

Venture capital has a role, but it is probably only five percent of the story.

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[13] Bhidé, A V (2000) *The Origin and Evolution of New Businesses,* New York, Oxford University Press., p.141
[14] *Economist* February 20, 1999
[15] United States. National Commission on Entrepreneurship (2001) *Five Myths About Entrepreneurs: Understanding How Businesses Start and Grow*, Washington., p.17
[16] Addressed in Gompers, P A (2001) *The Money of Invention: How Venture Capital Creates New Wealth,* Boston, Harvard Business School Press.

Attachment E
The MIT Media Lab

The MIT Media Laboratory has emerged as a world leader in redefining human-computer interaction in the digital age. Current projects range from "smart" prosthetic limbs, to tools to help children learn, to sociable robots.

Background

The Media Lab was conceived in 1980 by Professor Nicholas Negroponte and former MIT President and Science Advisor to President John F. Kennedy, Jerome Wiesner. It grew out of the work of MIT's Architecture Machine Group, and remains within MIT's School of Architecture and Planning.

In its first decade, the Lab pioneered much of the technology that enabled the "digital revolution," and enhanced human expression: innovative research ranging from cognition and learning, to electronic music, to holography.

In its second decade, the Lab literally took computing out of the box, embedding the bits of the digital realm with the atoms of our physical world. This led to expanded research in wearable computing, wireless "viral" communications, machines with common sense, new forms of artistic expression, and innovative approaches to how children learn.

Now in its third decade, the Lab is focusing on "human adaptability"– work ranging from initiatives to treat conditions such as Alzheimer's disease and depression, to sociable robots that can monitor

the health of children or the elderly, to the development of smart prostheses that can mimic–or even exceed–the capabilities of our biological limbs.

Academic Overview

Unlike other laboratories at MIT, the Media Laboratory comprises both a degree-granting Program in Media Arts and Sciences and a research program.

More than 40 faculty, senior research staff, and visiting scholars lead the Lab's research program, and more than 70 other staff members support Lab research, facilities, and administration. In addition, the Media Laboratory vigorously engages in numerous collaborations within MIT in the form of joint academic appointments, teaching efforts, and research programs.

Graduate enrolment totals approximately 135, with approximately 70 master's and more than 65 doctoral students. An additional 15 graduate students are formally based in other MIT departments, but carry out their research at the Media Laboratory. Some 150 undergraduates come to work at the Laboratory each year through MIT's Undergraduate Research Opportunities Program (UROP).

Facilities

The Media Laboratory houses a gigabit fiber-optic plant that connects a heterogeneous network of computers, ranging from fine-grained, embedded processors to mesh networks. The rapid prototyping resources include 3-D printing, injection moulding, and PC board fabrication. There are studios for audio and video, and laboratories for DNA labelling, new sensors, micro-encapsulation, quantum computing, and perceptual studies.

The Laboratory is beginning the 21st century with plans for a building complex that will approximately double its current space. When completed, the complex will house:

- The Okawa Center, focused on the ways children will live, learn, and play in the digital age.
- The List Visual Arts Center
- The School of Architecture + Planning's Design Lab and Center for Advanced Visual Studies
- The Department of Architecture's Visual Arts Program
- MIT's Program in Comparative Media Studies.

Research philosophy

The Media Laboratory vision of "enabling technology for learning and expression by people and machines" emphasizes technologies that improve the quality of life in the digital age, and that assist people in constructing their own tools for expression. The Lab advocates a process that includes imagination and realization, criticism and reflection.

Today's Lab continues to push the envelope with a range of research that no single industrial partner would be able to duplicate. Current research foci include machines with common sense, viral communications, "smart" prostheses, advanced sensor networks, innovative interface design, and sociable robots.

Projects range from a program that can convert drawings to musical compositions, to wearable sensors for monitoring health, to electronic ink. Lab researchers are dedicated to creating a future where machines not only augment human capabilities, but also relate to people on more "human" terms—a future where our devices not only respond to commands, but also understand them.

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