COMMENTS ON THE PRODUCTIVITY COMMISSION'S DRAFT REPORT ON PUBLIC SUPPORT FOR SCIENCE AND INNOVATION

DCITA supports much of the work undertaken by the Productivity Commission in its on draft report on Public Support for Science and Innovation. This supplementary submission is intended to bring out issues which we believe could have received more attention in the draft report.

While the Australian economy has been performing very well in recent years, there is some diversity of view as to whether such strong growth can be sustained with present policy settings in face of emerging strategic challenges facing Australia and other OECD economies. The case in the draft report for maintaining present policy settings is not accompanied by an analysis of the medium to longer term economic outlook. This could assist with assessing how well Australia's innovation system is positioned to meet emerging challenges, and meet our economic and social aspirations into the future. In this respect, DCITA's initial submission to this inquiry identifies:

- The need to seriously address major contextual issues driving major structural and social changes and affecting Australia's competitive advantage. These include globalisation, the re-emergence of China and India as major economies, and population ageing.
- The critical role of ICT in the innovation system. As a key part of innovation and research across the board, ICT has yielded very significant productivity gains to the Australian economy. With the appropriate policies, infrastructure, knowledge and skills, Australia has the potential to obtain very significant additional benefits from the further development and application of ICT into the medium to long-term.

The development of such a framework would be consistent with the policies of other advanced countries who are using their innovation systems to drive the development of ongoing and future competitive advantage. The outcomes of policy settings in all levels of government need to be monitored to ensure that Australia can continue to engage with ICT research at the leading edge and ensure that we retain the ability to access and exploit new ideas and technologies.

It is generally accepted that innovation in the form of a linear transfer of public research outcomes to the market occurs relatively rarely. The final report could give more consideration to the complexity and interdependencies in the ways impacts from R&D are effected, and acknowledge that a sharp distinction between basic and other research is difficult to make and may be particularly inappropriate for ICT R&D.

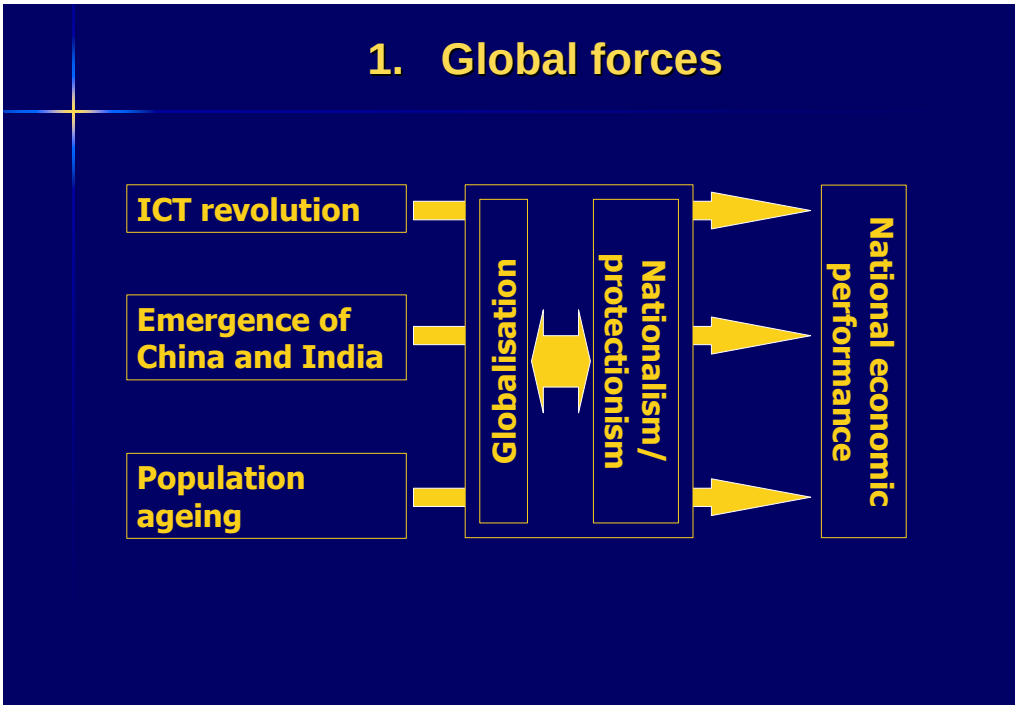
The analysis of public support for science and innovation would benefit from the use of multiple approaches to address the complexity of the actors and their interactions, and in particular to gain a better understanding of the incentive structures developing as a result of the interaction of market forces, local capabilities and government interventions.

Systemic failures could be more easily identified through the evolutionary approach. It is a useful method for identifying weaknesses and gaps in the system, and can give a useful guide to a constellation of issues that must be addressed or taken account of in specific interventions.

Contextual issues

Australia's economy is responding to the strong economic forces driving global transformations, including:

- Globalisation - increasing trade and the shift in trading patterns
- The rapid development of China and India
- The increasing importance of knowledge, in particular the ICT revolution
- Population ageing.[1]



A critical issue that needs to be examined is the role of Government in supporting science and innovation *in the context of the fundamental economic (and potentially also social) transitions that are occurring*.

The composition of Australia's economy has changed significantly since 1960. For example, services as a proportion of total value added in the economy have risen by some 40 per cent, while the value added by manufacturing declined by 67 per cent and

[1] *Economic Policies to address Global Pressures*, address by Dr Henry to Australian Industry Group August 2006

agriculture by 80 per cent.[2] In this regard, it is clear that, like the US, much of Australia's recent productivity growth has resulted from the application of ICT in the services sector. Much innovation discourse in Australia has failed to fully recognise the ongoing significance of services innovation driven by the effective use of ICT and as a consequence, this element of the innovation system has failed to attract sufficient policy attention.

Within these major changes, there is also considerable restructuring as many Australian firms move up the value chain in "traditional" industries such as manufacturing, mining and agriculture. This would indicate that firms need to enhance their ability to adapt and use advances from overseas and to move closer to the technological and business frontiers. Some new industries, eg ICT, have been created and knowledge has become much more important to all industries.

The rising economic importance of the world's two most populous countries is having significant impacts on Australia, including strong demand for our mining and agricultural products. However, as pointed out by a Working Group for the Prime Minister's Science, Engineering and Innovation Council (PMSEIC)[3]

> "…China and other developing economies are moving rapidly away from being low value, low labour cost producers of goods and services to sophisticated and globally competitive producers of technically complex and elaborately transformed goods and services. This the real threat that Australia, together with other developed countries, faces in maintaining growth and competitiveness.
>
> The Australian response to these challenges should be to move quickly to strengthen our economy and build technology-based export oriented manufacturing and services."

According to the Business Council of Australia:

> "Competing through efficiencies delivered by structural reform and competition is no longer enough for developed economies such as Australia. Instead, 21st-century economies are increasingly competing on the basis of unique value delivered through the application of knowledge in the production process and the development of new and better products and services."

The PMSEIC report recommended that Australia needs to become more closely engaged in collaborative research with these emerging superpowers. Appropriate infrastructure, including ICT infrastructure, will be needed to support the effort.

Context – The ICT revolution and its importance for innovation

---

[2] *ibid*

[3] *Strengthening Australia's Position in the New World Order* June 2006

DCITA considers that the PC's report would be enhanced by a substantive discussion of the role of ICT in enhancing innovation and research, and hence productivity. DCITA's previous submission summarised aspects of the impact of ICT in Australia and the importance of having a capability in ICT innovation. The following discusses some of the key aspects further and provides some case study examples.

ICT has been labelled "a General Purpose Technology" because of its wide scope for improvement and elaboration, applicability across a broad range of uses, the potential for use in a wide variety of product and process, and strong complementarities with existing or emerging technologies.[4] Several studies have pointed to the synergistic combination of emerging platform technologies - nanotechnology, biotechnology, information technology and cognitive sciences[5]. Australia's ICT skills and infrastructure will be important to our ability to capture opportunities from advances in these technologies.

ICT now so pervades economic activity and our lives more generally that it is easy to lose sight of its significance and the fact that it has brought about such extensive changes. The period we are living in has been described as the "ICT Revolution" and the implications of this for Australian innovation deserve serious consideration by the Productivity Commission.

ICT drives and enables innovation and it is an essential part of contemporary R&D, providing the tools and infrastructure for public and private research. It is an integral part of basic, applied and market-oriented research in all fields. ICT provides new opportunities to leverage Australian ideas and know-how, reduce costs and opens new opportunities to create domestic economic value and exports. ICT underpins innovative service industries, including the knowledge intensive services to the mining and agricultural industries. ICT and innovation are key to better social services and a better quality of life.

> "The tremendous contribution of information and communications technology (ICT) to achieving innovation through the creation of new opportunities and new value is set to continue. For this reason, Australia stands to gain lasting economic benefits from a national ICT policy framework that is designed to enable private and public sector organisations in Australia to increase their levels of innovation. By increasing their innovation capabilities, Australian businesses will be in a position to create new value for consumers and compete effectively in the fast changing global business environment. Importantly, innovation will be a vital source of increased productivity and growth for the nation over the medium to long term."
> *Business Council of Australia*

> "Innovation in Information and Communications Technology is of paramount importance to Rural Australia and to the benefits that an efficient, international competitive primary industry sector bring to the Australian economy"

[4] R Lipsey, C Bekar and K Carlaw 1998
[5] Eg *Converging Technologies for Improving Human Performance* Roco and Bainbridge 2003 and *Converging Technologies – Shaping the Future of European Societies*, Nordmann 2005

National Farmers Federation[6]

"ICT is the driving force behind the realisation of economic, social and environmental prosperity for current and future generations of Australians. It influences every waking day and is the solution enabler for the big issues facing Australia such as security of borders, people and assets and water and energy utilisation and management."
Australian Information Industry Association[7]

The nature of ICT as a fundamental general purpose technology enhancing our cognitive and organisational abilities means that there is considerable potential for significant network and innovation impacts.[8] Consequently, another wave of productivity bonuses from ICT is widely anticipated. In particular, according to the OECD, the bulk of spillover effects stemming from the use of ICT may be yet to come.[9]

The OECD notes that "any productivity gains from business reorganisation to take advantage of the Internet and other networks are likely to become clearly visible only after a certain threshold in network use has been passed." Electronic commerce is regarded as being generally in its infancy but fast expansion could improve distribution efficiency and work to strengthen competition, with beneficial effects on productivity and consumer choices.

The significant and growing global investment in ICT R&D and innovation point to an accelerating rate of ICT development and application. Broadband will increasingly become the communications infrastructure for the economy, driving innovation, the development of new goods and services and productivity gains[10]. What is more, the impact of ICT on research capacity through what has been labelled e-Research promises to herald a virtuous cycle of innovation.

Consequently, an analysis undertaken by Carlaw *et al*[11] for Industry Canada suggests that ICT is only at the early stages of its development and application trajectory, with much further potential for growth. Indeed, they consider that ICT has only reached a stage of maturity similar to that reached by electricity in 1920 and they expect a similar explosion in applications in the relatively near future.

For example, as noted in DCITA's previous submission, sensors, artificial intelligence and digital content development are areas of significant potential with rapid technological developments. The market for digital content is growing strongly and providing new business models of creativity and innovation. While digital content is of particular importance to the entertainment industry, its application is expanding rapidly more

---

[6] Comments by the Advisory Group to the Minister for Communications, Information Technology and the Arts
[7] *ibid*
[8] *The Economic Impact of ICT: Measurement, Evidence and Implications, OECD, 2004*
[9] *The Sources of Economic Growth in the OECD Countries*, OECD, 2003
[10] *Broadband Blueprint*
[11] *The GPT-driven modern ICT Revolution* Carlaw, Lipsey and Webb 2006

broadly through the economy with significant productivity implications in many sectors including health, education and security.

In summary, the ICT revolution is significant and radical and it is likely to generate further profound effects in the short and medium term. DCITA considers that government interventions relating to ICT should not just be regulation and ensuring the provision of adequate infrastructure. It is essential that Australia be prepared, in particular that appropriate Government support ensures that ICT and ICT-related innovation capability, skills and ICT infrastructure are up to the task.

> "The remarkable contribution of ICT to enabling Australian businesses to seize new opportunities and to grow is set to continue. For this reason the Business Council of Australia very much supports a strategic and comprehensive ICT policy framework for the nation."
> *Business Council of Australia*

Government intervention may also be necessary to address structural rigidities which inhibit Australia's development of an ICT capability. Technological progress often follows particular trajectories at the local level and thus the stock of expertise limits the set of R&D project options. Government interventions may be useful to develop new areas of expertise and critical mass or the renewal of pools of expertise in R&D organisations. This may be particularly important to develop capability in emerging technologies or to address weakness in enabling technologies.

The Government's decision to establish NICTA is relevant here and it is anticipated that NICTA and initiatives such as CSIRO's ICT Centre will result in improvements after some time. However the ability of the system to bolster ICT research and training capability and hence innovation will need ongoing, careful attention.

At the micro-level, the joint DSTO, CSIRO, DSTO and NICTA roundtable has identified a variety of impediments to collaboration, including different institutional objectives, timelines and IP. Nevertheless, they have managed to establish a joint research project.

Anticipatory myopia can occur when organisations underinvest in the generation and assimilation of information that contributes to their ability to act with foresight. This may be due to the incentive structures, information sources, propensity to opportunistic behaviour[12] or to culture and is likely to be particularly significant in relation to rapidly developing technologies such as ICT.

Imperfect information is endemic to the process of technological change and policy intervention can be desirable up to the point where the marginal social benefit of

[12] *Rationales for Government Intervention in the Commercialisation of New Technologies* Technology Analysis and Strategic Management, vol 14, pp 184-200 (2002)

information provision is equal to the marginal social cost of intervention.[13] Government intervention to improve access to information and skills such as through advisory services, technology foresighting activities etc, has the potential to reduce risks and failures and improve the efficiency and productiveness of the innovation system. The universities and public research organisations may have a role here but resourcing issues would need to be considered.

Information on advanced technologies is particularly important for technology-based firms. However SMEs may the lack the resources to keep abreast of directly relevant technology, and to identify and to make use of other advanced knowledge that could enhance their competitiveness.

Engaging knowledge-intensive SMEs with the public research sector has proven difficult both in Australia and overseas. Some Cooperative Research Centres (CRCs) have been particularly active in this space, and DCITA suggests that the Productivity Commission explore the issues in greater detail with some of the ICT CRCs. The annual IT Outlook Conference, held by the main Australian ICT research organisations has also from time to time, provided a venue for researchers in the public and private sectors to discuss current research and research trends in Australia and overseas.

In relation to information problems within firms, the Productivity Commission has argued that intermediaries have strong incentives to provide information that overcomes any deficiencies and that the appropriate policy response to apparent business information failures is to ensure that competitive processes and institutions are functioning adequately.

This argument assumes that there is a sufficient depth in the market to sustain intermediaries with the appropriate depth and spread of good technological knowledge to provide advice on specialist adaptation of advanced technologies. This is an area that has received relatively little policy attention in Australia at the national level yet may be particularly important for a small open country like Australia if it is to improve its capacity to absorb advanced foreign technologies.

Additional information on the impacts of Australian capability in ICT R&D

Australia has already received substantial social, environmental and economic benefits from its capability in ICT R&D and innovation. DCITA's earlier submission included summaries of several case studies to illustrate the connection between Australian capability in ICT R&D, ICT-based innovation and ICT infrastructure and their social, environmental and economic impacts. The following discussion expands on some of the points and provides some additional examples.

Public ICT R&D

Insight Economics' examination of Australian public ICT R&D identified seven key benefit channels from public ICT R&D in Australia:

[13] *Technology Diffusion and Public Policy* P Stoneman and PDiederen The Economic Journal, (1994) **104**, pp 918-930

- Benefits through commercialisation of new products based on Australian public ICT R&D via spin-off companies or licensing to existing companies.
- Benefits through the application by industry of new products or processes enabled by Australian public ICT R&D generated knowledge and technology.
- Environmental, health and social benefits through the application of Australian public ICT R&D generated knowledge and technology.
- Productivity gains from access to internationally generated knowledge secured through active engagement with international knowledge networks.
- Economic benefits through the delivery of enabling ICT skills capability to other industry sectors (including the R&D sector more generally).
- Benefits through the development of highly skilled ICT post-graduates that build a critical mass of skills in a region that either attract multinational companies to invest in the location, or help retain existing activity levels of multinational companies and other firms.
- Benefits through improved public policy delivery and outcomes.

Most public ICT R&D is not "basic research". In the absence of government support, many of these projects would either have been done more slowly or not have been undertaken at all or not have addressed the specific Australian context.

It should be noted that some of this research was for governmental purposes, including defence, infrastructure management and monitoring the environment and resource use. It is appropriate that such work be publicly funded and performed in the public sector to avoid issues such as security, conflict of interest or capture by interest groups.

Obtaining comprehensive estimates of the returns from investment in public ICT R&D is, at this stage, problematic, in view of the lack of adequate data, the diffuse impacts, the contributions to non-market sectors, uncertain time lags and limitations of economic modelling techniques. Nevertheless, these impacts are significant.

The application of several methodologies may assist in arriving at an approximation of the net benefits. DCITA's earlier submission summarised the findings from a mix of macro and micro approaches. The use of case studies is particularly valuable in relation to enabling technologies where, because they are adapted, embedded and used so broadly, the lines of causality are particularly hard to distinguish.

Insight Economic's approach, which uses case studies, provides a lower bound estimate of the economic benefit from the total expenditure on ICT R&D in the public sector over a 15 year period (1991-2005). Clearly identified economic benefits from research started before this period were not included in the modelling, nor were benefits that were not directly attributable to the ICT R&D in multi-disciplinary research projects.

For examples of demonstrable economic impacts of Australian ICT R&D, the Productivity Commission is referred to the Radiata[14], the NSW Road Transport Authority's (RTA) development of SCATS, the Centre for Accident Safety Research, Information Security Institute, the Defence Science and Technology Organisation (DSTO), and the Bureau of Meteorology (BOM) case studies (provided separately**)**. Some of these impacts are either not measurable or not well captured in the information currently available and case studies are the most useful tool currently available for identifying the scope of impacts.

While economic impacts can often be identified, it is clear that Australian ICT research has widespread social impacts. Case studies point to research and development of application-specific information systems being used for national security or to minimize the social impact of adverse physical, biological and human phenomena, increasing the quality and length of lives. The social impact of such ICT R&D varies with application – in the case of monitoring tsunamis, the benefit is in the immediate and subsequent reduction in morality and morbidity. Similar hard to measure social benefits accrue in the case of the RTA, BOM and DSTO case studies. Other examples involve the use of robotics to increase occupational safety, research into the prevention and restoration of hearing loss, etc.

The efficient scaling up of such systems may involve research and development of high speed, high capacity interactive broadband based information systems. Here the availability of public broadband communication infrastructure can reduce the costs of scaling up solutions for national or global impact. Moreover the extension of overseas-developed solution to Australia, and Australia's ability to participate in developing collaborative solutions to potential threats to our wellbeing depend on the Australia having the appropriate ICT infrastructure, skills and capabilities.

Insight Economics concluded that many of the potentially most significant impacts from public ICT R&D are the hardest to identify and quantify, being effectively "hidden" within the outcomes of other research fields. This illustrates the importance of Australian ICT R&D to the performance of R&D generally as a platform science and technology capability. It also illustrates the need for policy analysis to address some systemic issues in detail and in addition to high level indicators of performance and outcomes.

DCITA considers that an ongoing issue of concern is the level of investment in public ICT R&D, particularly in the universities.[15] These organisations have a central role in the innovation system in education, research and research training. University researchers also provide some technology advisory services. Thus a weakness in university ICT research can have particularly wide impacts on the productivity and innovation capability of all industries and the ability of the research (and education and research training) base to contribute to social, economic and environmental outcomes.

---

[14] Insight Economics' report, *The Impact of Public ICT R&D in Australia*

[15] Annex Box 9.1, "Current CRCs", of the draft report includes five CRCs which are winding down or have closed – Australian Photonics CRC, Australian Telecommunications CRC, CRC for Enterprise Distributed Systems Technology, CRC for Satellite Systems and CRC for Sensor Signal and Information Processing.

Broadband infrastructure
Broadband internet is expected to increase personal and national productivity, inspire and enable innovation and present new opportunities for entrepreneurs, industry and government to maintain and increase Australian competitiveness. It is becoming a key piece of economic infrastructure and it is important that the appropriate policy settings are in place to deliver a level of infrastructure that is competitive and which facilitates experimentation in applications and business models relevant to our circumstances.

An open and competitive market is expected to deliver next generation broadband with high levels of access to broadband services and increased capacity in the larger metropolitan areas, though it should be noted that there is a significant level of concern among some analysts that Australia's capacities are lagging those of exemplar nations. The uses of broadband, some of which are in the pilot stage, are illustrated in some additional case studies of the innovative use of broadband to deliver services in health and education, particularly in regional and remote areas of Australia (**Attachment 1**).

ICT is also an important part of the research infrastructure for all fields of research. **Attachment 1** provides examples of the significance of ICT infrastructure and associated innovation. Specific interventions are needed to support rollout in under-served markets, particularly in regional and remote Australia and for the delivery of essential areas.

Discussion of the draft findings

The appropriate level of support
In commenting on the Zheng and Shanks paper, we noted that modeling the various roots of economic growth is very complex, particularly in view of rapid changes in the economy and limited data sets, and suggested that econometric modeling based on equilibrium dynamics does not adequately capture the changing economic, institutional and technological context and, in particular, the significant impact that ICT is having on productivity growth. Other approaches may provide some assistance but none provide certainty, nor can they do so collectively.

Admittedly, judgements as to the appropriate level of support for innovation will inevitably be subjective. Nevertheless, as discussed earlier, decision making can be usefully informed by discussion of the future trends and stresses. In particular, the question of the presently appropriate level and balance of support for innovation and science might be informed by discussion of possible Government initiatives to maintain Australia's position and meet our aspirations in a globally transforming world?

Scientific discoveries and innovation may take many years to reach the marketplace or to be adopted in other activities. To the extent that Australian science and innovation contribute to our economic and social wellbeing, the impacts now being observed are the result of previous investment decisions.

Australian innovation policy needs to be forward looking, taking particular note of trends such as the increasing knowledge intensity of goods and services, not just in new technology based industries, but also in "traditional" industries such as mining and agriculture.

Many advanced countries are seeking to improve the competitiveness of their economies by improving their innovation systems. This includes targets for significantly higher investment in R&D (public and private).

- In 2006, the US President announced the American Competitiveness Initiative to encourage innovation and strengthen US ability to compete in the global economy. This included $US136 billion over 10 years for enhanced investment in R&D, to strengthen education and encourage entrepreneurship and innovation.
- In 2000, the European Council set the goal of becoming by 2010 "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion." In 2002, the Council proposed that European R&D must be increased with the aim of approaching 3 per cent of GDP by 2010, with business expenditure increasing to 2 per cent of total R&D investment.
    - The European Union's Seventh Framework Program for research and technological development (the EU's main instrument for funding research in Europe 2007-2013), will provide 9.1 billion euros for ICT research activities, 28 per cent of the total budget under its Cooperation Program.

The level of business expenditure on R&D (BERD) in Australia has been well researched and discussed. While there are some structural reasons to explain that Australian levels of investment might not particularly high, the low overall level, below the OECD average, remains a concern. In this regard, we question the utility of the Productivity Commission's attempt to normalise economies around an Australian model and the policy conclusions drawn from that normalisation. The more relevant analysis, regardless of its difficulty, is the social rate of return from Australia's R&D investment.

Analysis of individual R&D projects, as well as econometric modelling, have demonstrated that there are significant welfare gains from investment in R&D. DCITA's research indicates that the social rate of return from Australian business investment in R&D (BERD) is in the range between 10 and 30 per cent, implying subsidies to BERD could be increased to encourage additional private investment and so lift GDP. The social returns from investment in ICT R&D may be higher.

As the Business Council of Australia notes "R&D drives competitive advantage by increasing the absorptive capacity of firms and organisations. We should be concerned if Australia's business R&D intensity is substantially less than its international competitors."

The performance of the innovation system also needs to be considered in terms of the total value and mix of exports, particularly the growth of higher value added exports. Global innovation drives countries to specialisation and the pressures toward specialisation are particularly strong for smaller economies like Australia.
Issues such as ensuring that Australia has the breadth as well as the depth of capability will need constant attention. The need in particular for more attention to enabling technologies such as ICT, biotechnology and nanotechnology has already been noted in this submission. CeNTIE's exploration of potential services delivered through very high capacity and high speed communications networks provides an example of a small initiative that addresses technology trends and opportunities in a holistic fashion.

The regulatory environment is also relevant to innovation policy, including the impact on the incentives for business to innovate and for entrepreneurs to take risks to create and bring products and services to the market. For technology firms using rapidly developing technologies, regulations and the development of new standards can be particularly important.

The introduction of specific technologies will bring challenges to the system – the one size fits all approach may often not be appropriate. For example, Government programs such as IT Online (ITOL) can have significant catalytic effects in encouraging organisations to work collaboratively together for the adoption of platforms appropriate across industries or sectors (**see Attachment 2**).

With more people working on science and innovation, the rate of technology development and innovation will inevitably become faster and Australia may need to run harder just to stay still. At the minimum it will need to undertake ongoing policy experimentation to maintain the quality of its innovation system and it would do well to consider the policy experiences of other countries.[16]

[16] *The Sources of Economic Growth in OECD Countries* OECD 2003

Attachment 1

ICT INNOVATION AND RESEARCH INFRASTRUCTURE – BROADBAND

CeNTIE

The $60 million Advanced Networks Program (ANP) supports the development, trialing and demonstration of advanced communications networks and leading edge broadband applications that will deliver long-term benefits to the Australian economy.

Three major projects were funded through the program, including CeNTIE, m.Net and GrangeNet. CeNTIE provides a very high speed, 10 gigabit capacity, backbone network from Perth to Brisbane via Melbourne, Canberra and Sydney with links to research organisations in these centres.

- *Virtual Critical Care Unit* (ViCCU) – CeNTIE developed and installed a digital telepresence system that uses video over IP technology to enable a specialist located at one hospital to supervise a surgical team located at a peripheral hospital (to avoid unnecessary patient transfers). The broadband telepresence system has been in operation linking Blue Mountains Hospital in Katoomba with Nepean Hospital in Penrith since November 2003 and has proven to be very successful both in improving patient outcomes and providing professional support to the medical staff. In 2006, CeNTIE entered into an agreement with Telstra to licence ViCCU as a managed service for use in hospitals across Australia.

- *Virtual Surgical Training Environment* – CeNTIE (in collaboration with the Melbourne University) developed a virtual surgical training environment to train surgeons in temporal bone drilling. The virtual surgical training environment utilises CSIRO's Haptic Workbench technology, which is a networked technology that simulates feel. In 2006, CeNTIE and the Melbourne University entered into an agreement with Medic Vision (a company that provides specialty medical products and expert product knowledge, customer support and after sales service) to licence the joint project technology. The agreement enables the production of a commercial surgical training simulator. CeNTIE has also entered into a supplementary licence agreement with Medic Vision to licence the underlying haptic programming software to Medic Vision. This enables Medic Vision to develop further applications using haptic programming in the field of surgical simulation using CeNTIE technology.

- *Annodex* – CeNTIE has developed the base reference software (registered as trade mark 'Annodex') for a web-enabled browser to search time-continuous documents such as audio and video via hyperlinks. The Annodex technology is an open source software and has been used by CeNTIE for the *Continuous*

*Media Web (CMWeb**)*** project. CMWeb is being developed as a browser for commercialisation as a generic platform to perform annotation and hyperlinking of fragments of time-continuously sampled data in a Web-integrated manner.

- *Post Production Industry Network* – CeNTIE has worked with the film post production industry to build an advanced high speed network linking the industry cluster in Sydney. This network allows companies to test new collaborative, parallel work processes which have led to significant time savings during film projects and helped create critical mass to win work on large projects. The project has also demonstrated a collaborative editing application between post production houses in different parts of Australia.

Innovative use of ICT infrastructure

Learning Federation - Education/online content/All levels of Government/ all locations

The development of online curriculum is bringing many benefits, including the production nof a pool of material which is free to all jurisdictions to distribute. Online material in science, mathematics and numeracy, literacy for students at risk etc. The material is highly interactive and supports leading education practice.

Us Mob - Digital content/Indigenous

USMob is a website which presents a seven part, choose your own adventure story about a group of central Australian aboriginal teenagers. Visitors to the site can interact with characters by choosing story endings, playing games, activating video and text diaries and uploading their own stories. UsMob is the first project to be launched under the AFC and ABC New Media and Digital Services AFC/ABC Broadband Production Initiative, which supports dynamic projects developed and produced specifically for Broadband delivery on ABC Online.

Australian Education Digital Network

In the VTE sector, the Department of Education, Science and Training (DEST) is currently supporting a pilot as part of the Australian Education Digital Network (AEDN) initiative. The pilot involves collaboration between TAFE Tasmania and the New England TAFE at Armidale in NSW. The education networks in both states are connected to AARNet3 to facilitate the pilot, which involves collaboration in the development of online course materials and support for students.

Videolinq Network

Within the TAFE sector in Queensland, the Videolinq Network operates an extensive video-conferencing network and a video-streaming network to deliver courses in regional areas. Twelve of the fifteen TAFE Institutes in Queensland participate in the network, which is comprised of 60 video-conferencing sites located in TAFE institutes and

associated premises across the State. The network delivers real time, interactive telecommunications and learning technology services across multiple sites.
The Network also works with other organisations to develop and deliver specialised training courses. For example the network is supporting delivery via video-streaming and the Internet of course materials for the Diploma of Nursing (Enrolled), and Community and Site Safety and Health Representative course for the mining industry. It is also supporting "live" underwater video-conferencing and web-based instruction in marine biology and ecology education for Years 5/6 and 11/12 school students.

Eastern Goldfields reference site

The Eastern Goldfields Regional Reference Site (EGRRS) is a Broadband for Health funded demonstration reference site which was implemented to test, measure and demonstrate the benefits to healthcare providers of having high-speed, continuous, higher quality broadband using a variety of services including IP telephony and IP videoconferencing. The project provides a Virtual Private Network (VPN) link between 20 GP practices and homes, 3 medical specialists, a major regional hospital and 4 district hospitals, 2 ACCHS, the Eastern Goldfields Medical Division of General Practice (EGDGP), 4 pharmacies, 2 aged care facilities and the rural clinical schools in Kalgoorlie and Esperance. From July 2007 this moves to a sustainable commercial model no longer dependent upon Commonwealth funds.

Attachment 2

INFORMATION TECHNOLOGY ONLINE (ITOL) PROGRAM: OUTPUTS AGAINST PRODUCTIVITY TRENDS

Overview of The ITOL Program

The objectives of the ITOL Program are to provide assistance to a broad range of activities throughout Australia that:

- encourage collaborative industry based projects which aim to accelerate the adoption of business-to-business e-commerce solutions across a wide range of industry sectors, especially by clusters of SMEs; and
- foster the awareness and strategic take up of innovative e-commerce solutions within and across industry sectors which deliver sustainable economy wide returns and contribute to increased competitiveness.

In June 2001, the ITOL program objectives were revised, with the Minister's endorsement, to 'embed a strategic focus' and reflect an appropriate shift from a demonstration program to one that targets strategic issues and projects that have the potential to generate sustainable economy wide efficiencies and productivity gains.

The Productivity Commission report dated 13 July 2004, *ICT Use and Productivity: A Synthesis from Studies of Australian Firms* report also found that 'the acceleration in use of ICT in the 1990s raised the rates of growth in Australia's labour productivity and multifactor productivity' however made no specific mention of the Government's contribution. The forward projections of ITOL project participants with respect to anticipated productivity and efficiency increases within their organisation suggests that the ITOL program has contributed to domestic productivity growth, however this evidence remains qualitative and anecdotal in nature.

Program Reviews and Studies

ITOL has undergone a number of reviews since its inception. However, these reviews focused largely on internal efficiencies from a program management perspective. There have not been any impact studies or evaluations focused on the actual effect of the ITOL program on overall ICT use and productivity in the Australian economy.

There is therefore a lack of quantitative data regarding the impact that the ITOL program has made on the productivity and efficiency trends among project participants on an individual company or sectoral level. The imbalance of qualitative and qualitative data is something we are seeking to redress in the future.

CASE STUDIES

In view of the anecdotal evidence available, the following three case studies have been selected to demonstrate the ITOL program's contribution to efficiency and productivity gains various sectors of the Australian economy.

1. The Collaborative B2B for SMEs in the Mining Industry project

Conducted in Round 11 of the ITOL program, the Collaborative B2B for SMEs in the Mining Industry project piloted a solution to enable SMEs to trade electronically with larger, trading partners comprising over 30 000 entities in the resource sector. The project delivered two products: TradeRoute, middleware software tailored to the needs of SMEs and TradeForms, software to enable electronic trading with partners that have no e-business software.

This project was successfully completed and demonstrated increases in efficiency and productivity by:

- removing costs from the supply chain through; reduced transaction errors and timely delivery of information;
- automatically processing orders and eliminating errors resulting in more orders being processed correctly and reallocation of human resources;
- automating export documentation process resulting in faster shipping orders and an estimated 600% increase in the number of overseas customers; and
- integrating back-end systems and reducing operational costs.

2. The Cancer Institute NSW Registry e-Notification project

Conducted in Round 12 of the ITOL program, the Registry e-Notification project piloted a system which sends electronic notifications of cancer diagnoses from pathology laboratories to NSW and ACT Central Cancer Registries (CCR).

This project was successfully completed and demonstrated increases in efficiency and productivity by:

- streamlining existing services for almost 1150 full-time GPs by developing a secure interactive website;
- developing an efficient, transparent booking and management system which contributed to reducing the costs of providing a locum service to a realistic weekly rate;
- exerting pressure on more expensive (for profit) locum agencies to reduce their fees. More exposure and more access to services should stimulate growth in the locum pool and therefore increase supply; and
- better monitoring of NSW/ACT cancer trends, to evaluate cancer care programs, to support health policy in NSW, and to contribute to national and international benchmarking.

3. The Anomalous Behaviour Detection System project

Conducted in Round 8 of the ITOL program, The Anomalous Behaviour Detection System project piloted an automated detection tool to significantly improve the ability of

financial institutions to deal with online banking fraud and other types of financial crimes.

This project was successfully completed and demonstrated potential increases in efficiency and productivity by:

- developing a solution which will address some of the issues that current Intrusion Detection Systems (IDS) are not able to remedy;
- increasing the speed of detection by monitoring every online transaction and automatically identifying abnormal behaviour;
- allowing banks to address customer complaints more quickly and activate measures to limit online fraud;
- raising consumer and business confidence in the online payment system and in the use of the internet as a business medium;
- reducing the cost of fraud detection and prevention, in terms of both time and money and enabling banks to reallocate resources to other endeavours; and
- enabling the developer – Neuragenix – to integrate the prototype into existing solutions and implementation outside the banking environment.