



## CSIRO Submission 09/333

# RESPONSE TO THE DEPARTMENT OF BROADBAND, COMMUNICATIONS AND THE DIGITAL ECONOMY, 'DIGITAL ECONOMY FUTURE DIRECTIONS' CONSULTATION PAPER

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## Overview

The CSIRO welcomes the opportunity to provide input to the consultation paper. In addressing issues raised in the consultation paper. CSIRO has only responded to those areas where we have appropriate knowledge and expertise.

CSIRO has a great deal of experience in addressing issues associated with the open access to Public Sector information (PSI). In this regard, there is significant potential benefit to Australian society through a considered approach to making PSI available.

The Federal Government initiative to deploy a National Broadband Network (NBN) provides the infrastructure for Australia to participate in the Digital Economy. However, for Australia to fully participate and potentially take a global leadership role research and development will be a critical element in the creation and trial of new electronically delivered services.

The comments provided in this paper reflect issues CSIRO is currently addressing in the provision of information to collaborators and the public and ideas to enhance the use of the NBN through new technology for trust and privacy, innovation in web services and tele-collaboration tools particularly for the delivery of government services including healthcare and education.

The recent Korea OECD conference highlighted the need to improve confidence in the Internet and understand the impact of the convergence of voice, video and data on broadband tethered and mobile communications infrastructure. Three important issues emerged from this OECD meeting and significantly, areas where Australia can progress footprint:

*Confidence:* Australia and the global community can accrue great advantage from the Internet and technologies are required which ensure security of transactions, privacy of the users and safe use by children.

A key observation from CSIRO in this regard is that Australia's efforts in this area would benefit from a centre of focus where internet technologies and applications for government, business and consumers could be developed, deployed and tested to provide assurances of security, privacy and trust. Such a centre of focus could be established through a National Trust and Security Centre. At present Australia's capabilities in this space are limited; in both scale and competencies.

*Convergence:* Broadband voice, video and data services are now increasingly available through "one pipe", and broadband wireless has added the dimension of mobility. Hence understanding what services can be delivered at a quality that is marketable are key to Australian industry competing globally.

CSIRO's experience in tele-collaboration for health and education suggest further value and productivity can be achieved through increased focus in telework applications. A key challenge for Australia is to overcome the tyranny of distance. It will be increasingly possible to deliver quality public and commercial services over broadband. Providing 100% broadband access for all Australians with new and emerging cost-effective technologies is now within sight.

*Communications Infrastructure & Technologies:* The Australian Government has taken the initiative with the planned National Broadband Network (NBN).

CSIRO's work in extending the reach of the NBN is relevant here, particularly in looking to understand local access issues beyond the reach of the deployment of Fibre to the Node (FTTN) particularly in non-metropolitan areas and rural, regional and remote communities.

The delivery of Government services through the NBN is also an issue that CSIRO and others in Australia's Innovation framework have identified as one for further exploration.

One way this may be achieved could be through the establishment of a *National Collaboration Services Initiative*; a mechanism to provide a test bed for members of the National Innovation System (NIS) as well as for stakeholders and innovative businesses and organisations from the Australian Internet community to participate in independent trials of new collaboration services, and to validate new standards and technologies.

## Open Access to Public Sector Information

CSIRO:

- Supports and encourages the Commonwealth's shift toward open access to Public Sector Information (PSI).
- Supports dissemination of information and public access to information that is of general benefit to Australian society and where such dissemination does not infringe any third party rights or cause harm to Australian industry in any way.
- Has an obligation to promote the interests of the Australian scientific community and Australian industry more generally with a view to benefiting Australian society as a whole.
- Considers increased access to PSI as conferring a benefit to Australian society, so long as it is done with care to avoid breach of any contractual, legislative or other obligation that may exist in relation to that information.
- Future innovation will not only be driven by technology, it will also be data-driven. New hubs of commercial activity that assist in accessing PSI and creating value from PSI will become possible. Open innovation is increasingly becoming accepted alternative to IP driven innovation/

PSI is currently available for a range of purposes, but its full potential is far from being realised. Further opportunities may arise if for example PSI was made available through the internet as web services to allow not only web browsing and search, but to also to provide programmable interfaces for information integration, query, and quality assessment. Further benefit may be achieved through making PSI data available in an XML format in compliance with government sponsored standards that are developed for each PSI category. Opportunities exist for Australia to lead the way in sponsoring data standards in the public sector, through the World-Wide-Web Consortium (W3C) – which is the

internet standards organisation of which Australia is a member. CSIRO manages the W3C presence in Australia by hosting the Australian W3C Office in Canberra. This done by partnering with academia, industry and web communities to provide the Australian web technology industry with targeted education and outreach programs to improve the awareness of next generation web technologies.

The next step in promoting use and reuse of PSI could be through making the PSI and the corresponding web services:

- Citizen centric – addressing the needs of end-users rather than adhering to the provider's internal government organisational structure or business processes
- Scalable – capable of serving the increasing numbers of PSI users
- Targeted – addressing specific needs of individuals, families, and communities
- Compliant – with regulations and best practice standards
- Privacy preserving and trustworthy – addressing privacy concerns and gaining the trust of end-users.
- High value – annotate PSI with metadata (e.g., RDF annotations) that will increase the effectiveness of PSI searches (e.g., will provide highly relevant results) and increase the value of PSI related services.
- Consistent with new and emerging standards

***What categories of PSI are most useful to industry and other stakeholders to enable innovation and promote the digital economy?***

From CSIRO's perspective, there are various categories of PSI that would certainly be most useful to industry in particular and the digital economy in general, but these also constraints and issues related that must to be taken into consideration.

### **Contractual issues**

Of particular relevance to CSIRO is scientific information that is provided to Commonwealth departments via for example; consulting services agreements or collaborative research agreements. Often, the nature of the science in these transactions involves the participation of third parties and as such, the basic terms of those agreements may preclude public dissemination of the information supplied. Similarly, however, often all these factors can also point toward public access and publication. This dependent upon the ultimate aims and participants within the particular project and therefore, the determination may only be made on a case by case basis.

Working on the assumption that this type of scientific information falls within the Commonwealth's definition of PSI we have found it useful to apply the following criteria to determine whether such information may be published:

- The contemplated publication complies with the terms of the contract supplying the information; and
- No contractual party or third party rights will be infringed or adversely affected by the publication; and
- It is not unlawful or contrary to privacy, national security, copyright or other relevant Australian laws and policies; and
- It is in the public interest and not harmful to Australian society or industry more generally.

Also given CSIRO's experience in disseminating PSI material it is suggested that

- The Commonwealth may protect itself from unwarranted exposure through ensuring that any information provided is done so by the Commonwealth, without warranty on an 'as is' basis and at the risk of the user. The Commonwealth should disclaim all direct and indirect liability for any loss and not warrant accurateness or fitness for a particular purpose. The disclaimer should further clarify that any information displayed may be subject to change and/or the uncertainties of scientific and technical research (particularly if the information is comprises estimates or projections) and should not be used as a substitute for independent professional advice. Use of PSI should be for personal, non-commercial and/or educational purposes only and the access licence should specifically exclude commercial use.
- The Commonwealth and/or suppliers of the information should not put itself in a position where it may be held responsible for any use of the information that causes harm or loss, particularly where the information may be easily mis-interpreted, mis-applied or used for commercial purposes. Similarly, publication of information supplied to the Commonwealth should not expand the potential liability contemplated by the contract governing the supply of information to the Commonwealth in the first place.

These suggestions are made only in relation to scientific information and/or data and do not extend to the minefield of legal issues associated with publishing open source computer software, programs and models. The emerging trend toward access to computer programs requires a separate in-depth legal analysis and would also need to be determined on a case by case basis. This would involve an in depth review of the licensing structures that currently exist in the open source code forums. As such, it is assumed that publication of computer programs and associated computer systems and models do not fall into the category of PSI for the purposes of this paper.

### **Capturing Professional Expertise**

We observe the experience and knowledge of the best people in the Public Sector could be considered an untapped PSI resource. Creating publicly available expert profiles including details of the experience, knowledge and expertise of that individual openly available could be useful. Whilst ensuring compliance with privacy laws by ensuring that personal information is not conveyed in such a resource and ensuring an individual's consent to participation is obtained, it is thought that focus on the professional expertise,

knowledge and resources of publicly funded organisations could assist in breaking down barriers and improving public access to PSI.

### **Research Data**

Vast amounts of data are locked in the personal, departmental and institutional systems throughout the public sector, and this resource is growing exponentially. Productivity gains in the research sector alone would be significant if such data could be systematically captured, structured and shared amongst research groups. Issues relating to data interoperability, verification and incentives to share are some of the very significant hurdles to be addressed. New models for handling and sharing data are being established in the Australian academic community through the DIISR/NCRIS Australian National Data Service – see <http://ands.org.au/>. Some of these approaches and tools are worth considering for broader adoption within the digital economy.

The value of data is lessened considerably by just providing it to the community with the expectation that innovation jewels will immerge. On the contrary, it would benefit from being selectively mined to produce most value. Perhaps different Commonwealth Departments and Agencies could identify aligned interests and goals with respect to the collation, publication and sharing of public interest information. Commonwealth Departments and Agencies often hold a wealth of PSI as a result of internal and collaborative research interactions with one another.

A whole of government approach to sharing project outputs and data of this nature could result in a valuable central information resource accessible by Commonwealth Agencies and the greater community alike. Such an approach to the sharing and dissemination of data would reflect the recent emergence of a 'Whole of Government' approach to contracting, ownership of intellectual property and sharing of data rather than the sectoral approach to data management and information sharing employed to date.

Also, as with many products in the market, data offerings would benefit from being targeted to meet customer expectations:

- What data does the customer want?
- Has a PSI data-interface delivered to user expectations?
- How does it evolve to meet changing demand?
- Is it cost effective?
- Has it delivered measurable objectives?

Creating a data interface is only the first step and there must be ongoing investment to insure continuous improvement and measures in place to assess productivity gains.

### **Copyright Material**

There is a lack of clarity on what is actually included in this category with some of the product types and issues covered later in the submission.

### ***What are the priority issues that will facilitate the use of PSI?***

The answers to this question will be different for each user sector but may be generalised under the following points:

- ***Need*** – a census on the range of PSI available combined with market assessment to identify what various customers groups want would be fundamental to configuring PSI to meet perceived user needs
- ***Accuracy*** – PSI must be accurate and trusted by the user
- ***Accessibility*** – users must be able to find PSI today, tomorrow and next week and be able to access it through best practice interfaces
- ***Focus*** – PSI must be focused on the needs of users
- ***Depth*** – PSI must offer sufficient range to entice customers to use and reuse the information asset
- ***Safe*** – the fear of catching something or giving away too much private detail while online is prevalent and PSI platforms must be absolutely transparent and above reproach in the minds of users
- ***Customer satisfaction*** – delivering a positive experience (with expectations ranging from simple intuitive interfaces, to a “fun” experience to a commercially or intellectually rewarding outcome)
- ***Market driven*** – Provision of PSI ideally reflects market need ie close attention to market forces is needed to define and refine what PSI information is delivered (not necessarily to be confused with commercial drivers).
- ***Quality*** – in summary, PSI should aim to become an excellent product and a rewarding online environment to facilitate use and desired outcomes.

### ***If PSI is made open access***

. ***What are the best formats to enable and promote use and reuse?***

. ***What licensing terms would best facilitate and promote its use and reuse?***

These two questions are interrelated with a host of issues nested in them. The open access debate is contentious in the science community. CSIRO will only touch on a few very significant issues in this paper.

#### **Data**

The efficient use of research data is currently hampered by, for example; the sheer volume, multiple formats, lack of agreed data structures, entitlement to use and ownership of data, confidentiality and accuracy. These concerns, amongst others, must be addressed before access, format or terms of data access and dissemination may be considered.

Whilst many scientists and researchers often wish to publish and share their research data (especially that which may be considered to be information that is in the public interest), they are often faced with the conflicting pressure of protecting the value of that project output (often in the case where new

intellectual property is created) to ensure recognition, future work and future value in that field and the fundamental disincentive for researchers to share data due to the competitive nature of funding grants. The need to justify one's field of research and remain at the cutting edge of a field of science sometimes places pressure on organisations and individuals to protect their areas of knowledge sometimes at the expense of sharing of PSI. With access to public funds increasingly under threat, these types of pressures are likely to be on the increase.

From a structuring and quality control perspective, the lack of agreed, functional data standards is a core issue for ensuring the efficient use of research data. A nationwide agreed format for different types of data, agreed handling procedures and reliable quality control measures to facilitate a nationwide data management service for PSI could be considered. Scientists and analysts working in a variety of research fields could be surveyed as to the most up to date and efficient formats and methods of handling and exchanging data to ensure both the integrity of the data is retained whilst promoting dissemination and access. This is a rapidly evolving area, in which specialist in-put would be required to ensure the most up to date data access, handling and storage system is put in place. While a nationwide approach is advocated, such an approach needs to be informed by global standards that are emerging through the internet. Proprietary internet data standards such as Google Health record and Google Earth, are now emerging and would need to be carefully considered in terms of lock-in to proprietary platforms. Alternatives exist with the W3C, where open internet standards can be developed that will stimulate innovation and competition to develop new products and systems to use the data.

Data access agreements and licence terms would need to be considered for any information that may need to be protected or used only in a certain manner. Such terms would include restrictions upon the commercial nature of the use and/or restrictions or caps on liability in the event such data is relied upon to the detriment of the user. It is likely that use of a number of categories of PSI data should be on an as-is basis for non-commercial uses only, depending upon the nature of that data.

## **Reports**

CSIRO publishes over 600 technical reports annually<sup>1</sup> for a range of stakeholders. Many of these are already openly accessible to the community and systematic integration of such material with other similar PSI would be advantageous. Furthermore, there is also a wealth of print-based material in the public research sector that could be digitised both for the research community but also industry and the Australian public. A key factor inhibiting greater access to this information relates to the limited resources at an institutional and individual level to do so. Such limitations may be described as both human and financial.

Also, in certain circumstances an open access objective for reports may not be possible. Many research outcomes are the result of contracts with complex intellectual property implications (such as destroying the novelty of a patent application) and could also have commercial-in-confidence restrictions.

## Journal Papers

It is not clear on where research publications fit in the PSI discussion. For CSIRO, journal publications are extremely important and we ask for clarity on what is “in scope”.

For background, CSIRO researchers publish over 2200<sup>1</sup> papers annually through a range of journals. The validation process of peer review and global readership of these research outcomes is fundamental to advancing the research process and measuring the impact. The publishing sector has invested in the digital economy to provide systems that facilitate the peer review, link the world’s literature and deliver the world’s research outcomes to the desktops of CSIRO and virtually every researcher in the world. And the journal print archives have been digitised to offer a true global research library.

CSIRO scientists enjoy unprecedented access to this research (which includes journals, databases and increasingly digital books) as do researchers and students at Australian universities, commonwealth and state research groups and, of course, industry. The student population in particular has access to immense, high quality digital resources and is the core driver in the future growth of the Australian digital economy.

Is this journal publishing process perfect? Absolutely not, but to paraphrase Sir Winston Churchill, it is better than other systems that have been proposed. There are many issues in the current market place with the debate around open access perhaps the hottest.

For instance, virtually every journal publisher that CSIRO deals with offers an open access option where a researcher can choose to make a paper “OA” for a fee of about \$5000<sup>2</sup>. CSIRO could publish its journal content OA but the cost would be about \$11 million (2200 papers x \$5000). The investment required to take Australia’s research output OA would be about \$1 billion annually<sup>3</sup> (200 000 papers x \$5000) with insufficient cost offsets since we would still need to acquire the 98% of research literature created in other countries. Information models in scholarly communication are evolving rapidly, but CSIRO is currently of view that those who require our research have excellent, cost-effective access and there are better investment options available for our limited resources.

## Books

It is unclear if books are “in scope” for this PSI discussion and may require clarification.

Scientific books are similar to journal publications in many ways but also have differences. Last year, CSIRO researchers published 234 books or book chapters and over 1500 conference papers<sup>1</sup>. Complete books are often a way to capture the life work of our research experts and an important mechanism for transferring that knowledge to future generations. Book chapters and conference papers are often multi authored, international collaborations that bring together research on the current state of a research topic. These publications are important to building reputations, attracting research staff and developing international partnerships, as well as transferring outcomes to the community. Are research monographs and conference papers PSI?

It is worth noting that book publishing often involves commercial arrangements with significant benefits in technology transfer and with commercial returns. *The*

*CSIRO Total Wellbeing Diet* is an excellent example of good publishing, significant public engagement and a decent royalty return to CSIRO. Of course it was a print product, but books are fast morphing into digital commodities that will require careful consideration in the PSI context.

### **Format Options for PSI**

The ideal format for PSI is a moving, fast-evolving feast of opportunity! Interestingly, the current reading habits of our staff suggest that print era PDF copy is still highly prized. Many would read HTML journal content with the advantages of referencing linking to other papers a significant feature, but there is still a tendency to save and print the PDF for reading offline.

It is useful to note that almost all commercial publishers are using highly structured XML for both journal and book base content, which can be sent to print layouts and HTML web pages, but they are in a position to deliver to alternate platforms formats that *will* eventuate. From CSIRO's experience, Australia would therefore benefit from implementing standards and structure across PSI information to enhance its current functionality and future potential.

While the current tendency is for researchers to print and read offline, our people are at the forefront in using content alerts, mashups, video and voice communication, YouTube, Flickr, community networking and even Second Life. While structure and standards are important for slicing and dicing information for delivery to different platforms, incentives and "space" for owners of PSI to experiment with new channels is an important aspect of the digital economy. A key to progress will be balancing the need to be prescriptive in certain circumstances, yet allowing for and encouraging innovation.

### **Licensing Options for PSI**

From CSIRO's experience certain categories of PSI warrant aggressive protection by copyright and patent legislation while other information groups could have simple, explicit Creative Commons license terms that will facilitate use and reuse.

Introducing proper licensing options raises many complex issues depending on the information category concerned. From the CSIRO perspective, we would encourage deep consideration of the following issues:

- **Attribution** – The inalienable right to attribution is nonetheless a right that is often breached, either through lack of awareness or failure to take care when referring to a written work. Scientists build a career on their publication profile so proper attribution in leading journals is one of the corner stones for our people. The need and legal right of an author (artist, photographer, etc) to be credited for their work must be carefully considered in certain information categories and license terms under OA must specify this requirement.
- **Copyright** – related to the question of proper attribution, is the valuable right of copyright in a work by the author of that work. In accordance with Australian copyright laws CSIRO has clear policy on how copyright ownership of a work created by our staff during employment is handled. Australian copyright laws are increasingly under pressure as a result of a lack of understanding of these laws, non-compliance by badly managed open access and data sharing forums and increasingly blatant infringement of copyright rights in the face of inadequate policing and penalties for

infringement. As such, we expect policy and compliance may be variable across the public sector. Ensuring compliance with copyright laws when making copyright works publicly available requires careful consideration and clear guidance in the terms and conditions for any licence/use of the work.

- **Plagiarism** – is already a significant issue for the scholarly community. The emergence of the digital economy opens Pandora's Box with the requirement to consider the threats and manage the problem as PSI becomes widely available. Published written works that are subject to copyright could perhaps be provided in PDF form only and those systems and tools put in place by many Universities to avoid and discourage plagiarism could be considered.
- **Creative Commons** – Creative Commons (CC) licenses have many advantages for certain classes of PSI but these types of licence have a variety of approaches, requirements and levels of control. What rights access will be applied to PSI? CSIRO has particular concerns for confidential or commercial-in-confidence reports with contractual or lucrative intellectual property potential, so would seek clarity around what information types are considered suitable for CC licensing. In particular, most creative commons licences require that data and/or information including intellectual property is used for non-commercial purposes such as personal study and research and the user is responsible for verifying the validity of the information or data.
- **Liability & Indemnity** - It is suggested that the Commonwealth is not in a position warrant the accuracy or fitness for purpose of data, information and/or other intellectual property made publicly available as PSI. Any liability for a proper use (ie: non-commercial) of PSI may be capped and liability for consequential loss or liability to third parties excluded.

***Should licensing terms distinguish between commercial uses and non-commercial uses and reuses?***

Differentiation between commercial and non-commercial uses and reuses is appropriate. Careful consideration is required when providing information deemed to be in the public interest or useful to the public or broad industry groups. In such cases appropriate CC license terms to facilitate use and reuse (without placing an onerous burden upon the Commonwealth for paying for the cost of collation and supply of the information and/or sharing responsibility for the quality and accuracy of PSI that is used for financial gain) is required.

The opportunity for commercial gain from the use of PSI exists. When this is possible, it is appropriate for Industry and commercial entities to be required to negotiate access to information and data they may need for their proper business purposes on commercial terms that are agreeable between the information provider and the business concerned. As such, commercial use of information is best supported by commercial terms. That way, proper value is attributed to the collation of such information and markets are not distorted by the Commonwealth soaking up costs (and potential liability concerns) that are more properly borne by industry.

It is therefore clear open access to PSI does not necessarily equate to free access to information tools. Where an individual or business seeks to use PSI for a commercial use, they will be able to approach the organisation which is the

source of the information and negotiate the terms of an access or licence agreement that serves the mutual interests of both, balancing questions of value, responsibility, risk and on-going access in terms and conditions tailored to that particular commercial situation and end use. Furthermore, commercial licences often require the inclusion terms and conditions that go well beyond the standard open access licence terms and conditions, reflective of the requirements, costs and pressures of the industry involved and the particular requirements of the parties involved.

The aim of open access to PSI is not to give commercial entities a free ride without sharing the cost of collation of the data in the first place and without sharing the onus of accuracy and risk of using such information. Instead, the aim of open access to PSI is to foster community general knowledge and awareness, assist people with research and study and in gaining access to information that is in the general public interest. Businesses are still assisted by this new open access regime via increased awareness of the information that is available to be purchased. At the same time, markets are not distorted by the Commonwealth subsidising commercial activities by incurring the cost of collating and supplying PSI and further bearing the burden of risk of that supply.

It is also worth recognising the global context of PSI. The web is a global tool and access to Australian PSI will come from around the world. Issues of competitive positioning and security must be considered when PSI information is made available.

## Digital confidence

A key topic for consideration in the consultation paper is the ability of government, business & the community to be “... *confident to interact and engage via the internet as they are offline. Businesses that have digital confidence will expand their online service offerings and consumers with digital confidence will increasingly find information online, communicate and interact via the internet and shop online.*”

This issue is in keeping with a recent Gartner Report<sup>1</sup> which highlighted: “*Technology [underpinning the network and providing basic connectivity] is now less of a differentiator, whereas customer service excellence and quality of service [that the provider can offer] is becoming more important.*” Quality of service more than ever is imbedded in the need to have end-to-end trust between business-to-business, customer-to-business, and citizen-to-government.

There has been a significant growth of such services both in commercial and social applications such as electronic commerce, blogs or citizen journalism, and social networking that have transformed the way we live. However, along with the emergence of these new applications, there has been a growth in Internet

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1 Gartner Research, “*VNO Phenomenon Could Shake Up the World's Telecom Market*”, G00131283, November 3 2005

related crimes mainly due to its characteristics of global connectivity, anonymity, and lack of traceability.

In particular, there is a growing concern from businesses and consumers alike of security, dependability, privacy and trust in the Internet<sup>2</sup>. In the past, these issues have been dealt separately at different layers from applications to operating system to the network. This approach was effective in mitigating some of the concerns. However, this 'piecemeal' approach is no longer sufficient to be able to address the challenges posed by these new and emerging applications arising from the mobility and scalability of users, devices and services (e.g., mash-ups)<sup>3</sup>.

Providing end-to-end trust in the Internet applications is an essential element in providing businesses and consumers confidence to make good decisions about whom and what to trust throughout the Internet ecosystem. The requirement to have a trust framework on the Internet has been recognised by leading authorities and governments, and has led to significant international efforts. For example, for *ICT Security Research in EU 7<sup>th</sup> Framework Program 2007-2013*: *"...the evolution towards a ubiquitous service-centric information society raises new, unprecedented security and trust challenges for our society and economy"*

The driver for establishing a trust framework based on Internet technologies is critically visible in the scientific, research and innovative business communities both within Australia and internationally. Its promise of offering secure, trusted, reliable services to facilitate the sharing of information between collaborating partners as well as running business transactions underpins the growth of intellectual and economic wealth. This is particularly relevant to Australia, which has seen it move into an ICT enabled service economy from a primary industry based economy.

CSIRO endorses this as a major issue to consider. There is no doubt that Australia and the global community need to achieve full advantage from the Internet, but new technologies are required which ensure security of transactions, privacy of the users and safe use by children. The recent Korea OECD conference highlighted the need to improve confidence in the Internet and understand the impact of the convergence of voice, video and data on broadband tethered and mobile communications infrastructure.

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<sup>2</sup> The Future of the Internet. A compendium of European Projects on ICT Research Supported by the EU 7<sup>th</sup> Framework Programme for RTD.

<sup>3</sup> Mähönen, P; Trossen, D; Papadimitriou, G; Polyzos; Kennedy D. *"The Future Networked Society: A white paper from the EIFFEL Think Tank"*, Release 1, Dec 2006.

In response to the issues outlined above CSIRO has identified two key structural initiatives that may position Australia as the forefront of developments in digital economy space.

### **1. Development of a National Collaboration Services Initiative**

CSIRO has identified that Australia would benefit from the establishment of an advanced experimental network which is able to provide a test bed for stakeholders and innovative businesses and organisations from the Australian Internet community to participate in independent trials to validate new trust and security standards. Such a test bed would also provide an environment for *AusCERT* to test existing and new threats and vulnerabilities as well as their solutions in the current Internet ecosystem and provide on-time advice to Australian public, businesses, and governments. Furthermore, outcomes from these experimental activities would enable Australia to contribute to international activities (such as the Global Trust Centre <http://www.globaltrustcenter.org/>) in the development of policies, best practices and guidance to both governments and industries.

Recently, CSIRO and AARNet agreed to partner in the development of a *National Collaboration Services Initiative* (or *NCSI*) that will provide the test bed for members of the National Innovation System (NIS) as well as for stakeholders and innovative businesses and organisations from the Australian Internet community to participate in independent trials of new collaboration services, and to validate new standards and technologies. The proposed *NCSI* will be managed by CSIRO and other members of the NIS working together to provide project management and ongoing service management for the network as it grows. Tools and services will be developed and made available through the CSIRO and other players in the NIS.

Projects within the proposed *NCSI* which seek to develop, test and trial new collaborative services will be conducted both by NCRIS participants and across the public-private sector.

The development of the *NCSI* has the support of DSTO, NICTA, ISOC-AU, Google Australia and a number of Australian SMEs including PointDuty and IPv6now.

Beyond connecting the eResearch community, and subject to agreement to comply with acceptable use, the *NCSI* will be open to industrial researchers, SMEs and other enterprises wishing to develop or trial new ICT, and will provide: Interaction of publicly funded Australian research groups with Federal and State sectors (such as health, environment and education); co-development and transfer of technologies with Australian industry; a test bed to prove the value proposition and impact of new ICT technologies such as IPv6, and transfer of advanced collaboration technologies to enhance the impact of non-NCRIS research (in areas such as climate modelling and weather forecasting with the Bureau of Meteorology).

The infrastructure of the *NCSI* will form the basis (experimental network infrastructure with advanced network services) for the development of the proposed *National Trust & Security Centre*.

## **2. Establishment of the National Trust & Security Centre**

Given the issues identified in building trust within the digital economy, CSIRO considers the establishment of a National Trust & Security Centre to be an important and necessary step in building industry and consumer confidence. The National Trust and Security Centre would aim to develop the national computing infrastructure for building, deploying and testing secure, trusted, and privacy enhanced Internet technologies and applications for government, business and consumers. The infrastructure will be built using the National Collaboration Services Network, and be available for government agencies, businesses and organisations from the Australian Internet community to participate in independent trials of new trusted services, and to validate new security standards.

To obtain most benefit a National Trust & Security Centre would ideally be managed nationally on behalf of Government, businesses and the Australian research community. National organisations such as the CSIRO could play a role in such a centre. The wide range of applications within CSIRO from preventive health to bio-security together with the availability of a unique experimental network infrastructure provided by the *NCSI* (as described above) will provide many opportunities for the development; deployment and testing of new trusted services.

For example, application areas of national interest for validating trust and security technologies and standards include: emergency response to bio-security threats; smart grid technologies for implementing energy management systems involving advanced metering, distribution automation, and demand response; geological and mine modelling and analysis; and land and water systems visualisation, modelling and analysis. Each of these examples has critical sensitivities about how the information is accessed, distributed, shared and used across the Internet. In the case of emergency response to bio-security threats, State, Federal agencies and CSIRO Australian Animal Health Laboratories (AAHL) need to establish clear communication and information policies that are deployed, and enforced, within the ICT systems and services supporting the collaborative organisation.

## **Developing Australia's knowledge and skills base**

To take advantage of innovation and communication technologies in a broad range of domains and to sustain the nation's economic future Australia needs a highly ICT literate workforce. However, figures indicate that Australia's indigenous ICT capability is diminishing.

- Fewer students are undertaking ICT related university training today than in 2000 - and the numbers are continuing to decline
- CSIRO, and Australia more generally, is finding it difficult to import ICT skills; and
- There is a lack of a local ICT industry with an export focus.

The acknowledged<sup>4</sup> reduction in a high quality ICT skill base may be due to a number of factors including:

- The lack of an internationally cost effective national broadband system has inhibited the development of an ICT industry and an associated workforce. For example, none of Google's 44 global data centres are located in Australia; despite the fact the company has a high performing engineering team based in Sydney.
- 'Brain drain' of ICT professionals to overseas.
- A lack of clear understanding of the opportunities for the profession, and a perception that a career in ICT is akin to desktop system administration.

Finally, the demographics of the academic work-force suggest an ageing population, not be easily scaled up and subject to international competition.

The development of a strategic approach to respond to these observations could include the following:

- Investment in superior infrastructure to attract global data centres and a skilled workforce. A national broadband communication system that is internationally competitive from both speed and cost-effectiveness perspectives will create more favourable conditions for ICT employment opportunities.
- Pro-active measures (such as reduced HECS fees) to rebuild student numbers in under-graduate ICT courses<sup>5</sup>.
- Provision of more dual degrees to build skills in a technical/vocational area and also ICT literacy. Increasingly, more of our work will be driven by innovation in ICT, and all fields of Australian endeavour will require workforces that understand the future, and can harness new ideas and technologies to increase productivity and efficiencies.
- Working closely with ICT industry bodies (such as AIIA and ACS) to promote the ICT profession and the opportunities offered to graduates.
- More industry-based scholarship and student placement opportunities (such as summer internships with CSIRO).

The global economy has only one truly international standard – the Internet. It is important that the Australian society, government and business are absolutely at the cutting edge of the Internet in all aspects from legal standards, privacy and ethics through to information and communication technologies and business applications.

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<sup>4</sup> The ICT Skills forecast Project, First Report: Quantifying Current & Forecast ICT Employment, Centre for Innovative Industry Economic research, Inc., August 2008.

<sup>5</sup> A reduction in the HECS contribution for new maths and science students from the maximum annual student contribution rate of \$7,412 to \$4,162 applied from 1 January 2009.

## Digital economy and the environment

### **Questions for industry and other stakeholders**

***What, steps, if any, should Government take to promote the greater adoption of teleworking and videoconferencing? What impact do Operational Health and Safety laws have on the uptake of teleworking and videoconferencing in your industry?***

***The Government has already committed to review and propose regulation for e-waste and has taken steps to promote smart technology to manage scarce resources. Are there additional steps Government can take on these issues? What additional steps can industry take in relation to these issues?***

Knowledge-based industries such as health and education have great potential to benefit from tele-working. Both industries are characterised by interaction between a few individuals with high levels of expertise and complex knowledge needing to interact with others (students, rural doctors and patients) who might be widely geographically dispersed. The conventional solution has been to transport teachers, students, doctors or patients so that they are co-located. This is expensive, time-consuming and sometimes unnecessary. Transportation also has a significant environmental footprint. In the case of rural medicine, difficulty of access to medical expertise results in poorer health outcomes, which can result in higher costs than early intervention.

There are many videoconferencing systems available on the market, which can augment audio communication with video images. These have replaced some face-to-face discussions, but are regarded by most users as a very inferior to face-to-face interaction. These systems cannot convey the complex, shared information necessary for tele-teaching or telemedicine; they cannot supply the same “situation awareness” to all participants in a videoconference; and they do not convey a sense of “presence” resulting in confidence and trust in the transaction.

CSIRO has been demonstrating how the availability of advanced networks with their capacity for conveying larger amounts of information with high quality of service, combined with advanced user interfaces, can permit the building of systems which are very close to replacing physical presence. The Virtual Critical Care Unit demonstrated the delivery of specialist medical services into the Emergency Department of a small hospital which could not provide those services itself. The ECHONET system was able to bring an Intensive Care or Cardiology specialist to the “virtual” bedside of a critically ill patient in the Intensive Care Unit of a regional hospital. In many of the instances of care recorded in the clinical trials of these systems, medical specialists were able to deliver their services over a distance, not simply provide consultative advice. The outcomes were more appropriate choices for those patients who needed to be transferred to major hospitals, and a much higher confidence in decisions being made about patient management.

In education, CSIRO has worked with the Australian Film, Television and Radio School to demonstrate a system for teaching complex media skills over a distance. If implemented more widely, this system can permit a small number of highly specialised teachers located at its headquarters in Sydney to expand their

teaching to almost any part of Australia. CSIRO's telemedicine systems were also utilised for continuing medical education as clinicians need to continue their learning and benchmarking throughout their careers. The use of virtual reality techniques has allowed expert surgeons to teach their "hands-on" skills to trainees located anywhere in the world on advanced distributed simulation systems.

These systems were demonstrated on advanced networks using specially-developed user interfaces. By using such technology, a level of tele-collaboration much closer to physical presence was demonstrated, and the range of knowledge-based services capable of being delivered over a distance was very significantly increased compared with systems in common use today. Such systems currently require a higher investment than the simpler systems commonly in use, but are likely to be highly cost-effective because of the range of services which can be delivered. The role of government is to encourage and support continued demonstrations of such forms of service delivery, and to encourage the study of benefits to be obtained when knowledge-based industries are transformed through the introduction of such technologies.