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30 November 2017

The Hon Craig Laundry MP  
Assistant Minister for Industry, Innovation and Science  
Po Box 6022  
House of Representatives  
Parliament House  
Canberra ACT 2600

**ACS Response to the 'The Digital Economy: Opening up the Conversation' paper**

Dear Assistant Minister,

Thank you for the opportunity for the Australian Computer Society (ACS) to provide a submission on your government's paper 'The Digital Economy: Opening up the Conversation'.

ACS is the largest professional body in Australia that represents the ICT sector, with 26,000 active members who work in business, education, government and the community. ACS supports Australia's ICT industry and its advancement, partnering with some of Australia's largest corporations, to develop their ICT capabilities, and providing training for our future ICT professionals and leaders.

ACS accredits professional ICT education programs in Australia, meeting the needs of our future ICT professionals in a rapidly evolving digital education space. In 2017, ACS launched its Cyber Security specialism for the Certified Professional and Certified Technologist certifications, recognising the importance of cyber security to Australia's growing digital economy.

In preparation of this submission ACS drew upon its expertise and resources, including a range of ACS research publications and our Technical Advisory Board and Profession Advisory Board, whose membership is made up of leading Australian ICT, academic and industry experts. We have summarised the feedback that directly relate to the key themes and questions in the government's digital paper.

We believe that our submission will assist your government in its productive and progressive policy of developing the digital economy, and we look forward to the final strategy paper being released in 2018.

If ACS can be of any further assistance in developing your digital policy please don't hesitate to contact our Director of Corporate Affairs and Public Policy, Troy Steer on (02) 9299 3666.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Anthony Wong', is written over a faint, larger version of the same signature.

Anthony Wong  
FACS CP  
**President – ACS**



# **Submission to the Australian Government's Digital Economy Strategy**

## **'The Digital Economy: Opening up the Conversation'**

**Australian Computer Society**

**30 November 2017**



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## SECTION 1 – EXECUTIVE SUMMARY

The Digital Economy represents an unprecedented opportunity for Australia to create and exploit new technologies to enhance how we live, work and interact. It will enable higher levels of productivity, open up new markets for Australian ingenuity and deliver enormous benefits in enhancing quality of life, accelerating access to information and unlocking new realms of possibility.

The contribution of digital technologies to the Australian economy is forecast to be \$139 billion by 2020, which will equate to 7% of Australia's GDP<sup>1</sup>. This represents the size of Australia's digital economy and illustrates the significant role technologies such as cloud platforms, data analytics, artificial intelligence (AI) and the Internet of Things (IoT) will play in driving economic growth in Australia.

While \$15 billion of this figure is attributed to the Information, Media and Telecommunications industries themselves, the vast majority (\$123 billion) will come from the application of digital technologies across other sectors such as financial services, agriculture, healthcare and more.

This predicted growth will also fuel increased demand for ICT professionals, with forecasts suggesting Australia will require an additional 81,000 ICT workers over the next six years<sup>2</sup>. This makes it essential to continue building the digital skills base required to meet future workforce needs across the economy.

For Australia to fully capitalise on the tremendous potential of the digital economy, we must act now to create the right conditions, capability and commitment amongst our people to embrace this opportunity whole-heartedly. The inherent nature of the digital economy also means that, if we get the formula right, we can play a leadership role both domestically and internationally.

As the peak professional body for the ICT industry, ACS has defined a three-pronged strategy of:

- Building **Capacity** to ensure that we have sufficient technology professionals to meet our economic growth needs by encouraging more people into ICT and STEM-related careers and attracting top talent from around the world;
- Developing **Capability** by developing superior skills and expertise in our people, establishing benchmarks, providing education, and identifying areas for focused attention which represent significant opportunity; and
- Acting as a **Catalyst** to spark innovation and encourage both public and private sector organisations to embrace technology to transform processes and reimagine customer experiences.

ACS' vision is for a vibrant digitally-driven Australia with a capacity to create and commercialise innovative ICT products and services for the world market, as well as being effective users of technology to maximise productivity and quality of life for all Australians.

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<sup>1</sup> Deloitte Access Economics [DAE], The Connected Continent II: How digital technology is transforming the Australian economy. <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-connected-continent-ii-2015-300315.pdf>.

<sup>2</sup> Organisation for Economic Co-operation and Development [OECD] (2012), ICT Skills and Employment – New competencies and jobs for a greener and smarter economy.



This means creating an environment where:

- Technology products and services are readily available to all Australians, including high speed broadband via the NBN;
- There is a prevailing culture of ‘failing forward fast’ where good ideas are taken to market quickly and developed iteratively in response to user feedback;
- ICT innovators and entrepreneurs are supported through a network of start-up incubators and accelerators and funding is available via a range of investment options;
- We have a large and growing pool of ICT workers, sourced through a mix of university graduates, mature entrants from other sectors who have cross-trained in ICT and migrants with in-demand skills that are in shortage in Australia;
- Women and mature age workers are encouraged to choose ICT careers and enjoy similar levels of representation and success in the ICT sector as they do across the wider workforce; and
- Government procurement processes give priority to Australian suppliers and provide start-ups with reference sites for their products and services.

ACS believes Government, industry and the profession all have a role to play in creating a thriving digital economy within Australia. We continue to advocate and advise on the potential for ICT and the profession with Government, as we have for example with relation to the Skilled Occupation List (SOL) and ANZSCO definitions as outlined in our 2013 Skilled Occupation List submission – here we highlighted a growing shortage of Cyber Security professionals, and recommended the inclusion of ICT Security Specialist (ANZSCO 262112) in response.

This reflects a wider change in the nature and scope of Australia’s skilled ICT workforce. In our experience digitisation is resulting in the convergence of traditional professions, and a move for broader T-shaped skills – and in turn a need for a wider range of general ICT skills across a greater scope of occupations. This will only accelerate as technology embeds itself further as Australia transitions to a digital economy.

We have invested heavily into research into the future of work and the skill needs of a transitioning Australian economy in order to maintain our historically high standards of living. Relevant works that we have been involved with include:

- *Australia's Digital Pulse 2015*<sup>3</sup>; Key challenges for our nation – digital skills, jobs and education
- *Australia's Digital Pulse 2016*<sup>4</sup>; Developing the digital workforce to drive growth in the future
- *Tomorrow's Digitally Enabled Workforce*<sup>5</sup>
- *Crossroads: An action plan to develop a vibrant tech startup ecosystems in Australia*<sup>6</sup>

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<sup>3</sup> Deloitte Access Economics Australia's Digital Pulse Report (2015), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/02062015-Australias-Digital-Pulse-FINAL.PDF>

<sup>4</sup> Deloitte Access Economics Australia's Digital Pulse Report (2016), commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016\\_LAYOUT\\_Final\\_Web.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016_LAYOUT_Final_Web.pdf)

<sup>5</sup> CSIRO Tomorrow's Digitally Enabled Workforce Report, commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/16-0026\\_DATA61\\_REPORT\\_TomorrowsDigitallyEnabledWorkforce\\_WEB\\_160128.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/16-0026_DATA61_REPORT_TomorrowsDigitallyEnabledWorkforce_WEB_160128.pdf)

<sup>6</sup> Crossroads: An action plan to develop a vibrant tech startup ecosystems in Australia  
<https://pearcey.org.au/assets/Years/2016/2016-StartupAUS-Crossroads-Tech-Ecosystem.pdf>



Critically, CSIRO's *Tomorrow's Digitally Enabled Workforce*<sup>7</sup> highlights a number of trends that are pivotal to understanding how our digital economy will unfold and evolve:

According to the report, technology advances, digital connectivity, globalisation, an ageing population, and the rise of new economic structures are creating a 'perfect storm' for jobs and employment models over the next twenty years. As part of this, there is a need for targeted investment in skills, education, and training. Supporting individuals in applying general and transferable skills will be a key priority as we foster a sustainable and productive economy.

Today, 11% fewer year 12 students study maths than in 1992, and there has been a 35% drop in enrolment in information technology subjects at university since 2001. Yet STEM knowledge is associated with 75% of the fastest growing occupations, innovations, and wage premiums.

As the developing world closes the gap, and the world population grows, over a billion new online workers will join global labour markets. Unlike the industrial revolution, where geography limited the flows of products and labour, the information revolution has no geographical barriers.

We will thus see a greater need and demand for digitally-native workers, and continued growth of 'gig economy' industries. Successfully taking advantage of the digital economy means providing options for new market entrants to not just become sustainable quickly, but access and compete on a global market. At the same time we will see a blurring of the line as companies take advantage of a more interned-connected workforce enabled through key technologies like the NBN once complete.

The report identified six megatrends we will see in the coming years that will impact a digital economy, summarised here:

- **The second half of the chessboard** -- the exponential pace of change enabled by technology
- **Porous boundaries** – peer to peer working markets, remote work, 'freelancer.com'
- **Era of the entrepreneur** – technology lowering barrier for entry, small business driving factor
- **Divergent demographics** – living longer, greater load on workforce, ageing health issues
- **The rising bar** – automation and offshoring replace menial roles, higher skills for entry level jobs
- **Tangible intangibles** – moving to a knowledge economy and services industry after mining boom

This and other referenced reports can be freely downloaded from [www.acs.org.au/publications.html](http://www.acs.org.au/publications.html).

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<sup>7</sup> CSIRO Tomorrow's Digitally Enabled Workforce Report, commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/16-0026\\_DATA61\\_REPORT\\_TomorrowsDigitallyEnabledWorkforce\\_WEB\\_160128.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/16-0026_DATA61_REPORT_TomorrowsDigitallyEnabledWorkforce_WEB_160128.pdf)



## **SUMMARY OF RECOMMENDATIONS:**

In response to the call for input on 'The Digital Economy: Opening up the Conversation', a summary of the recommendations outlined in this document follows.

### **SKILLS**

1. **Continue to Support Digital Skills Development in Education.** Encourage policy support for coding and computational thinking in schools, multidisciplinary degrees and training programs to build a pipeline of ICT skills.
2. **Use Skilled Migration Appropriately to Support Skill Needs and Build Local Talent.** Maintain an open approach to skilled migration while ensuring it addresses genuine shortages and complements domestic workforce.
3. **Respond to Technology-Related Workforce Disruption.** Develop technology, innovation and education policies to assist workers in transitioning into ICT-related roles and ensure Australia can fully realise the benefits of the digital economy.

### **DATA**

4. **Accelerate Efforts Towards Open Data.** Develop and implement policies to proactively make government data publicly available to inform research, enable business opportunities and enhance quality of life for Australians.
5. **Define standardised, national frameworks for data sharing and privacy protection.** Define standards and frameworks for data sharing along with tests and risks relevant to data analytics and privacy protection.
6. **Introduce Valuation Standards for Intangible Assets.** Data is often seen as 'goodwill' on the balance sheet, rather than being recognised as valuable asset in itself. An Australian standard for the valuation of intangible assets like data would free up capital and foster new opportunities.

### **CYBER SECURITY**

7. **Strengthen Australia's Cyber Security Capabilities.** Collaborate with industry and academia to address cybersecurity threats, build Australia's cybersecurity skills and capabilities, and educate SMEs about common threat vectors and how to protect themselves.
8. **Cyber Security Certification.** In order for Australian businesses to feel confident in digital technologies, more certified skilled Cyber Security professionals are required. ACS strongly advocates and supports this through its new Cyber Security certifications.

### **POLICY FRAMEWORK**

9. **The Need for Agile Regulation.** Encourage the adoption of new business models and technologies by ensuring that regulators keep pace with changes while still protecting consumers and their personal information.
10. **Support Digital Transformation in Government.** Continue to implement digital transformation of government transactions and services, while learning from recent challenges.



- 11. Improve the Measurement of the Digital Economy and Workforce.** Improve the availability and measurement of data on the digital economy.
- 12. Create a 5G Data Policy in Australia.** Collaborate with industry and research agencies to optimise 5G mobile technology deployment.

#### **INDUSTRY DEVELOPMENT**

- 13. Use Government Procurement to Support Small Businesses, Start-ups and Innovation.** Improve procurement practices to reduce costs and open up opportunities for small businesses and start-ups as a way of strengthening local industry.
- 14. Establish Centres of Excellence around Key Technologies.** Foster collaborative development initiatives around pervasive technologies like AI, Blockchain, the Internet of Things, Fintech, Cybersecurity and Data Analytics.
- 15. Maintain Australia's Research and Development (R&D) Tax Incentives.** Maintain certainty in R&D tax policy settings to enable R&D policy objectives.
- 16. Provide Adequate Access to Digital Infrastructure for Regional Businesses.** Identify and address gaps in National Broadband Network (NBN) service provision for regional business.
- 17. Adopt a 'Fair Use' Approach to Copyright.** Focus efforts on increasing Australia's attractiveness as a market for technology investment and innovation.





## SECTION 2 – INTRODUCTION

The Australian Computer Society (ACS) welcomes the opportunity to contribute the insights and expertise of its members to the Federal Government’s Digital Economy Strategy.

As the professional association for the ICT sector, ACS is committed to advancing a vibrant, world-class technology capability and capacity in Australia and to acting as a catalyst for the innovative creation and adoption of ICT.

ACS was formed in 1966 and is Australia’s peak body for ICT professionals with over 26,000 active members and a national footprint. Like all professional bodies, a core function of ACS is the assessment and accreditation of its members as Certified Technologists or Certified Professionals.

Assessments are conducted against an internationally accepted framework called Skills for the Information Age (SFIA). To retain professional status ACS requires certified members to undertake ongoing professional development activities.

ACS also conducts research-based advocacy on behalf of members on ICT and skills related issues, and is increasingly starting to work more with Australian workplaces (public and private) to help them with their ICT workforce planning and training needs.

ACS is responsible for the professional accreditation of ICT degrees in Australia. It has accredited 950 education programs at a range of Australian universities and a number of registered training organisations (RTOs) that provide higher education degrees in ICT. ACS works closely with the Tertiary Education Quality Standards Agency (TEQSA) to align courses with national standards. It also works with the Australian Council of ICT Deans in the accreditation process.

This submission encompasses input from a broad array of sources including:

- ACS Profession Advisory Board;
- ACS Technical Advisory Board and its sub-committees specialising in AI and Ethics, Blockchain, Cyber Security, Internet of Things, and Data Sharing;
- Recent industry reports, articles and ACS publications including:
  - ***Australia’s Digital Pulse (2015-2017)***, an annual report prepared for ACS by Deloitte Access Economics on policy priorities to fuel Australia’s digital workforce;
  - ***Tomorrow’s Digitally Enabled Workforce 2016*** report, looking at megatrends for jobs and employment in Australia in the coming 20 years
  - ***Data Sharing Frameworks 2016***, a technical white paper developed by NSW Chief Data Scientist Ian Oppermann and published September 2017; and
  - ***Cybersecurity – Threats, Challenges, Opportunities 2016***, a comprehensive guide for governments and business leaders published by ACS in November 2016.

As before, the above reports can be freely downloaded from [www.acs.org.au/publications.html](http://www.acs.org.au/publications.html).

## SECTION 3 – ACS RESPONSES TO SELECTED QUESTIONS

### Section: The Digital Economy

#### 1. How are advances in digital technology changing the way you work, your industry, and your community?

The inevitable digitisation of our lives is impacting every Australian, changing how we work, interact, transact, learn and play. Digital technologies improve productivity, enhance connectivity, streamline a wide range of business processes and drive innovation across all sectors of the economy.

Today many Australians make daily use of digital technologies such as search engines, social media, mobile computing, cloud platforms, streaming services, the Internet of Things and much more, many of which have only come about since the turn of the century.

Technological progress is also a fundamental driver of increases in Australian living standards. New economic modelling finds that Australians are each better off by \$4,663 per year<sup>8</sup> (in 2016 dollars) as a result of general digital technology uptake, which increases the productivity of workers and businesses, improves the quality of products and services, and reduces prices. This benefit is equivalent to a 6.6% increase in Australia's gross domestic product (GDP) per capita over the previous decade<sup>9</sup>.

The contribution of digital technologies to the Australian economy is forecast to be \$139 billion by 2020, when it will equate to 7% of Australia's GDP<sup>10</sup>. This represents the size of Australia's digital economy and illustrates the significant role technologies such as cloud platforms, data analytics, artificial intelligence (AI) and the Internet of Things (IoT) will play in driving economic growth in Australia.

While \$15 billion of this figure is attributed to the Information, Media and Telecommunications industries themselves, the vast majority (\$123 billion) will come from the application of digital technologies across other sectors such as financial services, agriculture, healthcare and more.

**Changing Consumer Trends.** Digital technologies allow for greater flexibility in the way people engage with work (more flexible hours, working from home or in cafes, etc.), higher education and other activities. This is leading to changes in traffic patterns, infrastructure planning, building and office design and affecting the level of social activity and engagement in workplaces, university campuses and more.

**Data Sharing.** Underpinning the transformation to a smarter, truly digital economy is the ability to share data beyond the boundaries of an organisation, company or government agency. Future smart services for homes, factories, cities and governments will rely on sharing of data between individuals, organisations

<sup>8</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>9</sup> Qu, Jason; Simes, Ric; and O'Mahony, John (2016), How do digital technologies drive economic growth?

<sup>10</sup> Deloitte Access Economics Australia's Digital Pulse Report (2015), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/02062015-Australias-Digital-Pulse-FINAL.PDF>



and governments. The ability to create locally optimised, individually personalised services is contingent on users sharing ever more personal information in the form of preferences, contexts and usage patterns.

**The Challenges of Data Sharing.** Beyond the technical challenges, data sharing comes with a range of legal obligations, privacy considerations, data security requirements and privacy concerns relating to the presence of identifiable data in data sets. The linking or aggregation of different data sets creates the potential for data to be reidentified.

The current lack of clear standards around what ‘anonymised’ really means creates uncertainty for organisations seeking to engage in this space. Technology can potentially play a role in addressing this challenge, but defining and seeking agreement on what is an acceptable degree of anonymisation, and how to achieve it in quantitative terms, would greatly improve data sharing. This clarification of existing legal frameworks needs to include quantified descriptions of acceptable levels of risk in ways which are meaningful for modern data analytics.

**Ethical Issues.** The power of computational data analytics and the ability of new techniques to address expressed concerns about privacy raises other ethical concerns. The question some privacy advocates ask about new personalised services is more of an ethical one: Just because we can, should we?

## **2. What is your vision for an Australia that thrives in a digital economy? Where would you like to see Australia in five, 10 and 20 years’ time?**

The digital economy has already delivered enormous disruption and transformation, with the promise of much more to come as emergent technologies like Artificial Intelligence (AI), machine learning, robotics and the Internet of Things (IoT) combine to radically reshape our world.

These disruptions also offer enormous opportunities for Australia to establish thriving start-up eco-systems and established businesses offering world-class products and services in these areas.

**A Vibrant Technology Sector.** For Australia to truly thrive in the digital economy, we need to develop our capacity to create and commercialise innovative ICT products and services for the world market, as well as being effective users of technology to maximise productivity and lifestyle choices.

This means creating an environment where:

- Technology products and services are readily available to all Australians, including high speed broadband via the NBN;
- There is a prevailing culture of ‘failing forward fast’ where good ideas are taken to market quickly and developed iteratively in response to user feedback;
- ICT innovators and entrepreneurs are supported through a network of start-up incubators and accelerators and funding is available via a range of investment options;



- We have a large and growing pool of ICT workers, sourced through a mix of university graduates, mature entrants from other sectors who have cross-trained in ICT, and migrants with in-demand skills that are in shortage in Australia;
- Women and mature age workers are encouraged to choose ICT careers and enjoy similar levels of representation and success in the ICT sector as they do across the wider workforce; and
- Government procurement processes give priority to Australian suppliers and provide start-ups with reference sites for their products and services.

Our vision is for Australia to grow several technology companies of the calibre and size of Atlassian, which remains the poster child for home-grown success in the ICT industry.

**Centres of Excellence.** Given the pervasiveness of key technologies like AI, the Internet of Things, Fintech and Data Analytics, there would be significant benefit in establishing centres of excellence focused around these technologies to foster collaborative development initiatives. China's ability to establish world-leading expertise in AI over the past 10 years<sup>11</sup> offers both a lesson and a warning that Australia cannot afford to be left behind in this critical space.

**Continued Strong Demand for ICT Workers.** The outlook for the employment of ICT workers continues to be positive, consistent with the forecasts presented in *Australia's Digital Pulse* reports over the past few years. Under our current forecasts, Australia will require an additional 81,000 ICT workers over the next six years<sup>12</sup>, so it is essential to continue building up the digital skills base required to meet future workforce demands across the Australian economy.

The increasing prominence of digital technologies in all industries across the Australian economy translates to growing demand for ICT workers and skills in a diverse range of sectors and roles. Digital technologies are increasingly a 'horizontal' element that overlays all 'vertical' industries, so there are many more opportunities for ICT employment. This trend is expected to continue to create strong demand for ICT workers in the future, particularly since digitally enabled innovation is and will continue to be a significant driver of growth and competitive advantage among Australian businesses.

Employment growth is forecast to be strongest in ICT management and operations occupations, tipped to grow by 28,500 workers (2.4% p.a.) between 2016 and 2022<sup>13</sup>. We also predict relatively high growth for ICT technical and professional occupations, which we expect to increase by 26,700 workers. (1.9% p.a.)

In the 2016 edition of *Australia's Digital Pulse*, we distinguished between a 'narrow' measure of ICT specialists who develop, operate and maintain ICT systems, and for whom ICT is the main part of their jobs; and a 'broad' measure of employees who use ICT regularly as part of their jobs and rely on ICT skills to perform their work, but whose jobs do not focus on ICT. This distinction is consistent with the OECD's framework for considering ICT workers and skills.

<sup>11</sup> 26 July 2017 Paul Daugherty 'How China became an AI leader' for World Economic Forum Annual Meeting of the New Champions. <https://www.weforum.org/agenda/2017/06/how-china-became-ai-leader/>

<sup>12</sup> Organisation for Economic Co-operation and Development [OECD] (2012), *ICT Skills and Employment – New competencies and jobs for a greener and smarter economy*. [http://www.oecd-ilibrary.org/science-and-technology/ict-skills-and-employment\\_5k994f3prlr5-en](http://www.oecd-ilibrary.org/science-and-technology/ict-skills-and-employment_5k994f3prlr5-en)

<sup>13</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS <https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>



The narrow measure of specialists is closely aligned with this report's definition of ICT workers and the 640,800 workers we have estimated to be in Australia's ICT workforce. The broad measure of workers who are intensive users of ICT includes occupations such as accountants, solicitors, architects and environmental scientists. Our employment modelling suggests that this broader ICT workforce will grow from around 2,548,900 workers in 2016 to 2,785,600 in 2022, representing a projected gain of 236,700 jobs over this period<sup>14</sup>.

These employment forecasts could be affected by a faster-than-expected uptake of new and existing digital technologies, including mobile internet, data analytics, IoT and AI. As highlighted in the 2016 edition of *Australia's Digital Pulse*, this scenario could lead to a reduction in job numbers due to labour-saving digital technologies automating certain roles, but also an increase in employment due to growth opportunities associated with designing, implementing and maintaining new technologies. While the net impact on the employment of ICT workers and skills is therefore uncertain, so far the ICT workforce has been a net beneficiary of technological change, and could continue to gain from this future digital disruption<sup>15</sup>.

**Australia's Digital Services Economy.** Australia has a predominantly services driven economy which is increasingly digital, online and facilitated by user generated data. Within our digital economy, Financial Services – comprising principally banking, insurance and capital markets – has overtaken all other sectors to become the largest sector of the economy<sup>16</sup>. We are also seeing a rapid move to digital as-a-service models in many other sectors of the economy.

The recent financial crisis and its aftermath have fundamentally challenged beliefs about the ways in which traditional businesses, financial systems and households behave. There are increasing demands for both financial and non-financial services organisations to have a stronger customer-centric focus, to operate with more transparency and to provide better consumer protections. In the finance sector, customers have demonstrated a far greater willingness to engage with non-traditional providers for loans, investment, saving and retirement products. In non-financial services, new as-a-service models have evolved for transport, accommodation, education and entertainment.

As a consequence, there have been waves of technology-driven innovation in the finance and non-finance sector coming from both incumbents and from new entrants challenging for a share of the market. In such an environment, data is significantly undervalued as a factor of production, a means of increasing transparency and as a source of innovation. The ability to harness a wide range of large, constantly evolving and highly personalised data sets is a strong driver of productivity and supports the creation of new, high value services. As digital services companies continue to create value by digitally enabling their current business models, the opportunity exists to adopt new, disruptive business models targeted at ever more refined customer segments.

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<sup>14</sup> Deloitte Access Economics Australia's Digital Pulse Report (2016), commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016\\_LAYOUT\\_Final\\_Web.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016_LAYOUT_Final_Web.pdf)

<sup>15</sup> Deloitte Access Economics Australia's Digital Pulse Report (2016), commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016\\_LAYOUT\\_Final\\_Web.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/PJ52569-Australias-Digital-Pulse-2016_LAYOUT_Final_Web.pdf)

<sup>16</sup> Australian Centre for Financial Studies, 21 Oct 2015. 'Big and better data, innovation and the financial system' by Ian Oppermann. Available at <http://apo.org.au/node/58127>



**Addressing Falling Productivity.** Increasing productivity in the digital services sector has become the new benchmark for international performance and Australia has fallen behind many of our trading partners. Productivity growth in the digital (services) economy means taking advantage of advances in ICT, as well as increasing use of data available from government, industry and citizens.

In the rapidly growing number of ‘as a platform’ companies operating within the digital economy, data sets have become a major driver of output and also productivity, greatly outpacing the importance of land, labour or capital. In the digital economy, data deserves to be considered a primary factor of production in its own right.

Pervasive use of data means organisations can continually experiment, simulate and analyse outcomes to better understand their own business, improve operational performance, guide investment decisions and improve customisation of services. This can help reduce the variability of outcomes while improving financial and product performance.

As the largest sector of the Australian economy, the financial services sector has historically been a rapid adopter of ICT but has performed modestly in terms of productivity growth. Changing customer expectations and new waves of technology innovation are challenging traditional providers. Small, nimble companies are attacking parts of the traditional value chain, creating new services by harnessing a wide range of large, constantly evolving and highly personalised data sets: bigger, better data.

**Increase in teleworking.** The combination of faster internet access through the NBN with an increasingly wider opportunity for digital-driven roles and skills, will provide not only greater flexibility in the current workforce and an increase in the number of Australians working in the ‘gig economy’, but will also be a great enabler to address issues of diversity: allowing for women, older Australians, and those in remote areas access to job opportunities that otherwise wouldn’t have been possible.

### 3. What is the role of Government in achieving that vision?

Government must play a multi-faceted role in supporting the development of Australia’s digital economy by:

- Identifying and encouraging the development of key technologies and disciplines;
- Implementing policies and initiatives designed to educate and equip Australians for the digital age;
- Creating and promoting a national digital economy narrative that focuses Australians on the importance of this journey and engages them in the opportunities it offers;
- Establishing a relevant, contemporary and agile regulatory framework for investment and growth; and
- Using its purchasing power as Australia’s largest consumer of technology products and services to support local businesses.

Below is a range of strategies ACS believes are necessary to enable Australia to fully participate in the digital economy. The Government has already begun working towards some of these, but should urgently consider additional measures to maximise their impact and benefits for digital adoption and growth.





**Build Digital Communities to Facilitate Collaboration and Innovation.** Facilitating a supportive environment will encourage growth, particularly in the early stages of developing digital ecosystems. Initiatives could be targeted at building digital communities in particular sectors identified as having greatest potential.

**Continue to Support Digital Skills Development in Education.** Encouraging continued policy support for introducing coding and computational thinking in school classrooms, multidisciplinary degrees and relevant training programs will help to build a pipeline of workers with valuable ICT skills.

**Use Skilled Migration Appropriately to Support Skill Needs and Build Local Talent.** We must maintain an open approach to skilled migration while ensuring it addresses genuine skills shortages.

**Strengthen Australia's Cyber Security Capabilities.** It's important for the Government to collaborate with industry and academia to address cyber security threats, improve the detection and response to vulnerabilities and attacks, and build Australia's cyber security skills and capabilities.

**Accelerate Efforts Towards Open Data.** Work must continue towards making more government data publicly available and considering how best to combine and analyse data to enable business opportunities and enhance well-being.

**Procurement Reform with Open Data.** As an example, the NSW Government banking tender process has a requirement for the successful tender to make their data available to government. Applying this across all sectors – e.g. telecom, energy, transport among others and across both public and private – and the data generated by these sectors can be used for example to assist in better service provision planning by the government. By including data sharing in government contracts, we can move to a true partnership model for procurement and not just a transaction-based one.

NSW's green slip reform is an example of what's possible when government can work closely with industry while utilising data to inform decision making.

**Develop Practical and Effective Privacy Frameworks.** Privacy issues relating to new personalised services are not readily addressed by technology. The Government needs to develop practical frameworks which allow the creation of value while still preserving individual privacy. This would enable the creation of commercially viable service offerings while clarifying the rights and obligations of people producing, delivering and using these services.

**Support Digital Transformation in Government.** Efforts must continue towards the digital transformation of government transactions and services, including a commitment to learning from recent challenges associated with this digitisation process.

**Respond to Technology-Related Workforce Disruption.** Planning and investing in necessary technology, innovation and education policies will ensure Australia can fully realise the benefits from new jobs and industries that emerge as the digital economy grows.

**Improve the Measurement of the Digital Economy and Workforce.** The Government must work towards improving the availability of data on the digital economy, and ensure that the information collected accurately captures the innovative and dynamic activity of Australia's digital industries and workforce.

**Provide Adequate Access to Digital Infrastructure for Regional Businesses.** Policy can assist in addressing gaps in National Broadband Network (NBN) service provision to ensure that the infrastructure needs of businesses in regional Australia are met.



**Create a 5G Data Policy in Australia.** Collaboration with industry and research agencies will help to optimise the effectiveness of 5G mobile technology deployment in a way that creates new opportunities and addresses known challenges.

**Maintain Australia's Research and Development (R&D) Tax Incentives.** The Government must maintain certainty in R&D tax policy settings and carefully consider a Federal Government response to the Review of the R&D Tax Incentive, to achieve R&D policy objectives.

**Support Small Businesses, Start-ups and Innovation in Government Procurement.** Improving procurement practices will help to reduce costs, provide new ICT supply opportunities for small businesses and start-ups, and enable government departments and agencies to leverage innovative solutions while strengthening the local tech industry.

**Adopt a 'Fair Use' Approach to Copyright.** Given the growth in cloud computing and data-mining activities, efforts should focus on increasing Australia's attractiveness as a market for technology investment and innovation.

**The Need for Agile Regulation.** In finance and insurance, new technology and data driven services are offering immediate benefits to a growing class of consumers willing to move from traditional providers and financial products. It is important for the productivity of the sector to allow new business models and technologies to flourish. It's also critical that regulators keep pace with new technologies and develop agile frameworks to support the introduction of new services, while still ensuring that consumers and their personal information are protected.

**Opening Up Government Data.** In areas as complex as health and human services, access to data held by governments will be critical to understanding and addressing some of the greatest challenges facing Australia. The perceived and actual protection of private individual data remains the great challenge in opening up these data sets. Policy reform is required to clarify under what conditions governments can make public data sets (in a form which strips out personal information) accessible to researchers, private users and companies who can generate new value from them.

**Culture Change.** We need our governments to embrace the opportunities for policy reform and culture change needed for government departments and agencies to move from reactive data disclosure to a more open, proactive data release approach that instils trust and confidence.

The prize is the opportunity to create significant benefits for industry and government, providing greater transparency in decision-making for the citizens of Australia and still protecting the rights and sensitive, personal information associated with each individual.

#### **4. What are the key disruptive technologies or business models that you are seeing? What do you predict is on the horizon in five, 10, 20 years' time?**

Whilst increasing digitisation has been a major trend for all developed economies, a number of technologies on the horizon promise significant advances and inevitable disruptions.





**Artificial Intelligence.** Often seen as technology on a continually moving horizon, AI will continue to manifest in a range of forms to enhance analytics, facilitate new service creation and delivery methods, and push the frontiers of how we understand the world around us. AI and machine learning algorithms are driving significant innovations in Fintech.

**Robots and Automation.** Robots and automation will increasingly replace humans in handling manual, repetitive or high precision tasks across industrial, business, medical and domestic contexts. AI-enhanced robots will begin to take on higher-order functions in hospitality and other sectors interacting with people as well as functioning as personal companions.

**Blockchain and Distributed Ledgers.** Blockchain technologies offer an unprecedented approach to guaranteeing the integrity of data, beyond its role in ensuring the integrity of transactions within the cryptocurrency environment.

**Autonomous vehicles.** Autonomous cars, trucks, drones and trains will become more popular, changing the way people travel or ship products, and offering new pathways for interaction with the natural world and the digital world alike.

**Virtual and Mixed Reality.** These will play an increasingly important role in future systems for entertainment, education and training, infield support and business.

**Biohacking.** Defined as the use of state-of-the-art supplements, techniques and wearable technologies to allow people to enhance their physical capabilities and well-being, biohacking will expand to include high-tech implants that will increase in sophistication and popularity in coming years.

**Genomics.** Predictive healthcare approaches like genome sequencing, bioinformatics, epigenetics and more are enabling medical professionals to identify and address potential health issues before they arise.

**Internet of Things.** The number of devices and sensors attached to the Internet of Things will explode over the next few years to reach at least 28 billion by 2020<sup>17</sup> not including mobile phones, tablets and computers. The integration of all this data with social media, AI and data analytics will provide unprecedented access to information about customers and their behaviour, driving new approaches in product development and service delivery.

## 5. What communication services, and underlying data, platforms and protocols, does Australia need to maximise the opportunities of the digital economy?

Various studies and reports (from OECD, Deloitte Access Economics, Productivity Commission, among others) recognise the economic and productivity benefits associated with implementing digital technologies.

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<sup>17</sup> IEEE Spectrum 'Popular Internet of Things Forecast of 50 Billion Devices by 2020 Is Outdated'. <https://tinyurl.com/y8u8nkb3>



**Communications.** The digital economy requires ubiquitous connectivity. Only when ubiquity is achieved can we dispense with old models and make digital delivery the only way of delivering communications services. As long as we still need to support both traditional service models and new digital ones, our overall cost of service delivery is high, with a resulting impact on productivity and cost-effectiveness.

Our national agenda must include transitioning to full digital delivery as quickly as possible as the digital economy dividend cannot be realised until the efficiency of a single service delivery model matures.

The fixed telecommunications infrastructure and wireless infrastructure are both critical for the digital economy to help meet the ever-increasing demands for bandwidth for rich content delivery and for anywhere, anytime connectivity to the Internet of Things (IoT). Both these drivers create an enormous demand on the wireless networks and this will see fibre relentlessly shift closer and closer to the end users in support of many more mobile base stations required for 5G and beyond.

**Wireless Spectrum.** Spectrum is required for both licensed spectrum as well as unlicensed spectrum. The market will use all that can be allocated. Early IoT innovation is forging ahead with unlicensed spectrum and when 5G matures, innovation will find enormous opportunity there too. It is necessary to support both options and the ACMA is already well down the path in servicing these needs. There may be value in taking a fresh look at the way spectrum auctions are conducted as the ever-increasing price of licensed spectrum may create further burden on the future cost of delivering services.

## **6. What opportunities do we have to accelerate the development of technologies that will underpin Australia's digital economy?**

**A Thriving Start-Up Eco-System.** Data from the Department of Industry, Innovation and Science shows that start-ups and early stage companies generated nearly all the 1.6 million new jobs created in Australia from 2003 to 2014.

A thriving start-up eco-system requires a range of elements that contribute to its ability to create and successfully commercialise innovative products and services. According to Startup Grind, the elements that have enabled Silicon Valley's success as a start-up eco-system are:

- An entrepreneurial culture that cherishes innovation and risk taking;
- Access to a unique and diverse talent pool;
- Mentors who have done it before who can share advice and learnings;
- Capital to fund innovation from ideas throughout scale;
- Established tech companies who respect the innovator's dilemma and realise all innovation cannot happen from within and therefore partner with and acquire tech companies; and
- Other supportive infrastructure such as fast internet, not too much regulatory friction or government intervention, legal and media.



The rise of co-working spaces, incubators and accelerator programs designed to support the transition from nascent idea through to a successful business is being enhanced by increased focus and funding from both government and private sector entities.

The announcement in July this year of \$35 million from the NSW Government to create an 11-storey Start-Up Hub in central Sydney is bringing together key players including Stone & Chalk, Fishburners, Tankstream Labs and The Studio, providing facilities and resources for thousands of start-ups.

ACS' own commitment to supporting Australian ICT start-ups involves the recently announced accelerator hub based within our new office premises at Barangaroo in Sydney in early 2018 to contribute to and foster sustainable Australian ICT businesses and entrepreneurs, and to provide additional opportunities and economic growth for Australia. Our focus will be to demonstrate domestic job creation both within the accelerator and across the broader digital economy.

The accelerator will leverage not only ACS' core expertise in professional education, university accreditation, certification and member services, but will provide a platform for our 24,000+ members to engage and collaborate, creating a range of unique benefits.

Given the relatively small size of the Australian market, one of the best ways to scale a young business and exploit that job growth potential is to pursue a global customer base. The digital economy opens up unprecedented opportunities for Australian companies to sell and supply products and services to overseas markets.

**Investing in R&D.** Recognising its importance in facilitating business growth, investment in ICT R&D is a critical path for innovation. In particular, there is a focus on reinvesting revenue into technologies such as AI, cloud computing and software development to ensure that businesses can continue to grow in a highly competitive global market<sup>18</sup>.

**Adopt a Standards-Based Roadmap for Development.** Businesses increasingly recognise that digital technologies can enable new innovations and enhancements to existing products and services, and that there is a need to calibrate their technology investments to deliver value for their customers. As many applications, services and platforms are aligned to international standards, ACS encourages a strategic roadmap-based approach to standards development and regulation.

**Blockchain Standards.** Australia initiated the global standardisation of blockchains by asking the International Standards Organisation to facilitate this, which led to the formation of the 307<sup>th</sup> technical committee of the Geneva-based ISO. Leading the ISO/TC 307 process places Australia and Australian stakeholders in a strong position to shape and influence the future of International Blockchain Standards<sup>19</sup>. In particular, Standards Australia identified use-cases like financial services that experience a growing impact from Fintech and digital currencies as two possible use-cases for Blockchains.

<sup>18</sup> Abernathy, Mark (2017), 'High margin services and technology to take greater role: Ciobo', Australian Financial Review. <http://www.afr.com/news/special-reports/export-and-trade/highmargin-services-and-technology-to-take-greater-role--ciobo-20170319-gv1r6k>.

<sup>19</sup> <http://www.standards.org.au/OurOrganisation/News/Documents/Blockchain%20Standards%20Initiative.pdf>



**Opening Up Crowd-Sourced Funding.** In these contexts, there is a unique opportunity to develop Australia's digital economy through the recent announcement of new legislation to allow Australian start-ups to raise funds through crowd-sourced funding. Regulating the crowd-sourced funding of Australian public companies is a step forward that could provide substantial benefits for the local digital economy by opening up new funding options for companies seeking capital for growth and expansion.

The first round of legislation came into force in September this year, allowing licensed intermediaries to provide access to crowdfunding for retail investors. The second round, which was introduced into the Lower House on 14th September and which proposes to extend crowdsourced funding to eligible proprietary companies, will be a key catalyst for Australian innovators and start-ups while providing special investor protections.

Given the potential for this new bill to foster innovation by opening up funding opportunities for smaller and early stage companies that might otherwise struggle to access traditional funding sources, we encourage both sides of Government to support early passage of the legislation.

**Data Sharing Frameworks.** The spread of digital technologies across the economy means that more information – about companies, individuals, infrastructure and the environment – is captured and stored in digital form. While data is typically gathered for a specific use, we are increasingly seeing it being shared across traditional boundaries for a growing variety of reasons. This represents both a huge opportunity to enable innovation while also introducing a real risk of potential abuse of private information.

The Government urgently needs to develop and publish a Data Sharing Policy clarifying which kinds of data sharing are acceptable and which are not. While some forms of data sharing are clearly not appropriate, such as sensitive information containing personal details, the sharing of data containing no personal information, like environmental data, does not present privacy infringement issues. However, between these two extremes, there is a need for careful risk assessment and a robust policy framework to guide data owners in what is appropriate. It is essential that this framework comprises the right mix of 'enabling innovation' and 'protecting privacy'.

ACS has published the *Data Sharing Frameworks Technical White Paper*<sup>20</sup> in collaboration with the NSW Government, Data 61, Standards Australia and leading universities among others, that offers an informed approach to guide the creation of a Government Data Sharing Policy and Risk Analysis assessment of open data. There is growing support and alignment across most states and territories that this framework should become a consistent reference point for Australia.

It's important to recognise that raw data has only limited value in its own right. Rather, the value of data can be increased and even multiplied depending on the context in which it is collected, used, and aggregated, and the range of services to which it contributes.

The ability of governments to open up datasets that have been appropriately anonymised and make them available for use in a range of commercial and public sector applications has the potential to drive tremendous progress in areas such as health, financial services, retail, government service delivery, future planning, education, transport and more.

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<sup>20</sup> Data Sharing Frameworks Technical White Paper, Ian Oppermann published by ACS.  
<https://www.acs.org.au/carousel-pages/data-sharing-frameworks.html>



The fact that data can be reused in different ways and even tracked over time further enhances its value. So does its ability to create access to new and emerging markets, provide real-time insights into financial market movements and inform predictions about future trends.

Some of the benefits of a structured and consistent approach to data sharing and a policy of open data are:

- Protecting citizen privacy;
- Increasing government transparency;
- Enabling innovation and jobs creation in the rapidly growing data analytics sector;
- Fostering an ecosystem for problem solving through the use of data connecting industry, government and academia;
- Helping protect critical infrastructure while improving efficiencies;
- Improving the management of the environment;
- Enhancing the performance of services such as waste management, transport, utilities, health, aged care and many others; and
- Improving the sharing of data with and across states and territories, and local councils. Without a common framework across all three layers of government, data sharing is more costly and much less efficient, which suppresses innovation and reduces efficiency.

As local councils embark on their Smart Cities initiatives, the Federal Government has an opportunity to lay down a data sharing approach that is consistent with the states/territories. This would allow local councils to align their approach, resulting in a national consistency to data sharing that will drive efficiency, lower costs and free up resources to focus on innovation rather than interoperability.

## **7. What opportunities do we have in standards development and regulation to:**

- **Enable digital entrepreneurship, innovation and trade?**
- **Mitigate the risks associated with digital disruption?**

ACS believes that standards – both in technology and professionalism – are essential to our ability to develop and deliver innovative digital solutions. Regular engagement with stakeholders is necessary to ensure vertical market forces are driven by horizontally harmonized and interoperable standards and practices that maintain market balance and competitiveness.

At the same time, it's important to recognise that by virtue of the rapid pace of change and adoption with technology and technological disputation that it will always be hard for standards to catch up – instead, standards can be seen as and developed as a catalyst to create sandboxes for entrepreneurs and companies within which to safely innovate.

Technical standards should help support the regulations and laws around digital currencies and blockchain technologies. They should define, for example, the nomination of a governance body at the international level and across jurisdictions. This governance body could be responsible for maintaining existing



blockchain technologies. It could be an organisation in the form of the Internet Engineering Task Force (IETF) for Internet standards or the International Organisation for Standardisation (ISO).

In order to enable standards as drivers for regulation, ACS advocates that the Government establish a mechanism to regularly seek input from industry associations, not for profit institutions, academia and relevant government agencies on issues and developments in the technology-driven standards.

**Professional Standards.** Standards in professionalism are critical for mitigating any risks relating to the design, development, implementation and maintenance of digital technologies.

ACS has been a long-time advocate of the need for technology to be trustworthy, performing reliably and consistently delivering on the promises of its suppliers.

Professionalism in ICT is defined as a commitment to upholding ethical standards and professional conduct, to undertaking continuing professional development, a willingness to take responsibility for work and a commitment to act in the public interest. ACS members are required to demonstrate these commitments in their work and behaviour or face disciplinary action.

ACS also plays an active role in establishing global standards for ICT professionalism through its involvement in the International Federation for Information Processing (IFIP)<sup>21</sup>, the global federation of ICT professional associations, and its International Professional Practice Partnership (IP3). Former ACS President Brenda Aynsley was founding Chair of IP3 until September this year and ACS was the first international ICT society to be certified under IP3's Accreditation Program.

IP3 has gained global attention over the past few years after successful presentations at the World Summit on the Information Society (WSIS) Forum in Geneva and the United Nations in New York, where the importance of ICT professionalism was acknowledged by UN General Assembly President, Mogens Lykketoft.

## **8. What digital standards do we need to enable Australian businesses to participate in global supply chains and maximise the opportunities of the digital economy?**

**Connectivity Standards.** There are already many standards for connecting sensors to networks. Many of these rely on wireless connectivity and the ACMA (in collaboration with the IoTAA) has been working to make available sufficient radio spectrum to support a number of these standards. Through further allocation of spectrum in the ISM band as well as planning for the evolution of licensed spectrum from 3/4G towards 5G, Australia is reasonably well positioned for the digital economy.

**Need for Data Sharing Standards.** Australia is less advanced in the standardisation of data sharing. ACS, along with other industry bodies, strongly supports the NSW Government's initiatives in the area of data sharing. As we have three layers of government and all players will increasingly need to share data, it is vital that this is consistently operationalised.

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<sup>21</sup> IFIP <http://ifip.org/>



We need to classify data that is appropriate to open to the public and categorise more sensitive data to ensure it is not inappropriately opened or shared. ACS is a significant sponsor of the NSW Government's initiatives in this area through the work of the NSW Chief Data Scientist. This work needs to continue and be more widely embraced to ensure that all layers of government can share efficiently and without risk. Effective data sharing would not only drive domestic efficiencies but could also lead to the export of data sharing expertise.

**Existing Standards Driven Frameworks.** A standard protocol for defining requests and establishing data governance would improve the confidence and efficiency associated with data sharing projects. However, fundamental uncertainties relating to the presence of personal information in datasets highlights the limitations of most existing governance frameworks. The inability of human judgment to determine the 'reasonable' likelihood of reidentification when faced with sets of large complex data limits the ability to appropriately apply the regulatory test.

**ISO Standard 38505-1.** In December 2015, a voluntary framework for data sharing in the form of a Voluntary Code was released, based on the then developing ISO standards for the Governance of Data<sup>22</sup>. The Code takes three areas from the data accountability map in the developing ISO standard 38505-1; namely Collect, Store, Distribute, and applies the aspects of Value, Risk and Constraint to provide seven maxims for sharing data. To assist with adoption and compliance, the Code provides references to best practice and examples.

With the release in 2017 of the ISO/IEC 38505-1:2017 standard, there are now internationally acknowledged guiding principles for the acceptable use of data within organisations. The standard is meant to apply to governance of current and future use of data that is created, collected, stored or controlled by ICT systems, and to impact data-related management processes and decisions.

The challenge with both the Voluntary Code and the ISO/IEC standard is that they ICT governance focused rather than exploring issues of value or opportunity. Consequently, more work remains to be done.

**Introduce Valuation Standards for Intangible Assets.** The value of data ultimately depends on how it is used. The near limitless reproducibility and reusability of data, the low cost of storage and transmission, coupled with a high degree of software automation, have changed the number and ways data can be used and so the potential value of data.

For digital economy companies, data has become one of the primary factors of production as well as a means of customising service delivery. Modern services are increasingly created, delivered, and consumed via digital means.

The delivery and consumption of services in digital format greatly expands the geographic reach of service providers, crossing state and national boundaries, and allowing massive levels of data aggregation. The combined effects of the dramatic reduction in the marginal transaction and delivery costs of digital goods and services – coupled with the reduced costs to consumers of access, discovery and comparison of goods and services – are driving the world towards a single global market place.

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<sup>22</sup> Available online at <http://blogs.oii.ox.ac.uk/policy/new-voluntary-code-guidance-for-sharing-data-between-organisations/>





In some economic frameworks, data is treated in a similar way to intellectual property or software. The World Intellectual Property Organization describes intellectual property<sup>23</sup> as “*creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce*” with no explicit reference to data. There is currently no Australian standard that comprehensively addresses the treatment of data or even of intellectual property. IP Australia states that most relevant accounting standards include:

- AASB 138: Intangible Assets
- AASB 136: Impairment of Assets
- Accounting Interpretation 132: Intangible Assets Web site costs.

IP Australia further states that many Australian companies do not recognise their acquired intellectual property, often instead including it on their financial statements as ‘goodwill’.

Data is unlike a brand in that it can be used in many different ways for many different applications. It is different from software in that it may have no inherent operational function. Data differs from goodwill in that it can be sold in discrete volumes to individual users. It differs from copyright in that it needs resources to capture, contain or transport it. Data is even different from community-generated intangible assets such as open source software, in that a company like Facebook can own a collection of data created by many individuals.

Taking this view for data dramatically underemphasises the role of very large, highly scalable software platforms which provide an environment within which services are created for and by others. Ridesharing company Uber and online game Minecraft are examples of massively scalable platforms which provide services to millions of users by processing large amounts of personal data.

The ability to scale output requires only small amounts of the traditional factors of production: land, labour and capital. The most important input is arguably the data generated by the apps running on the devices of gamers or the smart phones of passengers and Uber drivers around the globe. Uber’s ability to scale its service output to new customers is only weakly dependent on the level of land, labour, and capital. Without user and driver generated data, the businesses would not function.

Framing data as intellectual property becomes increasingly inadequate when the data is not generated by the entity which uses it. In the case of social media companies such as LinkedIn, Twitter and Facebook, user generated data is harnessed to create services. These services encourage the creation of more user-generated data, leading to more services. The platform’s value to the business is driven by ever more users freely contributing data and less by the intellectual property in the underlying service creation.

An Australian standard for valuing intangibles like data would enable data-driven companies and platforms to clearly articulate the value of the data depending on how it is used and combined with other data sets.

Most importantly, however, establishing a robust industry standard would unlock a big part of the digital economy, freeing up capital and opening up new opportunities, as well as lending against it as valued asset.

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<sup>23</sup> See <http://www.wipo.int/about-ip/en/>





Indeed intangible assets such as data, content, patents, code, brands and designs account for some 87% of the value of the S&P 500. We only need to look at the Googles and Facebooks of this world to see the value that data holds, and its place as both a primary businesses driver and an asset of value in its own right.

## 9. What opportunities do we have to build trust and community confidence through resilience to cyber threats, online safety and privacy?

**Building Trusted Networks.** ACS' *Data Sharing Frameworks Technical White Paper* points to the Five Safes Framework, which was developed by the UK Office of National Statistics and is now in use around the world including at the Australian Bureau of Statistics.

A framework for making decisions about the effective use of data which is confidential or sensitive, it includes criteria to define:

1. Safe People – with the knowledge, skills and incentive to store data appropriately;
2. Safe Projects – referring to the legal, moral and ethical considerations surrounding the use of data;
3. Safe Setting – which sets out the practical controls around how the data is accessed, including both physical and procedural arrangements;
4. Safe Data – which outlines the potential for identification in the data or the level of sensitivity; and
5. Safe Outputs – or the residual risks of publishing sensitive data.

The ACS *Data Sharing Frameworks Technical White Paper* makes the following recommendations to enhance trust and community confidence in digital networks:

- Regulatory Clarification – ensure that existing legal frameworks include quantifiable descriptions of acceptable levels of risk in ways that are meaningful for modern data analytics
- Development of a framework which supports anonymisation of data which in turn facilitates sharing
- Develop a nationally accepted test for the existence of Personally Identifiable Information
- Agreed standards for minimum cohort size based on data type
- Agreed standards for Obfuscation/Perturbation
- Develop and promote open data enablers
- Establishment and maintenance of a dataset of issues arising from Privacy Impact Assessments.

We need broader discussion around issues relating to privacy and online safety, in ways that are accessible for the wider community. This is not only about technology, but about public safety. These issues need to be discussed in public forums, not in academic papers, because they affect everyone. This is essential to build trust and confidence amongst the broader user base and ensure that individuals understand how to protect themselves online.

**Cyber Security.** The cyber landscape continues to evolve relatively rapidly, driven by the increasing digitisation of consumer and business activity and growing international connectivity. Australians are known



to be enthusiastic early adopters of new technologies<sup>24</sup>, so it is important that the nation has a robust approach towards addressing cyber security risks.

Cyberattacks are costing global businesses as much as \$500 billion per annum<sup>25</sup>. The banking and financial sectors have been the leading targets for cyber criminals, following by IT and telecom, defence, and the oil and gas sectors.

It has been estimated that on average, a cybercrime attack costs a business in Australia \$419,542<sup>26</sup>. Cyber costs fall into two categories: those above the surface and those below it. Above-the-surface liabilities include direct costs such as lost customers or legal fees, while costs below the surface could include damage to a company's reputation, loss of intellectual property and business disruption.

Cyber security also presents a significant economic opportunity for Australian businesses that are willing to invest in the technologies and skills required to address these risks. ACS' *Cybersecurity: Threats, Challenges, Opportunities* report<sup>27</sup> highlights that "developing our own cyber security industry is also an opportunity for economic growth, job creation, and education – ensuring Australia is well positioned for a future as a digitally advanced nation". The report notes that as more products and services move online, cyber security becomes even more important as a fundamental building block of information systems in Australia and across the world.

The Deloitte report *What's over the horizon? Recognising opportunity in uncertainty*<sup>28</sup> recently modelled the economic impacts of three plausible scenarios for the future of Australia. One key scenario saw Australian businesses making a greater investment in cyber security.

By 2030, this scenario forecast an uplift of 5.5% in business investment, a 2% increase in wages and an additional 60,000 people employed. It found that investing in cyber security would "unlock potentially valuable investments in digital innovation, boosting most businesses", including those directly in the ICT industry and those with a higher 'cyber value at risk', such as in the banking, health, education and defence industries.

## 10. What roles should government, business and individuals play in protecting the community in a digital economy?

**Developing Australia's Cyber Security Capabilities.** As previously stated, the frequency and impact of cybercrime has increased significantly in recent years, with the average cost of a cyberattack to an

<sup>24</sup> Productivity Commission (2016), Digital Disruption: What do governments need to do?. Productivity Commission Research Paper, June 2016.

<sup>25</sup> Cyber Security: Threats, Challenges, Opportunities (2016), published by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/ACS\\_Cyber\\_security\\_Guide.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/ACS_Cyber_security_Guide.pdf).

<sup>26</sup> Ponemon Institute (2015), 2015 Cost of Cyber Crime Study: Australia.  
<https://ssl.www8.hp.com/ww/en/secure/pdf/4aa5-5210enw.pdf>.

<sup>27</sup> Cyber Security: Threats, Challenges, Opportunities (2016), ACS.  
[https://www.acs.org.au/content/dam/acs/acs-publications/ACS\\_Cyber\\_security\\_Guide.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/ACS_Cyber_security_Guide.pdf).

<sup>28</sup> Deloitte (2017), What's over the horizon? Recognising opportunity in uncertainty.  
<https://www2.deloitte.com/au/en/pages/building-lucky-country/articles/whats-over-horizon.html>.



Australian business recorded at around \$419,000<sup>29</sup>. On the flipside, the development of Australia's cyber capabilities presents new opportunities for digital growth and innovation.

ACS believes there are lessons to be learned from Israel's experience: moving from a strong focus on agricultural exports some 50 years ago to today where one of Israel's primary exports is now security software. Government support for a start-up culture and the belief that technology is the backbone of a strong economy has seen Israel now lead the world in cyber security, second only to the US globally.

Meanwhile in the UK, and since the British government published its cyber security strategy in 2011, the cyber security sector in the UK has almost doubled from £10 billion to £17 billion<sup>30</sup> and is now responsible for employing 100 thousand people.

Australia can galvanise its own cyber security industry with government and private-sector support – but part of this involves addressing the need for more trained scientists, mathematicians, engineers, and ICT workers. As a nation we need a scientifically literate community capable of engaging in a national conversation on vital technology issues like cyber security.

Effective cyber security requires the participation of all sectors of the community, both in how we handle data and technology in the workplace, and the frameworks and processes we put in place.

ACS has long played an active role in raising awareness of cyber threats, supporting the Government with expert advice back in 2011 and providing a coordinating role for an industry response.

The ACS *Cybersecurity – Threats, Challenges, Opportunities* report details five core pillars of cyber security readiness:

1. Education and Awareness – raising awareness of cyber threats and educating around social engineering tactics used by cybercriminals.
2. Planning and Preparation – implementing best practice policies, management systems, ICT auditing processes and dedicated staff responsible for cyber security operations.
3. Detection and Recovery – ensuring that systems and processes are in place to detect any breach and trigger steps for recovery and notification.
4. Sharing and Collaboration – encouraging reporting and collaboration on breaches and hacks to assist industry in responding quickly to threats and minimising their impact.
5. Ethics and Certification – ensuring that cyber professionals have the knowledge and skills to do the job.

**ACS Cyber Security Certification.** The role of ICT professionals in preventing and responding to cyberattacks cannot be overstated. In May 2016, Leon Strous, President of IFIP, the global federation of ICT professional societies, of which ACS is a member, took part in the strategic European Foresight Cyber Security Meeting<sup>31</sup>.

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<sup>29</sup> Cyber Security: Threats, Challenges, Opportunities (2016), published by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/ACS\\_Cyber security\\_Guide.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/ACS_Cyber%20security_Guide.pdf).

<sup>30</sup> Mike James, <http://www.smartfoxsecurity.com/history-of-ethical-hacking.html>

<sup>31</sup> [https://www.cybersecurityraad.nl/binaries/Report%20European%20Foresight%20Cyber%20Security%202016\\_tcm56-102235.pdf](https://www.cybersecurityraad.nl/binaries/Report%20European%20Foresight%20Cyber%20Security%202016_tcm56-102235.pdf)



He highlighted the critical role that professionalism plays in building trustworthy, reliable and secure ICT systems, saying, “cyber security and cyber resilience is also a duty of care of the individual ICT professional”.

In September this year, ACS announced the Certified Professional (Cyber Security) and Certified Technologist (Cyber Security) specialisms to enable certified Australian professionals to demonstrate their knowledge, skills and professionalism.

We have since made the specialism available to IFIP IP3, the professionalism arm of IFIP, which will use the ACS framework to provide the Cyber Security Certification available to its other member ICT societies around the world<sup>32</sup>.

## 11. What integrity and privacy measures do we need to ensure consumers can protect their data?

**Data and Privacy.** The ability to combine a wide range of large, constantly evolving and highly personalised data sets is a strong driver of productivity and supports the creation of new, high value services. It also leads to considerations of personal privacy.

The Productivity Commission’s *Data Availability and Use* report<sup>33</sup> highlighted underlying tensions around data availability and use between the various policies and regulatory schemes across the States, Territories and Commonwealth which have severely impeded data sharing by both public and private sector organisations.

It advocated fundamental changes to Australia’s legal and policy frameworks under which public and private sector data is collected, stored and used (or traded), including recommendations for:

- A Comprehensive Right for Consumers (including small/medium-sized businesses) to access their digital data and the ability to have it provided to a different supplier;
- A new Data Sharing and Release Act to authorise the better sharing and release of data;
- The appointment of a National Data Custodian and an advisory board and ethics advisor;
- The creation of National Interest Datasets; and
- Clear processes and structures for data sharing between State and Commonwealth entities.

While the various State and Territory Privacy laws, including the Commonwealth Privacy Act 1988, currently provide some constraints and protections, they only relate to data which meets the varying definitions of ‘personal information’.

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<sup>32</sup> <http://www.todayinbusiness.com/2017/09/14/ifip-ip3-launches-global-cyber-security-specialism/>

<sup>33</sup> Productivity Commission (2016), *Data Availability and Use: Productivity Commission Draft Report – Overview & Draft Recommendations*, October 2016. <http://www.pc.gov.au/inquiries/completed/data-access/draft/data-access-overview-draft.pdf>.



The framework proposed by the Commission goes further, seeking to cover all consumer data, including files posted online or on social media, data created from online transactions, internet-connected activity or digital devices, data purchased or obtained from a third party that is about the consumer, and more.

In most economies, there is no unambiguous, nationally accepted test for personally identifiable information in a data set. Most privacy assessments rely on tests of judgment tests described in terms such as 'reasonably' or 'likely'. With systems operating at gigahertz speeds performing analytics on input from potentially billions of devices, the disconnection between the world of data and human rates of privacy judgement represent an area for future development.

Questions which need to be addressed include:

- Has de-identification been appropriately addressed?
- In an IoT context, what is the acceptable level of risk for use or disclosure of de-identified data?
- What does it mean to say that the risk of re-identification is 'low or remote' in a data-rich IoT ecosystem?
- How can such terms be applied operationally?
- Is an industry de-identification standard/guideline/scheme needed, compliance with which provides a safe harbour from liability from the risk of re-identification?

**National Interest Datasets.** Most commentary on data availability and use focuses on efficiencies that may be realised in the delivery of public sector services and ensuring competitive advantage is not eroded when making available private sector datasets.

We propose that there is a dataset that should be initially prioritised for classification as a National Interest Dataset: aggregate anonymised mobile telephone location data. This dataset from telecommunications providers would provide a snapshot of the population in a given area each day. It would be useful for service provision, infrastructure planning, traffic management and would support smart service design. The finer the granularity (e.g. SA2, SA1, meshblock) and the more frequently this information is provided (i.e. number of times per day), the more use cases are enabled.

Smartphones are carried by more than 14.9 million Australian adults (according to IAB Mobile Ratings Report 2017). ACS believes that smartphone data, properly managed to protect privacy and other rights, offers such substantial insights and benefits to both public and private sectors that it should properly be classified as a National Interest Dataset.

## 12. What are barriers for business, particularly small business, in adopting cyber security and privacy practices?

While large businesses usually have substantial resources to commit to cyber security, SMEs often lack the time and capacity to focus attention on these issues. This leaves them vulnerable to threats such as phishing, trojans, hacks and ransomware, among others.



Government has a role to play in raising awareness amongst small businesses to ensure they take appropriate measures to protect themselves, such as implementing firewalls and recognised security applications on their systems and training staff to be alert to potential threats.

We recommend that Government collaborate with industry and the profession on the development of a simple online program that helps to:

- Raise awareness amongst small businesses of the threat and potential economic cost cybercrime poses to their business;
- Provide insight into how cybercriminals use social engineering in targeting businesses and how to guard against such tactics;
- Educate SMEs about potential off-the-shelf solutions that can assist in protecting their business; and
- Explain how and when to leverage the expertise of skilled cyber security professionals to add value to the business.

### **13. What integrity measures do the Australian Government and the private sector need to take to ensure business-consumer transactions are secure?**

**Safeguarding Transactions.** Data will increasingly become the most valuable asset in digitally enabled systems, especially data which contains sensitive personal and commercial information. For consumers, businesses and government to gain and maintain confidence in digitally enabled systems and be willing to rely on such systems, data must to be protected from misuse.

The protection of data should not be limited to when it is at rest (e.g., stored in a disk or memory) or in transit (transmitted in a network). Cryptographic approaches have been used to protect data where the data is encrypted both in motion and at rest so that they are never revealed to anyone other than data owners themselves.

**Cyber Security.** As previously detailed, cyber security principles and techniques are critical to the safeguarding not just of business-critical or privacy-aligned user data, but to transactions also: data must be protected at every link in the chain, which involves safeguarding not just electronic transmissions and data at rest but also preventing access gained through third-party suppliers in the delivery chain. Everyone is responsible for cyber security.

**Blockchain.** Blockchain and Distributed Ledger technology is gaining in popularity for security and ensuring the integrity of transactions and interactions in financial services, real estate and even defence applications.



Defence prime contractor Lockheed Martin announced in April that it was integrating blockchain features into its data systems to address threats such as manipulation in its "networked and weapons system embedded cyber physical systems".<sup>34</sup>

The move is consistent with the amount of investment and activity being focused on blockchain as a defence technology by the Israeli Defence Force. Blockchain's distributed node system, which gives participants specific layers of activity inside a cryptographically sealed network, affords a greater level of security and dispersion for sensitive defence operations.

Deloitte's 2016 report into Israeli blockchain research, *Israel: A Hotspot for Blockchain Innovation*, concluded that Israel's military-civilian incubation system had positioned the nation "as a hotspot for blockchain innovation".

Blockchain will play an increasingly important role in preventing fraud in transactions. Further research and development of nascent blockchain technologies will accelerate its potential to be used to secure business-consumer transactions, including to build products and services for export to global markets.

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<sup>34</sup> 'Blockchain becoming an integral part of some defence technology' Australian Financial Review 14 July 2017

## **Section: Building on our areas of competitive strength**

### **14. What is holding Australian businesses back in terms of benefiting from digital technologies?**

**Access to Skills.** There has been a boom in the growth of Australia's information and communications technology (ICT) workforce in recent years, from around 600,000 workers in 2014 to more than 640,000 workers in 2016, according to *Australia's Digital Pulse 2017* report<sup>35</sup>. Strong growth in the ICT workforce is expected to continue, reaching 722,000 workers by 2022. This represents average annual growth of 2.0%, compared to 1.4% for the Australian workforce as a whole.

The ongoing strong demand for ICT workers and skills is consistent with the significant role digital technologies will continue to play in driving Australia's economic growth. The increasing digitisation of Australian businesses' operations across all sectors of the economy has resulted in greater integration between ICT functions and broader business operations. For example, 52% of the current ICT workforce is employed outside ICT-related industries in areas such as professional services, public administration and financial services.

An essential part of driving future economic growth and innovation is ensuring that Australian businesses have access to a sustainable and high-quality supply of required ICT skills. Businesses have historically turned to ICT workers from overseas to fill short-term skills gaps; 2015–16 saw net migration inflows of around 20,700 ICT workers, representing 3% of the overall ICT workforce.

**Skilled Migration.** This provides Australian businesses with the capacity to meet immediate demand for ICT skills where there are shortages in the local workforce.

The recent Australian Government move to replace 457 visas with two- or four-year temporary skill shortage (TSS) visas aims to strategically target the visa program towards workers with the key skills required to grow the Australian economy, particularly those that may be in short supply among the domestic workforce. This is intended to ensure Australian businesses can access the necessary ICT skills to facilitate future growth, while balancing the need to build and train local talent over time.

Australia's success in the digital age will depend on businesses' ability to use and develop both local and overseas sources of ICT skills to drive further growth.

**Local Graduates.** Another potential source of workers is graduates with ICT degrees. While the number of students completing ICT degrees has picked up in recent years, it remains below that of the early 2000s.

Domestic undergraduate enrolments rose from around 19,000 at the start of this decade to 25,700 in 2015, while domestic undergraduate completion of ICT degrees increased from around 3,000 to almost 4,000 over the same period. Domestic postgraduate enrolments and completions have also increased marginally, but remain below the peaks of the early 2000s.

<sup>35</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>





Enrolments in and completions of ICT degrees will need to increase further to meet future demand for ICT-related qualifications and skills. We forecast that the expected increase in demand for ICT workers will be associated with an increase in the total qualifications these ICT workers hold, from 1,000,200 in 2016 to 1,148,100 in 2022, representing an average annual growth rate of 2.3%.

It is also likely that ICT workers will need a broader range of qualifications such as degrees in accounting, marketing and project management, as organisations increasingly seek ICT workers who have broader business skills in addition to their technical qualifications in computer science and software engineering.

**A Lack of Diversity.** Notably, women and older workers are significantly under-represented in Australia's ICT workforce. Women account for 28% of ICT workers, compared to 44% of workers across professional industries, while for older workers, it's 12% and 16% respectively<sup>36</sup>. Encouraging these groups to participate in the ICT workforce could help to meet future skill needs across the economy.

**Investments in ICT R&D.** In this context, it is important that Australian businesses continue to invest in technology-related R&D if they are to remain competitive in a constantly evolving global environment. ABS statistics indicate that businesses spent more than \$6 billion on ICT R&D in the 2013–14 financial year<sup>37</sup>. This accounted for around one-third of total R&D expenditure by Australian businesses, a share that has been progressively increasing over recent years.

However, ICT-related R&D investments are a relatively low percentage of GDP compared to that of businesses in other developed economies. An international comparison using OECD data for 10 other developed countries across North America, Europe and Asia puts Australia 8th out of 11 in terms of ICT R&D spending as a share of GDP<sup>38</sup>.

In contrast, Australia ranks relatively high compared to these countries on several other ICT-related metrics, such as the proportion of businesses that have broadband connectivity and the number of mobile broadband subscriptions per capita. To ensure that Australia remains competitive in the increasingly digitised and globalised economy, it will be crucial to tap into these high levels of consumer and business ICT adoption and use, and invest more heavily in ICT R&D.

## 15. What would help Australian businesses to embrace digital technologies?

There are several factors which are critical to enabling Australian businesses to embrace digital technologies, the foremost of which is ready access to skilled ICT professionals capable of developing, implementing and maintaining new products and services.

**ICT Skills.** The development over the past decade of digital ecosystems across Australian cities has created clusters of firms, suppliers, researchers and related networks to enable digitally driven collaboration and

<sup>36</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>37</sup> Source: ABS cat. 8104.0 (2015)

<sup>38</sup> OECD (2013), Measuring the Internet Economy: A Contribution to Research Agenda. OECD Digital Economy Papers, No. 225.



innovation. These ecosystems operate across a range of broader industries, reflecting the economy-wide impacts of digital disruption. However, key to the success of each of these digital ecosystems is a strong core of ICT skills and workers that will provide the foundations for growth and innovation.

Businesses that use existing technologies such as internet connectivity, social media, mobile technology, cloud computing and data analytics are typically more likely to engage in innovative activities. This might include producing new goods or services, or significantly improving operational or organisational processes. For example, 65% of innovation-active Australian businesses have a web presence, compared with only 35% of non-innovation-active businesses. Almost half (49%) of innovation-active businesses use social media, while less than one-quarter (22%) of non-innovation-active businesses do so<sup>39</sup>.

It is likely that digital change will continue across Australian businesses as a result of applying these existing technologies in new areas. Businesses and industries that previously had low levels of digital engagement will begin to adopt web, mobile and social media in an increasingly connected digital world. And in the future, more significant and disruptive changes – and greater opportunities for innovative activity – are likely to be driven by newer forms of technology that have emerged over more recent years.

The rapid pace of technological transformation means that technologies once considered futuristic innovations or ‘future waves’ are now being increasingly applied among Australian businesses and used across the workforce. These ‘exponential technologies’ – those that grow rapidly from low to high market penetration – include the IoT, AI and 3D printing and they are transforming sectors across the Australian economy. These changes may be particularly disruptive outside the information and services industries – in areas such as mining, manufacturing and agriculture – as these industries have a greater capacity to be affected by physically manifested technological developments.

**Trustworthy Technology.** A key requirement for businesses to embrace digital technologies is that they must feel confident in the ability of their ICT products and services to perform predictably and reliably. A fundamental enabler of trustworthy technology is the professionalism of the people who design, produce, implement and maintain those technologies.

At a meeting of the United Nations General Assembly’s informal interactive stakeholder consultation around the WSIS+10 review and the SDGs in late 2015, Stephen Ibaraki, IFIP Global Industry Council Founding Chair, Vice-Chair of IFIP’s Professional Partnership Practice, IP3, reinforced the importance of professionalism in delivering the trustworthy technology that is essential to assist developing nations in achieving their potential.

Mr Ibaraki reminded the assembly about the impacts of high profile ICT issues including VW’s illegal use of emissions test cheating software in over 11 million vehicles and Apple’s failure to detect that around 4,000 apps in its App Store were infected with the xCodeGhost malware. He said digital disruption, new work practices and the growing cost of failure mean that it’s time to focus on the people of ICT.

“The reasons for failure include lack of commitment and buy in from senior management, lack of skills in the project team – managers and ICT practitioners – lack of planning, inappropriate funding models, poor procurement practices and deficient or absent governance models,” said Mr Ibaraki. “It’s time to focus on

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<sup>39</sup> Source: Australian Bureau of Statistics cat. 8167.0 (2016)



the ICT people, the qualities they need to succeed – professionalism, skills and entrepreneurial acumen – and how we can enable and empower them to provide “trustworthy” computing globally.

“Given the reach of ICT in our lives, it is important for an ICT professional to be technically strong (in order to use the right technology for the relevant problem), ethically grounded (to ensure that technology is put to the right use), socially conscious (so that the technical solution takes into consideration elements of sustainability) and business savvy (to ensure commercial viability which is required for social prosperity and funding of new developments).”

In order for Australian businesses to feel confident in digital technologies, we need ways to measure and demonstrate the professionalism of our ICT workers, which ACS strongly advocates and demonstrates through its Certified Professional, Certified Technologist and Cyber Security certifications.

## **16. What efforts are you or your organisation making to respond to digital transformation? Why?**

As the professional association for the ICT sector, ACS recognises the potential digital technologies offer for economic growth and prosperity for all Australians. However, our ability as a nation to capitalise on this potential is contingent on our willingness and capacity to embrace technology to enhance productivity and create competitive advantage in key market sectors that offer significant opportunities, such as Fintech and AI among others.

In addition to implementing start-of-the-art technologies within our own organisation to improve efficiency and enable us to better serve our members, ACS undertakes the following roles and actions:

- Proactively advising government and business stakeholders about technology issues and developments;
- Playing an active role in international professional bodies such as IFIP and SEARCC, through which we can influence global initiatives and decisions;
- Undertaking research and stakeholder engagement/consultation to identify issues as they emerge and develop policy positions;
- Providing up-to-date education and professional development opportunities for our members and others, including our annual Reimagination Thought Leaders Summit, online and in-person trainings and workshops, certification programs etc.;
- Creating networking opportunities to encourage ICT professionals to remain connected and engaged with other professionals;
- Participating in standards development activities;
- Publishing regular thought leadership articles, research reports, policy statements and other documents to build awareness and educate industry, government and the community about ICT issues and how they affect them.



**ACS Accelerator Program.** To further support the growth of successful Australian ICT start-ups, as previously mentioned ACS is establishing a new start-up accelerator hub within our new offices at Barangaroo in Sydney in early 2018.

The ACS accelerator will offer programs to sustainable Australian ICT businesses and entrepreneurs looking to scale, with a focus on demonstrating domestic job creation both within the accelerator and across the broader digital economy. The accelerator will leverage not only ACS' core expertise in professional education, university accreditation, certification and member services, but will provide a platform for our 26,000+ members to engage and collaborate, creating a range of unique benefits for the businesses participating in the program.

## 17. What opportunities do we have to use digital technologies to improve linkages into export markets and global supply chains?

Thanks to the digital revolution, an increasingly interconnected world is opening up new trade and investment opportunities, enabling businesses to turn towards international markets as a new source of demand. This is reflected in the sharp rise in ICT services trade over the past five years.

Total trade flows in ICT services to and from Australia grew to \$5.7 billion in the 2015–16 financial year<sup>40</sup>, and both imports and exports grew by around 12% over the past year. In addition, our goods exports have included a greater share of embedded digital technologies over recent years as there has been greater uptake of new technologies across key economically significant industries, such as agriculture and manufacturing. The ICT input share of Australia's goods exports increased from 4% in 2013 to 7% in 2016, consistent with the increasing uptake of new digital technologies in key industries of economic importance in Australia.

The rapid rise in ICT trade underscores the growth in international opportunities for businesses that provide innovative service offerings to the market. In particular, Australian businesses that operate in the ICT sector have access to a highly skilled workforce and comparatively low development costs if they wish to specialise in exporting high-value-add ICT services<sup>41</sup>.

Beyond the ICT sector itself, the Internet is enabling businesses across a broad range of sectors to market and sell their products and services online, opening up new markets around the world. The use of ICT to automate and streamline manufacturing, supply chain and distribution processes has further reduced the time and cost associated with servicing customers and levelled the playing field for SMEs to compete with much larger organisations.

The integration of the Internet of Things (IoT) and AI technologies in coming years, and the rise of retail platforms such as Amazon and Alibaba will drive new efficiencies and cost reductions, delivering additional benefits for consumers everywhere.

<sup>40</sup> Source: Australian Bureau of Statistics cat. 5302.0 (2017)

<sup>41</sup> Australian Trade and Investment Commission (2017), Information Communications Technology. <https://www.austrade.gov.au/International/Buy/Australian-industry-capabilities/ICT>.



## 18. What opportunities do small and medium-sized businesses have to embrace digital innovation to drive customer value, improve their services and unlock their potential?

The economy-wide benefits associated with adopting digital technologies are driven by the implementation and use of different types of technology at the individual business, worker and consumer level. In this context, certain segments of the Australian economy may benefit more than others from adopting modern digital technologies.

For example, small businesses can benefit significantly from using digital technologies, such as by having a business website or engaging in online marketing strategies, which improve accessibility, information availability and customer communications. While companies of all sizes can use digital tools and realise these benefits, the opportunities are particularly important for small businesses, which may not otherwise have the size or reach to engage with existing or new customers. The Deloitte Access Economics report, *Connected Small Businesses*<sup>42</sup>, found that by adopting digital tools and boosting digital engagement, Australian small businesses can achieve significant economic dividends, such as increased revenue growth, job creation, exports and innovative activity.

**Agriculture.** A recent trend in the agriculture industry has been the rise of technology-driven ‘smart agriculture’ and the application of big data analytics across the sector<sup>43</sup>. This has been enabled by the proliferation of on-farm sensor technology, which, using the IoT, lets farmers remotely monitor and capture data on metrics such as soil moisture, crop growth and livestock feed levels. This data can be processed in real time to analyse conditions and aid decision making, to help boost crop productivity and yields while reducing on-farm costs across the agricultural industry<sup>44</sup>.

The potential for future growth in this area is huge. Research has forecast that the average farm will generate an average of 4.1 million data points per day by 2050, compared to only 190,000 in 2014<sup>45</sup>. Tapping into the opportunities for the IoT to drive productivity improvements can facilitate future export-led growth in the Australian agriculture sector.

**Financial Services.** Financial advice enables many Australian households and businesses to better understand how they can achieve financial goals such as owning a home or obtaining a business loan. For the industry to remain relevant and fulfil its growth potential, this advice must be affordable, timely and personalised to the needs of each individual customer.

The financial services industry is increasingly turning to Artificial Intelligence (AI) to meet the needs of its customer base. Voice services or ‘chatbots’ similar to Apple’s Siri, Microsoft’s Cortana and Amazon’s Alexa can now interact through ‘virtual conversations’ with customers seeking financial advice. These AI systems use algorithms to gather information and analyse customers’ requirements, so they can perform actions

<sup>42</sup> Deloitte Access Economics (2016), *Connected Small Businesses* 2016.  
<https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-connected-small-businesses-google-051016.pdf>

<sup>43</sup> Rural Industries Research and Development Corporation [RIRDC] (2016), *Cross-Industry Innovation Scan*.  
<https://rirdc.infoservices.com.au/items/16-046>.

<sup>44</sup> CSIRO (2016), *Home Monitoring of Chronic Disease for Aged Care*.  
<https://www.csiro.au/en/Research/BF/Areas/Digital-health/Improving-access/Home-monitoring>.

<sup>45</sup> Meola, Andrew (2016), ‘Why IoT, big data & smart farming are the future of agriculture’, *Business Insider*.  
<http://www.businessinsider.com/internet-of-things-smart-agriculture-2016-10/?r=AU&IR=T>.



faster than human operators and at any time of the day. For example, AMP has begun trialling an online chatbot developed by Sydney-based company Flamingo to help customers choose which financial product might best suit their situation.<sup>46</sup>

As AI technology continues to develop, the share of advice provided by machines will rise. It has been predicted that by 2020, robotic advisers will manage US investment assets worth more than US\$2 trillion<sup>47</sup>. Given the significant implications this could have for consumers and businesses across the Australian economy, appropriate government regulation is required to ensure that the associated risks are adequately managed. The Australian Securities and Investments Commission (ASIC) has recently consulted with the financial services industry and provided regulatory guidance in relation to algorithm-based financial advice.

**Healthcare.** Robotics, which is rapidly becoming more sophisticated and affordable, can help improve healthcare service delivery in regional areas. This technology can eliminate the need for regional patients to travel long distances to specialist clinics to undergo medical procedures. For example, new technologies now allow medical professionals to conduct ultrasound procedures up to 1,000 kilometres away<sup>48</sup>. And as modern robotic technologies become increasingly advanced and reliable, they are appearing in many surgery rooms across Australia, where their precision helps to speed up recovery times and reduce scarring.

**Manufacturing.** Technological developments in areas such as automation, robotics, 3D printing and more have enabled manufacturers to produce complex and high-value-add goods for niche applications in specific industries. This boom in advanced manufacturing enables Australian manufacturers to supply unique and specialised products for domestic industries and to transfer this expertise into overseas export markets.

3D printing is an additive process of layering materials based on instructions from refined digital models of the final product. This technology has particular applications in advanced manufacturing and allows individualised products to be manufactured faster and cheaper, benefiting a range of industries. For example, it's easier to make affordable medical prosthetics precisely tailored to a patient, or to create architectural models and designs more quickly and affordably than before<sup>38</sup>. Estimates suggest that using 3D printing can reduce product development time by up to 96%<sup>49</sup>. With the country's traditional manufacturing base being eroded by overseas competition, advanced manufacturing and 3D printing are emerging as the means by which Australia's manufacturing industry can become more innovative and add more value.

## 19. What are the key new growth industries that Australia should be tapping into? In what technologies and sectors should Australian businesses take the lead, and where should we be a 'fast follower' of international trends?

<sup>46</sup> Australian Financial Review 'AMP Trials Fintech Flamingo's Virtual Chatbot "Rosie"'.  
<http://www.afr.com/technology/amp-trials-fintech-flamingos-virtual-chatbot-rosie-20170123-gtwyi4>

<sup>47</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>48</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>49</sup> Barnes, John (2013), 'Can 3D printing rebuild manufacturing in Australia?', The Conversation.  
<http://theconversation.com/can-3d-printing-rebuild-manufacturing-in-australia-16670>.



**High Growth Industries.** There are various digital sectors which offer significant opportunities for Australia to develop products and services for global markets. These include:

- Financial Services and Distributed Ledger/Blockchain Technologies
- Artificial Intelligence
- Agricultural
- Mining Technologies
- Biotech and Genomics
- Healthcare and Robotics
- Transport Systems
- 3D Printing and Advanced Manufacturing

**Fast Followers Fail.** In the digital economy, coming second or being a fast follower is an ineffective strategy due to the rapid rate of change. Innovation rewards those who are first to market with a digital service and our focus should be on identifying and exploiting opportunities to lead a market sector or niche since this is our best opportunity for economic growth and jobs creation.



## **Section: Empowering all Australians through digital skills and inclusion**

### **20. What opportunities do we have to equip Australians with the skills they need for the digital economy, today's jobs, and jobs of the future?**

According to *Australia's Digital Pulse*, Australia will require an additional 81,000 ICT workers over the next six years, and an anticipated 236,700 more will be intensive users of ICT in their jobs<sup>50</sup>. Therefore, it is essential to continue building up the digital skills base required to meet future workforce demands across the Australian economy.

**Skilling Up Australia.** For Australia to succeed as an innovation-driven nation, we must have a strong culture of education and training that equips students and workers at all levels of the economy with the knowledge and skills to think creatively and to apply technology to solve problems and achieve their goals. This means ensuring that all Australians have opportunities to gain skills from the cradle to the grave.

According to the CSIRO's *Tomorrow's Digitally Enabled Workforce* report<sup>51</sup>, "Education is likely to be one of the most critical factors shaping workforce outcomes in the future. The research not only suggests that most of the new jobs of the future will require high levels of skills but also that continual investment in education will be required in order to keep up with the rate of change brought about by developments in digital technology. Thus, lifelong learning (and importantly, appropriately targeted learning) will be important in order to secure the productive and well-paid jobs of the future. The educational sector might need to work in close collaboration with business and industrial organisations as well as governments to ensure educational programs are developed in accordance with future employees' needs."

Furthermore, the Foundation for Young Australians predicts that 90% of Australia's workforce will need some level of digital literacy in the next two to five years, and makes it clear that these technical skills will need to be combined with broader enterprise skills<sup>52</sup>.

Employers in Australia are already seeking out workers with this mix of technical ICT capabilities underpinned by general business skills and knowledge. An analysis of LinkedIn data<sup>53</sup> on in-demand ICT occupations illustrates this trend: in 2016, the top three occupations featured in job advertisements – project manager, business analyst and business development manager – all connected technical ICT functions with broader business requirements. The list of top 20 skills among these workers includes a mix of technical skills (such as IT infrastructure, web programming and cloud computing) and enterprise skills (such

<sup>50</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>51</sup> CSIRO Tomorrow's Digitally Enabled Workforce Report, commissioned by ACS  
[https://www.acs.org.au/content/dam/acs/acs-publications/16-0026\\_DATA61\\_REPORT\\_TomorrowsDigitallyEnabledWorkforce\\_WEB\\_160128.pdf](https://www.acs.org.au/content/dam/acs/acs-publications/16-0026_DATA61_REPORT_TomorrowsDigitallyEnabledWorkforce_WEB_160128.pdf)

<sup>52</sup> Foundation for Young Australians [FYA] (2016), *The New Basics*.  
[https://www.fya.org.au/wp-content/uploads/2016/04/The-New-Basics\\_Update\\_Web.pdf](https://www.fya.org.au/wp-content/uploads/2016/04/The-New-Basics_Update_Web.pdf).

<sup>53</sup> The LinkedIn data used by Deloitte in this analysis was provided by LinkedIn to ACS in a customised report. Note that the LinkedIn data includes both ICT and digital skills. This data is based on information entered into LinkedIn by its members. As such, the data is influenced by how members choose to use the site. For example, LinkedIn users tend to be professional or knowledge workers and the data is therefore likely to be skewed towards office-related jobs and skills.





as project management, customer service and strategic planning), which is consistent with the increasing employer demand for ICT workers who can offer both areas of expertise.

At the same time, ICT workers with specific technical expertise are still in high demand; various developer, engineer and architect roles also featured in the list of top 10 occupations advertised.

**Educating Entrepreneurs.** Broader business skills are not just valuable for ICT workers already employed in Australia; they are also essential to increasing start-up activity and ensuring research ideas are commercialised and translated into innovative new products and services. Starting and growing a new company – particularly in the technology space – requires technical ICT skills to build the right product for the relevant consumer, as well as business and entrepreneurial skills to bring the product to market and continue developing it over time.

**Equipping Teachers for the Future.** Critical to our success in teaching digital literacy and ICT skills is our ability to upskill and empower teachers at all levels of the curriculum. Both primary and secondary teachers need to demonstrate confidence in teaching with digital technologies across all subject areas to enhance digital literacy in all students.

There are significant opportunities to develop and improve the national curriculum by embedding digital technologies in ways that enhance the learning experience and improve access to information. However, this would require greater facility with technology from teachers and curriculum designers, and would benefit consistent standards in content and methodology.

**Blended Learning.** Universities increasingly report that students across all disciplines typically attend fewer than half of the lectures associated with their coursework, preferring to access much of the learning content online. Rather than sitting passively in lecture theatres, students could be better engaged in spending on-campus time working collaboratively with other students in flexible learning environments such as flipped classrooms.

**Improve Diversity in the ICT Workforce.** The ICT workforce continues to see under-representation of key demographics across the Australian population, with women and older workers particularly affected.

Women comprised only 28% of all ICT workers in Australia in 2016, compared to a 44% female representation across all professional industries<sup>54</sup>, although trade and technical occupation groupings have a particularly low share of female workers. Average earnings also continue to be lower for women in the ICT workforce than for men, with an average pay gap of around 20%.

The relatively low representation of women in the ICT workforce is a global phenomenon. The World Economic Forum reports that women represent around 26% of the overall science, technology, engineering and mathematics (STEM) workforce in developed countries, where these numbers are skewed towards relatively more women in science and mathematics, and fewer in engineering and technology<sup>55</sup>.

<sup>54</sup> Deloitte Access Economics Australia's Digital Pulse Report (2017), commissioned by ACS  
<https://www.acs.org.au/content/dam/acs/acs-publications/Australia's%20Digital%20Pulse%202017.pdf>

<sup>55</sup> Plunkett, Suzanne (2016), Testing times: The Fourth Industrial Revolution will bring challenges for both genders.  
<https://www.weforum.org/agenda/2016/01/could-women-see-gender-parity-in-the-4th-industrial-revolution/>.



Previous analysis by Deloitte of women in ICT jobs suggested that improving female representation in the ICT workforce requires changing processes and cultures across the board, including in relation to the education pipeline; recruiting and hiring; remuneration and promotions; and retaining talent<sup>56</sup>.

In 2016, only 12% of Australia's ICT workforce was aged 55 years and older, compared to 16% of workers across all professional industries. Previous research has found that stereotypes and preconceived notions about older workers lacking the digital skills required to succeed in the modern workplace may be hindering their ability to find employment, and that three in five Australians aged over 50 experienced difficulties searching for jobs<sup>57</sup>.

This is despite older ICT workers bringing valuable skills and expertise to the workplace, being more stress-resilient in relation to using technology in the workplace 2016<sup>58</sup>, and Australian research showing that the most innovative companies are ones where employee age does not matter<sup>59</sup>.

Digital technologies also have the potential to enable mature age workers to remain productive for longer. Older people leave the workforce and with them their associated contributions to society, often due to the physical limitations of increasing age. However, using technology can enable them to continue using their skill set to continue to contribute to society. It also has the benefit of increasing their wellbeing since for many, retirement, particularly when forced due to health issues, has a detrimental effect on wellbeing.

**Assist Workers in Transitioning to ICT from Other Sectors.** One future potential source of ICT workers will be those who transition from other occupations into ICT-related roles. LinkedIn data from 2016 suggests that more than 40% of ICT workers had a previous role that would not have been classified as an ICT occupation. Transitioning from other occupations into ICT roles could become more common as the digital economy continues to grow, and as digital technologies become more integrated with general business.

## 21. What opportunities do we have to bridge the 'digital divide' and make the most of the benefits that digital technologies present for social inclusion?

**Digital Access for Regional Business.** Although telecommunications services continue to improve in metropolitan areas through commercial and technological developments, evidence suggests there is a significant digital divide between metropolitan and regional Australia. For example, Swinburne University's Australian Digital Inclusion Index<sup>60</sup> found that regional Australians are relatively disadvantaged in terms of access to, affordability of and ability to use digital services.

<sup>56</sup> Deloitte (2016), Women in IT jobs: it is about education, but also about more than just education. <https://www2.deloitte.com/au/en/pages/technology-media-and-telecommunications/articles/tmt-predictions-2016-tech-women-in-it-jobs.html>.

<sup>57</sup> Australian Seniors Insurance Agency (2016), Seniors in the workplace. <http://www.seniors.com.au/news-insights/ageism-in-the-aussie-workplace-are-we-missing-out>.

<sup>58</sup> DeNisco, Alison (2016), 'Myth busted: older workers are just as tech savvy as younger ones says new survey', Tech Republic. <http://www.techrepublic.com/article/myth-busted-older-workers-are-just-as-tech-savvy-as-younger-ones-says-new-survey/>.

<sup>59</sup> Patty, Anna (2016), 'Companies that use older workers are the most innovative: new research', The Sydney Morning Herald. <http://www.smh.com.au/business/workplace-relations/companies-that-use-older-workers-are-the-most-innovative-new-research-20160418-go93h1.html>.

<sup>60</sup> Swinburne University (2016), Measuring Australia's Digital Divide. <http://digitalinclusionindex.org.au/wp-content/uploads/2016/08/Australian-Digital-Inclusion-Index-2016.pdf>



As digital technologies are increasingly embedded in economic activities across all industries, growth in regional Australia could be constrained if businesses in these areas do not have adequate telecommunications infrastructure and capabilities.

Because rural populations are spread across larger distances, regional telecommunications markets provide relatively weaker commercial incentives for private investment compared with metropolitan markets. This means regional digital infrastructure and service outcomes are relatively more dependent on government policy, compared with those in metropolitan areas. This can be a particular issue for businesses located in remote and rural areas. For example, underdeveloped digital infrastructure potentially reduces competitiveness by limiting the extent to which these businesses can use new technologies and take advantage of the associated economic growth opportunities.

The rollout of the NBN will improve telecommunications services for households in regional areas; however, it is based on the density and geographical dispersal of premises rather than business need. As such, some regional areas will be serviced by fixed wireless or satellite NBN coverage, and will not have access to the same connection speeds and capacity as areas covered by fibre.

It is important for the Federal and State governments to consider whether regional businesses have adequate access to digital infrastructure and how government policy can address any gaps. These considerations should include fixed-line services provided through the NBN, as well as developments in mobile connectivity and coverage, which can also be crucial for servicing remote areas across regional Australia.

**Digital Inclusion.** We need to recognise that the digital divide has many dimensions – rural/regional, age, language and culture, to name just a few. Many organisations have reduced their service channels with the expectations that all customers can or will use the Internet to ask questions or seek advice. However, this is still not suitable for many in our communities and alternative modes of communication still need to be provided during this period of transition.