ATSE

SUBMISSION TO THE

Department of Industry, Innovation and Science Digital Economy Strategy Consultation

NOVEMBER 2017

AUSTRALIAN ACADEMY OF
TECHNOLOGY AND ENGINEERING

SUBMISSION TO THE AUSTRALIAN GOVERNMENT CONSULTATION PAPER

DIGITAL ECONOMY: OPENING UP THE CONVERSATION

The Australian Academy of Technology and Engineering (ATSE)[1] welcomes the opportunity to provide input into the Australian Government's consultation on the Digital Economy Strategy.

ATSE considers that establishing a national Digital Economy Strategy and outlook for Australia's digital future is a significant and valuable endeavour by the Australian Government. Understanding the role that technology plays and will continue to play in our economy is imperative for determining how we prepare ourselves across industry, government, education systems, and the community. In doing so, it is also essential to ensure that the discussion remains framed by the broader Australian society, one that actively determines our digital future. Priority must be given to preparing Australian industry and society to be leaders in the application and development of digital technologies.

Key points made in this ATSE submission that highlight the role for Australia in a digital future, are as follows:

- Strategies should be devised to harness and grow digital transformation expertise in all industry sectors including the biotech, financial, health and energy industries to enhance productivity and competitiveness;
- National leadership is required to ensure high quality digital network infrastructure and access availability across all of Australian society;
- Cybersecurity must be viewed as an enabler for our digital future by maintaining the highest of cyber security standards including the development of a highly professional cyber security workforce and a comprehensive education program for our citizens; and
- Education sectors at all levels need to accept that the knowledge and competencies to understand and use information and communications technology are critical in our 21st century society.

ATSE has provided a response to the consultation's questions, drawing upon the expertise and input of the Academy's Fellows - some of Australia's most eminent experts in technology and engineering across industry, government and academia.

AUSTRALIAN ACADEMY OF
TECHNOLOGY AND ENGINEERING

Our digital readiness

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

   ATSE engages in policy development activities, based upon the fields of our expert Fellows across all sectors, including agriculture, water, mining, healthcare, energy, infrastructure and education. In each of these sectors, we are actively assessing the role of new and emerging digital technology for industry, government and academia, and wider Australian society.

   ATSE has recently released a Digital Futures Position Statement. (Refer ATSE web site https://www.atse.org.au/content/publications/policy/embracing-australias-digital-futures.aspx). This is to be followed by the development of two priority policy Action Statements that will inform key aspects of Australia's digital future. The Australian economy will be impacted by advances in digital technology at every level. Ensuring each sector is embracing digital technology and that potential barriers to adoption are removed will ensure Australia can participate and thrive in the digital future.

   We also refer the Department to a joint project between ATSE and the Australian Academy of Science which is currently under development. Its focus is upon technological advancements in Australia to 2030 with strong linkages between research and industry. Upon completion, it will further inform Australia's Digital Economy strategy.

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?**

   It is important to recognise that the use of the term "digital economy" should not imply an economic system that is separate from what is understood by our general economy. We have only one economy, albeit one that is now being increasingly impacted by factors often referred to as digital transformation.

   Today's digital technologies, including the Internet, fixed and mobile broadband, and cloud services, are having a significant societal and economic impact within Australia. They are also acting as the basis of a newly emerging set of foundational technologies such as the Internet of Things, big data, machine learning and autonomous systems. These emerging technologies will disrupt every aspect of the economy including every industry sector.

   Information and communications technology (ICT) is arguably the key driver of productivity growth and innovation in the 21st century. The uptake and effective utilisation of ICT services has facilitated innovation across an increasingly diverse range of areas including, for example, advanced environmental management solutions, new diagnostic and preventative health techniques, and methods to detect, respond to and recover from natural disasters and emergency situations.

   ATSE is undertaking a significant project over the next three years to assess the 'technological readiness' (i.e. the readiness to develop, adapt to or adopt new technology) of key industry sectors. This will help develop a roadmap for what Australian industry needs to do to maintain currency with new technologies and fully integrate these technologies for full economic advantage.

   ATSE will develop a decadal plan for technology research in Australia that will explore the likely environment that Australian industry will need to adapt to by 2030, the readiness of key sectors of the Australian economy to adapt to this environment, and what industry sectors need to do to

maintain or increase their competitiveness. The research needs of key industry sectors will also be identified.

This decadal plan for technology research will help guide decisions by the research sector to ensure research activities are appropriately focused to promote Australian industry competitiveness, thereby enabling collaboration between Australian industry and publicly funded research organisations. It will also be a crucial tool to guide curriculum design to ready students in the transition to future work scenarios.

This study will focus on five key Australian industry sectors. Industry sectors will be chosen based on their critical importance to the Australian economy as a whole (for example. transport, agriculture, defence, energy, construction and healthcare).

In the next five to ten years ATSE would like to see that:
- Australian business leaders understand the impact of increased digitisation on their business;
- The Australian Government has comprehensively adopted digital solutions and is an exemplar for the nation;
- Accelerating the embrace by business and government of emerging digital technologies including automation is seen as a path to national growth in annual per capita GDP;
- Many businesses have positioned themselves in a good position to capture the benefits of digital transformation and have assigned clear responsibilities for implementing the changes required;
- Significantly greater collaboration between Australian technology industries and publicly funded research organisations is achieved, in part through more frequent staff transfer policies;
- Governments have responded to public concerns regarding data security arising out of outsourcing of services and data storage to third parties. Government accreditation based on robust, internationally accepted standards is being implemented.
- Governments and other policy makers will be taking steps to prepare the workforce for the transition; and
- Education, labour and welfare institutions will have commenced to evolve to ensure multiple levels of society can equitably participate in the new digital economy.

In 20 years' time, ATSE would expect that:
- Australia will be a global economic power house in the digital economy and will have used digital technologies to address major shifts in Australia's demography, changes in Australia's economic growth patterns, a declining workforce, the rise of the digitally empowered consumer, and a rise in global food demands;
- Productivity increases resulting from digitisation and automation have assisted Australia to stay competitive, including compensating for the impact of its rapidly ageing population on economic growth;
- A significant number of new businesses will have emerged and existing businesses will be even more competitive as a result of world class digital innovation; and
- Australia will have introduced laws, regulations, health and social systems in response to the rise of advanced digital technologies which will have disrupted all facets of the Australian way-of-life, from household amenity and food supply chains, through to systemic changes to health, transport, infrastructure, energy, business models and industry structures.

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

For government to enable this vision for the future, it would be desirable that a more bipartisan approach be adopted to creating structures taking advantage of digital transformation of business, government and society. Furthermore, policy decisions regarding the digital economy should be based on longer term considerations than 3-4 year election cycles.

Governments should develop robust policy and regulatory frameworks to enable society and business to prosper from digital transformation, taking into account an expected increase in globalisation. They will need to prepare frameworks for helping with the inevitable transitions that can be expected – including methodologies to intervene where there are market failures and to ensure that vested interests do not stand in the way of consumer benefit.

A rapid growth in digitisation of the public sector is desirable for all levels of government. Ambitious targets should be set and driven aggressively.

Policy makers need to look to the future to make sure society is ready for transitions in the digital economy, particularly through education systems, and actively support the societal shift. It will be necessary to plan for labour market changes and to provide better support for emerging numbers of independent workers.

Government needs to continue to implement the International Cyber Engagement Strategy[2]. ATSE supports this Strategy and suggests government accreditation based on robust internationally accepted standards would be worth considering.

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?

Disruptive models are difficult to predict, but those we can foresee include:
- The Internet of Things, Big Data and Artificial Intelligence will have a key role in the future economy and affect the ways we live, work and play as automation, remote sensing and robotics are applied to an increasing range of activities. Indeed, it has been said that AI is now turbocharging digital transformation;
- Augmented reality systems and sophisticated haptic technologies, (also known as tactile feedback technologies) that respond to human senses will affect future human interaction with new digital environments;
- Sophisticated brain–machine interfaces will also be created to enable neural control of ICT systems and devices;
- Substantial growth in data usage will create huge demand for cloud/edge computing services as businesses try to store more information than ever before. The resulting proliferation of information will increase demand for data analytics expertise to facilitate effective information management services to ensure the availability, confidentiality and integrity of this data;
- The ownership of data and the definition of monopoly power will be key considerations for the new economy;

---

2 http://dfat.gov.au/international-relations/themes/cyber-affairs/Documents/international-cyber-engagement-strategy.pdf

- New quantum technologies including computing, sensing and communications will become increasingly pervasive;
- 2D materials such as graphene and silicone will have an enormous impact on how things are made;
- 3D printing will disrupt the manufacturing industry;
- Genomics, Big Data, wearables and implantables will change the health system; and
- Increased productivity initiatives will become essential components of new businesses.

Digital Infrastructure

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

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

   Australia's ability to maximise the opportunities presented through digital technologies will increasingly depend on the availability of high performance broadband network services in order to create environments where digitised businesses can thrive. Successful completion of the National Broadband Network (NBN) in a timely manner is an essential element of Australia's required infrastructure development.

   Likewise Australia needs to develop appropriate platforms, protocols and regulations as key elements of digital infrastructure requirements.

   Decisions about performance requirements such as NBN transmission speeds and network protocols need to be grounded in an Australian context. It is highly desirable that such decisions are based on an apolitical approach to aim for bipartisan outcomes.

   Australia's unique geographical characteristics with dispersed population centres and urban environmental distribution will inevitably require unique solutions to the coverage, speed and cost parameter considerations. This requires a pragmatic and balanced response since a one size fits all solution is not rational.

   The NBN needs to continually evolve over the coming decades. There needs to be a low cost pathway for consumers to migrate to higher speeds – upstream as well as downstream – using the most appropriate technology (for example, pushing fibre closer to the consumer with systems such as Fibre-to-the-curb for city dwellers and utilising new global low earth orbit satellite systems for rural users). As a high priority, this should be the subject of continuous consideration by policy makers and network designers in the near future.

Standards and Regulation

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

   i. **enable digital entrepreneurship, innovation and trade?**

   ii. **mitigate the risks associated with digital disruption?**

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?**

Australia has a strong history as a good contributor to the development and adoption of standards for ICT networks, as for example, in ISO standard development. ATSE believes that it is important that Australian policy makers continue to realise the merits of ongoing and increased involvement in standards setting processes.

Government should give priority to ensuring that Australian involvement in standards development is guided by the goal of promoting digital entrepreneurship, innovation and trade. The temptation to approach regulation in a protectionist manner should be avoided.

Government should try and foresee digital disruption effects on industry. This should enable them to play a leadership role in supporting and investing in support of industrial change rather than seeking to prevent it, should also motivate support for flexible regulatory frameworks that can accommodate innovation and change while also ensuring public trust.

Cyber and trust

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

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

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

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

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

Cyber security must be positioned as a key enabler for our digital future. As a trusted global cyber nation Australia will need to maintain the highest of cyber security standards including the development of a top class professional cyber security workforce and a comprehensive education program for its citizens.

Cyber security should be treated from a legislative perspective in a similar manner to Occupational Health and Safety. Organisations should be held liable and suffer criminal penalties for negligent loss of consumer data.

There is a need to approach the design of standards and regulations around security considerations, especially for IOT networks and devices. It is also desirable to seriously consider risks of outsourcing of services and data storage to third parties in relation to data security, and to develop strategies to prevent this.

A strong research capability will be necessary to facilitate collaboration with allies to share the ever-expanding research burden of understanding system, data and process vulnerability and the development of techniques to build resilience to cyber-attacks.

Our emphasis on cyber security should be on proactive, rather than reactive, approaches and include:

- techniques for predicting likely threats and vulnerabilities;
- tools and techniques for achieving real-time comprehensive cyber situational awareness; and
- methods for ensuring business continuity in the face of cyber attack.

New technologies such as big data and autonomous and cognitive systems based on artificial intelligence will play a central part in this.

Public education will be critical, including campaigns around cyber security to give confidence to citizens to engage in and conduct business.

Education providers should promote opportunities in schools for understanding cyber security risks and strategies to mitigate against them.

Competitive Strength

13. What is holding Australian businesses back in terms of benefiting from digital technologies?

14. What would help Australian businesses to embrace digital technologies?

15. What efforts are you or your organisation making to respond to digital transformation? Why?

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

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

18. 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?

Priority should be given to preparing Australian industry to be leaders in the adoption and development of emerging digital technologies. Australia's productivity and competitiveness relies on innovative industry sectors that embraces research, technological innovation, and local and international collaboration.

Government can support industry through appropriate policies and regulations, and by means of promotion. However, in other respects, government should not intervene but should stay at arm's length and let industry get on with innovative developments.

Key to Australia's competitive strength is the skills matrix of Australians. The workforce of the future may be fragmented and combine traditional roles with those emerging in entrepreneurial start-ups, and as such, it is recognised that students that enter the workforce will need a combination of skills, both the 'softer' interpersonal skills and deep discipline knowledge to adapt to these opportunities. Over the next ten years, schools will specifically need to prepare students to work in a time where artificial intelligence and robotics are integrated into the workplace. Education systems must evolve to ensure that the necessary framework is available to meet the needs of the current generation of students into the future. The following matters will need attention:

- Curriculum design must evolve to meet the needs of students in future work scenarios, including ensuring maths is mandatory to year 12;
- Investigation must be underway to ensure appropriate qualifications in teachers of STEM; For example, initial teacher education and training for STEM teachers should require a bachelor's degree, with appropriate STEM major, along with either undergraduate or postgraduate qualifications in teaching;
- Teachers should encourage interdisciplinary learning environments for STEM through recognition of the effectiveness of programs, such as ATSE's STELR program[3] and promote careers that require STEM; and
- A comprehensive strategy should be developed to reposition Vocational Education and Training as a critical alternative to university.

The digital innovation environment is dynamic and complex, and time-to-market is typically very short. Strong collaboration between researchers and industry is key to seizing this opportunity, particularly given the challenges of digital disruption to industries that have significantly invested in traditional methods (see upcoming joint work from ATSE and the AAS as previously mentioned).

The global appetite for digital technologies and the rate of uptake is a significant opportunity to:
- establish new commercial enterprises and grow existing ones in digital technology supply and digital service provision; and
- improve the efficiency and effectiveness of existing industries.

Australia has leading skills in areas such as mining (automation) and biomedicine – there is a role for government to continue to promote successful stories (as it has done previously with agritech, aquaculture and cotton) of digital transformation and showcase demonstrations of SMEs displaying the advantages of digital technology. Detailed below are case studies of three Australian SMEs that are developing and commercialising technology across industries where Australia can claim leadership.

---

3 STELR (**S**cience and **T**echnology **E**ducation **L**everaging **R**elevance) is a national initiative of the Australian Academy of Technology and Engineering (ATSE). www.stelr.org.au

Case study 1: Logistics software/services - WiseTech Global

WiseTech Global develops cloud-based software solution for international and domestic logistics industries. Launched in Sydney in 1994, WiseTech Global has gown its business to work with over 7000 customers across over 125 countries, focused on global supply chains and the efficient movement of goods and information.

The core product provides end to end logistics solutions, increasing visibility and efficiency, quality of service and profitability of movable goods. WiseTech Global is an innovator, using software and hardware to solve problems to grow their business and enhance their product – underpinned by a robust people and culture.

WiseTech Global operates worldwide with offices in Australia, China, New Zealand, Singapore, South Africa, United Kingdom and the United States. WiseTech Global was listed on the Australian Stock Exchange in April 2016, since when its share price has doubled.

www.wisetechglobal.com

Case study 2: Telehealth - Blamey Saunders Hears

Blamey Saunders Hears was founded by Dr Elaine Saunders and Professor Peter Blamey in Melbourne over 20 years ago.

Through their IHearYou system, Blamey Saunders Hears are able, following online hearing tests, to sell hearing aids to clients online, which are then adjusted to the hearing needs of the client, also online.

The bionic ear technology was researched and designed in Melbourne and is changing the delivery and accessibility of health services, while also significantly reducing the cost of hearing aids typically available.

Elaine Saunders and Peter Blamey have both received Clunies Ross Awards – 2016 and 2012 respectively highlighting the importance of their work in bionics.

DR ELAINE SAUNDERS
MANAGING DIRECTOR
BLAMEY SAUNDERS HEARS

www.blameysaunders.com.au

Case study 3: Energy startup – Relectrify

Relectrify was founded in January 2015 by Valentin Muenzel and Daniel Crowley. They identified an opportunity to unlock second-life batteries, via a process called advanced control.

Muenzel and Crowley had the technical concept validated, and support then provided through the Melbourne Accelerator program. Within six months it had received investor backing.

This was followed by key partnerships with Selectronic and IBM Research, and support from the Victorian Government, which has in turn enabled recognition in Germany and Hong Kong for Relectrify as leaders in innovation.

In September 2017 Relectrify launched 12V battery product, the PowerTrak.

www.relectrify.com

Empowering all Australians

19. **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?**

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

21. **What opportunities do we have to ensure digital technology has a positive impact on the cultural practices and social relationships of Australians?**

Experience has demonstrated that in the digital technology area it is consumers who ultimately drive change. For Australia to thrive economically in the digital future, appropriate fiscal, regulatory and technical mechanisms must exist to empower consumers as the key change agents.

Ownership of and access to data is a key issue and consumers are central to this. Importantly, data ownership must not be allowed to create new 'digital monopolies', nor inhibit innovation by forcing data sharing.

In personal lives, people are adapting to and adopting technology quickly, where they see value. There is a strong awareness of digital enablement. This needs to be considered against real life problems and minimising the digital divide.

The skills required to understand and use ICT have emerged as a fundamental element in all levels of education, from the foundation years through to senior schooling, across a range of tertiary education offerings both in ICT and non-ICT disciplines, and for essential life-long learning. As a national priority, all students must have courses that teach computational thinking (e.g. mathematics and coding) as part of the curriculum. Students need also to be exposed to entrepreneurship (creativity, critical thinking etc) throughout their education, to align with the dynamic and changing real world environment.