

Embracing Australia's digital futures

Priority must be given to preparing Australian industry and society to be leaders and fast followers in the emergence and development of digital futures. Australia's productivity and competitiveness relies on an innovative industry sector that embraces research, technological innovation, and local and international collaboration.

Australia's digital futures

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 (IoT), 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, such as advanced environmental management solutions, new diagnostic and preventative health techniques, and methods to detect, respond to and recover from natural disasters and emergency situations.

Australia's manufacturing, production and services sectors will increasingly be enabled by access to broadband, both fixed and mobile, as well as low-power network technologies for IoT. This can facilitate the widespread adoption of digitally enabled technologies such as 3D printing, nanoscale fabrication, machine learning and automation. National capabilities in information technologies and digital engineering will underpin growth in all Australian industry sectors, including health, agriculture, finance, mining, education and other services sectors. The global appetite for digital technologies and the rate of uptake is a significant opportunity to:

- a. Establish new commercial enterprises and grow existing ones in digital technology supply and digital service provision
- b. Improve the efficiency and effectiveness of existing industries

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 achieving the agility to successfully seize this opportunity, particularly given the challenges of digital disruption to industries that have significantly invested in traditional methods.

ICT has also strongly impacted societal culture and behaviour. People are increasingly moving towards living part of their lives in the digital world, including socialising, learning, conducting financial transactions, and storing and sharing personal data. Emerging technologies will see this evolution continue with a deepening of human-machine partnerships and relinquishing of tasks to autonomous systems.

Digital developments can also have negative impacts on society, for example, the effects that automation can have on employment and digital systems which find application in crime and terrorist-related activities.

Digital transformation

The term 'digital transformation' is increasingly being used to describe the change associated with the application of digital technology in all aspects of human society. The transformation being referred to highlights the fact that rather than digital technology simply enhancing and supporting traditional methods in a particular domain, digital usages will enable new types of innovation and entrepreneurship. These affect individual businesses and whole segments of society, such as government, mass communications, art, medicine and science.

A range of technological trends, including ubiquitous high-speed broadband, data analytics, machine learning and cognitive computing, will transform all aspects of Australian society. The future for technological innovation looks bright. The diffusion of ICT across all industry sectors, and the pace of technological change, will ensure that ICT continues to generate change and drive innovation.

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

Big data, artificial intelligence and cloud services

The next generation of technological change will also effect considerable change on the way we live, work and play, as automation, remote sensing and robotics are applied to an increasing range of activities. This will include augmented reality systems and sophisticated haptic technologies, (also known as tactile feedback technologies), that respond to human senses.

New 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 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.

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.

Cyber security

Cyber security must be positioned as an 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. A strong research capability will be necessary to collaborate 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 attack. Emphasis on cyber security will be on proactive, rather than reactive, approaches, and will 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.

Education for digital futures

The knowledge and competencies required to engage with ICT have become critical in our 21st century society. Generic ICT skills and digital literacy have emerged as prerequisites for jobs across the economy. They are also central to the process of learning, as primary, secondary and tertiary educational institutions increasingly utilise technology in the delivery of educational programs. As a result, the skills required to understand and use ICT have become a fundamental element in all levels of education, 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 throughout their education, to align with the dynamic and changing real world environment.

Priority focus areas

The Academy will address the three pillars of Digital Transformation of: ICT development, ICT application and ICT societal impact across the following key topic areas:

1. Development of information and communication technologies in Australia, including:

- » Big data and analytics technologies
- » Artificial intelligence and machine learning
- » Quantum technologies including computing, sensing and communications
- » Broadband communications networks and content
- » Mobile computing
- » Robotics
- » Internet of Things

2. Advancement of digital transformation for industry and government in Australia, including:

- » Effective information technology systems and databases for areas such as health, education, advanced manufacturing and government services
- » Increasing productivity initiatives
- » Multi-cloud environments
- » Online communities and smart cities
- » Software as a service
- » Cyber security

3. Implications of digital transformation for society, including:

- » Social consequences of increased automation, eg. ethical issues
- » Confidence and trust in machine learning and decision making in artificial intelligence systems
- » Education policy that addresses evolving technology needs
- » Social robotics – human responses to new autonomous vehicles and other robotic machines
- » Privacy and security concerns in Australian society

The way forward

The Academy will analyse these priority focus areas to identify key actions that will assist industry and government to prepare for digital transformation opportunities in the future and to address current societal needs.