

## Appendix 5. Technology and Australia's Future: New Technologies and their Role in Australia's Security, Cultural, Democratic, Social and Economic Systems

### Introduction

Technological change is a major driver of social change and the dominant source of economic growth. It encompasses the processes of invention and innovation, as well as the diffusion of technology.

New technologies offer unprecedented opportunities for economic growth and community wellbeing. However, to capitalise on these opportunities Australians must be ready to adapt and learn.

The report by the Australian Council of Learned Academies (ACOLA), *SAF05 Technology and Australia's Future: New Technologies and their Role in Australia's Security, Cultural, Democratic, Social and Economic Systems* (<http://acola.org.au/wp/project-5/>) examines how technology has changed in the past, how it will continue to change in the future, and implications for the impacts of new technologies on Australia. The report makes an interdisciplinary assessment of today's technologies and emerging technologies, as well as how technology changes, the nature of its impacts, how it can be predicted and the types of interventions that help deal with the complexity and uncertainty inherent in technological change. The report draws on the authors' expertise in engineering, information and communications technology, life sciences and history.

### What is technology?

The term 'technology' has a broad meaning. It includes processes, products, materials, structures, information and practices. The term can describe sectors, such as biotechnology, transport infrastructure, public health or mining technology. Technology can also refer to collective needs or uses such as information and communication or energy generation and storage.

New technological products develop and are adapted from existing technologies, including the skills required to create and use them. For example, contemporary self-driving cars build on past advances in transport technology that yielded horse-drawn carriages, bicycles, steam trains and engines – and the infrastructure, components and know-how to create, build, and support them.

Technological change, comprising the invention, innovation and diffusion of technology, happens in many ways. There can be gradual or incremental changes, new combinations of existing technological components, or emergence of technologies that depend on advances in other technologies.

Meaning, attitudes and cultural influences all play significant roles in how and why technology is created, implemented and adopted. Science and technology cannot be considered in isolation from values; many emerging technologies trigger debate about ethical,

legal and social implications from invention to use. The introduction of new technology creates or affects social, cultural, economic and political processes. New technology is modified, adapted and changed as it interacts with people, cultures, governance and social structures.

## The impacts of technology on Australia

Technology has created and sustained our security, cultural, democratic, social and economic systems in many ways.

Australia is part of an increasingly connected international system. Globalisation is an impact of technology, with further ramifications for security, culture, democracy, governance, society and the economy.

ICT and transport technologies, in particular, facilitate globalisation, which critically affects Australia's sociocultural setting, our economy, governance and security. Globalisation and technology have differentially affected Australians, producing costs and benefits to the nation. Some people have benefited and some have been disadvantaged, both domestically and internationally.

The context in which technology is deployed affects its impacts. Technology and human nature are closely related: just as we change technology, using technology changes us. Technology changes the way we act, think, learn and socialise. The use of technologies helps shape national culture.

## Australia's technological future

Despite being notoriously difficult, prediction of new technologies is useful. Prediction helps industry and users make decisions about adoption. It can spur action, and help planning, policy development and investment decisions. Prediction also can inspire technology development.

*The Global Technology Revolution 2020*, a report released by the RAND Corporation, found that Australia has an excellent capacity to acquire a broad range of technologies.

Governments can play a central role in encouraging experimentation and entrepreneurship. To allow new technologies to develop and diffuse, policies and regulations must support the growth of niche markets and entrepreneurs. The Australian workforce should be supported by policies that encourage an acceptance of uncertainty, an understanding that failure is inherent in technology change, and a culture of experimentation and adaptation.

Adaptability and creativity are key skills in creating, assimilating and adopting new technology. Enhancing technological literacy, including fostering skills appropriate to engaging with technology in all levels of education, can enhance Australia's ability to adopt and adapt new technologies.

The difficulty of appropriating economic returns from early-stage technology research and development means that substantial ongoing government investment in research is warranted. Increased investment in high-quality scientific and technological research will lead to greater commercial and economic outcomes for Australia.

Technology and economic policy are inextricably linked. When evaluating new technology, government should consider both the benefits and the risks. Blocking or delaying new technology due to overweighting the risks relative to the benefits can slow economic growth and affect standards of living.

Short-term policies to deal with inequality in the workplace caused by technological change should not delay the adoption of new technology. Instead they should focus on facilitating worker transfers and re-skilling to enable those harmed by new technology to be protected and to adapt to the change.

Technology evaluation is of central importance to technology adoption. The costs of a technology are complex to determine, context-dependent, variable, and contested. Governments can facilitate better technology evaluation by adopting international best practice and by minimising the role vested interests play in technology evaluation.

Australian institutions will have to make increasingly thoughtful trade-offs between the benefits of a hyper-connected world and the associated risks of disruption, loss and harm.

A multidisciplinary approach that brings together different perspectives to consider how people feel about, talk about, and use technology can contribute to technology prediction, and help determine adoption, use and impact. Providing information and facilitating deliberation can effectively increase public familiarity with technologies and allow better understanding of their broader impact.

Australia's future use of new technologies will continue to be informed by our national technological imaginary – the way we understand and perceive technology. Reinvigorating this imaginary through investment in tinkering skills, scientific education and inculcating an attitude of experimentation and global confidence can accelerate Australia's technological future.

## Conclusion

Technology is complex and dynamic. Technologies and industries that have performed well in the past will not necessarily perform well in the future, at least without substantial adaptation and transformation.

While it is possible for companies to adapt to external disruption, they cannot do so by sticking with what has worked so far. Adaptation involves innovation, change, and new technologies.

What seems valuable now will not remain so in future.

Australia's growth and prosperity are likely to be enhanced by:

1. acknowledging that the world is changing, and embracing that change as a valuable business opportunity;
2. changing strategy away from focusing on what worked well in the past; and
3. creating and sustaining the capacity, skills, culture and the will to adopt, adapt, and develop our future source of prosperity and wellbeing.

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