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Surfing the Digital Tsunami: Scenarios Report. Preliminary scenarios exploring the decade ahead for Australian business and the economy

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SURFING THE DIGITAL TSUNAMI

SCENARIOS REPORT

Preliminary scenarios exploring the
decade ahead for Australian business
and the economy




Australian Government
Department of Industry,
Innovation and Science



ACKNOWLEDGEMENTS



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Citation

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FOREWORD



The digital age is building into a massive wave that will bring huge challenges and opportunities for Australian business in the coming decade.

Consider the following:

- Global data flows increased 45 times in the decade 2005–2014¹. Global data volume will continue to grow exponentially in the foreseeable future.
- Iconic tech firms like Apple, Google, Microsoft, Amazon and Facebook are now the world's most valuable companies, pushing aside banking and energy majors in the past five years².
- Almost half the world's population is online³. Billions more, largely from the developing world, will connect over the next ten years.
- Autonomous vehicles were considered improbable a little over a decade ago; now they are advancing rapidly and Tesla CEO Elon Musk estimates that within ten years all vehicles sold will be fully autonomous, able to function safely in any situation without driver intervention⁴.
- Artificial intelligence is racing ahead, catching industry veterans like Google founder and CEO Sergey Brin by surprise: "It's an incredible time. What can these things do? We don't really know the limits."⁵.

How will Australian business and the economy be impacted by this digital wave?

What should government do to help Australian business successfully ride the wave and achieve our full potential?

Surfing the Digital Tsunami report uses scenarios to explore answers to these questions.

Scenarios are hypothetical stories of the future that can help decision makers make sense of complexity and uncertainty. They are backed up by trends, but are not predictions. Nor do they provide prescriptions. This report frames important issues and trends for policy makers to consider, and provides compelling and engaging stories designed to inspire big picture policy discussions across government, business and community sectors.

Suspend disbelief when you read this report. Now is the time to engage in a big conversation about Australian business in a future digital economy that could look vastly different from today's.

It is a very special time in our history, the future will be what we make of it. It is not predetermined, but the rest of the world is not standing still. Australia can prosper in a digitally transformed economy, but our opportunity is here now and is perishable.

This report will bring value to anyone interested in forging a positive future for Australian business of all sizes and types, and to readers interested in understanding the potential impacts of digital technology on the economy.

Adrian Turner
CEO
CSIRO's Data61



CONTENTS



| | |
|---|-----------|
| Executive summary | 2 |
| 1 Inaction is not an option | 6 |
| What is Digital Disruption? | 6 |
| Australia's digital readiness – opportunities and challenges | 8 |
| Why use scenarios and what's unique about this report? | 11 |
| 2 Megatrends of the digital economy | 12 |
| Cybersecurity crunch | 13 |
| Accelerating digital technology | 13 |
| Asian economic transformation | 14 |
| Planet under pressure | 14 |
| Escalating social inequity | 15 |
| Human aging and health challenges | 15 |
| 3 Digital innovation timeline | 16 |
| 4 Australia 2027 Scenarios | 18 |
| Scenario quadrants | 19 |
| Differing futures: the scenarios | 20 |
| Effective planning | 21 |
| Scenario 1 Digital Protection | 22 |
| Scenario 2 Digital Detox | 26 |
| Scenario 3 Digital Kings | 30 |
| Scenario 4 Digital Alternatives | 34 |
| 5 Implications for government | 38 |
| The need for targeted action | 38 |
| Changing role of government | 38 |
| Addressing Policy Challenges with Data-Informed Innovation | 39 |
| Six strategic policy challenges | 40 |
| 6 Conclusion | 42 |
| Governments of leading economies use strategic foresight to inform policy | 43 |
| 7 References | 44 |

EXECUTIVE SUMMARY



The spectacular rise of digital technology has shifted the world into a new economic era increasingly influenced by mobile devices, online platforms and sophisticated algorithms. This moment in history is perhaps as transformative as the early industrial revolution. Advanced digital technologies are proliferating and transforming the way goods and services are produced, delivered and consumed – a phenomenon we know as ‘digital disruption’, and significant changes are in store for jobs, businesses, industries, nations and the future global economy.

Surfing the Digital Tsunami uses scenarios to explore how digital innovation might transform Australian business and the economy, and impact the role of government. The report is based on a scenario development process conducted by CSIRO | Data61 in partnership with the Department of Industry, Innovation and Science (DIIS). Scenarios are hypothetical stories about the future that are informed by evidence relating to important

trends or drivers of change. Scenarios do not predict the future but rather highlight critical issues and plausible chains of events, and their outcomes.

... **significant changes are in store for jobs, businesses, industries, nations and the future global economy.**

The report is presented in two parts:

- 1 Scenarios report** – describing four preliminary scenarios exploring the decade ahead for Australian business and the economy
- 2 Technical report** – providing important background literature and methodology that underpin the scenarios. This material is summarised in the scenarios report.

A LOT CAN HAPPEN IN TEN YEARS

Ten years might not seem like a long time for large scale ‘economy wide’ change, but consider what’s happened since 2007: touch screen smart phones were introduced in 2007,

now ‘everyone has one’; the rise of dominant business platforms, such as Amazon and iTunes; global tech companies now top the list of the world’s largest corporations; the Global Financial Crisis of 2008/09 is still impacting Europe and North America; Brexit and the Trump movement arguably signal profound anti-globalisation sentiment in the UK and US. These are tectonic shifts in the global economy. Further tectonic shifts seem likely as digital technology continues to accelerate and other global forces (e.g. population growth and aging, environmental change etc.) continue to put pressure on established ways of doing business.

A TOOL FOR EXPLORING LONG-TERM POLICY CHALLENGES

This report is a tool to promote dialogue and ‘joined up thinking’ across government and industry about the possible impact of digital disruption on business in an era of complex global change. It complements *Tomorrow’s digitally enabled workforce*³⁴, a CSIRO | Data61 report that used scenarios and megatrends to explore the future of work in a rapidly digitalising world.

CSIRO started developing megatrends eight years ago to bring to life major interconnected trends from geopolitical, environmental, economic, social and technological domains.



The world of business is not shaped by technology alone, but by a dynamic interplay of many factors across these domains.

Many scenario reports have been written about the future of digital technology and business^{e.g. 60, 61, 62}, but typically the focus of inquiry is on informing business strategy. This report is different in that the focus is on exploring the role of government and the strategic policy challenges that could arise from a future business world that looks very different from today's.

FOUR SCENARIOS FOR AUSTRALIAN BUSINESS AND THE ECONOMY

Figure 1 on page 4 summarises the four preliminary scenarios presented in this report. These scenarios were based on analysis of relevant trends and emerging digital innovations impacting on business, and

were developed in collaboration with a cross section of federal government policy makers through an interactive workshop (see key elements of the scenario planning process in *Figure 2* on page 5). The exercise explored changes and events that could show up to transform the business sector broadly rather than analysing impacts on specific industries. These scenarios are preliminary because they aim to open further dialogue about the role of government in a complex and rapidly digitalising economic environment. Continuing dialogue will shed more light on what could happen over the coming decade, including how digital disruption might uniquely impact different industries and businesses of varying sizes (SME vs large companies). Our aim is to see these scenarios and their implications evolve and help guide future policymaking. Underpinning this aim is the assumption that technological futures are not inevitable, but shaped by people. People bring values and aspirations, world views and agendas that can influence the direction and impact of technological change.

TWO UNCERTAINTIES AND SIX MEGATRENDS OF THE DIGITAL ECONOMY SHAPE THE SCENARIOS

The four scenarios are based on two highly uncertain factors that will have profound impacts on business:

- ♦ the extent to which advanced digital technologies have diffused globally



- ♦ the extent to which Australian businesses are agile.



These factors were chosen as key uncertainties for their relevance to the focal topic - impact of digital innovation on Australian business and the economy. The first factor was derived by analysing projections of digital technological development and adoption over the coming decade. The report identified technologies that could transform business processes and models. The second relates to the flexibility and adaptiveness of Australian businesses in response to digital innovation and global change.

Scenarios are shaped by extreme endpoints on these two factors as illustrated in the scenario matrix, and powerful drivers of change provide catalytic events pushing Australian businesses toward one particular quadrant. Six interrelated megatrends feature across the scenarios:

- 1 Cybersecurity crunch** – More connectivity and more personal information online brings new vulnerabilities. Hacking and fraud is skyrocketing, especially in banking and finance.
- 2 Accelerating digital technology** – The cost of processing power and data storage has plummeted over the past few decades, and costs for internet bandwidth are also falling. Technological innovations are building on these advances to open new possibilities that were unimaginable just a few years ago.
- 3 Asian economic transformation** – In accounting for most of the world's population and megacities (cities > 10 million people) and coupled with strong economic growth, Asian economies are rapidly developing their services sector and raising incomes, and becoming more prominent in global economic affairs.

FIGURE 1 THE FOUR SCENARIOS FOR AUSTRALIAN BUSINESS AND THE ECONOMY TO 2027

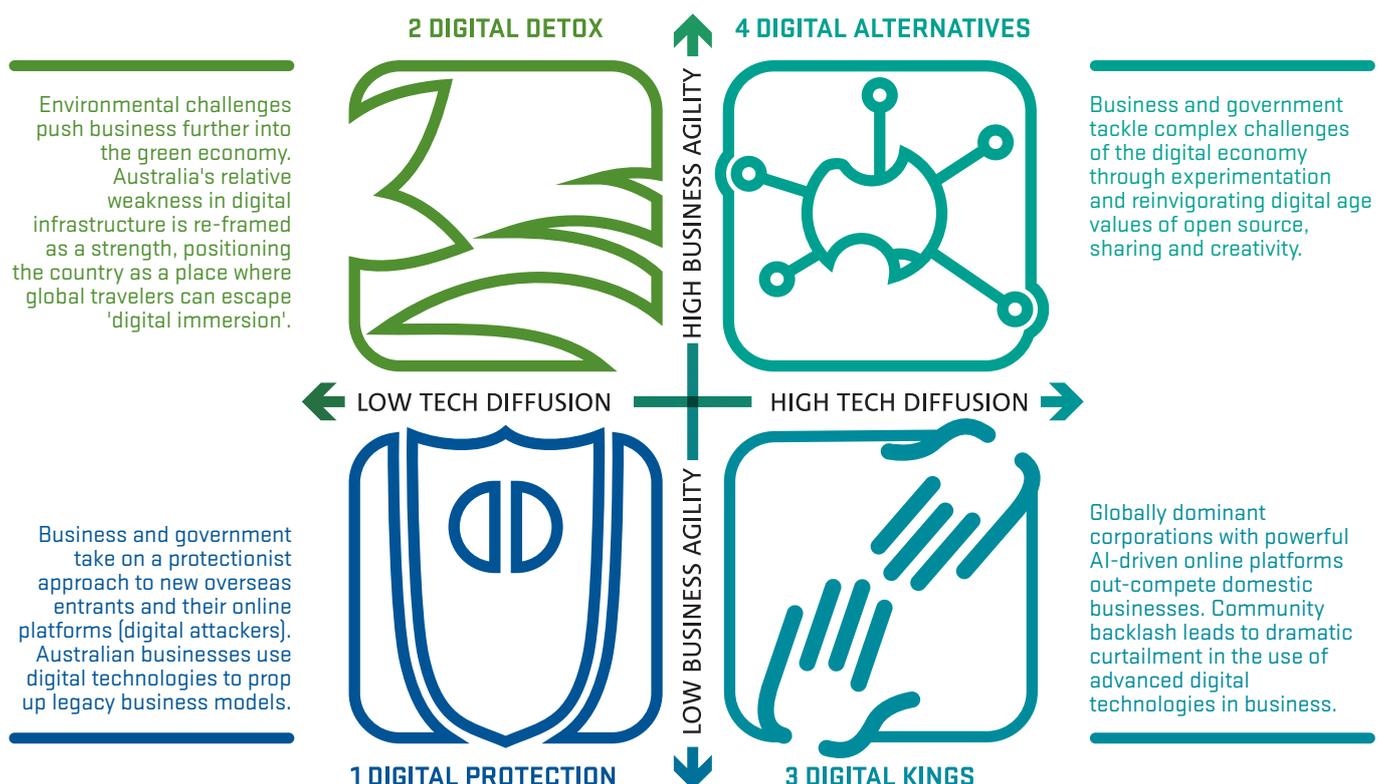
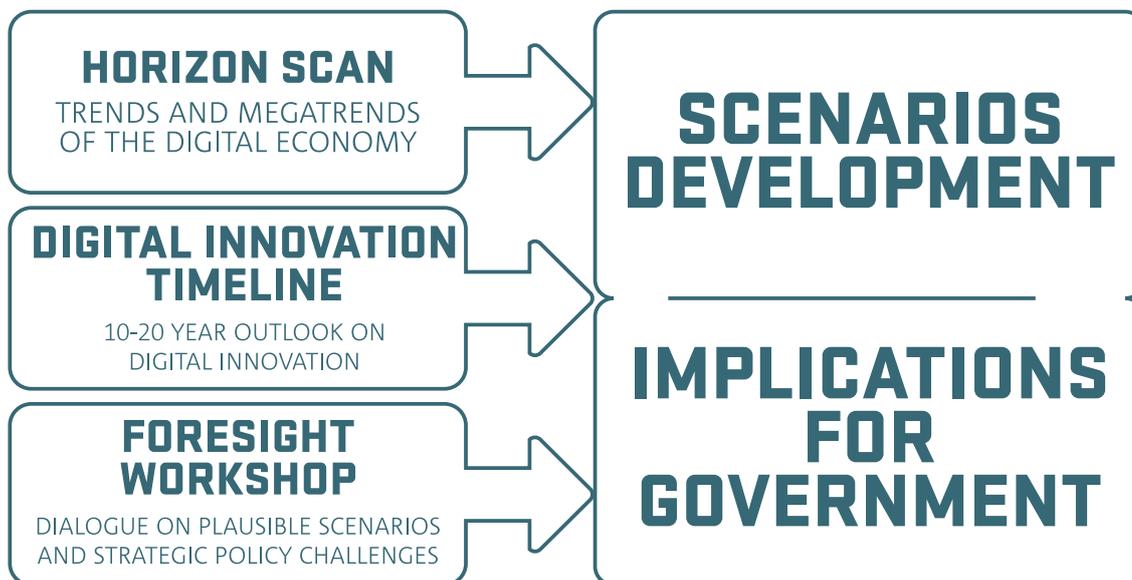


FIGURE 2 KEY ELEMENTS OF THE SCENARIO PLANNING PROCESS



4 Planet under pressure – Economic development and urbanisation is still heavily coupled with extraction and depletion of natural capital. The tropics are particularly sensitive in supporting most the world’s land and water-based biodiversity, and recent evidence suggests that climate change will impact the tropical zone sooner than temperate and cold climate regions⁹⁰.

5 Escalating social inequity – Big income and wealth gaps are opening up, and the trend seems to accelerate with the growing influence of digital technology on business. Online platforms and companies exhibit strong network effects in a seemingly ‘winner-takes-most’ economy.

6 Human aging and health challenges – Baby boomers are getting older and thanks to medical advances, average lifespans are increasing but people are not necessarily healthier. Lifestyle-related conditions (especially obesity and mental illness) are on the up, and increasingly in young people, with serious implications for healthcare costs.

questions. Strategic foresight is about providing a big-picture view that can inspire deep reflection about important trends and desired futures, and help inform wise decision-making.

These scenarios and drivers of change highlight important and complex challenges for government. The scenarios show that the role of government could vary considerably from strong protectionism or ‘command-and-control’ to a ‘hands-off’, enabling role. How can governments navigate this highly uncertain and complex economic transition?

The report offers a data-informed, systematic approach designed to assist government to integrate a futures perspective into policymaking and to deal with and foster cross-departmental responses. Referred to as ‘innovation for impact’, the approach guides targeted action in an increasingly complex and fast-paced economy, and comprises the following four stages:

- 1 Strategic foresight analysis
- 2 Goal development
- 3 Options analysis
- 4 Experimentation.

‘Innovation for impact’ creates a bridge between ways of thinking that are ‘practical here and now’ and those that are ‘conceptual and future-oriented’. Organisations tend to separate these two processes, rather than hold them in tension to foster new insights and social learning. The real challenge though is to move beyond hypothetical futures and into practical action.

ADDRESSING POLICY CHALLENGES WITH DATA-INFORMED INNOVATION

In providing these stories of the future, the report does not offer any predictions or prescriptions, nor does it answer all policy

1 INACTION IS NOT AN OPTION



We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten. Don't let yourself be lulled into inaction.

Bill Gates⁷ in *The Road Ahead*

WHAT IS DIGITAL DISRUPTION?

Digital disruption occurs when new digital technologies and business models fundamentally alter the value proposition of goods and services. The key ingredient is data. Data representing many aspects of the economy and society is becoming easier to capture, store and analyse to unlock new

business opportunities and shake up existing markets. Accenture's recent global survey of chief strategy officers found that nearly all agree that disruptive innovation will threaten today's incumbents, but only 20% of them believed they were prepared⁹.

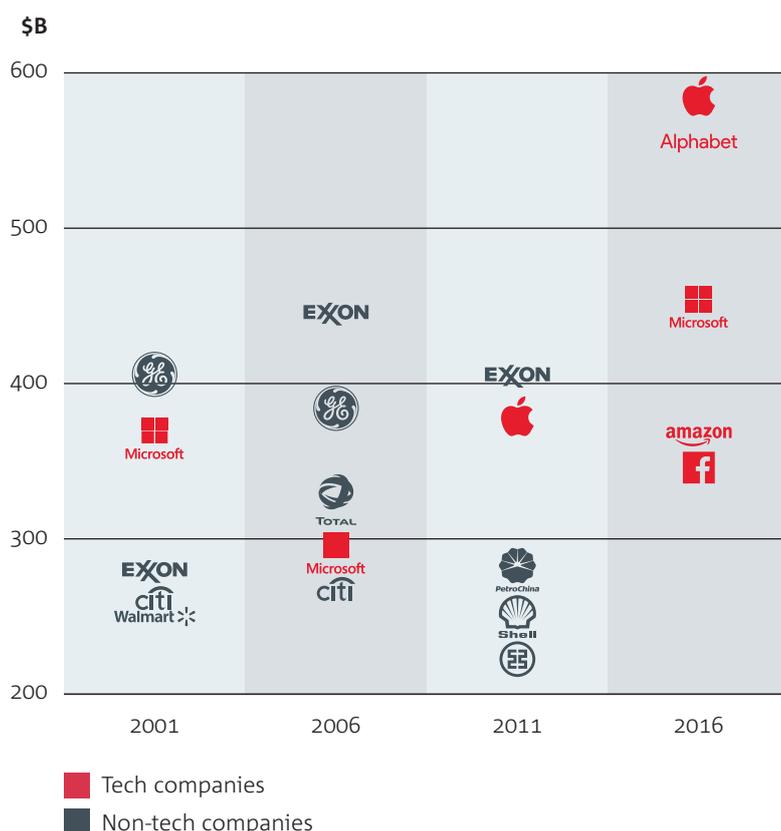
Digital disruption by definition is hard to predict and anticipate. However, at least three key challenges can be identified:

- 1 Uneven distribution of economic benefits in the digital economy
- 2 Potential for new business models to make regulations outdated
- 3 Difficulty with tracking the flow of value in the collaborative economy where volunteerism and new mediums of exchange (e.g. cryptocurrencies) predominate.

Digital business is booming but benefits are unevenly distributed

The effect of digital disruption is already being felt. Relatively young global technology companies now top the list of the world's large corporations with Apple heading the list, followed by Alphabet (Google), Microsoft, Amazon.com and Facebook¹⁰ (Figure 3). The Facebook community numbers almost 2 billion active users²⁷, dwarfing the population of China. And there has been a rise in businesses built on principles of collaborative consumption (e.g. Airbnb, Uber) and production (e.g. crowdsourcing) and individuals trading through platforms like eBay and Alibaba, or freelancing platforms like freelancer.com and Upwork. Working in the gig economy can provide more opportunity and flexibility, yet strip away job

FIGURE 3 TOP FIVE PUBLICLY-TRADED COMPANIES BY MARKET CAPITALISATION



Source: Venture Capitalist⁸

security, wage guarantees, and other rights and conditions.

Powerful online platforms such as Amazon and Apple iTunes demonstrate extraordinary network effects that consolidate markets and concentrate wealth. Such dominant market positions and ‘winner-takes-most’ dynamics are difficult to break once established and have profound implications for the distribution of benefits from the digital economy. Income inequality has been on the rise over the last few decades in Australia as well as in other OECD countries¹¹. Recent OECD forecasting indicates that technological progress and demand for high-skill labour could push average income inequality across the OECD area in the coming decades to levels experienced by the US today¹².

New rules of business will push regulators

Fundamentally new business models, processes and platforms are reshaping existing industries. Google, Apple, Amazon, Uber and Airbnb have already rewritten the rules of business by creating new products or service categories (e.g. the touchscreen smart phone by Apple), or building on business processes and models that outcompete incumbents using lower costs and simpler products and services¹³.

These companies show that seemingly infinite data coupled with broadband internet, computing and artificial intelligence systems can provide relatively small organisations (in terms of employee numbers) with access to bigger markets and a capacity to scale at an unprecedented pace. Existing regulations will be challenged as new practices emerge. This disruption of the regulatory environment requires balanced and timely responses to enable businesses to thrive and protect the public interest without disabling innovation¹⁵.

Some impacts of the digital economy are hard to measure

The ongoing rapid expansion of the internet and the increase in monetary flows for goods and services through online platforms is obvious and measurable. However, digital disruption is also being driven by forces that are not so apparent. More and more people

now work either for free or non-monetary exchange in a collaborative economy with digitally-enabled peer-based systems of production and consumption^{16,17}. Famous products of this unseen economy include the free online encyclopaedia Wikipedia, and the free open source computer operating systems Linux and web browser Firefox.

More information, tools and applications are now readily available online either for free or at minimal cost. And digital technologies enable activity outside the mainstream economy by providing the

infrastructure for new stores of value, like Bitcoin a cryptocurrency that can purchase goods and services. The online world is helping people create and exchange value, but not necessarily in an easily track-able or quantifiable manner. Wikipedia, which famously caused the decline of Microsoft’s subscription based encyclopedia service Encarta¹⁸, is providing a valued service for many people (in the order of 15-20 Billion page views per month¹⁹), but it’s not directly translating that traffic into revenue and jobs.

Key Questions for Australia

What do governments need to do today to ensure Australia is prepared to meet future opportunities and challenges?

In light of the rapid pace of technological change, how will Australian businesses maintain competitiveness?

How can policy makers enable space for businesses to innovate in new and emerging industries?

Much of what I believed about human nature, and the nature of knowledge, was upended by Wikipedia²⁰.

*Founding executive editor of Wired magazine
Kevin Kelly*

AUSTRALIA'S DIGITAL READINESS – OPPORTUNITIES AND CHALLENGES

Opportunities

Reshaping industry and employment

Many Australian industries have already faced a transformational shift driven by the digital economy and technology. The rise of big data and analytics is set to largely reshape many, if not all, sectors including manufacturing, banking, insurance, government, professional services, telecommunications, health, transport and retail²⁸. This will radically shift the professions and skills in highest demand and create new spheres of employment.

Data science and analytics (DSA) roles are already booming globally, and the demand is outstripping supply²⁹. Over 2.3 million job postings were recorded in the US in 2015, which is projected to increase to almost 2.8 million by 2020³⁰.

Emerging digital technologies offer opportunities for Australian businesses to

better address consumer needs across a broad range of industries. For example, offering technology-enabled services instead of selling the technology as hardware and software. RapidAim is a technology developed by CSIRO for fruit fly trapping and biosecurity. Rather than selling the devices, they offer a monthly subscription which incorporates embedded sensors and smart-phone applications³¹.

The exploding internet marketplace

Businesses in Australia are rapidly increasing their internet presence. The number of Australian businesses that optimised their websites for mobile use reached 35% in 2016,

up from 3% in 2011. By 2019 businesses are expected to spend over half their advertising budgets on online advertising³².

Internet penetration and global connectivity have changed the operating reality for Australian businesses. Almost half the world's population is online³³. Cloud computing, smart devices, sensors and other digital technologies are not only providing connectivity, but changing the way consumers and businesses interact. Technological change combined with international trade brings new competitors but also opportunities for Australian businesses to reach millions of new customers.

New niche markets and startup attitude

Economic and technology convergence coupled with globalisation can present new opportunities for Australian businesses and industries to participate and lead high value activities as part of the global value chain. The growing number of middle-class consumers in Asia, projected to reach 2.3 billion in China and India alone, will become increasingly important emerging markets for Australian high quality goods and services³² and a new frontier for the agriculture sector.

The internet has enabled some Australian businesses to gain new niches and become leaders in a number of global markets. Sydney based Atlassian is a recognised world leader in agile planning tools³⁶. Australian-founded Kaggle is a leading platform for data science challenges and competitions with over a million users³. Australia is also offering a supportive environment for enterprises and entrepreneurs to flourish, ranks in the top five for entrepreneurship culture among G20 countries³⁸ and is ranked seventh in the world (and first in the Asia-Pacific region) for entrepreneurial ecosystems according to the latest Global Entrepreneurship Index³⁹.

Challenges

Are businesses prepared?

However, Australian businesses are slipping behind global counterparts in leveraging digital technology to drive growth. According to the World Economic Forum's Digital Readiness Index⁴⁰, Australia's business use of ICTs is ranked 24th and has been trending

The internet could have been purpose-built for Australia. It has connected us with the world, given us new opportunities to export our smarts, and now it's helping our businesses transform to meet the needs of today's consumers.

**Maile Carnegie,
Managing Director of
Google Australia
and New Zealand**

^a Kaggle is now based in San Francisco and was recently acquired by Google³⁷

down since the early 2000s. While most businesses have internet access (95%), only about half have a web presence or place orders on the internet; less than one-third receive orders over the internet⁴¹. Australia ranks 27th in the OECD for ICT sector business research and development (R&D) expenditure as a proportion of GDP⁴². The proportion of Australian patent applications related to ICT (29%) is below the OECD average (37%)⁴³.

PricewaterhouseCoopers' Digital IQ Survey, a global survey of attributes driving business growth, shows Australian businesses scoring below the global average. Less than half of Australian firms have a single, multi-year digital enterprise roadmap and a little over half consistently measure outcomes from digital investments. Outdated technologies were cited by 80% of firms as a barrier to achieving expected results from digital initiatives⁴⁴.

Skills gaps

There are signs that Australia's existing skills are trailing peer economies. Young Australians are showing decreasing interest and performance in science, technology, engineering and mathematics (STEM) subjects at school and information technology courses at university. According to the OECD Programme for International Student

Assessment (PISA) results, the mean score in mathematics for 15-year-old Australian students was 494 in 2015. This is just above the average OECD score of 490, but significantly below leaders such as Singapore (556) and Japan (538)⁴⁵. Australia's PISA performance in mathematics and science has been declining since 2000⁴⁶ (Figure 4).

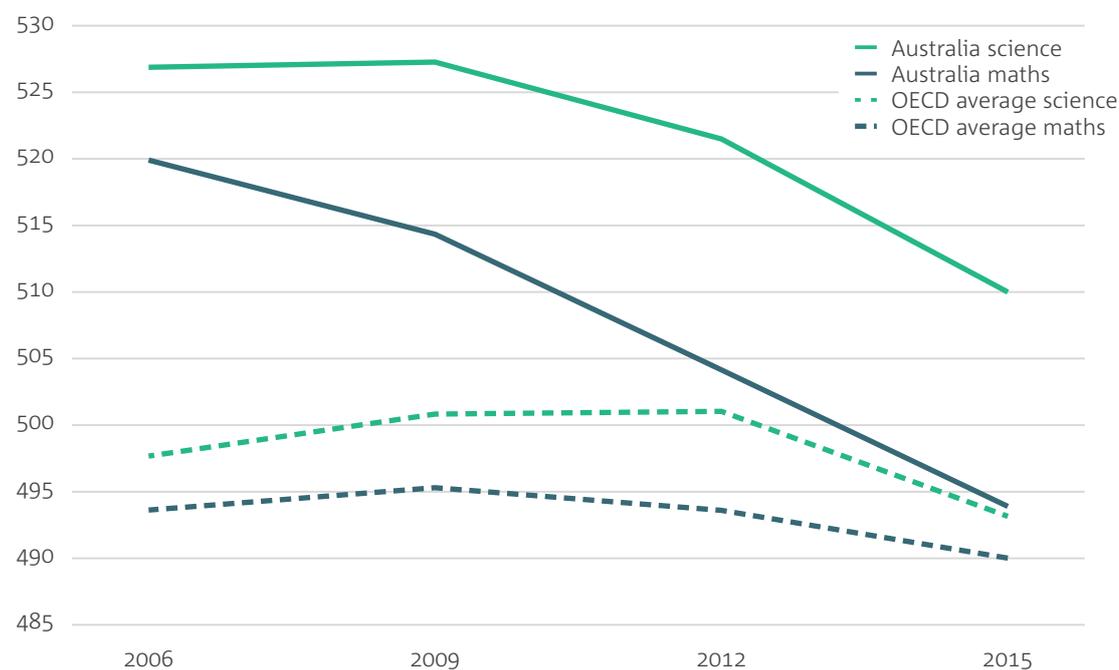
Another international comparative assessment of students in science and mathematics, Trends in International Mathematics and Science Study (TIMSS) shows Australian grade four and eight students have maintained the same achievement level over the past 20 years (1995–2015), with the exception of grade four maths, which has trended upwards^{47,48}. However, Australia's rankings are low compared to peer economies:

- ◆ 28 (out of 49 countries) for grade 4 maths
- ◆ 17 (out of 39) for grade 8 maths
- ◆ 25 (out of 47) for grade 4 science
- ◆ 17 (out of 39) for grade 8 science.

East Asian countries, such as Singapore, Korea and Japan, dominate the top rankings.

The next decade is likely to see an increasing number of occupations that require STEM skills¹ and digital literacy. Some digitally

FIGURE 4 PERFORMANCE OF AUSTRALIAN STUDENTS IN MATHEMATICS AND SCIENCE (PISA) COMPARED TO OECD AVERAGE



Source: OECD PISA^{45,46}

intensive professions such as data scientist and analyst are facing a booming demand internationally and in Australia⁴⁹, a trend which is expected to continue in the foreseeable future³⁴. Australia's global standing on STEM subjects could be a challenge as countries compete to attract new jobs, companies and investment.

Infrastructure demands and peak data

The growing digital economy also implies increasing demand for digital infrastructure for data collection, storage, transmission and analysis. Australia is believed to be approaching peak data, a situation where the existing wireless frequency spectrum becomes insufficient for the effective operation of the economy^{50,51}. Australians are among the highest smart phone users in the world⁵², putting pressure on available spectrum and increasing the need for innovation in the utilisation of radio frequency spectrum⁵¹. The

percentage of fibre connections in total fixed broadband subscriptions in Australia (June 2014) was 3.3%— well below the OECD average of 16.5% and leader Japan at 71.5%²¹.

Emerging technologies, such as the Internet of Things (IoT) and autonomous vehicles, will exponentially increase the volume of data downloaded in Australia³⁴. Coupled with the existing risk of reaching the point of peak data^{52,54}, Australian internet infrastructure will face increasing pressure, and will be a critical area of development in the digital age⁵⁵.

According to the WEF, Australia was ranked 18th globally on the Networked Readiness Index in 2016, down from 16 the previous year. The leading nations are Singapore, Finland, Sweden, Norway and the US. While Australia is in the top ten for government delivery of online services, information and tools, there are gaps to be bridged in government





procurement and business adoption and use of ICT⁵⁶.

WHY USE SCENARIOS AND WHAT'S UNIQUE ABOUT THIS REPORT?

The nature of digital disruption on business and the wider economy is difficult to predict. It's hard to know what technologies will emerge in the next ten years and how they will be applied. The world of business is not only driven by technology, but unfolds through the interplay of numerous factors, from long-range trends (population growth and demographic change, climate change etc.) through to more acute changes and events (new competitors, regulatory change, economic crises etc.).

Scenarios help provide structure to this complex landscape. They are a systematic way of contrasting alternative futures to understand the plausible impact of changes to the strategic environment and decisions taken in response to those changes. Today, governments of leading economies use scenarios to manage increasing complexity and uncertainty⁵⁹.

Many scenario reports have been written about the future of digital technology and business^{60,61,62}, but the focus of inquiry is on informing business strategy. This report is different in that the focus is on exploring the role of government and the strategic policy challenges that could arise from a future

business world that looks very different from today's.

How this fits with the Productivity Commission report

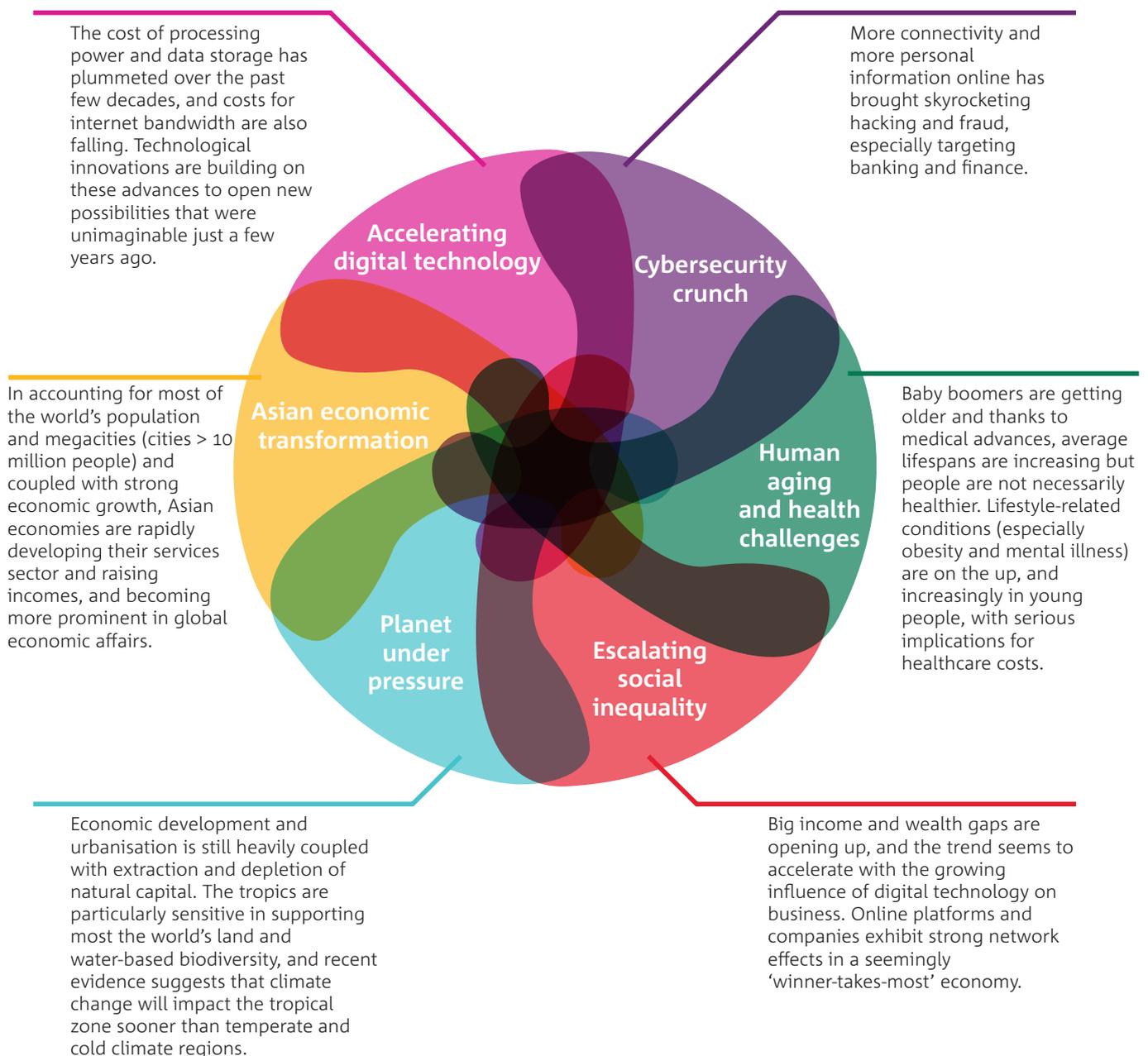
The Productivity Commission⁶⁵ reviewed the issue of digital disruption on the Australian economy and the role of government. This present report does not replicate the excellent market, economic and regulatory analysis and discussion of the Productivity Commission report. In brief, the Productivity Commission report describes the roles of government in the tradition of good economic governance that has typified Australia's evolution as a nation state for over 100 years. Specifically, the roles include: regulating markets, enabling technological innovation, mitigating risks to domestic workers and firms, and delivering public services.

This report complements the PC report by exploring the role of government in terms of style and emphasis, depending on the challenges and opportunities that emerge in each scenario. In other words, governments are performing all the roles listed above in each scenario, but in different ways. The style of governance varies in response to complex and unpredictable exogenous pressures and events. The dynamics of this change are worthy of exploration for governments because emerging digital disruptions raise important questions about what we value, and the assumptions that underlie our notions of 'progress', fairness and the distribution of economic benefits across society.

2 MEGATRENDS OF THE DIGITAL ECONOMY

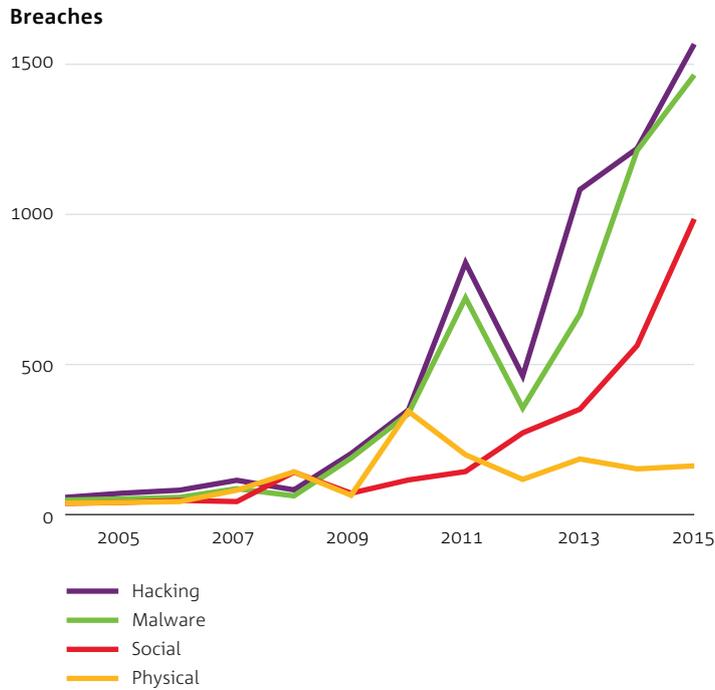


This report identifies six megatrends that are, or will be, powerful forces shaping the digital economy over the coming decade. These were narrowed down from the horizon scan and passed rigorous assessments of evidence and relevance. The six key trends were a critical input into the scenarios resulting in highly-varied scenario narratives. Full discussion of trends from the horizon scan is presented in the accompanying technical report.

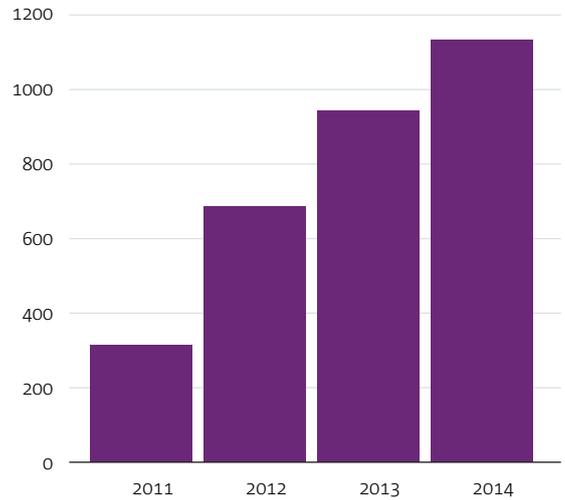


1 CYBERSECURITY CRUNCH

SECURITY BREACHES BY THREAT ACTION ⁷³

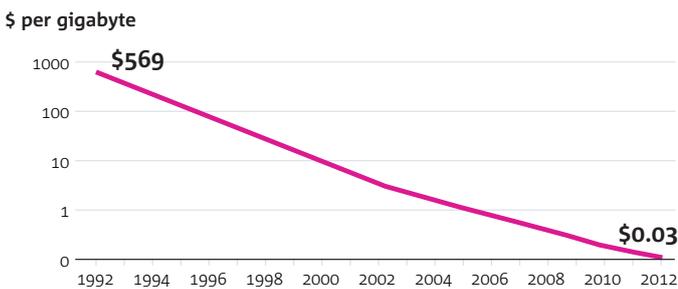


INCIDENTS RESPONDED TO BY THE AUSTRALIAN SECURITIES DIRECTORATE ⁷⁴

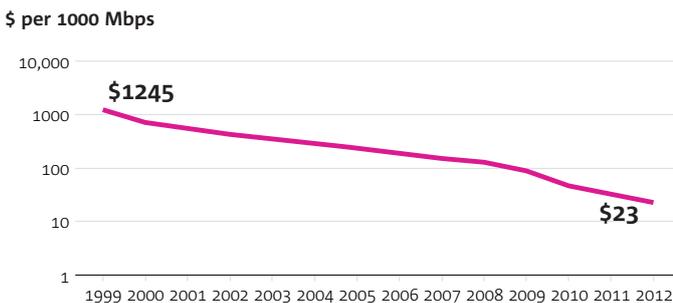


2 ACCELERATING DIGITAL TECHNOLOGY

STORAGE COST PERFORMANCE ⁷⁵

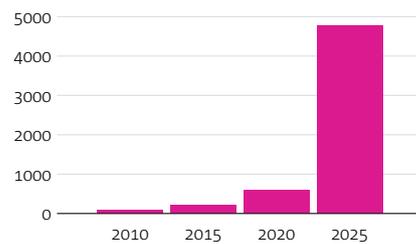


BANDWIDTH COST PERFORMANCE ⁷⁵



DATA-DRIVEN INTERACTIONS*⁷⁶

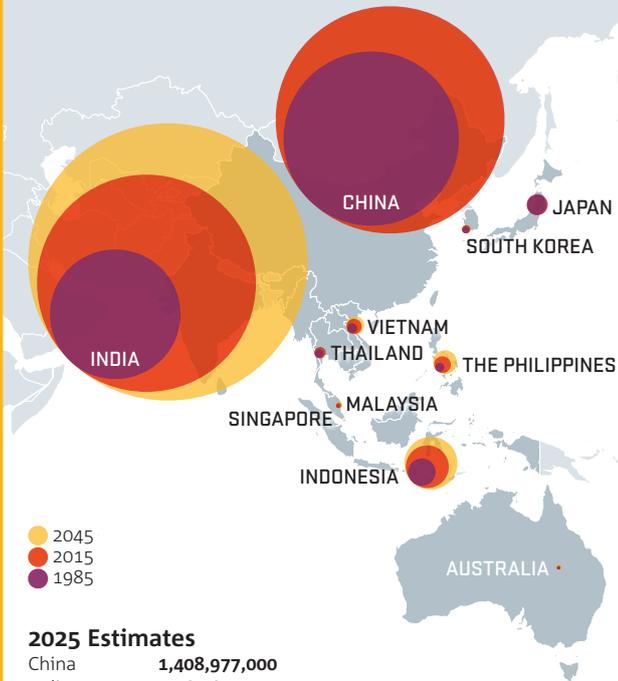
per connected person per day



*The flow of information between Internet connected and embedded devices, which will proliferate in homes, workplaces, appliances, vehicles, wearables etc.

3 ASIAN ECONOMIC TRANSFORMATION

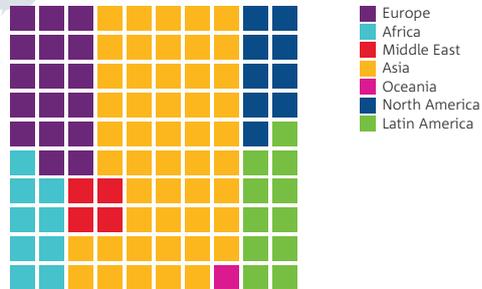
POPULATION ⁶³



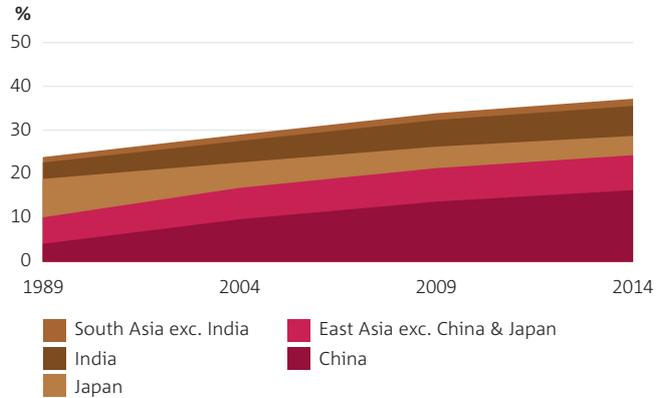
2025 Estimates

| | |
|-----------------|---------------|
| China | 1,408,977,000 |
| India | 1,461,625,000 |
| South-east Asia | 683,819,000 |
| Australia | 26,819,000 |

INTERNET USERS BY REGION ³



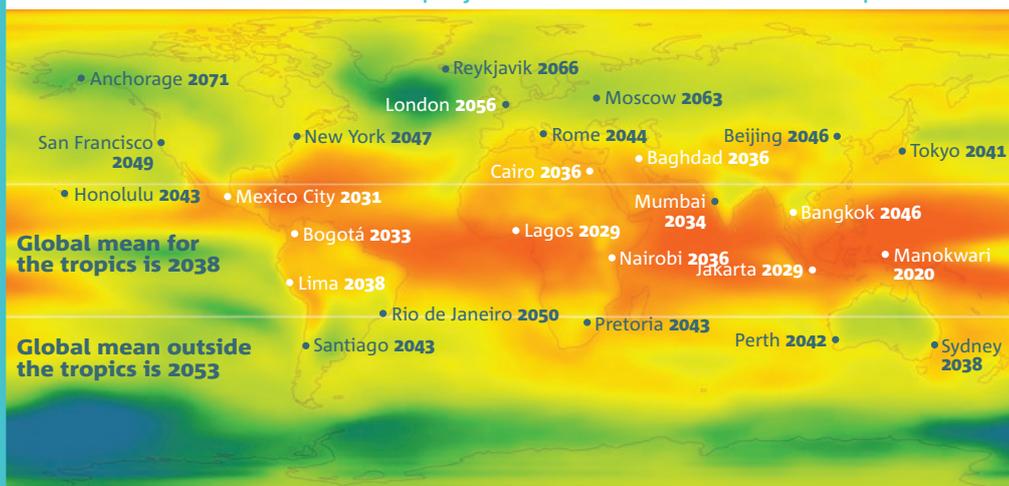
SHARE OF GLOBAL GDP ⁶⁴



4 PLANET UNDER PRESSURE

YEAR OF CLIMATE DEPARTURE ⁶⁵

Shift to a new warmer climate is projected to occur sooner in the tropical zone



Global mean year of climate departure* is 2047

*The estimated point in time in which annual temperatures continuously exceed the historic average.

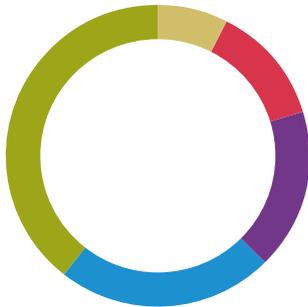


GLOBAL DECLINE IN POPULATIONS OF VERTEBRATE SPECIES ⁶⁶

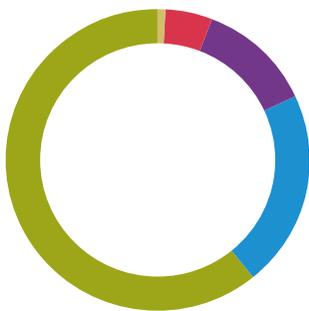


5 ESCALATING SOCIAL INEQUITY

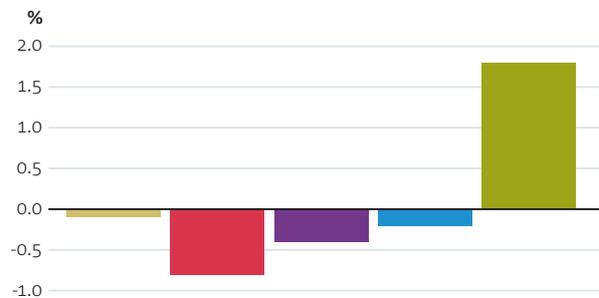
SHARE OF INCOME 2012 ⁶⁷



SHARE OF WEALTH 2012 ⁶⁷



CHANGE IN SHARE OF WEALTH 2004-2012 ⁶⁷



HOUSEHOLDS WITH A FLAT OR FALLEN INCOME ⁶⁸

25 advanced economies

1993-2005

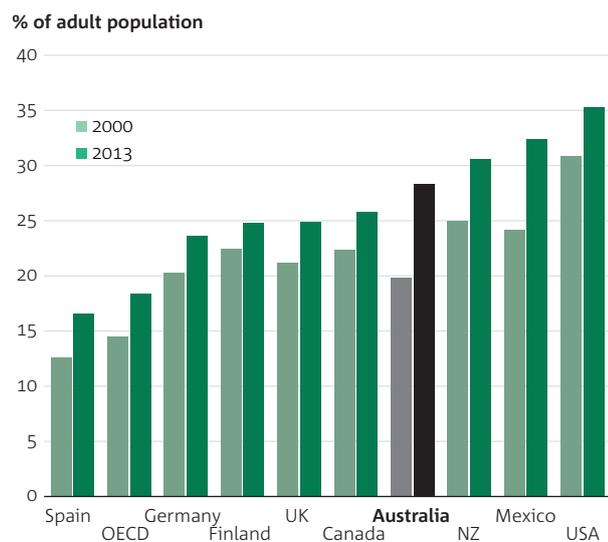
<2%

2005-2014

65-70%

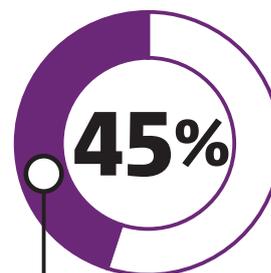
6 HUMAN AGING AND HEALTH CHALLENGES

INCREASING OBESITY AMONG ADULTS ⁶⁹



Australia's combined overweight and obesity rate is forecast to reach **70%** around 2024 ⁷⁰

MENTAL HEALTH ⁷¹



or **7.3 million** Australians aged **16-85** will experience a high prevalence mental disorder, such as **depression, anxiety** or a **substance use disorder** in their lifetime

AGING AUSTRALIAN POPULATION ⁷²

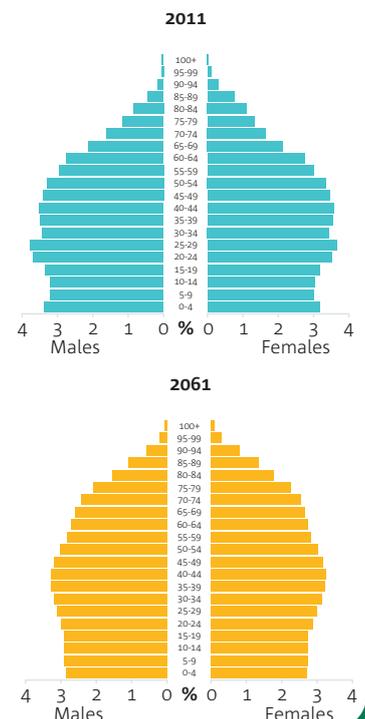


TABLE 1 TRACKING OUR DIGITAL FUTURE

| FIVE YEARS AGO | NOW |
|--|--|
|  <p>Sensors Becoming smaller and smarter ‘monitors’ of the physical world</p> <p>First ‘organ on a chip’ developed for drug testing</p> <p>Nest releases first WiFi learning thermostat</p> | <p>Zero-power ‘sensors’ placed on bees</p> <p>Sensors beginning to get paired with internet connections</p> |
|  <p>Share, exchange & analyse Online platforms are changing the way people interact</p> <p>Bitcoin takes off, sparking interest in blockchain</p> <p>Uber and Snapchat launched</p> <p>Airbnb takes off – hits 1 million nights booked</p> | <p>Blockchain trialled in areas such as agriculture</p> <p>Uber hits 60 million rides per month</p> <p>Airbnb controversy about displacing locals</p> <p>Deep Learning is used to beat a professional human player at the complex game of Go</p> |
|  <p>Store and process Data’s explosion and its move into the cloud</p> <p>iCloud launched</p> | <p>iCloud has 800 million users</p> <p>First reprogrammable quantum computer</p> |
|  <p>User interface New ways of interacting with devices</p> <p>iPad just released</p> <p>Siri voice commands begin</p> <p>Touch screen smart phones commonplace</p> | <p>Smart phones in nearly every pocket</p> <p>Amazon Echo, Google Home bring first ‘star trek like’ conversational interfaces to the home</p> |
|  <p>Machine / robotics Automating common tasks</p> <p>Roomba vacuum cleaners in some homes</p> <p>Google has begun researching autonomous cars</p> | <p>Google’s autonomous cars have travelled two million miles</p> <p>Consumer flying drones widely available, including limited autonomy</p> |
|  <p>Internet infrastructure The backbone of our communications and data transmission</p> <p>ADSL2 across most of Australian population.</p> <p>Some fibre optic coverage and first release of NBN</p> <p>3G commonplace</p> | <p>NBN construction hits peak phase – approx. 25% of Australia premises have access</p> <p>4G commonplace</p> |

Key milestones in the evolution of six core digital technologies that will transform the way we live, work and conduct business.

| IN FIVE TO SEVEN YEARS | IN TEN TO TWENTY YEARS |
|--|--|
| <p>Low power active sensors</p> <p>Low power radios embedded with sensors</p> <p>Mass deployment of sensors across hundreds of smart cities globally</p> <p>Early development of nano sensors</p> | <p>Ingestible sensors in the home medicine cabinet</p> <p>Personalised 'organ on a chip' can be used to design patient specific drugs</p> <p>Retail packaging includes sensors that confirm provenance of goods</p> <p>Many materials produced with sensing capabilities inherently 'baked in'</p> |
| <p>Blockchain used by default in some market segments</p> <p>Co-ops compete with Uber and Airbnb – promote 'authentic sharing economy'</p> <p>Streaming analytics techniques allow real time access to live big data insights</p> | <p>Decentralised services (ownerless, but trusted) disrupt and displace some large online monopolies</p> <p>Hyper-localised sourcing of materials for self-manufacturing</p> |
| <p>Personal clouds on the rise</p> <p>Graphics chips used in everyday computing devices</p> | <p>Distinction between 'cloud' and 'device' almost totally disappears for users</p> <p>Quantum Computing becomes commonplace</p> |
| <p>Voice interaction commonplace at home and work</p> <p>Augmented Reality (AR) glasses becoming commonplace for everyday computing</p> <p>Computing systems able to identify most objects</p> <p>Arbitrary gestures (free space and on-skin) perceived by everyday devices</p> | <p>Augmented reality with sense-of-touch interaction</p> <p>Collaborative computing usurps personal computing</p> <p>Use of shape-changing robots, including wearables</p> <p>Natural interfaces allow reprogramming of computing systems directly</p> <p>Computing systems can understand most objects in the world around the user</p> |
| <p>Autonomous freight vehicles on highways globally</p> <p>First wave of job automation</p> <p>Flying drones make deliveries within local areas</p> <p>Most new cars include autonomous capabilities</p> | <p>Most cars on the road can drive autonomously</p> <p>44% of today's current jobs done by robots/AI</p> <p>Second wave of job automation takes off – jobs relying on finger dexterity, observation, feedback, or working in cramped spaces</p> |
| <p>NBN concludes – 93% coverage of premises</p> <p>5G begins - enables autonomous systems to operate accurately in complex environments</p> <p>IoT with 50 billion internet connected devices</p> <p>Fixed-line Internet available at 10Gbps (download)</p> <p>Low orbit wireless broadband technologies emerge to address the digital divide</p> | <p>Fixed-line Internet connections available at 100Gbps to 1Tbps (download)</p> <p>Wifi logins obsolete as routers include 'secure guest access' default. Bandwidth so cheap that internet access as easy as plugging into electricity</p> <p>5G commonplace although devices change to 5G when not near fixed infrastructure</p> <p>Digital divide bridged for most remote users</p> |

4 AUSTRALIA 2027 SCENARIOS



This report includes four scenarios describing the future of Australian business and the economy over the next decade to 2027. Scenarios are presented as an abstract, simplified generalisation of a far more complex reality. They are evidence-based (i.e. based on trends) narratives about the future that are designed to inform operational and strategic decisions.



We can't predict the future but we can manage it through effective planning.

They are not mutually exclusive, nor are they the only possible futures. In fact, the actual future may be a combination of all four scenarios. The value of developing scenarios is

not in deciding which is most likely, but rather in framing important issues and factors, and exploring trade-offs and assumptions that contrast each scenario.





SCENARIO QUADRANTS

The four scenarios are mapped on a quadrant derived from crossing two critical areas of uncertainty and impact for the future of Australia’s digital economy. **The global diffusion of digital technologies and the extent to which Australian businesses are agile** were identified as likely to have the most impact on Australian businesses in a digitally disrupted future. These factors form two axes or continuums of possibility. Crossing these two factors forms four quadrants, each defining a unique scenario space for the future of Australian business and the economy

← LOW TECH DIFFUSION ——— HIGH TECH DIFFUSION →

This report conceptualises diffusion as the percentage of businesses adopting digital technologies. Diffusion of digital technology by business must be viewed in the global context because the pace of development is largely set by overseas research institutions, transnational corporations (e.g. Google) and governments from other countries (e.g. the US and Japan). This factor was created by analysing projections for digital innovation and adoption over the coming decade (see *Tracking our digital future* on page 16) and identifying a range of technologies that could transform business processes and models.

Uncertainty exists regarding the extent to which these technologies will mature and be integrated into core business processes (see the technical report for more information), which gave the range of futures that became the horizontal axis.

The end points of this axis represent very different levels of technology diffusion. At the low end advanced AI, big data analytics and robotics are still in the teething phase, and only being used by a niche market – an evolution on 2017 technology. At the high end these technologies have resolved very quickly, are widely used and have fundamentally transformed how business is done.

← LOW BUSINESS AGILITY ——— HIGH BUSINESS AGILITY →

Agility refers to the flexibility and adaptiveness of businesses to the external environment. This factor deals with Australian businesses’ use of agile planning and management methods. The uncertainty stems from the fact that while agile methods and principles are gaining popularity, research indicates that cultural barriers are constraining implementation within Australian organisations. Thus, a continuum from low to high agility was formed, and became the vertical axis for our scenario space.

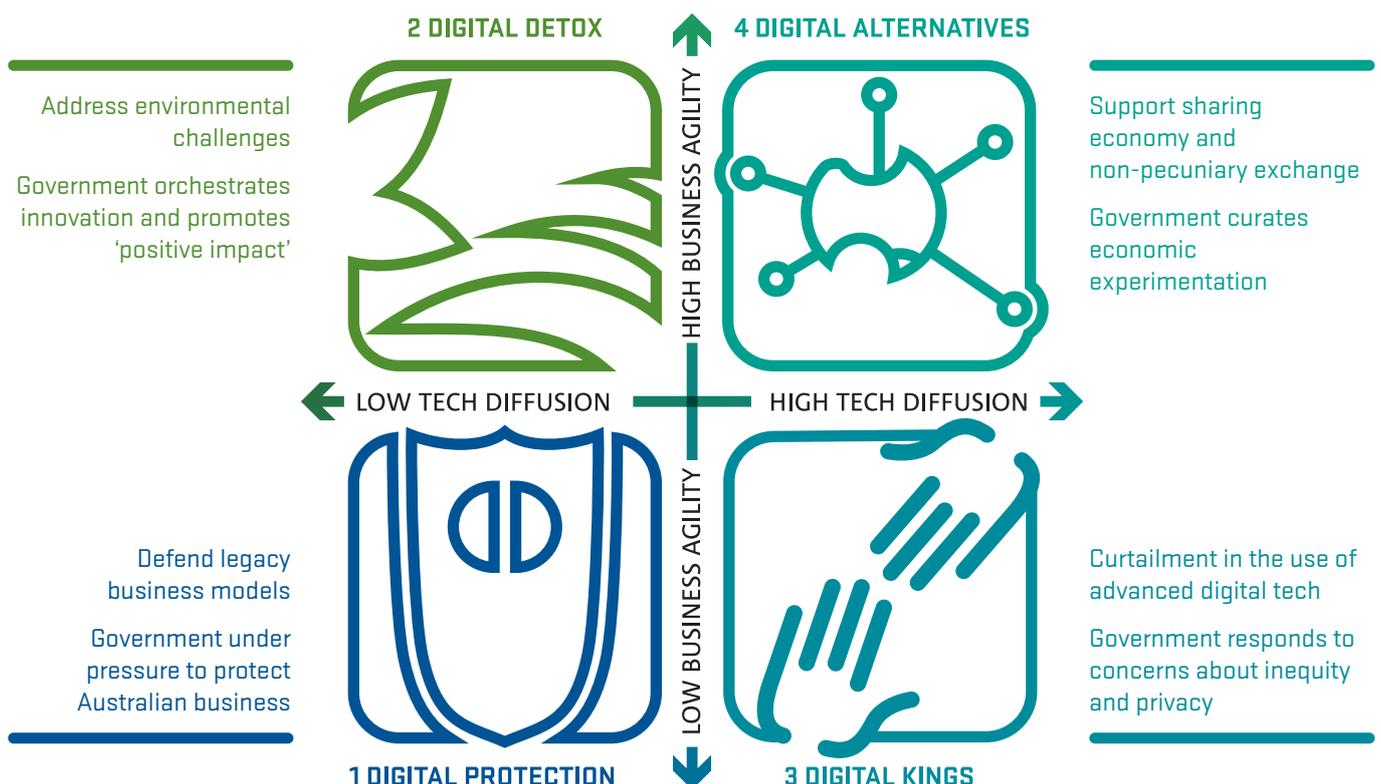
At the low end, most Australian businesses maintain hierarchical organisational structures,

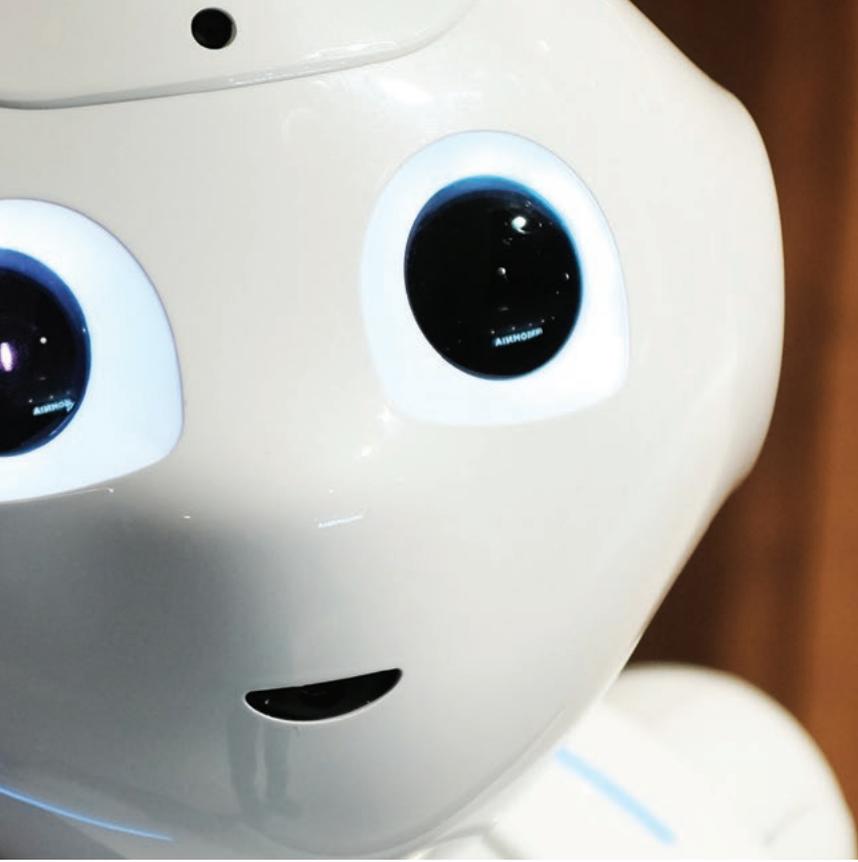
traditional business models and processes. By contrast, the high agility end sees a future in which businesses operate largely through network structures and systems of innovation that are responsive to changes in the market and the wider strategic environment. New business models and processes are co-created with customers to continuously build more value.

DIFFERING FUTURES: THE SCENARIOS

The figure below offers a high-level overview of each of the four scenarios, including a qualitative and directional evaluation of the impact they would have on business and role of government for Australia.

FIGURE 5 THE FOUR SCENARIOS FOR AUSTRALIAN BUSINESS AND THE ECONOMY TO 2027



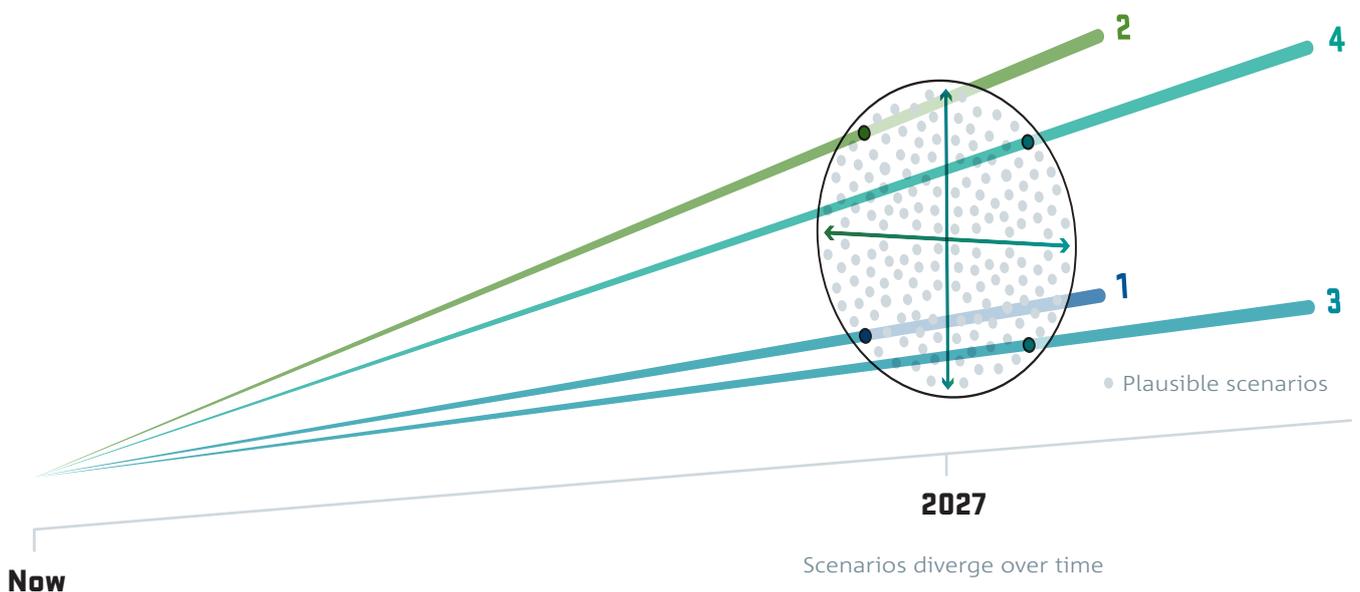


EFFECTIVE PLANNING

Being a function of the extreme ends of each axis, these scenarios attempt to provide a sharp contrast between different potential futures and more for Australian businesses and government. The scenarios were designed to be equally plausible, but in reality, the future is likely to resemble aspects of all four scenarios. Scenarios are an effective planning tool to expand thinking about the future and inform strategic policy choices and decisions.

Scenarios in this report are best used to facilitate dialogue among diverse stakeholders about the role of government in an era of digital disruption and global change. The narratives are provocative to illustrate the plausible impact of powerful trends, and encourage discussion about possible threats and opportunities, and their management. These scenarios also invite questions about what we value, and the assumptions that underlie our notions of 'progress', fairness and the distribution of economic benefits across society.

FIGURE 6 POSSIBLE SCENARIOS



SCENARIO 1

DIGITAL PROTECTION

Defend legacy business models
 Government under pressure to protect
 Australian business

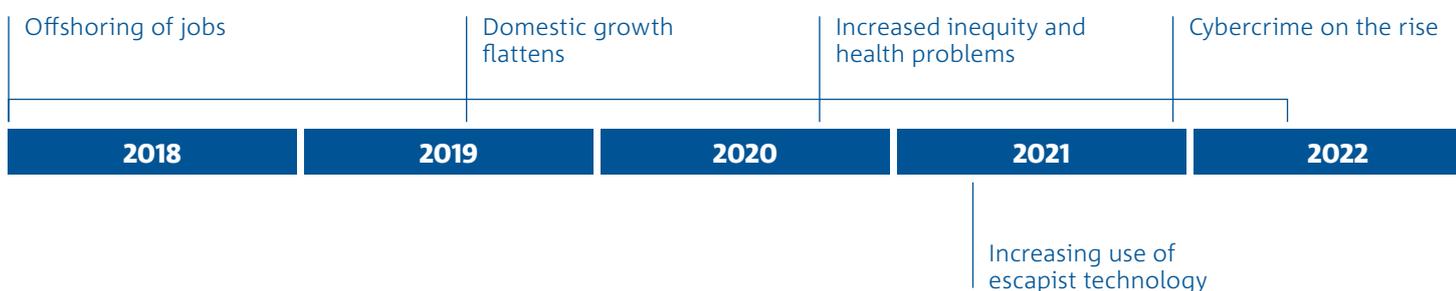
Digital disruption marches on steadily as new overseas entrants in key industries gradually expand market shares.

Nostalgia about the post-war and mining booms dominates the psyche of many Australian business leaders who are protective about what they battled so hard to build.

Digital technologies prop up productivity of their existing business models and help defend their market position, while they lobby government to regulate against overseas digital entrants that don't play by the rules.

The nation backs 'Australian made and owned' through support for protectionism.

SCENARIO 1 TIMELINE

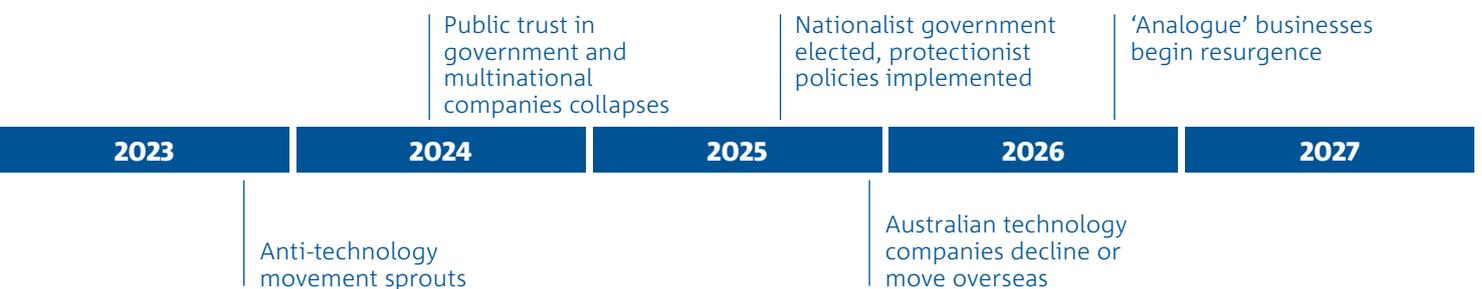




The Digital Protection scenario emerged from global economic integration, pronounced economic volatility and social inequity across much of the world during the early part of the 21st century. Corporations slashed costs by offshoring jobs and outsourcing entire functions to developing countries with weak labour and environmental laws, a rapid uptake of internet services and market exuberance in the early years of the internet caused the dot-com boom and bust in the early 2000s, and deregulation of banking and finance during the late 20th century fuelled the sub-prime mortgage crisis and the Global Financial Crisis in 2008–09.

A straining economy

Economic decline in certain ‘rust belt’ towns, cities and regions became more pronounced during the 2010s. Anti-globalisation and ‘anti-establishment’ movements blossomed and reshaped the political landscape across OECD countries. New, mostly US-based online businesses were on the ascendency, delivering products and services at lower prices and doing so using fewer employees than incumbents. By the late 2010s, Australia showed significant signs of economic strain. Domestic growth flattened and mining exports declined as the global economy dampened.





Digital decline

In the early 2020s, many headlines told sad stories of unemployment and economic inequity, anger in rust belt areas (the forgotten Australians), increasing obesity and mental health problems. Younger adults were particularly hard hit by social and economic challenges. Having been locked out of the housing and jobs market, many sought refuge in 'second life' digital realities. Social isolation and sedentariness followed, and pushed the prevalence of depression, suicide and obesity through the roof. Cybercrime and cyber-attacks also escalated as many tried to 'earn a living' through theft and fraud. High profile privacy breaches by prominent online companies and foreign government agencies pushed public trust to breaking point by the mid-2020s. Domestic internet services failed to keep pace with digitally advanced economies; Australia's digital readiness ranking steadily declined.

Meanwhile older Australians became critical of digital innovation and expressed the view that technology had created more problems than it solved. 'Technology needs to be managed and should have a limited role in society and business' became a common refrain in this group. Interest in digital innovations was marginal, and digital start-ups were viewed with suspicion and derision. Rust belts developed in the areas most affected by unemployment and poor internet connectivity.

A return to nationalism

In 2025 a new federal government was voted in on a nationalist platform designed to restore traditional economic strengths. Trade tariffs were instituted and websites deemed to be operating illegally or with dubious privacy practices were blacklisted, and became inaccessible to Australian citizens. The government established a new department (Department of Online Privacy and Protection) to monitor the internet for content that might threaten Australian industry, jobs and values.

From a market perspective, older Australians (baby boomers) led a movement promoting post-war values and practices such as buying local (Australian), trading used goods and being connected to one's local community. While some Australian companies buckled under the pressure of digital insurgents, many gained a second wind on the back of domestic market support and economic protectionism. Baby boomers were still the most powerful market segment in 2027 as younger generations tended to have little discretionary income.

Investment in start-ups and digital innovation was marginal. Australian companies and investors focused their attention on adopting basic digital technologies and systems. 'Defend core business' became the marching chorus of senior managers and executives. Any new products or services had the goal to serve existing customers and 'proven markets'.

Summary challenges and opportunities under the Digital Protection scenario

| ACTOR | CHALLENGES | OPPORTUNITIES |
|-------------------------------|--|---|
| Business | <p>Incumbent market shares are eroding and there is a need for protection from globalism and free trade.</p> <p>Large companies and SMEs are faring reasonably well, albeit with some downsizing. Few have a digital transformation strategy, but are driving traditional business process improvements with basic digital tools and technologies.</p> <p>Little domestic support for start-ups.</p> | <p>'Australian made and owned' is prominent in marketing and advertising.</p> <p>Companies delivering low cost goods and services are in the strongest position.</p> <p>Start-ups find supportive government policies and venture capital overseas.</p> |
| Consumers (the market) | <p>Demanding more protection from hacking, and curtailment of digital technology on commerce (reduced mining of personal data/meta-data).</p> | <p>Growth in demand for budget goods and services; resurgence of trading second-hand goods and economic re-localisation.</p> |
| Workers | <p>High under/unemployment among young people.</p> | <p>Traditional jobs and skills are still relevant though highest demand for low cost itinerant labour, and high paid management/executive capability.</p> |
| Government | <p>Internet sites and content threaten Australian industry, jobs and values.</p> | <p>Protect incumbents and re-establish economic stability and national values.</p> |



SCENARIO 2 DIGITAL DETOX

Address environmental challenges
Government orchestrates innovation
and promotes ‘positive impact’

Economic development globally has stalled amidst vast social inequities and major environmental disasters.

Despite the harsh and volatile conditions, Australian businesses show extraordinary resilience.

Through their close partnership with government, entrepreneurs and companies are developing new digital technologies and business models to take on global challenges, and breathe fresh life and optimism into global markets.

Australia has emerged as a ‘one health’ hub where the globally affluent reconnect with nature and detox from digital immersion.

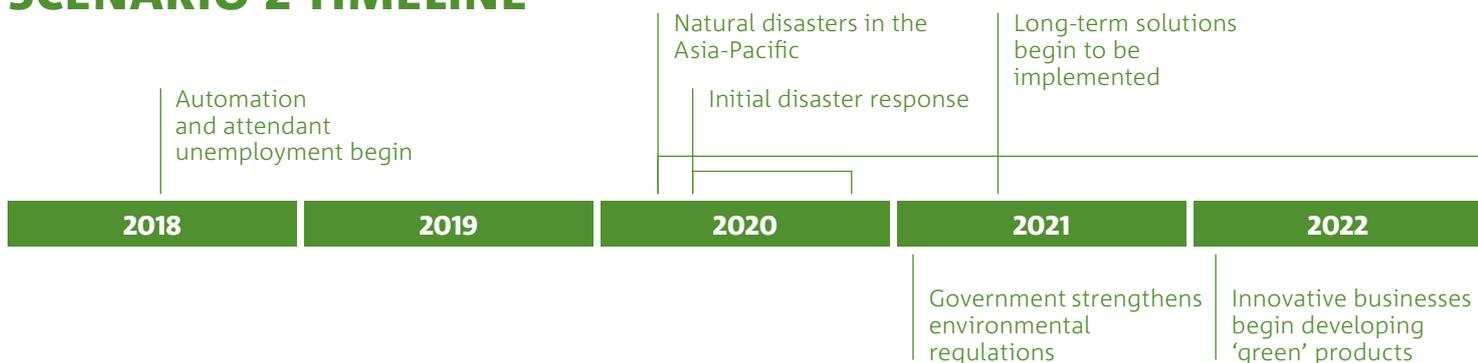
Environmental crises

The Digital Detox scenario was shaped by interacting pressures from growing economic inequity and the impacts of climate change whereby the frequency and severity of extreme weather events increased beyond previous expectations. As a result, climate change-related natural disasters gripped the Asia-Pacific region during the early to mid-2020s and precipitated the mass migration of refugees. Many fled to Australia, overwhelming existing offshore processing facilities. The scale of the crisis forced

Australian governments to adopt a nationally coordinated onshore response in partnership with the private sector. The government issued calls for private sector innovation to meet basic needs of large refugee settlements.

Initially factors such as food, shelter, energy, water and sanitation were managed using emergency provisions, but solutions for the longer term were needed as it became clear that the crisis could persist for years. Compounding the situation was high unemployment domestically, particularly among young people and the low skilled,

SCENARIO 2 TIMELINE



as the first wave of automation started eliminating routine repetitive tasks (and entry level jobs) across many industries.

Lean, green and cutting edge

From a market perspective, the mood toward environmental issues shifted and demand boomed for green products and services. Australian governments stepped up environmental protection and many local businesses reframed their purpose beyond ‘turning a dollar’ with traditional products and services. Now the challenge was about resolving lean (cost effective) and green solutions that could scale up quickly and

operate within government aid and disaster recovery budgets.

The challenge pushed professionals to experiment more with cutting-edge digital technologies and redesign business processes and supply chains. Innovation hubs sprang up around refugee camps as innovators and entrepreneurs employed user-led design processes to prototype solutions. Fluid, flat and more network-centric organisational structures flourished to support quick and seamless collaboration. ‘Just-in-time’ project teams and organisations readily formed and dissolved with the aid of online platforms.



New refugee settlements operating with relatively little interaction with government

New financial approaches

Prominent Australian businesses begin to relocate offshore

Rise of ‘digital detox’ tourism

2023

2024

2025

2026

2027

Unemployment reaches its peak

New approach adopted by mainstream businesses

Australia recognised as world leader in sustainability and entrepreneurialism



New inventions proliferated and makeshift refugee camps gave way to more permanent settlements. Cooperatives formed and local currencies and mutual credit schemes were developed to facilitate sharing of goods and delivery of services independent of government funding. Concepts and technologies around the circular economy^a matured and enabled the refugee settlements to operate successfully with few material and energy inputs.

Many in government and industry identified solutions that could be applied to existing towns and cities, particularly to address Australia's housing unaffordability, and recovery of rust belt areas domestically and globally. Private and public investment in R&D and early stage business financing soared.

World-leading high speed internet was lacking across much of Australia, with the exception of a few urban centres where new data-intensive businesses proliferated. Prominent Australian companies branched out to global 'gigacities' (cities with gigabit internet speeds), including Singapore, Manila and Jakarta, enabling expansion into Asian markets. Governments met with counterparts in other countries to share lessons learnt and facilitate technology transfer arrangements.

Ingenuity and innovation

Governments captured and shared heroic stories with the world about Australian business ingenuity and solidarity with climate change refugees. This inspired a generation of mission-driven start-ups. Digital innovation and the role of the entrepreneur became widely valued across Australian society. Digital technology was viewed as a critical driver of broader public good and economic opportunity; something that can hasten the circular economy and help communities recover from disasters and adapt to climate change.

Australia developed a globally recognised brand for ecological sustainability and climate resilience. Tourism boosted on the back of global recognition for Australia's strong environmental standards and protected high value ecological areas.

Poor internet in some areas was marketed as a 'digital outback' where tourists could detox from digital immersion and reconnect with nature on wellbeing tours. Australia emerged as a 'one health' hub, creating new jobs in human health and environmental management.

a An alternative to the linear economy (make, use and dispose), which achieves high levels of resource efficiency through recycling products and materials at the end of each service life.

Summary challenges and opportunities under the Digital Detox scenario

| ACTOR | CHALLENGES | OPPORTUNITIES |
|-------------------------------|--|---|
| Business | <p>Natural disasters and refugee crisis puts pressure on Australian business to innovate sustainable and cost-effective solutions.</p> <p>Large companies and SMEs succeed to the extent that they can demonstrate their environmental credentials and adopt network-based organisational structures and agile innovation.</p> | <p>Digital tools and technologies are employed to drive agility, sustainability and the circular economy.</p> <p>New companies capitalise on global demand for health and wellbeing products and experiences.</p> |
| Consumers (the market) | <p>Declining confidence as environmental crisis and economic decline cause rust belts in Australia and disaster zones in the Asia-Pacific.</p> | <p>Market demand for more environmentally sustainable products and services.</p> <p>Global market develops for health and wellbeing experiences, and gaining a reprieve from 'digital immersion'.</p> |
| Workers | <p>Automation of entry-level administration roles in office-based work and logistics.</p> | <p>Demand exists for digitally savvy professionals and freelancers with strong problem-solving skills and experience in agile environments.</p> <p>New jobs emerge in 'one health' tourism and counselling.</p> |
| Government | <p>Making effective responses to large-scale natural disasters while operating within budget constraints.</p> | <p>Scout, sponsor and act as a promoter with global connections.</p> <p>Orchestrate innovation challenges.</p> <p>Document and market positive business impact stories.</p> |



SCENARIO 3 DIGITAL KINGS

Curtailment in the use of advanced digital tech

Government responds to concerns about inequity and privacy

High-tech multinational corporations leveraging advanced AI and big data capabilities have shaken Australian businesses.

Despite accelerated technological progress, high social inequity and unrest continue to plague the world.

Backed by strong government intervention, Australian businesses are reinvesting in traditional strengths in primary industries, services and tourism; SMEs toil in niche areas around these industries.

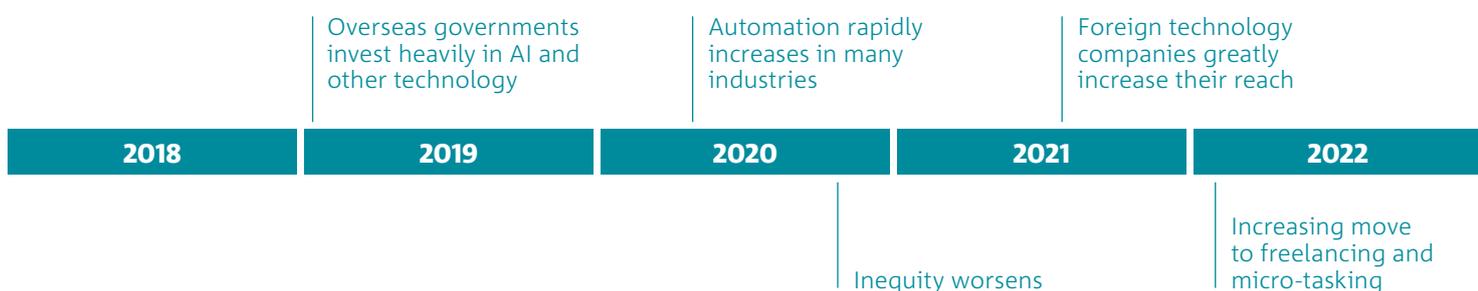
Australia is pitching old-fashioned honesty and the human touch to affluent markets.

Ongoing inequity in a digital tech boom

The Digital Kings scenario emerged amidst sluggish global economic growth and vast wealth inequities. Governments and businesses in Europe, East Asia and the US invested heavily in digital innovations to boost productivity and jump-start their economies. Successes flowed during the early 2020s from the development and deployment of sophisticated AI and robotic systems across many industries. However, the problem of inequity worsened with the rapid rise of technological unemployment.

A few new and established digital tech companies (Digital Kings) skyrocketed to become globally dominant corporations, while many businesses flagged. Consolidation of industries ensued as the Digital Kings seized opportunities for growth through mass acquisitions; a veritable gold rush for new markets and customers. New income and wealth flowed to fewer people. Australia was not immune to the influence of the Digital Kings. Local businesses could not compete with the AI power and network effects of digital business platforms. Owners and directors of large and iconic Australian

SCENARIO 3 TIMELINE

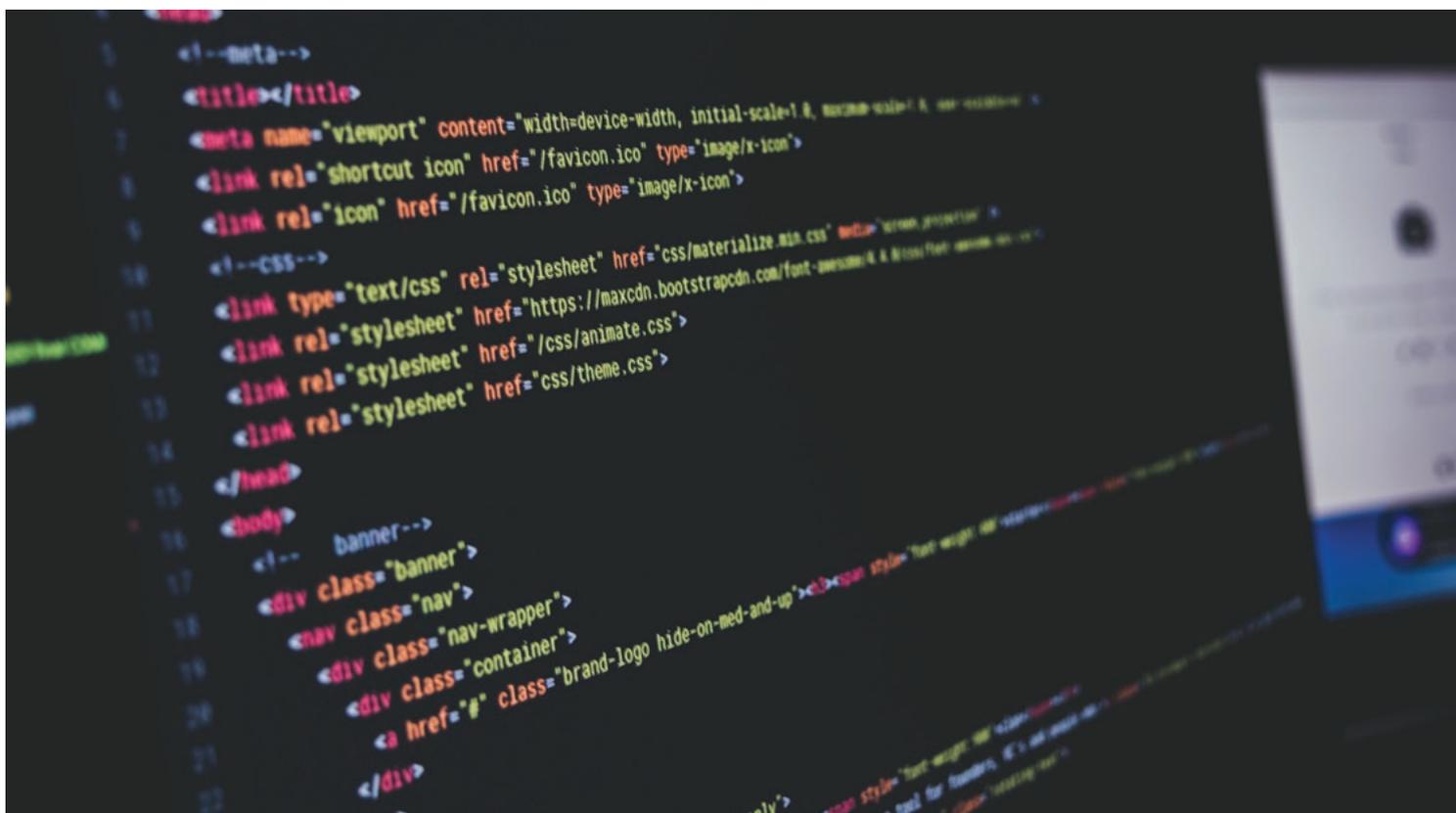


companies courted the Digital Kings to secure favourable acquisition deals. The new owners brought innovative business processes to unleash the power of advanced AI, big data analytics and robotic systems.

Unemployment reached historic highs with impacted workers scrambling to retrain. Jobseekers turned to freelancing in digital sweatshops ('micro-task' platforms) to do tasks that AI couldn't yet do. Pay was meagre, but there was the promise of subsidised food and housing in corporate-run apartments for hardworking and loyal freelancers.

Data mining and the rise of 'the beast'

By the mid-2020s, the Digital Kings were deploying sophisticated big data analytic tools across all their brands and subsidiaries. Even government services were being outsourced to these corporations amidst declining tax revenues. Remaining Australian-owned businesses fought hard but didn't change drastically. Hierarchical structures and traditional management practices persisted. But behind the veneer of familiar local shopfronts, brands and logos stood a common digital platform dubbed 'the beast', the Digital Kings' crowning achievement, predicting and optimising commercial outcomes. Tiny



Iconic Australian companies are bought by overseas interests

Data mining ubiquitous and shaping consumer behaviour

Privacy and corporate manipulation scandal

Restrictions placed on marketing and data mining

2023

2024

2025

2026

2027

Erosion of public trust in government and corporations

Anti-corporatist government elected

Australia repositioned as human-focused economy

smart sensors were widely deployed to form an invisible IoT system. People's data and metadata were mined by the beast to inform marketing messages, which were transmitted subliminally through people's devices (e.g. augmented reality visors and ear implants). Profits for the Kings soared.

Trust in institutions eroded globally as governments seemed incapable of addressing grievances of 'the forgotten'. Australians became increasingly uneasy about the extent of corporate control, and many questioned whether the digital economy had delivered real progress. Wealth inequity in Australia emulated the US, the growing sophistication of AI and robotic systems made employment more tenuous, and those left out in the cold were relegated to threadbare welfare safety nets in rust belt suburbs, towns and cities. Many unemployed passed their time in escapist virtual reality worlds.

Business recalibrates under anti-corporatist regime

In 2025, an online leak revealed the extent of social manipulation and invasion of privacy by the Digital Kings. While not surprised, many Australians were outraged; the event marked a tipping point in the political mood toward the digital economy. Pent up anger in rust belt areas bubbled over, bringing about a swift and decisive change of government led by a new anti-corporatist party. With relatively low debt to GDP levels, the new Australian government

was able to adopt Keynesian-style spending and a range of reforms including:

- ♦ **responsible marketing and advertising** – data mining for commercial use was outlawed, and all advertising had to be static plain text messages, subject to government approval
- ♦ **government procurement** – goods and services could only be sourced from Australian 'owned and made' businesses
- ♦ **workfare** – all job seekers were offered housing and work on government priority projects
- ♦ **Australian industry redevelopment** – historic strength industries were rebooted with a raft of incentives, advisory services and human capital (workfare recipients)
- ♦ **'made by humans' certification** – labelling was introduced to boost market support for companies that employed people over machines.

Most Australian businesses recalibrated their operations around these policy settings. Australian-made products and services were more expensive but found their market among the 'digitally jaded' and affluent around the world who wanted alternatives to pervasive and invasive corporate platforms. Tourists flocked to Australia to take a break from 'digital big brother', and experience authentic and honest human contact.



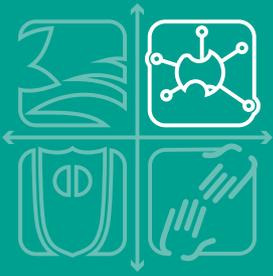


Summary challenges and opportunities under the Digital Kings scenario

| ACTOR | CHALLENGES | OPPORTUNITIES |
|-------------------------------|--|---|
| Business | <p>Dominant digital corporations outcompete Australian businesses, forcing them to sell, downsize or go out of business.</p> <p>There is a push for government to 'reset' and address imbalances within the economy.</p> | <p>Australian companies survive by developing high quality products and services, and bringing back 'the human touch'.</p> <p>Business re-calibrates around government mandates and incentives.</p> <p>Digital tools and technologies used sparingly to support worker safety and facilitate communication.</p> |
| Consumers (the market) | <p>Rising demand for privacy, transparency and ethical business conduct.</p> | <p>Niche markets exist for human-made products and services.</p> <p>Migrants and tourists seek refuge from digital big brother.</p> |
| Workers | <p>Many jobs are automated.</p> <p>Difficult transition to low pay freelancing.</p> | <p>Old jobs are returning to some extent with more secure jobs in professions with high human interaction (e.g. health services).</p> |
| Government | <p>Addressing high unemployment in a world dominated by multi-national tech corporations and automation.</p> | <p>Renegotiate economic rules, re-invest in historic strengths, employment programs, and provide links to global markets for premium goods and services made by local companies.</p> |

SCENARIO 4

DIGITAL ALTERNATIVES



Support sharing economy and non-pecuniary exchange
Government curates economic experimentation

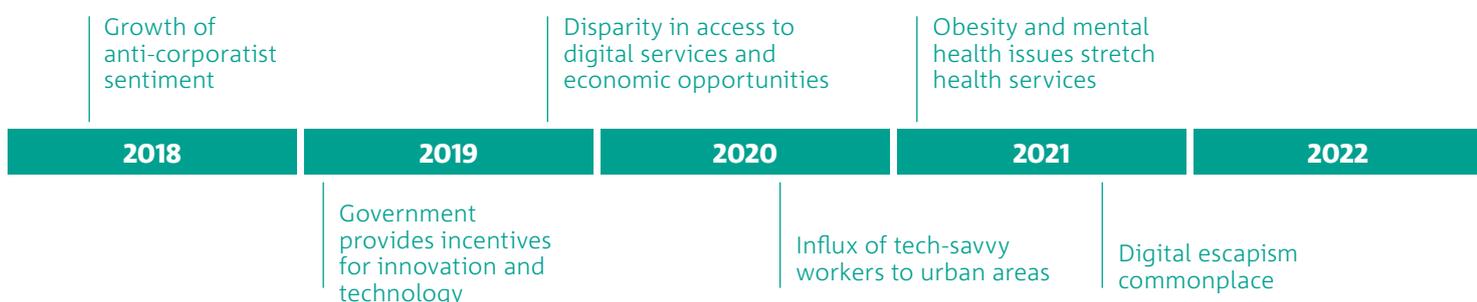
Australian businesses expand abroad to explore new models for success in the digital economy.

Companies are located in cities and countries with the best digital infrastructure and capability (e.g. Singapore, South Korea).

The domestic economy is as uneven as the rest of the world, but open for experimentation, delivering essential services through non-pecuniary peer-to-peer sharing platforms.

New global entrepreneurs flock to Australia searching for solutions to social and environmental problems. They bring with them virtuous digital age values of open source, individual creativity and sharing.

SCENARIO 4 TIMELINE





Growing social and economic insecurity

The Digital Alternatives scenario stemmed from deepening social and environmental problems. Despite accelerated development of digital technologies during the early 21st century, the global economy remained flat following the GFC and recovery seemed a long way off. Combined with a more volatile climate and growing divide between rich and poor, many were apprehensive about the future.

Post-GFC bank bailouts and austerity during the 2010s fomented an anti-globalist and anti-corporatist movement across the US and Europe. The movement prompted deep inquiry and reflection about underlying causes for these problems. Many films, YouTube clips and books were produced, and social movements rose to prominence with powerful critiques on the economic and financial system. Alternative economic paradigms, including peer-to-peer sharing and new mediums of exchange (e.g. cryptocurrencies, complementary currencies and time banking) emerged as niche innovations in countries and regions worse hit by the crisis.

Meanwhile global tech giants continued investing heavily in R&D on AI/autonomous systems, robotics, sensors and wearable technology. Markets were eager to embrace AI and IoT, and governments felt that such technologies could bring green growth, boost productivity and alleviate many social problems. But corporate and wealth consolidation accelerated during the 2010s, and automation brought high unemployment. In a bid to cut wealth gaps and ease social discontent, Australian governments stoked the business and tech sector with incentives for innovation and start-ups.

The rise of artificial intelligence and digital escapism

However, the innovation and new business investment boom was geographically uneven, benefitting major Australian ‘gigacities’ (cities with gigabit internet speeds) over regional and rural centres with relatively inferior internet services. Gigacities grew in economic prominence as the digital economy boomed on the back of mass adoption of powerful AI applications. This attracted increasing

Large-scale migration to cities

Rise in social and environmental capital as a focus of business

Sharing economy and physical activity bring new life to rustbelt areas

2023

2024

2025

2026

2027

Growth in service- and sustainability-oriented businesses

Alternative payment systems and peer-to-peer communities become commonplace



numbers of entrepreneurs and tech innovators. Many business processes were automated, exacerbating the un/underemployment problem in those cities; rust belt suburbs and satellite cities formed. Young people were particularly affected with high student debts and few job opportunities. Digital escapism was rampant with ‘second life’ virtual reality companies clamouring to offer ‘feel good’ experiences to dejected populations for a small fee. Mental health and obesity rates pushed healthcare costs to new heights.

During the early 2020s, much of rural and regional Australia declined. Many flocked into major cities, and escalating technological unemployment began to negatively impact domestic business. With government assistance, Australian entrepreneurs travelled abroad to find new markets. Development of agile customer-led business platforms brought forward many successful service-oriented business models and notable progress toward a sustainable economy. However, problems of worsening social inequity within cities and between cities and regions continued to surface.

An economic renaissance emerges

Many in the Australian business community studied the new organisational forms, mediums of exchange and sharing platforms that developed in economically challenged regions and countries. A new economic renaissance based on values and principles from pre-industrial era (artisanal) and early internet days (open source, sharing and public benefit) blossomed and offered an alternative to consolidated corporate run businesses and industries. Concepts ranged

from reducing standard working hours to employ more people and freelancer-owned cooperatives, through to community-run peer-to-peer sharing platforms based on mutual credit or cryptocurrencies that bypassed the mainstream banking and finance altogether. Governments experimented with Universal Basic Income schemes.

These ideas gained momentum during the mid-2020s as more and more Australian SMEs shifted their emphasis away from capital accumulation toward social and environmental value creation. Many businesses coalesced around rust belt areas, working with locals to create new platforms and business models for essential service provision. Such areas became hubs for ‘digital alternatives’, in which mature non-pecuniary peer-to-peer exchange constituted most of the local economy. Physical activity, creativity and real-life social interaction were celebrated in reaction to passive AI-driven virtual living. Tourists flocked to high profile digital bohemian areas to partake of the lifestyle.

At first, Australian governments were apprehensive as non-monetary activity cut tax revenue. However, the prevailing attitude among policymakers was to allow for economic experimentation in order to accelerate solutions to compounding (and costly) social and environmental problems. Governments still invested heavily in the mainstream economy, but they also created a flexible regulatory environment for alternative economic paradigms to flourish. Governments chose to participate in the sharing economy and outsource services to well-established P2P platforms to offset shortfalls in tax revenue.

Summary challenges and opportunities under the Digital Alternatives scenario

| ACTOR | CHALLENGES | OPPORTUNITIES |
|-------------------------------|--|--|
| Business | Persistent social and economic problems push Australian businesses to work with customers on service-oriented business models and alternative models for value creation. | Australian companies thrive on reframing business propositions and refocusing on the needs of customers. Digital tools and technologies used to support new business processes and models. |
| Consumers (the market) | Consumer spending and sentiment is low. Meeting basic needs is problematic for those impacted by automation. | Growing demand for sustainable and affordable products and services. Experimentation with non-market based P2P sharing platforms provides livelihoods and meets basic needs. |
| Workers | Artificial intelligence can perform many business functions, but people are needed to develop creative solutions for social and environmental challenges. | Ethics, social awareness and problem-solving skills are in high demand. |
| Government | Creating open and flexible regulatory environment to allow for novel solutions to social and environmental problems. | Act as 'carnival curator' in the economy, promoting diversity and experimentation. |



5 IMPLICATIONS FOR GOVERNMENT



THE NEED FOR TARGETED ACTION

This report used scenarios to explore how digital technology could impact business and the economy over the coming decade, and change the role of government in that transformation.

The next ten years are full of challenges and opportunities for Australia. With careful consideration, the scenarios presented in this report can guide governments to identify

new opportunities for the economy, build resilience for the future, and ensure sustainable development for the years ahead.

This report does not offer any predictions or prescriptions. The aim was to catalyse

a cohesive discussion across government departments and levels (local, state and federal) and to encourage targeted action to ensure Australia's flexibility and adaptiveness to disruptive change and volatility. To start this process, policy makers from across federal government agencies participated in a strategic foresight workshop. Here, they were invited to explore emerging digital innovations and global trends, develop scenarios, and to identify important policy challenges arising from these inputs. Six strategic policy challenges were discussed (see page 40). These challenges raise critical questions for government, industry and civil sectors to explore further. Answers to these questions will vary depending on future conditions. Navigating the emerging digital economy will require iterations of foresight and experimentation to identify and address

risks to businesses and communities, while maximising benefits.

CHANGING ROLE OF GOVERNMENT

Australia has proven to be agile and resilient in adjusting to change. However, Australian governments will need to build their understanding of this extraordinary period of digital transformation and global change to successfully navigate the coming decade.

The National Innovation and Science Agenda is recognition by the current Government that Australia's future prosperity will require citizens, businesses and governments to work innovatively in responding to the opportunities and challenges that lie ahead. Collaborating closely with the scientific community will be fundamental to better understanding emerging trends that will impact Australian society, and responding effectively to them. The commissioning of this scenario report is one element of that, but this should only be seen as a catalyst for conversation that needs to be sustained across government and more broadly to enable Australians to co-create the future they want.

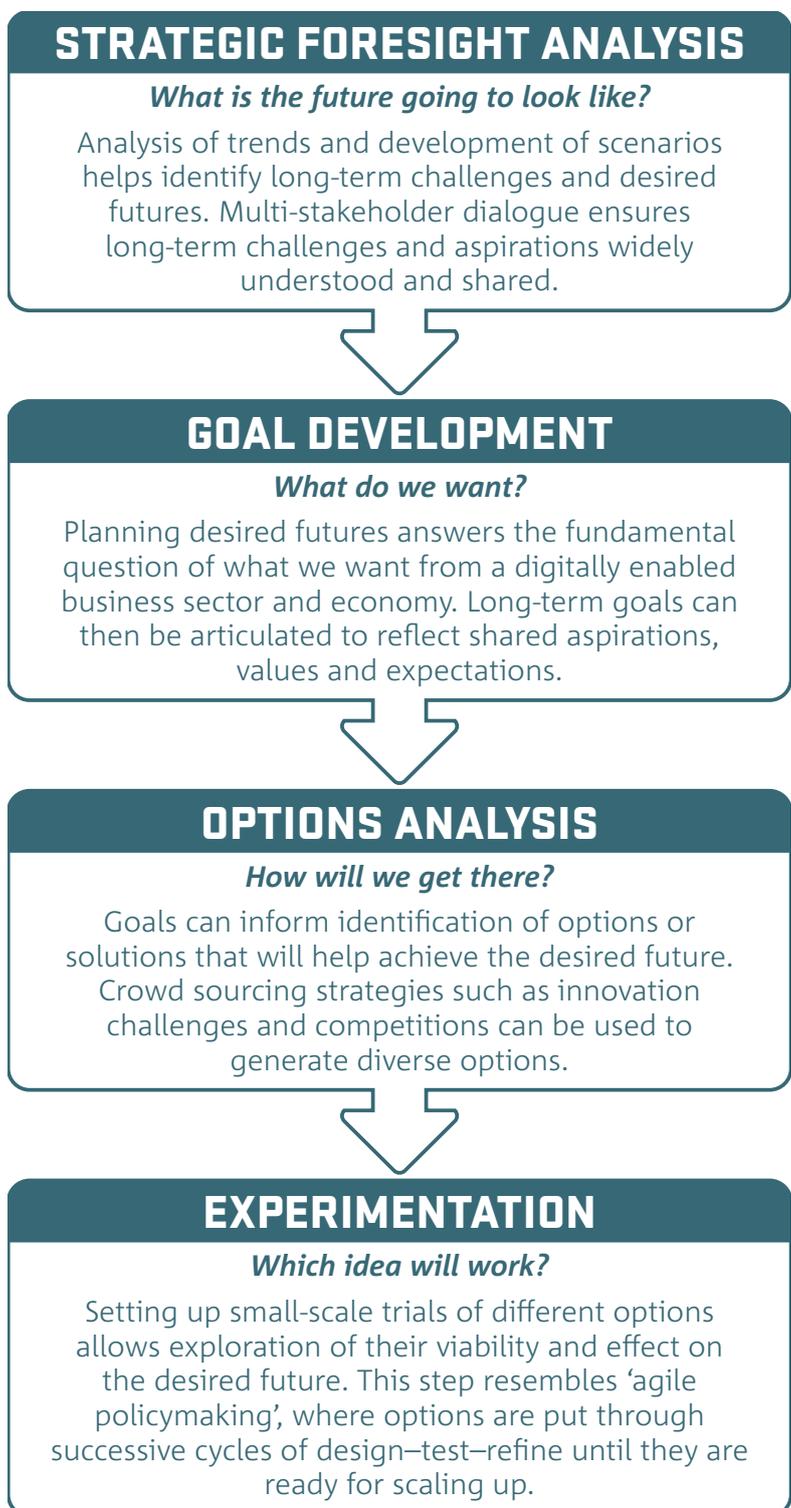
Expectations of government rise with growing uncertainty yet government influence may be increasingly constrained in a digitally disrupted future.

ADDRESSING POLICY CHALLENGES WITH DATA-INFORMED INNOVATION

Figure 7 outlines a policy making approach for tackling complex challenges in a data-informed, systematic way. It links insights from both strategic foresight and innovation studies. Scenarios help guide targeted action towards a desired future that can be pursued today. The economy is a complex system operating within a dynamic social, technological, environmental, economic and political context. Delivering desired outcomes in such complexity requires new tools for policymaking that can foster effective multi-stakeholder responses and integrate strategic foresight inputs, like trends and scenarios, into policymaking^{59,77}.

Innovation for impact is about using strategic foresight to guide targeted action. A learning cycle forms between foresight and present-day innovation. This produces a creative tension for policymaking between ways of thinking that are 'practical here and now' and those that are 'conceptual future-oriented'. Organisations tend to separate these two processes, rather than hold them in tension to foster social learning. Continuous learning arises from successive iterations of foresight analysis with data-informed evaluation of present-day policy experiments.

FIGURE 7 INNOVATION FOR IMPACT WORKFLOW



SIX STRATEGIC POLICY CHALLENGES

How can Australian governments best prepare for a digitally disrupted future?

Six critical policy questions were foreseen using the trends and scenarios described in this report.

| GOVERNMENT REVENUE AND INFLUENCE | TRUST AND PRIVACY | EDUCATION AND SKILLS |
|---|---|--|
| <p><i>How can governments adapt to ensure adequate safety nets and more evenly distribute the economic benefits from the digital economy?</i></p> | <p><i>What principles and mechanisms of data sharing can support societal trust and protect citizens' privacy in the future?</i></p> | <p><i>What can be done to prepare Australian workers for digital disruption, manage the costs of tertiary education and maintain equity of opportunity?</i></p> |
| <p>Traditionally, the capacity of governments to respond to volatile technological and economic transitions hinged on their ability to collect taxes and invest in redistributive policies, such as economic stimulus, welfare programs and universal education. However, this capacity will be challenged in a future with flattening wages, aging population and potentially high unemployment²⁵, where foreign-owned digital corporations play a growing role and non-market economic activity (peer-to-peer sharing/non-monetary based exchange) continues to rise. There is also the risk that Australia will experience declining terms of trade in the post-mining boom era⁷⁸.</p> | <p>Trust between individuals and institutions is fundamental to the fabric of stable commerce and society. We record and send personal information across the internet daily including private (such as bank details) and public (social media sites such as Facebook). Personal information can be accessed online and used to defraud or defame. The internet can be used to transmit facts or spread falsehoods and propaganda (so-called fake news). We live in the 'WikiLeaks era' where hacking has purportedly revealed evidence of government and corporate corruption and surveillance programs. Institutions can be scrutinised to an unprecedented level. This has massive implications for citizen trust in authorities and social stability.</p> | <p>Lifelong education and reskilling are essential for a changing world of business and work that increasingly values STEM knowledge and skills, creativity and problem solving, and social skills³⁴. Australia is slipping on key competencies for the digital age. Higher education will be a must for employability and entrepreneurialism, yet the cost of tertiary education to both government and students is skyrocketing⁷⁹, and government contributions have been declining as a percentage of GDP compared to other developed economies⁸⁰. Lifelong and targeted learning will be important in a workforce that needs to adapt to both automation and growth in well-paid knowledge economy jobs of the future³⁴.</p> |
| <p>Key Considerations</p> <ul style="list-style-type: none"> • flattening wages • aging population • potentially high unemployment | <p>Key Considerations</p> <ul style="list-style-type: none"> • security and privacy of personal information is a growing challenge • cybersecurity breaches continues to rise, and could severely undermine the benefits of the digital economy | <p>Key Considerations</p> <ul style="list-style-type: none"> • reskilling will increase with automation • Australia's low standing in the OECD on STEM skills and digital readiness could undermine future prosperity • Increased cost of education and re-skilling |

| ECONOMIC EQUITY AND POWER | REGIONS AND CITIES | 'ONE HEALTH' AND WELLBEING |
|--|--|--|
| <p><i>What new economic rules could be written to reverse inequity and promote the economic opportunity that digital connectivity can bring?</i></p> | <p><i>How could emerging wireless internet technologies re-shape the economic prospects of currently underserved regions?</i></p> | <p><i>What can be done to promote a business culture that applies advanced digital tools and technologies toward human and environmental health and wellbeing?</i></p> |
| <p>The rules of the digital economy ostensibly give us a grand game of monopoly, with profound implications for competition and equity^{81,82}. Internet connectivity can open economic opportunities for more people, yet the digital economy can also promote more income and wealth disparities. The emergence of platforms, such as iTunes and Amazon.com, has shown powerful network effects in wealth consolidation capped by the rapid rise and global dominance of internet-based corporations. The speed of the transformation could potentially outpace the capacity for governments to implement counterbalancing policies.</p> | <p>To date, the digital economy has driven strong inequities between cities and regions, whereby globally connected large cities and megacities become increasingly powerful economic engines of growth. A greater proportion of Australians are projected to live in state and territory capitals, approaching 70% by 2031 and over 75% by 2061 (up from 66% in 2011) under medium population growth projections⁸³. People are attracted to the high paid knowledge jobs found in big cities where it is currently more economical to deliver high quality internet services than in the regions. However, emerging wireless broadband technologies based on low orbit satellites or high altitude aircrafts could offer cost effective solutions to bridge the gap.</p> | <p>Modern technologies have brought extraordinary benefits, including longer lifespans and rapid and prolific communication across vast distances. However, our modern lifestyles have become more resource intensive⁸⁴ and sedentary⁸⁵. New digital applications and platforms are proliferating which aim to maximise 'eyeballs on screens', potentially exacerbating the problem of inactivity and obesity⁸⁵⁻⁸⁷. While the digital economy has the potential to ameliorate environmental problems by boosting energy and material efficiency and facilitating resource sharing, unavoidable impacts remain. These include demand for digital devices (their production, use and disposal), and growth in electricity demand to run the internet and data centres⁸⁸.</p> |
| <p>Key Considerations</p> <ul style="list-style-type: none"> • digital divide between people online and offline • inequality decreases the stability of society • Tax regimes that optimise the capacity to redistribute wealth from off-shored based enterprises extracting value from Australian consumers | <p>Key Considerations</p> <ul style="list-style-type: none"> • online collaboration will increase as society becomes more complex and knowledge intensive⁸⁹ • high infrastructure costs for Australia across a vast continent with a low population base • emerging wireless broadband technologies | <p>Key Considerations</p> <ul style="list-style-type: none"> • modern lifestyles are more resource-intensive⁸⁴ and sedentary⁸⁵ • 'rebound effects' that can undo the positive impact of technological innovations, and cause more harm than good |

6 CONCLUSION



Australia is facing a tidal wave of disruption that will transform established industries, markets and products and services.

This report used strategic foresight to explore four plausible scenarios representing Australia in a digitally disrupted future. Scenarios do not offer predictions or prescriptions. Rather, they offer a framework for making sense of complex change.

Scenarios in this report aim to stimulate conversation among diverse stakeholders about the role of government in an era of digital disruption and global change. The narratives are extreme yet plausible with the aim to encourage discussion about possible threats and opportunities, and their management. These scenarios also invite

questions about what we value, and the assumptions that underlie our notions of 'progress', fairness and the distribution of economic benefits across society.

Digital innovation offers a host of new possibilities and risks. This report details an 'Innovation for Impact' approach with key steps to identify new opportunities and rapid data-informed solutions to build national resilience and sustainable economic development.

Governments will need targeted action to marshal resources and decide how future technology will be developed and applied. There is a limited window for Australia to seize new opportunities and avoid sinking beneath the waters.





GOVERNMENTS OF LEADING ECONOMIES USE STRATEGIC FORESIGHT TO INFORM POLICY

Integrating strategic foresight into policymaking is consistent with global best practice. Singapore, one of the world's leading digital economies, has embedded a Centre for Strategic Futures (csf.gov.sg) within its Prime Minister's Office. Its mission is to enable the government to navigate emerging strategic challenges and harness potential opportunities. The Netherlands and UK governments have also embedded strategic foresight into their public policy development.

The Netherlands is unique in that it has a standing central planning agency under the government. The Central Planning Bureau (CPB), while funded by the Dutch government, works independently. Its objective is to carry out independent economic analyses that are both systematically sound and relevant to current policymaking. The CPB informs not only politicians and policymakers, but also societal organisations, the scientific community and the public. The UK Foresight

Programme is structured so as to improve the government's capacity to deal with cross-department and multi-disciplinary challenges. The program can be divided into three distinct events: horizon scans, futures analysis and public outreach programs.⁹⁰

A review of strategic foresight used by these three countries suggested that the process requires more than just an environmental scan of emerging trends captured in a report⁵⁹. The report is a mere starting point for a more effective process for guiding collaboration across interdisciplinary communities and organisations.

In the study of strategic foresight in public policy the author said⁵⁹:

"... the most significant benefits of foresight lie in the learning processes initiated, the emerging shared understandings, and the networks created between individuals and organizations across policy areas within and beyond particular professional communities. Such intensified interactions among experts from different fields in government, business, academia, and civil society can be observed in all the reviewed foresight programs."

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