

DIGITAL ECONOMY FAST FORWARD

SCAN

CREATING OUR
DATA-DRIVEN FUTURE

DATA
61



CONTENTS

Executive summary	2
1 Introduction	6
2 The scenario-planning process	8
2.1 Expert interviews and workshops	9
3 Public services in Queensland: Current profile.....	10
3.1 Non-Government service delivery	14
3.2 Digital government	15
3.3 Digital goods and disruption	15
4 Horizontal axis: Extent of digital immersion	16
4.1 Shallow	16
4.2 Deep	20
5 Vertical axis: Extent of institutional change	26
5.1 Substantial institutional change	26
5.2 Limited institutional change.....	29
6 The Scenarios	34
6.1 Scenario 1: Heritage.....	35
6.2 Scenario 2: New Order.....	36
6.3 Scenario 3: Turbocharge	37
6.4 Scenario 4: Stargate	38
7 Strategy Evaluation Framework	40
7.1 From scenarios to strategy	40
7.2 Building on existing strategic frameworks	40
7.3 Combing decision theory and scenario planning	41
8 Conclusion	44
Appendix: Wind-tunnel testing – A worked (and hypothetical) example.....	46
References	50

CITATION

Rudd L, Hajkowicz S, Nepal S, Boughen N, Reeson A, 2015. Fast Forward: Scenarios for Queensland in the year 2025 describing the marketplace for education, healthcare, policing, transport and other public services. A CSIRO consultancy report for the Queensland Government Department of Science, Information Technology and Innovation. CSIRO, Australia.

COPYRIGHT

© Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Queensland Government Department of Science, Information Technology and Innovation (DSITI) 2015. To the extent permitted by law, all rights are reserved and no part of this publication covered by copyright may be reproduced or copied in any form or by any means except with the written permission of CSIRO or DSITI.

IMPORTANT DISCLAIMER

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it. CSIRO is

committed to providing web accessible content wherever possible. If you are having difficulties with accessing this document please contact enquiries@csiro.au.

ACKNOWLEDGEMENTS

The authors are grateful to the many experts who shared their time and knowledge in a series of interviews and consultative workshop in Brisbane. The authors would also like to thank staff from the Queensland Department of Science, Information Technology and Innovation who actively participated in the research.







FAST FORWARD

Scenarios for Queensland in the year 2025 describing the marketplace for education, healthcare, policing, transport and other public services

A scenario planning exercise about the digital marketplace for government services in the future to inform decision makers

Lachlan Rudd, Stefan Hajkowicz, Naomi Boughen,
Surya Nepal, Andrew Reeson

September 2015

EXECUTIVE SUMMARY

A scenario is a plausible and evidence-based story about the future. Because the future is uncertain, there are multiple paths leading to multiple scenarios. Scenarios may describe futures that we would like to happen or would like to avoid. The aim in scenario planning is to be objective and inform decision makers so we can identify, select and implement optimal strategies to achieve a better future.

This study identifies four scenarios (Figure 1) that describe the digital marketplace for public services such as healthcare, education, transport, policing and other services in Queensland by the year 2025. The scenarios are designed to inform strategic planning by Queensland's service-delivery organisations in both the public and private sectors. This will help Queensland continue along a pathway of improved customer experience, effectiveness, efficiency and overall quality of public services.

The scenarios are defined using a process of strategic foresight developed by CSIRO. This involves the identification of two axes capturing continuums of plausible outcomes. The axis endpoints are extreme possibilities. Each axis is relatively independent of the other. The axes rest on a set of geopolitical, economic, environmental, social and technological trends compiled and synthesised by the research team. When the two axes are combined, four scenarios are generated.

The horizontal axis: extent of digital immersion

The horizontal axis relates to the extent of technology transformation in the service-delivery environment. It is stressed that at both endpoints (*shallow* and *deep*) technology has greater power, capability and adoption within the service-delivery landscape than today. Neither axis identifies a future with less technology as this was deemed not plausible.

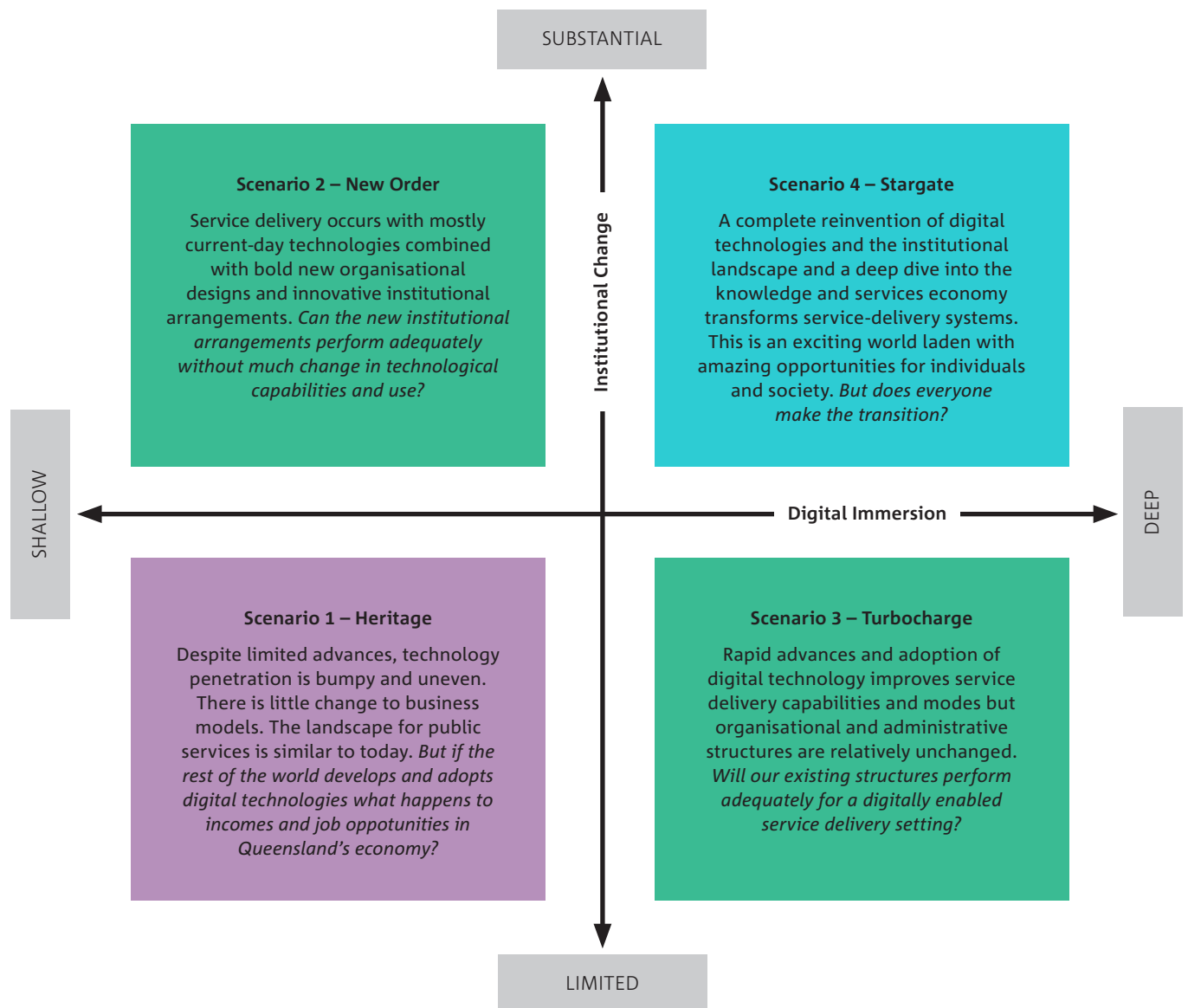
However, at the *shallow* endpoint, cybercrime, privacy concerns, interoperability constraints and user rejection of online interfaces have made the adoption of digital technology patchy, uneven and shallow. As a consequence, many of today's service-delivery systems still outperform technology-enabled models. At this endpoint, digital systems have improved and changed public services but only to a modest extent. Much of what the public service-delivery system does today also happens in the year 2025 at the *shallow* endpoint.

In contrast, the *deep* endpoint describes a future where the stumbling blocks of digital technology have been adequately addressed by scientific and business-process innovation. At the *deep* endpoint, most citizens have become 'digital natives' in an ecosystem of automated systems, data analytics, computing power and device connectivity (that is, the Internet of Things) that has surpassed many forecasts. Much of what is done via conventional means today can be handled more efficiently by computers and robotic devices. There is also widespread acceptance of (and preference for) online interfaces among diverse customer demographics.



Source: Adobe Stock, Shutterstock

FIGURE 1. QUEENSLAND'S DIGITAL MARKETPLACE FOR PUBLIC SERVICES: FOUR SCENARIOS IN THE YEAR 2025



The vertical axis: Extent of institutional change

The vertical axis relates to the extent to which institutional structures change within private, community and government organisations (at local, state and federal levels). As with the horizontal axis, there is change from the current situation at both endpoints. However, the extent of change varies considerably.

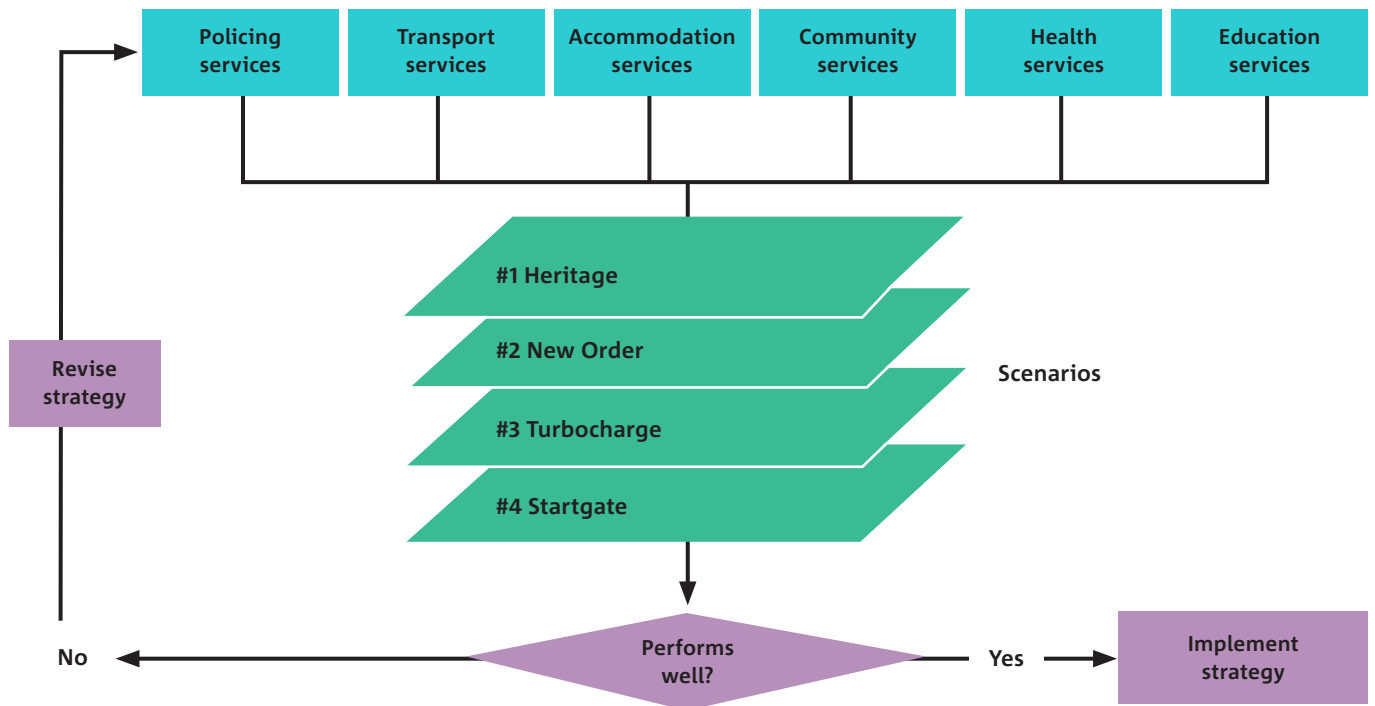
At the *limited* endpoint, institutional structures of the year 2025 are much the same as they are today. The peer-to-peer economy (for labour markets, transport,

accommodation, banking and finance and so on) hasn't expanded much beyond its current-day envelope and the same structures are used for governance within large organisations. The move towards matrix-style and networked organisational structures hasn't happened much and today's hierarchical models are commonplace.

At the *substantial* endpoint, there is much change in the way markets, organisations and society are structured. At this endpoint the peer-to-peer economy has taken hold in transport, accommodation, banking and finance,

and labour markets. Many existing business models and incumbents have been replaced by the new agile and networked market entrants. There is also much change to governance structures. Trusted relationships and information flows are reshaped as the *one-to-many* (or *few-to-many*) governance structures of the past become the *many-to-many* governance structures of the future. Organisational models become more matrixed, networked and agile as traditional hierarchical structures hold less relevance.

FIGURE 2. WIND-TUNNEL TESTING STRATEGIES USING THE SCENARIOS





Source: Adobe Stock

From scenarios to strategies

From the two axes there are four scenarios: Heritage, New Order, Turbocharge and Stargate, as described in the quadrant diagram. These four scenarios represent a generalisation of a much more complex array of future possibilities. As with any model, scenarios must simplify a more complex reality in order to inform decisions. By capturing a range of plausible future scenarios, it is possible to ‘wind-tunnel test’ strategic plans for public service delivery (Figure 2).

A strategy involves choosing actions to achieve a desired future, given the range of uncertain possible outcomes. If a strategy is found to deliver a desired future with an acceptable level of residual risk (that is, risk that cannot be completely extinguished via mitigation options) under all four scenarios, it can be considered resilient. However, if a strategy fails to achieve acceptable performance under one or more scenarios, it is not resilient. Under this circumstance the strategy may need to be redesigned and re-evaluated against the scenarios.

In real-world planning problems, an organisational strategy will seldom perform equally well under all scenarios. Choosing the best strategy from a finite set of candidate strategies is a multi-objective decision problem with trade-offs. One approach is to generate

strategic options, test them against the scenarios, measure their outcomes against agreed performance criteria and then choose the strategy that provides the best overall outcome.

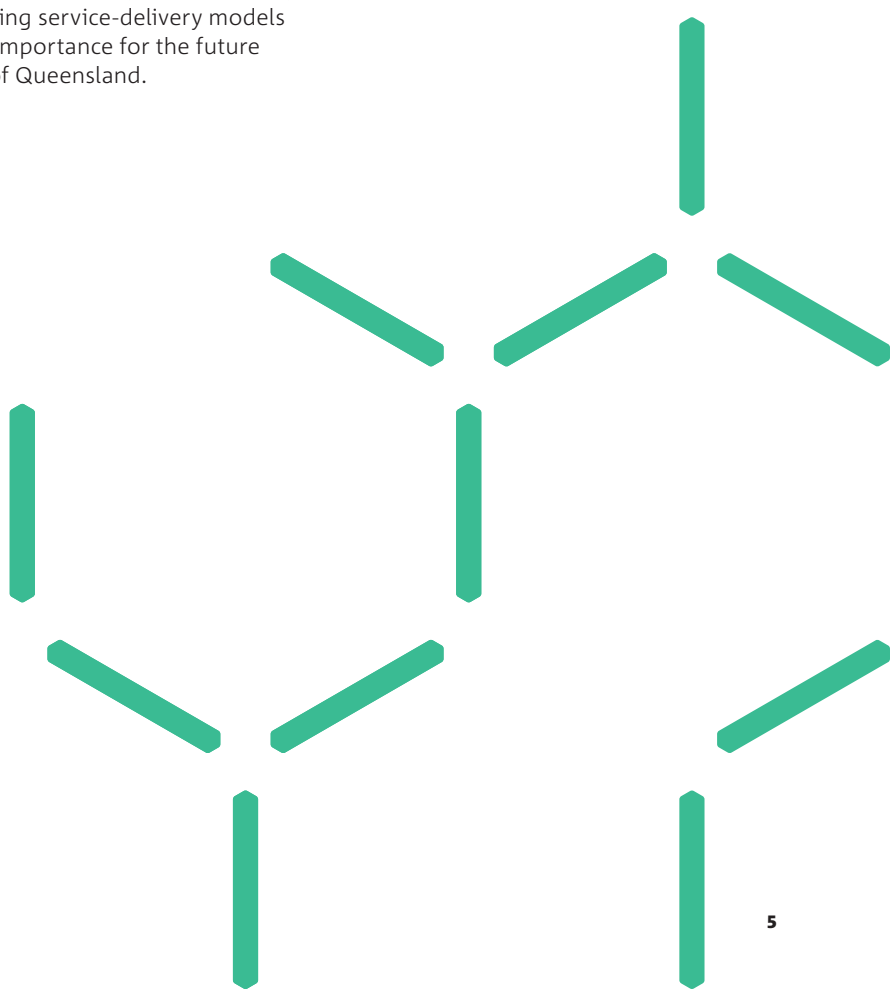
Conclusion

There are plausible futures in which the landscape for public service models in Queensland is substantially reshaped and barely recognisable from today. While this is not the only possible future, a substantial shift fits within the envelope of plausibility. This is largely due to the accelerating rate of technology advance and adoption by consumers.

The Queensland government has seven departments spending over \$1 billion and delivering 1600 unique services that have an impact on all citizens and visitors to the state to some extent. Entertaining plausible futures for service delivery and subsequently identifying, implementing and improving service-delivery models holds vital importance for the future wellbeing of Queensland.

We have reached the point where a confluence of trends, digital disruption, shifts in the locus of economic power, globalisation and demographic change – each of which on their own would rank among the strongest economic forces the global economy has ever seen, are casting our world into a completely different reality ... My contention is that, given the disruption of a hyper-connected world, many of our policy settings are simply not fit for purpose.

Catherine Livingstone, National Press Club Address, 29 April 2015



1 INTRODUCTION

Digital technology is changing the way we do business and govern society. Data volumes, device connectivity, computing power, artificial intelligence, e-commerce, online communication and the overall penetration of digital technologies are increasing at an accelerating rate. In recent times autonomous (robotic) systems capable of replicating manual and cognitive human tasks have made major capability leaps within the areas of customer service, medical diagnostics, transportation, agriculture, mining and defence.

The exponential growth of digital technology creates the possibility of a future very different from the world of today. When digital technology is combined with the drivers of globalisation, demographic change and cultural change, the operating context for business, government and community organisations is likely to be reshaped. Examining trends, generating plausible scenarios and designing resilient strategies can help decision makers chart a pathway towards a better future for their organisations and for society.

This period of rapid change is likely to have an impact on the delivery of public services in Queensland along with other states and territories of Australia. A service is defined as a set of activities that meet a human need or want. Public services have some level of social benefit and can be supplied by governments, companies and community organisations. Public services are provided for education, healthcare, policing, transport, welfare and a wide range of other purposes.

This study is concerned with how digital technology, and other driving forces, will reshape the marketplace for public service delivery in Queensland. The timeframe of ten years provides sufficient scope for strategic planning by the many service-delivery agencies. However, some of the changes are already taking place and many will continue to manifest themselves beyond this timeframe.

There is always a debate about whether the market drives technology or technology drives the market. The answer is in the mix, and this report attempts to strike a middle ground. When dealing with specific

trends or technologies the report may take on a frame of reference of 'technological determinism'. However, when these trends or technologies are considered on aggregate, the influence of any one technology is drastically diminished.

The study identifies four scenarios for the year 2025. A scenario is a plausible and evidence-based narrative about the future. People may prefer one scenario over another. However, scenarios do not represent choices. Scenarios are the result of trends and drivers, many of which are powerful and lie beyond the decision maker's direct control. Scenarios aim to inform current-day strategic decision making by identifying a range of plausible futures. This allows the formulation and implementation of robust strategies that perform well under multiple futures. Scenarios allow decision makers to 'wind-tunnel' test a strategic plan to identify whether and how it needs to be improved.

The scenarios presented in this report are designed to help government, industry and community organisations in Queensland plan for the future of public service delivery. The scenarios are relevant to all service-delivery sectors and a wide range of service-delivery models. Equipped with information about plausible futures, organisations will be better positioned to continually grow and improve the standards of service delivery in Queensland while achieving improved cost-efficiency and a reduced regulatory burden.

The following section of this report describes strategic-foresight methods and concepts related to scenario planning. This is followed by a description of the trends and drivers relating to the horizontal and vertical axes – continuums of possibility – that give rise to the scenarios. The next sections describe the scenarios and a framework for using the scenarios to evaluate and refine the strategies. The concluding section reflects on the implications of this study for decision makers.

e-learning



2 THE SCENARIO-PLANNING PROCESS



Strategic foresight is an emerging field of research, and a growing profession, concerned with exploring and describing plausible future events to help people make wise choices when planning for such things as technological and organisational development. It is often described as both an art and a science because foresight studies combine robust analysis of data, facts and theories with creative, compelling and engaging narratives of the future. There is no single established method for conducting foresight research. Many of the tools and techniques of strategic foresight are still under development by the research community.

However, the application of strategic foresight by private and public sector organisations is widespread and increasing. Global consulting company Bain & Co conducts an annual survey of management tool usage with responses from over 13,000 corporate executives and decision makers from 70 countries (Bain & Company, 2015). This survey finds ‘scenario and contingency planning’ tools are used by 20–40% of respondents, with an average satisfaction rating of 4 (out of 5). Usage rates spiked at 70% during the period of geopolitical and economic uncertainty that characterised the early 2000s. The study finds foresight’s umbrella framework, ‘strategic planning’, has usage rates that varied between 40% and 80% over the past 20 years.

Scenario planning is perhaps the most widely applied, well-recognised and standardised tool used in strategic foresight. The concept was pioneered by energy company Royal Dutch Shell in the 1960s and helped the organisation negate the oil shocks of the late 1970s and early 1980s (Wilkinson and Kupers, 2013). Today, over 45 years later, Shell still has a dedicated scenario-planning team. Their current ‘new lens’ scenario report identifies two scenarios for the future of world energy markets.

Scenarios are evidence-based stories about the future designed to inform both operational and strategic choices. Because the future is unknown, or at least uncertain, a scenario-planning exercise will typically identify multiple futures. In reality there are an infinite number of possible futures. Scenarios represent an abstracted generalisation of a more complex reality. This is necessary in order to inform decision makers. Attempting to reproduce the infinite complexity of the real world is counterproductive and inimical to decision making.

Over time, many processes have been proposed for scenario planning. These processes involve similar stages and refer to similar concepts, albeit with varied terminology. The scenario-planning process used in this study is based on the following stages:

1. *Define the focal issue.* The focal issue is associated with challenge or opportunity in the future. In this study the focal issue is the emergence of a digital marketplace for public service delivery with implications for current models used by governments, companies and community organisations.
2. *Initiate horizon scanning to identify trends (drivers of change).* Trends are patterns of change extending into the future. They are classified as geopolitical, economic, environmental, social or technological. Trends typically have well-defined spatial, temporal and typological definition. Trends are distinct from background issues because they have the quality of directionality (change over time).
3. *Screen and validate the trends.* For the trends to be used in the analysis they must pass the evidence and relevance hurdle. Evidence requires a qualitative or quantitative information source demonstrating the trend is real and/or likely to happen. Relevance requires

that the trend matters to the focal issue and subsequent operational and strategic choices. The final set of trends should be comprehensive, exhaustive and non-redundant. The CSIRO team compiled a database of 67 trends in this study.

4. *Identify clusters (megatrends) and scenario axes.* A megatrend (or cluster) exists where multiple trends intersect and combine to create a more significant, deep-set and longer term trajectory of change. Sometimes the megatrends are the final product of the strategic foresight exercise. In the case of this study they are an interim step to generate axes that combine to describe the plausible scenarios of our marketplace in 2025.
5. *Construct the axes (continuums of possibility).* The axes represent continuums of plausible though uncertain outcomes that have an impact on the focal issue. The end of each axis represents an extreme outcome based on how a megatrend plays out. The endpoints of the axes are created by the megatrends that map out the scenario space and identify extreme outcomes.
6. *Identify the scenarios.* A scenario exists for every sector formed by the axes. One axis creates two sectors, two axes create four sectors (or quadrants), three axes (the third being three-dimensional) create eight sectors and so on. Most scenario studies use one or two axes (generating two or four scenarios). Using more axes runs the risk of making the results complex, hard to visualise and hard to interpret. A general guideline is that people cannot easily handle more than seven objects simultaneously without losing track of what’s happening. In this study we generate two axes and four scenarios. As with any model, scenarios represent a simplification of a much more complex reality in order to provide useful information to a decision maker.

7. *Prepare and communicate the narrative.* In the final step the catchy and meaningful titles are developed for the scenarios. They are briefly described, based on the detailed trends and information used to construct the axes. The narrative of the future aims to be descriptive and not prescriptive. It aims to explore what might happen based on the best available data. The key test for scenarios is whether they are plausible and consequential. If they pass these hurdles, the scenarios hold salience for decision makers.

For scenarios to be useful they need to inform decision makers. This typically occurs through a strategic-planning process. The scenarios provide a mechanism for testing the performance of alternative strategies. Decision makers can choose a strategy that performs best under all scenarios. Details of the ‘wind-tunnel’ testing framework are given near the end of this report.

2.1 Expert interviews and workshops

As part of the foresight process CSIRO conducted interviews with experts and stakeholders. A consultative workshop was held on Thursday 18 June 2015 at the State Library of Queensland. The interviews were part of the horizon-scanning process to identify trends. Interviews were held with 15 experts from state government departments, peak industry bodies, professional associations, economic development agencies, business and investment fields, academics and researchers. The convergent interviewing technique (Williams and Lewis, 2005), based on a conversational style, was used to structure the sessions with experts, which typically lasted 30 minutes. The opening question was: ‘What do you think government services will look like in the year 2025 and what are the key trends that you can see emerging that will lead to this future?’ A world cloud generated from interview notes

FIGURE 3. WORLD CLOUD FOR INTERVIEW RESULTS



provides insight into the topics raised by experts (3). The results of the interviews were combined datasets, reports, journal articles and media reports, which contributed towards a database of trends.

The workshop was attended by 34 people from a range of government, university and private sector organisations. A set of draft axes and scenarios was presented to the audience by the CSIRO team. Feedback was obtained via whole-group discussion and small focus groups examining specific issues. Overall the narrative of the future being put forward was considered both plausible and relevant. Based on additional feedback from workshop attendees, the CSIRO team made additions to their work. The titles of the scenarios and axes were changed to better convey their meaning and minimise ‘good’ versus ‘bad’ connotations. The ordering of the scenarios was also altered to ensure a logical flow.

Interviews – key themes

Structure of service delivery agencies

- The role of government
- The structure and speed of government
- New business models
- Changing employment arrangements

Amount and utilisation of available data

- Connectedness or integration
- Opportunities and challenges of data

Customer expectations

- Friction-free transactions
- Personalisation of services

Social issues

- Ageing population
- Urbanisation
- Social media
- Privacy and security
- Equity

Environmental

- Climate change

3 PUBLIC SERVICES IN QUEENSLAND: CURRENT PROFILE

Public service delivery in Queensland represents a large, diverse and continually evolving ecosystem of service providers and customers. In the 2014–15 Queensland state budget 20 government departments were engaged in service delivery. Seven departments with their associated entities accounted for over \$1 billion in service-delivery costs each, with the four largest departments consuming 74% of the total of service delivery for the 2013–14 financial year. Across all departments there were 480 broad service categories related

to over 1600 direct transactional services between government and citizens or businesses. Ranked by service-delivery cost, the seven largest Queensland government departments accounted for 90% of the cost of service delivery in 2013–14 (Queensland Parliament, 2009–2014).

The four largest service categories that the Queensland government is responsible for are education, health, police and transport (Queensland Parliament, 2012). Constitutionally, the states are responsible for government

services not provided by the federal government. However, the federal government often gives money to the states to carry out federal programs.

Government services are not all outwardly facing. For example, the Department of Transport and Main Roads delivers South-East Queensland’s public transport. The delivery of this service encompasses both the customer-facing provision of public transport vehicles, as well as the inward-facing services of route and network planning.

Classification of Queensland Public Services

In the 2014–15 state budget 20 departments issued service delivery statements. The seven departments with service delivery costs over \$1b report on the following service categories:

Queensland Health

- Hospital and health services
- Queensland Ambulance Service
- Department of Health

Department of Education, Training and Employment

- Early Childhood Education and Care
- School education
- Training and employment

Department of Transport and Main Roads

- Transport system investment planning and programming
- Transport infrastructure management and delivery
- Transport safety, regulation and customer service
- Passenger transport services

Queensland Police Service, Queensland Fire and Emergency Services

Public Safety Business Agency

- Crime and public order
- Road safety
- Fire and Emergency Services
- Executive, corporate and business services
- Independent assurance and advice to improve emergency management

Department of Housing and Public Works

- Housing services
- Building services
- Procurement services

Department of Communities, Child Safety and Disability Services

- Child Safety Services
- Community Services
- Disability Services

Department of Justice and Attorney-General

- Criminal and civil justice
- Fair and safe work
- Legal
- Human rights protection
- Liquor, gaming and fair trading
- Youth justice
- Custodial
- Probation and parole

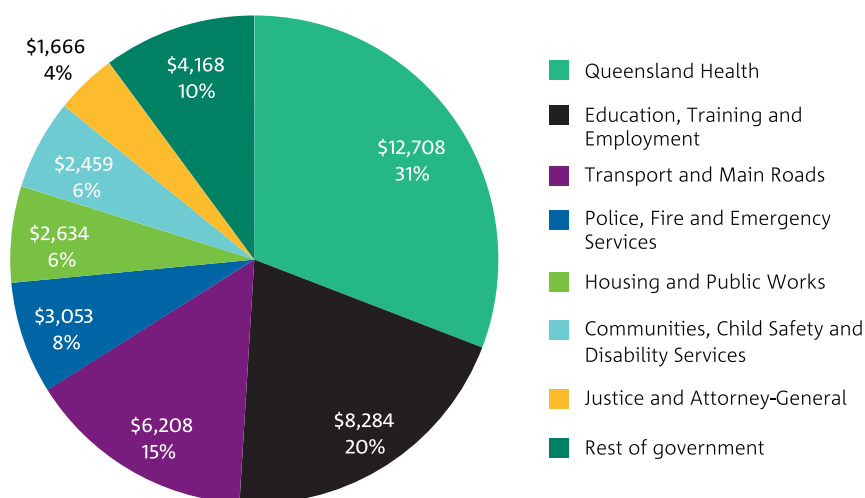
As shown in Figure 4, the four biggest service categories by a considerable margin were health (including the ambulance service), education and training, transport and main roads, and police. Some of these services transitioned between departments in successive budgets. In the graph provided in Figure 5, each service was reconciled to the 2014–15 budget configurations to get an understanding of historic cost growth.

Figure 5 shows that the cost of health services had grown at close to twice the rate of the other three major service categories, with a 40% increase in the five years since 2009. The remaining three service categories showed 20 to 25% cost growth in the first three years following 2009, before plateauing in the final two years of data.

Service-delivery staffing correlated with the cost of service delivery for most departments in 2013–14 (Figure 6). One variation was between the Department of Justice and Attorney-General and the Department of Main Roads and Transport. This is because legal services are dominated by staffing costs while road construction and infrastructure is heavy on material costs.

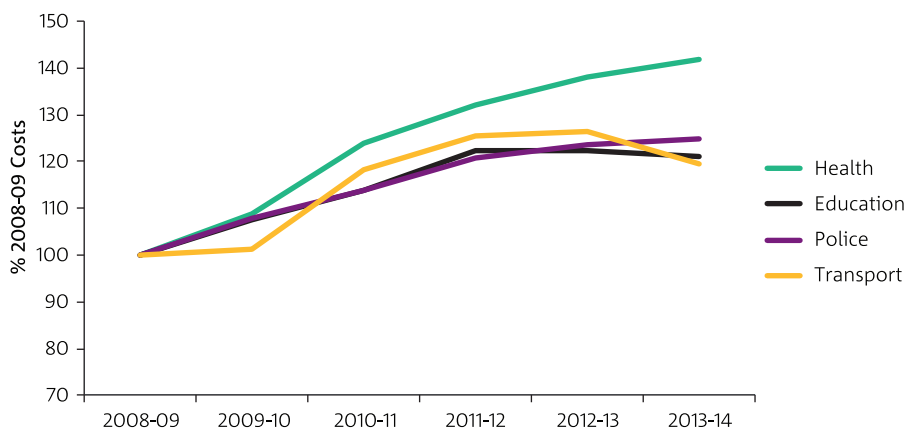
Education and police showed a 5% growth in service-delivery staff in the five years since 2009. Health staff grew the most over the period, with a 15% increase. Transport staffing was flat until 2011–12, when TransLink was moved into the Department of Main Roads and Transport as part of the machinery-of-government changes.

FIGURE 4. QUEENSLAND GOVERNMENT 2013–14 SERVICE DELIVERY COSTS BY DEPARTMENT (\$'000)



Source: Queensland State Budget 2009–2014 (Queensland Parliament, 2009–2014)

FIGURE 5. QUEENSLAND GOVERNMENT SERVICE DELIVERY COST GROWTH



Source: Queensland State Budget 2009–2014 (Queensland Parliament, 2009–2014)

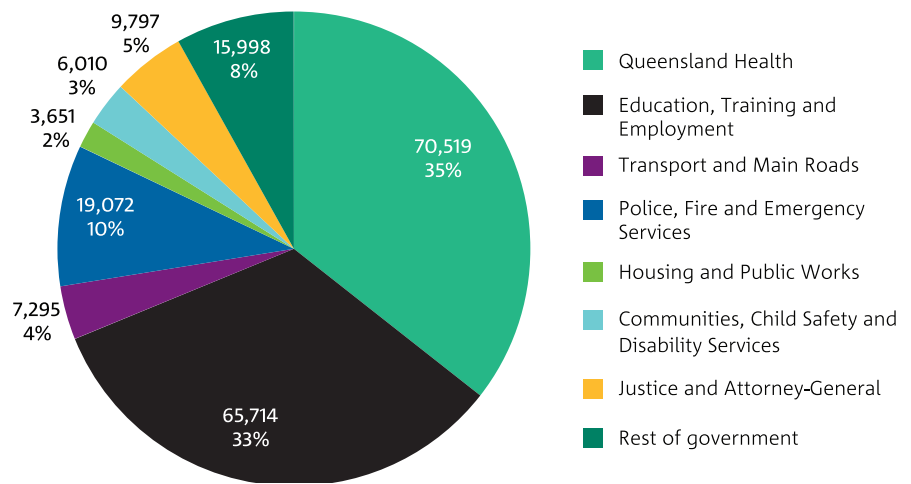
Employment growth in the Queensland public service is stable when compared with other sectors. Figure 7 illustrates growth in FTE positions in the Queensland public service when compared with jobs in mining.

Each Queensland government department is responsible for monitoring and managing the transactional services it conducts with citizens and businesses. To present a simpler experience for customers, most transactional services operate through Smart Services Queensland, a one-stop-shop interface. Services are organised into tiered groups, with tier one being an information enquiry, which may or may not lead to further services. Currently all tier-one information enquiry services have been made available online.

The extent to which Queensland government departments deliver services via manual and/or paper-based methods versus fully online systems differs between departments. Business intelligence is not equivalent between departments, and not all services are classified or have their usage monitored.

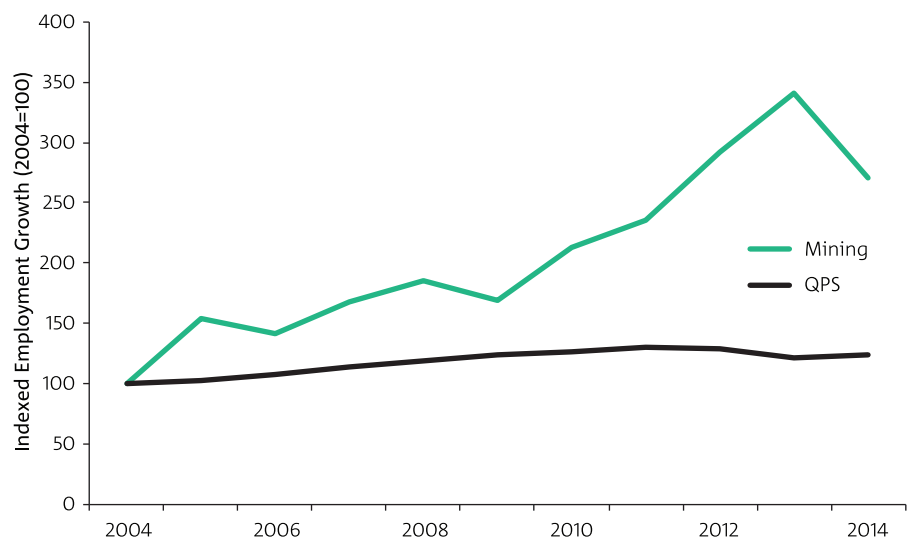
As a loose indication of service usage, departments were ranked solely based on reported tier-one information enquiry numbers. As a general indication of usage, 81 million tier-one transactions took place across all departments in the latest data set. The graph shown in Figure 8 lists departments with the highest service volume, from left to right.

FIGURE 6. QUEENSLAND GOVERNMENT 2013–14 SERVICE DELIVERY STAFF BY DEPARTMENT



Source: Data aggregated from Queensland State Budget 2009–2014 (Queensland Parliament, 2009–2014)

FIGURE 7. MINING JOBS GROWTH VERSUS QUEENSLAND PUBLIC SERVICE FTE GROWTH



Source: Australian Bureau of Statistics (ABS, 2014a)



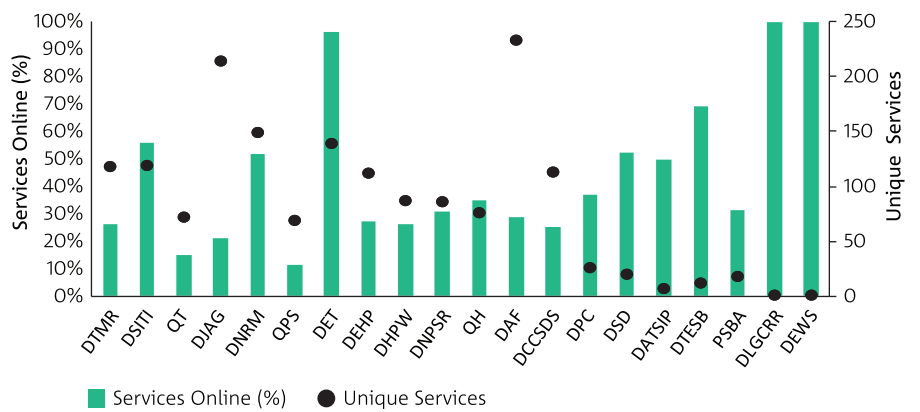
Source: Shutterstock

The Department of Transport and Main Roads had the highest volume of customer interaction across 119 unique services, although only 26% of its services were listed as online. The Department of Education, Training and Employment provided almost all of its services online and had quite high usage volumes. The Department of Justice and Attorney-General was ostensibly low in terms of online services, as a majority of its services are not readily digitised.

The above comparisons between departments should be taken as being only indicative, as business intelligence is not equivalent between departments and different departments aggregated services into bundles of different sizes. For example, if the Department of Transport and Main Roads unpacked its licensing services into individual services, it would drastically increase the number of reported unique services.

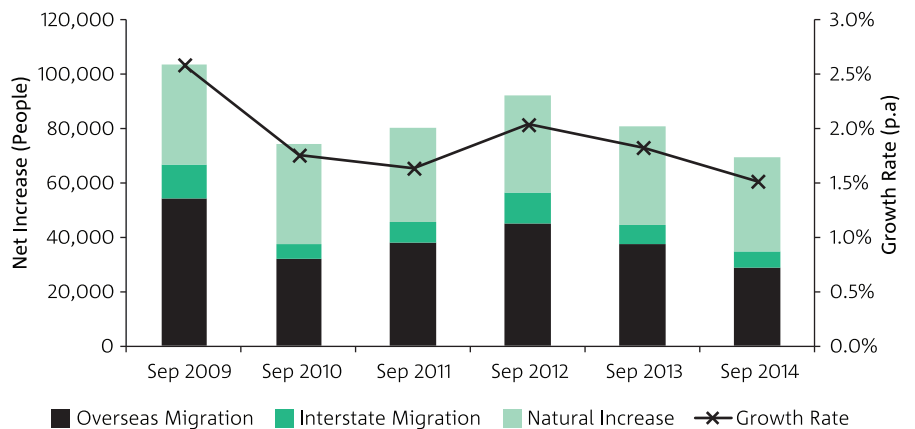
Given the broad range of services provided by the Queensland government, from police to main roads, all Queenslanders can be seen as service users. Population growth, shown in Figure 9 is intrinsically tied to the demand for government services.

FIGURE 8. QUEENSLAND GOVERNMENT DIRECT CUSTOMER SERVICES (HIGHEST VOLUME FROM LEFT TO RIGHT)



Source: Queensland government records

FIGURE 9. QUEENSLAND POPULATION YEARLY NET INCREASE AND GROWTH RATE



Source: Australian Bureau of Statistics (ABS, 2014a)

In the year ending September 2014, Queensland had a net population increase of 70,000 people, ranking third among all states and territories. Over the past six years, population growth has trended downwards, ostensibly reducing pressure on government service demand. Natural births and deaths accounted for 44% of the growth, overseas migration 47% and interstate migration 9%.

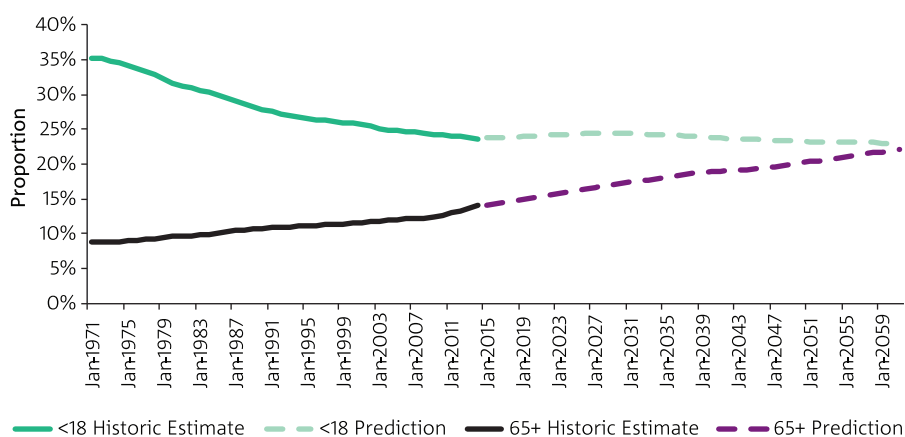
As shown in Figure 10, the proportion of the population aged 65 and over has increased on average by 0.21% per year over the last ten years. During this period the proportion of children under 18 decreased by 0.12% per year. Combined, these demographics show that Queensland is becoming a more multicultural place, with a larger proportion of retirees and a smaller proportion of children.

Queensland is dominated by small to medium-sized firms, with 97% of Queensland businesses employing fewer than 20 people. The number of firms employing 1–19 people and 20–199 people showed strong growth in the four years leading up to the 2008 global financial crisis (GFC), but there has been little growth since.

3.1 Non-Government service delivery

Health, the largest cost service delivered by the Queensland government, has shown considerable growth over the ten years to 2012–13. Across Australia between 2002–03 and 2012–13, state contribution to health funding increased on average by 78.6% (\$10.6 billion) compared with a Commonwealth government spending increase of 37.2% (\$5.4 billion). The non-government

FIGURE 10. PROPORTION OF QUEENSLAND POPULATION BY AGE



Source: Australian Bureau of Statistics (ABS, 2013; ABS, 2014a)

sector grew 88% over this period, increasing spending by \$5.6 billion (AIHW, 2014).

Australia has the seventh-largest proportion of private investment into education among OECD nations, behind the United Kingdom at third and the United States at fifth place. In 2011 it was estimated that 15% of Australian non-tertiary education was privately funded, compared with 55% of tertiary education (OECD, 2014).

Non-government organisations and charities that were not primarily religious or sporting groups, and had operations in Queensland, reported 149,359 full-time staff and 136,515 part-time staff employed in the year 2013–14 across their entire organisation. Collectively these groups reported 125,888 unpaid hours and 619,899 paid

hours of work across areas as diverse as social services, education, emergency relief and advocacy, to name a few. Queensland, New South Wales and Victoria had proportionally the largest number of small not-for-profits, making up over 50% of organisations in each state (ACNC, 2014).

Non-government organisations are expanding their operations in healthcare as government health budgets come under pressure. As communities grow throughout all parts of Queensland, local charities and not-for-profits spring up to service these groups. Although budgets nationally are becoming increasingly difficult to balance, there is a plausible future in which the private and non-government sectors step up to meet the increasingly customised demands of citizens for their service delivery.



Source: Adobe Stock

3.2 Digital government

The definition of digital government historically has not been clearly defined. 'E-government' emerged as a term in academic literature during the 1990s, when it was mostly concerned with increasing the role of IT in the internal operations of government (Grönlund and Horan, 2005). However, government's use of computing has been discussed in academia since at least the 1970s (Dutton and Kraemer, 1978).

During the early 2000s global e-government initiatives switched focus to delivery of government services, with programs like one-stop government. In 2000–01 US state and federal government departments began implementing online service portals. At the same time, the federal government began firstgov.gov, which linked to all national-level agencies and departments. However, service delivery was not fully integrated, with factors like availability of online payment systems slowing progress (West, 2004).

By 2007 the European Union benchmarking report on e-government had scored Austrian government services 100% for online availability and 99% for online sophistication. The latest benchmarking report shows that, in 2012–13, 75% of national services in the EU had been digitised, with 65% digitisation at the regional and local levels (European Commission, 2015).

The development of the internet and other ICT technologies has expanded the ways in which governments can connect with their citizens. As technologies grow and change, so will the way people connect with each other. At its core, digital government is about enabling or orchestrating quality customer-centric services.

3.3 Digital goods and disruption

Digital goods are created and stored by digital technology. They are intangible, can be consumed by multiple people at no additional cost (e.g. zero marginal cost of reproduction), are incredibly low cost to transport and can be combined to form endless permutations of new goods. In essence, they are strings of 0s and 1s floating in the ether, while still holding substantial economic value (Quah, 2003).

Disruption occurs when an innovator enters a sector and competes with incumbents. This innovator may improve on product experience, customer relationships, speed to market, cost, power, business structure and so on. Traditionally, established players in any given sector had been the recipients of the strong advantages of being an innovator; however, digital has changed the landscape.

Digital innovators are not constrained by geography, they have cheap access to a global market of consumers, and they are able to prototype and test products with real consumers at a rapid pace. There is a constant flow of these innovators entering the market each day. The concept of a digital good being infinitely consumable and incredibly cheap to transport highlights an obvious source of disruption for non-digital incumbents.

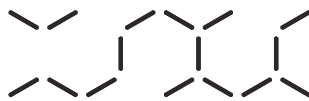
Established companies may adopt technologies enabling them to do old things in new ways. True disruption occurs when technology is used to do new disruptive things. The strongest protection against digital disruption for established firms is for them to disrupt themselves, at both a product and process level (McQuivey, 2013). Companies such as Facebook, which

sprang up in the digital age, cling to this philosophy firmly. Each new employee at Facebook is told, 'If we don't create the thing that kills Facebook, someone else will.'

A 2015 report from CISCO highlights that incumbents are advantaged disruptors in terms of their capital, brand and customers. Start-ups win in terms of innovation, agility and ability to experiment and take risks. The report polled 941 business leaders across 13 countries; they ranked sectors on extent of potential competitive disruption within five years as a result of digital technologies and business models. The technology sector was deemed most vulnerable, followed by media, retail, financial services, telecommunications, education, hospitality and travel, manufacturing, healthcare, utilities, oil and gas, and finally pharmaceuticals (Bradley et al., 2015).

Government services are not at risk of disruption in the same sense as businesses. However, as the nature of business and consumer behaviour is disrupted by technology, governments must continue to service a changing marketplace. When developing a digital strategy, the wider ecosystem and plausible directions in which it is heading must be considered.

4 HORIZONTAL AXIS: EXTENT OF DIGITAL IMMERSION



4.1 Shallow

This endpoint of the axis describes a plausible future in which the full promises of the digital technology revolution are not realised. It still describes a world with greater availability and uptake of digital technology than today – a future with less digital technology is not considered plausible. However, at this axis endpoint the development and penetration of digital technology is far less than many people predicted due to multiple stumbling blocks.

The stumbling blocks include cybercrime, privacy breaches, interoperability failures and a lack of user trust and interest in digital platforms for service delivery. Despite the innovation and adoption of digital technologies, a number of challenges could still erode the trust of citizens in digital transformation and stagnate, or even reverse, the progress.

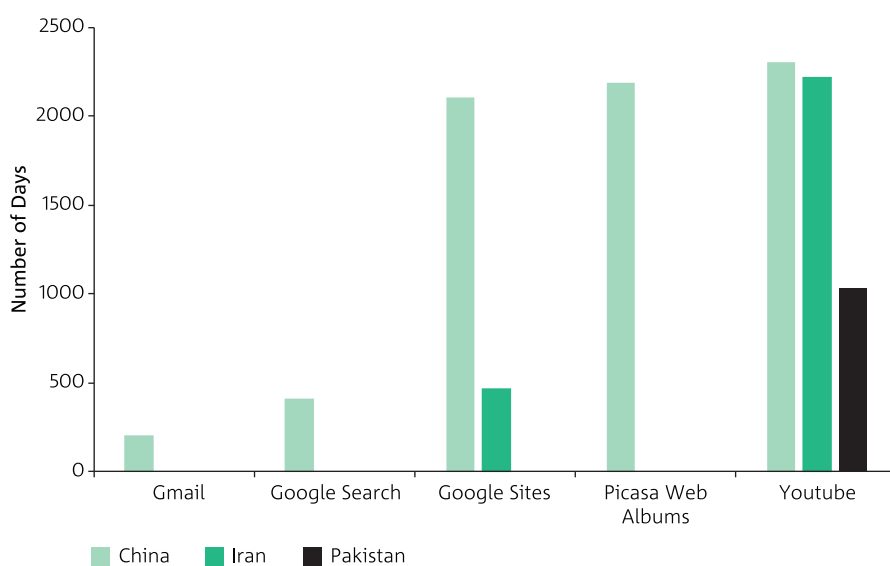
Addressing these challenges require efforts from not only technical, but also political, social and economic viewpoints. A holistic approach is needed. This section presents some of these challenges that may inhibit digital service delivery in 2025. The Queensland government, industries and community groups can influence whether we experience shallow digital immersion; however, many other national and global drivers beyond our direct control are at play, some of which are described here.

4.1.1 NATIONAL AND GLOBAL DRIVERS

THE END OF THE CURRENT INTERNET

The internet has been a great success story of globalisation in the last two decades. It has enabled global connections of people, creativity, ideas, businesses and governments, and

FIGURE 11. CURRENT AND ONGOING DISRUPTIONS OF TRAFFIC TO GOOGLE PRODUCTS AS OF 19 JULY 2015



Source: Google Transparency Report (Google, 2015a)

became the single most important driver of the digital economy. However, some recent events threaten fragmentation of the internet (also commonly known as *The Balkanisation of the Internet*) due to a number of factors, including politics (controlling messages by unpopular governments), commerce (protection of local industries) and nationalism (dealing with national security issues) (The Economist, 2010; Meikar, 2012).

Governments around the world are increasingly asserting their sovereignty over the internet. The golden shield project (also popularly known as *The Great Firewall of China*) is an example of how the Chinese government is attempting to exercise control by blocking potentially unfavourable incoming data from foreign countries (Fallows, 2008). Many developed and emerging economies such as Iran

(Naughton, 2013), Russia (Kramer, 2013) and the EU (Bonner, 2014) are trying to set political boundaries over the internet. In the process, they are destroying the unifying, neutral characteristics of the current internet. An extreme result of this process could be the emergence of national internets; that is, each nation-state having its own internet (Dvorak, 2012).

The current and ongoing disruptions of traffic to Google products from three different countries (as of 19 July 2015) have been substantial (Figure 11). For example, YouTube has been blocked by Pakistan since 17 September 2012 (1035 days) after Google failed to take down a film that the government considered offensive. The Balkanisation of the internet will certainly have a negative impact on the progress of digital

transformation, and in some cases may reverse the trend. Although Australia is extremely unlikely to Balkanise, the cumulative effects from countries that do, will affect the development of the internet as a whole. The internet is a global technology and its use in Australia and Queensland can be impacted by actions taken offshore.

DATA SOVEREIGNTY LIMITS THE FREE FLOW OF INFORMATION

Citizens, enterprises and governments are increasingly using cloud-based services for data management to achieve high efficiency. In the cloud environment, the data owner does not have full control of where the data resides, who is accessing the data and how many copies of the data have been created. In general, users would have a service-level agreement (SLA) with cloud service providers and the expectation is that the providers guarantee the SLA at all times (Irion, 2012). Since internet-based cloud services operate across borders, the loss of sovereignty over data becomes a real concern. The concerns have risen significantly since the introduction of the Patriot Act in the United States after the September 11 terrorist attack (Gallagher, 2011). The impression is that this Act allows US law enforcement and national security agencies unrestricted access to any data, anywhere, any time. This conflicts with European data privacy laws. As a result, an increasing number of data centres have been built in Europe to host European data.

In Australia, the Privacy Amendment Act, passed in late 2012, introduces many significant changes to the Privacy Act, which have been effective since March 2014 (Australian Government, 2012). The most relevant to data sovereignty is the Australian Privacy Principle 8: cross-border disclosure of personal information. It states that, before the

disclosure of personal information offshore, the Australian sender must take reasonable steps to ensure the overseas recipients will comply with Australian Privacy Principles (APPs). It is clearly stated that Australian senders remain liable for overseas recipients' acts and practices. This potentially conflicts with many laws in the United States, including the Patriot Act. This has been identified by industries as one of the main reasons for the slow uptake of cloud-based services in Australia. An alternative is to have data centres hosted in Australia, which is not yet proven to be economically sustainable due to market size. Satisfying Australian data sovereignty requirements may become a hurdle for using some of the emerging technologies that can revolutionise the delivery of public sector services. Governments are also held to a higher standard for delivery of their own services and data.

HITTING THE WIRELESS SPECTRUM CEILING

The demand on wireless connectivity has skyrocketed in the last few years. Due to the emergence of the internet of things (IoT) and the popularity of mobile devices, we are connecting more wireless devices and generating and transferring a larger amount of data than ever before. It is expected that this will continue to propel digital transformation in all aspects of our daily life. However, we are hitting the ceiling on the availability of sufficient wireless frequency spectrum needed to support the growing number of consumers and IoT devices (CSIRO, 2014). The lack of sufficient wireless frequency spectrum is referred to as *spectrum crunching* (Goldman, 2012).

In its report on spectrum crunch, CSIRO stated that many global cities, including cities in Australia, are fast approaching the point of 'peak data', where user demand for wireless connectivity can

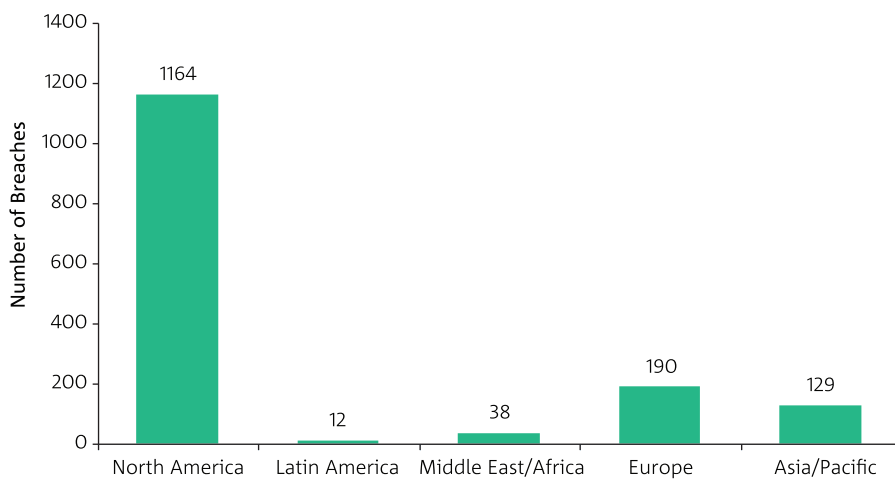
no longer be fully accommodated due to the availability of the radio frequency spectrum (CSIRO, 2014). According to an ACMA report, there may be a 160 MHz to 700 MHz shortfall in spectrum capacity for mobile broadband services and applications in Australia by 2020 (ACMA, 2011). The problem needs solutions not only at the technology level but also at the policy level. This may threaten the progress of the digital transformation that we expect to see from emerging technology trends, in particular big data, mobile devices and IoT.

DATA BREACHES ARE ERODING PEOPLE'S CONFIDENCE ON DIGITAL ECONOMY

There have been large-scale data breaches in recent times. In late 2008, Heatland Payment Systems, a New Jersey-based company, reported the largest data breach, in which 130 million records of debit and credit cards were compromised (Cheney, 2010). In December 2013, retail giant Target confirmed 40 million debit and credit card numbers as well as 70 million records containing personal information of customers were compromised (Milletary, 2014). This demonstrated that the retail network, even though it meets the recommended security standards, is vulnerable to a number of potential attacks including intrusion and data exfiltration.

Data breaches are impacting diverse industries. In 2011, over 100 million records were compromised in Sony's online entertainment services (CERT-FI, 2011). The game services remained closed for over three weeks and the company reported a loss of over \$170 million due to the data breach. According to the breach level index report for 2014 (Index, 2014), there were a total 1541 data breach incidents, an increase of 78% from 2013, which resulted in 2,803,036 data records being stolen or lost every day. Australia

FIGURE 12. NUMBER OF DATA BREACH INCIDENTS IN 2014



Source: Break Level Index Report

had 30 incidents (2% of data breaches) compared with 1107 (72%) in the United States (Figure 12). The actual number of data breaches, including those unknown or unreported, is estimated to be substantially higher.

IMPACT OF DATA BREACHES ON CONSUMER CONFIDENCE

A survey of 1925 people was conducted in the United States to understand the impact of security breaches on consumer confidence (Humphries, 2014). Of these, 22% were concerned about the safety of their personal data and 9% expected to get hacked. With the increase in the number of data breach incidents, these numbers will likely increase in the near future. Australian Privacy Principle (APP) 11 in the Australian Privacy Act 2012 deals with data breaches (Australian Government, 2012). APP 11 requires organisations that hold personal information to take reasonable steps to protect the information from misuse, interference and loss, and from unauthorised access,

modification or disclosure. In addition, processes to deal with data breaches should be streamlined to instil trust and confidence in the digital economy. Furthermore, voluntarily submitted citizens’ data is not directly protected by APPs; this includes publicly available social media data (such as Twitter and Facebook) and data stored by overseas companies. Government services delivered in cooperation with private or not-for-profit organisations may put the data of private citizens at additional risk.

CYBERCRIME IS STILL RISING

Cybercrime is a threat of unprecedented nature to the digital economy globally. The global cost of cybercrime in 2013 has been estimated at US\$113 billion with an average cost per victim of US\$298 (Symantec, 2013). Australia mirrors these global trends on a national scale. In 2011–12, there were more than 400 cyber incidents against Australian government systems alone, while 5.4 million Australians fell victim

to cybercrime, with an estimated cost to the economy of \$1.65 billion (Department of Defence, 2013). With the number of internet-connected devices set to almost double by 2020, the opportunity for cybercrime is growing exponentially. An increasing proportion of new internet users are living in countries with poor IP protection and high rates of piracy. As a consequence, increasing rates of malware and growth of botnets are anticipated. For Australia, this means a massive increase in the sources of global attack and huge risks to our national economy and social stability.

DSTO (Bilbao-Osorio et al., 2014) and CSIRO (Arco and Srinivasan, 2014) reported that we are already feeling the impact of cybercrime on our different level of governments and industries, and are struggling to respond effectively to these threats. The vision of fully integrated digital government will face a number of difficult hurdles.

MODERNISATION OF LEGACY SYSTEMS IS CHALLENGING AND COSTLY

A legacy system is a software system that is critical to day-to-day business activities and resists modifications (Khadka et al., 2014). The study found a number of perceived benefits of legacy systems such as business critical and proven technology. It also observed a number significant drivers for modernising legacy systems, including keeping the business-critical system agile, reducing the high performance cost and reducing the tendency to be prone to failure due to a scarcity of experts. The legacy system modernisation faces a number of challenges; such as on-time finishing of the modernisation process, data migration, lack of documentation and difficult-to-extract business logics. Similar observations were made by the National Association of State Chief Information Officers’ 2008 survey of legacy systems in the United States (National Association of State Chief Information Officers, 2008).

In Australian government departments, legacy systems are commonplace and often operate as standalone systems. For example, the Australian Taxation Office had over 180 specialised IT systems to manage every phase of tax administration from registration to compliance (Australian National Audit Office, 2010). Sir Peter Gershon's review of the Australian government's use of ICT found that government agencies are trapped by the heavy burden of maintaining legacy systems, as 77% of their total ICT spend was on business-as-usual activities (Gershon, 2008). The modernisation of these systems is costly. For example, it is estimated that the Department of Human Services may need as much as \$1 billion to replace its legacy platform (Bajkowski, 2015). Ernst & Young's recent global insurance digital survey (Ernst & Young, 2013) found that 80% of companies identify legacy technology constraints as the top inhibitor of the digital transformation.

INTEROPERABILITY IS AN ACHILLES HEEL FOR DIGITAL GOVERNMENT

The aim of the digital government is to enforce a user-centric digital approach to government services that enables the engagement of citizens and the private sector more closely in government problem solving. The Australian government Digital Transformation Office (DTO) has been established with a similar aim, so that government agencies can adopt a coordinated, whole-of-government approach to service delivery. This requires implementation of government services that are reusable and interconnected. The current model, where the agencies are operating in silos, requires a major overhaul. Interoperability between government agencies plays a major role in breaking those silos. Interoperability problems occur at multiple dimensions: technical, semantic and organisational (Huijsman, Plomp and Batenburg, 2012). The technical dimension deals with linking computer systems and services

that includes data exchange, data integration, accessibility and security. The semantic dimension mainly concerns the interpretation of data exchanged between agencies. The organisational dimension deals with the integration of business processes.

A number of initiatives have been taken by governments around the world to address the problem (Open Technology Foundation, 2015). For example, the UK's eGovernment Interoperability Framework (Office of the e-Envoy, 2004), the EU Interoperability Framework for European Public Services (European Commission, 2010), and the US Federal Enterprise Architecture Framework. In Australia, the National e-Health Transition Authority (NEHTA) has developed an interoperability framework for the health sector (National E-Health Transition Authority, 2007). Despite the efforts of governments, adoption of these frameworks has been slow and interoperability initiatives often fail to meet the integration objectives. The vision of digital government is impossible to achieve without making significant inroads in addressing the interoperability issue.

A SECOND DOT-COM BUBBLE IS A POSSIBILITY

It has been 15 years since we witnessed the burst of the first dot-com bubble. The first bubble was created off the back of Web 1.0 by building a large number of web-based businesses, which became valued far in excess of their likely revenues. A number of economists and investors are predicting that we are on the verge of the second bubble, created by Web 2.0, mainly social media. For example, Twitter is yet to make a profit but it is still valued highly in the marketplace (Colombo, 2013). The case is similar for Facebook, which is valued \$156 billion in 2014 (Kay, 2014). Facebook and Google have acquired a large number of small tech companies, currently with no strong revenues, at

substantially high values (Cormode and Krishnamurthy, 2008). Some economists believe that these values are highly inflated and hence the foundation for the second dot-com bubble may have been laid. If the bubble becomes realty and bursts, this will have a tremendous impact on the progression of digital transformation across many sectors.

THE LIMIT HAS BEEN REACHED

Analysts and commentators in the digital-electronics markets have started predicting that Moore's law is decelerating, as they have been since the law was first popularised. One reason for the current prediction is that we have shrunk electronic components to a theoretical limit, where further shrinkages impact efficiency. (Huang, 2015). Another reason for the slowing of Moore's law is cost. Moore's law is not only about doubling the size of transistors in every 18 months, but also reducing the cost of the computer. *The Economist* explains the economic reasons for the end of Moore's law (ABS, 2015c). The cost of building a new semiconductor fabrication plant is now more than \$6 billion. With the rise of the centralised computing model, like data centres and cloud services, there is no need to increase efficiency of a single chip. Robert Colwell, director of the microsystems group at the Defense Advanced Research Projects Agency (DARPA) expects the end of Moore's law by 2020 (Merritt, 2013). However, it is worth noting that there are other ways for improvements in computing power and speed to continue.

SKILL SHORTAGE FOR THE AUSTRALIAN ICT SECTOR

Australia is facing skill shortage in key ICT areas. The Australian Computer Society (ACS), in its report to the Australia 2020 summit, identified some key factors: a significant drop in the number of students enrolling ICT courses; graduates not being considered well equipped with the required skills;

the movement of employees from ICT to other sectors; the limited life span of the acquired skills; lack of retention of women in the ICT sector; and lack of planning to up-skill and retain the workforce (ACS, 2008). Hudson, the recruitment and talent-management company, reported the following ICT areas were in high demand in 2014 in Australia and New Zealand: cloud, mobility, security and business intelligence (Hudson, 2014). These are key ICT areas driving the digital transformation. Unless the shortage in the key ICT skill is addressed, innovation in service delivery is likely to fall behind.

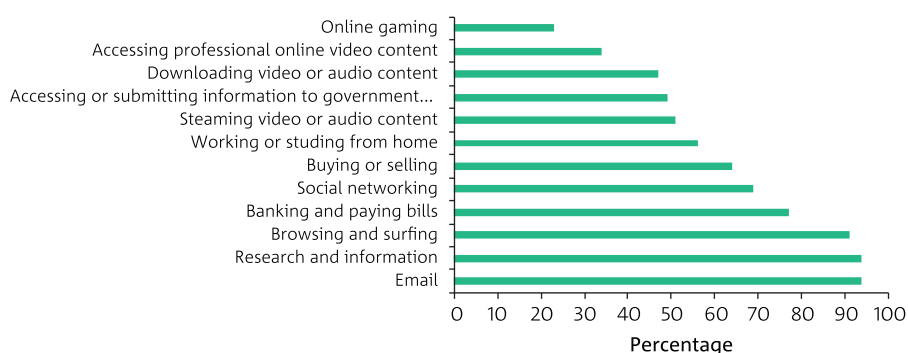
INVESTMENT IN INNOVATION IS LACKING

The Australian Industry Group has reported a direct link between ICT investment and productivity (Australian Industry Group, 2013). Industries that have the most innovative and intensive use of ICT have experienced labour productivity gains of 40–50% in the last decade, whereas the figure is just 13% on average over all industries. It is noticeable that the impact and use of ICT is not uniform throughout the industries, but the ICT investment in industries has grown generally in the last decades. However, Australian government's investment in innovation is low and has fallen to 2.2% of total budget expenditure in 2014. Research and development spending is continuously falling as a share of GDP (Phillips, 2015). Australia ranks poorly for science expenditure among OECD countries as a share of GDP – just above Greece and Slovakia.

TRAPS IN BIG-DATA ANALYSIS

In 2008, Google, in collaboration with the Center for Disease Control and Prevention (CDC), launched a system, Google Flu Trend (GFT), that can

FIGURE 13. ACTIVITIES PERFORMED ONLINE IN THE SIX MONTHS TO MAY 2014



Source: Australian Communications and Media Authority (ACMA, 2013)

perform data analysis and modelling on flu-related search terms in Google's search engine to monitor the prevalence of flu. At the beginning, the system seemed to match with CDC's own traditional monitoring mechanism. The system was then rolled out in 29 countries and extended to other diseases like dengue fever. In 2013, *Nature* reported that GFT was predicting more than double the proportion estimated by CDC (Butler, 2013). In 2014, *Science* presented a detailed analysis of the reasons for GFT failure (Lazer et al., 2014), and also observed that this problem is prevalent in all prediction systems based on search and social-media data. Big data is often a supplement rather than substitute for traditional data collection and analysis techniques. If the technologists do not get it right, cases like GFT will have a negative effect on new digital trends and slow the progress of digital transformation.

4.2 Deep

At the other end of this axis is a future in which digital technologies fulfil and surpass people's expectations. In this future, many of the challenges identified in the previous section are met. In digital immersion the Queensland government will be transformed to an advanced digital government by adopting state-of-the-art information and communication technologies and operating in a mature digital economy. The government will be able to do more with less and become more transparent and participatory. There will be a transformation in the relationship between government and citizens that will bring a paradigm shift to the way services are delivered. Some of today's technologies are going to play a key role in bringing these revolutions. Here, we present some of these technologies and their current state.

4.2.1 CURRENT TECHNOLOGIES THAT WILL PLAY A FUTURE ROLE STEADY GROWTH IN INTERNET USE AMONG QUEENSLAND HOUSEHOLDS

The number of households accessing the internet has grown steadily in Queensland in the last decade. The ABS reported (ABS, 2014b) that 84% of households in Queenslanders had access to the internet in 2012–13. Of these, 78% had broadband internet access and 81% accessed the internet on a daily basis. These numbers are expected to grow steadily in the next decade.

INCREASED USE OF ONLINE SERVICES

The community has a growing appetite for internet-based services and data. According to an ACMA communications report (ACMA, 2013), online participation by Australians has grown not only in size (14.72 million Australians have access to the internet) and volume (a 53% increase in data download in a year), but also in the variety of financial and social activities, such as banking (77%), social networking (69%) and buying and selling (64%). Figure 13 shows the percentage of activities performed online in the six months to May 2014. Of all activities,

49% were in accessing and using government websites, which lags notably behind banking and paying bills. In the coming years, this activity will increase significantly when a digitally savvy generation will start accessing existing digital government services and more government services are digitised.

INTERNET AND WWW ARE TWO KEY DRIVERS FOR DIGITAL TRANSFORMATION

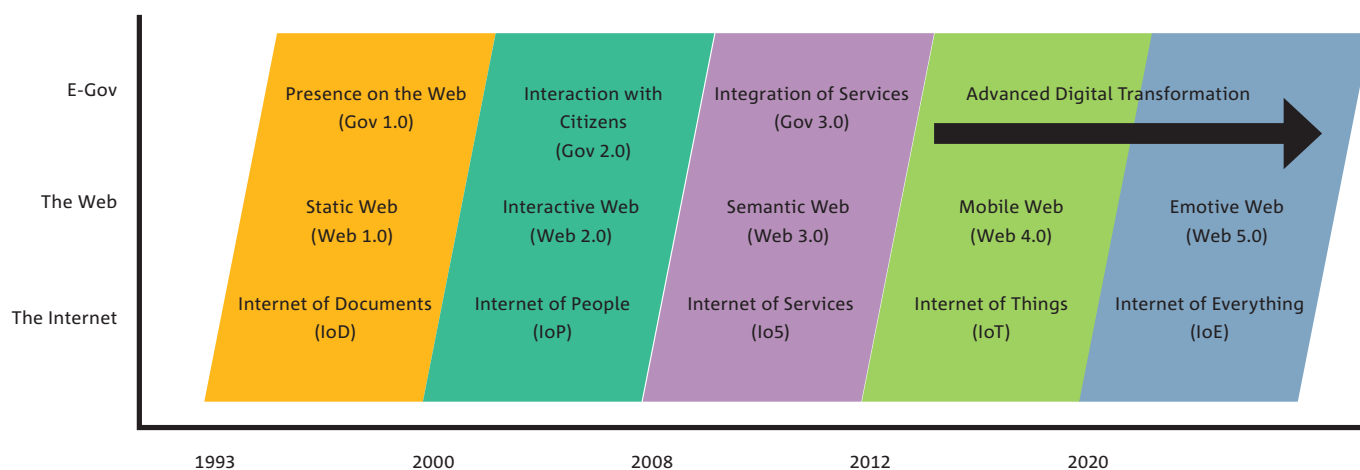
The digital transformation we are witnessing today started with the inception of the Internet in 1950s. The internet is used as a foundational technology for many of today's services such as telephony, email and file sharing. The World Wide Web (WWW), also popularly known as the Web, invented by Tim Berners-Lee and Robert Cailliau in 1990, is the most popular internet service today. Most digital services today are delivered through the Web in the internet. In a nutshell, the internet supports global connectivity, whereas the Web provides a service-delivery platform. Hence, the digital transformations in private and government sectors follow the evolution of the internet and Web, including

e-government initiatives. Figure 14 shows the evolution of e-government initiatives along with the evolution of the internet and Web.

CONTINUOUS EVOLUTION OF THE WEB

The Web has evolved from the static Web to the mobile Web in the last two decades and is expected to develop some extremely limited aspects of human intelligence and emotions by 2025 (Benito-Osorio et al., 2013). The first generation Web (Web 1.0) was the Web of content, where static information is shared between Web users and websites. It lacks active interactions with the users. A large number of websites were created during this time. At the beginning of the 21st century, the Web evolved from the Web of content to the Web of communication (Web 2.0) (Cormode and Krishnamurthy, 2008). This provided interactive platforms like blogs, enabling non-technical users to interact with the Web, create user content and share with other users. Social media (such as Twitter, Facebook and YouTube) is an example of a platform developed in this period. Around 2008, we started to see the emergence of

FIGURE 14. EVOLUTIONS OF THE INTERNET, WEB AND E-GOVERNMENT SERVICES



semantic Web (Web 3.0) (Aghaei et al., 2012). Two key technologies that support the semantic Web are semantic markup and Web services. Semantic markup provides the context to Web data in order to reduce the communication gap between human Web users and Web applications, whereas Web services provide the communication between Web applications. These technologies enable automatic integration and execution of Web applications. We are now in the mobile Web era (2012–19) or Web of Things. This era is not drastically different from those earlier; however, the number of connected devices has grown exponentially (Guinard et al., 2011). The iteration is the emotive Web. It supports emotional and intelligent interactions between users and the Web (Kambil, 2008). This is also called the Web of Thoughts, where human nature meets artificial intelligence (Benito-Osorio et al., 2013). By 2025, we expect to see Web applications that can interact with users on a human level, and they will completely revolutionise the way public services are delivered.

E-GOVERNMENT IS MATURING

Electronic government (e-gov) is evolving over time. With the evolution of the internet there has been a paradigm shift in ways of delivering government services. At the beginning, government services were limited to online presence with some downloadable forms. The websites were designed to deliver static information. The next stage was

interaction between the citizen and the government, including support of online transactions. Many government agencies started using social media to provide emotional and informational support in different domains, ranging from human services to health. Two-way communication between citizens and governments were supported. Peer support among citizens who find themselves in a similar situation is also encouraged and supported. The next stage is to support discoverable services in which government departments and agencies can offer an integrated service as a whole-of-government approach. Many current e-government initiatives are at this stage now, including the initiatives taken by the Australian government’s Digital Transformation Office (DTO).

BEYOND INTERACTION BETWEEN CITIZENS AND GOVERNMENTS

Delivery of a number of government services requires interaction not only between governments and citizens, but also between governments and businesses. Table 1 presents the nine possible interactions among governments, businesses and citizens. Supporting these interactions requires interoperability between digital services operated by different providers, whether they are government departments and agencies or private businesses. Next Step, an online community developed by CSIRO to provide informational and emotional support to single parents,

is an example of a human service that supports G2C (government as a platform), C2G (citizen sourcing) and C2C (do-it-yourself government) interactions (Linders, 2012; Bista et al., 2013). According to the ABS, only 47.1% of Australian businesses had a Web presence as of December 2014 (ABS, 2014c). This will increase significantly in the next decade as the Web becomes the preferred medium for conducting business and interacting with customers and governments.

In the coming decade, we will see the continued transformation of government services through a number of key emerging technologies. Following is a brief review of some of the key technologies that help to build the next generation of innovative government services.

4.2.2 KEY TECHNOLOGIES FOR GOVERNMENT SERVICES

INNOVATIVE WAYS OF USING SOCIAL MEDIA

The emergence of social media has changed the tools and strategies for communication between governments and citizens (Bertot et al., 2010). It is applied to a wide range of applications, including listening to citizens’ voices at difficult times, understanding their needs and helping them to deal with their current circumstances. One of the distinguishing features of social media is that it is a hybrid communication medium. Social media offers a platform not only for communication between service providers and service consumers (such as G2C), but also among service consumers themselves (C2C) (Mangold and Faulds, 2009). Due to this offering, the government agencies have increasingly adopted social media to improve the quality of governments

TABLE 1. NINE POSSIBLE INTERACTIONS IN DIGITAL GOVERNMENT

	GOVERNMENT (G)	CITIZEN/CUSTOMER (C)	BUSINESS (B)
Government (G)	G2G	G2C	G2B
Citizen/Customer (C)	C2G	C2C	C2B
Business (B)	B2G	B2C	B2B

through greater citizen engagement, as part of e-government initiatives (Gov 2.0). Within these initiatives, social media plays an important role in achieving the following goals:

- efficient delivery of government information and services to citizens (Bonsón et al., 2012)
- improved flows of information within and around government (Bertot et al., 2010)
- more open and transparent governments (Chadwick and May, 2003)
- increased political engagement (Sweetser and Lariscy, 2008)
- understanding of citizens' voices and needs (Rheingold, 2008).

The use of social media in governments is also driven by – in addition to other potential benefits – the desire to reduce costs and increase effectiveness of service delivery. Governments all over the world look for ways to curtail costs and, at the same time, find innovative ways of providing services to citizens (Janssen and Estevez, 2013).

INCREASING PRESENCE IN SOCIAL MEDIA

The presence of Australian citizens, governments and businesses in social media is increasing. The ABS reports 30.8% of businesses already had a social-media presence in Australia by December 2014 (ABS, 2014c). This number is significantly high when we compare it with the proportion of businesses with a Web presence (47.1%). Almost 50% of Australian consumers access social media and spend around 8.5 hours a week on Facebook, according to a recent Sensis report on how Australian consumers and businesses are engaging in social media (Sensis, 2015). It also observed

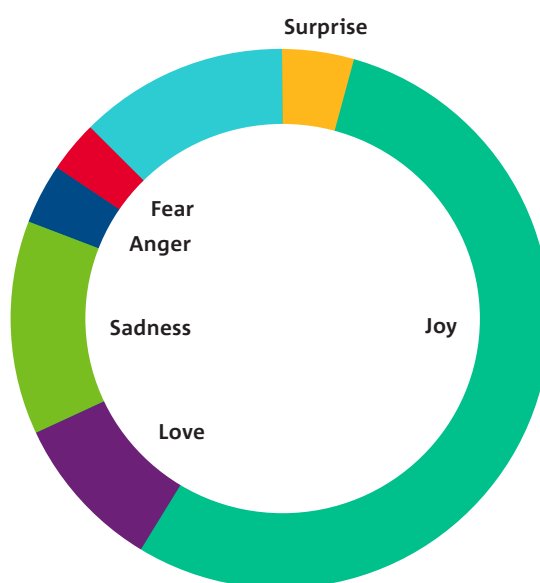
that social media plays an important role in customer satisfaction, as 62% of surveyed people were willing to change their opinion of a business based on feedback on social media. Australians have already shown how social media like Facebook can be used to gather and disseminate real-time information in emergencies, such as during the Queensland and Victorian floods (Bird et al., 2012). The Queensland police department's use of social media in disaster management is considered by many as an example of how social media can be used in e-government (Magro, 2012).

SOCIAL MEDIA APPLICATION EVOLUTION

CSIRO has developed and trialled an online community, Next Step, for the federal Department of Human Services,

to help parents currently receiving a welfare payment transition into full-time work to become self-sufficient. The community enabled its members to share their experiences and relevant information, and support each other during the transition process (Bista et al. 2013). Next Step is an example how social media can be used to support delivery of government services. Another social-media tool developed by CSIRO is for monitoring social media, called Vizie. This tool enables government agencies to gather relevant citizen-contributed feedback in publicly available social media and provides an engagement platform for communication staff within the agencies (Wan and Paris, 2014). This is a good example of how communication staff within government departments and agencies can utilise

FIGURE 15. EMOTIONS CAPTURED BY WE FEEL SOFTWARE FROM 19,068 TWEETS IN 14 HOURS FROM BRISBANE



social media. Emergency management is another application area where CSIRO has developed a social-media tool, called Emergency Situation Awareness (ESA) (Yin et al., 2012). Social-media applications are also evolving. A new breed of applications is capturing human emotion within social media (see Figure 15) and taking us one step closer to the emotive Web. CSIRO has developed a tool, called We Feel, to compute human emotions embedded within Tweets, using an advanced natural language-processing technology (Larsen et al., 2015).

AUTONOMOUS CARS WILL DISRUPT THE TRANSPORT SECTOR BY 2025

Driverless vehicles are today used in Australian iron-ore mining. Major car industries and transport technologists predict that these vehicles will make their way to our roads by 2025 and disrupt the transport sector. The current trend is that this will be realised sooner than many people thought a few years ago; the impetus for this comes from the fact that the innovation in car industries has recently moved from Detroit and Japan to Silicon Valley. Google started a project driverless vehicle in 2009 and built a prototype vehicle capable of driving 25 miles per hour. The vehicle is already driven more than 1 million miles in the streets of Mountain View, California.

DRIVERLESS VEHICLES WILL BE IN THE MARKET SOONER THAN MANY PEOPLE THINK

With the recent progress in technologies we have seen bullish predictions for autonomous cars. The CEOs of Ford and Nissan, in interviews with Forbes, predicted that fully autonomous cars will be a reality by 2020 (Bigman, 2015; Su, 2015). Jaguar, Land Rover, Daimler and Continental envisage autonomous cars by 2025 (Hawley, 2014). From technologists, the Intel

CEO expects to see autonomous cars on our roads by 2022 (Gaudin, 2012), whereas Google founder Sergey Brin foresees autonomous cars much earlier, by 2018 (Driverless car market watch, 2012). Expert members of the Institute of Electrical and Electronics Engineers predict that up to 75% of vehicles will be autonomous in 2040 (IEEE, 2012).

WHAT DOES IT MEAN FOR GOVERNMENTS AND CITIZENS?

The driverless car has numerous advantages. It not only eases the operating cost and offers greater convenience, but also reduces the number of accidents and saves time. The driverless car revolutionises personal cars as Uber did for taxi industries. If the vision as predicted by experts is realised, the driverless car would be highly efficient as it does not need a costly human operator to work. Furthermore, high availability of such cars in highly populated urban areas diminishes the need for owning personal cars. The current transport and corresponding insurance policies require a complete overhaul. For example, four states and Washington DC in the United States have already passed legislation permitting the operation of driverless cars. Driverless cars also offer the potential for enormous productivity gains if driving time is converted to productive output.

DEEP-MACHINE LEARNING IN TOURISM AND HEALTHCARE

Deep-machine learning is a new technology that is gaining a lot of attention from different applications. For example, Google's deep-machine learning algorithm, DeepStereo, improves Google's street view to show the process of travelling and exploring the streets by adding extra frames of images to the video (Flynn et al., 2015). This makes street-view tourism plausible. People can visit any street in the virtual

world and feel as if they are roaming the streets in the real world. Another application that has started attracting investment in deep-machine learning is healthcare. For example, Butterfly Network is developing a disruptive medical imaging system that will let doctors see inside patients more easily by using a scanner the size of an iPhone (Regalado, 2014). Deep-machine learning also enables data-driven medicine, where health data such as medical images, lab tests, doctors' notes and personal information are used to train a deep neural network. The system is then able to classify new cases and associate with already identified diseases, helping doctors to make evidence-based diagnoses (Garling, 2014).

ROBOTICS

A Perth-based company, Fastbrick Robotics, has developed a bricklaying robot (Hadrian) that will revolutionise the building industry (Fastbrick Robotics, 2015). Hadrian can work 24/7 and can lay 1000 bricks an hour. It can perform automatic loading, cutting, routing and placement of all the bricks to complete a house structure within two days. Hadrian is expected to be rolled out for commercial use by 2017. We have also witnessed the increasing interest and advancement in humanoid robots (IEEE, 2015). The humanoid robots have been used and trialled in military and law-enforcement applications. In the near future, we will see humanoid robots in use in other applications, such as infrastructure monitoring, medicine, emergency response and exploration. We are now ever closer than before to have robots policing our streets (Watson, 2015). The European robot market is expected to grow to \$66.4 billion by 2025 (NSPYRE, 2015), and we expect to see proportional growth in Australia.

IBM'S WATSON

Watson is a machine developed by IBM as part of a grand challenge that took part in the nationally televised quiz show *Jeopardy*. Watson competed against two of the best human competitors in the game and beat them (Guizzo, 2011; Ferrucci, 2012). Watson can directly and accurately answer people's questions over a broad domain of human knowledge with a high degree of confidence. In *Jeopardy*, Watson needed to make a decision within three seconds, including critical decisions like when to buzz in and how much to bet. Watson's achievement was possible due to the advancement of technologies in multiple disciplines such as Natural Language Processing (NLP), Information Retrieval (IR), Machine Learning (ML), Knowledge Representation and Reasoning (KR&R) and Parallel Computing.

WATSON BEYOND JEOPARDY

Watson's deep language-processing capability has made its way to applications such as healthcare and customer support. Watson is used for oncology to help oncologists to make more informed treatment decisions. Watson analyses a vast array of data coming from different sources and identifies potential evidence-based treatment options. In essence, Watson works as a couple of knowledgeable and experienced colleagues to an oncologist. Another healthcare application is clinical trial matching. Watson helps clinicians to find the potential list of clinical trials for which a patient is eligible. This increases the likelihood of a patient getting an offer for the trial and also contributes to the success of the trial through effective recruitment of patients. In customer support, Watson is used to handle customers' calls in call centres.

WATSON IN AUSTRALIA

Watson has already arrived in Australia. The Watson-based financial services application has been used by ANZ in Australia to offer investment advice by analysing customer profiles (Henschen, 2015). Deakin University launched a Watson-powered student engagement adviser in February 2015 (Deakin University, 2015). Students can ask a question of Watson and get personalised advice based on the student profiles recorded in the university database.

INTERNET OF THINGS

The Internet of Things (IoT) is emerging as the next big technology megatrend. Merging physical and cyber worlds by connecting billions of devices, the IoT will open up new opportunities for businesses, governments and individuals. Intel predicts that there will be 200 billion devices connected by 2020 (Intel, 2014). We have already witnessed a large number of IoT applications in operation. In the transport sector, the intelligent freight trucks application collects real-time data using sensors in commercial trucks, and analyses those data to optimise safety and reduce fuel consumption (Intel, 2014). In the agriculture sector, the precision agriculture application collects real-time data on weather, soil, air, crop maturity and so on, to perform predictive analysis so that a farmer can make smarter decisions on how to maximise food production, reduce cost and minimise environmental impact (IBM, 2015). Other industries that have started to exploit the full potential of IoT include manufacturing and retail.

GOLDEN ANNIVERSARY OF MOORE'S LAW

In 1965, Gordon Moore made a prediction that computing power would double every year, driving the cost

down. His prediction is still valid after 50 years. The following quote from the famed futurist and physicist Dr Michio Kaku (Kaku, 2015) sums up the validity of Moore's law: 'Today, your cell phone has more computer power than all of NASA back in 1969, when it placed two astronauts on the moon.' The impact of Moore's law is profound in all aspects of our lives: economic, technological and social. Kaku predicts 'By the year 2020, a chip with today's processing power will cost about a penny, which is the cost of scrap paper we throw in the garbage. Children are going to look back and wonder how we could have possibly lived in such a meagre world, much as when we think about how our own parents lacked the luxuries – cell phone, Internet – that we all seem to take for granted.' (Kaku, 2014)

THE QUEST IS CONTINUING

Artificial brains are machines that have creativity and intelligence just like humans. These machines have not been built yet, but the quest is continuing. A number of projects around the world are currently working towards this. The blue brain project (Markram, 2006) is one such project that successfully simulated 1 billion neurons in November 2011. They have a target of performing full-scale human brain simulation of 86 billion neurons by 2023 (EPFL). The other project is SyNAPSE (systems of Neuromorphic Adaptive Plastic Scalable Electronics) funded by DARPA, which aims to build a new kind of computer similar to the human brain in form and function. IBM released a SyNAPSE chip on 7 August 2014 that is the one of the largest chips built by IBM. The chip can perform 46 billion synaptic operations per second by consuming as little as 70 milliwatts of power.

5 VERTICAL AXIS: EXTENT OF INSTITUTIONAL CHANGE

5.1 Substantial institutional change

The endpoint of the substantial institutional change axis describes a plausible future in which there has been substantial institutional change. In this future, the private sector has adopted digital technologies to enable a raft of small, agile businesses able to compete on a global scale. Peer-to-peer businesses have become commonplace across most industries. Governance structures have shifted from hierarchical to horizontal as governments and organisations become more transparent and decentralised.

5.1.1 DEVELOPMENTS TO STEER CHANGE

QUEENSLAND IS BECOMING A MORE DIVERSE PLACE

An average of 50% of Queensland's population growth has been driven by international migration over the past five years. In 2014 Queensland's population increased by 70,000 people, the lowest increase since 2001. Interstate migration has plummeted, from contributing 40% towards the 2003 net population growth, to just 10% today (ABS, 2014a). Queensland is becoming a more multicultural place as overseas migration has begun to drive the state's population growth (Figure 16). Historically there has been a correlation between immigration and small-business growth. The growing wave of people accustomed to different cultures will subtly change public perception concerning the role of government and business.

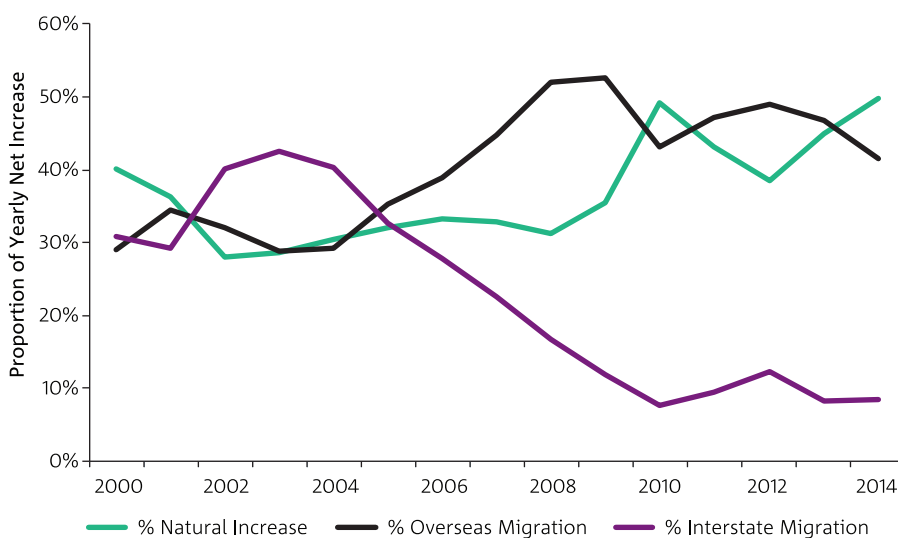
TRADITIONAL RETAIL IS DISAPPEARING

The cost-effectiveness and convenience of online stores, coupled with digital distribution models, has impacted on many traditional retailers around the world. Australia is transitioning into a services economy, with manufacturing declining as a share of GDP and professional services being the fastest growing employer over the past three decades (ABS, 2015a). To compete with online sellers at a higher cost base, bricks-and-mortar stores have begun to transition towards an experience economy model (Enders and Jelassi, 2000). Academics describe the experience economy as the next stage of a services economy. The experience economy shifts focus away from the product itself, instead building theatre and positive memories around the purchase experience (Pine and Gilmore, 1999). The Australian retailer Myer has been hard hit by changes in customer attitude and online shopping preferences. Myer's 2014 annual report speaks of a strategic shift towards the experience economy, specifically focusing on, '... the delivery of enhanced in-store theatre and experiences ...' (Myer, 2014). Digital technologies and customer preferences are forcing traditional organisations to adapt to a changing institutional landscape.

DIGITAL TECHNOLOGY ENABLES AGILE COMPANIES

The lean start-up model is a business-creation strategy that foregoes the time and money spent on early stage product research and development, instead experimenting with real customers online. This enables rapid prototyping and product revision via the low-cost marketplace of the internet (Blank, 2013; Agan, 2014). The net result is lower barriers to entry for start-up companies, coupled with access to global markets. Digital technologies have also facilitated growth in small firms with horizontal management structures (Vossoughi, 2012).

FIGURE 16. QUEENSLAND NET POPULATION INCREASE



Source: Australian Bureau of Statistics (ABS, 2014a)

These companies are able to remain more agile than their larger competitors with vertical hierarchies. Digital technologies have enabled a future of substantial institutional change, in which a larger number of small, innovated firms are able to cost-effectively enter the market.

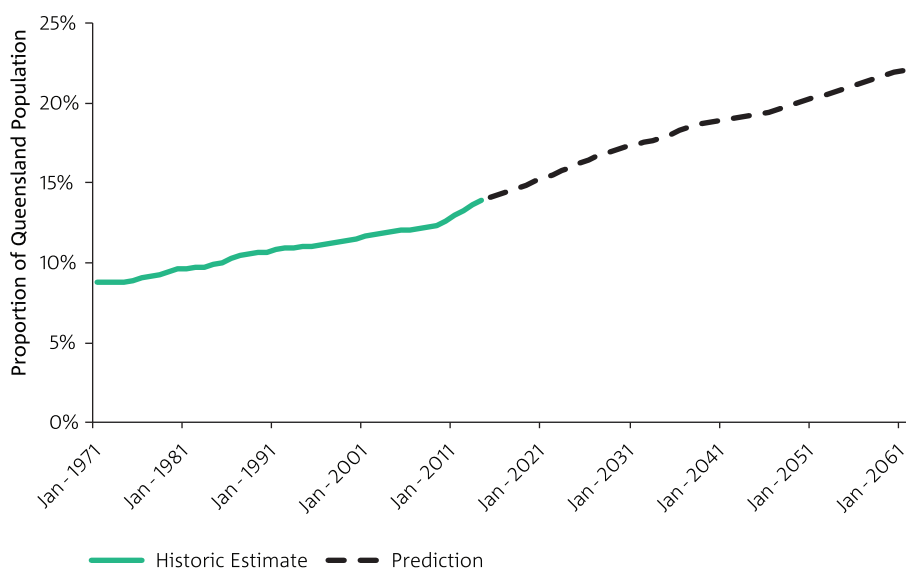
BALLOONING COSTS DRIVE CHANGE

Between 2009 and 2014, the number of Queenslanders aged over 65 increased by 124,310, which in turn increased the proportion of Queenslanders aged over 65 from 6.2% to 7% (ABS, 2014a). By 2025, the ABS predicts this proportion to reach 16% of Queenslanders (Figure 17). Academic studies indicate that 30% of all medical costs are attributed to the 5% of beneficiaries who die each year, with one third of those costs occurring in the last month of life (Barnato et al., 2004). The cost of the Queensland government's health service delivery has increased 40% since 2008–09, more than twice the rate of any other service category (Queensland Parliament, 2009–2014). With more than 50% of hospital funding coming from the states, significant pressure towards cost-reducing innovation is to be expected. In 2013–14 the total cost for health service delivery was \$12.7 billion and grew at an average of 7.26% per annum over the previous six years. If this growth rate persists over the next twenty years, the cost of health-service delivery alone would consume the entire \$50 billion state budget (AIHW, 2014). There is a plausible future where the unmet needs of the ageing population is dealt with by a more diverse private and not-for-profit sector.

REGULATING THE INTERNET PROVES TO BE A CHALLENGE

Digital marketplaces are becoming more common; however this is not always positive. Currently the largest online site for pirated media, Kickasstorrents, is regularly targeted for takedown by government regulators and corporate lawyers. In an effort to mitigate this, the

FIGURE 17. PROPORTION OF QUEENSLANDERS AGED OVER 65



Source: Australian Bureau of Statistics (ABS, 2013; ABS, 2014a)

site has adopted a policy of relocating to a new country every six months (Ernesto, 2015). Even when successfully closed, the low barriers to entry make copycat sites very difficult to control. In October 2013 the United States Federal Bureau of Investigation (FBI) closed the darknet site Silk Road, at the time the largest online marketplace for illegal drugs. Within six months Silk Road 2.0 was launched, and two copycat sites of significant size emerged. In the years since, the FBI has shut down nine major illegal darknet marketplaces, only to have the vacuum filled almost immediately by a new batch of copycats. The market for illegal drugs has continued to grow despite ongoing government intervention. Although a future of substantial institutional change may bring many benefits, not all aspects are guaranteed to be positive.

QUEENSLAND FOSTERS A VIBRANT COMMUNITY OF NON-GOVERNMENT ORGANISATIONS

They deliver community services ranging from healthcare to poverty alleviation. While large charities command more donation dollars and have a national reach, there are myriad smaller groups focusing on niche issues in local communities. Excluding primarily religious groups, 9842 charities have declared Queensland operations as of June 2015, with 53% registered as small, 15% as medium, 19% as large and 13% unspecified. The larger states of Victoria, New South Wales and Queensland have over 50% of operating charities classified as small, while small charities play a lesser role in the other states and territories (ACNC, 2014). A future of substantial institutional change, enabled by digital technology and regulation reform, could see an increasing number of niche non-government organisations complementing traditionally state-run services, as barriers to entry are removed.

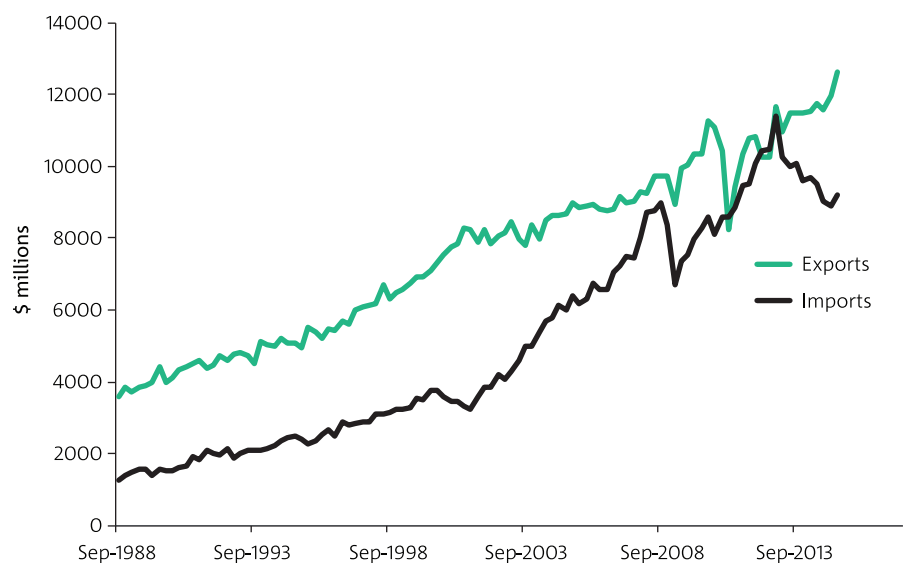
TECH START-UPS ARE EXPLODING

Start-up technology companies backed by venture capital in the United States are some of the fastest growing companies globally. These are the companies that deliver the technology that drives digital disruption on a global scale. Within this select group, time to market cap between the years 2009 and 2013 has accelerated 2.8 times for companies reaching the \$500 million milestone, three times for companies reaching the \$1 billion milestone and 3.1 times for companies reaching the \$3 billion milestone. Consumer-focused companies are accelerating faster than the enterprise companies, with listed venture-backed consumer companies growing market cap by \$600 million per year on average, compared to \$100 million per year for venture-backed enterprise companies. The top 35 listed venture-backed technology start-ups represent 70% of total market capitalisation, demonstrating that a small group is having a large global impact. Companies in this space include Palantir, which has revolutionised how intelligence agencies analyse networks of people, to the more widely recognised Uber, Dropbox and the like. Although the impacts of Queensland's start-up sector are not felt on the global scale, they do shake up local dynamics. In 2014 it was estimated that there were over 226 start-up enterprises in South-East Queensland, employing approximately 1900 people (Kruger and Cacioppe, 2014).

DIGITAL TECHNOLOGIES ENABLE NEW BUSINESS MODELS

The peer-to-peer, or sharing, economy is a decentralised model in which individuals interact to buy and sell goods directly from each other (Stalnaker, 2008). Uber and Airbnb are often in the newspaper headlines; however, they are only the tip of the iceberg.

FIGURE 18. QUEENSLAND IMPORTS AND EXPORTS (SEASONALLY ADJUSTED VOLUME CHAIN MEASURE)



Source: Australian Bureau of Statistics (ABS, 2015a)

Freelancer.com listed on the ASX in November 2013; by January 2015 there were over 13 million professionals registered on this site and \$1.5 billion worth of projects listed (Freelancer, 2015). Liquid space is entering Australia as a P2P office-leasing solution; at the same time the Property Council of Australia predicts Brisbane CBD vacancy rates will peak at 18.4% by January 2017 (Propertyoz, 2015). Early movers such as EBay are well established; however, the diversity of emerging P2P businesses is staggering. There are growing P2P markets for credit, vehicle sharing, solar power, rentals across a variety of goods, travel, skill sharing, parking, bartering, secondhand goods, pets and education, to name only a few.

CROWDFUNDING OFFERS NEW AVENUES TO CAPITAL

The term 'crowdfunding' has several definitions; however, the basic idea is that funding traditionally financed via a bank or financial institution is instead gathered from a group of individuals (Belleflamme et al., 2014). Crowdfunding structures such as rotating or accumulating savings and credit associations predate the internet; however, today's digitally connected world greatly expands the 'crowd' these models can draw from (Bouman, 1995). Small-scale crowdfunding is currently being conducted in Australia but we trail behind our peer nations. Prosper and Lending Club are the two largest P2P lenders in the United States. Between

2007 and 2012 Prosper increased total loans to small business from \$850,000 to over \$22 million, while increasing personal loans from \$4 million to \$700 million (Mach et al., 2014). With access to capital being one of the major barriers to growth in small business, a diversified lending sector may lead to a future open ocean of small innovative businesses for Queensland.

QUEENSLAND'S TRADE IS BOOMING

Since 1988 the volume of Queensland exports has been increasing on average 4.9% per annum while imports have increased by 6.8% per annum (Figure 18). By contrast, New South Wales has had exports increase by 5% per annum on average over the same period, while Victoria increased by just 4%. Western Australia has had the largest average growth rate in exports over the period, at 7.3% per annum, fuelled predominately by the mining boom. The quantity of Queensland imports exceeded exports for the first time in 2011 and again in 2012, although imports have fallen off slightly in recent years (ABS, 2015a). Between 2010 and 2014 the total tonnage of goods moving through Queensland ports grew from 270 million tonnes to 315 million tons, an increase of over 16% (DTMR, 2015). The world is becoming a more globalised place, with new markets for import and export opening up. Combined with rapidly developing third-world nations, the demand for Australian products is likely to continue to grow at similar rates into the future. Many opportunities will be created for new firms to enter the market.

5.2 Limited institutional change

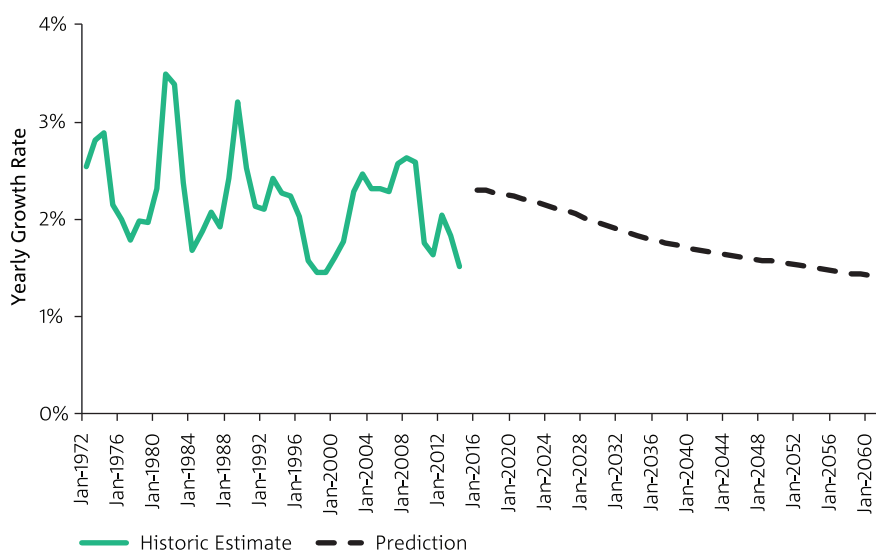
The endpoint of the limited institutional change axis describes a plausible future in which the institutional landscape of 2025 is much the same as it is today. The peer-to-peer economy is not proportionally larger, and it does not spread to as many industries as currently predicted. Governance structures remain hierarchical, especially in larger organisations. Government continues to operate in much the same way as it has since Federation. Organisations are able to use advances in digital technology to enhance current operations, but they themselves are not radically altered.

5.2.1 LIMITATIONS TO DEVELOPMENT

POPULATION GROWTH IS SLOWING

Queensland's year-on-year percentage growth rate is predicted to trend downwards until 2060, according to ABS projections (ABS, 2013) (Figure 19). Between September 2009 and September 2014 Queensland's population growth rate dropped from 2.5% to 1.5% per annum, with the yearly net population increase falling from 100,000 people to 70,000 people (ABS, 2014a). Regions experiencing large population growth are faced with the challenge of servicing a larger population. Queensland is not facing the same population-driven pressure as other states in Australia. A slower growth rate will put less upwards pressure on delivery of government services;

FIGURE 19. QUEENSLAND POPULATION GROWTH RATE



Source: Australian Bureau of Statistics (ABS, 2013; ABS, 2014a)

however, there may be implications for the private sector if population growth fails to keep pace with labour demand.

THERE ARE CHALLENGES AHEAD OF THE PEER-TO-PEER ECONOMY

Digital technology has enabled new business models that globally crowd source delivery of their core business. Kaggle, which was founded by an Australian, sources the minds of data scientists around the globe to tackle commercial problems in the big data space. Airbnb and Uber have both entered the Australian market in the last five years. Both companies are growing rapidly, without owning a single taxi or hotel room. Between November 2012 and December 2014 Uber claimed 22% of the electronic taxi payment market (Pocketbook, 2015). Regulation of these new businesses has proven to be a difficult task, exemplified by Uber’s continuing operation in Queensland, despite government sanctions. The crowd-sourced model promises a future in which a wealth of diverse businesses

operate in a shared economy but there is still resistance to change. Couchsurfing.com was an early entrant to the market, but without regulation it became entangled with a raft of violence and sexual assault cases (News.com.au, 2015). Search volume for couch surfing on Google is down to 20% of the 2009 peak (Google, 2015b). Uber is likewise facing resistance from incumbent taxi industries globally, with violent clashes between Uber and taxi drivers taking place in South Africa throughout July 2015 (smartraveller.gov.au, 2015). Although Uber and similar P2P businesses continue to grow, there is no absolute certainty of their sustainability.

FUNDING SHORTFALLS CONSTRAIN BUSINESS

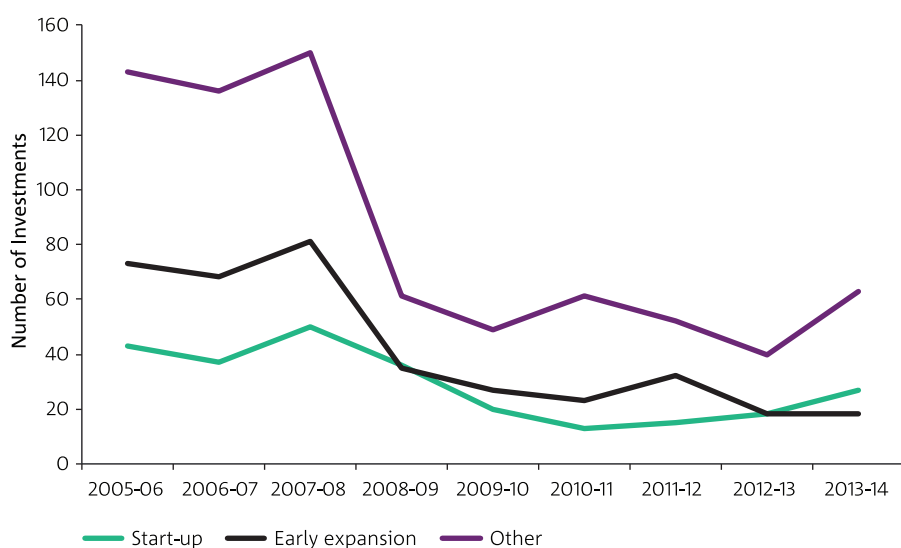
Digital technologies have created many opportunities for entrepreneurs and small businesses; however, capital is still a significant barrier to entry and growth (Figure 20). In Australia, venture-capital investment has dried up post-GFC (ABS, 2015c). The United States, on the other

hand, has drastically increased funding for small business and venture capital for entrepreneurs, which in turn has been correlated with a small business-driven economic recovery (PWC, 2015). Economic and cultural analysis shows that Australia offers an environment conducive to entrepreneurialism, and government policy is supportive of small business (Budget.gov.au, 2015; GEDI 2015). However, business confidence remains low post-GFC and trends in venture capital speak to a wider scarcity of capital for small business and entrepreneurs (NAB, 2015).

REFORM IS DIFFICULT TO REALISE

A future of substantial institutional change has the potential to reshape government to the same extent as the private sector; however, historically, Australian governments have shown resistance to change. In 2008 the Queensland government moved to amalgamate local councils, condensing 157 regional councils into 73. Local governments and ratepayers objected to this move and an ongoing lobbying campaign began (LGAQ, 2015). In 2013, ratepayers from four former shires in the Noosa region voted for de-amalgamation. In October 2005, the Western Australian government began a review into local government reform, which recommended amalgamations in its final report (LGAB, 2006). In 2015, planned amalgamations were defeated in a vote by local ratepayers in five of the thirty councils targeted for amalgamation (ABC, 2015). Although digital technologies can facilitate structural reform in government, the will of the people is still required. Australians have shown significant inertia towards governmental reform, especially if it affects them.

FIGURE 20. NEW INVESTMENTS BY AUSTRALIAN VENTURE-CAPITAL FIRMS

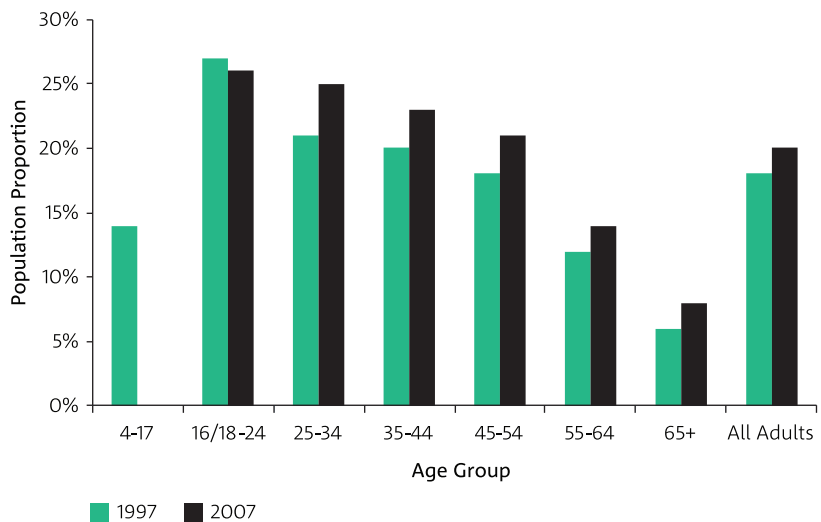


Source: Australian Bureau of Statistics (ABS, 2015c)

MENTAL HEALTH IS AN ISSUE IN THE OFFICE

Computing devices allow employees to stay connected to work at all times, which can result in heightened stress. A study conducted across two investment banks during the early adoption of the Blackberry, and then five years later, showed hyper-connected users increased work stress levels over time (Maccormick et al., 2012). The Australian National Survey of Mental Health and Wellbeing shows that, at some time during their life, around 45% of Australians aged 16–85 will experience a common mental health-related condition. Between 1997 and 2007 the number of people experiencing common mental health conditions increased in all but one age group (ABS, 2007; AIHW, 2015) (Figure 21). A world of increased digital connectivity may have mental health consequences that may also slow the rate of institutional change. Traditional workplace environments may become more desirable for an increasing number of affected people.

FIGURE 21. PREVALENCE OF COMMON MENTAL HEALTH DISORDERS IN THE AUSTRALIAN POPULATION, 1997–98 AND 2007

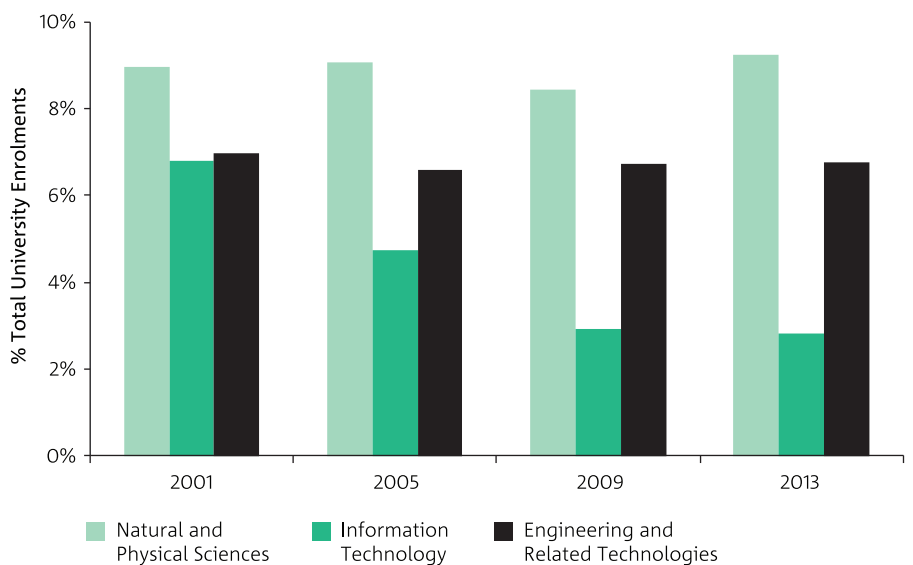


Source: Department of Health (DoH, 2013)

AUSTRALIA LACKS SUFFICIENT WORKERS WITH ADVANCED IT SKILLS

A future of substantial institutional reform promises to be driven by technological advancement and societal change, leading to a new institutional landscape. However, a technology-driven transformation requires a workforce with information technology skills and an innovative mindset. Over the past decade enrolments in sciences courses, including mathematics, have remained steady (DoE, 2013). Enrolments in information technology degrees, however, have been declining since 2001 (DoE, 2015). The World Economic Forum Global Information Technology Report ranks countries based on the global competitiveness of their IT capabilities (Bilbao-Osorio et al., 2014). Between 2012 and 2014 Australia dropped from 11th globally in IT skills availability to

FIGURE 22. DOMESTIC STUDENT UNIVERSITY ENROLMENTS



Source: Department of Education (DoE, 2015)

20th position. With a shrinking pool of skilled IT professionals, a future resulting from digitally driven institutional change will be difficult to realise (Figure 22).

RED TAPE NEVER DISAPPEARS

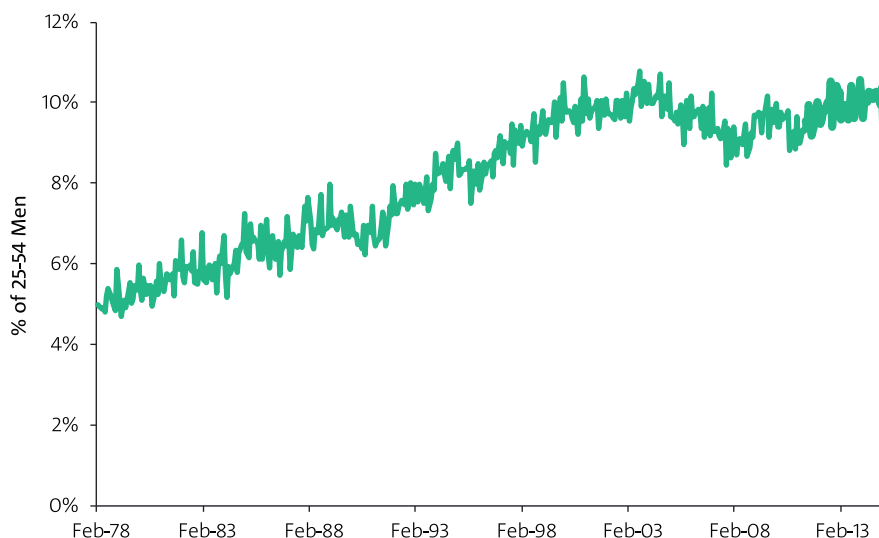
Bureaucratic 'red tape' is currently estimated to cost Australia \$65 billion per year, or 4.2% of GDP (DFAT, 2014). In 2014 the federal government launched an annual deregulation report in an effort to reduce this figure. However, from a historical point of view, red tape never appears to decline. Each new piece of legislation introduced is tempered by the values to which people in our society subscribe. Red tape arises from government's responsiveness to these values. As the world becomes a more diverse and complex place, governments are forced to regulate across an ever-increasing list of issues (Kaufman, 1977). While red tape is not intrinsically bad, it can serve as a barrier to entry or growth for business. As business interactions in a globalised world become subject to regulation from multiple nations, under-resourced small businesses may be unable to handle the administrative workload. There is a possible future in which only larger companies are able to devote the resources to effectively navigate a complex web of global regulation.

FEWER PEOPLE ARE WORKING

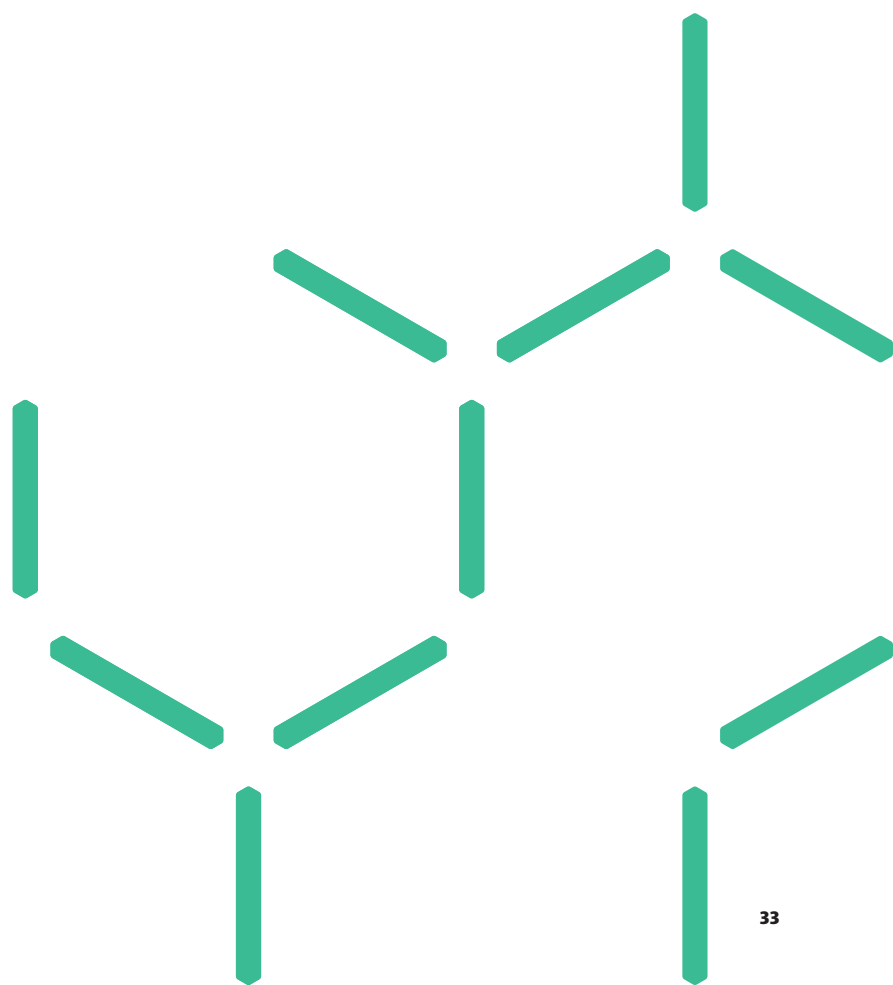
A negative result of globalisation and technological advancement has been a decrease in labour force participation by people of working age (Figure 23). The percentage of Australian men aged 25 to 54 who are not in the labour force has increased from 5% in the late 1970s to 10% today. The decline in workforce participation has been correlated with slowing growth for jobs of lower ANZSCO skill levels (ABS, 2015d). The mining

boom suspended the trend by offering high-paying, low-skill jobs in mining and related services, although these jobs are now disappearing. A future in which smaller, agile firms leverage technology-driven productivity increases and a highly skilled workforce may be detrimental to a sizeable number of Australians who are unable to retrain or up-skill. There is a plausible future in which government protects a number of large industries offering low-skill jobs.

FIGURE 23. AUSTRALIAN MEN AGED 25–54 NOT IN THE LABOUR FORCE



Source: Australian Bureau of Statistics (ABS, 2015d)



6 THE SCENARIOS

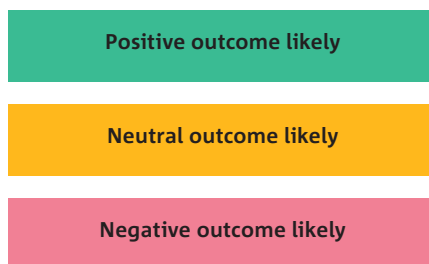
This section examines four scenarios concerning plausible future environments, covering the intersections of the digital and institutional axes discussed earlier in the report. The scenarios are analysed at the Queensland level, under the assumption that the scenarios occurs globally. In reality, however, different organisations and jurisdictions will change at differing paces. A future where the world changes but Queensland remains the same will have a profound impact on the state's economy and society. Likewise, at the micro level, there will be a heavy impact on organisations that do not change while their industry does.

The purpose of this section is not to describe one scenario as more desirable than another. Neither is it to encourage government to influence the world towards a particular destination. The butterfly effect shows that small changes can lead to unpredictably large cumulative impacts. By preparing for a series of plausible futures, the robustness of any given strategy is enhanced.

The four scenarios are associated with trade-offs. The trade-offs are represented by circular charts (also called 'wheel-and-spoke diagrams') showing the likelihood of positive, negative and neutral (unclear) outcomes (Figure 24). It is stressed that government, industry and society can do much to change the likelihood of positive and negative outcomes for Queensland's marketplace for public services. However, the scenarios are created by powerful drivers and lie beyond the direct and full control of any one organisation.

The trade-off wheel-and-spoke diagrams contain eight criteria that can be used to evaluate the overall performance

FIGURE 24. LEGEND FOR SCENARIO TRADE-OFF WHEEL-AND-SPOKE DIAGRAMS



and quality of the Queensland public service delivery sector. These criteria are measured at three levels (positive, neutral and negative) based on judgements by the CSIRO research team. The criteria relate to outcomes occurring over the next ten years and are described as follows:

- *Workforce stability.* This is about the adjustment pains experienced by the predominately public-sector workforce as a new service-delivery ecosystem emerges. While it can be managed, deep and far-reaching changes in staffing numbers, roles, structures, cultures and reporting lines may be associated with short-term challenges and instability.
- *Government debt reduction.* The delivery costs for public services is a major expenditure item for the Queensland government and will have an impact on its ability to reduce debt levels. Some scenarios are associated with lower cost service-delivery systems more conducive to debt reduction.
- *Even distribution of benefits and costs.* Changes in the public service-delivery landscape are unlikely to impact all Queenslanders in the same way. Some of the scenarios may be

associated with increased or decreased wealth, or income disparity, and/or access to services.

- *Economic growth.* Government spending patterns and policies can have an impact on economic growth both in the short and long term. This criterion captures the possible differences in economic growth associated with the scenarios.
- *Efficiency of services.* The amount of expenditure, staff time, effort and risk involved in a service-delivery transaction may be decreased under some of the scenarios.
- *Access to services.* A key objective for the public service-delivery system is to improve access for all Queenslanders to services by removing barriers (such as time, cost, distance, complexity). The scenarios are associated with the creation and removal of barriers.
- *Quality of services.* The quality of the service relates to the extent to which the customer's needs have been met and their perception of service standards. Some of the scenarios may be associated with changes in service quality.
- *New opportunities for private businesses.* Many small, medium and large businesses are able to supply services to citizens or to the government departments that supply the services. The scenarios may create new opportunities for growth in the private sector.

The following sections describe the characteristics and future conditions associated with each of the scenarios. The trade-offs and performance against the criteria are also shown using the wheel-and-spoke diagrams.

6.1 Scenario 1: Heritage

The Heritage scenario represents a future of shallow digital emersion and limited institutional change (Figure 25). Despite steady advances, technology penetration is bumpy and uneven. There is little change to business models in the private sector, and government operates in much the same way as today. Whilst the adjustment pains for government, industry and society are avoided there is little in the way of innovation and inefficiencies rise. This will have implications for the quality of services, public debt and the Queensland economy.

The following dot points give an example of potential future global events under this scenario:

- Net neutrality overturned, allowing large corporations to purchase the lion's share of available internet bandwidth, leading to a small number of large firms dominating the online space.
- Several governments claim sovereignty of their domestic internet, creating strict rules concerning what can and cannot be accessed or shared.
- A pattern of cybercrimes and data breaches undermines consumer confidence, reducing growth in online business.
- A loss of trust, and therefore use, of online service options among customers with a preference to keep using traditional models.
- Business confidence remains low in Australia, reducing venture capital and other funding available to new and innovative businesses.
- Technology-driven institutional change occurs in Australia at a slower rate than other developed nations as the pool of skilled IT professionals continues to fall short of demand.

FIGURE 25. HERITAGE SCENARIO TRADE-OFFS



- With a slower rate of change, fewer jobs are made redundant via computerisation or outsourcing. Australia has lower unemployment and a more stable workforce.
 - Primary and secondary education continues to be delivered by different teachers across different schools; 'massively online open courses' do not substitute this.
 - The cost of health for services will overwhelmingly contribute to a growing budget deficit, as health costs continue to balloon at current-day rates.
- What this could mean for Queensland:
- Industry is not drastically reshaped. For example, mining employment will decrease with the market cycle, but driverless vehicles and automated mines will not eventuate on any large scale to disrupt employment.

- Transport networks are operated in the same manner as today, driverless vehicles do not take over the roads, and trains, ships and planes continue to be operated by people. The planning of these networks continues to require large amounts of human input.
- At the community level, tangible events and spaces are demanded. Government-funded digital communities are of little interest to the public.
- Policing is carried out in much the same way as today. Overall public safety is soundly managed using traditional techniques.
- Slowing population growth in Queensland reduces pressure on cost-induced reform for both government and the private sector.

6.2 Scenario 2: New Order

The New Order scenario represents a future of shallow digital emersion coupled with substantial institutional change (Figure 26). In this scenario, there is slowing growth in technology for service delivery. However, there is much innovation and reshaping of business models and organisational structures. Existing technologies put to work within new institutional arrangements prove effective. Many of the impacts against the criteria are unclear or neutral.

The following dot points give an example of potential future global events under this scenario:

- The prevalence of mobile devices and high-bandwidth applications brings us close to the wireless-spectrum ceiling. New devices and technologies cannot be incorporated into offices without first creating space by removing existing devices and applications.

FIGURE 26. NEW ORDER SCENARIO TRADE-OFFS



- Legacy systems remain integral to the core business of many organisations. Cost and a proven track record of performance disincentivise upgrades to modern systems.
- The promise of big data falls short of expectations. Companies previously scrambling towards technology solutions for data warehousing shift their focus to other areas of the business.
- An increasingly globalised world opens up new opportunities for import–export operations. A raft of agile businesses spring up to navigate the intricacies of international trade.

- Firms become more welcoming of telecommuting for certain roles. Regional hubs offering hot desks with video-conferencing technology save employees long commutes to city centres.

What this could mean for Queensland:

- Queensland’s population growth continues to be fuelled by international migration, leading to a more multicultural state. This mix of different cultures leads to a fusion of business models and company structures from different regions of the globe.

- Rapid cost growth associated with an ageing population causes government service delivery to fall short of demand. Non-government organisations and private operators expand their scope through new businesses and restructures to meet this demand, without the need for new technology.
- Secondary education undergoes a refocus as low-skill white-collar and service jobs are increasingly automated or outsourced. Vocational education gains in popularity, with increased uptake by students starting from late high school.
- Regional office hubs from which people can telecommute change the dynamics of town planning. Traffic congestion grows evenly with population and becomes easier to manage.
- Current-day mobile apps and video recorders bring citizens into the fold of public safety. Crimes are increasingly recorded by multiple bystanders. Unsafe situations are rapidly brought to the attention of appropriate parties.

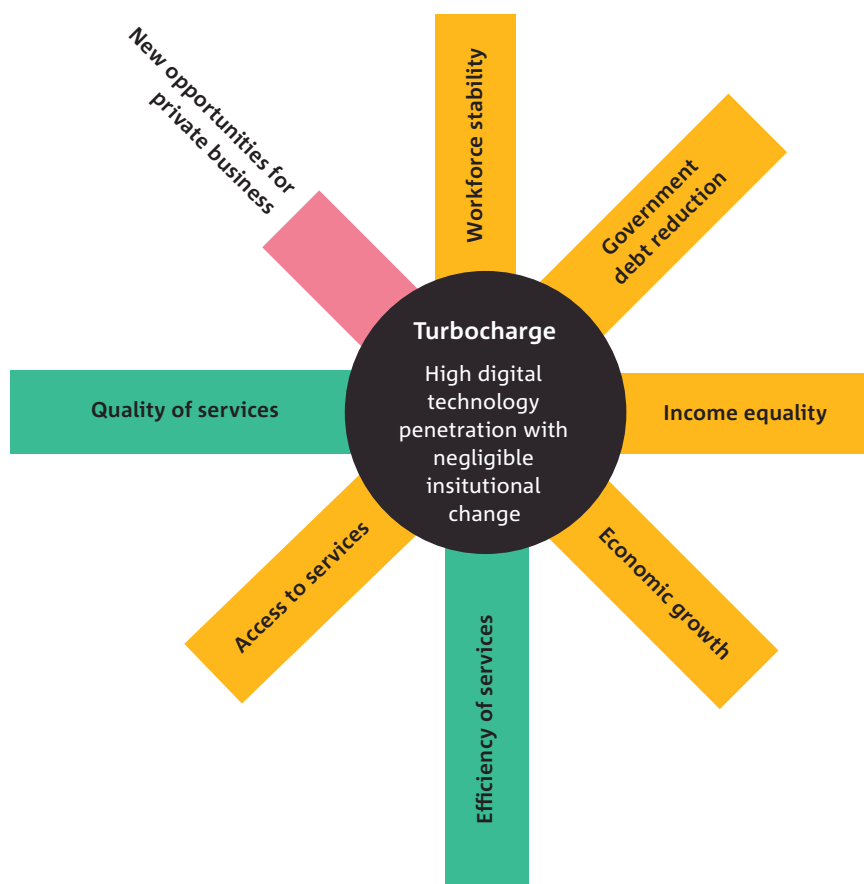
6.3 Scenario 3: Turbocharge

The Turbocharge scenario represents a future of deep digital emersion coupled with limited institutional change (Figure 27). In this scenario, information technology experiences rapid advances and service-delivery systems are able to draw on a much wider range of powerful gadgetry. However, there is little change to the existing institutional landscape. New and powerful technologies are dropped into the existing structures.

The following dot points give an example of potential future global events under this scenario:

- Growth in online service delivery continues unabated until digital delivery is considered standard for

FIGURE 27. TURBOCHARGE SCENARIO TRADE-OFFS



all appropriate services. However, services are not significantly changed.

- Processing power continues to grow exponentially, increasing the speed at which applications and database queries can run. Although software is not drastically different, the improvements in speed and usability considerably increase uptake.
- Services in the peer-to-peer economy prove difficult to regulate. A series of cyber breaches, violent crime and variable quality sees P2P remaining a niche subset of the economy.
- Government continues to operate in much the same way it has since Federation. Technology enhances capabilities but government is not reformed around technology.
- The constant connectivity of modern social networks is correlated with higher levels of work related stress. Organisations return to traditional corporate environments in an effort to improve their employees' wellbeing and productivity.

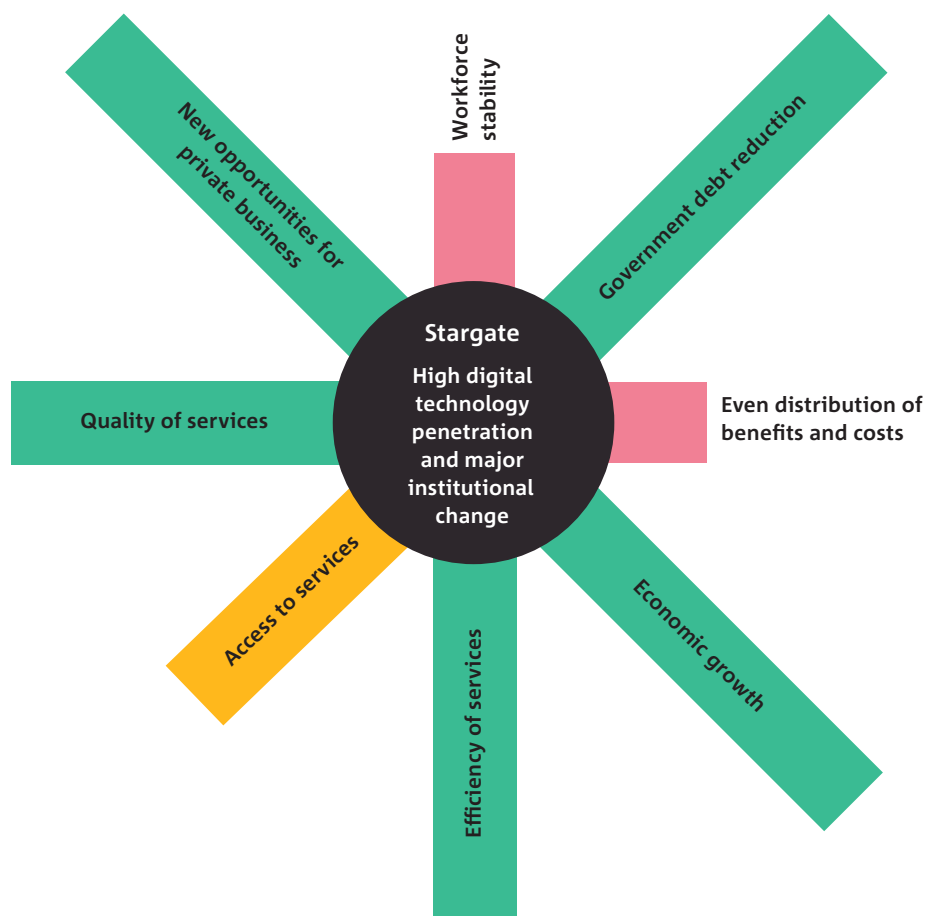
What this could mean for Queensland:

- The number of Queensland households with broadband access continues to increase at its current pace. In the next ten years, nearly all dwellings have access to high-speed internet. Government service centres decrease in size, as more transactions are handled online.
- Driverless vehicles begin to operate on mine sites and in factories but are not deemed suitable for open roads. Liability issues guarantee regulations remain in favour of human drivers.
- Swathes of low-skill white-collar and service jobs are computerised. Vocational education providers come under pressure as large portions of the workforce suddenly seek retraining. The transition period weighs heavily on public optimism.
- Sensor networks across transport systems allow for fine-tuning of vehicle flows and better adaption to current traffic situations. Moderate efficiency gains are made.
- Predictive analytics is applied across a range of public safety issues. Emergency services and police officers are able to be allocated in ways that substantially reduce risks.

6.4 Scenario 4: Stargate

The Stargate scenario represents a future of both deep digital emersion and substantial institutional change (Figure 28). Under this scenario there is a reinvention of the current institutional landscape combined with rapid advances in digital technology with deep and broad penetration. Queensland’s service-delivery sector of 2025 is vastly different and, in most ways, vastly improved from today. The government service-delivery landscape is completely reshaped with new service providers, new delivery

FIGURE 28. STARGATE SCENARIO TRADE-OFFS



models and new technologies. This delivers major benefits via long-term debt reduction and economic growth. However, it is also associated with major adjustment challenges for government departments, public-sector staff, community organisations and private companies. These challenges can be met through wise choices and effective management.

The following dot points give an example of potential future global events under this scenario:

- E-government reaches rapid maturity in Australia, with a majority of government service delivery taking place online. Services are transformed for optimal digital delivery.

- Citizen choice for customised service experiences break down traditional government ‘one size fits all’ business model, with new entrants bundling government and other services to meet their needs.
 - Autonomous vehicles become commercially ready, and government swiftly passes regulations to integrate them onto Australian roads.
 - Big data and deep-learning algorithms are applied to optimise business performance, enhance public health, streamline global financial systems and myriad other tasks.
 - Robotics and computerisation replace many repetitive, low-skill jobs. This creates issues with retraining and unemployment but opens new high-skill professions.
 - Businesses are forced to restructure around a digital world. Large retailers reimagine their stores around the experience of shopping to compete with online distributors.
 - Digital tools allow companies to prototype products and business models rapidly at low cost. Barriers to entrepreneurialism are lowered and the number of small innovative businesses increases.
 - Peer-to-peer becomes a major component of the economy, expanding into most industries, and drives employment and trade at the expense of large incumbent organisations.
 - Government becomes a platform for service delivery.
 - Advances in cybercrime capabilities allow law enforcement agencies to substantially improve the safety of online experiences.
 - A new generation of encryption algorithms and data-handling systems deliver far superior levels of privacy for citizens and government, allowing collaborative service-delivery systems to operate smoothly.
 - While many benefit, sections of the workforce and society struggle to make the transition and are at high risk of marginalisation.
- What this could mean for Queensland:
- The workforce is made to up-skill as routine jobs are progressively automated. This risks the creation of an underclass unable to transition into the new higher skill jobs that emerge as productivity increases.
 - Emergence of wearable sensors combined with big-data analysis allow for early low-cost interventions for emerging illnesses, vastly decreasing the load on the public hospital system.
 - The education system is rebuilt around delivering lectures from the best teachers globally. Class rooms exist and are staffed with tutors, but core content is delivered digitally as interactive media from world-class teachers in the most prestigious institutes.
 - Community groups shift their core activities online and are able to operate with reduced funding. More services are delivered and by fewer staff, with a greater impact on the community.
 - Road networks are rebuilt with automated vehicles in mind. Traffic lights and pedestrian crossings disappear. Freight is automatically scheduled. Fewer roads need to be built as traffic is close to perfectly optimised.
 - Predictive analytics coupled with widespread sensor networks and growing big-data processing power drastically decrease the toll of natural disasters on Queenslanders. Public health and safety issues are identified before they become a serious issue. Uniformed police are distributed based on stochastic models in a way that deters the maximum amount of crime.

7 STRATEGY EVALUATION FRAMEWORK

7.1 From scenarios to strategy

The scenarios identified in this research are mostly exogenous to the Queensland state and local government agencies responsible for the delivery of public services. This means that, while government departments can influence future directions, they cannot completely control what happens. Government, industry and community groups will need to respond to these scenarios. A response to scenarios takes the form of a strategic plan.

A strategic plan is a statement of interlinked actions that achieve a desired outcome for an organisation or society at a future point in time. Strategy can be considered the process through which descriptions of plausible futures captured via foresight are converted into practical actions. Most large organisations have a strategic plan for the coming years or decades. The time horizon varies widely. Many corporations use a strategic planning cycle of one to five years for successive updates, due to the changing operating environment, and may plan for up to twenty (or more) years into the future.

A strategy document can be a broad statement of intent about an organisation's vision, purpose, objectives, functions and culture. Often a strategy document will identify areas within the organisation for investment, divestment and restructuring. A strategy document may identify new markets, research priorities, operating systems and targeted acquisitions of assets or other companies. Many strategic plans include a statement of strengths, weaknesses, opportunities and threats, and a set of key performance indicators to evaluate progress towards objectives.

7.2 Building on existing strategic frameworks

Queensland government agencies have a range of formal and informal strategic plans relevant to the future delivery of public services. The formal strategic plans are typically updated on an annual basis and look four–five years into the future. The following Queensland government agencies, involved in delivering the bulk of public services (in terms of expenditure), have current strategic plans:

- The Department of Communities, Child Safety and Disability Services has a 2015–19 strategic plan that outlines 'how we will enable vulnerable Queenslanders to participate in and contribute to a fair, resilient and prosperous Queensland'. The plan identifies 'digital' as a 'game changer' for the department. The list of priority actions does not specifically refer to digital technologies but does identify 'facilitating responsive and integrated services'.
- The Queensland Department of Transport and Main Roads has a 2015–19 strategic plan that defines the department's vision and purpose and provides a 'blueprint to delivering on the government's commitments'. The plan recognises the pace of technological change and the impact of disruptive events as external factors impacting the department.
- The Queensland Department of Health 2015 update of the 2014–18 strategic plan 'outlines the department's strategies for supporting the health and wellbeing of all Queenslanders'. The plan's performance indicators relate to improved efficiency and quality of healthcare services.

- The Queensland Police Service has a 2015–19 strategic plan that 'outlines the direction for the Queensland Police Service and the strategies for delivering effective policing' and is updated on an annual basis. The plan identifies technological trends as key strategic challenges and risks.
- The Queensland Department of Education and Training has a 2015–19 strategic plan that 'sets the direction for the department to deliver high-quality learning and skilling opportunities for all Queenslanders'. The plan identifies 'fit for purpose and future focused infrastructure and ICT' as an important supporting service for education.

There are many other strategic plans held within Queensland state and local government agencies. These documents are important and valuable mechanisms for informing future decisions about the delivery of public services in Queensland. Many of these strategic plans make reference to the impact of digital technology and the likely disruption to existing service-delivery models. However, as a general rule there is limited explicit consideration of the impacts and proactive response to digital technology disruption.

The scenarios presented in this report identify the possibility of profound changes to service-delivery models and structures that go beyond simple computerisation of current manual or paper-based transactions. Digital technology advances, and the institutional change happening in parallel, mean the marketplace for public services could be fundamentally restructured. Furthermore, this restructuring is driven by commercial and societal forces beyond the direct control of government departments.

Therefore, there is value in evaluating both existing and new strategies for public service delivery in light of the scenarios developed in this report.

Another consideration relevant for the design of strategic responses to the scenarios is the cross-sectoral and cross-agency nature of digital-technology disruption. It may be more efficient to have a centralised strategic response rather than numerous strategies all attempting to solve the same problem. However, it may also be necessary to have in-built redundancy (via multiple strategies) to ensure that all areas of public service delivery continue to function satisfactorily and improve over time. This document cannot prescribe a single correct pathway – which may involve aspects of both centralised and distributed strategy – however, the issue is raised as being worthy of consideration as the Queensland government and public–private sector partner organisations plan for a digital future.

7.3 Combing decision theory and scenario planning

A formalised process for evaluating strategies in light of multiple scenarios was first proposed in 2001 in the *Journal of Management Sciences* by United Kingdom-based researchers Paul Goodwin and George Wright, from the University of Bath and the University of Strathclyde. This approach has been expanded on and tested in real-world situations by other researchers. The Goodwin and Wright method involves the application of multiple criteria analysis – a commonly applied technique within the field of decision theory – to evaluate strategies under the full range of possible futures. Decision makers can then choose, implement and monitor the strategy that performs best.

Multiple criteria analysis (MCA) is a technique to evaluate (and choose) a finite set of options against multiple objectives. It is also referred to as multiple objective decision making, multiple attribute utility theory and other similar names. The technique emerged within the field of operations research during World War II when allied forces needed to make difficult trade-off choices in light of multiple military objectives. Today MCA has widespread application within agriculture, environmental management, banking and finance, urban planning, energy planning and many other fields. It is applied within the field of management science to evaluate strategies in light of numerous scenarios describing plausible futures.

An MCA process is broken up into three main phases (Figure 29, page 42). In the first phase, organisational objectives are identified along with performance criteria that measure (at either ordinal or cardinal levels of measurement) the extent to which the objectives are met. When there are many objectives and criteria, a hierarchical structure may be used to manage complexity. The first stage also involves the identification of a finite set of decision options. In this case the decision options are strategic actions relating to the digital marketplace for public service delivery in Queensland. The strategic actions may be implemented by a government department, the entire government or a mix of government, community and industry organisations.

The second phase of the process involves decision analysis through constructing an evaluation matrix that contains the decision options as rows and the performance criteria as columns (Figure 30, page 43). The evaluation matrix is populated with performance data such that each cell (occurring at the intersection of a row and column)

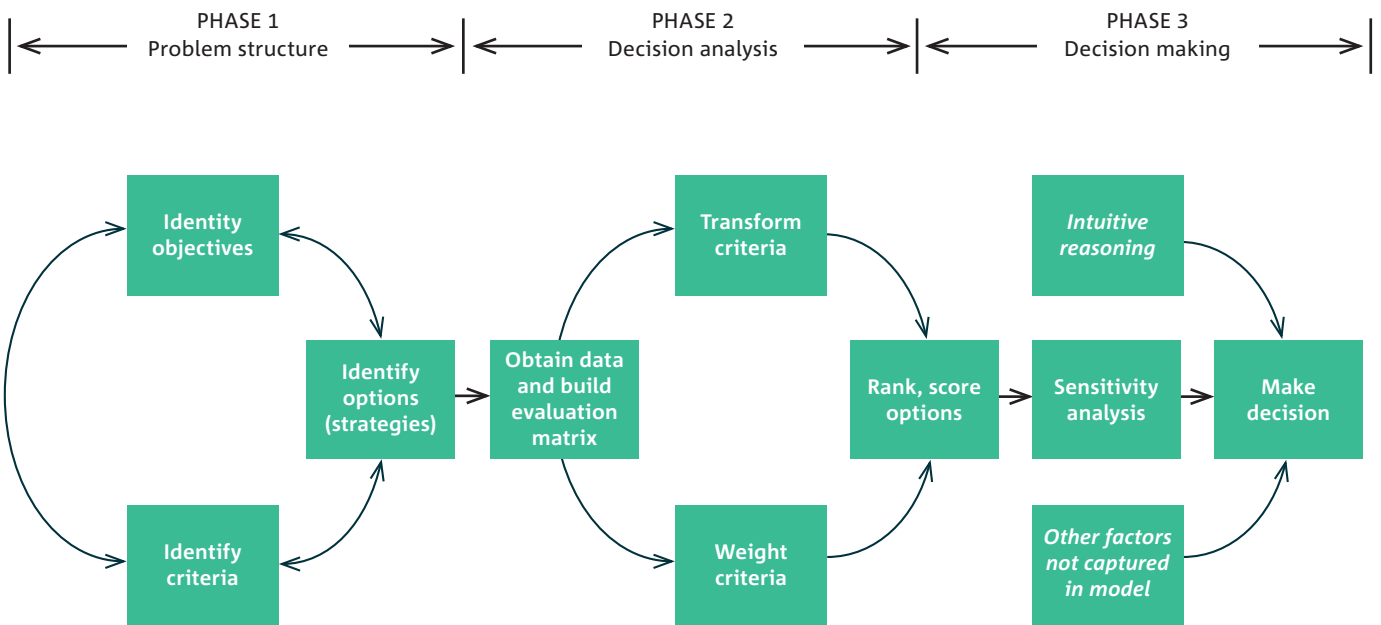
Decision options (Strategies)

In this case, the decision options are the set of existing and/or new strategies designed to achieve improved public service delivery in Queensland. The strategy contains a set of sequenced and interlinked actions that achieve a desired outcome. The new strategies are identified through an iterative and consultative process of ideation.

holds performance data. The criteria may be in different measurement units (such as dollars, population counts and years). If this is the case they need to be transformed into commensurate 0–1 scales so they can be combined. The objectives and criteria rarely hold equal importance to the decision maker so they may also be weighted. One weighting technique involves allocating percentage points across all criteria ensuring the sum total is 100%. The weights and performance data are then combined via a range of algorithms (ranging from simple to complex) to derive an overall score and ranking of the decision options (alternative strategies).

There is an important difference between using MCA to evaluate strategies in a scenario-planning exercise compared with normal use of MCA to just evaluate options. In a scenario-planning exercise, multiple future states, and therefore multiple versions of the evaluation matrix, are possible. This is because the performance of a single strategy will be different under different scenarios.

FIGURE 29. MULTIPLE CRITERIA DECISION ANALYSIS PROCESS



This means the evaluation matrix must be populated under each identified scenario. Multiple evaluation matrices mean multiple rankings and scoring of the decision options (strategies). Different methods of aggregation are used to obtain a final score, such as rank on minimums, maximums, means or medians.

The third phase involves sensitivity analysis and making a final decision (that is, selecting one of the strategies under consideration). At this stage, intuitive reasoning and other factors that could not be explicitly incorporated into the model (such as insufficient data or political sensitivities) are also given consideration. Ideally these factors are

clearly documented in a transparent manner. Sensitivity analysis allows for systematic variation of weights and methods used in the MCA model to test the stability of results. Final and binding choices can then be made. These are followed up by continued monitoring against key performance indicators and implementation of the strategic plan.

A step-by-step procedure for conducting an MCA can be seen in the appendix. This is accompanied by a worked example utilising hypothetical data.

FIGURE 30. EVALUATION MATRIX FOR A SINGLE SCENARIO (THIS IS REPEATED FOR EACH SCENARIO BECAUSE THE FUTURE STATES AND PERFORMANCE DATA CHANGE UNDER ALTERNATIVE SCENARIOS)

Objectives					
	Criterion 1	Criterion 2	Criterion 3	Criterion <i>m</i>	
	Weight 1	Weight 2	Weight 3	Weight <i>m</i>	Overall Score
Strategy 1	$X_{1,1}$	$X_{2,1}$	$X_{3,1}$	$X_{4,1}$	V_1
Strategy 2	$X_{1,2}$	$X_{2,2}$	$X_{3,2}$	$X_{4,2}$	V_2
Strategy 3	$X_{1,3}$	$X_{2,3}$	$X_{3,3}$	$X_{4,3}$	V_3
Strategy <i>n</i>	$X_{1,n}$	$X_{2,n}$	$X_{3,n}$	$X_{4,n}$	V_4

8 CONCLUSION

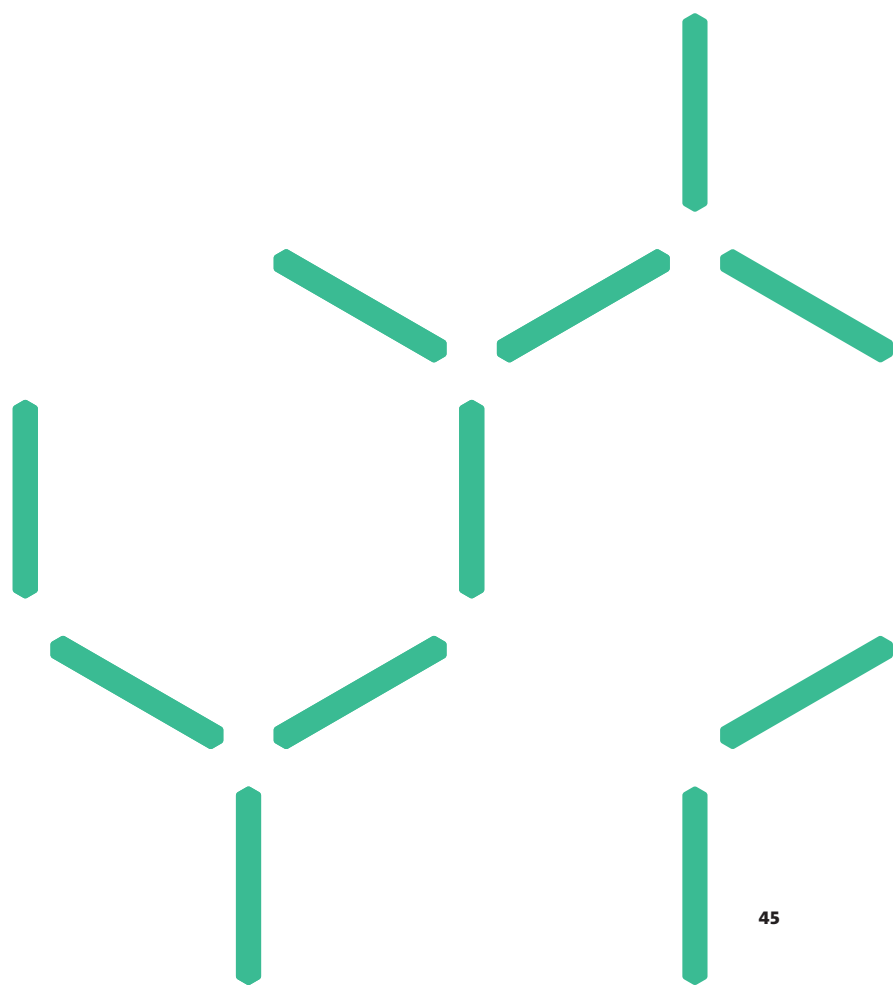
The Queensland government has seven departments spending over \$1 billion annually to deliver 1600 unique services that, to some extent, have an impact on all citizens and visitors to the state. Entertaining plausible futures for service delivery and subsequently identifying, implementing and improving service-delivery models holds vital importance for the future wellbeing of Queensland.

This report has identified four scenarios describing the marketplace for public services in Queensland by the year 2025. The scenarios include plausible futures in which increased capabilities and penetration of digital technology, combined with institutional change, radically alter the current marketplace. The rapid pace of change may exceed the capacity of current governance structures, regulatory environments and administrative arrangements to keep pace.

The change goes beyond simple upgrades or replacement of paper and manual transactions to digital versions. New service-delivery systems could have an impact on fundamental issues such as the size, structure, roles and functions of service-delivery agencies. There may be new marketplace entrants offering competitive services, and challenging existing models, via new digitally enabled models.

The expectations of customers may shift into markedly new territory. New threats such as cybercrime, data governance failures and privacy breaches could challenge the capabilities of law enforcement agencies and other government departments. Government may increasingly find itself one of many sources of information and service provision in a larger and more diverse service ecosystem.

In summary, there is a plausible future that is very different from today. The four scenarios identified in this report can be used to evaluate departmental and whole-of-government strategy for service delivery. This will help decision makers identify and select strategic directions that harness the opportunities and mitigate the risks of technology-fuelled change in the marketplace for public services by 2025 and beyond.



APPENDIX:

Wind-tunnel testing – A worked (and hypothetical) example

Based on the methods described in the report this section provides a worked (hypothetical) example of how whole-of-government strategies could be identified and evaluated using the scenarios and decision theory. The process is completed through a series of steps under three phases of evaluation.

Phase one: Problem structuring

Step 1. Identify objectives. The objectives of government in this example are (a) to reduce overall costs of service delivery and thereby improve the budgetary position of the Queensland government; (b) improve the quality of services experienced by citizens; and (c) reduce risks of failure. In reality there are likely to be many additional objectives but these provide a starting point.

Step 2. Identify criteria. In this example, we identify four criteria based on the above three objectives. The criteria are measured on a qualitative scale from 0 (worst performance) to 10 (best performance). For high-level and generalised strategy problems it is often difficult to move beyond ratings of this nature in the absence of resource-intensive modelling, forecasting and data-acquisition activities. However, if budgets permit the acquisition of quantitative (cardinal-level) data, that is desirable. In this example, we identify the following four criteria:

- Upfront Implementation costs. This relates to the initial (first few years) cost of implementing the strategy, including the information technology infrastructure costs, organisational restructure costs, staff changes, training and other costs. While in theoretical terms we should think only

in terms of net present value (that is, amortised costs) the reality is that high upfront costs create more risk, challenge and complexity for governments with many other immediate calls on public resources.

- Lifetime (amortised) costs of service delivery. This is the cost of the strategy computed through discounted cash-flow analysis and measured as a net present value over the life of the investment (such as the next 20–30 years).
- Quality and accessibility of services to citizens. This is an assessment of the user and citizen service experience in terms of how easy they are to use and access (quick, reliable, simple, for example) and in terms of how well the services meet customer needs.
- Risk of system failure. This relates to the risk of service-delivery systems experiencing an abrupt and severe failure where the services become dysfunctional or completely unavailable for a prolonged period.

Step 3. Identify strategic options. In this step processes of ideation and brainstorming are used to identify actions and portfolios of actions (strategies) that will achieve the objectives. Here we identify three hypothetical whole-of-government strategies (that would be supported by multiple, more specific actions) to achieve the objectives. The strategic options we identify are as follows:

- Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).

- A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.
- Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally ‘find its way’.

Phase two: Decision analysis

Step 4. Build the evaluation tables. In this stage, four evaluation tables are built and populated with performance data (one table for each scenario). The rows are the strategic actions and the columns are the criteria. The performance data are ordinal, rating from 0 (worst performance) to 10 (best performance), as entered based on the best judgements of the research team. In a real exercise more effort would go into the creation of this data and, where possible, statistical forecasts, mathematical models and validated expert judgements would be sought.

Step 5. Weight the criteria. The criteria are weighted using percentages that add to 100% in this example. In this hypothetical case the criteria weights have been entered by the research team. In a real application decision makers and/or stakeholders from government and partner organisations would provide the weights through some type of structured process.

Step 6. Determine overall performance scores for each scenario and an average across all four scenarios.

This is achieved here simply by multiplying the percentage weight by the performance data and then summing across columns (criteria)

to get an overall performance score for each strategy. The strategies have different performances under the different scenarios because the performance data will differ under different future states. An average across all four scenarios is one way of attaining a single and final performance score for all strategies.

Phase three: Decision making

Step 7. Conduct sensitivity analysis.

This isn't done in this example as we are dealing with a hypothetical situation, but sensitivity analysis could be used

to determine the stability of the results in response to systematic variation in weights and performance data. If the results are roughly the same under many alternative model specifications, then they are considered more stable and more reliable. Monte Carlo simulation is a technique of sensitivity analysis in which a computer program randomly generates input parameters (weights and performance scores) within defined ranges and runs the model many times (perhaps thousands) to test the stability of results.

Step 8. Make a decision. The winning strategic option is the one with the highest overall average score once all scores have been aggregated. In this final step, the decision makers review all information in the model as well as other information that could not be included in the model and then make a final choice of a strategy. It is acceptable for decision makers to disagree with model results, albeit with transparent reasons, because a model, no matter how good, seldom captures all matters of relevance to the strategic choice.

Worked Example: Evaluation of Strategic Options against Criteria Across All Four Scenarios

HERITAGE SCENARIO	UPFRONT IMPLEMENTATION COSTS	LIFETIME (AMORTISED) COSTS OF SERVICE DELIVERY	QUALITY AND ACCESSIBILITY OF SERVICES TO CITIZENS	RISKS OF SYSTEM FAILURE	OVERALL SCORE (WEIGHTS MULTIPLIED BY CRITERION SCORES AND SUMMED)
Criteria weights	15%	25%	40%	20%	
Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).	1	3	4	1	2.7
A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.	3	5	5	2	4.1
Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally 'find its way'.	9	6	6	1	5.5

Rating scale: 0 = worst possible performance, 10 = best possible performance

NEW ORDER SCENARIO	UPFRONT IMPLEMENTATION COSTS	LIFETIME (AMORTISED) COSTS OF SERVICE DELIVERY	QUALITY AND ACCESSIBILITY OF SERVICES TO CITIZENS	RISKS OF SYSTEM FAILURE	OVERALL SCORE (WEIGHTS MULTIPLIED BY CRITERION SCORES AND SUMMED)
Criteria weights	15%	25%	40%	20%	
Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).	2	7	4	3	4.3
A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.	7	8	9	9	8.5
Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally 'find its way'.	9	3	3	2	3.7

Rating scale: 0 = worst possible performance, 10 = best possible performance

TURBOCHARGE SCENARIO	UPFRONT IMPLEMENTATION COSTS	LIFETIME (AMORTISED) COSTS OF SERVICE DELIVERY	QUALITY AND ACCESSIBILITY OF SERVICES TO CITIZENS	RISKS OF SYSTEM FAILURE	OVERALL SCORE (WEIGHTS MULTIPLIED BY CRITERION SCORES AND SUMMED)
Criteria weights	15%	25%	40%	20%	
Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).	1	9	8	5	6.6
A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.	5	8	7	6	6.8
Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally 'find its way'.	9	1	2	4	3.2

Rating scale: 0 = worst possible performance, 10 = best possible performance

STARGATE SCENARIO	UPFRONT IMPLEMENTATION COSTS	LIFETIME (AMORTISED) COSTS OF SERVICE DELIVERY	QUALITY AND ACCESSIBILITY OF SERVICES TO CITIZENS	RISKS OF SYSTEM FAILURE	OVERALL SCORE (WEIGHTS MULTIPLIED BY CRITERION SCORES AND SUMMED)
Criteria weights	15%	25%	40%	20%	
Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).	2	10	9	7	7.8
A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.	5	6	7	6	6.3
Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally 'find its way'.	9	1	3	4	3.6

Rating scale: 0 = worst possible performance, 10 = best possible performance

STRATEGIC OPTIONS	OVERALL SCORES				AVERAGE
Criteria weights	15%	25%	40%	20%	
Rapid and ubiquitous transition to personalised and digital service-delivery models coordinated across all levels of government (local, state, federal).	2.7	4.3	6.6	7.8	5.3
A decentralised approach where individuals, agencies and local governments make choices about which services are digitised and what technologies or platforms are used with help from central agencies.	4.1	8.5	6.8	6.3	6.4
Business as usual, involving gradual and modest change from current systems and allowing the marketplace to naturally 'find its way'.	5.5	3.7	3.2	3.6	4.0

Rating scale: 0 = worst possible performance, 10 = best possible performance

REFERENCES

- ABC (2015). 'Perth Councils Vote Against Mergers, Defeating WA Government Amalgamation Plans'. Perth, ABC.
- ABS (2007). 4326.0 National Survey of Mental Health and Wellbeing: Summary of Results, 2007. Canberra, Australian Bureau of Statistics.
- ABS (2013). 3222.0 Population Projections, Australia. Canberra, Australian Bureau of Statistics.
- ABS (2014a). 3101.0 Australian Demographic Statistics, Sep 2014. Canberra, Australian Bureau of Statistics.
- ABS (2014b). 8146.0 Household Use of Information Technology, Australia, 2012–13. Canberra, Australian Bureau of Statistics.
- ABS (2014c). 8166.0 Summary of IT Use and Innovation in Australian Business, 2013–14.
- ABS (2015a). 5206.0 Australian National Accounts: National Income, Expenditure and Product. Canberra, Australian Bureau of Statistics.
- ABS (2015b). 5302.0 Balance of Payments and International Investment Position, Australia, Mar 2015. Canberra, Australian Bureau of Statistics.
- ABS (2015c). 5678.0 Venture Capital and Later Stage Private Equity, Australia. Canberra, Australian Bureau of Statistics.
- ABS (2015d). 6291.0.55.001 Labour Force, Australia, Detailed. Canberra, Australian Bureau of Statistics.
- ACMA (2011). *Towards 2020: Future Spectrum Requirements for Mobile Broadband*. Canberra, Australian Communications and Media Authority, Australian Government.
- ACMA (2013). *Communications Report 2012–13*. Canberra, Australian Communications and Media Authority, Australian Government.
- ACMA (2014). *Communications Report 2013–14*. Canberra, Australian Communications and Media Authority, Australian Government.
- ACNC (2014). *Annual Information Statement*. Canberra, Australian Charities and Not-for-Profits Commission.
- ACS (2008). *ICT Skills in Australia*. Submission to the Australian 2020 Summit, Australian Computer Society.
- Agan, T. (2014). *The Secret to Lean Innovation Is Making Learning a Priority*. Boston, Harvard Business Review.
- Aghaei, S., et al. (2012). 'Evolution of the World Wide Web: From Web 1.0 to Web 4.0'. *International Journal of Web & Semantic Technology* 3(1): 1–10.
- AIHW (2014). *Health Expenditure Australia 2012–13*. Canberra, Australian Institute of Health and Welfare.
- AIHW (2015). *Australia's Health*. Canberra, Australian Institute of Health and Welfare.
- Arico, S., and V. Srinivasan (2014). *Enabling Australia's Digital Future*. Cyber Security Trends and Implications. Canberra, CSIRO.
- Australian Government (2012). *Privacy Amendment (Enhancing Privacy Protection) Act 2012*.
- Australian Industry Group (2013). *Ready or Not? Technology Investment and Productivity in Australian Businesses*.
- Australian National Audit Office (2010). *The Australian Taxation Office's Implementation of the Change Program: A Strategic Overview*. The Auditor-General Audit Report No.8 2009–10.
- Bain & Company (2015). *Management Tools & Trends*. Boston MA, Bain & Company.
- Bajkowski, J. (2015). 'Thanks a Billion: Centrelink's Megasystem Overhaul Looks Primed for Budget'. *GovernmentNews*.
- Barnato, A. E., et al. (2004). 'Trends in Inpatient Treatment Intensity among Medicare Beneficiaries at the End of Life'. *Health Services Research* 39(2): 363–376.
- Belleflamme, P., et al. (2014). 'Crowdfunding: Tapping the Right Crowd'. *Journal of Business Venturing* 29(5): 585–609.
- Benito-Osorio, D., et al. (2013). 'Web 5.0: The Future of Emotional Competences in Higher Education'. *Global Business Perspectives* 1(3): 274–287.
- Bertot, J. C., et al. (2010). 'Social Media Technology and Government Transparency'. *Computer* (11): 53–59.
- Bigman, D. (2015). 'Driverless Cars Coming to Showrooms by 2020, Says Nissan CEO Carlos Ghosn'.
- Bilbao-Osorio, B., et al. (2014). *The Global Information Technology Report 2014*. Geneva, World Economic Forum and INSEAD.
- Bird, D., et al. (2012). 'Flooding Facebook: The Use of Social Media during the Queensland and Victorian Floods'.
- Bista, S. K., et al. (2013). *Next Step: An Online Community to Support Parents in Their Transition to Work*. Proceedings of the 2013 conference on Computer-Supported Cooperative Work Companion, ACM.
- Blank, S. (2013). 'Why the Lean Start-Up Changes Everything'. *Harvard Business Review* 91(5): 63–72.
- Bonner, S. (2014). 'Balkanisation of the Internet'. KPMG Report.

- Bonsón, E., et al. (2012). 'Local e-Government 2.0: Social Media and Corporate Transparency in Municipalities'. *Government Information Quarterly* 29(2): 123–132.
- Bouman, F. J. (1995). 'Rotating and Accumulating Savings and Credit Associations: A Development Perspective'. *World Development* 23(3): 371–384.
- Bradley, J., et al. (2015). Digital Vortex: How Digital Disruption Is Redefining Industries. Switzerland, Global Centre for Digital Business Transformation, An IMD and Cisco Initiative.
- Budget.gov.au (2015). The Jobs and Small Business Package. Canberra, Australian Government.
- Butler, D. (2013). 'When Google Got Flu Wrong'. *Nature* 494(7436): 155.
- CERT-FI (2011). Information Security Review.
- Chadwick, A., and C. May (2003). 'Interaction between States and Citizens in the Age of the Internet: 'e-Government' in the United States, Britain, and the European Union'. *Governance-Oxford* 16(2): 271–300.
- Cheney, J. S. (2010). 'Heartland Payment Systems: Lessons Learned from a Data Breach'.
- Coase, R. H. (1937). 'The nature of the firm'. *economica* 4(16): 386-405.
- Colombo, J. (2013). Twitter's IPO Is More Proof that Tech Is in a Massive Bubble. Forbes.
- Cormode, G., and B. Krishnamurthy (2008). 'Key Differences between Web 1.0 and Web 2.0'. *First Monday* 13(6).
- CSIRO (2014). A World Without Wires.
- Deakin University (2015). IBM Watson.
- Department of Defence (2013). Australian Cyber Security Centre To Be Established.
- DFAT (2014). Annual Deregulation Report 2014. Canberra, Australian Government.
- DoE (2013). Students: Selected Higher Education Statistics. Canberra, Department of Education.
- DoE (2015). Enrolment Count by Year by Year by Field of Education by Citizenship Category: uCube. Canberra, Department of Education.
- DoH (2013). National Mental Health Report. Canberra, Department of Health.
- Driverless car market watch (2012). 'Sergey Brin on Driverless Car Future'.
- DTMR (2015). Trade Statistics for Queensland Ports. Brisbane, Department of Transport and Main Roads.
- Dutton, W. H., and K. L. Kraemer (1978). 'Management utilization of computers in American local governments'. *Communications of the ACM* 21(3): 206–218.
- Dvorak, J. C. (2012). 'Here Comes the National Internet'. PCMag.com.
- Enders, A., and T. Jelassi (2000). 'The Converging Business Models of Internet and Bricks-and-Mortar Retailers'. *European Management Journal* 18(5): 542–550.
- EPFL. The Blue Brain Project.
- Ernesto (2015). Kickasstorrents Moves to Ilse of Man Domain Name. Torrent Freak.
- Ernst & Young (2013). Insurance in a Digital World: The Time Is Now. EY Global Insurance Digital Survey 2013.
- European Commission (2010). European Interoperability Framework (EIF) for European Public Services.
- European Commission (2015). Delivering the European Advantage? 'How European governments can and should benefit from innovative public services'. European Commission.
- Fallows, J. (2008). 'The Connection Has Been Reset'. *Atlantic Monthly* 301(2): 19.
- Fastbrick Robotics (2015). Technology demonstration. Perth, Cygnet Capital Group.
- Ferrucci, D. A. (2012). 'Introduction to "This Is Watson"'. *IBM Journal of Research and Development* 56(3.4): 1: 1-1: 15.
- Flynn, J., et al. (2015). 'DeepStereo: Learning to Predict New Views from the World's Imagery'. *arXiv preprint arXiv:1506.06825*.
- Freelancer (2015). 'Freelancer.com Celebrates Unique Personal Stories of Its 15 Million Users'.
- Frey, C. B. and M. A. Osborne (2013). 'The Future Of Employment: How Susceptible Are Jobs to Computerisation'. Retrieved 7 September 2013.
- Gallagher, S. (2011). 'Patriot Act and Privacy Laws Take a Bite Out of US Cloud Business'. *Ars Technica*.
- Garling, C. (2014). 'A Startup Hopes to Teach Computers to Spot Tumors in Medical Scans'. *MIT Technology Review*.
- Gaudin, S. (2012). 'Autonomous Cars Will Arrive within 10 Years, Intel CTO Says'. *Computerworld*.
- GEDI (2015). The Global Entrepreneurship and Development Index. Washington, The Global Entrepreneurship and Development Institute.
- Gershon, P. (2008). 'Review of the Australian Government's Use of Information and Communication Technology'.

- Goldman, D. (2012). 'Sorry, America: Your Wireless Airwaves Are Full'. *CNN Money Tech*.
- Google (2015a). Transparency Report. Mountain View, Google.
- Google (2015b). Google Trends: Couch Surfing.
- Grönlund, Å., and T. A. Horan (2005). 'Introducing e-Gov: History, Definitions, and Issues'. *Communications of the Association for Information Systems* 15(1): 39.
- Guinard, D., et al. (2011). 'From the Internet of Things to the Web of Things: Resource-Oriented Architecture and Best Practices'. In: Uckelmann, D., M. Harrison and F. Michahelles (eds) *Architecting the Internet of Things*. Springer: 97–129.
- Guizzo, E. (2011). 'IBM's Watson Jeopardy Computer Shuts Down Humans in Final Game'. *IEEE Spectrum* 17.
- Hawley, J. (2014). 'Jaguar Joins the Race to Driverless Cars'. *Drive*.
- Henschen, D. (2015). 'IBM Watson: 10 New Jobs For Cognitive Computing'. *InformationWeek*.
- Huang, A. (2015). 'The Death of Moore's Law Will Spur Innovation'. *IEEE Spectrum*.
- Hudson (2014). IT Recruitment: Top ICT skills in Demand in 2014.
- Huijsman, K., M. Plomp and R. Batenburg (2012). Measuring Interoperability to Maturity in Government Networks. Utrecht University.
- Humphries, D. (2014). 'Survey: Consumer Confidence in the Security-Breach Era'.
- IBM (2015). Precision Agriculture. Using Predictive Weather Analytics to Feed Future Generations.
- IEEE (2012). News releases.
- IEEE (2015). 'Humanoid Robots'. *IEEE Spectrum*.
- Index, B. L. (2014). 2014 Year of Mega Breaches and Identity Theft.
- Intel (2015). 'Tech Today: Intelligent Freight Trucks'.
- Intel (2014). 'A Guide to the Internet of Things Infographic'.
- Irion, K. (2012). 'Government Cloud Computing and National Data Sovereignty'. *Policy & Internet* 4(3–4): 40–71.
- Janssen, M., and E. Estevez (2013). 'Lean Government and Platform-Based Governance: Doing More with Less'. *Government Information Quarterly* 30: S1–S8.
- Kaku, M. (2014). 'The Future of Computing Power (Fast, Cheap, and Invisible)'.
- Kaku, M. (2015). 'Michio Kaku's Official Website'. From <http://mkaku.org/>.
- Kambil, A. (2008). 'What Is Your Web 5.0 Strategy?' *Journal of Business Strategy* 29(6): 56–58.
- Kaufman, H. (1977). *Red Tape, Its Origins, Uses, and Abuses*. Brookings Institution Press.
- Kay, R. (2014). Inflated Tech Valuations Bloat the Entire Economy. *Forbes*.
- Khadka, R., et al. (2014). *How Do Professionals Perceive Legacy Systems and Software Modernization?* Proceedings of the 36th International Conference on Software Engineering, ACM.
- Kramer, A. E. (2013). 'Russians Selectively Blocking Internet'. *New York Times*.
- Kruger, M., and J. Cacioppe (2014). Startup Ecosystem Report. Brisbane, Queensland Department of Science, Information Technology, Innovation and the Arts.
- Larsen, M., et al. (2015). 'We Feel: Mapping Emotion on Twitter'.
- Lazer, D., et al. (2014). 'The Parable of Google Flu: Traps in Big Data Analysis'. *Science* 343(14 March).
- LGAB (2006). Ensuring the Future Sustainability of Communities. Perth, Local Government Advisory Board.
- LGAQ (2015). De-amalgamation. Brisbane, Local Government Association of Queensland.
- Linders, D. (2012). 'From e-Government to We-Government: Defining a Typology for Citizen Coproduction in the Age of Social Media'. *Government Information Quarterly* 29(4): 446–454.
- Maccormick, J., et al. (2012). 'Engaged or Just Connected? Smartphones and Employee Engagement'. *Organizational Dynamics* 41(3): 194–201.
- Mach, T., et al. (2014). 'Peer-to-Peer Lending to Small Businesses'.
- McQuivey, J. (2013). Digital Disruption: Unleashing the Next Wave of Innovation. Forrester Research Incorporated.
- Magro, M. J. (2012). 'A Review of Social Media Use in e-Government'. *Administrative Sciences* 2(2): 148–161.
- Mangold, W. G., and D. J. Faulds (2009). 'Social Media: The New Hybrid Element of the Promotion Mix'. *Business Horizons* 52(4): 357–365.
- Markram, H. (2006). 'The Blue Brain Project'. *Nature Reviews Neuroscience* 7(2): 153–160.
- Meikar, S. (2012). 'The Balkanisation of the Internet'. *DIPLOMAATIA* (104).
- Merritt, R. (2013). Moore's Law Dead by 2022, Expert Says. *EE Times*. New York, UBM.
- Military, K. J. a. J. (2014). 'Inside a Targeted Point-of-Sale Data Breach'.
- Myer (2014). 2014 Annual Report. Sydney, Myer.

- NAB (2015). NAB Monthly Business Survey, May 2015. Sydney, National Australia Bank.
- National Association of State Chief Information Officers (2008). Digital States At Risk! Modernizing Legacy Systems.
- National E-Health Transition Authority (2007). Interoperability Framework v2.0.
- Naughton, J. (2013). 'Edward Snowden's Not the Story. The Fate of the Internet Is'. *The Guardian* 28.
- News.com.au (2015). 'Couchsurfing Host Dino Maglio on Trial for Drugging and Rape of Australian Teenager'.
- NSPYRE (2015). 'Robots Are the Next Big Thing'.
- OECD (2014). Education at a Glance. Paris, Organisation for Economic Co-operation and Development.
- Office of the e-Envoy (2004). e-Government Interoperability Framework Version 6.0. London, Cabinet Office.
- Open Technology Foundation (2015). Principles of Modern Design for Sustainable Government.
- Phillips, I. T. and N. (2015). Australian Government Investment in Science Reaches 30-Year Low.
- Pine, B. J., and J. H. Gilmore (1999). *The Experience Economy: Work Is Theatre and Every Business a Stage*. Harvard Business Press.
- Pocketbook (2015). *The Rise and Rise of Uber in Australia*. Sydney, Pocketbook.
- Propertyoz (2015). Office Vacancy. Sydney, Property Council of Australia.
- PWC (2015). Moneytree Report. Washington, PricewaterhouseCoopers and National Venture Capital Association.
- PwC Australia (2015). A Smart Move: Future-proofing Australia's Workforce. Sydney, PwC Australia.
- Quah, D. (2003). Digital Goods and the New Economy. CEPR Discussion Paper No. 3846.
- Queensland Parliament (2009–2014). Queensland Budget Service Delivery Statements.
- Queensland Parliament (2012). Factsheet 1.1, Three Levels of Government. Brisbane, Queensland Parliament.
- Regalado, A. (2014). 'With \$100 Million, Entrepreneur Sees Path to Disrupt Medical Imaging'. *MIT Technology Review*.
- Rheingold, H. (2008). 'Using Participatory Media and Public Voice to Encourage Civic Engagement'. *Civic Life Online: Learning How Digital Media Can Engage Youth*: 97–118.
- Sensis (2015). 'Sensis Social Media Report: How Australian People and Businesses Are Using Social Media'.
- smartraveller.gov.au (2015). South Africa. Canberra, Department of Foreign Affairs and Trade.
- Stalnaker, S. (2008). 'Here Comes the P2P Economy'. *Harvard Business Review* 86(2): 17–45.
- Su, J. B. (2015). 'Exclusive Interview: Ford CEO Expects Fully Autonomous Cars In 5 Years'. *Forbes*.
- Sweetser, K. D., and R. W. Lariscy (2008). 'Candidates Make Good Friends: An Analysis of Candidates' Uses of Facebook'. *International Journal of Strategic Communication* 2(3): 175–198.
- Symantec (2013). 2013 Norton Report.
- The Economist (2010). *The Future of the Internet: A Virtual Counter-Revolution*.
- Vossoughi, S. (2012). *Today's Best Companies Are Horizontally Integrated*. Boston, Harvard Business Review.
- Wan, S., and C. Paris (2014). *Improving Government Services with Social Media Feedback*. Proceedings of the 19th international conference on Intelligent User Interfaces, ACM.
- Watson, S. (2015). 'DARPA'S Next Generation Terminator-like Robot Unveiled'.
- West, D. M. (2004). 'E-Government and the Transformation of Service Delivery and Citizen Attitudes'. *Public Administration Review* 64(1): 15–27.
- Wilkinson, A., and R. Kupers (2013). 'Living in the Futures'. *Harvard Business Review* (May).
- Williams, W. and D. Lewis (2005). 'Convergent Interviewing: A Tool for Strategic Investigation'. *Strategic Change* 14: 219–229.
- Yin, J., et al. (2012). 'Using Social Media to Enhance Emergency Situation Awareness'. *IEEE Intelligent Systems*(6): 52–59.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

AT CSIRO WE SHAPE THE FUTURE

We do this by using science to solve real issues. Our research makes a difference to industry, people and the planet.

As Australia's national science agency we've been pushing the edge of what's possible for over 85 years. Today we have more than 5,000 talented people working out of 50-plus centres in Australia and internationally. Our people work closely with industry and communities to leave a lasting legacy. Collectively, our innovation and excellence places us in the top ten applied research agencies in the world.

WE ASK, WE SEEK AND WE SOLVE

FOR FURTHER INFORMATION

Digital Economy
Stefan Hajkowicz
t +61 7 3833 5540
e stefan.hajkowicz@csiro.au
w www.csiro.au/digitaleconomy