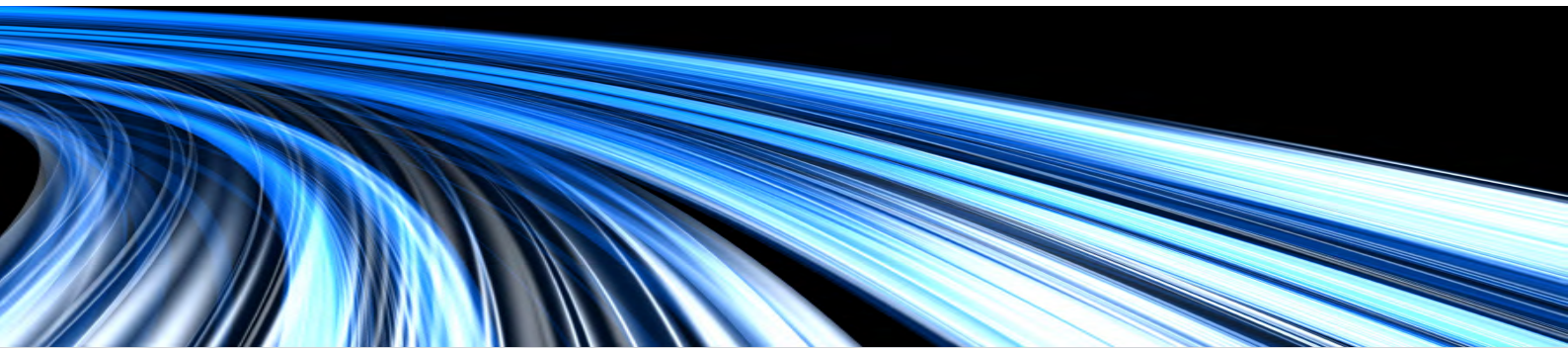
Deloitte Access Economics



# The Connected Continent II

## How digital technology is transforming the Australian economy

An update to *The Connected Continent 2011*

Deloitte.

# Contents

# Executive summary

Just a few years ago most consumers logged on to the internet to access email, search the web, and do some online shopping. Business digital strategies focused on websites and e-commerce. Most Australians still accessed the internet using a computer. In 2011, Google commissioned Deloitte Access Economics to prepare a report, *The Connected Continent*, which estimated that the internet was already contributing $50 billion to the economy (3.6% of GDP) and forecast this would grow to $70 billion by 2016.

Today, digital technology including cloud platforms, smart hand-held devices and social networks are the new beachheads of the sweeping impact of the internet. Rapidly evolving from basic connectivity, these technologies are further changing not only how consumers interact with businesses, but also how businesses are organising themselves.

In this report we expand and update our analysis of the internet in the 2011 report to the digital economy as a whole in 2015.

Based on the latest methodologies, technology trends and statistics we consider the impacts on GDP, productivity and employment, and the consequent impact on governments and policy makers. And through case study and analysis, we report the impacts in the workplace, on businesses, and for consumers.

Overall, the findings of this report are:

- The digital economy **contributed $79 billion (or 5.1%) to GDP in 2013–14**, based on the latest methodology capturing the rising digital intensity within traditional businesses. While the methodology has changed, the digital economy is growing in significance and is 50% larger in real terms than the 2011 estimate. If the digital economy was an industry it would be larger than Australia's agriculture, transport or retail industries.
- It is estimated that the digital economy could be worth $139 billion by 2020 (7.3% of GDP).
- We estimate that the economy was about $45 billion bigger in 2013 than it otherwise would have been because of the positive impact of digital technologies on Australian productivity. Digital technologies can help Australia respond to the national challenge of maintaining growth in living standards.
- The digital economy supports employment across many industries. Analysis in this report is based on the related but different concept of information and communications technology specialists. We estimate that there are 451,000 information and communication technology (ICT) specialists in Australia, equal to around 4% of employment. As an indication of the breadth of digital impacts on the wider economy, **most ICT specialists (97%) work outside the ICT industry itself**, in other industries such as manufacturing, construction, professional services, health and education. About 2.5 million employees (22% of the workforce) are in the OECD's 'broad' definition of ICT workers, which also includes intensive users of ICTs.
- While reaching new customers and responding to customer needs is clearly a big driver for businesses to go online and use social media, we are now seeing internal **business transformational change**, through the next wave of related technologies - cloud, data analytics, and machine-to-machine technologies.
- As in *The Connected Continent* 2011 report, we discuss how the digital economy also has wider impacts on national welfare through **consumer benefits** in terms of choice and convenience, which are estimated to be worth around $75 billion, and benefits for the recipients of **government services** – the government's share of productivity benefits is around $7 billion a year.
- The digital economy is changing from being a standalone industry to being **embedded in businesses across the economy**. Our case studies of Jimmy Possum, Haigh's Chocolates, ANZ and Xero demonstrate how it is transforming traditional businesses such as manufacturing and retail, and service businesses such as banking and business services.

### The productivity benefits

*The Connected Continent* 2011 estimated that the internet contributed about $27 billion in the form of increased productivity in Australia in one year. In this report, we adopt the approach of Czernich et al. (2009), which calibrated an econometric model based on data from 25 OECD countries between 1996 and 2007. The model departs from previous literature by using instrumental variables to isolate the effect of broadband penetration from other technological developments.

The results suggest that a 10 percentage-point increase in broadband penetration rate will most likely result in a 0.9 to 1.5 percentage point increase in annual per capita growth. This approach is favourable as high-speed internet (i.e. broadband) is often the common underlying factor for modern digital technology developments.

In this report, we estimate that the economy was about $45 billion bigger in 2013 than it otherwise would have been because of the productivity impacts of digital technologies, approximately 3% of the Australian economy. Higher productivity means Australia has greater output for its inputs to production. This occurs through a variety of mechanisms including increased competition, reducing prices, enabling efficiencies within businesses, and driving innovation for better goods and services. It also means digital technologies can be an important source of productivity and living standards growth in the future.

### How digital technologies are transforming business

Businesses across the Australian economy are rapidly changing and responding to emerging digital technologies, including those operating in traditional sectors. We chose four businesses across different sectors, including retail, manufacturing, finance and business services, and examined how they transformed their businesses using digital technology.

Overall, there are some common trends and observations:

- Digital technologies clearly have the potential to support transformation across different businesses, from traditional areas such as retail and manufacturing, to service businesses such as banking and business services
- Digital businesses are not a standalone industry category that sells to non-digital businesses; digital technologies are a strong part of the core operations and identity of all of these businesses
- While reaching new customers and responding to customer needs is clearly a big driver for businesses to go online and use social media, we are now seeing internal business transformational change, through cloud, data analytics, and machine-to-machine technologies emerging as a second big driver of change
- The rise in mobile access to the internet and digital services through smartphones and connected devices has prompted new ways of thinking about presenting information to consumers on smaller screens and capitalising on usage trends.

## Haigh's Chocolates – reaching new markets

Haigh's Chocolates is an iconic South Australian confectionery brand founded in 1915. Today the company has 14 locations across Adelaide, Melbourne and Sydney, employs over 500 people and delivers over 250 products. Haigh's has an online presence but it initially faced particular challenges: difficulties in transporting delicate goods to customers, and replicating the rich sensory in-store experience online. To overcome this, Haigh's had to develop a transport strategy and invest in re-photographing its product range to reflect the boutique Haigh's experience.

Haigh's is also reaping benefits from using data analytics, which helps its stock, ordering and delivery process. This has allowed the company to analyse sales data that was not visible before and the data has provided useful insights on which products are selling, through which channels, and where they are being delivered.

## ANZ Bank – building a digital culture, improving customer experiences and maintaining trust

Through the establishment of ANZ Digital, and its integration into the core of ANZ's commercial strategy and operations, ANZ is undertaking transformational change to its underlying culture, incorporating a firm-wide agile approach to digital strategy and innovation.

A good example is how digital tools are working internally. Frontline bankers are able to evaluate and rate the quality of leads and customer offers by providing star ratings to the central teams responsible for generating leads and offers. This allows for feedback and insights to and from the central office and frontline teams. This has enabled rapid testing and learning for both the central office and frontline employees, which has resulted in greater agility and considerable customer service improvements.

In the past quarter, year on year digital sales at ANZ bank have grown by 80% over the previous period. Digital sales are products and services that are marketed to consumers and purchased through a digital platform, such as ANZ.com or the ANZ mobile app.

## Xero – enabling better decision making

Xero is a software company that offers a range of cloud-based financial platforms to businesses. Founded in 2006, Xero is now one of the top 20 companies on the New Zealand Stock Exchange. It is also widely recognised as one of the most innovative businesses in the world for its contribution to cloud technologies. Xero is a business that is growing fast because of the internet and the benefits of cloud technology over desktop software.

According to Managing Director Chris Ridd, digital technology is becoming increasingly important for businesses, especially small to medium businesses. Technology tools including cloud platforms have shifted from being 'nice to have' to a 'must' for survival. Cloud platforms like Xero offer business owners the ability to monitor their cash flow in real-time, helping them make informed business decisions with up-to-date information, and reducing time spent on accounting. Xero customer and food retailer Sixth Course has experienced benefits including automated cash flow and an 80% reduction in time spent on accounting tasks – time better spent running the business. Mr Ridd from Xero believes the shift in how businesses are using digital technologies is transforming some of the traditional business functions. For example, Xero's accounting practice is moving away from an account reconciliation tool to a real time financial status monitoring service.

## Jimmy Possum

Jimmy Possum, an iconic Australian manufacturer of furniture and homewares, remains competitive by launching its own retail store network and more recently, expanding its online offering. The business realised that consumers are increasingly doing their research online before purchasing furniture, which meant that communicating the value proposition was shifting away from the stores to the website.

"Our website was the key," according to creative director Georgia Carrington. "We had to overhaul it many times, adding much more information about the product, including photos, dimensions, material descriptions and design recommendations." Average store visits prior to each transaction have decreased from four times to less than two over the years, with many customers making a transaction on the first visit. Customers are increasingly making purchasing decisions online. This means that the ability to communicate the product design, the brand image and quality through the website is critical.

Digital technologies internally have allowed Jimmy Possum to streamline the production process and communicate much more efficiently. The business has also made significant strides in social media, especially in creating customer advocates and driving awareness through Facebook.

### Transforming workplaces

In 2013–14, there were around 2.5 million intensive ICT users in Australia (the OECD's broad measure), representing 22% of total employment. The largest occupations in this broad group were accountants, accounting clerks, advertising, public relations and sales managers. A full list of ICT specialist and intense users is in Appendix B.

Interestingly, less than 3% of ICT specialists or users work in the Information, Media and Technology (IMT) industry – 97% work in other industries such as construction, manufacturing and professional services. Over 30% of ICT specialists work in the health and education sectors.

### Future drivers of growth

It is estimated that the digital economy could be worth $139 billion by 2020 (7.3% of GDP). This is based on growth in e-commerce, which has consistently outpaced GDP growth in the decade to 2012–13 and growth within the IMT industry.

# 1

# Introduction

Google commissioned Deloitte Access Economics to study the impact of the internet and other related digital technologies on Australian businesses and its broader effects on the economy as a whole. It builds on a previous report commissioned by Google in 2011 on the value of the internet to the economy and the role of digital technologies in modern businesses.

Just a few years ago, most consumers logged on to the internet to access email, search the web, and do some online shopping. Company websites functioned as vehicles for corporate communication, product promotion, customer service and, in some cases, e-commerce. Today, digital technology, including cloud platforms, smart devices and social networks, is reinvigorating the sweeping impact of the internet. Rapidly evolving from basic connectivity, these technologies are fundamentally changing how consumers interact with business and how businesses operate more broadly.

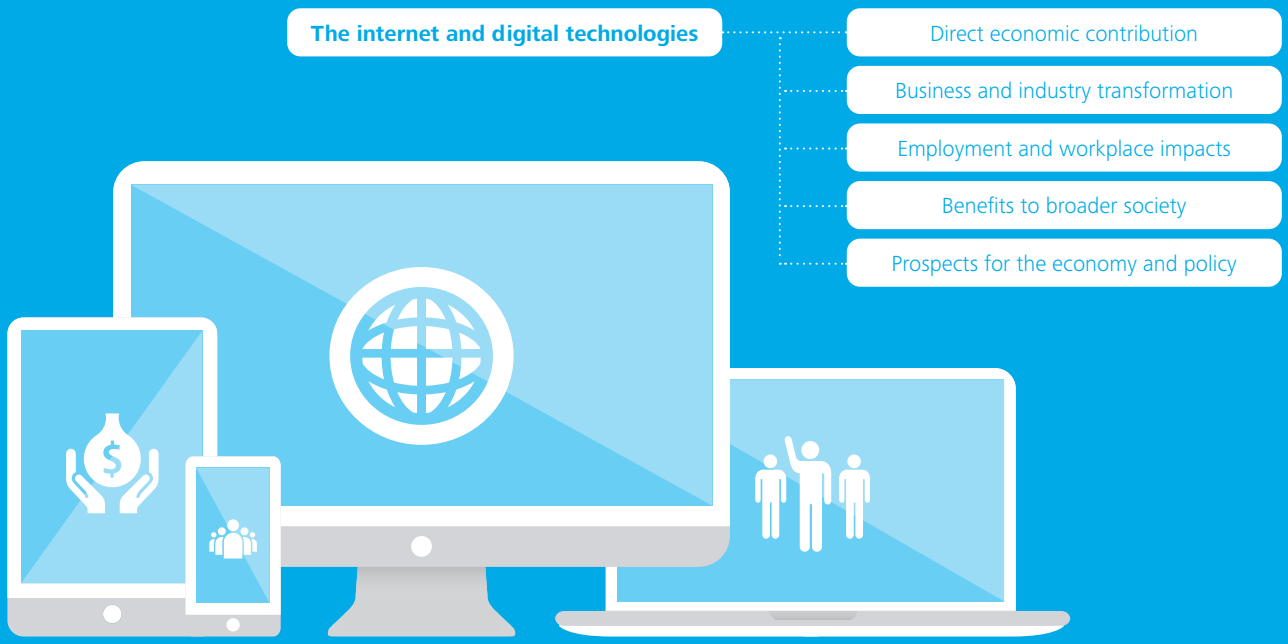
In 2011, Deloitte's *The Connected Continent* report stated that the internet contributed $50 billion to the Australian economy. The report examined the direct contribution of the internet in the form of ICT capital investment, technology consumption and productivity benefits.

In this update of the previous report, we build on our results by expanding our analysis to include the transformative changes of digital technologies in addition to the connectivity brought about by the internet. The report also focuses on how the role of the internet and digital technologies in the Australian economy has changed since 2011, how new innovative digital technologies are transforming businesses and delivering broader benefits to society.

**Framework for analysis**

This report is based on an extensive review of existing academic literature, especially in the field of operational research and economic modelling surrounding the value of various digital technologies including the internet. We conducted a series of interviews with prominent business leaders across different industries to gain a qualitative insight into Australian businesses and to help shape our narrative.

**Figure 1.1: *The Connected Continent* 2015**



**Chapter 2** builds directly on the 2011 report and examines the direct contribution of the internet to the Australian economy and the productivity impact of the internet.

**Chapter 3** describes the various aspects of business in Australia that have been or are being transformed by the internet and related digital technologies. We provide examples of successful Australian businesses across key sectors and illustrate how they have embraced digital technologies to bring about positive transformations to their business functions.

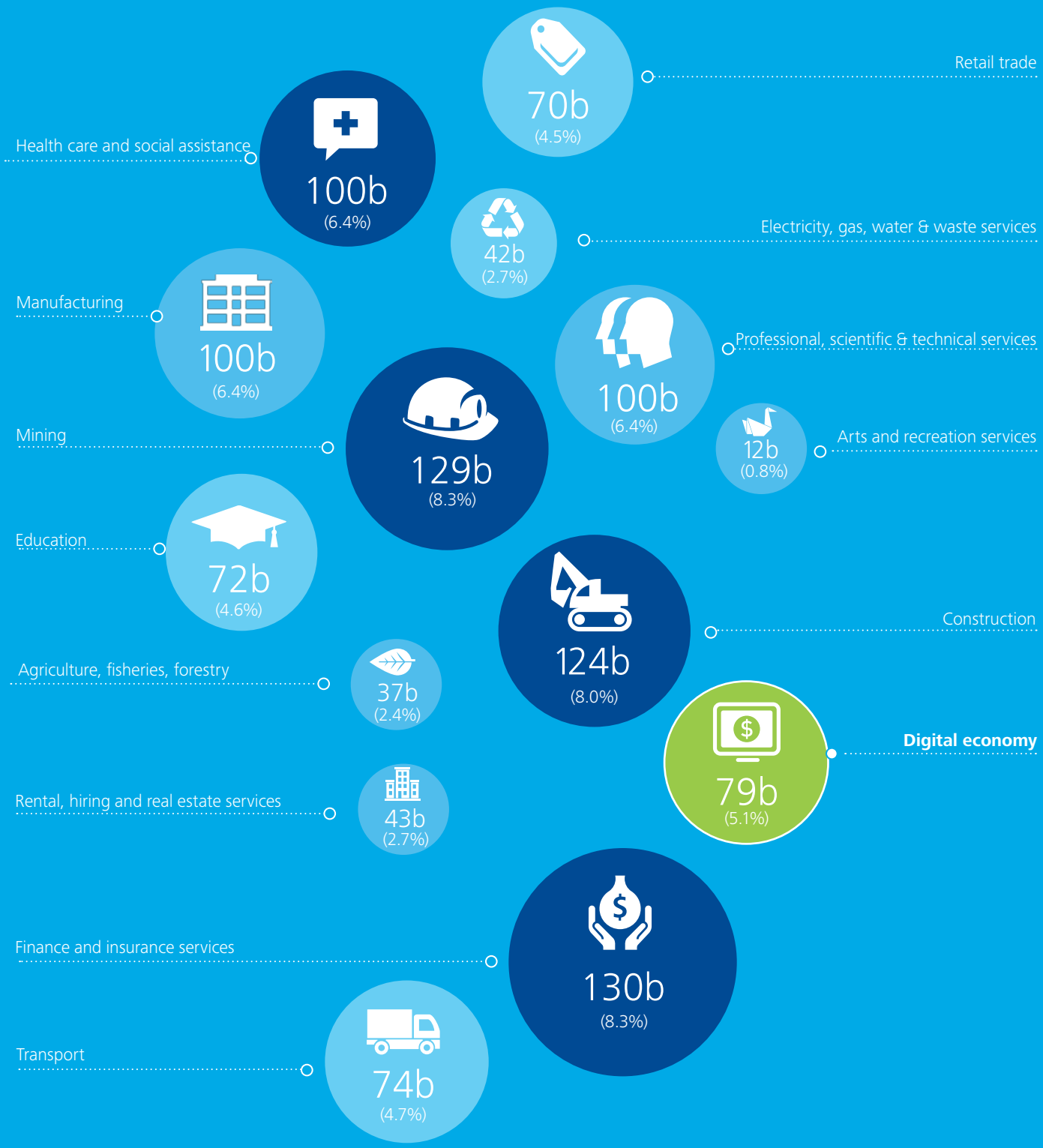
**Chapter 4** examines the impact of the internet on jobs and workplaces. The internet has created many jobs and many occupations use the internet intensely. We also highlight the employee engagement and flexibility benefits of internet technologies.

**Chapter 5** explores some of the wider impacts of the internet and related technologies on our society, and evaluates the benefits to consumer welfare and to clients and customers of government services.

**Chapter 6** lays out the prospects of the Australian economy in the digital age, and discusses potential impediments to its growth, including policy and regulatory settings.

# 2

# The contribution of the digital economy


Retail trade
70b
(4.5%)
Health care and social assistance
100b
(6.4%)
Electricity, gas, water & waste services
42b
(2.7%)
Manufacturing
100b
(6.4%)
Professional, scientific & technical services
100b
(6.4%)
Mining
129b
(8.3%)
Arts and recreation services
12b
(0.8%)
Education
72b
(4.6%)
Construction
124b
(8.0%)
Agriculture, fisheries, forestry
37b
(2.4%)
Digital economy
79b
(5.1%)
Rental, hiring and real estate services
43b
(2.7%)
Finance and insurance services
130b
(8.3%)
Transport
74b
(4.7%)

# 2 The contribution of the digital economy

Digital technologies are having profound impacts on us as individuals and as a society. Their importance extends from the most intimate of communications, through to how we respond to a crisis, and conduct our democracy. There are many ways to measure the impact of the digital economy, from the number of households with broadband access to the number of social media users around the world.

We begin our analysis in this chapter with an estimate of the economic contribution of digital technologies to our economy, as measured by gross domestic product (GDP). This is a partial measure but a useful starting point.

### Defining and measuring the digital economy

The terms relating to the digital economy are changing all the time, but generally refer to the role of communications and computing power in business and the economy. In *The Connected Continent* 2011, the focus was on the internet. In this report we broaden our analysis to include related technologies such as social networks, cloud platforms, mobile apps, search engine marketing and optimisation, data analytics, and machine-to-machine technologies. We use the terms 'internet and related technologies' or the 'digital economy'. The digital economy as defined by the Australian Government is 'the global network of economic and social activities that are enabled by information and communications technologies, such as the internet, mobile and sensor networks.' In Chapter 4 we also use another related concept – Information and Communications Technology (ICT), a sector of the economy that includes other areas that are not all internet related, such as landline telephone calls and some computing activities.

*The Connected Continent* 2011 valued the internet as worth $50 billion to the Australian economy (3.6% of GDP). Since then, there have been a number of developments, including:

- The continued growth of the internet's role in our economy
- The rapid growth of digital innovations on the internet platform, including cloud computing, data analytics, social media, and mobile apps
- Improvements in the way in which the internet is measured.

We note that in recent years, the traditional ICT sector is actually slightly declining across OECD economies as a share of GDP (OECD, 2014). ICT manufacturing has declined. Some telecommunications services have declined. Declining prices for ICTs reduce their measured size.

However, digital technologies are clearly playing a more important role in our economy, and most of this is captured by the impact of digital technologies on sectors outside of ICT. In general, we have seen the internet become more integrated within existing businesses. It is becoming harder to distinguish a 'digital economy' from the broader economy. It is harder to measure the digital economy.

The latest summary of approaches is presented by the OECD (2013), which outlines three methodologies for measuring the impact of the internet on the economy.

- Approach 1 is the direct impact: value added by internet-related activities
- Approach 2 is the dynamic impact: net GDP growth generated by all activities related to the internet
- Approach 3 is the indirect impact: measuring the consumer surplus and welfare gains generated by internet activities.

The previous estimates were based on similar concepts to those used in this report but changes to data sources mean that the previous estimates cannot be readily updated. In any case, the OECD's methodology represents an advance on previous estimates.

In Chapters 5 we look at how approach 3 may be applied in Australia; here we apply approaches 1 and 2. In settling on these approaches, the OECD acknowledged the challenges in measuring the impact of the internet:

*Measuring the internet and its economic and social impacts presents a number of significant data challenges. These include all of the same ones that have bedevilled efforts to estimate the economic impacts of computers, broadband, and other Information and Communications Technology (ICT) components…To reiterate, it is extremely difficult to provide a single measure to capture the whole internet economy. The continuously evolving internet has changed from a service used by some to an essential, basic economic infrastructure that will soon be used by nearly everyone in nearly all places. It affects almost all economic activities and its impact is found in numerous short and long-term economic processes.*

## The OECD's measurement agenda

**Action 1**: Improve the measurement of ICT investment including broadband investment and its link to macroeconomic performance

**Action 2**: Define and measure skill needs for the digital economy

**Action 3**: Develop metrics to monitor issues of security, privacy and consumer protection

**Action 4**: Promote measurement of ICTs for social goals and impacts of the digital economy on society

**Action 5**: Invest in a comprehensive, high-quality data infrastructure for measuring impacts

**Action 6**: Build a statistical quality framework suited to the internet as a data source

*Source: OECD (2014)*

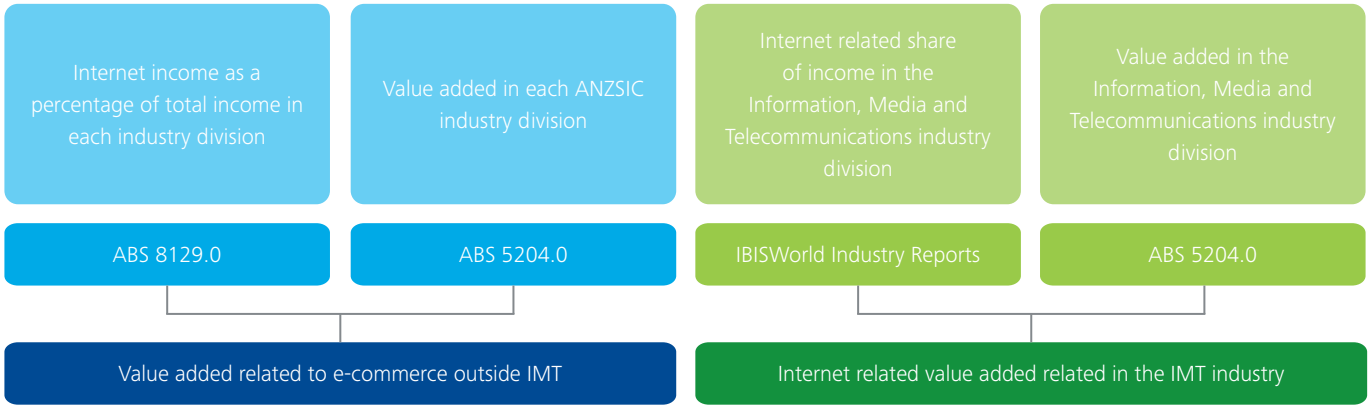
### The direct contribution of the internet and related activities

The OECD's Approach 1 calculation is based on adding two items:

- Value added in activities supporting the internet (e.g. ISPs and internet equipment manufacturers). This measures that part of the information sector that is internet related. It does not include all ICT activity. An important assumption in the OECD's work is that the share of revenue from internet-related activities in total revenue for the information sector is proportional to the share of value added from these activities in total value added for that sector. This is relevant to how Deloitte Access Economics has performed the calculation (below) because we use value-added figures from the start (not revenue figures).
- Value added in activities based purely on the internet (e.g. search engines, e-commerce). This measures how the internet and related technologies are adding to value in non-internet sectors, such as retail, construction and mining. An important assumption is that the share of revenue from e-commerce in total revenue for each industry sector is proportional to the share of value added from e-commerce in total value added for that same industry sector.

The figure shows the methodology used to derive the value-added based estimate of the internet and digital technologies industries in Australia.

**Figure 2.1: Value added based estimate methodology**



For industries other than Information, Media and Telecommunications (IMT), the share of income generated through the sale of goods and services over the internet is taken as an indicator of their depth of engagement with the internet. This is multiplied by industry value added to derive an estimate of total value added related to the internet.

For the IMT industry, IBISWorld industry reports have been analysed to estimate the share of total IMT income related to the supply of goods and services supporting the internet, or based purely on the internet. For example, income related to voice services provided by telecommunications companies has not been included, but income related to data services has.

The OECD does not include the non-market sector (education, health, government) in its measurement of the internet economy because of data limitations with the value of internet sales or digital goods and services.

In this report we assume that the internet contributes the same proportion to the non-market sector as the market sector, i.e. around 5.1%, this implies that the digital economy within the non-market sector is worth $14.1 billion.[1] This approach is based on the assumption that the use of digital technologies by government-dominated sectors such as health and education is likely to be significant if somewhat lagging behind key private sectors (as described in Deloitte's 2014 report, *Digital Disruption: Short Fuse, Big Bang?*)

On this basis, the internet and digital economy was worth $78.8 billion in 2013–14. This represents 5.1% of total GDP. The table steps through how this figure was derived, based on the above methodology.

**Table 2.1: The value-added estimate of the economic contribution of the internet and digital technologies in 2013–14**

| | Information, Media, and Telecommunications | The rest of the market sector | Non-market sector | Total |
|---|---|---|---|---|
| Total value added (billion) | $43.5 | $1,160.8 | $256.0 | $1,460.3 |
| Share of GDP (%) | 3% | 74% | 16% | 94% |
| Internet and digital technologies economic contribution | $13.0 billion | $51.7 billion | $14.1 billion | $78.8 billion |
| As a share of the total economic contribution of the internet | 16% | 66% | 18% | - |
| As a share of GDP | 0.8% | 3.3% | 0.9% | 5.1% |

*Sources: Deloitte Access Economics, ABS 5206.0 National Accounts, ABS 8219.0, Business Use of Information Technology 2011–12.*
*Note: net taxes and subsidies have been attributed across industries based on information in ABS 5209.0.*

1. *Note that the value of ownership of dwellings has been excluded from these calculations – it is conventionally included in the non-market sector.*

## The productivity benefits

An important impact of digital technologies is their ability to lift productivity in businesses and across the economy. This can help Australia respond to the national challenge of maintaining growth in living standards.

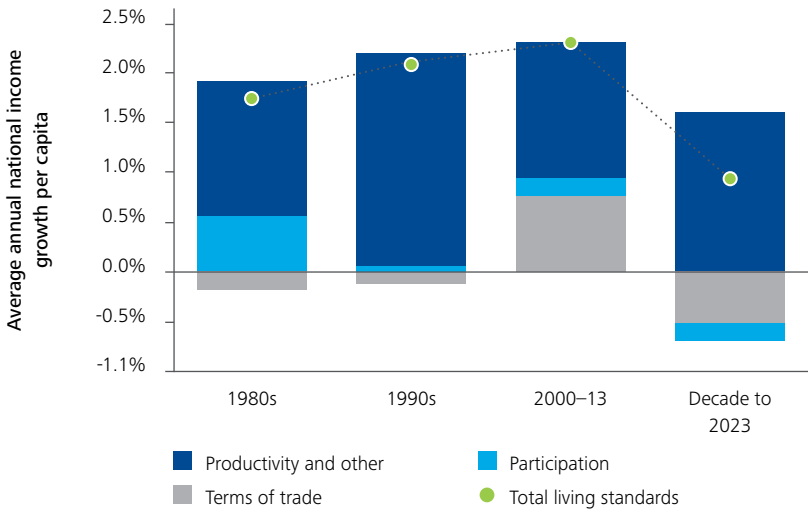
Productivity is a measure of the rate at which inputs, such as labour, capital and raw materials, are transformed into outputs. In other words, it is a measure of the extent to which workers become more efficient in transforming inputs to outputs. As one of the key drivers of living standards in Australia, our productivity performance over the past decade has been less than ideal.

Productivity growth over the past decade has been lower than it was in the 1990s, commodity prices are high but no longer rising, and the share of the population in employment has fallen recently. If these trends continue, we face the prospect of considerably slower growth in our living standards than we have become accustomed to.

**Philip Lowe**, *Deputy Governor of the Reserve Bank*

As illustrated in Figure 2.2, demography – labelled as 'participation' – added to our living standards in the 1980s. It was mildly positive thereafter, but it is expected to go the other way in the years ahead, presenting significant challenges to our standards of living.

**Figure 2.2: Drivers of living standards – component contributions to growth in national income per head, by decade**




*Source: Dr. Martin Parkinson, Secretary to the Treasury, 'The 2014–15 Budget and sustaining broad-based growth in living standards' speech, 20 May 2014; Deloitte Access Economics*

## Technology enhances productivity and overall growth

There is a great deal of economic literature demonstrating the significance of technology in advancing productivity growth. For example, Fornefeld et al (2008) suggested that companies adopting broadband based processes could improve their employees' labour productivity on average by as much as 5% in the manufacturing sector and 10% in the services sector.

Colecchia and Schreyer (2000) found that technology contributed 0.3% to 0.9% of GDP growth per year in the late 1990s. More recent studies from the OECD (Spienza, 2012) showed that technology investments accounted for 10% to 53% of value added growth in OECD business sectors from 1995 to 2007.

Closer to home, Deloitte's previous report in 2011 – *The Connected Continent* – estimated that the internet contributed about $27 billion in the form of increased productivity in Australia in one year. A similar study by AiGroup in 2013 – Business Prospects Survey – showed over 30% of businesses that invested in new technologies in 2012 reported their labour productivity improved, while only 16% of businesses that did not invest in new technologies reported labour productivity increases.

### Measuring the intangible benefits

Traditionally, productivity measures are calculated by expressing the output (GDP) as a ratio of inputs used, including labour and capital. The difficulty in measuring the precise impact of digital technology on productivity lies with our imperfect measures of outputs and inputs, namely the mismatch between our digital economy and the way we account for it.

Digital capital is traditionally accounted for through tangible asset investments, such as servers, routers, online-purchasing platforms, and basic internet software. These capital assets are obviously important; they are the critical infrastructure supporting the digital economy. However, with the development of the next generation of internet applications, a growing portion of what is powering today's digital economy consists of intangible capital assets that cannot be measured in the traditional sense.

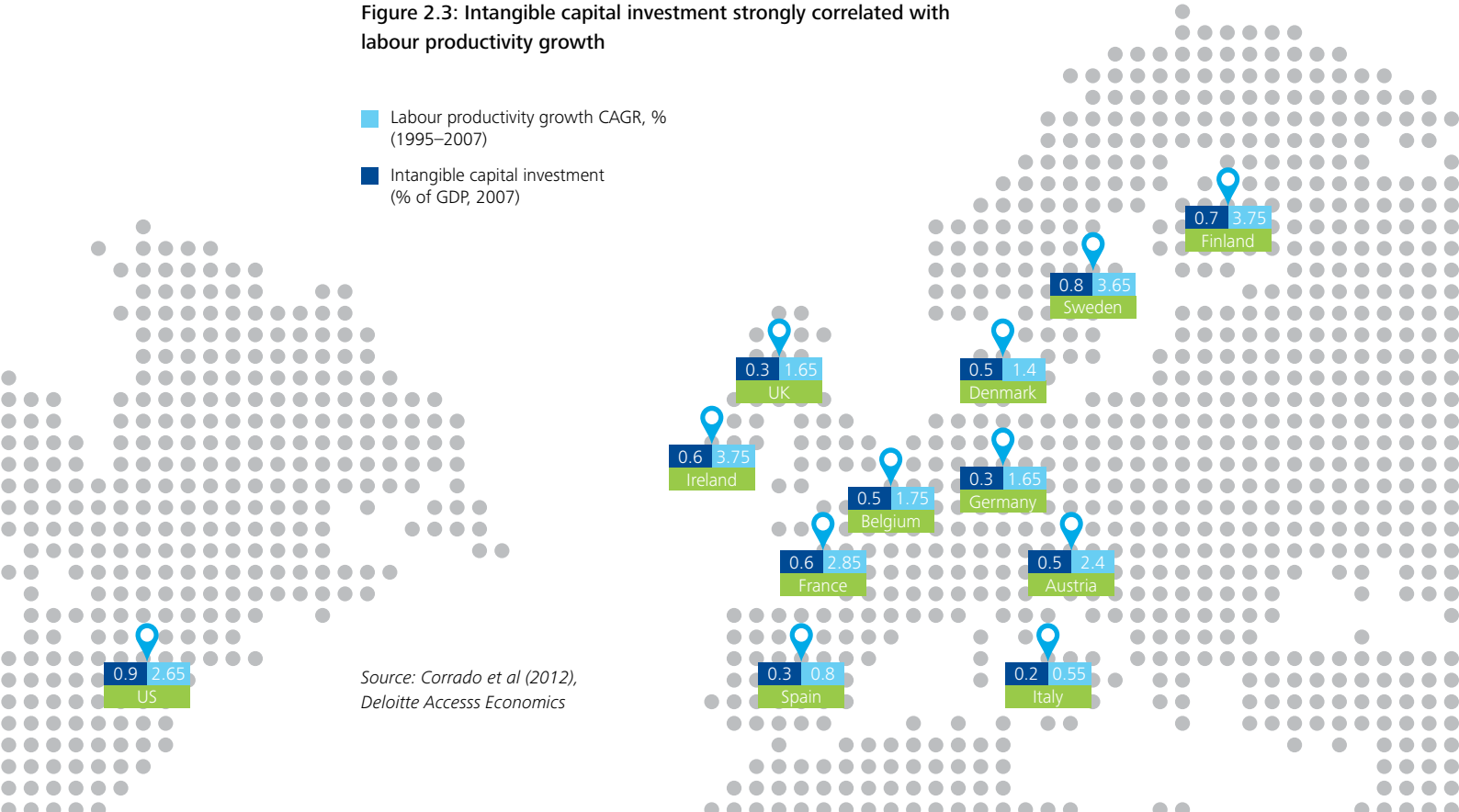
Intangible assets can come in different forms including patents and business information.

While intangible assets are difficult to measure, they are valuable assets nonetheless, generating benefits over time. For example, computerised information such as user generated content, social profiles and user behaviour data are becoming a source of information on sales and marketing. The collection and use of this data allows businesses to extract significant value. Similarly, organisational capital such as brand equity is also valuable and companies such as Google, WhatsApp or Amazon have built substantial digital engagement over time, which serves to reinforce their market presence.

Macroeconomic researchers have shown that intangible digital capital is not only growing rapidly, but has also become a major contributing factor in global economic growth. McKinsey (2013) examined national accounts data of 40 countries and found that digital capital investment represented barely 0.8% of GDP for those countries in 2005, rapidly growing to over 3.1% of GDP in 2013.

Corrado et al (2012) showed that across 13 countries, intangible capital investments strongly correlate with growth in labour productivity, with countries investing more in intangible technology capital assets such as system designs, brand equity and patents also likely to have higher labour productivity growth (Figure 2.3).

**Figure 2.3: Intangible capital investment strongly correlated with labour productivity growth**




*Source: Corrado et al (2012), Deloitte Accesss Economics*

Separate research by the OECD estimated that for every 10% increase in ICT capital investment there is likely to be a corresponding 0.56% increase in value added in the business sector. For Australia, this meant that ICT capital investment accounted for around 30% of our value-added growth.

In addition to their significance in overall economic growth, intangible assets also have implications for how we account for economic performance. Treating investment in intangible assets as capital raises measured final output and measured capital inputs and alters the capital-labour ratio – this will have a complex effect on the measured multi-factor productivity growth.

### Measuring digital impacts on productivity

Several studies have attempted to quantitatively estimate the impact of the internet and digital technology development on economic growth. In this report, we examine the results from two prominent studies by Czernich et al. (2009) and Koutroumpis (2009) in the Australian context.

Both research efforts depart from traditional ways of measuring digital technology in the form of ICT capital investments, which does not account for the intangible components of the digital economy, in favour of using broadband penetration rates as a proxy for the digital technology development. This approach is favourable as high-speed internet (i.e. broadband) is often the common underlying factor for modern digital technology developments. Broadband can facilitate the spatial distribution of a large amount of information that is otherwise difficult to access, this in turn allows for the development of new and innovative technologies, collaboration between firms and consumers, and encourages digital engagement. Despite this commonality, the studies have yielded very different results.

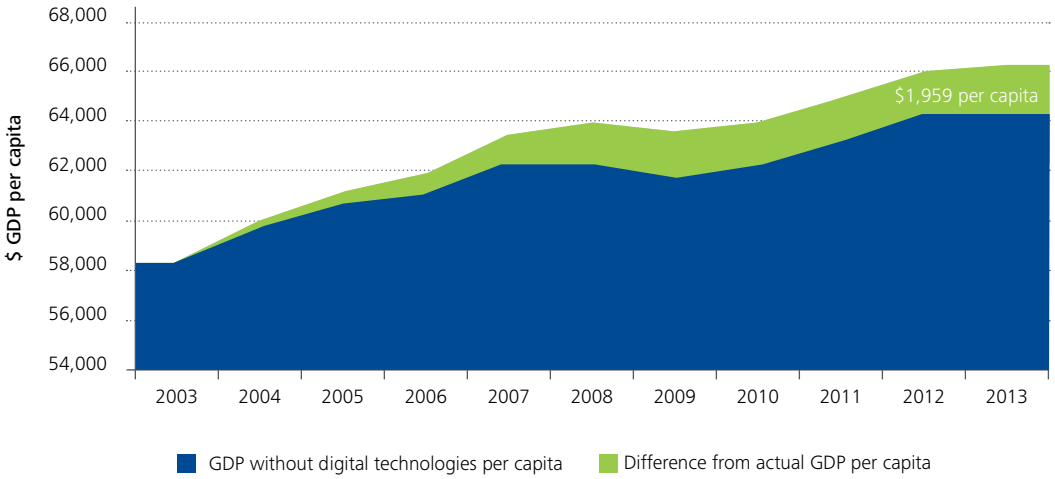
Czernich et al. (2009) calibrated an econometric model based on data from 25 OECD countries between 1996 and 2007. The model departed from previous literature by using instrumental variables to isolate the effect of broadband penetration from other technological developments. The study's results suggest that a 10 percentage point increase in broadband penetration will most likely result in a 0.9 to 1.5 percentage point increase in annual per-capita growth across OECD countries including Australia.

In contrast, Koutroumpis (2009) constructed a production function framework that endogenised development in broadband networks. Based on data from 15 European Union countries between 2003 and 2006, the study concluded that a 1% increase in the rate of broadband penetration rate will lead to an increase in economic growth of between 0.023% to 0.025% per year.

It is difficult to directly compare the results from the two research pieces as Czernich et al. (2009)'s result is a static multiplier based on nominal broadband penetration rates, while Koutroumpis (2009) yields an elasticity measure of broadband penetration growth to economic growth. Czernich et al. (2009)'s approach isolated broadband access from other technological developments, indicating a more conservative result as it does not account for the effect of other digital technologies.

Nevertheless, the results of the studies provide a useful tool to calculate the current net value of GDP that was generated through the development of the internet and other digital technologies. In this section, we perform a simulation exercise similar to that of the OCED (2013) on the Australian economy to ascertain the net impact that digital technology has had on the total GDP in the economy. Our result shows that the internet and digital technologies could have contributed between $45 to $92 billion to the Australian economy in 2013, approximately 2.9% to 5.9% of Australia's annual GDP.

Figure 2.4: The impact of digital technologies




Note that these measures are based on the midpoint between the high and low estimates produced by the two studies (i.e. 1.2 percentage points for Czernich et al. (2009), and 0.0245% for Koutroumpis (2009)). It is also important to note that the approach used in this report depends on a number of assumptions adopted by OECD (2013), including the following two assumptions. First, it is assumed that the broadband penetration rates are a proxy for all internet related activities. Second, constant elasticity of broadband penetration on growth is assumed. As noted by OECD (2013), although the assumptions are not unrealistic, they are relatively strong.

# 3

# How digital technology is transforming business

# 3 How digital technology is transforming business

Businesses across the Australian economy are rapidly changing and responding to new emerging digital technologies, including those that operate in traditional sectors. To help us articulate these transformative changes, we chose four businesses across different sectors, including retail, manufacturing finance and business services, and illustrated their journey in transforming their businesses through digital technology.

Overall, there are some common trends and observations:

- Digital technologies clearly have the potential to support transformation across different businesses, from traditional areas such as retail and manufacturing, to service businesses such as banking and business services
- Digital businesses are not a standalone industry category. Digital technologies are a strong part of the core operations and identity of all of these businesses
- While reaching new customers and responding to customer needs is clearly a big driver for businesses to go online and use social media, we are now seeing internal business transformational change, through cloud, data analytics and machine-to-machine technologies. These new digital technologies have emerged as a second big driver of change
- The rise in mobile access to the internet and digital services through smartphones and connected devices has provided new ways of thinking about presenting information to consumers on smaller screens, in turn capitalising on usage trends.

## Retail

Retail is one of the industries most heavily transformed by digital technologies in the past few years. The emergence of online shopping and the internet more broadly have changed how consumers buy products and services and what they are buying; the industry is increasingly facing intensified competition from online-only vendors and overseas vendors. Just how are businesses in the sector responding?

## Haigh's Chocolates – reaching new markets

Haigh's Chocolates is an iconic South Australian confectionery brand founded in 1915. Today the company operates from 14 locations across Adelaide, Melbourne and Sydney, employs over 500 people and delivers over 250 products.

Haigh's success today can be partially attributed to its ability to deliver a premium customer experience, and the capacity to energise its customer base through social media and other digital channels. Fourth generation Haigh's Chocolates managing director Simon Haigh shared his insights on how a traditional business like Haigh's has undergone its digital transformation and reaped its dividends.

As with many other businesses in Australia, Haigh's digital transformation started with the rising demand and pressure from its customers, especially those that were not located near any of its stores. "We knew there was a lot of demand, it was just email in those days, but internally we knew it was a strategic choice to go online, it's a huge growth area for us," Simon says as he recalls the decision to bring Haigh's Chocolates online.

For Haigh's, its website is much more than just a retail portal. "It's all about the Haigh's experience. We want our customer to experience the same feeling as if they come into one of our stores, to feel the history, and the effort we put into our chocolate."

Haigh's faced particular challenges in moving online because of the difficulties in transporting delicate goods to customers and replicating the rich sensory in-store experience online. To overcome this, Haigh's had to develop a transport strategy and invest in re-photographing its product ranges, making sure the photos reflected the boutique Haigh's experience.

Central to Haigh's growth strategy is activating its customer base, evoking passion around Haigh's products. "Our customers love our recipes, behind the scene footage and client stories," Simon reveals. Online social platforms such as Facebook, Twitter and YouTube have helped the company build a strong and dedicated customer base, and the capacity to energise these customers and have a significant online influence.

Haigh's is also using data analytics to help improve its overall ordering and delivery process. Last year, the company centralised its ordering system, whereas orders previously were managed on a store by store basis. This has allowed Haigh's to analyse a large volume of sales data that was not visible before. The data has provided useful insights on which products are selling, through which channels, and where they are being delivered. Data analytics has allowed Haigh's to identify areas where improvements could be made throughout its production chain, including key challenges such as the logistics of delivery and managing customer feedback.

**Finance**

Technology has long played a role in financial markets in some way. Frequently, the introduction of new technology had tremendous and sometimes unexpected effects on the structure of financial markets. This is what we are seeing today: digital innovation is playing an increasing role in how major financial institutions compete, both in attracting customers and increasing productivity in their own internal operations.

## ANZ Bank – building a digital culture, improving customer experiences and maintaining trust

ANZ Bank is working to develop a firm-wide agile digital culture focused on improving customer experiences and achieving growth. Pam Rebecca, General Manager of ANZ Digital, and Matt Boss, Managing Director, Products and Marketing at ANZ, provided details and insights into ANZ's digital strategy and its successes in recent years for this case study.

With the fast-paced nature of digital disruption and innovation (particularly in financial services) it can be difficult to make long lasting and effective changes to ICT strategy and operations without broad-reaching support and buy in by all members of an organisation. Through the establishment of ANZ Digital, and its integration into the core of ANZ's commercial strategy and operations, ANZ is undertaking transformational change to its underlying culture, incorporating a firm-wide agile approach to digital strategy and innovation.

ANZ has seen this transformation as an opportunity to invest substantially in the capabilities, tools, infrastructure and the people who are able to deliver effective digital strategies and innovation into the long term. This has involved collecting and harnessing the capabilities of many streams of digital innovation through new content management platforms, enhanced ICT security, the further development of ANZ.com, new multi-channel secure banking systems, integrated adobe services and data analytic capabilities and through an enhancement of the culture and IT capabilities of the entire organisation.

This has provided a strong base for the development of agile and impactful digital innovations to be developed that are expected to have a significant and long-lasting positive effect on customer experiences.

For example, frontline bankers are now able to evaluate and rate the quality of leads and customer offers by providing star ratings to the central teams responsible for generating leads and offers. This allows for feedback and insights to and from the central office and frontline teams. This has enabled rapid testing and learning for both the central office and frontline employees, which has resulted in greater agility and considerable customer service improvements. The significant cultural buy-in and general support behind this innovation is enabling growth in cross-selling to existing customers and broader improvements to the customer experience.

ANZ has also built a real-time customer feedback tool where customers are able to quickly rate their experience with ANZ. This started with Home Loans and is now moving to other areas, and enables ANZ to respond rapidly to customer feedback.

Importantly, ANZ's digital strategy has not been driven by the desire for improvements in efficiency or productivity but rather a focus on growth and providing a frictionless experience to their customers. Naturally, there is an expectation that significant commercial benefits will follow.

Part of the blueprint for change has been to make the digital channel an increasingly commercially relevant channel to the organisation. In the past quarter, year on year digital sales at ANZ bank have grown by over 80% over the period prior. This digital channel has had a material impact on ANZ mix of product sales with a very significant shift towards digital channels across multiple products.

During this period ANZ bank has also recorded the highest rate of engagement (mobile logons) through mobile banking in the Australian and New Zealand region (Finalta, 2014) and continues to grow the number of customers that access ANZ's digital services with over one million active ANZ goMoneyTM users, more than 7,000 active ANZ FastPayTM merchants and 1,200 frontline bankers enabled with mobility tools (Tablets).

Notably "there are certain things we won't compromise on to go faster", these principally include risks associated with trust, privacy and security, which are fundamentally important principles of ANZ's business operations. However, building upon its firm-wide agile digital culture ANZ can have the confidence that digital innovations are being made in an environment where, along with the customer experience, trust and security still remain a key focus.

**Business services**

Increasing access to information and technologies is changing the role and value of specialist knowledge. Digital technologies such as cloud-based computing systems mean that business owners can use state-of-the-art systems to perform key business functions at a very low cost.

## Xero – enabling better decision making

Xero is a software company that offers a range of cloud-based financial platforms to businesses. Founded in 2006, Xero is now one of the top 20 companies on the New Zealand Stock Exchange. It is also widely recognised as one of the most innovative businesses in the world for its contribution to cloud technologies. Xero is a business that is growing fast because of the internet and the benefits of cloud technology over desktop software.

Managing Director Chris Ridd shared his views on how digital technologies are transforming businesses in our economy and globally. "Consumer technologies opened the eyes of many on how IT can be or should be consumed." Indeed, digital technologies are no longer expensive and clunky machines that are only accessible to big enterprises. Today every employee and business owner is a consumer of digital technology. This fundamental shift has changed how digital technologies are developed; it has reshaped our expectations on how they should be used in the workplace and in businesses.

"IT has been a disappointment for a lot of business owners. More often than not it has been expensive, hard to integrate, difficult to use and doesn't deliver the result as promised. The new wave of cloud technology is designed to solve exactly that." The rise of cloud technology is hardly news to anyone; it is a compelling way of acquiring and utilising IT products for a lot of business owners. The ability to sign up to a service with no up-front cost, a monthly subscription cost, flexibility to opt out and minimal integration issues takes a lot of the hassle out of using technology and reduces costs substantially.

The benefit doesn't stop there. "Moving to the Cloud means businesses also have the means to connect to a whole range of other available services. They can streamline a lot of their operations online, including supply chain, accounts, and relationship management." This allows businesses to better integrate their technology products, allowing them to extract the productivity benefits and reduce costs.

Having the right digital technology is becoming increasingly important for businesses, especially small to medium businesses. Technology tools including cloud platforms have shifted from being 'nice to have' to a 'must' for survival. Cloud platforms such as Xero can offer business owners the ability to monitor their cash flow in real-time, helping them make informed business decisions with up-to-date information, and reducing time for accounting. Xero customer and food retailer Sixth Course experienced benefits including automated cash flow and an 80% reduction in time spent on accounting tasks – time better spent running the business. According to Chris Ridd, these shifts in how businesses are using technology are fundamentally transforming some of the traditional business functions. For example, Xero is moving away from an account reconciliation tool, to a real time financial status monitoring service. Putting small business owners at the centre of Xero's product development strategy was a crucial part of this shift.

According to Chris Ridd, "We (Xero) are seeing huge growth opportunities in cloud technology. In Australia, 46% of businesses we surveyed said they will take up cloud technology in some form over the next few years."

### Manufacturing

Manufacturing is an industry that has faced challenging economic conditions including stronger exchange rates and international competition. Many household names have closed local operations or gone out of business. However, there are still manufacturing opportunities in Australia and digital technologies offer these businesses an opportunity to reach more customers and undertake their operations more productively.

## Jimmy Possum – a manufacturer's transformation

Jimmy Possum is an iconic Australian manufacturer of furniture and homewares. Founded in 1995 by Margot and Alan Spalding, the business has grown from a country oriented small business to a manufacturer and 10 store retailer. With its manufacturing base in regional Victoria, Jimmy Possum's story is one of a business that has adapted to the changing market, and taken advantage of innovative technologies to complement its core business.

"Prior to 2002, we supplied 60 to 70 retailers nationally in Australia. We realised at the time, retailers were increasingly looking overseas for cheaper suppliers. If we didn't react, we would have lost control over our business," creative director Georgia Carrington said. The business had to make the difficult decision of pulling its products out of the existing retailers and opening its first retail store in Brisbane.

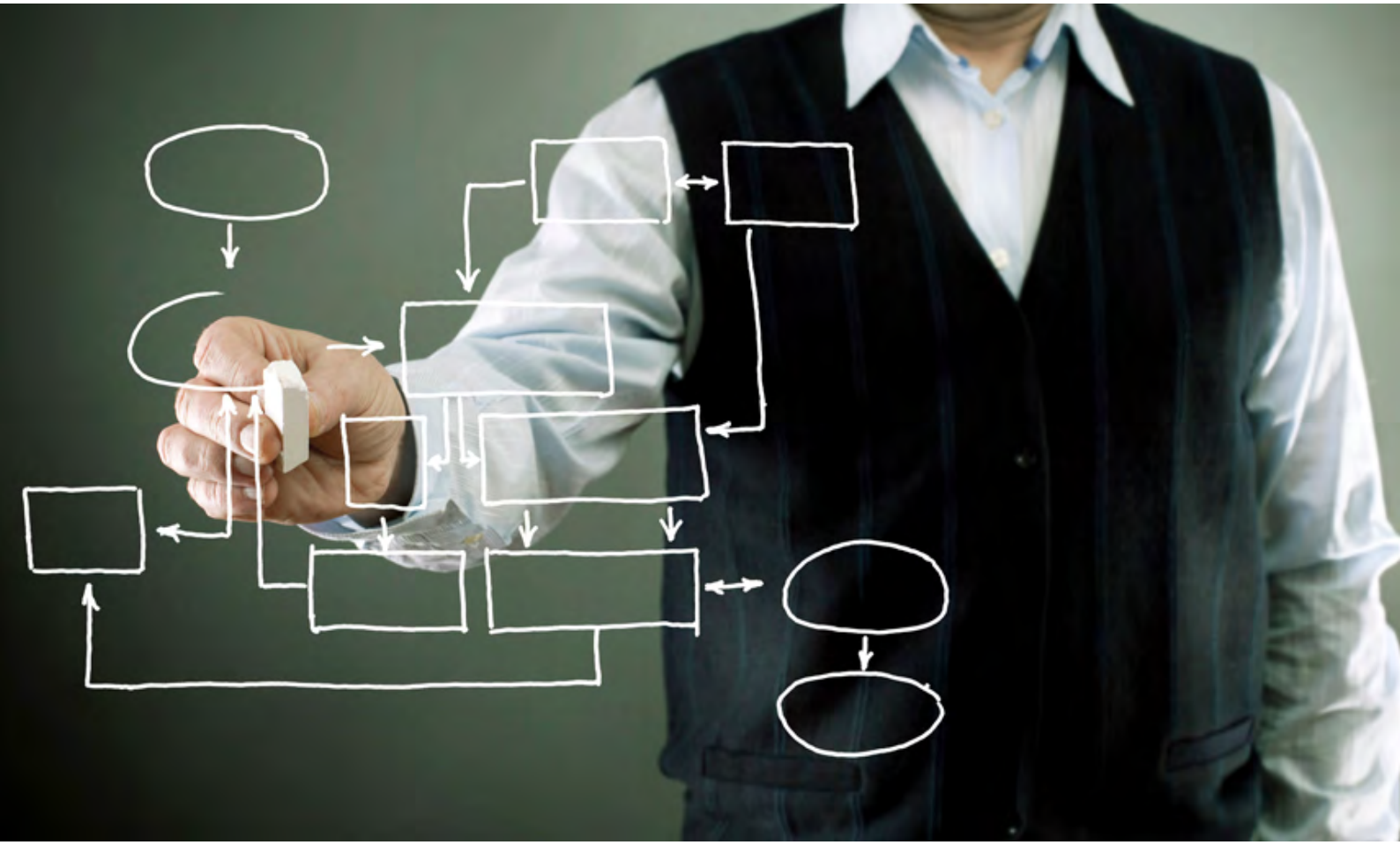
"We found that when we took control of the store and dealt with customers directly, we could communicate our product much more clearly, build our brand image and deliver better service. We had the control we needed to make every customer transaction experiential, and that's how we stood out in a really competitive market," says Georgia. The business has grown to at least double its size since then, opening stores in other major cities in Australia.

Like many retailers in Australia, Jimmy Possum also suffered from the economic downturn. The business saw a shift in the customer's willingness to pay and the volume of foot traffic coming through its stores. "We saw what was happening in the market, and we had to adjust our product offering and the materials we were using to make our products."

In addition to its retail step, the business has also reinvented itself online and its digital strategy. "Having great stores is great, but we have to get people into them. Our website was the key." The business realised that consumers were increasingly researching online before purchasing furniture, which meant it was essential to communicate the value proposition on the website. "We had to overhaul our website many times, adding much more information about the product, including photos, dimensions, material descriptions and design recommendations." Georgia noted that average store visits prior to each transaction had decreased from four times to fewer than two over the years, with many customers making a transaction on the first visit. This meant that the ability to communicate the product design, the brand image and the quality through the website was critical.

With a factory and head office based in Bendigo and shops all over the country, Jimmy Possum has a large network to manage. Georgia says "our IT team is the hero of the business. We use advanced technologies in everything from production to ordering." Digital technologies internally have allowed Jimmy Possum to streamline the production process and communicate much more efficiently. In addition, the business has also made significant strides in social media, especially in creating customer advocacy and driving awareness through Facebook.

Today, Jimmy Possum continues to grow at a substantial rate. Inquiries from around the world for Jimmy Possum products are giving the business the confidence it needs to venture overseas.



# 4

# Transforming workplaces

*Share of ICT workers in different industries*

**16%** Health care and social assistance

**15%** Education and training

**15%** Professional, scientific and technical

**9%** Construction

**7%** Manufacturing

**6%** Public administrative and safety

**5%** Other services

**4%** Financial and insurance services

**4%** Retail trade

**3%** Information media and telecommunications

**2%** Arts and recreation services

**2%** Administrative and support services

**2%** Transport, postal and warehousing

**2%** Accomodation and food services

**2%** Wholesale trade

**2%** Electricity, gas, water and waste services

**2%** Mining

**2%** Agriculture, forestry and fishing

**1%** Rental, hiring and real estate services

# 4 Transforming workplaces

Digital technologies are creating new jobs, transforming old jobs, and influencing how workplaces are organised. Digital technologies also have the potential to substantially increase employee engagement.

### Measuring employment

In Chapter 2 we analysed the importance of the digital economy with reference to industries. We looked at how digital technologies were not just in information, media and telecommunications, as it is defined by the ABS, but also contributing to other industries such as agriculture, manufacturing, mining and business services.

Another way of measuring the significance of the digital economy is by measuring how many people are employed in digital jobs.

*The Connected Continent* 2011 estimated that around 190,000 workers' jobs directly related to the internet in 2010. This was based on analysis of employment data from a range of sources and the figure included employment in: ISPs, web search portals and data processing; hardware; IT software and consulting; online information services; advertising and enterprise sites; government; and e-commerce. In 2010, 190,000 workers corresponded to 2% of all employment in Australia. This was used as an alternate measure of the size of the internet economy.

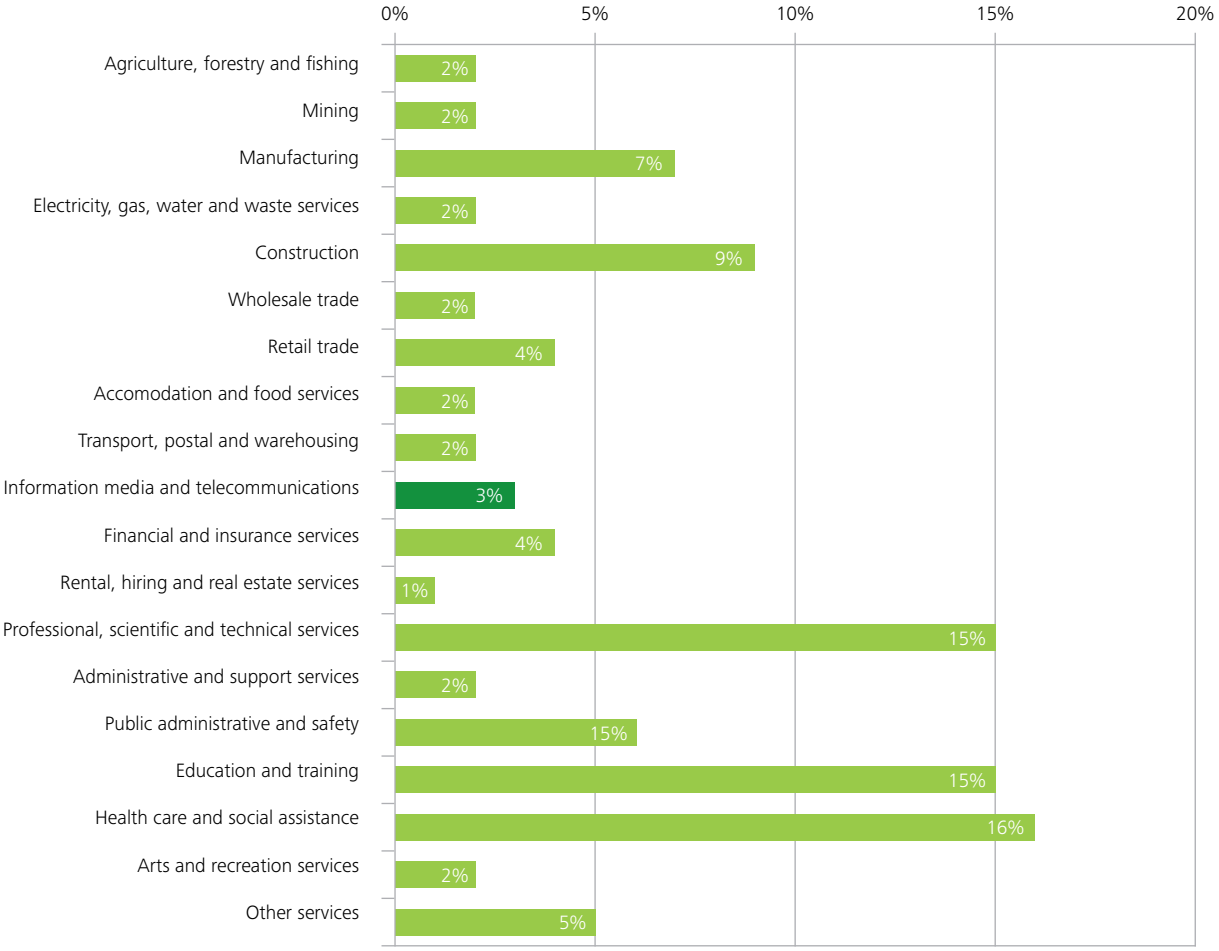
The recent developments in OECD methodology do not focus on employment measures of the internet and related technologies. Instead, skills and employment analysis by the OECD (2012) is based on a different concept – information and communications technology (ICT). There is a lot of overlap between ICT and the digital economy – e.g. multimedia specialists and web developers are in both. However, ICT includes some occupational categories that are more traditional communications or electronics jobs and that are not part of the digital economy, and there are some jobs such as digital marketing that might not be considered an ICT job but are very much part of the digital economy.

The OECD calculates a narrow measure of ICT jobs (specialists) and a broad measure of ICT jobs (intensively using ICTs).

The narrow measure of ICT specialists includes specialists who have the ability to develop, operate and maintain ICTs, and for whom ICTs constitute the main part of their job. There were 451,000 ICT-skilled employees in Australia in 2013–14, or 3.9% of total employment. Three occupations made up over 40% of this total – software and application programmers, ICT support technicians and ICT managers.

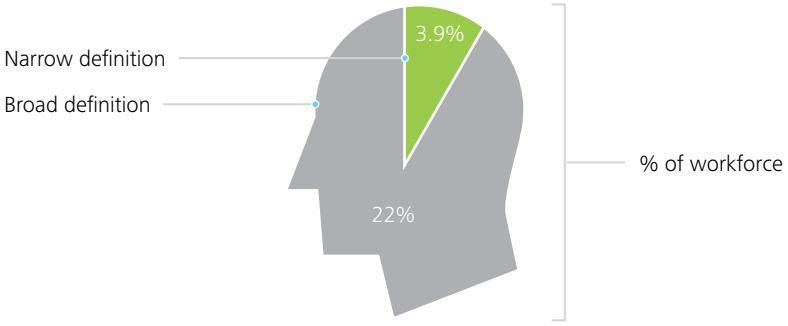
Even on the narrow definition of ICT occupations, there is an evident spread of ICT workers across industries. Less than 3% of ICT specialists work in the IMT industry – 97% work in other industries such as construction, manufacturing and professional services. Interestingly, over 30% of ICT specialists work in the health and education sectors.

**Chart 4.1: Share of narrowly defined ICT workers across industries**




On the OECD's 'broad' definition, which also includes intense users of ICTs, there were around 2.5 million workers in ICT employment in Australia in 2013–14. This corresponds to around 22% of total employment. As for ICT specialists, only a fraction (less than 3%) of intense ICT users are in the IMT industry. Accountants, accounting clerks, advertising, public relations and sales managers made up the greatest number of occupations in this broad group. A full list of ICT specialist and intense users is included in Appendix B. The wide upper and lower bound estimates illustrates the challenges in measuring all aspects of digital technologies.

**Chart 4.2: ICT employment in Australia, 2013–14**



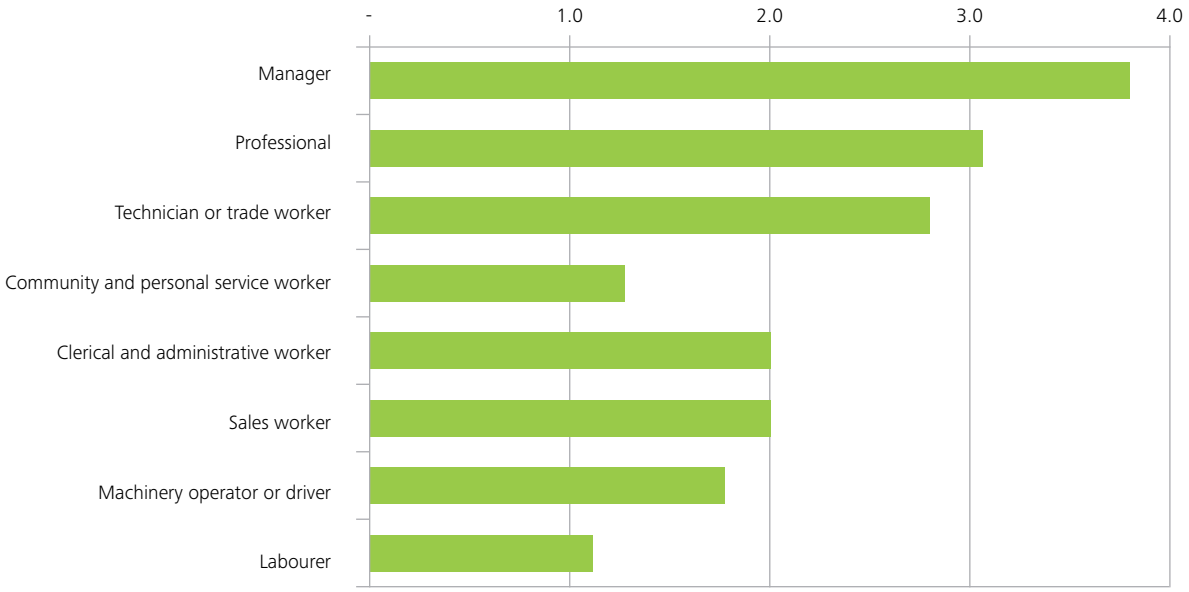

*Source: Deloitte Access Economics, based on ABS data.*

Previous research has found that many of these employees in the broader category are indeed significant users of the internet. Based on research conducted for *The Connected Workplace* 2012, published by Deloitte Access Economics, on average, employees spent just over three hours per day using the internet at work.

Looking at the data by occupation, on average, managers use the internet most. The internet clearly plays a significant role in the working lives of many Australians.

Defining who is an 'internet employee', or a significant 'internet employee' is only likely to get more challenging in the future as digital technologies become more embedded in more aspects of different occupations.

**Chart 4.3: Average daily internet use at work, hours**



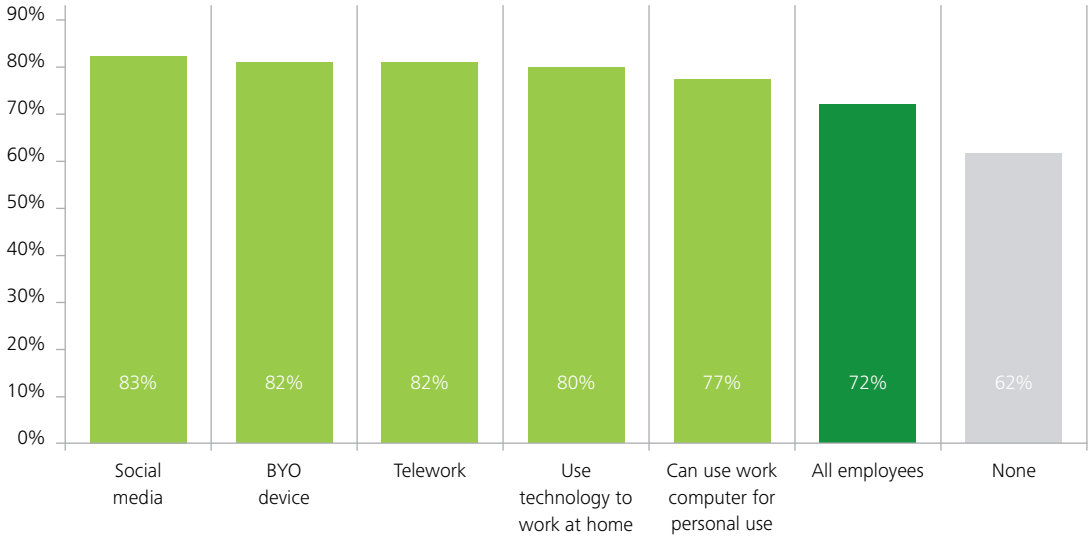
### Employee engagement and flexibility

There are a number of channels through which employees are benefiting from the new uses of digital technology in the workplace. Many of these benefits are not captured by traditional measures of economic activity such as GDP – for example, increased employee engagement and travel time savings.

*The Connected Workplace* 2012 found that flexible policies surrounding the use of digital technology in the workplace lifts employee job satisfaction.

These policies include using technology to enable arrangements such as the ability to telework, using social media in the workplace and using employees' own devices for work. The report found that up to 83% of employees in workplaces with flexible technology policies reported feeling satisfied at work, compared to 62% of employees in workplaces without such policies (Chart 4.4).

**Chart 4.4: Flexible technology policies and job satisfaction rates**




*Source: Stancombe Research & Planning and Deloitte Access Economics, 2013*

Also, the use of digital technology in the workplace is associated with increased employee retention. *The Connected Workplace* 2012 found that 9% of employees in companies without flexible technology policies are dissatisfied and intended leaving their job within the next 12 months, compared to only 6% of employees with flexible access to technology.

One reason for the increased job satisfaction and retention is that using digital technology in the workplace increases employee engagement, for example by facilitating collaboration. *The Collaborative Economy* 2014 found that 56% of employees were happier when collaborating in the workplace.

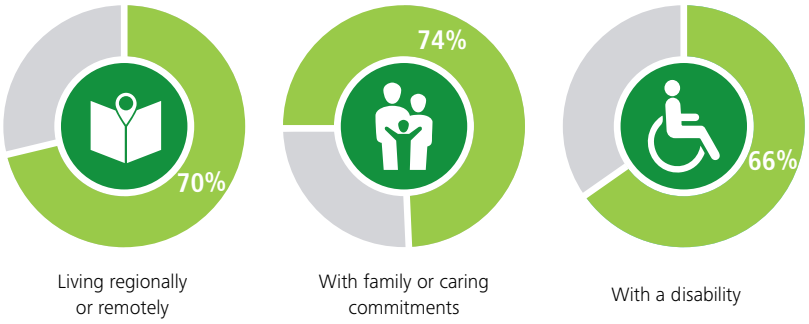
Technologies such as phone, email and video-conferencing provide an easy means of communication across teams and geographies. Electronic document management systems can facilitate collaboration by enabling multiple employees to work on documents together, while portable devices such as smartphones and laptops can facilitate group work away from individual desks. The increase in employee engagement that arises from these applications of digital technology contributes significantly to increased job satisfaction and employee retention.

As shown in Chart 4.5, the ability to use digital technology to telework is valued by many employees. It is also has potential benefits to many individuals who are not currently participating in the labour force, particularly those who are in this position because they are required to remain at home. This includes individuals not in the labour force because they have family or caring responsibilities, have a disability or live in a remote or regional area.

Teleworking reduces the barriers for these individuals to enter the labour force by enabling more flexible working arrangements to suit their circumstances. *The Creating Jobs Through NBN Enabled Telework* 2012 report found that increased telework opportunities (due to the National Broadband Network rollout) could create an additional 25,000 full-time equivalent jobs by 2020–21 due to increased labour force participation.

The report found that around 65-75% of those not in the labour force due to living in a remote or regional area, having caring responsibilities or a disability would take up employment if telework was available (Chart 4.5). Telework is able to address the main barriers to entering the labour force for these groups, for example by providing flexible hours, reduced travel time to work or a home office suited to a disability.

**Chart 4.5: Likelihood of telework uptake for those not in the labour force**



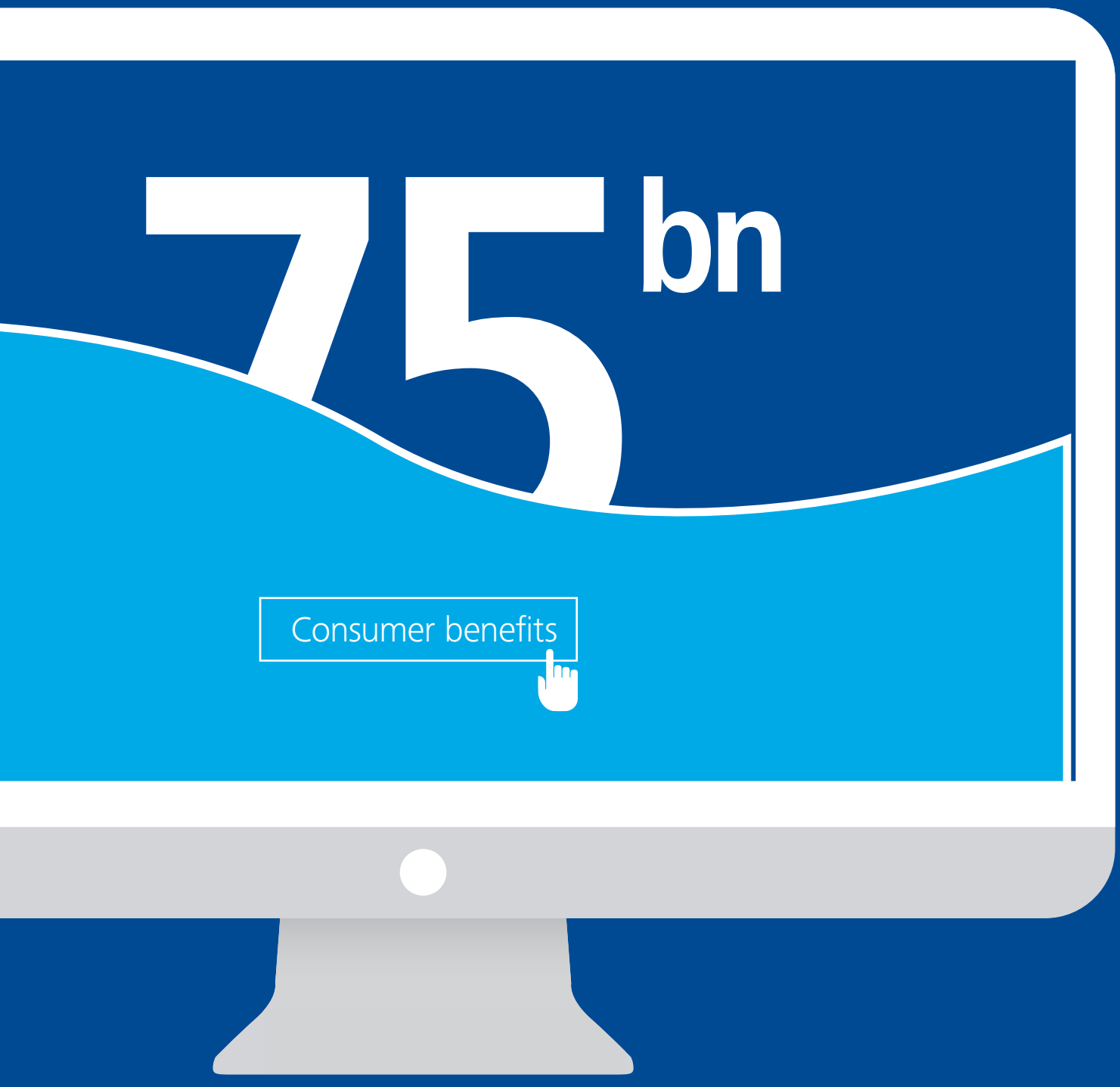

*Source: Stancombe Research & Planning and Deloitte Access Economics, 2013*

Introducing more flexible digital technology policies in the workplace can also come with costs, such as implementation costs, security issues and additional management expectations. Costs to employees include the fact that greater changes in occupations could lead to work insecurity and concerns about the need to always be connected to work.

Also, some argue that digital technology such as telework allows work to intrude on personal time at home. However, *The Connected Workplace* 2012 found the time spent using the internet at home for work purposes is often offset by using the internet for personal matters at work.

# 5

# How digital technology is benefiting society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Consumer benefits

# 5 How digital technology is benefiting society

Beyond the impacts of digital on the economy and businesses, as outlined by the OECD (2013), there are a range of indirect benefits to households and governments that cannot be adequately measured by GDP.

## Benefits to households – consumer welfare

This section provides estimates of the internet's value to households that cannot be solely observed in GDP figures. Updated data has been applied to the methodology used in *The Connected Continent* 2011, providing estimates of the internet's value in terms of search, variety, convenience, and recreation.

The estimated value to the Australian economy that accrues to households from accessing the internet is $75 billion in 2013–14, a real increase of over 20% from the estimate in *The Connected Continent 2011*.

Consumer benefits cannot be added to the economic contribution estimates in Chapter 2 because in some areas they overlap.

### Search

The ability to search for information quickly and for free provides perhaps the most tangible benefit for many internet users. All of the information stored on servers across the globe is worthless if people cannot find it, and search bridges that gap. Specialised search facilities help people find jobs, homes, cars, and the best prices on a range of goods and services, to name a few areas.

Providers of search services face a commercial imperative to continually improve their understanding of what interests users. The better they can understand users' interests, the better they can match advertising to users. In this example of a two-sided market, companies wishing to advertise their products effectively fund the provision of search facilities, which also direct users to a wealth of free content.

The value of search to Australian internet users was estimated at nearly $7 billion in 2010. That calculation was based on the assumption that Australian internet users were asking one answerable question every two days, and used average hourly earnings as a proxy for the value of users' time. Even keeping the assumption regarding the number of answerable questions constant - it is difficult to know how many internet searches should be valued because obviously not all would be answered without the internet – the value of search to Australian internet users is estimated to have grown to $8.4 billion, a real increase of 10%. This growth is due to increases in the number of internet users and wage growth (which increases the imputed value of time). In 2013 there were 15.4 million internet users, compared with just over 14 million in 2011. An after-tax wage of $24 per hour has been used throughout this chapter to value internet users' time.

We note that search functions are provided by businesses that partly funded advertising (which is included in GDP), so the value to consumers is not entirely additional to GDP.

### Variety

*The Connected Continent* 2011 highlighted the value to consumers of the ability to access goods and services through the internet that are not locally available. Then, there was a focus on online book purchases. More recent research has examined the effects of the democratisation of music production and distribution associated with digital technologies and the internet (Waldfogel, 2013). The available evidence suggests that this has satisfied niche tastes – for example, artists from independent labels made up over a third of the Billboard 200 in 2010, compared with 14% in 2001 (in the United States).

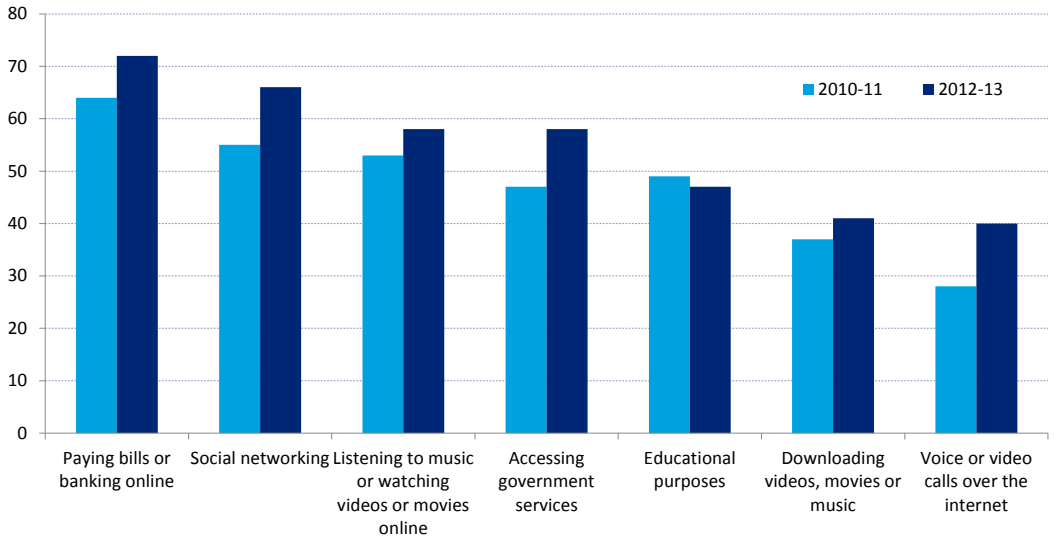
Consumers continue to benefit by being able to access goods and services through the internet that they could not in a bricks and mortar setting. If, as in *The Connected Continent* 2011, it is assumed that 40% of consumers' online purchases could not be made without the internet, the value of this variety to Australians is around $9.5 billion.

### Convenience

More Australian internet users are using the internet to undertake a range of activities than ever before. From 2010–11 to 2012–13 the proportion of users who pay bills or bank online increased by more than 10% (see Chart 5.1). There has also been a more than 20% increase in the proportion of users who access government services.

The range of services, both business and government, available online has increased significantly in the past few years. Businesses are tapping into people's willingness to use online services and the cost savings from not having a physical presence (see, for example UBank). A number of government agencies' services are now accessible through the myGov portal, including Medicare, Centrelink and the Australian Taxation Office.

Chart 5.1: Activities performed on the internet at home, % of internet users.




*Source: ABS 8146.0 Household Use of Information Technology, Australia, 2012–13*

*The Connected Continent* 2011 highlighted the value to internet users of being able to undertake necessary everyday tasks online. The value of this convenience is akin to the value of search – people save valuable time. It was estimated this was worth $8 billion in 2010.

If the time saving associated with paying bills, banking or dealing with government is assumed to have increased by only 10% (a figure of half an hour per week was used in *The Connected Continent* 2011, the convenience value of the internet to Australians is around $10 billion in 2013–14.

**Recreation**

Australians' use of the internet for recreational activities has doubled in recent years. Whereas *The Connected Continent* 2011 report used a figure of 45 minutes per day spent using the internet for recreational purposes (e.g. social media, email and browsing), current data suggests the figure for 2013–14 could be around an hour and 20 minutes.

Consumer gains from recreational use of the internet are estimated to be around $47 billion in 2013–14 – in 2010 the figure was just under $24 billion (in 2013–14 dollars). This is based on the same methodology used in *The Connected Continent 2011* (which accounts for the amount of time typical subscribers spend on internet access), but only includes video watched online using PCs or laptops, and Facebook use – so it is likely to be regarded as a conservative estimate.

We note that some internet recreational activities are provided by businesses that partly funded advertising (which is included in GDP), so the value to consumers is not entirely additional to GDP.

There are a range of other figures that highlight growing recreational use of the internet. The latest Sensis Yellow Social Media Report (2014) indicates that 95% of Australians using using social media used Facebook, averaged 17 minutes per visit, and accessed it on average 30 times per week. Average time spent per visit to other social media platforms ranges from seven minutes (Snapchat) to 19 minutes (Tumblr), but data is not available on how often they are visited, so these are excluded from calculations here.

The Australian Multi-Screen Report (Oztam et al. 2014) indicates that users spent, on average, six hours and 20 minutes per month watching video on the internet using PCs or laptops from Q3 2013 to Q1 2014. While a further three hours and 45 minutes was spent watching video on smartphones or tablets. This is not being included in the calculation of the value of recreation on the internet because sharing videos (or photos) is a major reason people use social media, so there could be overlap with the Sensis social media use data.

## Benefits for government

The effect of digital technologies and the internet is pervasive across all parts of the economy, including government. The government is significant in the three 'non-market' sectors of:

- public sector administration and safety
- education and training
- health care and social services.

Together, these sectors accounted for more than 16% of GDP in 2014. Digital technologies increase the productivity and efficiency of these sectors and improve non-market interactions such as the quality of government services and the way they are delivered to individuals. The non-market sectors share of the national productivity estimates for the whole economy is around $7 billion in the form of increased productivity to the government and non-market sectors in 2014, including general government administration, education and health care.

In this section, we will explore just how digital technologies are transforming these sectors, and improving outcomes for consumers and individuals.

### General government

In recent years, some agencies have made significant progress, such as moving tax returns and licence renewals online - and we are seeing broader and more sophisticated digital rollouts such as MyGov, MySchool and other online service delivery platforms. These initiatives have not only provided people with better service and increased convenience, they have also delivered a substantial productivity dividend in terms of a relative reduction in the share of workers tied up in back-office functions, such as filing clerks, and switchboard operators.

As Briggs (2009) has noted, old methods of government service delivery have been based on individual transactions and built around specific programs. With digital technologies, however, governments have the opportunity to do what the private sector is increasingly doing: tailoring service delivery and financial support to the needs and wants of the individual.

In addition to productivity, there are also significant opportunities to further improve government service with the use of digital technologies such as data analytics. Governments around Australia have become increasingly adept in using digital technologies to improve the outcome of public services. For example, Fire and Rescue NSW (FRNSW) is developing a world-first predictive system that uses environmental, geographic and operation data to gauge the risk of disasters such as flood and fire, to every property in the state. Such technologies will enable FRNSW to deploy its resources more proactively in an emergency situation to minimise life and property loss, delivering substantial benefits to residents of NSW.

### Health care

Digital technology and the internet are increasingly being used in the health sector, particularly to address escalating health care costs. Internet based applications such as search engines, e-health records and dedicated health websites could help to significantly reduce the demand for physical doctor visits.

According to The Australian Institute of Health and Welfare, health expenditure in Australia during 2012–13 was almost $150 billion, around 9.6% of our annual GDP and growing. Health care is also the second biggest public expenditure category for the Australian government, estimated to be around $65 billion in the 2014 Federal Budget.

E-health applications enhance the access of information and health records by patients and health professionals. The ability to access relevant, routine health care information online significantly decreases the cost of providing health services and the opportunity cost of individuals visiting health care providers.

E-health records also have the ability to improve the continuum of care, by providing unified health information that tracks a lifetime record of up-to-date patient history. This information can help reduce health care costs arising from duplication of diagnostics and ill-informed medication complexities.

Governments are also increasingly looking to use online health applications for early diagnosis, patient monitoring and aged care services, which can help reduce transportation costs for medical professionals and allow staff to be trained remotely, further improving the efficiency of the health care system.

Internet-based technologies also have the ability to enable people matching, such as finding the right doctor or support communities. In the US, some 80% of the population searched online for health related topics in 2010, each performing an average of 60 to 65 health-related queries per year (Pew Research, 2012). Although these benefits are difficult to quantify, they are undoubtedly considerable.

**Education**

In the field of education, digital technologies and the internet have had a significant influence on how the sector organises itself and how services are being delivered. The OECD (2013) identifies two key ways in which the internet can help make education more efficient. First, the internet improves education by enhancing remote communication and delivering teaching or training materials. Second, the internet greatly facilitates gathering of information using a myriad of services and applications such as online classes and seminars, dedicated webpages and online forums for expertise exchange.

In addition to efficiency gains, the internet and related technologies also provide significant non-market benefits such as opportunities for general learning by lowering the barrier of access to information, materials and contents of educational value. Analysis by Pew Research (2012) suggested that 86% of US internet search tools users reported learning something new or important that really helped them or increased their knowledge, and 50% of users found a really obscure fact or a piece of information using search engines they thought they would not be able to find.

In recent years online education has grown with universities beginning to offer Massive Open Online Courses (MOOCs) remotely. To the extent that the internet can help individuals access information and applications online, this content provides great opportunities for individuals to learn.

The benefits of search tools for higher education and research could also be substantial. According to a report by Advertising Age in 2007, over 40% of all education web traffic is driven by internet search tools. The ability to access information in a timely manner through internet search tools provides significant benefits, both to academic researchers and those working in professional services more broadly.

## Not-for-profits

Another important part of the non-market sector that is benefiting from digital transformation is the $105 billion not-for-profit (NFP) sector. The internet and related technologies offer more efficient ways of running organisations and delivering services. The impacts vary across the diverse NFP sector, which extends across a variety of areas such as health and aged care, community and support services, arts and cultural organisations, religious groups and social advocacy.

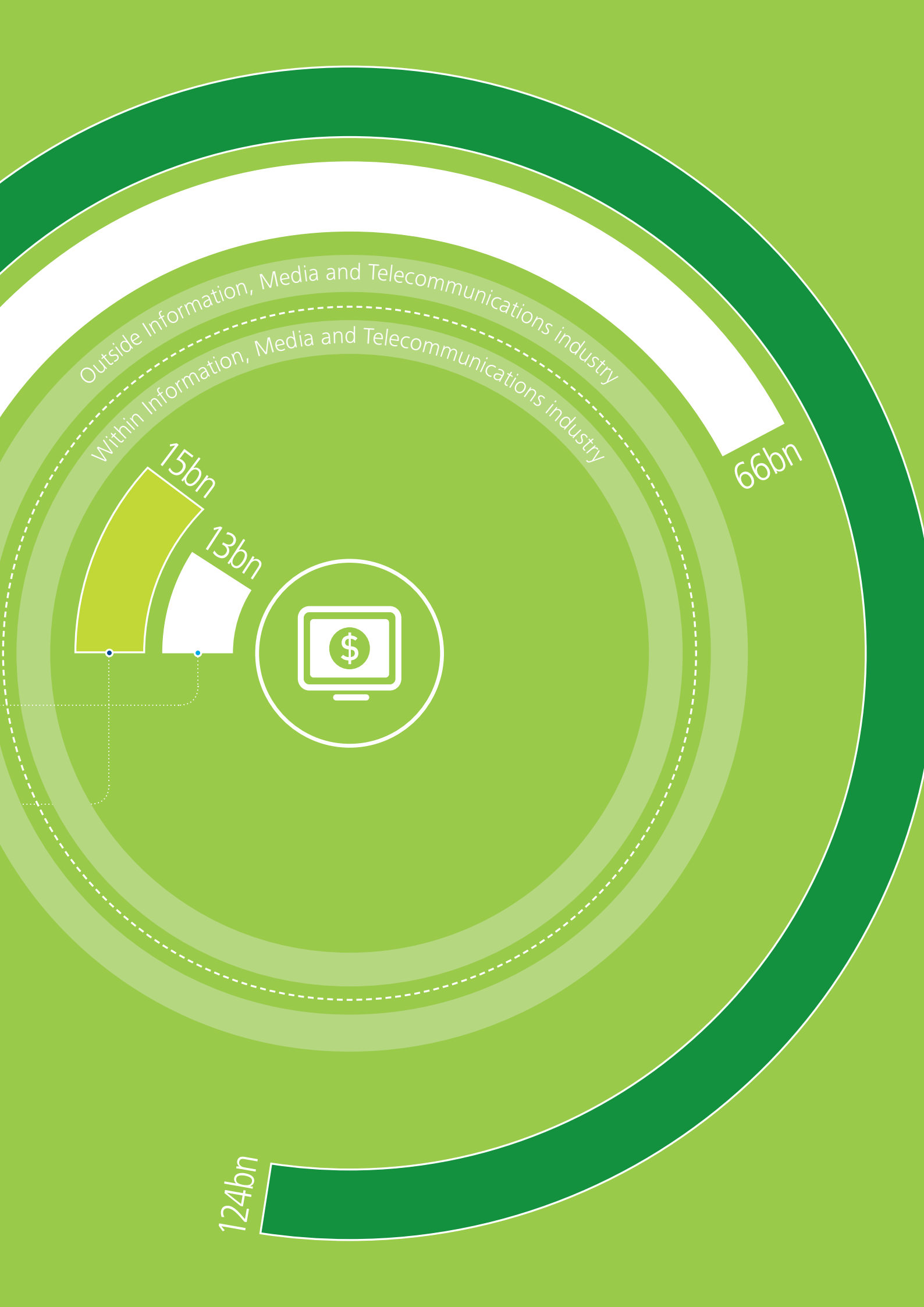
NFPs typically have limited budgets and lower levels of ICT capability than their corporate or government peers. They may have less capital or organisational capability to transition from legacy software and structures. NFPs often operate in sectors of the economy where privacy and data security issues are a perceived barrier to technology use. However, in several respects digital technologies offer even greater potential for NFPs:

- Website tools may offer not-for-profits more efficient ways of doing organisational tasks. For example, consider the costly task of fundraising. www.GoFundraise.com.au allows charities and NFPs to fundraise online. https://www.mycause.com.au/ is also an online fundraising website.
- Social media can be especially valuable for organisations that depend on networks of engaged people, for volunteering and donations etc. http://govolunteer.com.au/ is an initiative of Volunteering Australia to link volunteers with organisations.
- Rich-content video can be an especially powerful tool for NFPs seeking to stir an emotional response. More broadly, there is a shift towards social media peer to peer sharing. Accessing large-scale audiences is less reliant on just paid media; instead creativity and virality are important. It can also be used for remote service delivery to reduce costs and achieve efficiencies. Many examples are in The Solution Revolution www.solutionrevolutionbook.com/ Online advocacy campaigns are undertaken by www.theparenthood.org.au.
- Smartphones and tablets can be especially useful for workforces by reducing administrative overheads and enabling efficiencies by reducing costs for data entry, bookings and invoices. For example, Queensland aged care services provider BlueCare has a Community Mobile Project that introduced mobile tablet devices to support quality care, information access and staff efficiency.
- Cloud technology, which can lower ICT costs and reduce the in-house ICT function, can reduce a traditional disadvantage for NFPs. Multi-platform tools can have minimal licensing or start up costs, universal accessibility, and continually evolving functionality. For example, some NFPs are using Salesforce to manage their donor base for targeting and retention.

Like other non-market sector organisations, NFPs face some organisational challenges to integrate digital changes, but have significant opportunities to unlock benefits for their workforces and their clients.

# 6

# Prospects for the digital economy


Outside Information, Media and Telecommunications industry
Within Information, Media and Telecommunications industry
15bn
13bn
66bn
124bn

# 6 Prospects for the digital economy

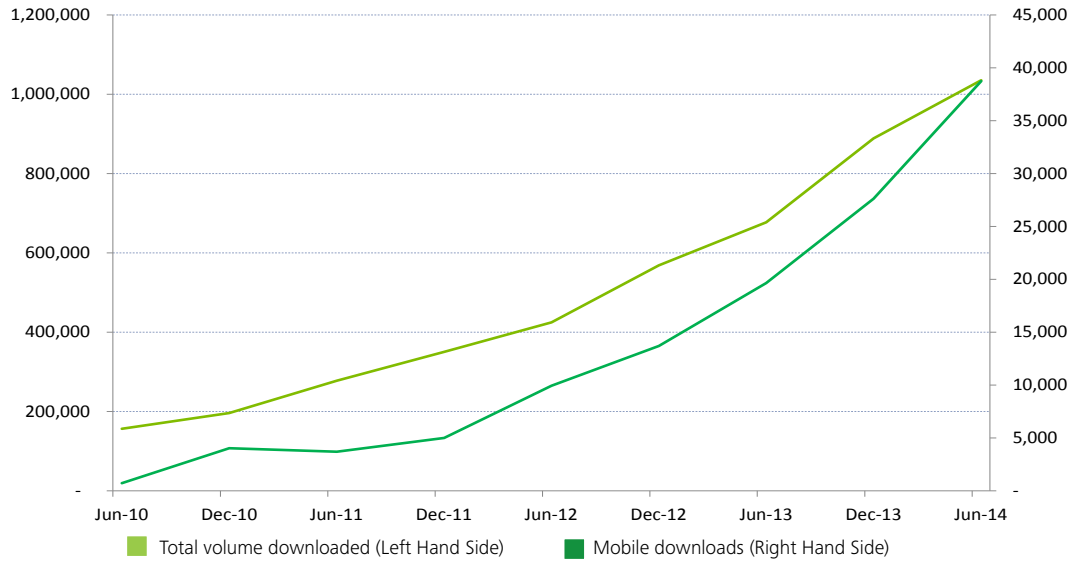
The internet and related technologies are playing an important and growing role in the Australian economy. In coming years, this is likely to continue because of faster internet speeds and greater uptake by households, businesses and governments, as well as the continued development of internet-related technologies such as mobile apps, social media platforms, and machine-to-machine (M2M) technologies. In this chapter, we discuss the likely growth of the digital economy, based on previous trends and current forecasts. We also discuss how the policy landscape will influence how the digital economy develops.

## Future drivers of growth

There are many ways of measuring the growth of digital technologies. A recent OECD paper (2014) outlined a range of data sources to measure the digital economy including internet use, employment in ICT professions, e-commerce levels, cloud adoption by enterprises and trends in data mining.

The volume of data downloaded is one measure of internet use. Since 2011 the volume of data downloaded in Australia has increased by nearly four times. Over the same period, the volume of data downloaded using mobile handsets has increased more than tenfold (see Chart 6.1 below).

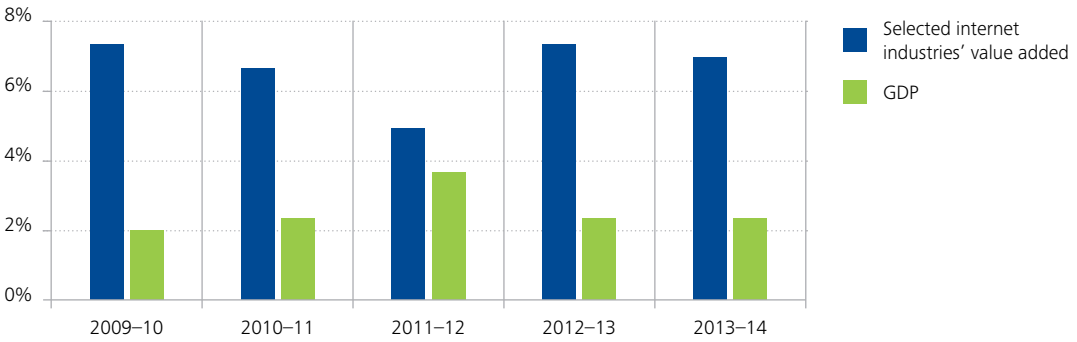
**Chart 6.1: Volume of data downloaded in Australia, in Terabytes**




*Source: ABS 8153.0*

A second area of consistent growth is in the value-added internet and related industries: internet service providers, internet publishing, search engines, data centres, and smartphone app developers. Annual growth in these industries' value added has been well over double that of GDP in all but one of the past five years (see Chart 6.2).

Chart 6.2: Selected internet industries' value and GDP annual growth rates




*Source: ABS 5204.0 and IBISWorld reports for internet service providers, Internet publishing and broadcasting, search engines, data centres, and smartphone app developers industries.*

Three other areas of notable growth worldwide are big data analytics, M2M technologies and cloud computing. According to a range of private and public sources cited in the OECD (2014), data mining scientific articles have doubled their share of scientific articles between 2006 and 2014 (albeit from 1% to 2%); M2M patents have more than doubled to around 175 per million between 2010 and 2014; and the market for cloud computing is expected to approximately double in size between 2013 and 2017.

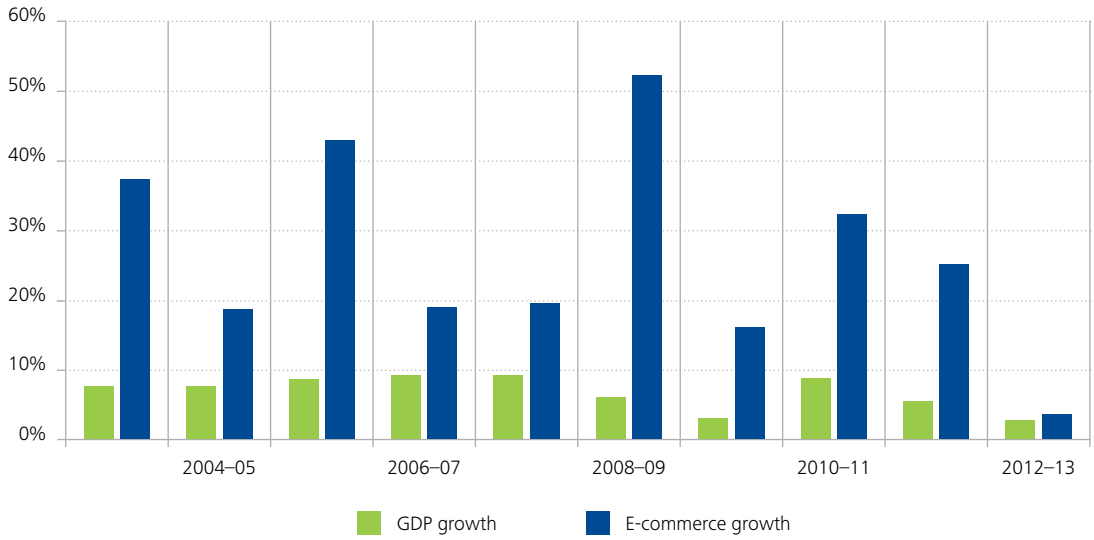
Continued improvement in internet access, broadband speed, and mobile take up is likely to further enhance the growth of innovative digital technologies. Applications such as data analytics and M2M technologies will benefit from broader use within the digital economy, such as the increased availability of big data.

### A forecast of value add

In this section we provide a forecast of the value of the digital economy, based on the methodology in Section 2.2. Growth in the value added-based estimate of the internet's economic contribution can be estimated, based on the internet and digital goods and services share of income in the Information, Media and Telecommunications (IMT) industry, and the e-commerce share of total goods and services income in the rest of the economy.

Growth in e-commerce consistently outpaced GDP growth in the decade to 2012–13 (see Chart 6.3). While there was a decrease in the growth of e-commerce in 2012–13, the internet's role in the economy is only likely to grow. The e-commerce aspect of the value of the digital economy is calculated by applying a growth rate of 9% to the value calculated for 2013–14. This is equal to the annual growth rate imputed from data on the internet share of income across industries from 2009–10 to 2011–12 (from ABS 8129.0), and is a more conservative number than would be calculated based on the total value of internet sales in other ABS publications (see ABS 8166.0 – *Summary of IT use and Innovation in Australian Businesses*). Also, while forecasts for growth in e-commerce sales in particular industries are hard to come by, online shopping is forecast to grow at 9.5% out to 2018 (IBISWorld 2015).

Chart 6.3: Annual GDP and e-commerce growth, 2003–04 to 2012–13



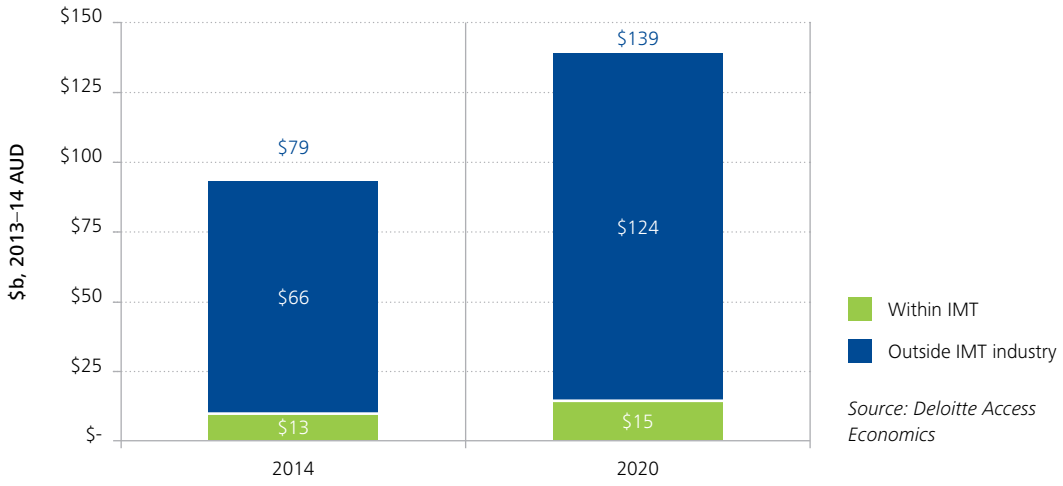

*Source: ABS 5206.0 , ABS 8166.0*
*Note: all growth rates are based nominal underlying data*

The contribution of the internet will also be driven by growth within the IMT industry. Taking into account IBISWorld growth forecasts for parts of the IMT industry, and how much of the economic contribution of the internet within the IMT industry is attributed to each part, this aspect of the economic contribution of the internet is forecast to grow at a compound annual growth rate of 3.25%.

This aspect of the size of the digital economy is dragged down by forecast negative growth in the wired telecommunications sector. The digital economy within the IMT industry will grow to be worth around $15.1 billion in 2020 (in today's prices).

It is estimated that the internet and digital enabled economy could be worth $139 billion by 2020, which would correspond to around 7.3% of GDP.

Chart 6.4: Economic contribution of the digital economy in 2014 and 2020




*Source: Deloitte Access Economics*

In making this forecast we note a couple of points about interpretation. First, we note that this is a real increase in the contribution of the internet and related technologies to the economy, from around 5.1% to 7.3% of GDP. Second, this methodology of estimating value added of the internet and related technologies depends upon the assumption that e-commerce is a proxy for digital intensity of industries. Third, while e-commerce will continue to grow, it is likely to reach some plateau or saturation point (as a share of consumer spending) in the future. Fourth, it is actually other digital technologies – data analytics, M2M technologies etc – that are the likely growth drivers for the internet. And finally, this value add estimate of the internet and digital technologies is only one measure of value and needs to be complemented by other measures such as productivity analysis and non-market benefits (e.g. consumer welfare, public benefits) that are not measured in this forecast.

## Public policy enablers

The digitisation of the economy is one of the most critical issues of our time. While the transition of the Australian economy to a digital economy is primarily a market-led phenomenon, government policies remain an important tool in shaping the digital landscape and promoting the growth of the digital economy. In line with other developed countries, the core issue that Australia faces is how to design and implement strategies that will optimally support economic growth, productivity, innovation and employment.

A strong policy framework will facilitate the growth of the digital economy and ensure it plays a role in providing employment, adding to productivity growth and generating consumer benefits. However, if the policy framework is not sound, including poorly conceived regulation, over-regulation or inadequate incentives for digital innovation, it will constrain the growth in the digital economy and potentially damage the investments already made in Australia by the technology sector.

### The role of government in the digital economy

The digital economy has led to innovation in business models, including how goods and services are produced, how value is created and how value is monetised. The transformational changes delivered by digital technologies have also given rise to new forms of business models, innovative products and solutions that thrive in a digital environment. What role governments play and how they respond to changes in the economy remains one of the key factors that will determine whether businesses and communities can confidently, productively and safely participate in the digital economy.

According to *Australia's Digital Economy: Future Directions* (2009) the government's role is to fill a gap left by the market, to address social inequity, to protect the community, to assist markets to work fairly and efficiently and to address market failures. In this report, we focus on policy initiatives that promote the digital economy, regulatory concerns and government service delivery.

### Broadband

Broadband is an important enabler of the digital economy, especially through encouraging participation. Effective participation in the digital economy will deliver positive benefits for Australians in the form of improved access to business and job opportunities, health, education and government services. The ability for people to share common interests will become easier through high-speed internet in Australian homes, businesses and community centres.

In turn, that means governments can make a difference through policy support for accessible, high quality, and affordable high-speed broadband, as well as their support for competition in telecommunications generally.

Australia has performed strongly in mobile broadband, ranking second in the OECD (from 34 countries) on mobile broadband subscriptions. However, OECD figures (2014) suggest that subscriptions to fixed broadband access in Australia rank 21st out of 34 countries – below the OECD average. Australia's connectivity to high-speed broadband should improve with the NBN rollout.

Broadband also needs to be affordable. While access to the internet in Australian is considered to be relatively high, there remain some gaps in access. ABS figures in 2012–13 show that over 97% of those earning $120,000 or more are internet users, compared to 77% of those earning less than $40,000 a year. Internet affordability remains an issue among low-income earners, with the Australian Communications Consumer Action Network (ACCAN) reporting that 50% of low-income earners cannot afford broadband internet.

As the most common form of access, availability of ubiquitous high-speed broadband connections remains a key factor in encouraging future growth of the digital economy. Australia was ranked 42nd in the world for internet speed by Akamai's most recent 'state of the internet' study in 2014. Broader availability of broadband can enhance the productivity benefits of digital technologies, connect rural and remote communities to products, services and people, bring about new business models, and changes in where and how people work. In addition to the digital economy, broadband can also have profound impacts on our society as a whole, such as changes to family relationships, access to fundamental services and stronger integration with remote communities.

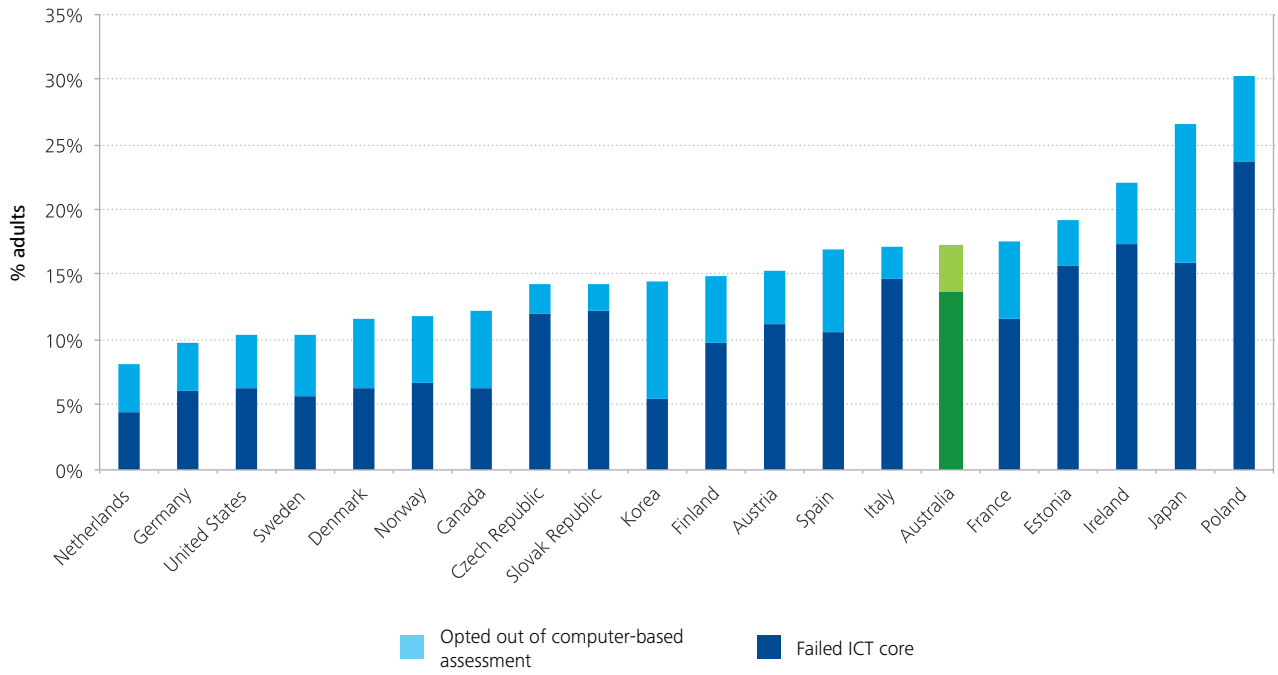
### Innovation and skills

In addition, other policy measures, including R&D incentives, tax and skilled labour are also important policy areas that are critical to the development of the digital economy. Such policies have a significant long-term influence on the technological and structural make-up of our economy.

According to the OECD (2014), Australia has a relatively low level of IMT industry R&D as a share of total business R&D. Although ahead of Turkey, Mexico and a few other countries, Australia ranks 26 out of 32; behind all major developed OECD countries.

There are many dimensions to skills issues in the digital economy and Australia has a mixed performance. While formal skills are very important, successful innovators of the future will require a much broader skill set - including problem solving, communication skills and design thinking, among others (highlighted in a 2014 Innovation report by Deloitte). They will require not just a depth of expertise, but also a breadth of knowledge. This involves a more well-rounded education system where the focus is on teaching students to think - creatively, analytically and critically. Students should be encouraged to use the tools of the digital age efficiently and effectively in order to solve problems and develop an understanding of the global environment. Chart 6.5 shows that Australians perform poorly relative to other OECD countries on this metric.

**Chart 6.5: Problem solving in a technological environment**



In the digital economy, creativity, innovation and collaboration through digital platforms will be critical for business success; in turn this means that ICT skills will be essential in the future. Working to develop new products entails greater uncertainties and requires higher-skilled workers than when production processes are better understood. As digital technologies become more pervasive in the economy, the demand for a high level of competency in ICT skills will also increase at a rapid pace. The ability to meet this demand will partially determine the future success of the digital economy.

**Conducive and adaptive regulatory framework**

Digital technologies are rapidly evolving, and so are the challenges faced by regulators and industry participants. Often, the regulatory challenges brought about by new and innovative technologies extend beyond the ICT sector.

The Murray inquiry (2014) into Australia's financial system recognised the important role digital technologies play in the financial system, including its contribution to advancements in payment systems. The inquiry also noted regulatory challenges such as those relating to Bitcoin, and payment routing.

The Harper review (2014) into competition policy has also highlighted the challenges brought about by rapid technological development. Mobile applications such as Uber are severely disruption existing industries and present unique regulatory challenges.

Technological developments are rapidly changing; new technologies emerge at an increasing rate, with the offering of both fixed line and mobile broadband services throughout the world, applications and services that blur the distinctions that previously existed between devices and services are growing in popularity. This convergence in functionality and interaction between technologies gives rise to new regulatory challenges.

It is important that regulatory regimes are conducive to facilitating digital innovation and encouraging future growth in the digital economy.

Technological innovation is a major driver of the digital economy and can benefit consumers. Government and regulators need to balance these benefits against the risks, as they seek to manage the flexibility of regulatory frameworks and the regulatory perimeter. The government is also well positioned to facilitate innovation through coordinated action, regulatory flexibility and forward-looking mechanisms.

**Government service provision and social media**

Much of the analysis of the digital economy revolves around business innovation. Yet, as the largest single business in Australia, government at the federal, state and local levels, – which accounts for almost one-third of all spending in Australia – can also benefit from the digital economy.

As Australia's Government 2.0 Taskforce noted in late 2009, "Once public sector information is liberated as a key national asset, possibilities - foreseeable and otherwise - are unlocked through the invention, creativity and hard work of citizens, business and community organisations. Open public sector information is an invitation to the public to engage, innovate and create new public value. Similarly, governments can now know a lot more about what their 'customers' want."

Some agencies have made major strides such as moving tax returns and licence renewals online, and e-health and online education initiatives are also being rolled out. Such policy initiatives have the potential to transform how government services are delivered to households and significantly improve the efficiency of government operations. As Briggs (2009) noted, old methods of government service delivery have been based on individual transactions and built around specific programs. Now, however, governments have the opportunity to do what the private sector is increasingly doing: tailoring service delivery and financial support to the needs and wants of the individual, improving service quality and lessening the demand for onerous authentication and personal information.

In 2013, the Department of Finance and Deregulation released its paper *Australian government cloud computing policy: maximizing the value of cloud*. The paper outlined key policy considerations surrounding the use of cloud technology in government, including internal use and service delivery. Key action items arising from the policy paper included transition of public-facing websites to public cloud services where suitable, and better procurement guidelines that support the evaluation of cloud alternatives.

There remain significant gaps in the application of digital technologies in the delivery of government services. Many departments and agencies are lost in 'business as usual' mode, failing to recognise that they can now tap into their customers' wants and needs in a manner never before possible, and then use that information to tailor their services ever more cost effectively.

## Digital Transformation Office

In 2015, the Commonwealth Government announced the establishment of a Digital Transformation Office (DTO). The overall objective of the office will be to drive transformation across government agencies, especially in service delivery, through business-like design processes rather than traditional government approaches.

A recent OECD report (Mickoleit, 2014) noted that a presence and activity on social media is no longer a question of choice for most governments as those new platforms empower individuals and non-traditional interest groups. Government institutions around the world are slowly becoming more represented and active on social media; some 26 of 34 OECD member countries' governments operate a Twitter account; and they maintain a Facebook page in 21 of 34 countries.

The report found that social media has the potential to make policy processes more inclusive and therefore build confidence between governments and citizens. Empirical evidence for the US, for example, suggests that social media uptake is very similar across different ethnic minorities, education and income groups (Pew Internet, 2012). In this context, governments can alleviate some of the existing imbalances in supply and uptake of municipal online services, especially where imbalances correlate with social-economic factors such as distribution of ethnic groups, education and income levels.

Social media engagement with the public sector also has the capacity to drive innovation in public service delivery and government operations. The OECD report noted that social media can amplify the effects of the internet on public information and services; and provide opportunities to deliver on expectations that are not met by traditional online government services.

Most parts of the Australian government have already made significant progress in using social media to consult and engage with the community, including a plethora of blogs, Twitter, Facebook and YouTube. In addition, cross-agency collaboration platforms such as GovDex provide a valuable opportunity for civil servants to connect internally and establish communities on the internet. Past experience has shown such platforms can help improve workplace satisfaction and raise productivity levels through increased collaboration.

# Appendix A: Previous methodology

## *Expenditure approach to measuring the contribution of the internet discussion*

*The Connected Continent* 2011 used a method for measuring direct economic contribution that relied on the expenditure approach to GDP measurement. This was an attempt to examine the share of Australia's output that can be directly attributed to the building and maintaining of infrastructure necessary to support access to the internet, the facilitation of its use, and the development and distribution of content.

While expenditure-based estimates have been widely used – the Boston Consulting Group used similar methods to estimate the size of the internet economy in a number of countries – there have since been developments in methodology and data collection that give us new means of examining the role of the internet in the economy. This report does not produce a revised estimate because of methodology issues and because of changes in data sources in recent years, as described below.

Consumer spending related to the internet is the first aspect of this measure. For 2013–14 it could be estimated as being worth just under $27 billion. This is made up of $15 billion of household final consumption expenditure that could be attributed to the internet (ABS 6530, 5204) – spending on access to the internet, half of spending on mobile phones and mobile phone charges, half of spending on computer equipment – and $11.5 billion on online retail (NAB 2014).

There remains uncertainty around how much Australians spend online: Forrester Research (2013) forecast online retail spending of $32.5 billion in 2013–14; the ABS estimates that domestic online retail sales were worth $6.5 billion in 2014 (ABS 8501.0, 2014). The NAB appears to provide a 'middle of the road' estimate. While the NAB online retail sales index shows year on year growth of nearly 10% to June 2014 and ABS online retail sales data indicated growth of nearly 30%, it is difficult to produce a reliable consumer-spending estimate.

Investment by the private sector related to the internet is another part of this measure. It could be estimated to have been worth nearly $17 billion in 2013–14. This figure includes half of non-dwelling construction in the IMT industry (which includes ISPs, app development, software production, internet publishing, data centres and so on) - worth $4.5 billion – and half of investment in computer software and hardware in all other private industries. This data comes from ABS national accounts data on gross fixed capital formation. Investment in the public administration and safety sector was worth a further $1.7 billion.

Applying the same methodology to government spending as a final consumer of internet-related goods and services, government spent just under $5 billion in 2013–14. This figure has been interpolated from the ratio of consumption to investment spending evident in an old report on government ICT expenditure (ABS 8119.0, 2004) and gross fixed capital formation data. Using this methodology produces an estimate of total ICT spending by the federal government of $5.9 billion in 2011–12, which is identical to that produced in the *Australian Government ICT Expenditure Report 2008–09 to 2011–12* (Department of Finance and Deregulation, 2013).

Perhaps the most significant difficulty in producing expenditure-based estimates of the internet economy is the calculation of relevant imports and exports. At the economy-wide level, net exports are simply added to final spending on consumption and investment items by individuals, businesses and governments to calculate gross domestic product. When use of the internet and related technologies is deeply embedded in goods and services, which are imported and exported, it is more challenging to isolate a digital trade deficit.

It is likely that the net exports component of GDP related to the internet economy has a negative value. Consider two areas of ICT goods: net exports on office machines and automatic data processing machines and telecommunications equipment – the deficit in 2013–14 was -$14.5 billion (ABS 5368.0, 2014). The net imports of these products make up some proportion of the consumer, business and government spending noted above. We also operate a trade deficit in goods that are popular online purchases – clothing and accessories, consumer electronics. However, it is harder to identify the proportion of net exports of something such as data analytics, which will be embedded in a country's exports and imports.

# Appendix B: ICT workers

Below is a table categorising ICT employment. All of these categories are included in the OECD's (2012) broad measure of intense users; the **bolded** occupations are included in the narrow measure of ICT jobs. The following list is ordered by number of employees in each occupation.

Accountants
Accounting clerks
Advertising, public relations and sales managers
Office managers
Bookkeepers
**Software and applications programmers**
Chief executives and managing directors
Personal assistants
Advertising and marketing professionals
Solicitors
Secretaries
Keyboard operators
General managers
Management and organisation analysts
Production managers
Bank workers
**ICT support technicians**
Civil engineering professionals
Finance managers
**ICT managers**
Financial investment advisers and managers
**Electronics trades workers**
Human resource managers
**Database and systems administrators, and ICT security specialists**
Payroll clerks
Credit and loans officers
Supply and distribution managers
Insurance, money market and statistical clerks
**Computer network professionals**
**Industrial, mechanical and production engineers**
**ICT business and systems analysts**
Policy and planning managers
Architects and landscape architects
Engineering production workers
Engineering managers
Financial brokers
**Electrical engineers**
Other information and organisation professionals
Environmental scientists
Auditors, company secretaries and corporate treasurers
Intelligence and policy analysts
Transport services managers
Medical laboratory scientists
Practice managers
Medical imaging professionals
**Multimedia specialists and web developers**
Surveyors and spatial scientists
ICT sales professionals
Mining engineers
ICT sales assistants
Insurance agents
Financial dealers
Geologists and geophysicists
Agricultural and forestry scientists
**Electrical engineering draftspersons and technicians**
Librarians
Judicial and other legal professionals
**Telecommunications engineering professionals**
Urban and regional planners
**ICT support and test engineers**
Archivists, curators and records managers
Other accommodation and hospitality managers
Life scientists
Other natural and physical science professionals
Barristers
**Electronics engineers**
**Electronic engineering draftspersons and technicians**
Chemists, and food and wine scientists
Actuaries, mathematicians and statisticians
Economists
Auctioneers, and stock and station agents
**Telecommunications technical specialists**
ICT trainers
Other sales support workers
Chemical and materials engineers

*Source: Deloitte Access Economics based on OECD (2012) and the ABS's Australian and New Zealand Classification of Occupations (ANZCO).*

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