

# Digital Australia: Seizing the opportunity from the Fourth Industrial Revolution





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# Preface

Digitally-enabled innovations are creating opportunities and disrupting business models across all sectors of our economy. This Digital Australia report represents a synthesis of our recent research into the digital opportunities and threats across seven major sectors of the Australian economy, as well as providing a picture of the level of digital maturity across the Australian economy as a whole (the 'Digitisation Index'). It is the latest in a series of similar reports published by McKinsey & Company that have drawn on insights from the McKinsey Global Institute (which published our Digital America report in 2015 and a similar Digital Europe perspective in 2016). The report draws on the result of a research collaboration with the Australian Federal Department of Communications and the Arts, and we gratefully acknowledge their contribution to the research.

The intended audience of the report includes policy makers and influencers; CXOs in industry who are trying to navigate choppy and at times ambiguous waters of digitisation; and practitioners who are 'at the coal face' of driving digitally enabled innovation in their organisation.

The core McKinsey team who worked on this report included:

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We benefitted immensely from contributions from a range of industry and digital experts, including: Douwe-Klaas Bijl, Chad Bright, Julian Carrigan, Tim Fountaine, Ryan Geraghty, Chris Hartley, Olivia Loadwick, Jonathan Michael, Manuela Nicolae, Simone Nieuwendam, Sree Ramaswamy, Joao Segorbe, Helen Seidel, and Marek Stepniak; and feedback and contributions from the Australian Federal Departments of Industry, Health, Treasury, and the Federal Digital Transformation Agency.

One of the central goals of this report is to contribute to the debate about how Australia can benefit most (both economically and socially) from what the World Economic Forum has called the Fourth Industrial Revolution. We welcome comments on the research at [digital\\_australia@mckinsey.com](mailto:digital_australia@mckinsey.com).

# Abstract

New technologies and new ways of working are transforming the nature of work and—over time—reshaping the Australian and global economies. While the pace and magnitude of change varies significantly from industry to industry (and often from player to player in those industries), in each sector we looked at in this report, we saw fundamental changes underway. These changes are in the way organisations engage with their customers, the way they develop and deliver products and services, as well as how they plan and shape their future workforces. We see a window of opportunity for Australian consumers, businesses, and governments alike to profit from the wave of change being driven by this ‘Fourth Industrial Revolution’.<sup>1</sup>

In this report we define the term ‘digital’ broadly as a suite of technologies and ways of working which together enable a set of opportunities in: innovating business models, product offerings, and markets; growing existing revenue streams and enhancing the customer experience via improved customer interactions and service; and streamlining internal processes and operations (see Exhibit 1 in the introductory chapter).

By this broad definition, digital is not just about IT infrastructure, nor focused narrowly on online/mobile presence, but an integrated set of opportunities leveraging technologies ranging from automation, the Internet of Things, and advanced analytics, through to agile methodologies and customer-centric product and experience design.

We applied two lenses to the digital opportunity in Australia. First, we looked at the potential of digital across the economy as a whole; the trends that are shaping digital adoption and the current state of Australian industry. To do this, we built on our earlier McKinsey Global Institute-sponsored Digital America and Digital Europe work, to develop a Digitisation Index for Australia, which tracks the relative digital maturity of the different sectors of the Australian economy, based on 37 variables spanning digital assets, digital usage and digital labour. Our key findings at an economy-wide level include:

- Waves of digital innovation are accelerating, reaching scale faster than ever before—resulting in inevitable disruption, but also creating new opportunities for those who are able to move quickly to take advantage of the disruption
- Digital can represent the next frontier of productivity and economic uplift for Australia, with the potential to contribute between A\$140 billion and A\$250 billion to Australia’s GDP by 2025, based on currently-available technology alone
- Australia’s digitisation is uneven, and still a distance from its full potential; knowledge intensive industries lead service industries, which in turn lead asset intensive industries
- Australia has doubled its digital growth over the last five years, however, particularly asset intensive Australian sectors still have in general lower levels of digitisation than their peers in the United States
- High digitisation growth for a sector over the past 5 years appears to be correlated with higher labour productivity.

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<sup>1</sup> *The future of jobs: Employment, skills and workforce strategy for the fourth Industrial Revolution*, World Economic Forum, January 2016.

Second, we explored the opportunities (and threats) from digital in depth across seven key sectors of the Australian economy: healthcare, the public sector, retail, the arts, banking and insurance, mining, and utilities. In each sector chapter we identify not only the digital levers that have the greatest potential, but also the actions required by players to unlock that potential. Key findings by sector include:

- **Healthcare:** By automating and simplifying processes, facilitating better connectivity, and using better reporting and advanced analytics, Australia's annual healthcare expenditure could be reduced by 8 to 12 percent. Even more importantly, there is an opportunity to significantly improve the quality of care. Capturing these opportunities will require significant cooperation between individual providers and government
- **Public sector:** The Australian Government has many strong digital initiatives and foundations in place. Applying digital tools to the government's citizen-facing activity and back office support has the potential to generate annual efficiency gains of 4 to 15 percent, primarily from digitisation of citizen interactions and internal processes, with additional potential upside from increased revenues and policymaking informed by advanced analytics. Capturing the opportunity will require continued investment in nationwide digital literacy and attracting new skill sets into public sector roles
- **Retail:** Despite strong strides in recent years, the digital maturity of Australia's retail sector lags behind international peers, particularly in relation to reaching and influencing consumers through digital channels. Digital has the potential to transform each step of the retail value chain, from sourcing, distribution, logistics, and instore operations, through to the customer-facing areas of marketing, omnichannel consumer experience, and ongoing consumer engagement. The total potential EBIT improvement opportunity is between A\$15 billion and A\$30 billion, with the additional potential for first movers to also grow revenues significantly via increased market share
- **Arts:** Digital solutions can help organisations in the arts reach new or remote consumers, individualise marketing and consumer experience, provide new products, and improve operations. Doing so will radically disrupt the traditional (physical) channels by which cultural offerings are typically delivered, but the upside is a manifold increase in reach and awareness—as early adopters in Australia and overseas are already seeing
- **Banking and insurance:** While the banking and insurance sectors have been at the forefront of digitisation, there is further opportunity to increase digital service and sales, apply advanced analytics particularly in managing risk, and use new technologies like telematics to reinvent traditional products. In retail banking, the potential EBIT improvement opportunity is between A\$7 billion and A\$11 billion. In personal lines insurance the opportunity ranges between A\$440 and A\$880 million in operations costs and up to A\$1.1 billion in claims costs (part of which is expected to be passed on in the form of reduced premiums)
- **Mining:** By better applying sensor technology, advanced analytics and process automation, the value of digital to the mining sector is between A\$40 billion and A\$80 billion in EBIT improvement. Capturing this opportunity requires end-to-end integration for real-time performance monitoring, optimisation, and control

- **Utilities:** Digitally-enabled innovations can be applied across the entire utilities value chain, encompassing generation, transmission and distribution, energy trading, and energy retailing. The value of the opportunity is up to A\$1.3 billion in EBIT improvement, achieved by optimising supply and demand management, maintenance, workforce management, automating processes, digitising customer journeys, and collecting and mining the data unlocked by new technologies such as smart meters.

Capturing the full potential of digital and analytics will require organisations to commit to a journey of reinvention: from the capabilities they hire and develop, to the ways they think and work, to the investments they commit to. Today, Australia has pockets of impressive digital performance, ranging from world-leading mobile banking engagement, to world-leading mine automation deployment. Translating these pockets of best practice into digital maturity across entire industries will require vision and commitment from both the public and private sectors. Governments need to embrace digital in their own operations (both policy development and service delivery), while fostering digital innovation in the Australian economy by investing in infrastructure, the Australian workforce and R&D. Companies need to set a strategic ambition for digital, challenge orthodoxies in the way they work, invest in building digital capabilities while focusing on ROI, and shift cultures and ways of working.

# Introduction

The rapid digitisation of value chains, ranging from product and service design through to manufacturing, plant optimisation, marketing, distribution and customer interactions is fundamentally changing the way businesses, governments, and non-government organisations operate, and driving a revolution in business models and customer empowerment. Already today the world's largest hotel service, Airbnb, does not own beds, the world's largest ride services such as DiDi and Uber, own few cars, and the world's largest retailer, Alibaba, does not own physical stores.

This report examines both the current state and impact of digitisation (as broadly defined) on the Australian economy, as well as the potential it offers to impact productivity, performance, and the way organisations operate in the future. In addition to providing a snapshot of the current state of digitisation in the Australian economy, we have examined seven sectors in more detail, to profile the nature and size of the opportunity in each and what it will take to capture it. The report has been developed in conjunction with the McKinsey Global Institute and the Australian Federal Department of Communications and the Arts and builds on our previous reports, most notably 'Digital Europe' and 'Digital America'.<sup>2</sup>

The intersecting fields of digital, design, analytics, DevOps, the Internet of Things (IoT) and other related areas are replete with competing buzzwords and definitions. For the purposes of this report, we have taken an expansive view by using the simple label 'digital' as an umbrella term to encompass the broad suite of technologies and ways of working which underpin a set of opportunities in:

- Innovating business models, product offerings, and markets;
- Growing existing revenue streams and enhancing the customer experience via improved customer interactions and service; and
- Streamlining internal processes and operations (Exhibit 1).

By this broad definition, digital is not just about IT infrastructure, nor focused narrowly on online/mobile presence, but an integrated set of opportunities leveraging technologies ranging from automation, the Internet of Things, and advanced analytics, through to agile methodologies and customer-centric product and experience design. It is applicable (in varying forms and to varying degrees) across all industries and sectors.

Given their rapid pace of development, the specific technologies encompassed by this definition of digital are always evolving, as are the outcomes in terms of business model innovation, revenue growth, and streamlining of operational processes and their associated costs. These are exciting—and often challenging—times where orthodoxies are rapidly being upended and the pace of change is accelerating. We see a substantial opportunity for Australia to capitalise on, and in many cases lead, this new digital revolution.

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<sup>2</sup> *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015, and *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

Exhibit 1

| Definition of 'digital' opportunities |                                |   |
|---------------------------------------|--------------------------------|---|
| Levers/Enablers                       |                                | How we define the Digital opportunity   |
| New frontiers                         | New business model             | • Seeking new revenue streams that emerge as a result of the digital economy (e.g. comparator websites and aggregators, peer-to-peer energy trading)  |
|                                       | New offerings/markets          | • Expanding customer value proposition through new digital markets, products or services (e.g. 3D printing or use of latent capacity such as Uber and Airbnb)   |
| Existing revenue streams              | Sell/retain                    | • Using digital engagement and advanced analytics for personalised and targeted acquisition efforts, increasing the effectiveness of new customer propositions and the speed at which they are delivered  |
|                                       | Serve customers                | • Delivering a seamless customer experience and using analytics to maximise customer stickiness and reduce churn  |
|                                       | Front-end process streamlining | • Fundamentally redesigning customer journeys in a customer-first and design-led way by challenging constraints and preconceptions and finding rapid digital solutions (e.g. embracing zero-based design) |
| Internal operations and processes     | Talent management              | • Continuing to raise workforce productivity and creating an unrivalled, 'seamless' experience for employees to attract and develop the best talent (e.g. through online talent platforms)                |
|                                       | Sourcing optimisation          | • Using digital tools to increase competitive tension (e.g. through e-auctions) and enabling targeted vendor collaboration  |
|                                       | Back-end process streamlining  | • Rapidly identifying and addressing pain points and unmet needs through back-end process automation  |
|                                       | Asset optimisation             | • Improving safety, reliability and efficiency across an organisation through automation and analytics-based continuous improvement   |
| Enablers                              | Capabilities                   | • Upgrading talent across multiple disciplines, ranging from data scientists to agile coaches, digital marketers, human-centred designers and technology architects                                       |
|                                       | Tools                          | • Investing in tools such as machine learning, advanced analytics and mobile applications   |
|                                       | Ways of working                | • Taking a customer-first and design-led approach, moving an entire organisation to an agile, rapid test and learn approach   |
|                                       | Systems & platforms            | • Developing IT infrastructure, cloud computing, and application platforms  |

## Waves of digital innovation are accelerating, reaching scale faster than ever before, resulting in inevitable disruption for many incumbents

Successive waves of digital innovation are becoming shorter and quicker (Exhibit 2) As individual technologies mature, rapid innovation is being increasingly driven by the combination of digital innovations—in what the World Economic Forum recently termed a 'fourth industrial revolution'.<sup>3</sup>

These innovations are also reaching scale faster than ever before (Exhibit 3). For example, it took radio more than 50 times as long as Twitter to reach an audience of 50 million.<sup>4</sup> This poses risks along with opportunities, as technologies, and brands, take hold, expand, then become obsolete at a pace on which many traditional companies are not accustomed. While vinyl records had a shelf-life of 70 years before declining from the mainstream, for example, the lifespan for media in the entertainment industry decreased to 30 years for CDs, five years for HD DVDs, and now instant, digital consumption is the norm.<sup>5</sup>

The explosion in the amounts of data generated and captured, the computing power required to contain and process it, and the increasing 'connectedness' of the world's population is underpinning this growth in digital. For example, every two days in 2016, as much data was created as was generated from the start of recorded history up to 2003; while a modern washing machine has more computing power than Apollo 11; and 40 per cent of the world's population is online today with 30 billion connected 'things'—whether people or assets—expected by 2020.<sup>6</sup>

3 *The future of jobs: Employment, skills and workforce strategy for the fourth Industrial Revolution*, World Economic Forum, January 2016.

4 *The social economy: Unlocking value and productivity through social technologies*, McKinsey Global Institute, July 2012 and McKinsey Global Institute analysis.

5 Ibid.

6 Dominic Barton, *Global megatrends and implications for leaders*, McKinsey presentation, 2015.

Exhibit 2

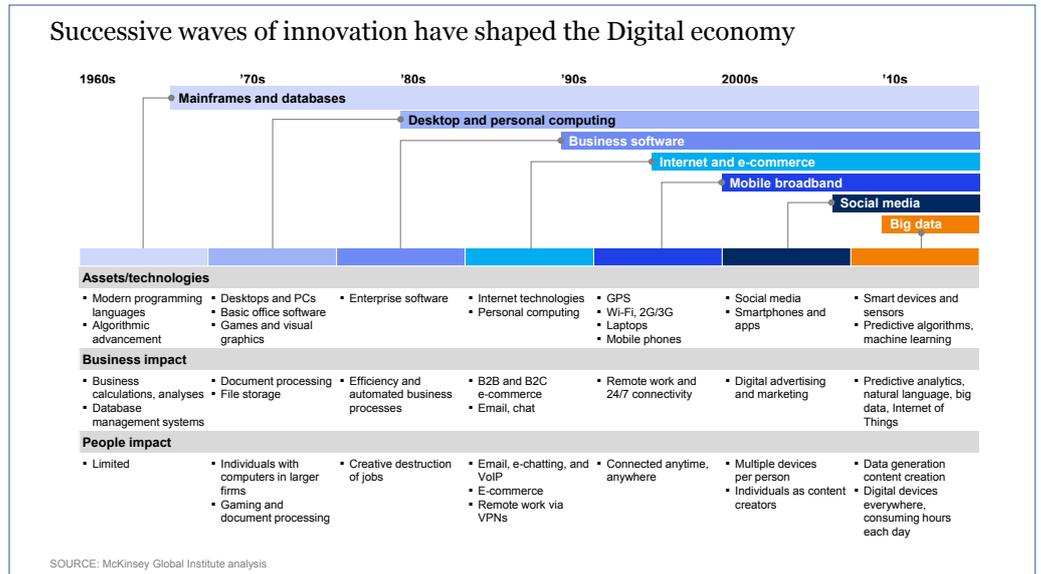
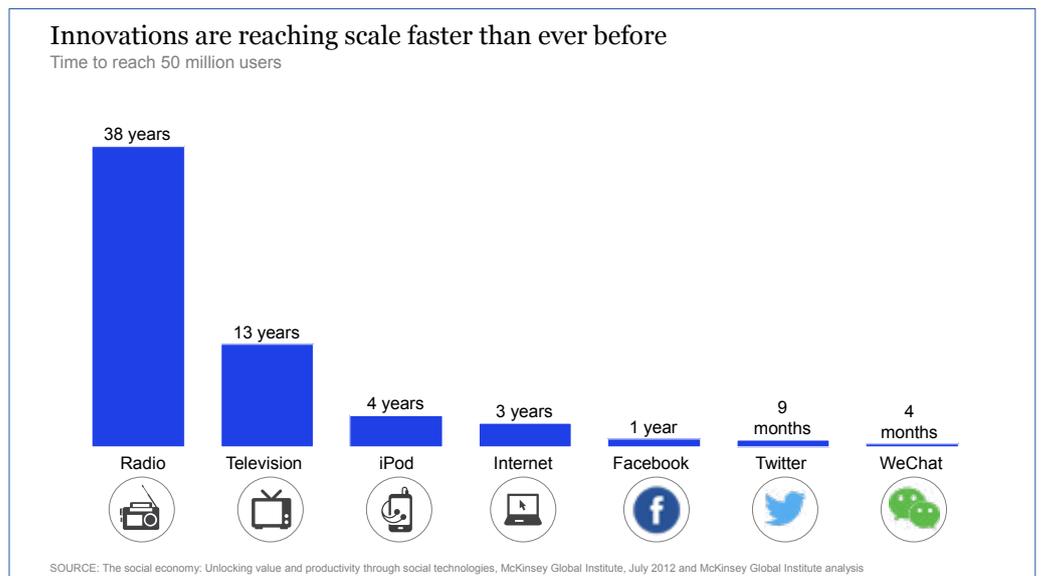


Exhibit 3



This speed of technological evolution, and the birth of attackers taking advantage of it, has disrupted incumbents in most industries: either in the form of direct competitors in core services (in the canonical example, Blockbuster’s demise with the emergence of Netflix) or as collateral damage as digital first-movers capture adjacencies (for example, camera makers in the smartphone revolution).<sup>7</sup> Fundamentally, digital technologies lower barriers to entry, which ultimately causes boundaries between sectors to blur and competitors to emerge from unexpected places. The best-known examples are the ‘hyper-scale’ platforms of tech players like Amazon (which has evolved from book sales to electronics, general merchandise, global logistics and cloud computing services), and Google (moving from online search to advertising, e-commerce, software, media, social networks, cloud computing and hardware, and

7 Chris Bradley and Clayton O’Toole, ‘An incumbent’s guide to digital disruption’, *McKinsey Quarterly*, May 2016.

now the automotive industry).<sup>8</sup> The typically significantly lower costs of digital versus legacy business models enable a ‘winner takes all (or most)’ dynamic, allowing new, digitally-enabled, market entrants to scale rapidly and enjoy a virtuous cycle in which the data they gather enables the use of advanced analytics to better target and acquire more consumers.

At the same time, ‘plug and play’ digital assets are breaking up traditional value chains. This allows smaller digital disruptors (with global reach enabled by digital platforms) to cherry-pick the higher-margin elements of the value chain that were previously the protected domains of vertically-integrated incumbents. Of particular concern for incumbents is the potential for third parties (such as online aggregators) to disintermediate relationships between companies and their customers.

The greater choice and transparency driven by digital entrants can also place pressure on prices and margins, for example via the online comparison sites that already exist in many industries which enable potential customers to quickly compare prices, service levels, and product performance, and the opportunity to switch providers at low (or negative) cost and with much more ease than in paper-based economies.

Incumbents often underestimate the magnitude of disruption until it is too late (Exhibit 4). In the face of the emergence of Netflix, Blockbuster attempted a portfolio play, operating a diverse business model and increasingly expanding its product offering. By 2010, when it went bankrupt, Blockbuster had 3,306 bricks and mortar stores and 6,630 kiosks.<sup>9</sup> Its last digital attempt, forming partnerships with third-party consumer electronics developers to deliver entertainment through devices like internet-connected televisions, came too late, as Netflix and similar providers had already captured consumers’ loyalty.<sup>10</sup>

Digital disruption, however, does not have to be driven, and ‘won’, by new entrants. For example, having successfully disrupted Blockbuster and its peers, Netflix became the de facto incumbent, from which position it transformed its business model twice over to remain at the forefront of digital innovation. After having added online streaming at no cost in 2007, it cannibalised its DVD-by-mail model by requiring subscribers to choose either this mode of delivery or (much less operationally costly) streaming, in 2011.<sup>11</sup> Second, after profits fell by 90 percent in 2012 and analysts had written off its ‘broken’ business model, Netflix changed tack toward becoming an entertainment creator, increasing its original content production, and has since achieved its highest ever share price.<sup>12</sup>

While established players are often characterised as being at a disadvantage due to legacy systems or a hesitancy to cannibalise themselves, they often also have unique advantages, such as a wealth of tangible assets that would be highly desirable to any start-up: established customer base, deep insight into customer behaviour, and cash flow. If they are willing to challenge existing ways of working and cannibalise themselves, incumbent players can unlock substantial digitally-enabled opportunities, as outlined in the seven sector-specific chapters of this report.

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8 *Amazon.com, Inc Annual Report, 2015 and Alphabet, Inc Annual Report, 2015.*

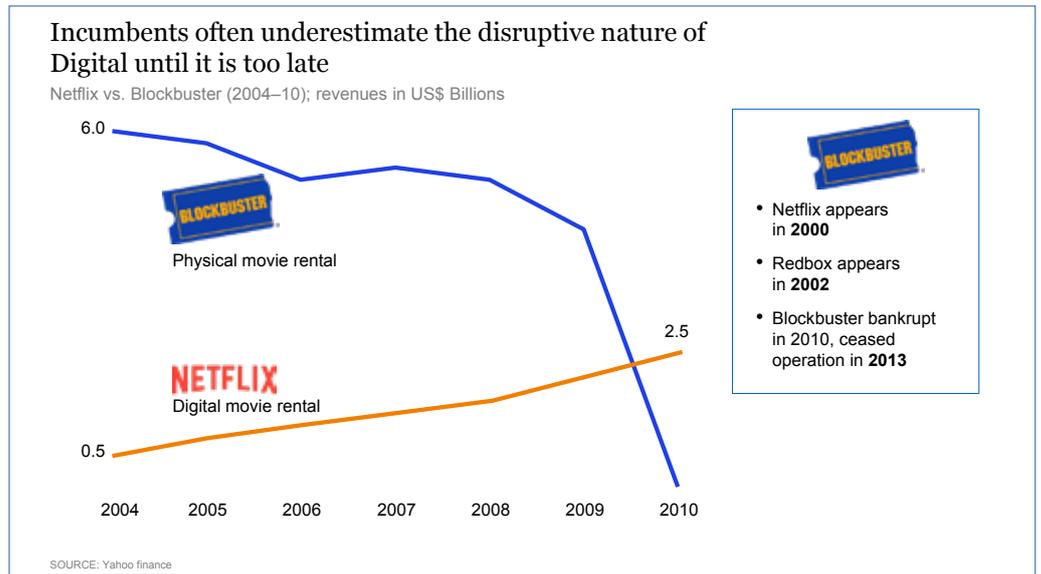
9 Todd Davis and John Higgins, ‘A Blockbuster failure: How an outdated business model destroyed a giant’, *chapter 11 Bankruptcy Case Studies*, Spring 2013.

10 Michael Liedtke, ‘Blockbuster expands digital delivery of video’, *Associated Press*, 14 January 2009

11 *Netflix, Inc. Annual Report, 2007, 2011.*

12 Yahoo Finance, 23 January 2017.

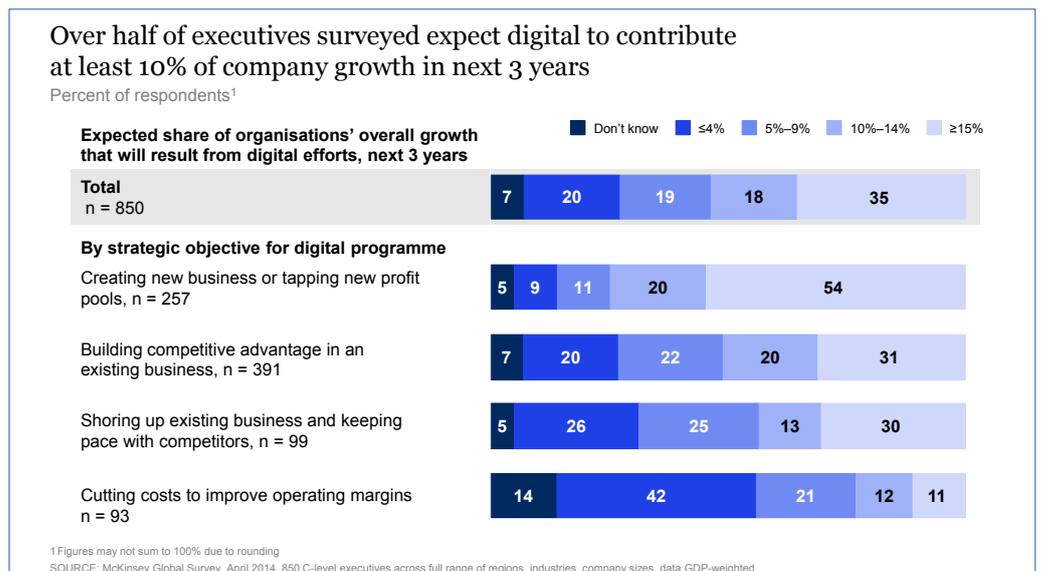
Exhibit 4



## Digital can represent the next frontier of productivity and economic uplift for Australia

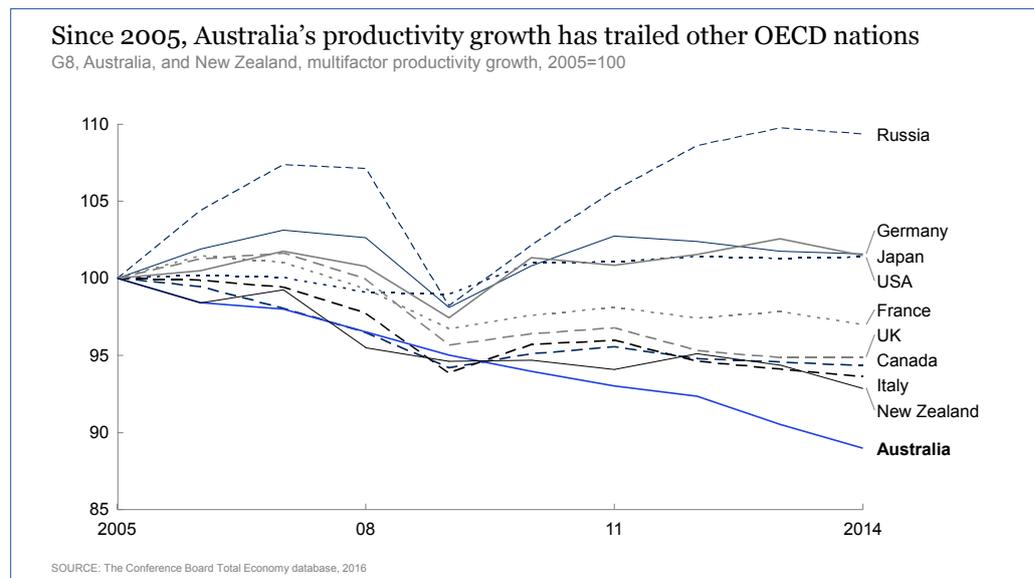
Capturing opportunities enabled by the broad suite of digitally-enabled technologies and business models—whether by incumbents or new entrants—is increasingly being looked to as the driver of the next horizon of economic growth for developed economies. More than half of executives surveyed globally by McKinsey in 2014 expected digital to contribute at least 10 percent of company growth in the next 3 years (Exhibit 5).

Exhibit 5



This is particularly significant for Australia, which has, for almost a decade, faced a widening competitiveness gap to other developed economies.<sup>13</sup> This has been particularly driven by declining productivity—the measure of the outputs of an economy, in terms of gross value added, divided by the total inputs (typically capital and labour). Since 2005, Australia has lost ground on productivity relative to all of the G8 nations (and New Zealand)—multifactor productivity has dropped nearly 10 percent (Exhibit 6).

Exhibit 6



Following this decade of relative productivity decline, most of Australia's major industries now lag well behind the most productive OECD nation(s). For example, of the largest 11 sectors of the economy (together totalling to approximately 70 percent of GDP), only five (mining, agriculture, finance, transport, and construction) are in the top quartile of the OECD on labour productivity (Exhibit 7). Education and healthcare, together contributing 11 percent of GDP, are only ranked 14<sup>th</sup> and 17<sup>th</sup> in the OECD—of particular concern, as these two industries are increasingly looked to as growth areas in the Australian economy post the mining and resources boom.

<sup>13</sup> John Lydon, David Dyer, and Chris Bradley, *Compete to prosper: Improving Australia's global competitiveness*, McKinsey & Company, July 2014.

Exhibit 7

Most of Australia's largest industries lag behind the most productive OECD peer

| Gap, Australia vs OECD highest performer <sup>1</sup><br>2013, Percent | Australia's rank<br>within OECD<br>Rank out of 35 countries | Industry contribution<br>to Australia's GDP<br>Percent |
|--|---|--|
| Public Sector 79   | 14  | 5  |
| Wholesale and retail trade 61  | 12  | 8  |
| Manufacturing 60   | 11  | 6  |
| Education 49   | 14  | 5  |
| Health and social services 47  | 17  | 6  |
| Utilities 47   | 11  | 3  |
| Transport, storage and communication 45                                | 5   | 8  |
| Finance 29   | 3   | 9  |
| Construction 25  | 7   | 8  |
| Agriculture 23   | 2   | 2  |
| Mining 1   | 2   | 9  |

1 Comparison made using labour productivity defined as sector GVA divided by hours worked in the sector  
SOURCE: OECD 2014

The productivity imperative becomes even more stark when set in Australia's demographic context—continued GDP growth relies either on increasing labour and capital inputs, or growth in labour and capital productivity. With a falling population growth rate, however, the ability of growth in labour inputs to drive GDP will disappear. If Australia's productivity growth continues at its historical rate coupled with this decline in population growth, long term GDP growth will be 36 percent slower than its rate over the last 50 years.<sup>14</sup>

Digitally-enabled innovation represents one important means to address this productivity and GDP growth challenge. Previous McKinsey Global Institute research suggests that, of the total productivity imperative facing developed nations to maintain historic GDP growth rates, 75 percent of the gap can be closed by bringing all organisations in a given sector up to the highest-performing productivity in their sector, with the final 25 percent requiring sector-wide technological innovation i.e. moving the digital frontier forward.<sup>15</sup> Increasing digital maturity across all sectors of the Australian economy is likely to play an important role in capturing both parts of this opportunity. Many organisations within sectors will need to rapidly digitise to catch up to their sector peers, and sectors as a whole will need to leverage new digital opportunities to close the final 25 percent gap. The following chapters speak to the specific digitally-enabled opportunities we see across seven key sectors of the economy, whilst in the next section we estimate the size of the opportunity for the Australian economy as a whole.

Early signs suggest that these high hopes for the impact of digital are well founded. The Digitisation Index analysis below, along with similar analysis in previous McKinsey reports on digital in the US and Europe, suggests there is a linkage between the productivity of individual sectors of economies and their digital maturity.<sup>16</sup> While

<sup>14</sup> *Global growth: Can productivity save the day in an aging world?*, McKinsey Global Institute, January 2015.

<sup>15</sup> *Ibid.*

<sup>16</sup> *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015, and *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

many Australian industries are not at best practice on digital maturity today, we have a population that is highly digitally-savvy (for example, 88 percent internet penetration; 77 percent smartphone penetration; and 58 percent active social media penetration),<sup>17</sup> and examples of world-leading practice on digital channel use (for example, in banking) and automation (for example, in mining).

To date it has been difficult to measure the impact of digitisation on economic indicators such as productivity and GDP. This so-called ‘digital productivity paradox’ has been compared with the ‘Solow’s paradox’ of the 1960 and 1970s, where despite the advancement and widespread adoption of technology, little productivity uptick was seen. In the case of the move to digital, we see compelling arguments as to why the full impact of digitisation has not (yet) been seen directly in economic metrics, including:

- Digital has transferred value out of some industry profit pools and back to consumers as surplus—through lower prices, better information, and higher-quality products. This consumer surplus cannot be directly captured in productivity metrics. In 2013, for example, Skype accounted for 20 percent of long-distance calls, representing a surplus moved from the telecommunications industry to consumers of US\$37 billion in 2014 alone, or an aggregated US\$150 billion since Skype’s inception in 2005. Estimates suggest total consumer surplus would have accounted for an additional 0.7 percentage points of GDP growth in the US in 2012<sup>18</sup>
- In some cases, digital will drive a ‘zero sum game’ in which productivity and performance improvements by innovative players result in a redistributed share of profits, rather than growing sector profit pools as a whole
- There is very likely a time lag between companies’ investments in technology and digital and the productivity and performance impact—companies may be ‘laying the groundwork’ for a digital future now
- Capturing performance improvement from digital technologies and ways of working is about much more than just systems investments or establishing online/mobile channels. In each industry we have studied, there are a specific set of ‘unlocks’ for capturing digital potential that organisations need to pursue
- Digital leaders in many industries are smaller ‘born digital’ firms which have yet to grow to a size that moves the needle substantially on aggregated industry performance metrics
- Last, digital advances also can result in benefits beyond economic performance, for example by driving improved societal outcomes such as better patient outcomes in healthcare and improved education levels.

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17 *Digital in 2016*, We Are Social, January 2016, *Spring 2015 Global Attitudes Survey*, Pew Research Center, June 2015, and *Measuring Australia’s Digital Divide*, *The Australian Digital Inclusion Index 2016*, Swinburne University of Technology, Swinburne Institute for Social Research and Telstra, 2016.

18 *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015, and *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

## Digitisation could contribute between A\$140 billion and A\$250 billion to Australia's GDP by 2025, based on currently-available technology alone

Digitisation has the potential to impact GDP substantially, ranging from labour and capital inputs to productivity.

While we believe the most effective way to size the digitisation opportunity is on a sector-specific basis (see analysis in subsequent chapters), we have also roughly sized the overall potential of digitisation on the Australian economy as a whole.

To do so we have made a number of simplifying assumptions and applied methodologies developed by the McKinsey Global Institute in other geographies. Specifically, the analysis sizes the opportunity from four digital innovations already changing the workings of the world economy: the Internet of Things, big data analytics, automation, and online talent platforms (Exhibit 8). These four digitally-enabled innovations cover the majority of the productivity levers discussed in our sector analyses. This sizing assumes that companies and workers are able to capture the majority of these digitally-enabled efficiency advances, in the form of higher profits and wages, but it is of course likely that some of these gains will instead be captured as consumer surplus. Our analysis also assumes that baseline GDP growth has not been substantially influenced by these technologies to date.

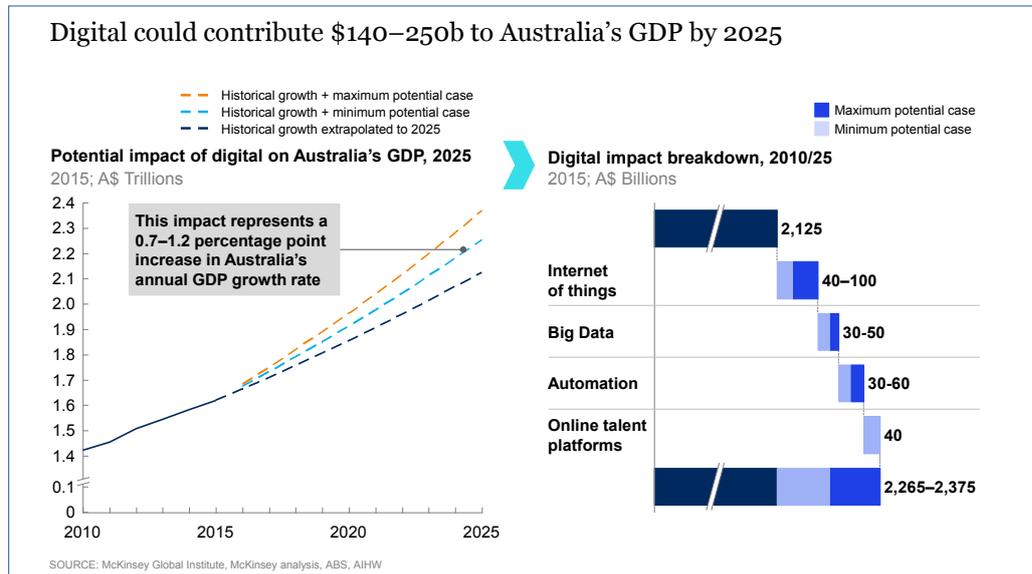
In aggregate, we calculate that Australia's GDP could be increased by an additional A\$140 billion to A\$250 billion by 2025 if the full potential of these four digitally-enabled innovations is achieved. This represents an increase to Australia's annual GDP growth rate of 0.7 to 1.2 percent, and an aggregate GDP increase over historical trend of roughly 10 percent by 2025. Of course, the potential impact of digital could be higher still; new technologies not sized here may provide a meaningful boost to GDP by 2025, and the indirect economic benefits of digital (such as improved population health and education) have not been sized.

Similar work estimating the digital potential for the US and Europe calculated opportunities of US\$2.2 trillion and US\$2.6 trillion respectively in GDP uplift to 2025—also roughly a 10 percent increase to projected GDP.<sup>19</sup>

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19 *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015, and *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016. Digital Europe GDP uplift of €2.5 trillion is equivalent to US\$2.6 trillion as at 20 December 2016.

Exhibit 8



Breaking the opportunity down into the constituent technologies:

- The economic benefits from the Internet of Things (IoT) will be realised in a wide range of settings, ranging from offices, to factories, to hospitals, and to the home. Some of these applications will be discussed in detail in the sector chapters to follow, such as those in mines, power generation plants, and transmission networks, where IoT sensors will help to monitor the health of machinery and enable condition-based maintenance. Substantial benefits can also be derived from operations and supply chain optimisation, through the real-time monitoring and control of production lines, and better logistics routing. By 2025, we estimate the impact on Australian GDP from IoT could be A\$40 billion to A\$100 billion.<sup>20</sup>
- Second, we considered the potential benefits of big data and advanced analytics. Similarly to the IoT opportunity, much of the upside found here will impact upon manufacturing, mining, and retail environments, where improvements to operations, supply chain, and R&D can create considerable value, by optimising the movement of supplies, machinery, and labour around complex worksites. Analytics on customer data, too, will serve to allow companies across industries to offer tailored, improved products—however here it is less clear the extent to which this will grow the market versus reallocating share between players within a sector, and to what degree the upside will be captured by providers versus returned to consumers. These issues are explored in more depth in both the banking and insurance and retail chapters of this report. Taking this into account, and based on the impact of big data previously assessed by the McKinsey Global Institute, we estimate the impact from big data and advanced analytics on Australia’s GDP to be between A\$30 billion to A\$50 billion.
- Third, we examined the potential impact of automation, ranging from advanced robotics to machine learning. While our research suggests few occupations will be automated in their entirety in the near or medium term, McKinsey Global Institute

<sup>20</sup> *The Internet of Things: Mapping the value beyond the hype*, McKinsey Global Institute, June 2015, Australian Bureau of Statistics data.

analysis has estimated that currently-demonstrated technologies could automate 45 percent of the activities people are paid to perform and that about 60 percent of all occupations could see 30 percent or more of their constituent activities automated.<sup>21</sup> Automation is already advancing beyond its early impact in the manufacturing sector and has the potential to transform sectors such as healthcare and finance, which involve a substantial share of repetitive knowledge work.<sup>22</sup> The potential impact to Australia's GDP from automation is estimated to be between A\$30 billion and A\$60 billion.

- Last, online talent platforms promise substantial economic impact by enabling a better-skilled, more agile workforce. This includes websites and apps that facilitate the so-called 'gig' or 'sharing' economy by modularising work, the best known of which include Uber, Lyft, and Airtasker. Estimates suggest up to 53 million people in the US are working at least part of their time as 'digital freelancers', and up to 1.5 million in Australia.<sup>23</sup> Our opportunity sizing also includes platforms whose primary focus is more traditional jobs, like LinkedIn and Monster.com. The impact of these platforms on GDP is threefold: they have the potential to boost participation in the labour market, reduce unemployment, and raise productivity of workers by ensuring better matching of skills to tasks and reducing labour informality. Previous McKinsey Global Institute research has estimated that the increased labour market efficiency driven by these technologies could add US\$2.7 trillion to global GDP and increase employment by 72 million FTE by 2025—translating to an A\$40 billion uplift to Australia's GDP.<sup>24</sup>

While the potential impact of digitally-enabled innovation on GDP is very substantial, capturing it requires careful investment, capability building and a willingness to challenge orthodoxies in ways that are uncomfortable for many organisations—themes which we explore in our sector-specific deep dives. The implications for Australian workers are also significant. What some see as opportunity (such as the flexibility of the gig economy by making extra income driving for Uber in your spare time), others will see as a threat (such as the rise of automation and consequent obsolescence of some traditional jobs). These are issues that governments and corporations alike will need to wrestle with in the coming decade. We have included some reflections on potential implications for government policy in the concluding chapter of this report.

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21 Michael Chui, James Manyika, and Mehdi Miremadi, 'Where machines could replace humans—and where they can't (yet)', *McKinsey Quarterly*, July 2016, and Michael Chui, James Manyika, and Mehdi Miremadi, 'Four fundamentals of workplace automation', *McKinsey Quarterly*, November 2015.

22 Michael Chui, James Manyika, and Mehdi Miremadi, 'Where machines could replace humans—and where they can't (yet)', *McKinsey Quarterly*, July 2016.

23 Freelancing in America: A national survey of the New Workforce, Freelancers Union and Elance-oDesk, September 2014; and *Freelancing in Australia: A national survey of the New Workforce*, Elance-oDesk, October 2014.

24 *A Labour Market that Works: Connecting Talent with Opportunity in the Digital Age*, McKinsey Global Institute, June 2015.

## Australia's digitisation is uneven, and still a distance from its full potential

In spite of the clear, and significant, economic opportunity outlined in the previous section, and despite notable green shoots, the adoption of digital technologies by Australian businesses and sectors has to date been incomplete and uneven. Accordingly, most of Australia's companies remain some distance away from the 'digital frontier'—that is, the sector that is furthest ahead on tapping into the potential from digital (typically, the Information Media and Telecommunications Services (IMT) sector);<sup>25</sup> and even further away from the true digital 'technical limit'—that is, the full exploitation of existing technologies.

To break down Australia's digitisation at the sector level we have used McKinsey's Digitisation Index, which has already been applied to map the digital maturity of industry sectors in the United States and European Union.

### Measuring the impact of digitisation requires a perspective on digital assets, usage and labour

The McKinsey Global Institute has developed an Digitisation Index which examines sectors across the economy through the lenses of digital assets, digital usage, and digital labour. The index provides a view across sectors of how enterprises are investing in digital capabilities, how they deploy digital technologies to interact with customers, digitise their supply chains and processes, create a digitally-enabled workforce, and digitise work itself.<sup>26</sup> The result is a composite measure of digital 'maturity' in any given sector.

We have used a version of this same approach adapted for the Australian context and data in this report. Our index uses 37 indicators to capture the spectrum of ways in which companies are digitising (Exhibit 9). To measure digital assets, for instance, we consider business spending on computer systems, internet, and telecommunications, as well as the stock of ICT assets. Usage metrics include an industry's use of digital ordering, digital marketing, and social technologies, as well as the adoption of digital supply chains, business processes and customer interactions. For the digital labour category, we have measured the share of workers in each sector in digital occupations, as well as computer systems spending on a per-worker basis.<sup>27</sup>

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25 'IMT' is an ANZSIC classification referring to the Information Technology and Media sectors, and therefore not fully equivalent to 'IT' or 'ICT'. It includes units mainly engaged in creating, enhancing and storing information products in media that allows for their dissemination; transmitting information products using analogue and digital signals (via electronic, wireless, optical and other means); and providing transmission services and/or operating the infrastructure to enable the transmission and storage of information and information products. However, it excludes specialised computer services such as programming and systems design.

26 See *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015, and *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

27 For the purpose of the 'digital jobs as a share of total jobs' metric (which is one of 37 metrics used in our Australian Digitisation Index), we have defined 'digital occupations' as those with job titles containing any of the words 'digital', 'data' or 'software'. While some industries may have certain digital job titles unique to that industry, we have used these three terms as they are broad, generic, and generally apply across industries.

Exhibit 9

Australian Digitisation Index is comprised of 37 metrics, across Digital Assets, Usage, and Labour

|                          |                               | Metric  | Description   |  |
|--------------------------|-------------------------------|---|---|--|
| Assets                   | Digital financing             | Replace hardware  | • Share of businesses for which replacement of IT hardware is reason for financing                        |  |
|                          |                               | Upgrade hardware or software                                    | • Share of businesses for which upgrade of IT hardware or software is reason for financing                |  |
|                          |                               | New hardware or software  | • Share of businesses for which purchase of additional hardware or software is reason for financing       |  |
|                          | Digital spending              | Computer systems share of all spending                          | • Computer systems industry input uses as a share of total input uses                                     |  |
|                          |                               | Internet (including telecommunications) spending                | • Internet industry and telecommunications input uses as a share of total input uses                      |  |
|                          | Digital assets stock          | Computer software net capital stock                             | • Computer software net capital stock as a share of total net capital stock                               |  |
| Usage                    | Transactions                  | Enterprises receiving orders online                             | • Businesses that receive orders via the internet   |  |
|                          |                               | Enterprises placing orders online                               | • Businesses that place orders via the internet   |  |
|                          | Digital supply chain          | Share of suppliers' business systems that are automated         | • Share of suppliers' business systems that are automated   |  |
|                          |                               | Customer systems automation                                     | • Share of customers' business systems that are automated   |  |
|                          |                               | Reordering replacement supplies automation                      | • Share of reordering replacement supplies that are automated   |  |
|                          |                               | Invoicing and payment automation                                | • Share of invoicing and payment that are automated   |  |
|                          |                               | Production or service operations automation                     | • Share of production or service operations that are automated  |  |
|                          |                               | Logistics automation  | • Share of logistics (including electronic deliver) that are automated                                    |  |
|                          |                               | Marketing operations automation                                 | • Share of marketing operations that are automated  |  |
|                          | Customer service Interactions | Businesses with internet access                                 | • Share of businesses with internet access  |  |
|                          |                               | Businesses with web presence                                    | • Share of businesses with web presence   |  |
|                          |                               | Businesses with social media presence                           | • Share of businesses with social media presence  |  |
|                          |                               | Businesses with social media presence                           | • Number of Facebook and Twitter posts per ASX300 company   |  |
|                          |                               | Use of social media for marketing                               | • Share of businesses that use social media to develop company image or market products                   |  |
|                          |                               | Use of social media for customer communications                 | • Share of businesses that use social media to communicate with customers                                 |  |
|                          |                               | Use of social media for product development                     | • Share of businesses that use social media to involve customers in development or innovation of products |  |
|                          | Process                       | IT use in accounting processes                                  | • Extent of IT use in accounting processes  |  |
|                          |                               | IT use in production processes                                  | • Extent of IT use in production processes  |  |
|                          |                               | IT use in invoicing processes                                   | • Extent of IT use in invoicing processes   |  |
|                          |                               | IT use in stock control processes                               | • Extent of IT use in stock control processes   |  |
|                          |                               | IT use in business planning processes                           | • Extent of IT use in business planning processes   |  |
|                          |                               | App use for front-end processes                                 | • Number of iTunes and Google Play apps per ASX300 company  |  |
|                          | Strategy and innovation       | R&D expenditure   | • R&D expenditure as a share of total investment  |  |
|                          |                               | VC funding  | • VC funding as a share of total investment   |  |
|                          |                               | Use of 'digital' in annual reports                              | • Number of times the word 'digital' appears per page in the annual report of each ASX300 company         |  |
|                          | Labour                        | Digitisation of work  | Digital jobs as share of total jobs   | • Number of job titles that include the words 'digital', 'data' or 'software' on LinkedIn as a share of the total number of jobs on LinkedIn, per ASX300 company |
|                          |                               |   | Ability of staff to work from home  | • Share of employees given the ability to work from home by their employers  |
| Digital spend per worker |                               | Computer systems spending per worker                            | • Computer systems industry input uses per employee   |  |
| Digital talent           |                               | Social media recruitment  | • Share of businesses that use social media for recruitment   |  |
|                          | Digital 457 visa jobs         | • Share of 457 visas granted for digitally relevant occupations |   |  |

While the level of digitisation of each sector will, to some extent, vary due to its unique characteristics, each sector's score relative to other sectors, across the 37 different input metrics, generates valuable insights into each sector's level of digitisation and scope for digital opportunities.

### There is a significant gap in digital maturity between sectors in Australia

The current Australian Digitisation Index is shown in Exhibit 10.

The Digitisation Index indicates both digital penetration across sectors and the gap between the 'digital frontier' (represented by the sector furthest ahead on that particular metric) and the rest of the economy. The Index shows that Australia's leading sectors in digitisation are markedly ahead of the rest of the economy. At or near the digital frontier is a cluster of high-tech, knowledge-intensive service industries: IMT, Financial, Professional and Administrative services. Beyond these four there is a substantial drop in Digitisation Index score: the remainder of the Australian economy sits at almost half of the Digitisation Index score of the IMT sector.

In this Index, and as is borne out in the sector-specific chapters that follow in this report, we see that the way successful digitisation takes place can (and should) vary between sectors. It would be easy to assume that companies that invest in digital assets will see the benefits flow quickly and easily. However, digital assets are more useful when placed in the hands of a digitally-skilled workforce and used in a range of business activities. As the IMT and manufacturing sectors in our Australian Index demonstrate, a smaller stock of digital assets is not always an impediment to achieving a high level of digital maturity.

It is no surprise that there is no single formula for successfully capturing the opportunity from digital innovation, as a closer look across the leading industries reveals (Exhibit 11). For the IMT sector for example, economy-leading digital usage and digital labour drives a strong Digitisation Index score for the sector. By contrast, the finance and insurance sector, which is ranked third overall in terms of digitisation, performs strongly through its focus on its digital supply chain, and its digital spending on workers and assets. Further down the rankings on overall digitisation, retail (fifth), and healthcare and social assistance (tenth), excel in terms of digital financing. However these two sectors have significant scope to improve their focus on digital labour elements—particularly per-worker digital spending and digital talent—and several other digital usage dimensions such as digital process and digital supply chains. These elements are explored at some length in both the healthcare and retail chapters in this report.

Notably, the strongest correlation between a single group of metrics and overall digital maturity is the 'digital spending' group (correlation coefficient of 0.89) which indicates that, perhaps unsurprisingly, investment in the right assets is the critical first step toward digitisation. Also of interest is that 'strategy and innovation' is next most correlated group of metrics (coefficient of 0.74), suggesting that digital focus and ambition are essential to successful digitisation. It follows that for digital, as with most strategic change, successful companies are setting the ambition and investing in the change, even prior to seeing the impacts flow through in 'time-lagging' metrics of labour and process digitisation.

Exhibit 10

## Australia Industry Digitisation Index

2016 or latest available data<sup>1</sup>

Relatively low digitisation  Relatively high digitisation

| Industry                       | Overall digitisation             | Assets |        |        | Usage             |                  |                      |              |                       |                               | Labor   |                       |                      | Share of GDP (2015) | Share of employment (2016) |                          |                |
|--------------------------------|----------------------------------|--------|--------|--------|-------------------|------------------|----------------------|--------------|-----------------------|-------------------------------|---------|-----------------------|----------------------|---------------------|----------------------------|--------------------------|----------------|
|                                |                                  | Assets | Usage  | Labor  | Digital financing | Digital spending | Digital assets stock | Transactions | Digital supply chains | Customer service interactions | Process | Strategy & innovation | Digitisation of work |                     |                            | Digital spend on workers | Digital talent |
| Knowledge intensive industries | IMT                              | Green  | Green  | Green  | Green             | Green            | Orange               | Green        | Orange                | Green                         | Green   | Green                 | Green                | Green               | Green                      | 2.9%                     | 1.8%           |
|                                | Professional services            | Green  | Green  | Green  | Green             | Green            | Green                | Green        | Yellow                | Green                         | Green   | Green                 | Green                | Orange              | Green                      | 5.9%                     | 8.5%           |
|                                | Finance and insurance            | Green  | Green  | Green  | Red               | Green            | Green                | Yellow       | Green                 | Yellow                        | Green   | Green                 | Green                | Green               | Red                        | 8.7%                     | 3.6%           |
|                                | Administrative services          | Green  | Green  | Yellow | Green             | Yellow           | Green                | Yellow       | Yellow                | Green                         | Red     | Orange                | Orange               | Green               | Green                      | 2.7%                     | 3.5%           |
| Service industries             | Retail trade                     | Green  | Green  | Green  | Green             | Red              | Yellow               | Green        | Orange                | Green                         | Yellow  | Red                   | Yellow               | Red                 | Orange                     | 4.4%                     | 10.6%          |
|                                | Wholesale trade                  | Yellow | Green  | Green  | Green             | Orange           | Yellow               | Green        | Orange                | Green                         | Green   | Yellow                | Green                | Red                 | Red                        | 4.1%                     | 3.2%           |
|                                | Arts and recreation              | Yellow | Orange | Yellow | Yellow            | Yellow           | Red                  | Red          | Green                 | Red                           | Green   | Orange                | Orange               | Green               | Red                        | 0.8%                     | 1.9%           |
|                                | Rental and real estate services  | Yellow | Orange | Yellow | Yellow            | Yellow           | Red                  | Red          | Yellow                | Green                         | Green   | Red                   | Red                  | Green               | Red                        | 2.8%                     | 1.8%           |
|                                | Healthcare and social assistance | Orange | Yellow | Orange | Red               | Green            | Red                  | Orange       | Yellow                | Red                           | Yellow  | Red                   | Yellow               | Red                 | Red                        | 6.5%                     | 12.8%          |
|                                | Accommodation and food services  | Orange | Red    | Yellow | Red               | Yellow           | Red                  | Red          | Yellow                | Orange                        | Green   | Orange                | Red                  | Yellow              | Red                        | 2.4%                     | 7.0%           |
|                                | Manufacturing                    | Yellow | Orange | Green  | Orange            | Green            | Red                  | Orange       | Green                 | Orange                        | Yellow  | Yellow                | Green                | Yellow              | Red                        | 6.2%                     | 7.4%           |
| Asset intensive industries     | Mining                           | Orange | Red    | Yellow | Yellow            | Red              | Red                  | Red          | Yellow                | Yellow                        | Red     | Orange                | Yellow               | Green               | Red                        | 8.6%                     | 1.9%           |
|                                | Utilities                        | Orange | Orange | Orange | Orange            | Yellow           | Red                  | Red          | Yellow                | Red                           | Yellow  | Orange                | Red                  | Green               | Red                        | 2.7%                     | 1.2%           |
|                                | Construction                     | Red    | Red    | Orange | Orange            | Red              | Red                  | Red          | Yellow                | Yellow                        | Orange  | Red                   | Orange               | Yellow              | Red                        | 7.8%                     | 8.9%           |
|                                | Transport and warehousing        | Red    | Orange | Red    | Red               | Yellow           | Red                  | Red          | Red                   | Yellow                        | Red     | Red                   | Red                  | Orange              | Red                        | 4.6%                     | 5.2%           |
|                                | Agriculture                      | Red    | Red    | Red    | Red               | Red              | Red                  | Red          | Red                   | Yellow                        | Orange  | Red                   | Red                  | Orange              | Red                        | 2.2%                     | 2.7%           |

<sup>1</sup> Based on a set of metrics to assess digitisation of assets (6 metrics), usage (26 metrics), and labor (5 metrics); see technical appendix for full list of metrics and explanation of methodology  
SOURCE: ABS; DIBP; ASX300 annual reports; Facebook; Twitter; Appstore/iTunes; Google Play Store; LinkedIn; McKinsey analysis

The Index also shows some natural clustering of sectors by digital maturity, with informative differences within these clusters. For example, at a high level we can identify clusters characterised as ‘asset intensive’ versus ‘knowledge intensive and service focused’, within which we see variations on the path to digital maturity:

- Asset intensive industries generally exhibit a low level of digitisation (Exhibit 11). Manufacturing leads in terms of digital transactions, strategy and innovation, and processes. Utilities scores lower across all metrics, as does mining on digital transactions and processes. However, an important leading indicator for mining might be its favourable performance on digital strategy and innovation—this could be indicative of the sector’s increasing focus on leveraging digital as a key opportunity to improve efficiencies and reduce costs in its operations (discussed at length in the mining chapter later in this report).
- Knowledge intensive and service industries generally exhibit moderate-to-high levels of digitisation, but the shape of this digitisation varies (Exhibit 11). After IMT, the finance and insurance sector leads across all metrics, with the exceptions of digital transactions, customer service interactions, and talent (where retail leads). This supports findings in the banking and insurance chapter of this report that finance and insurance still has significant scope international best practice on levels of digital sales and service.

Although retail trade quite logically leads on these customer-facing metrics, analogous opportunities are yet to be captured in respect of back-end processes and supply chains, as well as in the manual labour involved in in-store operations (see retail chapter).

Finally, healthcare and social assistance, which has relatively moderate scores in the areas of digital customer service interactions, transactions and digitisation of work, has significant scope for improvement across almost all other digital areas (as discussed in both the healthcare and public sector chapters that follow).

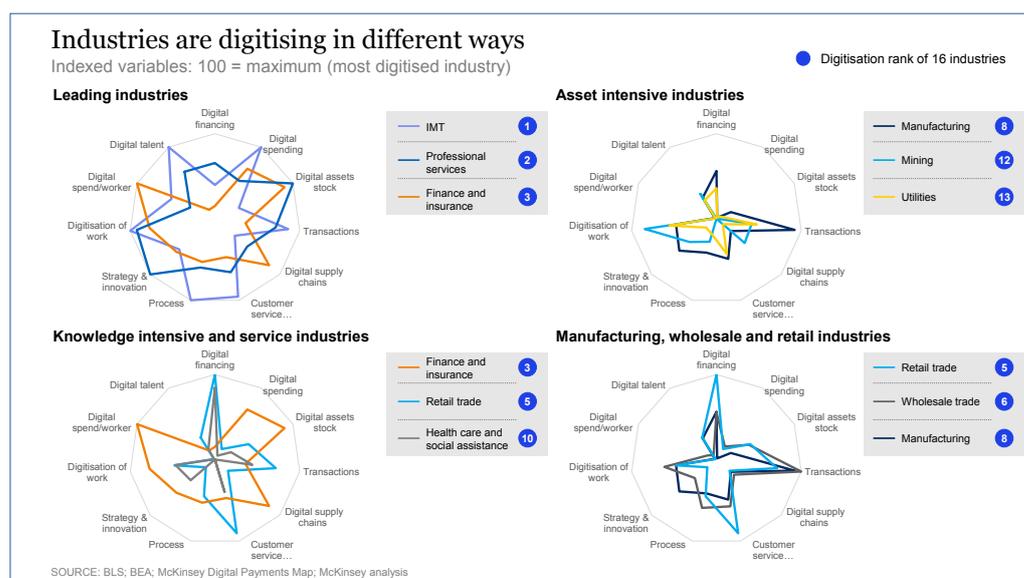
In many cases we also observe similar ‘fingerprints’ of digital maturity across the value chain across different sectors, suggesting similar challenges and opportunities face players in different industries. This is exemplified by the similar fingerprint of digitisation across manufacturing, wholesale trade and retail trade—which share digitisation score peaks in digital financing, transactions and customer service interactions and low to moderate level scores in other areas (Exhibit 11). Not surprisingly, the digital scores for customer service interactions increase from manufacturing, to wholesale trade, and to retail trade, reflecting the fact that digital customer touch points have become more important (and thus given more focus) the closer a sector is to the end consumer.

It could be argued that knowledge intensive sectors are by their nature advantaged on the digital spending metrics—having lower asset bases than the service and heavy industries sectors. However, even after normalisation for asset and capital intensity, the overall sector ranking remains unchanged, and overall digitisation relative to IMT varies only minimally.

Each sector will, of course, develop digital capabilities relative to its inherent characteristics and the available opportunities. For example, even though the agriculture sector scores lower than others in the Digitisation Index, in Australia the

increasing uptake of agriculture technology is already driving productivity gains. This includes impact through digital software and applications supporting data-driven farm management, as well as technological improvements in equipment, such as drones to remotely monitor crop or pasture health. Australian agriculture is also expected to benefit from international research and development, including the US, which has well-developed experience with digital agriculture.<sup>28</sup>

Exhibit 11



## Australia has doubled its digital growth over the last five years and industries with high digital growth have achieved labour productivity growth

Time series comparisons of the Digitisation Index metrics demonstrate that, on average, Australian sectors have doubled their Digitisation Index score over the last 5 years (Exhibit 12). This growth in overall digitisation is driven by increases in digital usage and digital labour (both exhibit 3.0 times growth) with minimal growth in digital assets (1.1 times growth). The explanation here is likely a combination of two factors: the declining cost of digital technologies as they achieve scale and prevalence; and secondly, that sectors which invested early in digital (i.e. more than 5 years ago), have begun to reap the downstream benefits within labour and processes.

In this period, individual sectors have experienced digitisation growth at different rates, both overall and in terms of their digital assets, digital usage and digital labour composition (Exhibit 13). The arts and recreation sector has increased its level of digitisation more than any other sector (4.2 times), driven by improvements in digital usage (4.8 times) and digital labour (8.8 times).<sup>29</sup> Examples of new digital initiatives in the arts include the Australia Ballet's adoption of social media to widen its audience globally, and the Museum of Old and New Art (MONA)'s innovative guided app which provides visitors with a personalised experience and targeted information as they

28 *The Implications of Digital Agriculture and Big Data for Australian Agriculture*, Australian Farm Institute, April 2016.

29 The arts and recreation sector includes heritage, creative and performing arts activities, sports and recreation and gambling activities.

browse the collection (further discussed in the arts chapter). The sector has also invested heavily in digital capability to support the transition to services which are increasingly marketed online, sold online and even consumed online. Meanwhile, the healthcare sector has experienced the lowest overall growth in digitisation (1.1 times), driven by a decline in digital assets (0.8 times) and minimal improvement in digital labour (1.1 times). Opportunities to address this lack of digital growth are discussed in the healthcare chapter later in this report.

Exhibit 12

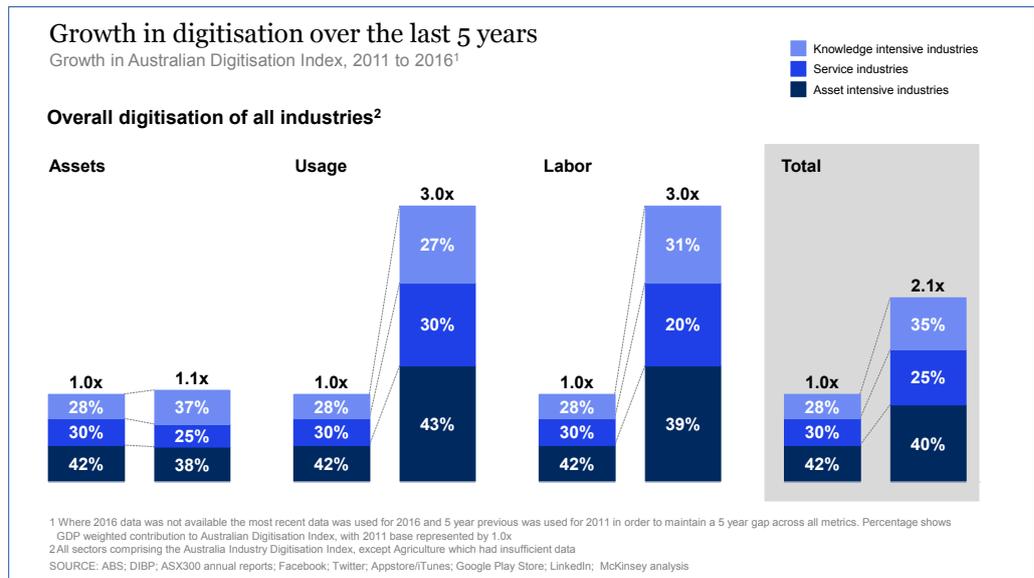
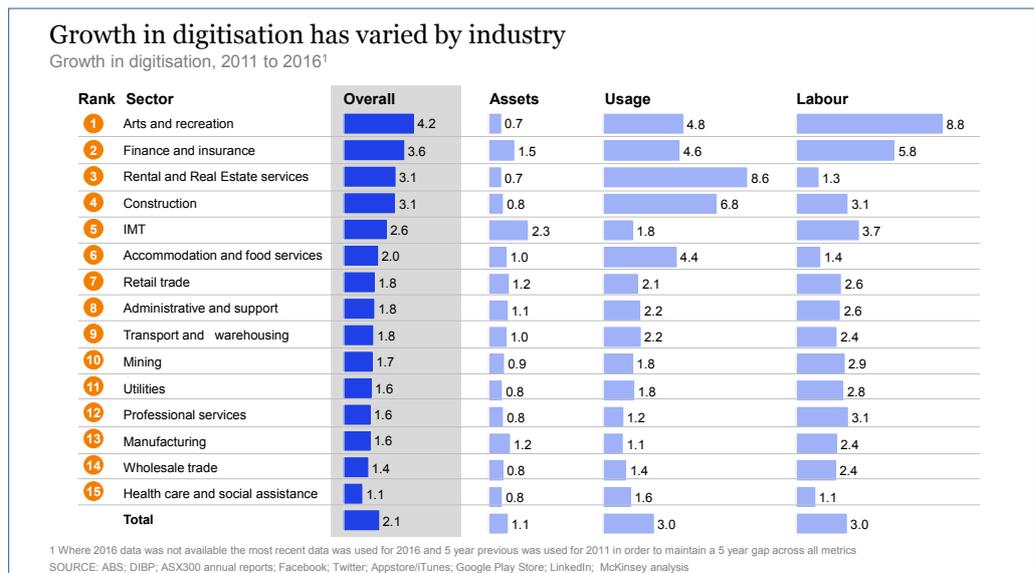


Exhibit 13

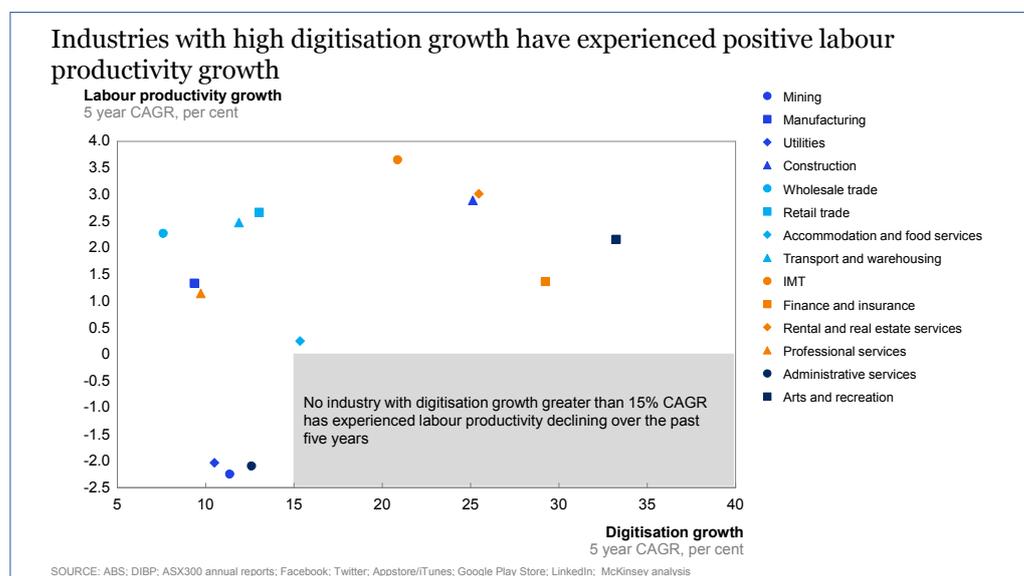


Although most industries have become more digitised in the last 5 years—in their assets, usage and labour—there are some cases where industries appear to have become less digital in one or more of these three areas. For example, mining’s digital

asset score has fallen by approximately 10 percent in the last 5 years—as the total asset base has grown faster than purely digital assets. This highlights a limitation in the data sets available to construct indices such as this, since miners investing to embed digital capabilities into non-digital assets (such as the adoption of digital sensors in heavy equipment) would not be captured as digital asset investment in ABS data.

High digitisation growth also exhibits some linkage with high labour productivity growth (correlation coefficient of 0.41). Over the past 5 years, every sector with a 15 percent or greater CAGR of digitisation growth has simultaneously achieved positive labour productivity growth (Exhibit 14). Whilst these observations are based on only 15 sector data points, it does offer support to the suggestion, that capturing the digital opportunity may improve labour productivity across sectors (explored in the sector-specific chapters to follow).

Exhibit 14



## Asset intensive Australian sectors generally have lower levels of digitisation than their US peers

In general, international comparisons of economy-wide ‘digital maturity’ are complicated by a lack of consistent data across industries and between countries. Where the McKinsey Global Institute has constructed similar Digitisation Indices (for the US and Europe), we compared both the sector rankings and relative performances on common metrics for insight into how Australian sectors compare internationally. On the whole, except for the asset intensive industries noted below, Australian digital maturity by sector is largely consistent with the maturity of those same sectors in the United States.<sup>30</sup> Also, relative levels of digitisation between sectors are also generally consistent, both in terms of each sector’s level of digital maturity relative to others, as well as the areas in which they have opportunity for greater digital uptake.

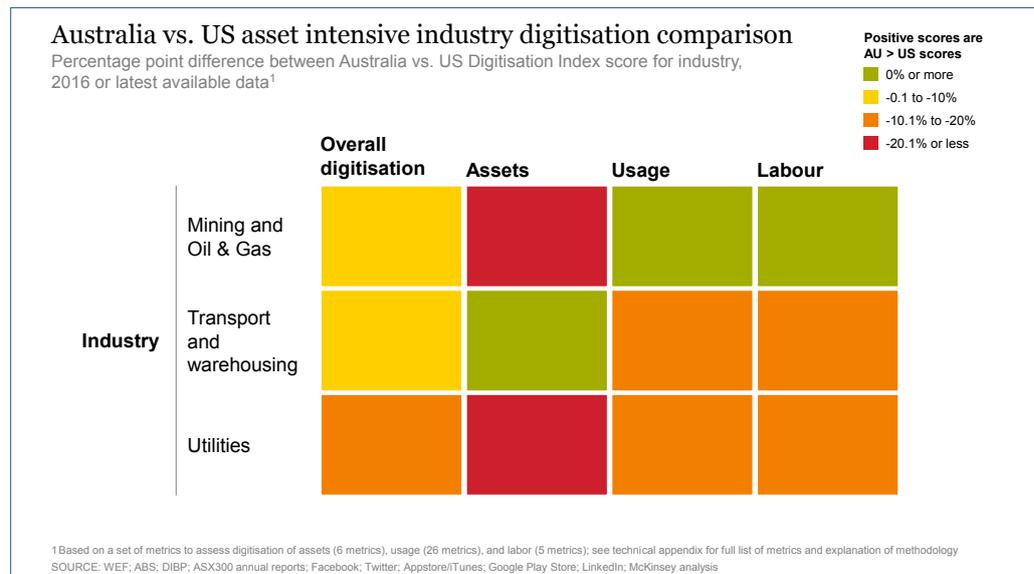
Within both economies, ICT/IMT is the most digitised sector, with the US ICT sector setting the benchmark and the Australian IMT sector following closely at 95 percent of the US sector’s maturity. As in the US, Australian knowledge intensive sectors

30 See *Digital America: A Tale of the Haves and the Have Mores*, McKinsey Global Institute, December 2015.

(professional services and financial and insurance services) round out the top three places. In both the Australian and the US Digitisation Indices, knowledge intensive sectors are followed by service sectors, with asset intensive sectors ranking amongst the least digitised.

Differences in industry classifications, sub-industry sizes and input metrics make absolute comparisons between Australian and overseas industries difficult. However, there is a noticeable difference in the digitisation results between three Australian asset intensive industries—mining (which includes oil and gas), transport, and utilities—and their US peers (Exhibit 15). Australian mining and utilities exhibit significantly lower scores on digital assets—with proportionally lower capital and operational spending on digital—while both transport and utilities exhibit lower digital usage and digital labour results. Some of the impact for mining may be a sector mix effect, or a reflection of geological assets at different stages of the lifecycle, and therefore relative differences in capital being invested in exploration and mine extension. However in general, the cross-geographic comparison indicates that Australia’s asset intensive industries, already the lowest-scoring on digitisation relative to other Australian sectors, have a significant gulf to global best practice in their own sector.

Exhibit 15



Such comparisons in aggregate (in effect, an ‘average of averages’), however, do not necessarily give the best view of relative levels of digitisation—more relevant is understanding the range of digital maturity within each sector and the gaps to best practice performance on each of the dimensions of digitisation. The seven sector-specific chapters that follow do exactly this, comparing the Australian sectors’ levels of digitisation, on a lever-by-lever basis, against international best practice. Taken together, these lever-by-lever comparisons explain a sector’s overall digital performance against its overseas peers, and bear out the general impression of Australia’s current digital maturity as pockets of leading practice, but with an overall substantial opportunity to reach, and exceed, current best practice.



The potential impact on the Australian economy from effectively capturing the digitisation opportunity is large. In the following chapters of this report we examine in greater detail the digital opportunities and imperatives for a number of the most important sectors within the Australian economy, working from this baseline of digital maturity and taking into account lessons from comparisons between sectors and across geographies. We also consider specific implications and recommendations to capture the digital potential within each sector. In each case the same overarching message holds true, consistent with the findings of our Digitisation Index: the full potential from digital can only be realised by taking an integrated approach: linking up the right investments in assets, with end-to-end digitisation and automation of business processes, supported by a digitally-enabled and empowered labour force.

## Introduction—takeaways:

- We define digital for the purposes of this report as a suite of technologies and ways of working which together underpin a set of opportunities in innovating business models, product offerings, and markets; growing existing revenue streams and enhancing the customer experience via improved customer interactions and service; and streamlining internal processes and operations.
- This includes online and mobile enablement, automation and internet of things technologies, advanced analytics, agile methodologies and customer-centric product and experience design.
- Digital has the power to disrupt, and has already disrupted, entire industries, but also offers incumbents significant opportunities if they move in time.
- This Fourth Industrial Revolution could offer the next frontier of productivity and economic uplift for Australia—digitisation could contribute A\$140 billion to A\$250 billion to Australia's GDP on an annual basis by 2025, based on currently-available technology alone.
- Australia has pockets of world-class practice to build on, including world leading mobile banking engagement and mine automation deployments.
- Australia's digitisation is uneven; knowledge intensive industries lead service industries, which in turn lead asset intensive industries.
- High digitisation growth for a sector over the past 5 years is loosely correlated with higher labour productivity.



# Digital in key sectors of the Australian economy

We expect all sectors of the Australian economy to be substantially impacted by digitally-enabled innovation. The nature of these opportunities and disruptions will vary widely across sectors, however—not just in terms of the overall financial opportunity and value at risk, but also the relative importance of specific levers and technologies in capturing this opportunity.

The following chapters lay out the potential impact we see for seven key sectors of the Australian economy, based on each sector's starting baseline of digital maturity, as well as a perspective on the set of specific digital levers which represent the highest, and most easily implementable, opportunities for each sector. The seven sectors selected together represent 37 percent of Australia's 2015/16 GDP, as well as 38 percent of total employment (Exhibit 16). In addition, they represent a broad spectrum of industries significant to the Australian economy—from heavy industry through to B2C services and consumer goods—as well as spanning both the public and private sectors.

The seven sectors also span the spectrum of sources of digital/technological disruption. For example, within the Australian banking and insurance industry, the largest players, and hence a majority of the economic value of the sector, are widely considered 'world-leading' in leveraging digital to improve customer experience. They have consequently avoided the 'race to the bottom' industry dynamics which have beset similar service-based industries, such as telecommunications, overseas. The Australian electricity sector, on the other hand, is already in the throes of disruption across the value chain, and is seeing the resulting impact on profitability, a situation that will only deepen with increasing customer choice and the lowering of switching costs, complicated by the rise of energy storage and distributed generation technologies.

Each of our sector chapters follows a similar structure: first, a brief outline of the industry in an Australian context and the forces pushing that industry toward an imperative to capture digital potential. Second, a review of the digital levers that early experience (both Australian and international) and expert forecasts indicate will represent the biggest opportunity for existing players to capture digital upside. Based on this, and analysis of current digital maturity (building on the Digitisation Index from the introductory chapter of this report), the likely economic impact of deploying these digital levers to their full potential is estimated. Here, the emphasis is on existing technologies: capturing the opportunities that already exist to drive economic upside rapidly. Speculation as to how far beyond the current digital frontier we may move in the longer 5 to 10 year horizon has not been included in the economic modelling. Last, each chapter touches on specific implications for players within the sector who are looking to unlock the full digital potential, and some of the common obstacles they will need to overcome.

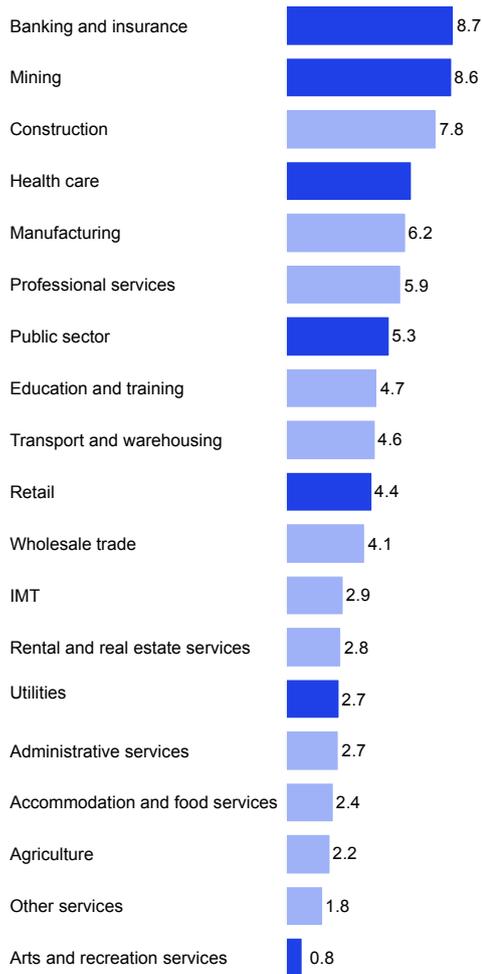
Exhibit 16

The following chapters cover the digital opportunity across seven key sectors of the Australian economy

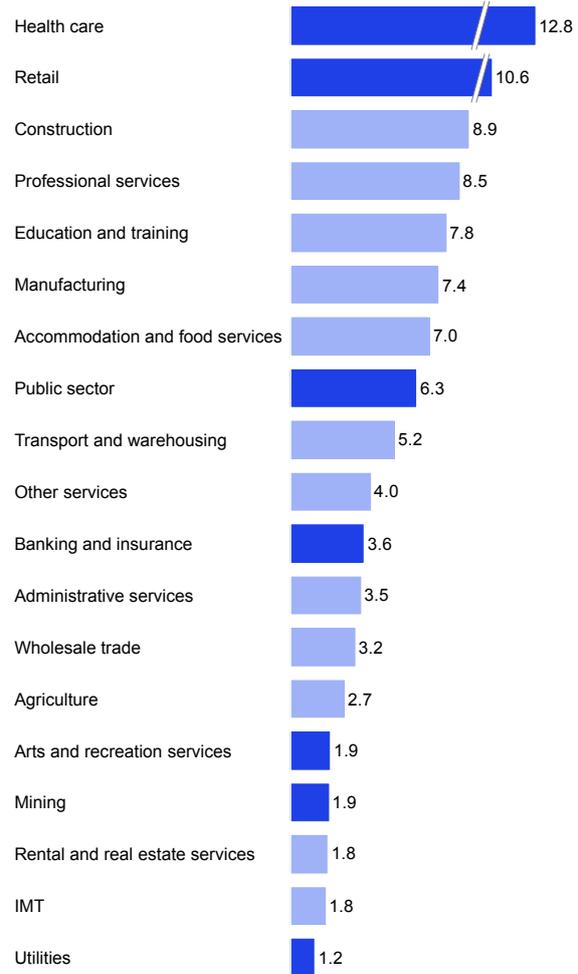
Percent

■ Deep dive sector

Contribution to Australian GDP, 2015–16<sup>1</sup>



Contribution to Australian employment, 2015–16



<sup>1</sup> Excludes non-sectoral contributions such as ownership of dwellings and subsidies, which represent 15% contribution to GDP  
 Note: ANZSIC classification with some classification names simplified (e.g. 'Utilities' is electricity, gas, water, and waste water services, 'Public sector' is Public sector, 'Banking and insurance' is Finance and insurance, 'Healthcare' is Healthcare and social assistance and 'Retail' is Retail trade)  
 SOURCE: ABS

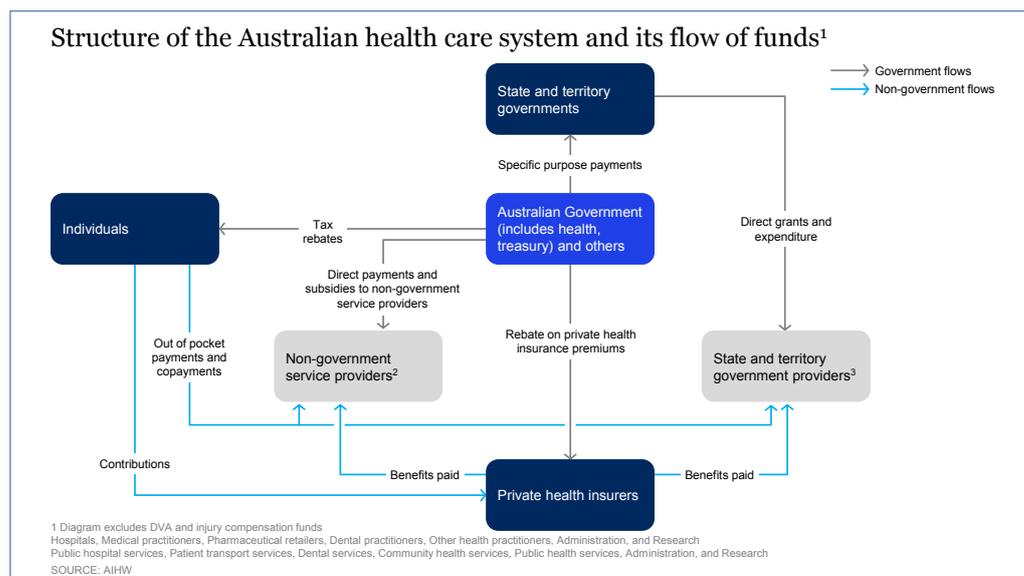




# Digital in healthcare

Australia's healthcare system—the network of public and private organisations tasked with overseeing the governance, provision, and funding of healthcare services (Exhibit 17)—is pivotal to the nation's quality of life and economy. It is a major employer; together with social assistance the system engages nearly 13 percent of Australia's workforce.<sup>31</sup> It also demands considerable annual expenditure, with total healthcare spending in 2013/14 amounting to A\$154.6 billion, or 9.8 percent of GDP.<sup>32</sup>

Exhibit 17



This spending is directed in a number of ways:

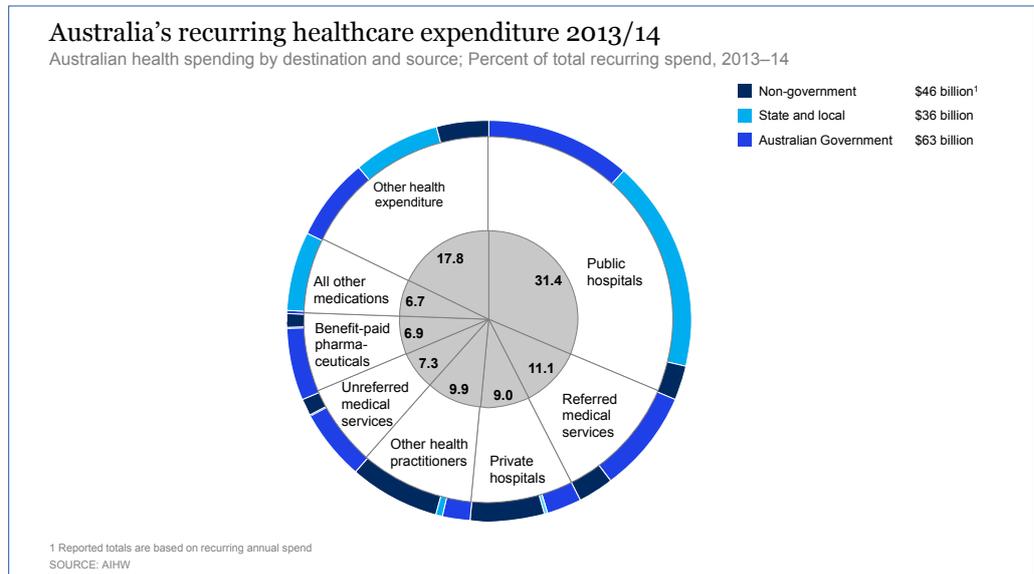
- Expenditure on hospitals is the largest destination, accounting for 40 percent of the country's recurring annual health spend. In 2013/14, there were approximately 1,360 hospitals nation-wide, 55 percent of which were public, and 45 percent private.
- Practitioners operating outside the hospital system account for another 28 percent. Referred medical appointments and GPs account for the majority of this spending, with the remainder paid to dentists and other allied health practitioners.
- The remaining recurring healthcare spend is directed towards medications,<sup>33</sup> research, medical aids, administration, and medical transport. It is worth noting that spending on disabled and aged care is currently characterised as welfare spending by the Australian Institute of Health and Welfare (AIHW), and hence was omitted from our analysis in this chapter.

31 6291.0.55.003 - Labour Force, Australia, Quarterly, Australian Bureau of Statistics, November 2016, Table 4.

32 *Health Expenditure Australia 2013/14*, Australian Institute of Health and Welfare, 2015. Unless otherwise stated, all healthcare spending figures come from the Australian Institute of Health and Welfare (AIHW), the agency responsible for providing health and welfare statistics.

33 Note that medications administered whilst in hospital are included in the hospital spend figures.

Exhibit 18



As a fraction of GDP, Australia's healthcare spend sits only 0.1 percentage points above the OECD median, and is sourced from both public and private payors. Federal, State and Territory governments cover around 68 percent of the total, with the federal government outlaying approximately 2 dollars for every 1 spent by the states and territories. The remaining 32 percent of annual spend is covered largely by individuals, with support from private health insurers (PHIs) and other NGOs.

### Australia's healthcare system is under pressure to limit rising costs, and improve outcomes

The healthcare system in Australia currently faces two major challenges: managing the rising costs of providing care, and addressing the inequality of access and outcomes experienced by certain segments of the population.

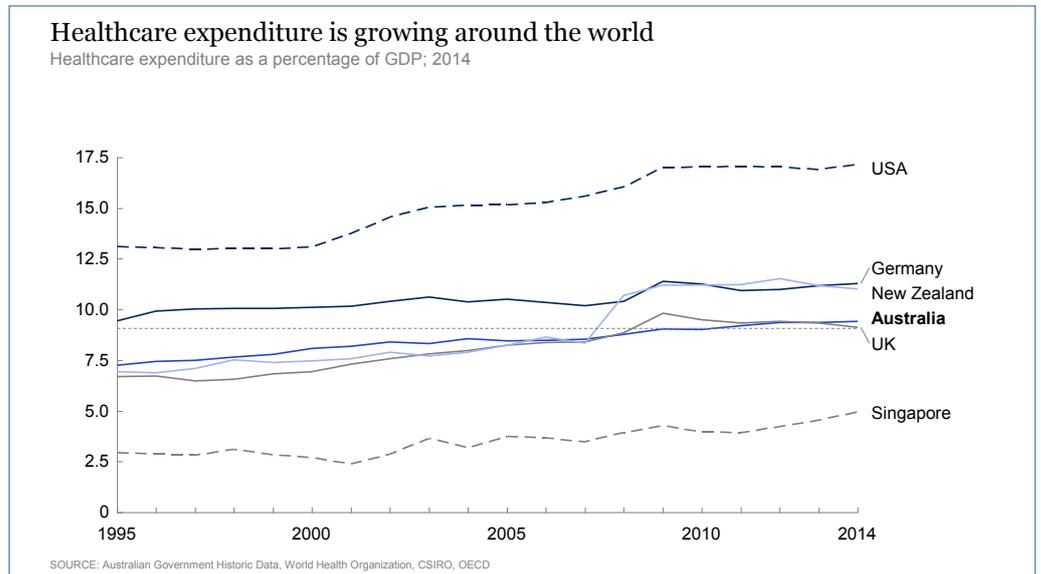
#### Rising costs of care

Australia's healthcare expenditure has long been trending upwards (see Exhibit 19). Indeed, over the last 10 years actual healthcare spend (i.e. spend accounting for inflation) has increased at an average rate of 5 percent per year, almost double that of GDP (2.8 percent).<sup>34</sup> This growth in spend can be largely attributed to Australia's ageing population. Forty three percent of the increase in Medicare benefits spend over the last 5 years was generated by those aged 65 and above (see Exhibit 20). Elderly patients incur a disproportionate slice of the healthcare spend: those 65 and older only represent approx. 14 percent of the population, but account for 40 percent of hospitalisations, and make up 38 percent of Australians with a disability.<sup>35</sup>

34 5206.0 - Australian national accounts: national income, expenditure and product, Australian Bureau of Statistics, March 2015.

35 *Australian Hospitals at a Glance 2013/14*, Australian Institute of Health and Welfare, June 2015; *Australia's Health 2014*, Australian Institute of Health and Welfare, July 2014.

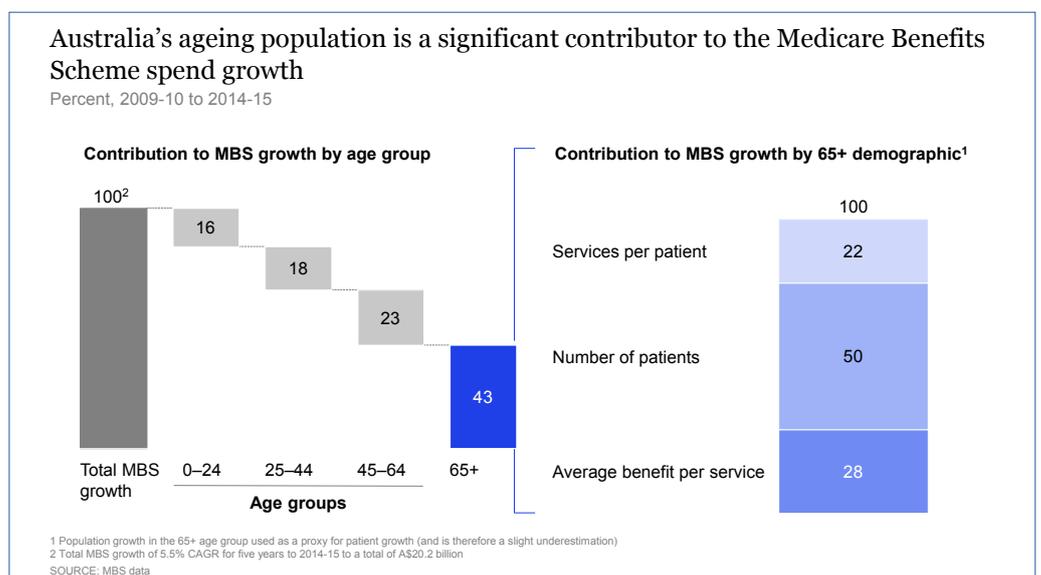
Exhibit 19



As Australia's population continues to age, this problem will become ever more pressing. Indeed by some estimates, health expenditure in Australia could surpass the entire 'own source' tax revenue of the states and territories by 2045/46.<sup>36</sup> When coupled with public pressure to maintain (and improve) current service levels, there is an onus on governments and providers alike to reduce the cost of providing care.

This impetus to lower costs is not only being felt at a systemic level, as individual providers are also increasingly required to compete on costs. One indicator of this is the mounting rate of bulk billing seen across the Australian healthcare system— between 2009/10 and 2014/15, the number of services that were bulk billed rose by 4 percentage points (from 74 percent to 78 percent), indicating that providers felt charging additional gap payments would cost them business.

Exhibit 20



36 A National Health and Hospitals Network for Australia's Future, Department of Health, May 2010.

## Inequality of access and outcomes

While Australia performs well at a macro level when it comes to health outcomes—in 2012, the nation ranked sixth in the world for male life expectancy (79.7 years) and seventh for female (84.2)<sup>37</sup>—this masks some persistent variances amongst smaller segments of the population. In 2010/12, Aboriginal and Torres Strait Islander life expectancy was well below the national average, a gap driven largely by a greater likelihood of death from circulatory disease, and endocrine, metabolic or nutritional disorders.<sup>38</sup> This disparity can be partially attributed to issues of accessing care. In spite of the greater likelihood of contracting these health conditions, Indigenous Australian claim rates for specialist services in 2010 were 39 percent lower than those of the general population, as was PBS expenditure.<sup>39</sup> Rural Australians also suffer from health outcomes below the national average: in 2013/14 hospitalisation rates in remote Australia were more than 1.5 times those in major cities. Access to care again partially appears to be the cause; by one estimate, remote Australia only supported 589 nurses and 58 GPs per 100,000 residents, as opposed to almost 1,000 nurses and 200 GPs in major cities.<sup>40</sup>

## Digital can provide a means for Australia to address these concerns

Overseas, healthcare's digital transformation is underway. Digital's promise is substantial: significantly lowered costs across the system, accompanied by a step change in treatment quality that is highly patient-centred. Here, we have focused our attention on the 13 most significant, increasingly-proven healthcare digitisation technologies and approaches which can be organised into three key clusters:

- **Automation and simplification of existing processes.** The best-known example of this is the use of electronic medical records (EMRs), which replace paper-based medical charts. When implemented effectively, not only do they reduce administration time for providers, they also dramatically improve clinical outcomes through error reduction, limit unnecessary appointments, and eliminate repeated tests. Previous EMR implementations overseas, when coupled with other process automation and simplification, have produced a 25 percent reduction in avoidable hospital readmission rates, and a 20 percent reduction in length of stay. eBooking platforms (such as Zocdoc in the United States, and Guahao.com in China) are also increasing in use. Such systems are also becoming popular in Australia (as evidenced by the rise of HealthEngine), with one survey suggesting that as many as 30 percent of all Australian GP appointments are now booked online.<sup>41</sup>

Additional automation aids include patient flow optimisation and digitally-enabled

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37 *Australia's Health 2014*, Australian Institute of Health and Welfare, July 2014.

38 Aboriginal and Torres Strait Islander life expectancy was 7.4 years below the Australian average for females, and 10.6 years lower for males. Indigenous Australians were also twice as likely as non-Indigenous Australians to rate their health as only 'fair' or 'poor.' *Australia's Health 2014*, Australian Institute of Health and Welfare, July 2014.

39 *Australia's Health 2014*, Australian Institute of Health and Welfare, July 2014.

40 *National Strategic Framework for Rural and Remote Health*, Department of Health, 2012.

41 *HealthEngine Survey 2014*, Networking Health Victoria, accessed October 2016.

workforce management, both of which aim to reduce a patient's length of stay. The development of eICUs are another such development; these eICUs make use of patient sensors and a central control room to monitor intensive care wards, a shift that in one case led to a 22 percent reduction in mortality rates and a 23 percent reduction in the average length of hospital stays.

- **New methods of connecting doctors, patients, and healthcare information.** Digital technologies are driving significant changes in the way patients access information and care. A notable example is telemedicine, which shifts traditional face-to-face appointments to lower cost, easier to access care channels like remote-care consultations. Traditional healthcare providers have begun to embrace such services (like the Airedale Trust in the UK), and new entrants such as Teladoc in the US are also making inroads in this space.<sup>42</sup>

Technology is also used to reduce the number of appointments patients need altogether by providing patients better access to the tools and information to manage their own care, thus reducing interactions with a physician. For example, web or app-based self-management tools are now used for managing chronic disease, as are self-service eTriage and information portals such as Australia's mindhealthconnect.com. Remote patient monitoring is also being used to this effect; start-ups such as InstaMD or Ginger.io make it easy to remotely monitor patients' health indicators (both mental and physical) and share this information with a physician, sparing the need for a regular in-person check-up.

Still other digital innovations are aimed at improving overall population health, either by encouraging medication adherence (such as the Mango Health app, through a combination of reminders and financial incentives), or by improving the underlying risk factors of poor health through a variety of primary prevention mechanisms. Examples of this range from platforms that aggregate health data (for example, Apple Health), to wearables encouraging better fitness (for example, Fitbit.)

- **Advanced analytics and improved data transparency.** Finally, digital advancements can now provide support to clinicians in their diagnoses and treatment decisions. This area of clinical decision support has varying degrees of sophistication. At its simplest, there are tools linked to patients' medical records that suggest best practice treatment pathways, whilst improved physician performance transparency ensures adherence to treatment protocols. More powerfully, new algorithms are being developed that can compare clinical data with large datasets and draw a full body of scientific literature to assist with diagnoses. IBM's machine learning platform, Watson, has shown promising results in this area by collaborating with Memorial Sloan Kettering hospital in New York and achieving greater accuracy with certain cancer diagnoses compared to those of experts.

Independently, these technologies can be harnessed to both reduce the magnitude of total healthcare spending and improve the quality of care. The real prize, however, would be driving a true step-change in healthcare provision by implementing these innovations together—not just in a specific facility, but across an entire healthcare system. The result: a radically revised patient journey, characterised by a more

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42 The Airedale NHS trust in the UK has seen substantial benefits from its telehealth programs, such as a 45 percent reduction in admissions and an 11 percent reduction in LOS for patients in the program.

accessible care model, where empowered patients take the central role in directing the course of their care, with interoperable digital platforms that support both the patient and the healthcare provider to better outcomes.

Exhibit 21

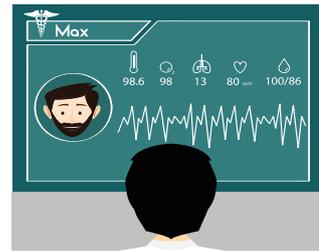
Early detection, co-management and quick access to care will change the patient experience



Max, a 28 year old AFL player, is notified by an app that his vital signs indicate heart problems



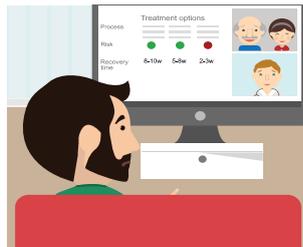
He conducts an eTriage self-diagnostic and the app recommends he do a remote GP consultation



The GP needs more information, and prescribes remote vital sign monitoring over the following two days



Max still feels fine, but his EKG results are cause for some alarm. He books a video consultation with a cardiologist



The cardiologist uses a clinical decision support system to propose treatment options, based on Max's eHealth record, genomic setup, lifestyle pattern and AFL career



Max then selects his surgeon based on outcomes, patient reviews and availability



He schedules a first meeting and chooses to go to the hospital and meet her in person



When Max leaves the hospital he receives a treatment plan that describes what he will experience, and how he can prepare



On surgery day, Max's surgeon is supported by robotics to help her avoid mistakes



Max has to stay overnight, just as predicted by the patient flow system. His nurse was alerted by his EMR to his lactose intolerance and has arranged alternative meals



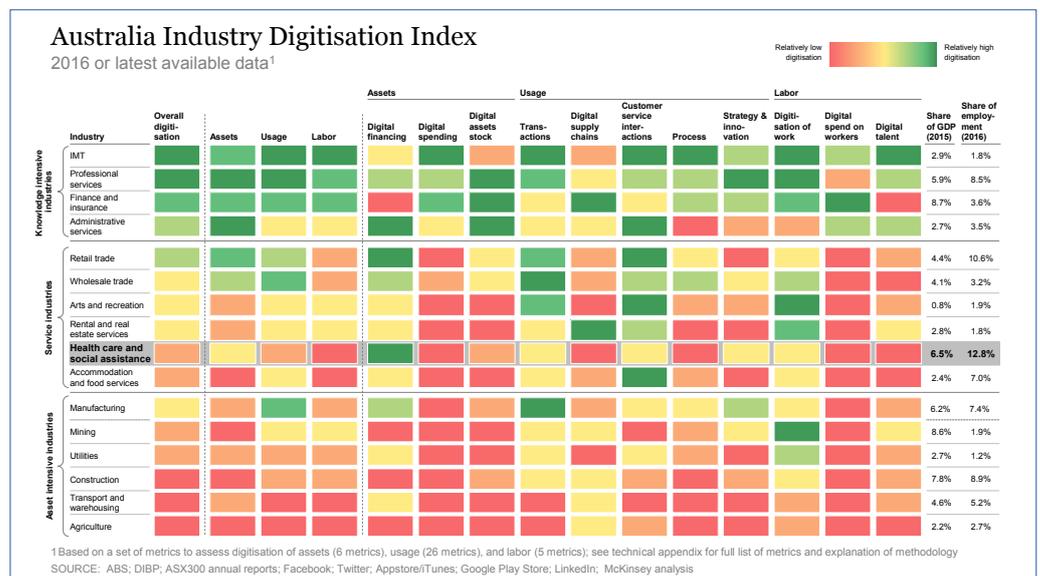
After discharge, Max follows a rehab plan in a smartphone app and his progress is constantly reported back to his care team

- Benefits of the new patient flow**
- Without proactive monitoring Max could have died from myocardial infarction
  - He avoids two unnecessary visits through video consultations
  - He feels informed and involved and is able to affect his own care
  - His after care is managed from home
  - Total lead time is considerably lower than today

## Australia could reduce its annual healthcare spend by 8 to 16 percent, if these digital innovations were implemented system-wide

Despite the advantages healthcare could derive from digitisation, and recent advances made by select institutions in Australia, our analyses suggest that the healthcare sector still has a distance to go before capturing the full benefits of digitisation. The sector scores lower than most other service industries (Exhibit 22), suggesting that it is far from reaching its full digital potential.

Exhibit 22



Digital represents an immense opportunity for the nation's healthcare system. As detailed in the previous section, effective digitisation can lead to highly compelling improvements in patient outcomes and their experience of care. Beyond these critically important care outcomes, our analysis also suggests that there are significant financial gains to be made.

Based on results from the implementation of digital health technologies overseas (notably in the UK and Scandinavia), and scaling for Australian healthcare's current baseline of digital adoption, we believe that between 8 and 16 percent of the nation's annual recurring healthcare spend could be avoided if the successes elsewhere were to be replicated Australia wide.

To size this impact, the following methodology was used:

- **Baseline.** Australia's 2013/14 total healthcare expenditure (as estimated by the AIHW) was used as a baseline. Of that total, only spending on hospitals, medical appointments (both referred and unreferred), and benefit-paid pharmaceuticals was judged to be readily addressable by digital levers.

## Box 1: Digitised healthcare— St. Stephen’s Hervey Bay:

Opened in 2014, St. Stephen’s Hervey Bay is Australia’s first fully-integrated digitised hospital, and still Australia’s only HIMSS (Health Information Management Systems Society) level 6 facility.<sup>1</sup> Run by a private hospital provider, it was built with the support of the Health & Hospitals Fund, who supplied approx. 50 percent of the A\$96 million required to build the 96 bed hospital.

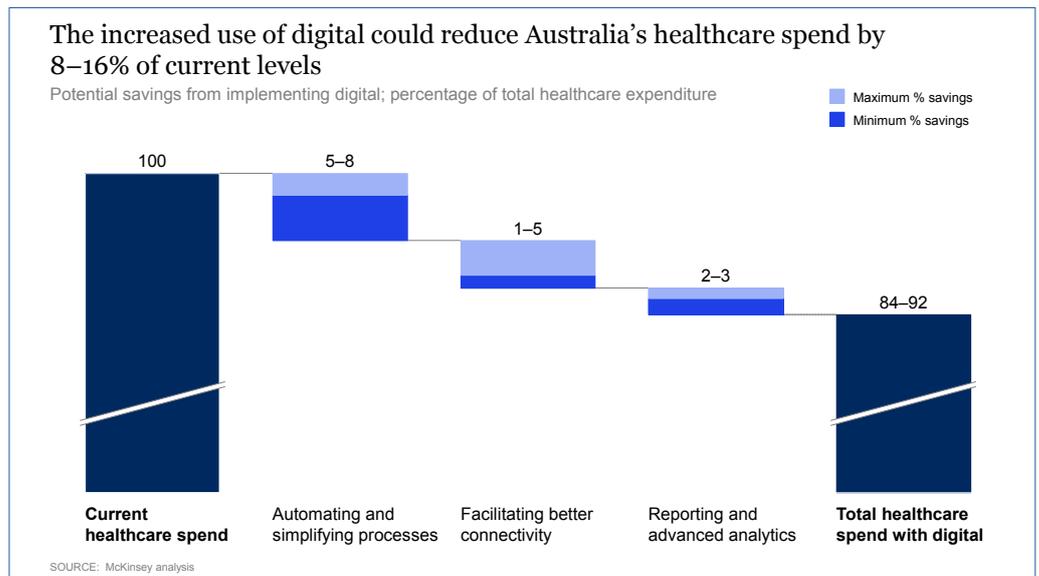
Key features of the hospital include:

- Electronic medical records for each patient—which interface with over 20 types of device throughout the hospital
- A single system for ordering medications and procedures—based on pre-designed plans, which are informed by both best practice and local standards
- Closed loop electronic medication management (CLEMM)—pharmaceuticals are tracked through all stages of the medication journey using a system of barcodes affixed to individually packaged medications. Benefits include:
  - Error checking—automated checks alert staff if prescribed drugs would have adverse reactions with food, other drugs, or allergies. The system also checks dosage amounts (both for a single instance and in a 24-hour period). This has led to an 89 percent reduction in medication omissions, and a 22 percent reduction in medication errors
  - Faster, more accurate inventory management—approx. 3.3 scripts processed a day for PBS claims versus approx. 0.8 before
  - Drastically reduced times to service orders—6 minutes for day surgery
  - Staff efficiencies, with fewer people needed in the dispensary
- Although St. Stephen’s is already seeing the benefits of digital, arguably the true payback is yet to come. The full set of data generated by its EMR system is yet to be fully mined for insight, and as yet the system operates largely in isolation, as surrounding providers have not yet invested in similar technologies.

<sup>1</sup> HIMSS rates hospitals on their use of EMRs, ranking them from level 0 to 7. Level 6 designation recognises those hospitals that make use of a fully integrated EMR system, as well as clinical decision support systems (CDSS) and closed loop medication administration. Level 7 is achieved when hospitals making use of their data to improve care for a period longer than 12 months.

- **Uplift potential.** To assess the potential savings, a literature review of over 500 research papers and case studies was carried out, generating a list of 13 eHealth technologies and their potential impact. Each technology’s impact on healthcare cost drivers was quantified based on the research papers, complemented with external case examples, and expert input. These potential uplifts were then adjusted, based on the levels of adoption already seen in Australia.

Exhibit 23

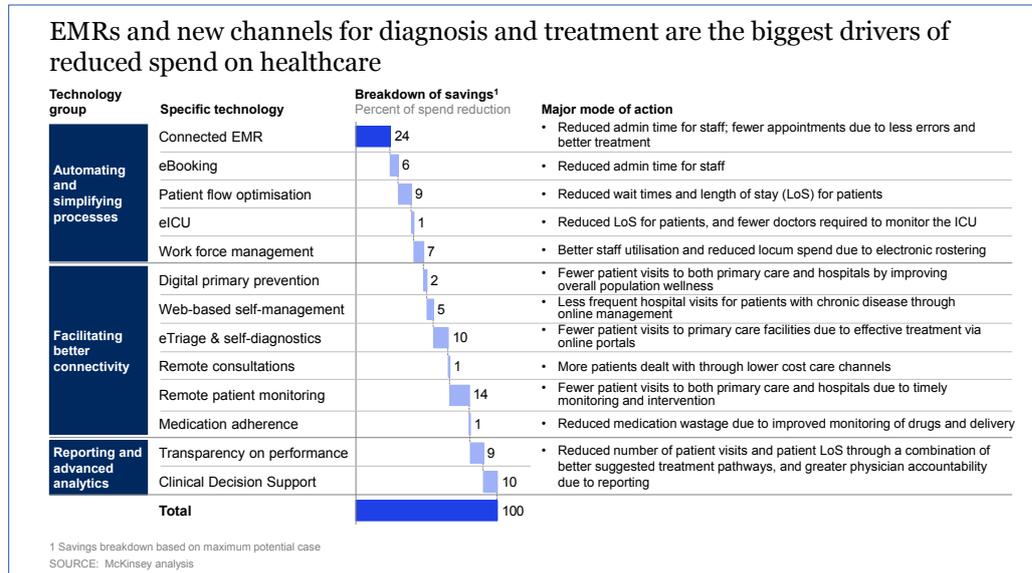


Approximately half of the potential savings come from automating and simplifying processes (Exhibit 23, 24). This makes sense in the context of the current low level of digitisation of Australia’s healthcare sector, as in general, the first wave of digital opportunity is often grounded in operational efficiencies.

Better connectivity between providers, patients, and healthcare information is forecast to reduce healthcare spend by a further 2 to 5 percent. It is also worth noting that the benefits here could be understated. For example, digitally-enabled primary prevention represents only 2 percent of the total projected benefits as there are very few demonstrable use cases seen to date. It is also worth noting that many of the benefits of telehealth will not show up in these savings, as travel costs for patients (which could account for almost 80 percent of the savings for rural patients) are not captured in the official spending statistics.<sup>43</sup>

43 See Darshit Thaker, Richard Monypenny, Ian Olver, and Sabe Sabesan, ‘Cost savings from a telemedicine model of care in northern Queensland, Australia’, *Medical Journal of Australia*, volume 199, issue 6, 2013.

Exhibit 24



## Capturing the digital opportunity in Australian healthcare

### A portion of the digital opportunity can be captured by providers taking individual action

Although our analysis indicates that digitisation poses a substantial opportunity for the Australian healthcare system, in reality it would not be feasible for a majority of providers to implement this full suite of technologies without considerable support.

Costs are the most significant reason for this. The capital outlay necessary to ensure that the requisite network infrastructure is in place, when coupled with the costs of new systems and devices, means that going digital all at once is likely to come at a prohibitively high price. Ongoing operating costs are also substantial if they are unable to be defrayed across a number of facilities. For hospitals, enterprise bargaining agreements mean that providers are bound to fixed ratios of doctors and nurses to patients, limiting their ability to access the potential efficiency gains of digital immediately. The externality of benefits is also a barrier to investment, as the upside from implementing digital is often captured by someone other than the provider of service, or is dependent on network effects to be truly useful. The barriers also extend beyond the financial—advances like remote care could require an adjustment in medical culture that is traditionally based on in-person appointments, and extracting full potential from digital investments requires doctors and healthcare staff to be fully technically trained.

These factors currently mean that only a few providers could financially justify going ‘fully digital’ based on returns in the short term. However, this does not mean that digital should be abandoned by providers—there are many practical steps providers can take to still reap some of digital’s promise, such as:

### 1. Capturing digital’s quick wins, and beginning staged rollouts of more complex technologies

Certain digital technologies are immediately accessible to providers given their speed to implement, cost, and return. The likes of eBooking platforms, as well as patient flow and workforce management solutions can bring reasonable financial benefits, many of which are captured by the provider.

In addition, although implementing high-value technologies like EMRs at brownfield sites is a difficult and costly ask, administrators could roll out more cost-effective EMR pilots (along with associated technologies) in certain departments (usually the ED or surgery), as a precursor to full implementation.

It is important to note however, that the efficiency upsides of digital will not be fully captured if traditional processes are simply mirrored in the digitised work. Benefiting from digital will require processes to be brought into line with best practice, accompanied by a willingness to reengineer if unexpected improvements come to light.

### 2. Investing in bringing staff along the digitisation journey

Cultural change is a key component of unlocking digital’s potential across all sectors; providers cannot hope to see its benefits otherwise. There are two main things that can be done to further this aim.

First, providers must ensure that workers are invested in the success of digital initiatives. To achieve this, it is critical to articulate a compelling value proposition for the change, highlighting not just the macro benefits (such as operational efficiency improvements and better clinical outcomes) but also day-to-day improvements (such as eradicating the need to read scrawled handwriting). It also requires that clinicians and nurses are involved from the beginning of the digitisation process—i.e. that from the early stages of process mapping, those that will be using the new systems are involved in designing them. Fostering a better culture of entrepreneurship within hospitals will also support the change. This means nurturing good ideas that are developed by those within the system, ensuring that they are implemented, and potentially giving founders a stake in the success (through partial IP ownership for particularly innovative solutions).

Second, providers must ensure that their staff have all the requisite capabilities to use their new systems. Achieving this requires more than simply teaching staff about the new systems pre-launch. It is also critical that providers give ongoing support to staff in the months after go-live. In one such successful digital implementation in Australia, a system of ‘superusers’ was created and demarcated throughout the launch by different coloured uniforms and scrubs. These self-selected clinicians not only taught their fellows how to use the new systems, they were champions for the change, ultimately helping build support for the shift amongst even the most reluctant staff.

## Government involvement is key to unlocking digital's full potential

Capturing the full potential of digital cannot be achieved through the actions of providers alone; governments are also integral in unlocking digital's full promise. Several areas of focus have proven important overseas, such as:

### 1. Encouraging digital healthcare initiatives

This could be achieved directly by ring-fencing funding for digital healthcare initiatives to assist providers with the upfront investment required for some of the more impactful digital technologies. Similarly, governments can also address financial disincentives to digital adoption. For example, individual practitioners are currently not typically rewarded for advancing self-service or other innovations that would reduce the number of visits, as they are paid based on the number of patients they see. One solution may be the limiting of fee-for-service models, and moving towards funding mechanisms that provide incentives to adopt new behaviours, such as episode-based or outcomes-driven performance payments.

### 2. Removing barriers to digital's adoption

One potential barrier to digital innovation is ambiguity in legislation, particularly around data privacy. This leads providers to err on the side of caution when deciding whether to implement a new system and/or release anonymised datasets for healthcare analytics. Research Australia's 2016 survey suggests that 91 percent of Australians would allow their healthcare data to be used for research purposes; governments should support such initiatives, targeting the numerous competing standards for healthcare data.<sup>44</sup> Legislation still stipulating the use of manual, paper-based solutions should also be tackled.

Providers also face difficulty in extracting the efficiency gains of digital as many of them ultimately reduce labour time. Governments will therefore need to bear in mind the evolving balance of demand with supply in the number of clinicians and nurses entering the medical profession.



The opportunity that digitisation presents to Australia's healthcare sector is immense. Even implementing just those technologies that are currently in existence (and more broadly used overseas) could drive significant improvements in both cost and quality of care, along with secondary economic benefits in the form of reduced absenteeism and greater productivity.

The shift to digital will not come easily, and it will require a culture shift and investment from providers, patients, administrators and governments. However, when coupled with the developments expected in the next two decades, such as next generation '-omics', the rise of truly patient-centred practices, and the automation of many traditional specialties, it is not understatement to talk of digital as a revolutionary force in healthcare.

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<sup>44</sup> *Flying Blind: Australian Consumers and Digital Health Australian Health Data Series*, Capital Markets Cooperative Research Centre, October 2016.

## Digital in healthcare—takeaways:

- **The healthcare sector in Australia is far from its full digital potential.** It sits in the **bottom half of service industries** according to our digitisation heatmap, and there is still considerable scope to introduce best-practice innovations currently seen overseas.
- Digital represents a significant opportunity for the nation's healthcare system. It can radically improve **access to care, patient outcomes** and experiences of care, as well as the **total cost of the healthcare system**. The benefit comes from three broad areas: **automating and simplifying processes, facilitating better connectivity** between patients and providers, and **better utilising reporting and advanced analytics**.
- Effective use of digital across the healthcare system could **reduce the nation's total yearly health expenditure by 8 to 16 percent**, based on an analysis of best practice digital healthcare internationally and at home.
- **Individual providers can capture some of this value.** Doing so requires providers to capture digital's 'quick-wins', whilst ensuring that health professionals have the requisite skills and motivation to be brought along the digitisation journey.
- **Capturing the full opportunity of digital will likely require government support.** Many of the benefits of digital are felt at a systemic level, and need strong leadership and intergovernmental cooperation to make implementation viable. Overseas experience suggests that governments can also play a significant role in removing the still-extant barriers to digital adoption, legislative or otherwise.

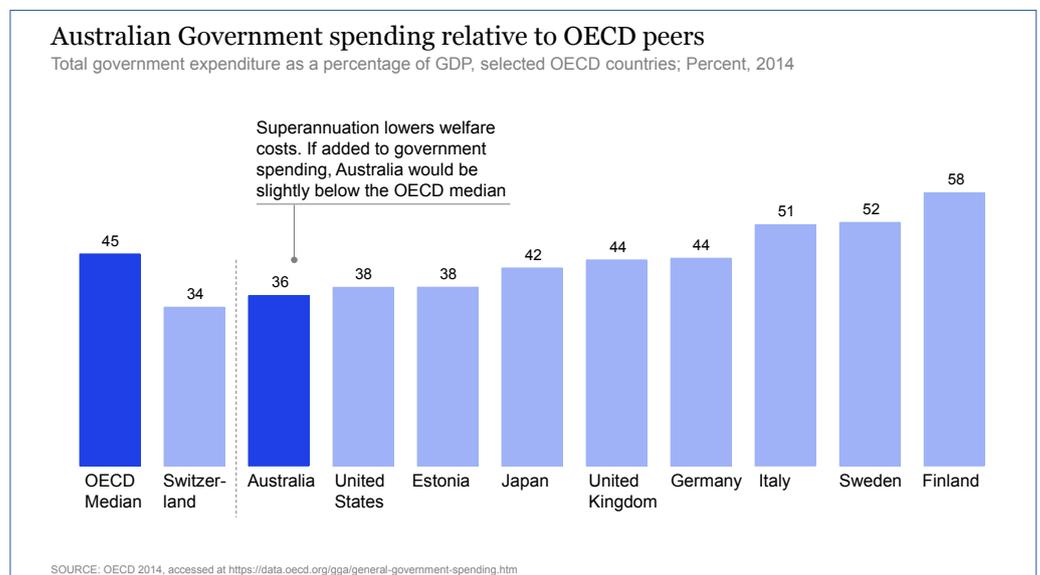


# Digital in the public sector

As they become increasingly exposed to the competitive pressures typical in the private sector (such as increased expectations of digital interactions), governments the world over are pursuing digital with gusto. The prize for doing so is immense: a more efficient government that better serves and engages with its constituents, supported by an economy well placed to compete and thrive.

Governments play a central role in the national economy; the public sectors of the OECD spend anywhere from 30 to 60 percent of GDP (see Exhibit 25), account for up to 35 percent of employment,<sup>45</sup> and affect all sectors via the legislation they enact and enforce. The Australian public sector is no different. Spending across Australia's three tiers of government in 2014/15 amounted to A\$582 billion (approximately 36 percent of Australia GDP), and the sector employed 15 percent of the nation's workforce.<sup>46</sup>

Exhibit 25



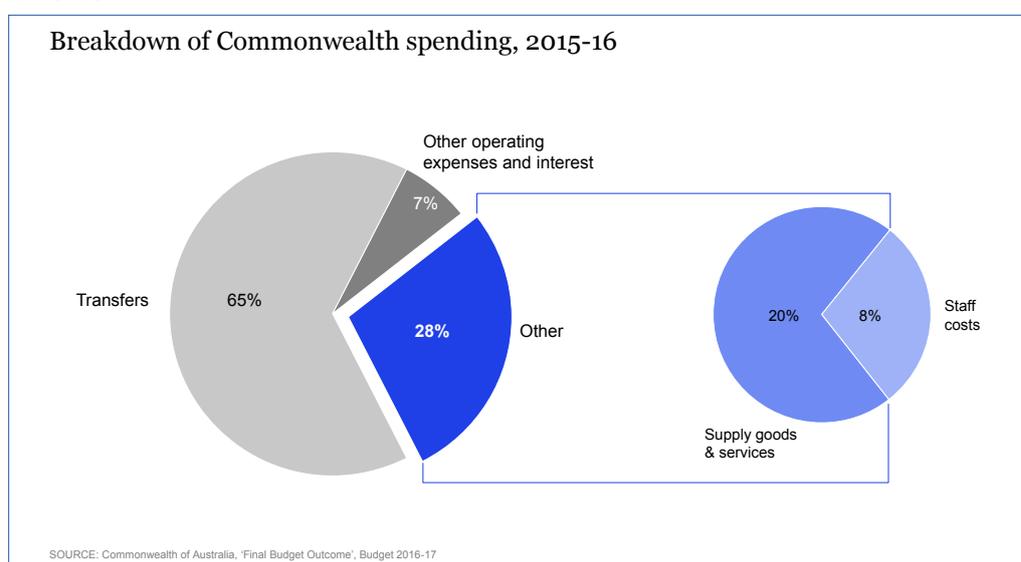
This chapter focuses primarily on the digital opportunities at the Commonwealth (or Federal) government level, rather than those of the States, Territories and local councils. Where relevant, we also call out examples of digital excellence from both state and local government, and detail levers and interventions pertinent to all levels of the public sector. The respective sizes and activities of these three tiers are detailed below and in Exhibit 26:

<sup>45</sup> *Government at a Glance 2015: Employment in the public sector*, Organization for Economic Cooperation and Development, 2015

<sup>46</sup> 5512.0 - Government Finance Statistics 2014/15, Australian Bureau of Statistics; and 6248.0.55.002 - Employment and Earnings, Public Sector, Australia 2014/15, Australian Bureau of Statistics. Some other ABS sources place the percentage of public sector employees at ~6 percent. This is because our chosen estimate uses: (i) a broader scope encompassing those working for all government affiliated institutions (such as the courts, universities, and government controlled non-profits), and (ii) a different survey methodology, based on sampled businesses rather than household data.

- **The federal government**—employed 239,000 people in 2015/16,<sup>47</sup> and oversaw around A\$420 billion of spending.<sup>48</sup> However, it bears note that 65 percent of this total consisted of transfer payments, as Exhibit 26 illustrates. Many of these transfers are categorised in the budget as 'administered' spending—payments, distributed by government agencies in areas such as welfare. The remaining 35 percent was comprised of operating expenditure and interest expenses. Of this roughly A\$63 billion was deemed 'departmental' spending—costs of government agencies.
- **The six state and two territory governments**—collectively had costs of around A\$230 billion over the same period.
- **Local government**—is considerably smaller, spending A\$34 billion between the roughly 560 councils.

Exhibit 26



Where digital is concerned, the Australian Government has a dual imperative, to digitise itself, and to catalyse digitisation in other sectors of the economy. This chapter will focus on the former, analysing the four areas of government activity where our earlier work has shown digital's benefit can most be felt:<sup>49</sup>

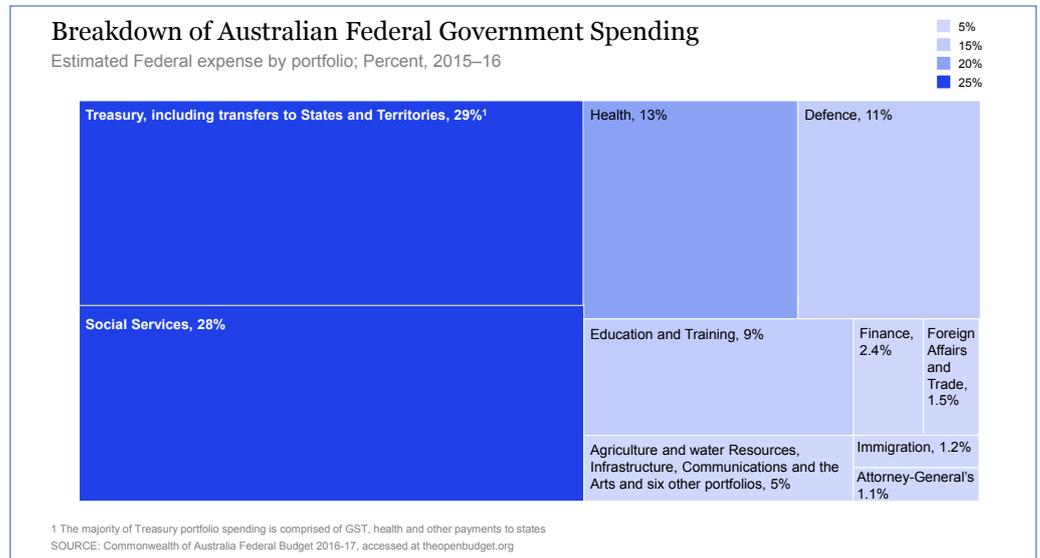
- **Government interactions**—with citizens, businesses and other governments, and the processes that support them.
- **Internal operations and processes**—such as IT, procurement, HR, finance and other internal processes that support the departments in their work.
- **Applying data analytics to policy**—including legislating, decision making, and administered spending.
- **Data sharing**—ensuring that government data is easily accessible, both by other government departments, and by those outside the public sector.

47 Includes civilian staff and military personnel. *Estimates of total Average Staff levels in the general government sector*, Commonwealth of Australia, Budget Paper No.4, May 2016.

48 *Budget Statement 5*, Commonwealth of Australia, Budget Paper No.1, May 2016.

49 *Digital by default: A guide to transforming*, McKinsey Centre for Government, November 2016.

Exhibit 27



The first three areas collectively cover the revenue and cost base of the Australian Government, and all four are directly within government control. However, the government is also partly responsible for enabling a more digital Australian economy. As discussed at the end of this chapter, governments must ensure that the appropriate infrastructure is in place, and that citizens have the necessary skills to take advantage of digital opportunities.

### The Australian government has made significant strides in digital, but substantial opportunity remains

In many respects, the Australian Government is a digital leader. Indeed, according to the UN E-Government Survey 2016, Australia’s ‘digital government’ offering is the second most developed in the world after the UK’s.<sup>50</sup> Australians have a high level of digital literacy: the World Economic Forum’s Networked Readiness Index ranks Australia 13th of 139 countries in digital skills readiness and usage of digital (opportunities to improve upon which are discussed in more detail in the concluding chapter of this report).<sup>51</sup> The Digital Transformation Agency (DTA) is leading the transformation agenda by coordinating improvements in digital government services; this includes overseeing a single portal for all government websites (gov.au) and a government services cloud platform, amongst other initiatives.<sup>52</sup> These efforts have the potential to simplify the user experience for citizens and improve efficiencies for staff.

50 The UN’s e-government development index is based upon a range of primary and secondary measures that combine to form three input indices, assessing: telecom infrastructure, online service quality, and human capital. See *United Nations E-Government Survey 2016*.

51 *Measuring Australia’s Digital Divide, The Australian Digital Inclusion Index 2016*, Swinburne University of Technology, Swinburne Institute for Social Research and Telstra, 2016.

52 *govCMS and GOV.AU Beta: a joint approach to improving online service delivery*, Digital Transformation Office, April 2016. See also *GOV.AU—Alpha assessment*, Digital Transformation Office, February 2016.

In spite of this, the Commonwealth's digital offering does not consistently reach international best practice, indicating further opportunity remains if action is taken to improve the following areas.

### Government interactions with citizens

The digitisation of government interactions (and the processes that support them), is an area in which the Australian Government is at times a global leader. The Government has a single portal (myGov.com.au) that provides access to government services like Medicare, Centrelink and the ATO's online tax platform, myTax. In 2015, myTax was used to lodge 1.75 million returns, and over 3 million are expected in 2016, representing about one in four of more than 12 million returns.<sup>53</sup> The ATO avoided millions of security questions and passwords for taxpayers through a voice biometrics authentication system for phone and online services,<sup>54</sup> and the ATO's digital chatbot Alex has answered almost 1 million queries since February 2016.<sup>55</sup>

In other examples, the ABS has made use of gamification with 'Run That Town', an app that improves census awareness by using real data, and the Commonwealth also provides a spectrum of digital business services, from the Australian Business Register to the ATO business portal. AUSkey, for example, is an initiative providing a single secure login for online business interactions across a range of Commonwealth agencies.

To further improve in this area, the government should look to spread the implementation of best-practice digital interactions throughout more Commonwealth agencies. While digital interactions are most prominent for tax and welfare transactions, other opportunities exist to streamline citizen-facing transactions for other agencies. There is also an opportunity to improve cross-cutting citizen interactions (i.e. those that touch multiple agencies). This is particularly pressing with interactions that involve both State and Federal agencies; the Gold Coast University Hospital's pilot of automatic enrolment of newborns in the Medicare and other Federal medical programmes is an early example of potential gains.<sup>56</sup>

The government could also look to deploy additional innovations seen overseas. One example is proactively suggesting personalised services to citizens at relevant moments. Norway's tax administration provides most citizens with fully pre-filled tax returns, and more than 70 percent of citizens accept these returns with no action required on their part. Likewise, in Sweden, parents receive regular digital reminders about upcoming health check-ups and vaccinations for their children. Some other governments are leveraging newer forms of social media (in addition to well-established platforms like Facebook and Instagram) to make government interactions more seamless for citizens. For example, some Chinese provinces are making the most of WeChat's support for the creation of apps within the messaging platform. 'Shanghai Publish' is one such app, providing real-time bus schedules, visa applications, real-time traffic monitoring, weather and air-quality indices to the citizens of Shanghai.

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53 *ATO retires e-tax in 2016*, Australian Taxation Office, June 2016.

54 *ATO Implements Nuance Voice Biometrics to Become the First Organisation to Offer Multi-Channel Voice Biometrics Authentication*, Nuance Communications, January 2016.

55 Chris Jordan, *Opening statement to Senate Estimates, Senate Standing Committees of Environment and Communications*, Australian Taxation Office, 19 October 2016.

56 *Media release: Digital trial creates automatic enrolment of newborns In Medicare*, Department of Human Services, August 2016.

## Internal operations and processes

The Commonwealth has made progress on digitising its internal operations and processes, however successes in other countries again point to additional potential that Australia can capture.

Much of the opportunity comes through the consolidation and automation of back office processes. Shared services are often used to facilitate this, for they reduce the number of systems used by public servants for common activities, such as parliamentary document preparation, financial planning and reporting, and human resource management. Australia has made progress here; the government's Shared Services Centre (SSC) provided shared services to 16 Commonwealth agencies in 2016,<sup>57</sup> and has reduced duplication of Finance, HR and other corporate functions.<sup>58</sup> However, the government's ICT spend as a proportion of operational spend was ~3.5 percentage points greater than that of other international governments in 2014-15 and has grown at a compound annual rate of 1.4 percent from 2009 to 2015.<sup>59</sup> This level of spending suggests room for consolidation of spend.

To reach best practice internationally, Australia could look to provide fully shared government services across all its agencies, automating processes as they go. One country that has done this effectively is Estonia, where the state's shared service centre provides nationwide financial, HR and payroll accounting services to most public sector agencies. Its introduction led to a 20 percent increase in efficiency.

Procurement is another area where the Australian Government has further opportunity to capture, in spite of progress to date. The AusTender site publishes details of business opportunities, annual procurement plans, and awards contacts for Australian government procurements. It also supports standardised and streamlined panel buying across the Commonwealth's 500 procurement panels.<sup>60</sup> The recently established ICT Procurement Taskforce is working with industry to lower entry barriers for SMEs,<sup>61</sup> an effort bolstered by the National Innovation and Science Agenda's Digital Marketplace, which makes it easier for small business to compete for Commonwealth ICT contracts.<sup>62</sup>

As awarded contracts still do not go through a central bidding portal, there is still some upside to be captured here. A central portal can drive significant savings in procurement expenses, for they make auctioning simpler for bidders and enable cheaper, specialised SMEs to bid on contracts. An example can be found in South Korea, where the government developed an 'e-procurement' system to increase opportunities for SMEs to win government procurement contracts. In 2010, SMEs gained 75 percent of the business available via this system compared to 55 percent in

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57 *The Shared Services Centre*, Australian National Audit Office, accessed November 2016.

58 Other examples include the Department of Human Services providing ICT services to the Department of Veterans' Affairs and the Australian Electoral Commission, and the Department of the House of Representatives managing payroll of the Department of Parliamentary Services.

59 *Government ICT Trends Report 2014/15*, Australian Department of Finance, March 2016.

60 *Direct Sourcing for Panels*, Department of Finance, December 2016.

61 *ICT Procurement Taskforce Consultation Paper*, Department of Prime Minister and Cabinet, November 2016.

62 *About the Digital Marketplace*, Digital Marketplace, accessed December 2016.

2003, saving transaction costs of around US\$8 billion annually.<sup>63</sup> By comparison, only 24 percent of Australian Government procurements went to SMEs in 2014/15, down from 28 percent in the previous year.<sup>64</sup>

### Applying data analytics to policy

The Commonwealth is making some inroads into data-driven legislation, policies and programmes; here, too, there are further benefits to be captured from consistent use of data analytics across portfolios.

Some quick wins are currently being captured. For example, inter-agency arrangements to detect welfare fraud through data matching will see a A\$173 million investment to recover an estimated A\$1.7 billion in debts over 5 years.<sup>65</sup> There are also Federal efforts to coordinate across tiers of government. The Population Health Research Network has funded efforts to bring together health data from around the country to inform health policy, ranging from better service planning for Indigenous Australians in the Northern Territory, to lowering hospital wait times in hospital emergency departments.<sup>66</sup>

These efforts aside, the Australian Government is still some steps away from consistent use of data to inform policy. For example, New Zealand's Treasury is using longitudinal data from their Integrated Data Infrastructure to identify youth at risk of poor outcomes in adulthood, based on analysis of a specific cohort of young people. The analysis provides insights into the effectiveness of various policies and interventions—a necessary first step to improve the outcomes possible for at-risk youth.<sup>67</sup> New Zealand's approach enables improvements across a range of portfolio matters; for example, using the IDI, the Ministry of Education has analysed student loan, tax and education data to identify trends in career pathways of past students. The analysis forms the basis of the Careers NZ Compare Study Options tool that helps young people make better decisions about their study choices.<sup>68</sup>

The Commonwealth can also leverage the knowledge of States that have taken a whole-of-jurisdiction approach. The NSW Data Analytics Centre (DAC) was established in 2015 under the auspices of the NSW Department of Finance, Services and Innovation (DFSI) to facilitate data sharing between NSW Government agencies, with the aim of leveraging data to inform more efficient, strategic, whole-of-government decision making. This is an example of utilising existing data in a structured way to underpin policymaking, which is a key opportunity for the federal government.

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64 This comprises US\$6.6 billion of private sector savings from reduced visits and labour costs, and US\$1.4 billion of public sector savings from reduced lead times and streamlined processes. Republic of Korea, *e-Procurement Experience in Korea: Implementation and Impact*, June 2012.

64 *Statistics on Australian Government Procurement Contracts*, Australian Department of Finance, December 2016.

65 Official Committee Hansard, Senate Community Affairs Legislation Committee, 3 June 2015.

66 *Case Studies*, Population Health Research Network, accessed December 2016.

67 *Business Longitudinal Analytical Data Environment*, Australian Government, Office of the Chief Economist, accessed December 2016.

68 *How researchers are using the IDI*, Statistics New Zealand, November 2016.

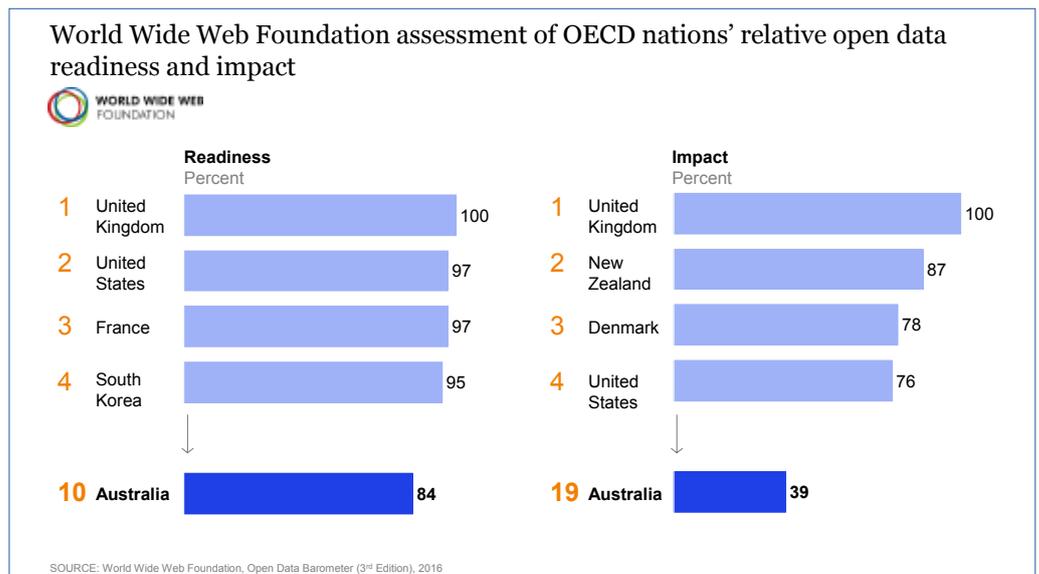
## Data sharing

In addition to joining the Open Government Partnership (a commitment by 75 countries to promote government transparency and accountability), there are many sound instances of data sharing in the Commonwealth. Data.gov.au provides a single source for all Australian Government data, and the Australian Business Register is a central repository of all public Australian business details. However, only a limited number of agencies are publishing data through these repositories; Geoscience Australia alone is responsible for over half the datasets available on data.gov.au, whilst other statistical agencies hold many of their datasets on separate, offline repositories.

Furthermore, there is fragmentation across levels of government, with several State-based data portals unlinked to the Federal architecture. The UK's consistent use of data.gov.uk is one example of the potential to promote open data sharing across departments, making the release of public data a business-as-usual practice. Another best-practice example is Estonia's 'X-Road' platform; a virtual, decentralised database which provides a secure and seamless way to exchange authentic data between government databases, without relying on a central data repository which brings high coordination costs and security concerns.

This context of strong data infrastructure hampered by under-utilisation and fragmented data practices is reflected in the World Wide Web foundation's assessment of Australia in its 'Open Data Barometer'. Whilst Australia scores within the top 10 countries overall, this is driven by its high 'readiness' score; the score on driving impact from these data is well below international best practice (Exhibit 28). In particular, Australia still lags behind in availability of spending, legislation and health data—these are opportunity areas for policy making, co-designing policy with the private and research sectors, and engaging with citizens.

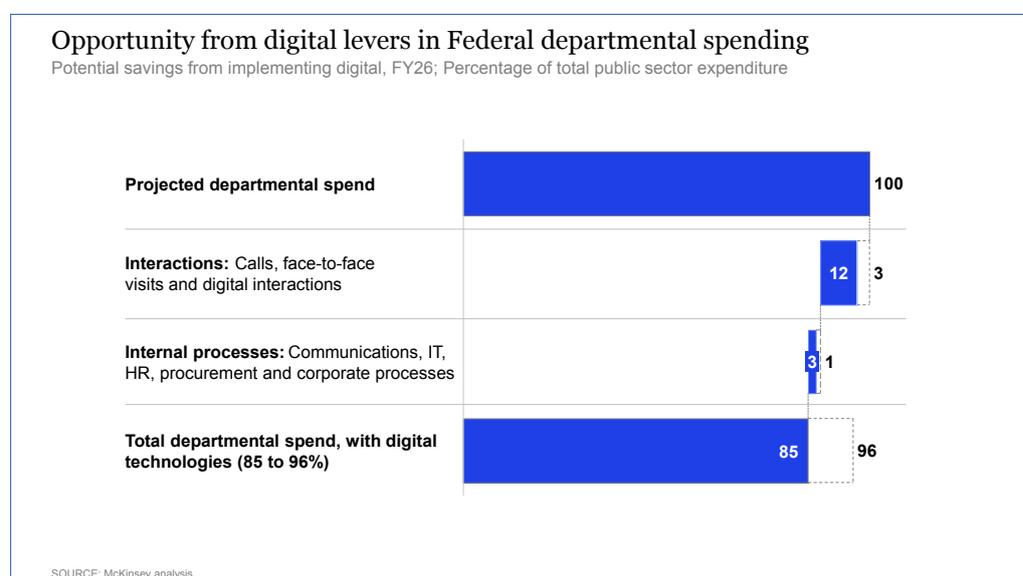
Exhibit 28



## The potential digital efficiency opportunity is 4-15 percent of departmental spend, with additional upside from increased revenue and better policymaking

The direct and indirect benefits of digital in the public sector are many and varied. Based on overseas and Australian cases of digital impact on transaction and corporate function spending, we believe that between 4 and 15 percent of the Commonwealth's annual departmental expenditure could be saved through the full-potential adoption of digital (Exhibit 29). This could be achieved if best practices in the Commonwealth and from overseas were adopted for transactions and back office processes over coming years.

Exhibit 29



The sized opportunities come from the first two of the four areas of digital opportunity discussed in the previous section:

- Approximately three quarters of the calculated savings come from **digitising more interactions** between the Commonwealth and its citizens. As centrally-coordinated digital transformation efforts continue to link agencies within the Commonwealth, there will be a higher proportion of transactions that can be digitised. This will achieve a two-fold benefit: firstly, avoided in-person and phone transaction costs and secondly, improved economies of scale in digital transaction delivery. To calculate the savings, we modelled the shift in channel volumes (for phone, in-person, and digital transactions) across every agency toward the 'best practice' standards already seen in the Commonwealth, and applied transaction unit cost savings that have been achieved in other countries. **Revenue uplift** from more effective tax collection is another key area of potential direct financial benefit, though sizing the potential benefit has not been attempted here. One recent example saw the ATO analyse tax debt data to identify and contact habitual late payers, triggering A\$1.4 billion of on-time payments and saving significant costs of late payment in 2015 and 2016.<sup>69</sup> This is just one example of the ATO's efforts to

69 Chris Jordan, 'Better services and a better experience for Australians', *12th International Conference on Tax Administration*, March 2016.

move beyond ad hoc debt collection by leveraging a range of analytics and other digital measures.

- **Digitising internal processes** to drive corporate function spending efficiencies represents the remaining quarter of savings. Back office functions such as HR and Corporate services are provided to a number of agencies in the Commonwealth by the SSC. To estimate the opportunity, we took the target levels of activity consolidation from the UK's Next Generation Shared Services strategic plan,<sup>70</sup> and triangulated against the National Audit Office's findings on the savings levels currently being achieved by the Federal Shared Services Centre.<sup>71</sup>
- The third area of digital opportunity discussed above, using **data analytics to improve legislation, decision making and the management of administered spending**, also represents a significant savings opportunity. We have not attempted to size in aggregate the opportunity, but recognise this area can yield substantial and tangible savings. One example of this is improving payment integrity in administered welfare services via digital and analytics. This year, DHS will spend approximately A\$158 billion on welfare, including over A\$100 billion on payments, to over 7 million Australians. In recent years, the Commonwealth has made great strides to apply data analysis and data sharing to improve the efficiency of these payments.

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70 *Next Generation Shared Services*, HM Government, December 2012.

71 *Shared service centres*, National Audit Office (UK), May 2016.

## Capturing these benefits for Australia will require four unlocks

Capturing the digital opportunity in each of these four areas—citizen interactions, internal processes, decision-making, and data sharing—will have a substantial impact on Australia.

Australia is well positioned to bring the advantages of digital to scale. While interactions for welfare and tax are increasingly digital, building a critical mass of digital service delivery will unleash economies of scale and simplify interactions for citizens. Realising the full opportunity for Australia could proceed on four fronts:

- First, the Commonwealth needs to ensure that its workforce has the **appropriate skills** to implement the innovations discussed above. Some of these skills will have to be recruited externally. For example, the UK's Government Digital Service has developed a comprehensive talent-management strategy for digital skills. Its recruitment hub helps all departments recruit digital talent, and organise rotational programmes. Skills also can, and should, be developed internally. For example, the United States is building the capabilities of its employees through its DigitalGov University, which trains 10,000 federal civil servants each year from across government in digital and data skills. Moreover, knowledge can be transferred on the job by cross-pollinating between existing agencies with high and low levels of digitisation.
- Related to the above, building an **advanced analytics capability** and **making it available to all agencies** will bolster policy development, implementation and optimisation. This capability requires not only workforce skills uplift, but also investment in software, work processes, agency relationships and work cultures. Already, some agencies are investing in this capability; for example, the ATO is developing more advanced analytical models to predict and prevent tax debts. The DTA and Shared Services Centre are two initiatives that position the Commonwealth well to bring such a capability to scale, ensuring access for agencies of all sizes, and avoid duplication of IT infrastructure investment between agencies.
- Thirdly, Australia needs to continue to **close the digital literacy divide within its citizenry**, targeting those groups that have a high degree of dependence on government services, but low digital skills. Though Australians' digital literacy is currently strong on average, it will require ongoing development to maintain the advantage and narrow variation that exists. To this end, the Commonwealth will need to continue to enable the digital inclusion of Australians who are most disadvantaged in digital skills development or access. This typically includes those who are unemployed, older Australians, those with disabilities, Indigenous Australians, and those in regional areas. The expansive network of Commonwealth premises for in-person transactions, from welfare agencies to public libraries and post offices, provides a strong base that can be leveraged for computer literacy and other community and privately-run digital literacy training grounds.
- A final area of focus could be **removing the barriers to data sharing between agencies, citizens and institutions**. These barriers can be structural, such as the difficulties collaborating across the three tiers of government. They can also be cultural, or even legislative. As the UK has shown, through the release of anonymised prescription and dispensing data for third-party uses (including

academic research and industry studies), there is great potential for digital to enable public, professional and personal benefits without compromising privacy and other private benefits. Its commitment to making government data more easily available extends to document and information security classification, which has been simplified to just three tiers. This greatly widens the net of information that can potentially be published.



Australia's improving digital infrastructure and digitally-literate citizenry provides a strong foundation for the government's digitisation agenda. By sustaining efforts to bolster both, Australia can continue to leverage these advantages into improved citizen engagement, service delivery and policy making.

## Digital in the public sector—takeaways:

- The Australian Government performs well digitally when compared to other nations, though there is still significant room to improve. Digitisation has occurred unevenly across the Commonwealth, and there is still scope to reach international best-practice in the four key areas of government activity; government/citizen interactions; internal operations and processes; applying data analytics to policy; and data sharing.
- Further digitisation of the Commonwealth would have a meaningful financial upside, whilst also driving higher citizen satisfaction and engagement. The opportunity across both government transactions and internal operations is between 4 and 15 percent of annual departmental spending.
- The key to unlocking this capability lies primarily in capability building, both within government and amongst the wider population. Additionally, the government could look to remove the barriers to data sharing, putting in place frameworks and systems to enable the sharing of data that is currently considered too sensitive or private.



# Digital in retail

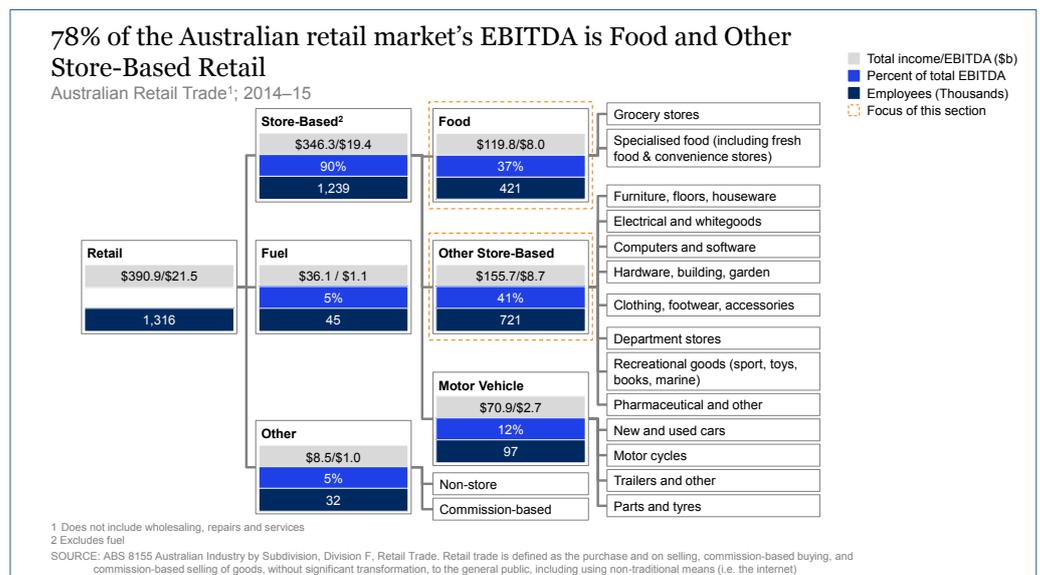
In 2015, retail trade comprised 4.4 percent (A\$72 billion) of Australia's GDP.<sup>72</sup> The sector's contribution to the economy in terms of employment is significant, employing over 10 percent of the workforce, second only to healthcare and social assistance.<sup>73</sup>

Not only does the sector employ a large proportion of the population, but the industry plays an important role in providing employment to particular sub-sectors of the workforce; the sector has one of the youngest age profiles of employees (75 percent under 45 years and more than 33 percent under 24 years), and a higher than average proportion of female (56 percent versus 46 percent average across all industries), and part-time workers (49 percent versus 30 percent average across all industries).<sup>74</sup>

At a high level, retail trade can be broken into three main components (Exhibit 30):

- Store-based retail—food (grocery stores and supermarkets), department stores, consumer electronics, hardware, apparel, motor vehicle
- Fuel
- Other—commission-based retail and non-store retail, like markets

Exhibit 30



Two key components of store-based retail (food and other store-based) make by far the largest contribution to Australia's economy; representing over 78 percent of the total retail EBITDA and 87 percent of the employment.<sup>75</sup> Thus, this chapter focuses on these two elements, which include (but are not limited to) grocery, furniture, electrical, clothing, recreational goods and computer retail.

72 5206 - Gross Value added by Industry, Annual, Australian Bureau of Statistics, 2015, Table 37.

73 6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, Australian Bureau of Statistics, November 2016, Table 4.

74 *Retail Workforce Study*, Service Skills Australia and Australian Workforce and Productivity Agency, March 014.

75 8155 - Australian Industry by Subdivision, Australian Bureau of Statistics, Division F, Retail Trade. Retail trade is defined as the purchase and on selling, commission-based buying, and commission-based selling of goods, without significant transformation, to the general public, including using non-traditional means (i.e. the internet).

## Retail trade in Australia is below its full digital potential, and is less ‘digitally mature’ than it’s overseas peers

Globally, the retail sector has been one of the sectors most disrupted already by digital. Many of the canonical ‘born digital’ frontrunners, such as Amazon and Tencent, began in the retail space (even if they have now expanded well beyond its boundaries). Despite some strong recent advances, retail in Australia still has a significant gap in digital maturity relative to leading international peers. Until quite recently, geography has helped to insulate Australian retailers from some of the pressures felt by their counterparts in the United States and Europe. However, this insulation is rapidly being chipped away, and improving digital maturity represents one, key, tool for Australia’s retailers to withstanding these increasing consumer and competitive pressures.

### Whilst retail trade leads the Australian economy in consumer-facing digital metrics, lack of back-end digitisation indicates significant opportunity to improve digital maturity.

According to our Digitisation Index metrics, retail trade’s score is approximately half that of the leading sector(s) in the economy (Exhibit 31). Retail’s pattern of digitisation is highly polarised: the retail sector scores highly—in fact at an economy-leading level—on consumer-facing metrics, i.e. customer service interactions and transactions, but poorly on back-end processes and the digitisation of labour.

This reflects a common pattern across geographies, of economies digitising ‘from the consumer back’, driven by a combination of both increased consumer demand for digital channels and interaction points, and the greater availability of data the closer to the consumer a sector is. This is further evident when retail is compared with other stages of the consumer goods value chain—for example we see customer service interactions progressively improve from manufacturing to wholesale to retail trade.

Interestingly, wholesale trade and manufacturing score highly, along with retail trade, on the transactions and digital financing metrics. This suggests early signs of end-to-end integration via digital interactions through the value chain—something which, as discussed later in this chapter, will become increasingly significant as the industry looks to capture the digital opportunity.

Areas of retail that are not consumer-facing, however, including back-end processes such as the supply chain, are less digitised than in other industries. This reflects, in particular, a persistence of manual labour where other sectors have been more readily able to apply automation. Indeed, retail ranks 10th out of 16 sectors in the economy on digitisation of labour (at 21 percent of the economy-leading sector on this metric), despite significant investment in digitisation of supply chains by Australia’s largest retailers. A troubling sign for the retail industry is poor performance on the digital talent and digital spending on workers metrics—as both will likely be key as retailers look to address the digital imperative rapidly in the near future.

Exhibit 31



## Australia’s retail sector is less digitised than its US and European peers

Even though retail leads across Australian sectors on digital consumer-facing interactions, even on this metric it is well behind the most digitised retail sectors globally, particularly the United States and the United Kingdom. The most obvious ‘digital interaction’ consumers can have with a retailer is browsing and purchasing products online. As such, this is a ‘table stakes’ metric on which to compare Australian retail’s digital maturity with overseas sectors. By some estimates, Australia’s proportion of online retail sales is comparable to the United States and United Kingdom, sitting at 11.5 percent of total sales, compared with 10.5 percent and 13.8 percent for US and UK respectively.<sup>76</sup> However, Australia lags well behind in the degree of consideration and influencing of consumers through digital channels—in the US, fully 12 percent more sales are web-influenced than in Australia. In particular, 45 percent of Australian retailers surveyed did not have any online presence at all, and of those that did, less than 30 percent considered their online/digital strategy ‘best practice’.<sup>77</sup>

What this speaks to is a relative lack of maturity in reaching and influencing consumers through an omnichannel presence, which, as will be discussed below, is the ultimate ‘unlock’ to the market share potential from digital. As highlighted in the discussion of the Digitisation Index in the introductory chapter of this report, it should be noted that this relative underperformance on digital maturity relative to international peers is at the level of the sector in aggregate. As will be discussed in the analysis of the specific digital levers available to retailers, individual Australian players have invested in, and are leading globally, in certain areas. The ability for this best practice to be adopted throughout the entire sector—including across the base of small- and medium-sized retailers which make up >50 percent of the sector value added—is discussed at the end of this chapter.<sup>78</sup>

76 *Online and Web-Influenced Retail Sales Forecast, 2015 to 2020*, Forrester Data, July 2016.

77 *Australian Retail Research Report: How Australian Retailers are transforming the e-commerce marketplace*, AIMIA (Digital Industry Association for Australia), July 2014.

78 Australian Bureau of Statistics 8155, *Australian Industry by Subdivision, Division F, Retail Trade*;

## Consumer and market pressures are creating an imperative for retailers to digitise to improve productivity, rationalise cost bases, and maintain market share

In general, the market conditions in Australian retail have been favourable in recent years—between 2012 and 2015, record-low interest rates and growth in disposable income provided a positive force increasing consumers' discretionary spending power in Australia. This contributed to a 2.5 percent annual growth rate in gross value added for the retail sector.<sup>79</sup> Over the same period, however, productivity growth lagged behind other service-based sectors of the economy (for example, rental, hire and real estate services and financial and insurance services had ~4x higher productivity growth rates).

The implied opportunity to increase retail's productivity is increasingly pressing in the face of two key trends in Australian retail: the entry of new players with different business models seeking to compete on price and/or consumer experience; and the changing expectations of consumers who are increasingly demanding cross-channel digital enablement.

### An increasingly competitive market is putting pressure on Australian retailers' margins as they seek to maintain market share

In the last five years, we have seen new entrants—including category specialists, online retailers and discounters from overseas, as well as home-grown start-ups, enter the market and put competitive pressure on incumbents. Examples include Marimekko, Muji, COS, H&M, Pottery Barn, Uniqlo, The Iconic, and Sephora, with Lidl expected in 2016/17. As digital evolves, the potential for further competition will only grow, as new and overseas players can enter the market without necessarily needing to invest in a capital-intensive store network. Adding to this competition is the so-called 'consumer-led' supply chain, i.e. consumers purchasing product on an overseas retailer's site and shipping the items to Australia.

The degree of competition, and its impact to date, clearly varies from category to category, but in general the impact has been price deflation and consequently increased pressure on retailer margins and loss of incumbents' market share to the new entrants. The grocery retail sector is the best-known example: from 2007 and 2015, German discount supermarket chain Aldi has had a 10 percent annual growth rate in their share of dollars spent, reaching approximately 12 percent share. Over the same period, Woolworths, Coles and smaller and independent grocery retailers have had negative market share growth rates of -1.2 percent, -0.4 percent and -1.2 percent respectively.<sup>80</sup>

### Consumers are increasingly demanding digitally-enabled engagement across channels

Consumers' interactions with businesses across all industries, including retail, are

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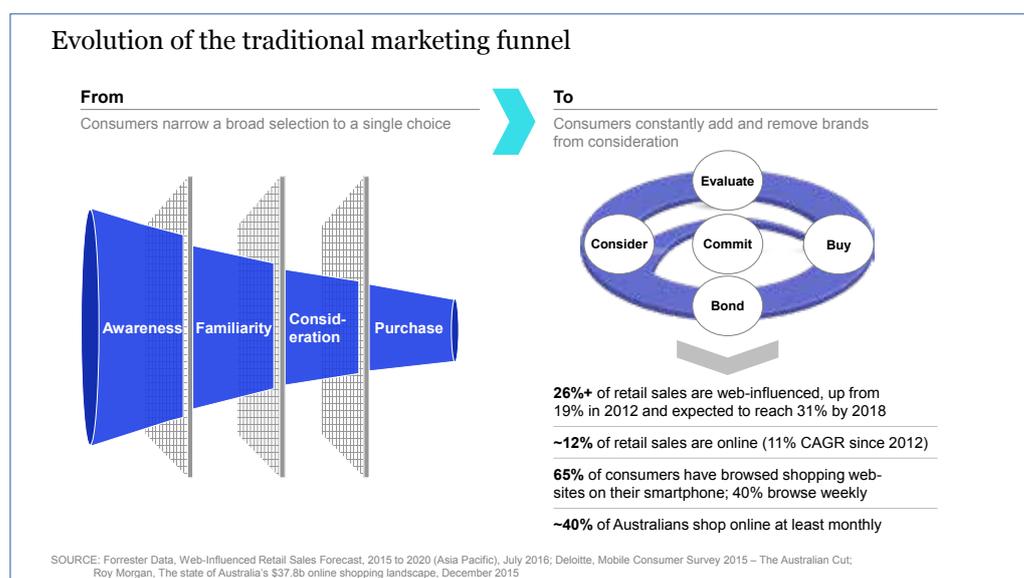
Australian Bureau of Statistics 8165, Counts of Australian Businesses, including Entries and Exits, Jun 2011 to Jun 2015.

79 5206—Industry Gross Value Added, Annual, Australian Bureau of Statistics, May 2016, Table 37.

80 Supermarket Sweep: Aldi's share of the Aussie market still rising, Roy Morgan Research, April 2016. Roy Morgan Single Source (Australia), estimated values January 2007-December 2015, average 12-month sample = 14,793, Base: Australian grocery buyers 14+, weighted to households.

changing. In retail, this change in consumer behaviour is disrupting the traditional marketing and sales funnel, as transparency and choice unlocked by digital give consumers much greater relative power (Exhibit 32). In particular, consumers have greater control (and greater variety) over where to buy products; have access to a much larger choice of products than analogue retail channels have traditionally been able to provide; and have much greater transparency over the price and quality of the products available. Consequently, consumers are no longer obliged to tolerate retailers that do not accommodate their preferences, and can show loyalty to those that do.<sup>81</sup>

Exhibit 32



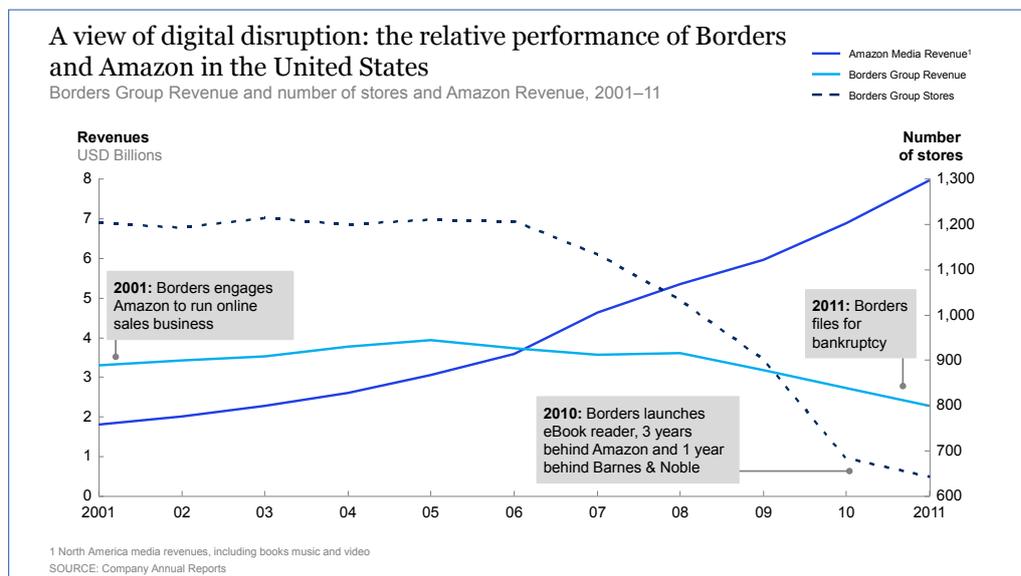
Retailers understand that tackling this shift head-on is not optional—we have already seen multiple examples of how quickly segments of the retail industry migrate to digital and leave incumbents with much reduced market share, or out of business entirely. The pace of change is rapid: in 2005, Borders operated over 1,200 stores internationally, with 3 percent net profit and US\$3.9 billion in revenues. By 2007 they were no longer turning a profit, leading to a massive drop in store numbers. In 2011, after seeing revenues fall to less than US\$2.3 billion, the company filed for bankruptcy. Over the same period, Amazon's North American media revenue (books, music, video and DVD) went from US\$3 billion in 2005 to US\$8 billion in 2011 (Exhibit 33). Moreover, unlike Borders, media was not Amazon's only 'bet'; over the same time period, its media revenue relative to total revenue also decreased from 36 percent to 17 percent.<sup>82</sup> This speaks to the rapidity with which a small handful of companies—for example Amazon and Alibaba in multi-category—have captured a majority of online retail activity globally. As is true across industries and discussed at length in the concluding chapter of this report, these digital first-movers companies benefit from a 'virtuous cycle' advantage in that they have been able to rapidly build up customer

81 *Shoppers Disrupted: Retailing Through the Noise, Australian Insights from the Smarter Consumer Study*, IBM, July 2015; *The Retail Metamorphosis: Stores in the Eye of the Storm*, McKinsey Discussion Document, October 2013.

82 *Borders Group Annual Reports, 2001-2011*; Peter Osnos, 'The End of Borders and the Future of the Printed Word', *The Atlantic*, 26 July 2011; 'The 8 Reasons Borders Went Bye-Bye', *Business Insurance*, July 2011; *Amazon Inc. Annual Reports, 2001-2011*.

data, use this to drive improved customer experience and higher cross-sell, and achieve scale advantages.

Exhibit 33



For retailers, this new ‘normal’ means that driving loyalty is harder and can only be achieved by generating a distinctive understanding of consumer preferences, and responding to their demands for seamless omnichannel engagement. At a minimum, consumers expect:

- To be able to use multiple channels (mobile, online, instore) and transition between them easily<sup>83</sup>
- The best possible price—up to 37 percent engage in ‘show-rooming’ (the practice of examining merchandise in a physical store, and then buying it through an alternate channel or retailer<sup>84</sup>)
- An engaging experience—and they are more willing to share valuable personal information to get it.<sup>85</sup> For example, in 2015, 24 percent of consumers reported their willingness to share their location and 28 percent their social media handle for a better digital experience.<sup>86</sup>

It is key to note that ‘omnichannel’ differs from ‘multi-channel’. Whilst a retailer may use multiple channels to engage with consumers, without the consistency and focus on seamless consumer experience across these channels implied by an omnichannel focus, much of the consumer experience benefit is lost. Modern consumers are defined by their connectedness and constant use of digital devices, with 65 percent browsing shopping websites on their smartphone and 40 percent browsing online

83 *The Role of the Store, a Leap into the Future*, McKinsey Discussion Document, Sept 2015; *Digital opportunities for wholesalers, consumer goods companies and Retailers in Asia*, McKinsey Discussion Document, May 2014.

84 *Omnichannel: The Best of Clicks and Bricks*, McKinsey Discussion Document, April 2014.

85 *Shoppers Disrupted: Retailing Through the Noise*, Australian Insights from the Smarter Consumer Study, IBM, July 2015.

86 Ibid.

weekly.<sup>87</sup> This is only forecast to increase as ‘millennial’ consumers grow into adulthood and begin to make the purchasing decisions for their households. As these changing consumer preferences take hold and start to affect a critical mass, retailers need to (and are beginning to) adjust their business models and put strong digital foundations in place.

## Digital opportunities exist at each step of the retail value chain

The digital opportunities in retail are many and varied, given its value chain spans sourcing, distribution, network, and instore operations, through to the customer-facing areas of marketing, merchandising, and ongoing consumer engagement and loyalty. At each stage of the value chain, retailers looking to win in digital need to enhance their collection and usage of consumer data.

While retailers lack a full picture of a consumer’s spend in their industry, they can optimise their collection and analysis of data to develop as comprehensive an understanding of their consumers as possible. Third-party companies, such as Quantum (part-owned by Woolworths), assist retailers in doing so by combining datasets to provide a more complete picture of consumer behaviour. When retailers have access to more data about their consumers, they have access to the key prize that few retailers are currently truly exploiting; making use of this data to optimise the value chain end-to-end.

The technologies available to help retailers better understand their customers and hence tailor experiences and offerings are continually evolving and being adopted by leading players. These include advanced analytics, the Internet of Things, automation, artificial intelligence, consumer experience design and machine learning. These opportunities at each stage of the value chain are discussed in this section.

### Sourcing: better use of analytics and data in forecasting and negotiations can reduce COGS and inventory costs

**B2B and B2C sales forecasting platforms** employing advanced analytics allow for integrated demand planning and optimised inventory management. Analytics software improves a retailer’s ability to forecast their sales under a variety of different scenarios, including integrating external data on, for example, weather, stock market dynamics, regional sporting outcomes and day and time of the week. With these data on hand, inventory can be optimised, reducing stock-outs and over-stocked items. Importantly, these systems also provide a platform for sharing forecast data with suppliers in order for suppliers to optimise their own demand planning. For example, Walmart shares POS data and the dates and locations for all promotional events with Procter & Gamble, who can then coordinate production and distribution more efficiently.<sup>88</sup> Similarly, Tesco’s ‘Connect’ B2B platform has reduced the number of late deliveries from suppliers by more than 30 percent.

Optimised use of consumer transactional data and characteristics of SKUs like volume, lead-time, promotions, quality, and supplier negotiability also allow for

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87 *The State of Australia’s \$37.8b Online Shopping Landscape*, Roy Morgan, December 2015.

88 *Supply Chain Digitisation for Omnichannel Retail – Part Two*, PowerRetail, April 2013.

**analytics-enabled negotiations.**<sup>89</sup> This gives retailers the ability to have more informed and fact-based conversations with suppliers, enabled by digital tools including, for example, real-time scenario modelling in the negotiation room.

These two levers raise an interesting consideration, based on the strategic advantage that privileged access to consumer data currently confers on retailers relative to their suppliers. Early research suggests that data-driven collaboration can drive mutually beneficial commercial and operational benefits. However, retailers must tread a strategic line, balancing data sharing in order to optimise demand planning and sourcing costs, whilst guarding against the potential of being disintermediated by upstream suppliers using that data to begin to sell direct to consumers.<sup>90</sup>

### Distribution: as technology evolves, the economics of digitising the supply chain and distribution network will improve

Retailers can use digital and analytical tools to optimise both distribution between distribution centres (DCs) and stores, and deliveries to consumers. Retailer experience suggests that **distribution automation** can enable an estimated 2 percent reduction in COGS—due to more efficient and better handling, reducing breakage and spoilage—and a 4 percent reduction in distribution labour costs. This is an area in which Australia’s major grocery retail players, Coles and Woolworths, have made significant digital headway. For example, a Coles meat processing facility in NSW utilises robotics to automate their de-palletising process of roughly 200 pallets a day. The benefits are being seen across the whole facility—both in cost savings and a one-day reduction in the time for a pallet to get from DC to store.<sup>91</sup>

However, Australian retailers still have a long way to go on scaling the potential of automation. Overseas, Amazon’s full-scale investment in technologies such as ‘Kiva Bots’, which perform the role of a ‘picker’ at facilities throughout the US, has reduced operating expenses at distribution facilities by approximately 20 percent. Automation can only realise its full potential when combined with effective consumer and instore analytics. For example, if a robot’s workflow is informed by insights from data collected instore (sales, inventory, consumers and store layout) a pallet that is retail-ready can be stocked in a warehouse and fed straight into store shelves. As will be discussed in the following sections, the difficulty here is integrating the many data sources into one coherent sourcing and logistics plan.

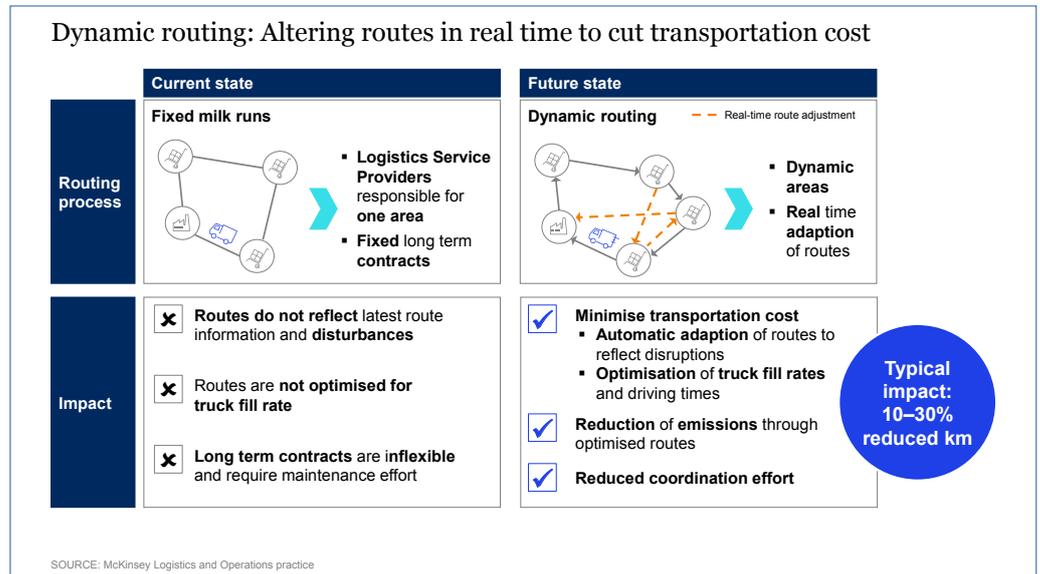
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89 Hasan Al-Sakran, ‘E-Commerce Fact-Based Negotiation Using Big Data Analytics and Agent-Based Technologies’, *International Journal of Advanced Computer Science and Applications*, B2C, volume 5, issue 12, 2014.

90 Andreas Brinkhoff and Jochen Großpietsch, *Secrets to successful manufacturer-retailer collaboration*, McKinsey & Company, May 2014.

91 *Automated depalletisation: A case study on the Coles distribution centre*, CeMat Australia, July 2016.

Exhibit 34



Moving products from DCs to stores, or directly to consumers, can be optimised using **advanced analytics to design fleet usage and routing** (Exhibit 34). Retailers can use fleet telematics and advanced algorithms to analyse data on truck locations, stock levels, weather and traffic patterns to determine the optimal schedule for a fleet of trucks, reducing delivery times and ultimately maximising delivery capacity. Software used by logistics companies like UPS conducts tens of thousands route optimisations per minute and monitors driving habits to identify training needs.<sup>92</sup> When insights are also shared with suppliers, COGS can also be negotiated down; Amazon reduced logistics spend by 3–4 percent through investing in sophisticated supply chain systems to optimise routing.<sup>93</sup> For so-called ‘last mile’ delivery—i.e. getting products to end consumers, Amazon is also leading the way on innovation, with Amazon Flex, an **‘Uber-like’ network of independent delivery contractors** to fulfil Amazon orders.<sup>94</sup>

Leading retailers are also optimising transportation by using GPS-enabled big data telematics (i.e. remote reporting of position, etc.) and route optimisation to improve their fleet and distribution management. Transport analytics can improve productivity by optimising fuel efficiency, preventive maintenance, driver behaviour, and vehicle routing.

Also on the horizon, though only relevant for a subset of products, is drone-based delivery. Investment in drone infrastructure still requires a high capital outlay but it is estimated that with economies of scale, it could offer a strong return on investment and enable same-day delivery that is significantly cheaper than current alternatives.<sup>95</sup>

<sup>92</sup> *Supply Chain 4.0 - Perspective on Digital Transport*, McKinsey Discussion Document, July 2016.

<sup>93</sup> *Performance and growth*, Overcoming obstacles and clearing the path for growth, McKinsey & Company Google Retail Advisory Council, April 2016.

<sup>94</sup> Michael Lierow, Sebastian Janssen, and Joris D’Inca, ‘Amazon Is Using Logistics To Lead A Retail Revolution’, *Forbes*, 18 February 2016.

<sup>95</sup> Tasha Keeney, ‘Amazon Drones Could Deliver a Package in Under Thirty Minutes for One Dollar’, *Ark Invest*, 1 December 2015.

## Network: advanced analytics can provide insights for retailers on their store and DC networks, and the optimal product range for a given location

Particularly for national retailers with large numbers of stores, understanding the relative importance of different factors in contributing to store performance is key. Here, big data and advanced analytics can provide insights by combining a retailer's own consumer data with multiple external data sources (such as demographics data, competitor data, and street maps). This can then guide a multitude of decisions, ranging from store **network rationalisation**, to new store placement, opening hours, and product range. Retailers most advanced along this path suggest that the benefit, which manifests in terms of inventory and overhead costs, could be between 10 and 15 percent.<sup>96</sup> This would also contribute to optimisation of the significant capex investment that the store network represents—in 2015/16, Woolworths and Coles had capital expenditure of A\$700 million and A\$800 million respectively, a key contributor to which is growth and refurbishment of retail store networks.<sup>97</sup>

## Instore operations: technological advancements and advanced analytics could improve instore efficiency and reduce inventory and labour costs

Instore operations have the potential to become significantly more efficient as technology continues to evolve and as data is collected and used more effectively. Many elements of instore operations are still performed via manual labour, and the value at stake from productivity improvement is high, as instore labour comprises nearly 60 percent of a store's expenses on average. Australian retailers have begun pulling some technological levers instore, but the full potential has not yet been realised.

Grocery retailers are trialling **smart trolleys** (shopping trolleys with their own checkout consoles attached) and have invested heavily in **self-checkout machines** all over the world, which is also commonplace in supermarkets, hardware stores (Bunnings) and 'big box' retailers (IKEA, BigW and Kmart). Self-checkout has an estimated impact of at least a 17 percent reduction in instore labour costs.

US grocery retailer Kroger is testing **smart-shelving technology** where shelves display video images of price tags which can be easily altered by computer and can also display ads or on-demand nutritional information to improve consumer engagement. These tags also free up employee time—it takes more than 2 weeks to manually re-price a whole Kroger store.<sup>98</sup>

In the not-too-distant future, we expect to see **automated checkout systems** taking hold in the retail market, which could mean a customer's visit to a retail store could be completely free of interaction with technology or staff members. This is achieved by using sensors to detect when a customer is leaving and charging their account automatically. Amazon is already trialling this 'Just Walk Out' technology, which will be available at Amazon Go grocery stores from early 2017. This is likely to result in a drop in labour costs (we estimate up to 26 percent) and shrinkage (via reducing losses through theft).<sup>99</sup>

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96 *Towards the New Science of Management: Advanced Analytics in Retail— Retail Primer on Advanced Analytics*, McKinsey & Company, August 2016.

97 *Woolworths Annual Report, 2016; Wesfarmers Annual Report, 2016.*

98 'Kroger Tests 'Smart Shelf' Technology', *USA Today*, 3 October 2015.

99 *The Internet of Things: Mapping the Value beyond the Hype*, McKinsey Global Institute, June 2015.

**Inventory management** can be substantially improved by leveraging **advanced analytics**. For example, video analytics in stores enables retailers to conduct real-time analysis of inventory to reduce shrinkage; number of people entering the store (i.e. footfalls) and areas of heavy foot traffic (i.e. crowding) to improve staff allocation; and movement of consumers through the store to optimise store layout—with potential to reduce staffing by up to 10 percent. The benefits are even more substantial when integrated across multiple segments of the value chain. Retailers have long used RFID tags on shipping pallets to manage inventory, but sensors (i.e. Internet of Things) and supporting software now take inventory management to the next level. Examples include smart packaging to prevent spoilage, inventory-monitoring shelves (shelves that weigh the product and estimate inventory) and statistical analysis of sales patterns, providing automatic identification of out-of-stocks and real-time alerts.<sup>100</sup>

McKinsey Global Institute analysis estimates that by replenishing inventory when needed, rather than using rule-based methods (once a week, for example), Internet of Things technology and analytics could help reduce inventory-carrying costs by 10 percent.

### **Merchandising: advanced analytics can improve promotional effectiveness and optimise product range and pricing**

**Optimising product range**, whether individualised by store or aggregated at a higher level, has both revenue and cost benefits for retailers. Analysis of transaction, geographical and demographic data to improve assortment has been demonstrated to have the potential to increase revenues by up to 5 percent; as well as reduce COGS by 5 percent. This is because retailers are better able to rationalise product ranges and negotiate from a position of greater certainty on consumer demand.<sup>101</sup> Moosejaw, an apparel retailer in the United States, uses analytics not only to optimise its product range, but, further, to narrow down to the less than 10 percent of its product range that is actually stocked instore, drastically reducing inventory holding costs. It combines this with an ‘endless aisle experience’ (i.e. enabling consumers to view on screen and purchase products that are not held instore to be delivered to them later)—the sort of digital instore experience discussed in greater length in the next section.

Dynamic (even individualised) pricing is also an effective lever—both in optimising sale price and hence margin, but also in driving sales volume. Optimised real-time pricing combines a number of digital levers—the ability to web-scrape pricing data from competitor websites (replacing manual, inefficient, and expensive instore competitor price checks), advanced analytics to conduct scenario modelling to optimise the price (including building in external factors such as weather, what sports events are on television, etc.), and automated updates of the price, whether onto the retailer’s website or in store, via ‘smart’ shelving. Experience suggests that optimising pricing in this way can represent an opportunity of several percentage points of revenue.

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<sup>100</sup> Ibid.

<sup>101</sup> *Big Data and Advanced Analytics in Grocery Retail*, McKinsey Discussion Document, April 2014.

## Marketing and customer engagement: promotional effectiveness and consumer engagement can be improved by both online and offline levers

### Improved marketing mix and effectiveness through advanced analytics

Digital affords retailers the opportunity to capture consumer attention with a cheaper, more compelling marketing proposition. Digital marketing levers can drive significant increases in revenues, but also can reduce the marketing spend that typically represents 2 percent of a retailer's expenditure.

Experience suggests that retailers can access a 15 to 25 percent reduction in this spend by using **advanced analytics to understand marketing return on investment**.<sup>102</sup> This requires building a model, trained on historical data, to better allocate spend by geography and channel.

Analytics can also help optimise promotional strategies. Analysis of promotional elements like price discounts, coupons, online offers, incentives, displays, packaging and loyalty rewards, can provide insights on the optimal number of promotions per year, ROI by promotion type, sales trade-offs between types of promotions, and the contribution of promotions to total performance. A national retailer in the United States saw an increase in gross margin on promotions return by 2–3 percent when this capability was prioritised.

### Personalised marketing and offers to individual consumers to have the 'right message at the right time in the right place'

Digital also provides a means to personalise marketing materials, as well as the means and timing of their delivery. **Trigger-based marketing campaigns** suggest products and offers based on consumer-specific stimuli—perhaps providing recommendations due to recent purchases or recent life events. These trigger-based campaigns have the potential to drastically increase conversion, but capturing this opportunity requires insights from a **'smart' consumer relationship management (CRM) system**. Qantas is one company investing substantially in gathering consumer data to achieve this; consumers can even earn points by sharing data. This data is also used by staff on planes to provide bespoke service. McKinsey Global Institute research suggests that implementing a comprehensive smart CRM system in ways such as this has the potential to elicit a revenue improvement of over 10 percent.<sup>103</sup> **Geospatial marketing technologies** provide another means to personalise retail offerings. Macy's in the United States has been a pioneer in this space,<sup>104</sup> using iBeacons embedded within or outside stores to push personalised relevant notifications to a consumer's phone via an app.

### Engaging with consumers across all channels, including social media

**Social media engagement** is an increasingly critical channel for reaching consumers; those who interact with retailers on social media can see a conversion rate 18 percentage points higher than non-users, according to some reports.<sup>105</sup>

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102 *Towards the New Science of Management: Advanced Analytics in Retail—Retail Primer on Advanced Analytics*, McKinsey & Company, August 2016.

103 *The Internet of Things: Mapping the Value Beyond the Hype*, McKinsey Global Institute, June 2015.

104 *Ibid.*

105 *Navigating the New Digital Divide: Global edition: A Global Summary of Findings from Nine Countries on*

Leading retailers are pursuing pro-active social media engagement, for example Walmart's Twitter teams monitor and respond to consumer queries about where to buy products, even when they do not mention Walmart. Warby Parker lets consumers 'try on' glasses by uploading a picture of themselves—and encourages potential customers to share it across social media.

### **Driving innovative consumer experiences instore**

While digital channels are rapidly increasing their influence on consumers and capturing a larger portion of their spend, there remains a strong future for the bricks and mortar store, especially for retailers who create desirable experiences for their customers. Retailers in international markets are acting early and deploying technologies which focus on consumer customisation as well as providing a unique and memorable experience.

**Optimised mobile applications** enhance the shopper's experience. They can, for example, store a consumer's shopping list, guide them around the store, or clip and store virtual coupons. When US grocer Kroger launched its app in 2013, it saw triple-digit growth in usage in its first few months, and reached the top 2 percent of Apple app downloads.

**Digital fitting rooms and visualisation** are becoming more common in apparel retailers. For example, Hointer's technology allows a consumer to scan the QR code on an item instore and it will be automatically sent to a fitting room. Consumers can then purchase the item in the fitting room by swiping their credit/debit card on a kiosk. Neiman Marcus' 'memory mirrors' enable side-by-side comparison of outfits and include an option to email videos/photos to friends for input or to share on social media. These technologies can be taken to the next level when integrated with devices and targeted directly at individual consumers. At Nordstrom and David Jones, touch-screen monitors allow consumers to design their own shoes in store, pay for their design and have the finished product delivered within 4 to 6 weeks. Finally, Nike has begun trialling **in store 3D printers**, enabling consumers to design and print footwear, though this is clearly a lever restricted to certain product categories.

### **Expanding the shopping experience beyond the store**

Effective use of mobile and online channels remains critical to capturing Digital's top-line potential. However, Digital leaders are also moving beyond these channels and **testing innovative technologies for selling to consumers. Virtual stores**, 24 hour window-shops where consumers can browse and purchase products, provide one example. Kate Spade's window shops do not require either inventory or staff, and Adidas saw significant increases in sales after introducing an interactive, life-sized virtual footwear wall in London, New York and Tokyo. Another model is being used by Target, who is partnering with Shazam to make print and TV ads directly shoppable by scanning barcodes with a smartphone. Amazon has pioneered the 'dash button'—a WIFI-enabled sensor which can be stuck to cupboard doors and automatically adds an item to the consumer's online shopping basket when pressed. Finally, retailers are also adopting the ability to sell directly through social media platforms like Facebook Messenger.

## The value at stake is between 6 and 11 points of margin improvement for the sector, with a sizeable market share advantage for first movers

We have calculated the full-potential economic opportunity from digitisation for the Australian retail sector on a bottom-up, lever-by-lever basis, based on Australian and overseas experience. In this calculation, we take into account firstly the current levels of digitisation of the sector (which, as discussed above, are relatively minimal outside of the largest players), and also potential overlaps between digital levers (for example, where two levers impact the same cost base).

Based on this methodology, our analysis suggests a potential value of between 6 and 11 percentage points of cost reduction (and hence EBITDA improvement) driven by digital. This represents an opportunity of between A\$15 billion and A\$30 billion for the store-based retail sector based on 2015 baselines. In addition to this recurring cost-saving opportunity, the digital levers which result in improved inventory management also represent a one-off working capital opportunity for retailers of between A\$2 billion and A\$4 billion relative to the 2015 baseline (Exhibits 35, 36).

The greatest potential for cost optimisation from digital is within instore operations and sourcing elements of the value chain, which represent the two largest spend bases. The largest single digital lever is automated checkouts (representing 3 of the 11 percent total cost opportunity). The full extent of this opportunity will become accessible to the whole sector as technology continues to advance. As long as self-checkouts require significant capital investment in kiosks, they are unlikely to be economical for smaller retailers; however, as technology continues to improve and the cost of IoT sensors goes down, automated checkouts could realistically be adopted by all retailers at a relatively low cost, resulting in significant cost savings.

While it is possible that a retailer pulling these cost-savings levers could significantly improve their EBITDA margin, in competitive markets savings are often reinvested through lower prices or improved product and service quality in an effort to increase share.

Moreover, many of the levers discussed above have the potential to increase revenues (for example by driving greater store footfall, conversion, and optimising pricing). Retailers successfully implementing these digital innovations have the chance to capture substantial market share from competitors that are slower to enact digital levers. Given this is, in the main, a redistribution of share and value between players, rather than an expansion of the market itself, revenue levers are not factored into the calculation of uplift in sector value. However in Australia's increasingly competitive retail environment, the ability to capture points of market share is clearly of significant value to individual players.

Exhibit 35

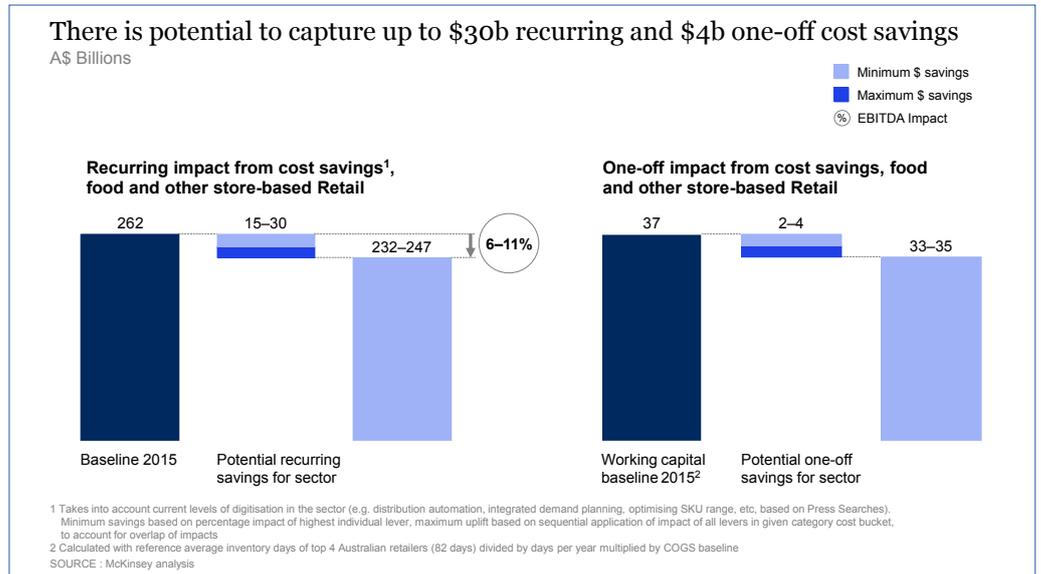
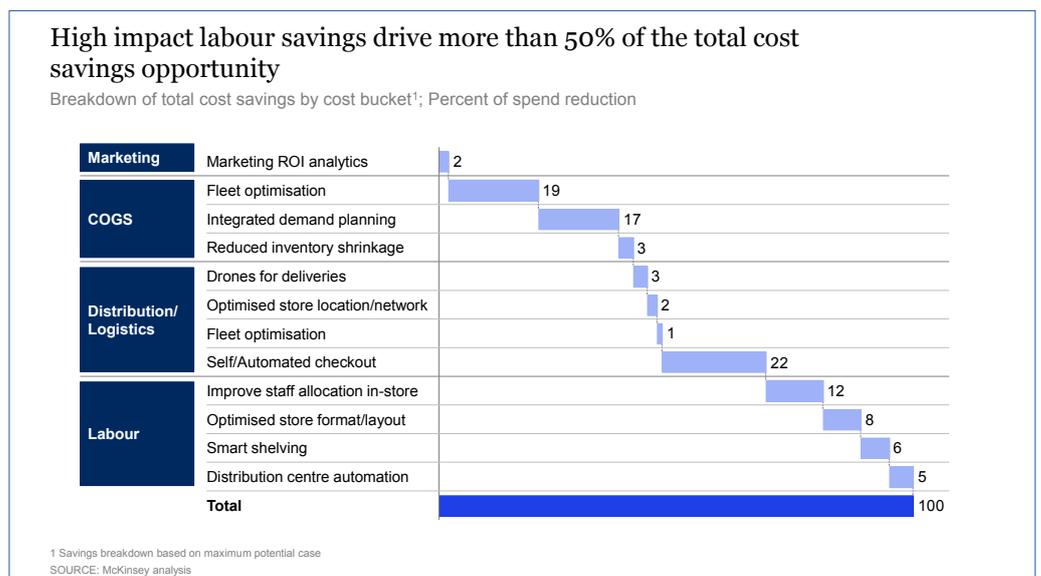


Exhibit 36



## Unlocking retail's digital potential

For Australian retailers, digitisation offers an enticing opportunity to optimise costs and capture market share in an increasingly competitive sector. There are three overarching themes retailers must focus on to ensure digital's full potential is seized:

- Adapt their cultures and develop capabilities to embrace digital tools and ways of working
- Focus investment of time and resources carefully, especially for the smaller players
- Ensure that their physical store networks align with digital strategy.

## Adapt cultures and develop capabilities to embrace digital tools and ways of working

Achieving the full potential of digital in retail will require both digitally-enabled tools like advanced analytics, and more agile ways of working. However, implementing these can require significant organisational change for incumbents.

This is particularly true in retailing, with its long-established norms for how supply chains function, inventory management, and sales strategies. Retailers have traditionally had a straightforward formula for growth: expand and gain access to a larger consumer base.<sup>106</sup> Consequently, strategic network rationalisation and store footprint scale-downs have until relatively recently been at odds with traditional perceptions of 'success'. Operationally, experience-based purchasing and relationship-based negotiating have generally been the norm; property departments have focused on acquisition and expansion; and stores have been seen as the principal source of revenue.

In a fully-digitised world, leading-edge retailers will embed data-driven analytics at the heart of everything they do. Doing this requires developing or acquiring the capability to capture, analyse, and rapidly act upon any insights found in customer data. Retailers will also need to shift to a more agile mindset; being willing to rapidly test ideas in the marketplace, learning from both mistakes and successes and abandoning ideas where necessary. These retailers—as we see early adopters doing already—must challenge traditional assumptions (such as those surrounding sourcing) wherever possible, and break down the vertical silos within their organisations that can make them slow to react to changing consumer demands.

## Focus investment of time and resources carefully, particularly for smaller players

Over 90 percent of Australia's 70,000 retail businesses have less than 20 employees, yet these businesses contribute 52 percent of total value added for the retail sector.<sup>107</sup> The size of these players impacts their ability to access the value identified in this chapter. However, by selecting appropriate digital levers, and leveraging select third party digital platform services, SMEs can also tap into the digital opportunity.

Whilst SMEs have significantly less capital available to invest than larger businesses, there are areas of opportunity where the advent of digital has removed the need for significant capital investment. The ability to conduct digital marketing, including social media campaigns, has enabled SMEs to reach large numbers of consumers relatively inexpensively. Optimising online presence need not require significant investment; websites can be optimised by making small investments in solutions such as Google's PageSpeed which analyses a website and offers optimisation suggestions.

There are also often lower-cost, off-the-shelf tools and technologies designed specifically for SMEs to enable digitisation. Examples include cloud-based accounting software MYOB and Xero, providing a digital solution for book-keeping as well as bill

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106 McKinsey and Company (Louise Herring, Tobias Wachinger, and Chris Wigley), Making Stores Matter in a Multichannel World, Dec 2014.

107 Australian Bureau of Statistics 8155, Australian Industry by Subdivision, Division F, Retail Trade; Australian Bureau of Statistics 8165, Counts of Australian Businesses, including Entries and Exits, Jun 2011 to Jun 2015.

and supplier payments. Last-mile-delivery and CRM are possible through services such as Fulfilment by Amazon, which, since 2006, has allowed SMEs to outsource inventory fulfilment and consumer services.

### Ensuring that physical store networks align with digital strategy

Whilst a growing number of consumers are embracing digital sales channels, much of the customer base of Australian retailers is expected to remain loyal to physical stores in the next decade. Though certain categories make significant use of online channels (61 percent of computers and software were sold online in 2015), bricks and mortar sales have seen minimal decline. Sales in physical stores remain by far and away the primary source of revenue for retailers and are predicted to continue as such for the medium term.<sup>108</sup>

It is thus paramount for retailers to find ways to integrate their online offerings with physical experiences in ways that are not only economical, but also drive increasing engagement and sales.

To manage the changing economics of retailing effectively, players need to optimise their network of stores and tailor categories and formats to align with their vision of the future role of their stores. Using advanced analytics to optimise the physical network can help retailers make more informed decisions about where and what types of presence to maintain (e.g. flagship, kiosk, even virtual, stores). In the UK, home and general merchandise retailer Argos has moved to a 'hub-and-spoke' approach, with a handful of flagship stores, which essentially become a marketing and service channel for the online business, supported by numerous digitally-enabled smaller outlets that offer convenience and a curated product offering. This allows all Argos stores in the area to guarantee same-day or next-day fulfilment on some 20,000 products.<sup>109</sup> Likewise, for retailers which exist within malls or department stores, an increasing move toward 'showcase malls' rather than suburban shopping centres will have implications for last-mile logistics, the balance between online and instore browsing and purchasing, and rent costs.<sup>110</sup>

Other innovative formats are rapidly emerging, many of which are digitally enabled. Ikea has announced ten pickup-only stores in Canada, one-tenth of the size of an average store, to enable online order fulfilment. In Australia, Coles and Woolworths have established strategically located 'dark stores' with no consumers to fulfil online orders. Still other retailers are establishing virtual stores, allowing customers to purchase at physical locations no bigger than a subway wall display. There are also opportunities for digital-native players to avoid developing expensive store networks. For example, eBay has established network partnerships with 'traditional' retail players Woolworths in Australia and Argos in the UK to allow eBay consumers to 'Click&Collect' from physical stores.

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108 See Forrester Data, Web-Influenced Retail Sales Forecast, 2015 to 2020 (Asia Pacific), July 2016.

109 McKinsey & Company (Louise Herring, Tobias Wachinger, and Chris Wigley), Making Stores Matter in a Multichannel World, Dec 2014.

110 McKinsey & Company (Roberto Fantoni, Fernanda Hoefel, Marina Mazzarolo), The future of the shopping mall, Nov 2014

## Digital in retail—takeaways:

- The digital maturity of the Australian retail sector overall lags well behind international peers, particularly in relation to reaching and influencing consumers through digital channels—there are digital frontrunners within Australia, but the fragmented nature of a sector in which 90 percent of businesses have fewer than 20 employees means digitisation has to date been patchy.
- Recent trends in the retail market are creating an imperative for retailers to digitise. Digitally-enabled new market entrants are able to compete on both price and consumer experience, and consumer preferences and behaviours are changing: consumers have greater control over where to buy products; access to a much larger choice of products than retail channels have traditionally been able to provide; and much greater transparency over the price and quality of the products available. This ‘new normal’ means that driving loyalty is harder and can only be achieved by generating an analytically-underpinned detailed understanding of consumer preferences, and delivering distinctive experiences and omnichannel engagement.
- The potential opportunity from digital is between 6 and 11 percentage points of cost reduction (and hence EBITDA improvement)—an opportunity of between A\$15 billion and A\$30 billion from today’s baseline spend; some of which will be reinvested into lowered prices and/or improved quality and customer service. For the first movers, the opportunity to capture market share within the sector is also significant.
- Unlocking the potential of digital across the sector will require three things: adapting cultures and developing capabilities to embrace digital tools and ways of working; focusing investment of time and resources carefully, especially for smaller players; and finally ensuring that physical store networks align with digital strategy.





# Digital in the arts

In spite of its relatively small size, creative activity in the arts plays an outsized role in the life of the nation. In 2012/13 as a sector, creative and cultural activity in the communications and arts sectors contributed 1.6 percent to GDP and employed around 240,000 people, and estimates suggest that an average of 70 percent of Australians attended arts performances in 2015, spending a total of A\$20 billion on cultural activities.<sup>111</sup>

The industries within the sector are varied, covering broadcasting and film, performing arts, literature and publishing, music recording, libraries, exhibit spaces, museums, and more. The Australian Government makes a significant contribution to the arts, providing up to A\$685 million in funding in 2016/17, across all relevant agencies.

With such a diversity of activity, it is no surprise that there is a broad range of ways in which digital tools can be applied to support the arts, with organisations increasingly developing fit-for-purpose solutions to take advantage of the opportunities on offer. Within Australia, the Australian Ballet, the Museum of Old and New Art (MONA) and film production company Animal Logic offer leading examples of how digitisation can create value. These and other examples in this chapter demonstrate the variety of ways by which organisations within the arts can use digital to reach new or remote customers, personalise marketing and tap into new funding streams, enhance traditional experiences and create new digital products and revenue streams, as well as streamlining their operational cost bases.

## The arts and recreation sector scores relatively highly on digitisation of customer-facing interactions, but its assets and processes are relatively under-digitised

The Digitisation Index analysis developed for this report suggests that the arts and recreation sector scores relatively highly compared with other sectors of the economy, but there is still scope for digital improvement (Exhibit 37).<sup>112</sup> In particular, the sector excels at digitised customer interactions and transactions—driven mostly by the prevalence of online and mobile ticket purchasing. Perhaps unsurprisingly, the sector also has amongst the highest proportion of ‘digital’ or digitally-related jobs across the economy, and the highest degree of flexibility in working remotely—both contributing to an economy-leading score on the ‘digitisation of work’ metric.

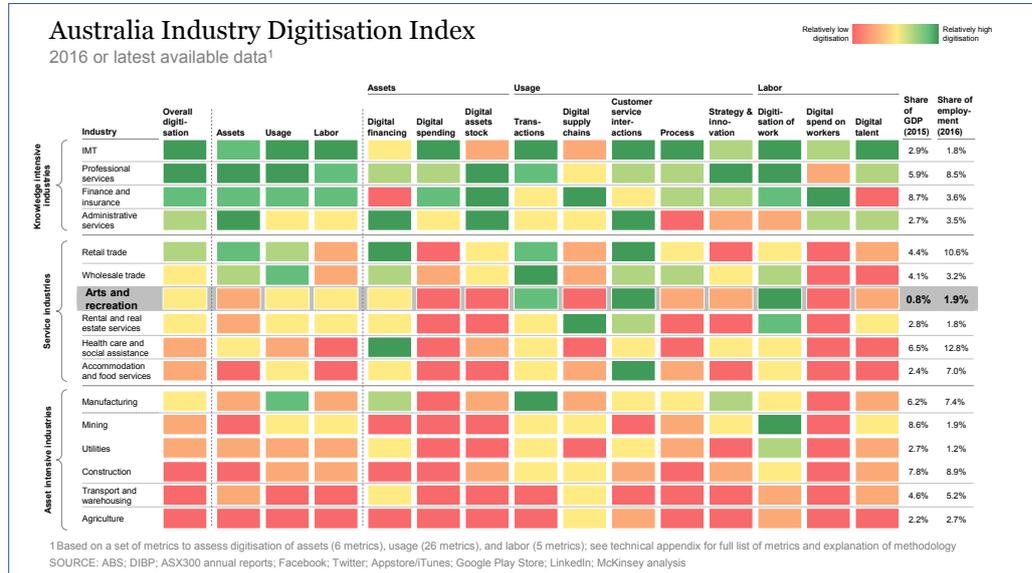
By contrast, the arts and recreation sector scores comparatively poorly on spend-based metrics (the degree of digital spending on assets), and on providing digital tools for workers. This could partly reflect the fragmentation of the industry—which is made up of smaller organisations with less access to capital to digitise fully. It does, however, indicate potential to capture efficiencies by digitising processes, and also reflects the trend common across sectors that consumer-facing organisations have to date largely focussed on digitising customer interactions, ahead of internal operations.

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111 *Creative and cultural activity in Australia, 2012/13*, Bureau of Communications (forthcoming).

112 This category includes heritage, creative and performing arts activities, sports and recreation, and gaming activities.

Exhibit 37



## Diverse opportunities exist to apply digital in the arts—to drive engagement, revenues, and streamline cost bases

Digital will necessarily disrupt the traditional delivery channels of a majority of the incumbent institutions in the arts—as consumers become increasingly able to engage online and through their devices with content traditionally experienced through physical attendance at performances or exhibitions. However, digital also offers significant opportunity to revolutionise both the consumer experience of the arts, and the operations and cost bases of institutions developing and delivering it. These opportunities break into five categories:

### Reaching new consumers, and remote and overseas audiences

By using digital channels, institutions are shifting the way audiences engage with cultural content and enabling a much broader reach. Australian consumers are already heavily engaged with cultural content online; in 2013/14, 70 percent of viewers used online platforms to observe exhibitions from Australian cultural institutions. This is up from just 31 percent in 2009, indicating the early successes of digital deployment to this end in the sector.

The Australian Ballet has been an early leader in using digital technology to reach, and provide content to, consumers. In October 2016, for example, it participated in its third ‘World Ballet Day’, a 20-hour video streaming experience available on Facebook live, including live performance footage and access to behind-the-scenes content from the Australian Ballet, as well as the Bolshoi, the Royal Ballet, the National Ballet of Canada and the San Francisco Ballet. In 2015, World Ballet Day had 349,000 streaming views on the day, with over two million viewers accessing the content throughout the year.

Additionally, the Australian Ballet has developed partnerships with digital media players, for example Foxtel, for behind-the-scenes and concert live-streaming, and recently launched its own digital content hub, Ballet TV. All of this activity supports the Australian Ballet’s broader digital and social media strategy, which saw Facebook

followers increase from around 60,000 in 2013 to almost 150,000 by the end of 2015, YouTube subscribers increase from around 11,000 to almost 35,000 over the same period, and online views of Australian Ballet content increasing from 1.9 million to 4.3 million. By comparison, the number of physical attendees at Australian Ballet performances in 2015 was approximately 313,000.

In addition to digital content hosted by individual institutions, the number and size of online cultural content aggregators is also growing. Google's Cultural Institute, for example, is an initiative to migrate cultural material from major institutions around the world online—to preserve it digitally, but also to enable viewers worldwide to engage with it. To date, the Cultural Institute has partnered with over 1,000 institutions worldwide, including 35 in Australia (the Sydney Opera House, Australian War Memorial, and National Portrait Gallery among them).

Closer to home, the National Library of Australia (NLA) has developed Trove—a metadata aggregator, content repository and platform—which has collated nearly 500 million resources including newspaper articles, web archives, public lists, books, and audiovisual content from thousands of organisations around the world and makes it available to the public through a website and API. There were almost 21 million visits to Trove in 2015/16,<sup>113</sup> and developers and researchers are making use of its API to create spin-off tools, for example GlamMap allows users to visualise geo-referenced cultural heritage artefacts on a map.<sup>114</sup> Other content aggregators are targeting the performing arts space—for example, Digital Theatre Plus, Qello Concerts, Concert Vault, and Medici TV provide subscriptions to live streaming and video of concerts online.

With the increasing quality of digital content being provided by both competitor institutions and these content aggregators, cultural institutions in Australia will need to seize the opportunity to engage with patrons, rather than be disintermediated. There is a strategic question for institutions in this (though the two options are by no means mutually exclusive)—between participating in aggregator platforms like the Google Cultural Institute, or investing in developing their own repository.

Beyond growth in recognition and, consequently, revenues, the provision of cultural content via digital channels also has the potential to enable greater accessibility to the arts—including Australians with disabilities, who are 12 percent less likely to attend physical performances, or those who would not traditionally attend a physical venue. The National Museum of Australia (NMA), for example, is increasing the number of visitors it can reach through robot-enabled remote tours. Two robots provide laser-guided virtual tours that allow users in remote locations to control their view on each robot, talk to a guide, and discover hidden digital content. The tours have been rolled out for schools, community groups, libraries and workplaces, and the numbers of participants are expected to grow rapidly from 2,300 in 2015/16, via new partnerships between the NMA and the Asia Education Foundation.<sup>115</sup>

In addition to the importance in reaching disadvantaged communities with content, digital tools are better enabling groups to share important parts of their culture within their community and more broadly in society. In 2014, the Yugambah Museum launched the first app in a Queensland Indigenous language. The content and

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113 *National Library of Australia 2015/16 Annual Report*, 2016.

114 *Ibid.*

115 *National Museum of Australia 2015/16 Annual Report*, 2016.

languages on the app have expanded, and in 2016 it contained seven Queensland Aboriginal languages as well as ‘how to say g’day’ in over fifty Aboriginal and Torres Strait Islander languages. The app is complemented by Yugambah TV, an online education program allowing students to access Aboriginal language lessons developed as a teaching and learning resource.

### **Better and personalised marketing and accessing wider funding and support**

Advances in analytics to develop a better, real-time, understanding of individual visitors/attendees are beginning to allow cultural institutions to provide better-tailored personalised marketing, to raise awareness and drive patronage and revenues. For example, in addition to the success of World Ballet Day, the Australian Ballet has partnered with Shazam (the music/video identification app) and Avant Card (a media agency) to broaden its customer reach via innovative digital marketing. Australian Ballet advertisements can be scanned using the Shazam app that then takes the viewer directly to the Australian Ballet interactive hub, which contains customised content for consumers. Digital technologies are also increasing the ability of artists to move away from traditional funding sources (e.g. government grants) and raise funds via crowdfunding efforts; an estimated A\$4.8 million was raised from crowdfunding websites, such as Kickstarter and Artspire, to support various projects in the arts in Australia in 2015.

### **Enhancing the traditional visitor experience**

Increasingly too, leading digital players in the arts are leveraging digital technologies—most notably mobile apps—to deliver a personalised experience of the performance or exhibit space in real time. For example, the Australian National Maritime Museum (ANMM) has developed an app for iOS and Android, which allows visitors to personalise their experience by building their own tour; gain a deeper experience of objects and exhibits by providing extra information, photos, audio and video content; or select from a variety of themed trails available on the app. The app allows visitors to tick off all the objects along their selected trail and share their favourite objects on social media, and encourages a continuation of the experience once they have left the institution.

The ANMM has also partnered with Roar Film, Screen Australia and Screen Tasmania to develop ‘The Voyage’, an online educational game that immerses students in a journey from London on a convict ship to Australia. The game won the educational categories at the Museums and Galleries National Awards and Australian Teachers of Media Awards, and in 2015/16, almost 40,000 sessions of the game were played.<sup>116</sup> Similarly, the NMA has created its ‘Kspace augmented reality trail’ app, which encourages visitors to explore the Museum by hunting characters from the game.<sup>117</sup>

In another leading Australian example, the Museum of Old and New Art (MONA) in Hobart, Tasmania, opened in 2011 with a focus on using digital technology to enable rich visitor experiences. At the centre of this is ‘The O’ app, which is provided to each visitor on a pre-loaded iPod Touch.

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<sup>116</sup> *Australian National Maritime Museum 2015/16 Annual Report*, 2016.

<sup>117</sup> *National Museum of Australia 2015/16 Annual Report*, 2016.

The O provides visitors with detailed information on artworks, including insights and narratives from artists, and gives visitors the ability to rate pieces immediately. Based on this live feedback and geolocation functionality of the app, The O can immediately update the list of suggested artworks, taking into account the visitor's location and tastes, and then guide the visitor through the museum. MONA also benefits from the information gathered by The O; feedback on artworks, the time spent at each artwork and routes taken through the Museum are used to choose new artworks and exhibitions, as well as to design layouts. MONA has experienced huge success since its opening, with visitors reaching 335,100 in the year ending 2016, an increase of 62 percent since 2012.<sup>118</sup>

### Developing new digital products and tools

Digital has also enabled leading-edge companies in the arts sector to create wholly new digital product offerings and tools. Film production company Animal Logic, for example, is a world leader in the application of digital technology to the production of artistic content. Primarily based in Sydney (with studios in Los Angeles and Vancouver), its focus is on creating high quality animation, visual effects and design for feature films. Major current projects include a partnership with Warner Bros. to create three upcoming LEGO films.

As well as its core business of film production, Animal Logic provides a blueprint for capturing additional revenues by productising digital tools developed in-house. For example, it now sells its 'Eddie' special effects software, and more recently a rendering programme called 'Glimpse', to other production studios. To continue producing these innovations, the company has recently joined with the University of Technology in Sydney to create the Animal Logic Academy, which will create a real-life production environment for students along with access to Animal Logic staff and equipment. The aim of the course is to ensure that both the company and entire sub-sector is supplied with quality candidates to further growth in the industry and to attract production companies to Australia.

### Improving internal operations and processes

Finally, organisations in the arts sector can also benefit from the streamlining and digitisation of back-end processes and internal operations. For example, Finance, HR, and other admin functions typically consume well over 20 percent of a performance company or exhibit space's costs, and are subject to the same digital improvement levers as those in other industries. In addition, digital can be used to overcome some of the unique challenges that cultural institutions often experience as a result of, for example, touring performances or exhibits. The Australian Ballet's operations, for example, are geographically distributed across studios and locations throughout Australia, and have traditionally been constrained by collaboration and communication challenges across this distance. As part of the company's digitisation strategy, bespoke internal collaboration tools have been put in place, allowing for innovations such as simultaneous rehearsals conducted via video link.

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118 Tourism Tasmania: Museum of Old and New Art—visitor statistics, year ending June 2016, accessed at: [www.tourismtasmania.com.au/research/reports/mona\\_statistics](http://www.tourismtasmania.com.au/research/reports/mona_statistics) in January 2017

## **To unlock the digital opportunity in the arts, sector players must be willing to make, and financially back, bold strategic decisions**

Much like players in other industries, organisations within the arts sector will need to make long-term strategic decisions on how to evolve their offerings in the digital age. They must be willing to pursue digital opportunities, such as opening up new digital channels, even if these organisations risk cannibalising their existing (physical) channels. The Australian Ballet is a pertinent example; as discussed earlier, it has successfully reached a much broader audience by branching out into digital channels to provide a new direct-to-the-home experience to consumers. Organisations in the arts may face significant cultural resistance (both internally and from traditional consumers) in doing so. Breaking through will require delivering truly distinctive digital experiences, and, likely, demonstrating ‘early wins’ with prototype digital offerings.

Once sector players have decided to pursue digital opportunities, they must be willing to invest their own funds to capture them. While, as previously noted, the Australian Government does make a significant contribution to the arts, given the non-consolidated nature of the sector it will typically be up to individual players to fund the majority (if not all) of their own digital investments. Here, again, institutions in the arts will be challenged by the diverse nature of their sources of funding (much of it often from private donation)—convincing patrons not only with compelling business cases for digital, but also demonstrably-improved consumer experience, will be key.

## Digital in the arts—takeaways:

- The arts sector covers a broad range of industries, with a correspondingly diverse set of fit-for-purpose digital solutions and opportunities.
- Areas of digital opportunity in the sector include:
  1. Reaching new consumers, and remote and overseas audiences
  2. Better and personalised marketing and accessing wider funding and support
  3. Enhancing the traditional visitor experience
  4. Developing new digital products and tools
  5. Improving internal operations and processes
- Digitisation has the potential to generate significant revenue increases and cost savings for organisations within the sector. Importantly, too, changes have already contributed to a shift in the way audiences engage with cultural content and enabled a much broader reach to populations within Australia who currently have less access, including Australians with disabilities, low-income earners, and members of disadvantaged communities.
- To unlock the digital opportunity in the arts, sector players must be willing to make bold strategic decisions—for example, even at the risk of cannibalising existing channels—and financially back their decisions, bringing consumers and funders along with them.



# Digital in banking and insurance

Making up 8.7 percent of Australia's GDP, the financial and insurance sector is the largest contributor to GDP and employed 3.6 percent of the Australian workforce in 2015.<sup>119</sup> The potential for digital tools and processes to drive improved performance in the sector is therefore of significant importance to the Australian economy. This chapter focuses in particular on the emerging role of digital in retail banking and personal lines insurance—although the digital technologies and approaches discussed have potential across the breadth of the financial and insurance sectors.

Retail banking, which includes consumer banking products such as savings accounts, credit cards, and home loans represents over 50 percent of the Australian banking market by revenue.<sup>120</sup> These banking services are integral to the lives of Australian consumers, with the average Australian interacting with their bank 15 times over the course of a month.<sup>121</sup> The subject of the second half of this chapter, personal lines insurance, represents approximately 60 percent of Australia's A\$42 billion general insurance industry,<sup>122</sup> comprising primarily home and contents, motor, and compulsory third party insurance.

Both the retail banking and personal lines insurance sectors are highly concentrated, with the top four players holding over 75 percent market share.<sup>123</sup> The push toward digitisation to date has largely been led by these established players using digitally-enabled innovation to secure market share and reduce costs. The open question for the next phase of digitisation is to what extent the existing market structure will be disrupted by new digital attackers carving out parts of the value chain, and how effectively existing players will be able to compete in the face of this disruption.

## While banks and insurers have been at the forefront of digitisation to date, the threat of disruption necessitates further innovation

To date, the banking and insurance sectors have been at the forefront of digitisation in Australia and currently rank third amongst Australian industries on the Digitisation Index (Exhibit 38). Much of this performance has been driven by significant investment in both IT systems and software. However, the sector scores lower than other knowledge intensive industries.

Given the scale of disruption occurring in both the banking and insurance industries, the need to further digitise is pressing. From the digitisation index, particular opportunities for banks and insurers lie in increasing the proportion of online sales and service interactions, automating back end operations and further expanding recruiting channels for digital talent to support ongoing digital transformation.

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119 5206 - Gross Value added by Industry, Annual, Australian Bureau of Statistics, May 2016, Table 37.

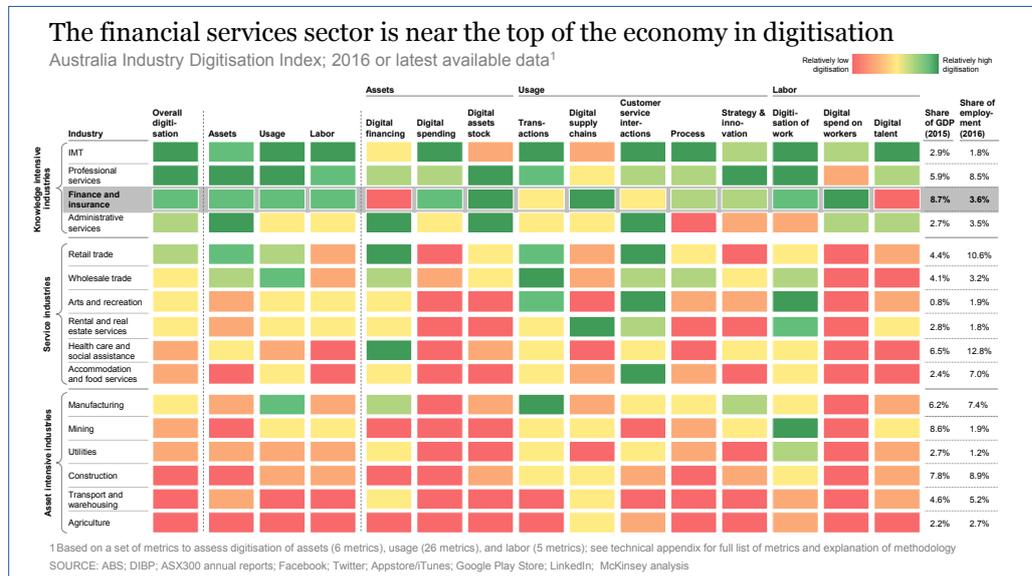
120 McKinsey Panorama—Global Banking Pools, 2015.

121 *McKinsey Asia Personal Financial Services Survey*, McKinsey & Company, 2014. Survey answer does not specify type of activities (for example, may include account enquiry activities).

122 General Insurance Institution-level statistics, Australian Prudential Regulation Authority, 2015. As measured by gross earned premium.

123 Monthly Banking Statistics, Australian Prudential Regulation Authority, 2016: as measured by share of loans and advances and deposits on Australian books of individual banks; Insurance estimate based on Macquarie Research, September 2016; General Insurance data, Australian Prudential Regulation Authority, 2015; General Insurance Industry in Australia, *IBIS World*, 2015.

Exhibit 38



### The retail banking industry faces significant disruption

In banking, the next wave of digitisation offers both opportunity and risk for established players; globally, competition from outside the traditional banking sector is expected to compress margins by 10 percent and expose 30 percent of banks' revenue to significantly-increased competition. As well as facing competition from start-ups, banks are increasingly under pressure from the more innovative offerings of incumbents (such as white label digital brands) and adjacent industries (such as online retailers extending their product offerings). Already, the greater price transparency driven by online comparators on products such as credit cards and savings accounts is driving margin compression and transferring surplus to the consumer. Likewise, digitally-enabled peer-to-peer lending, for example SocietyOne (funded by the Westpac-backed Reinventure fund) which provides personal loans up to A\$50,000 in value, could potentially disintermediate banks as lenders.

The current regulatory regimes in developed banking markets constrain, to a certain extent, the ability of digital start-ups, or 'FinTechs', to compete with retail banks in large-scale lending, due to the cost and complexity of complying with significant regulatory requirements.<sup>124</sup> However, this still leaves the some of the most lucrative elements of banks' portfolios vulnerable to disruption by FinTechs: returns on equity from customer-facing origination and sales activities, such as transactions and payments, are approximately three times higher than from credit provision activities,<sup>125</sup> and despite the mortgage boom over the last ten years one third of Australian retail banks' revenue has come from banking fees.<sup>126</sup> Start-ups are already concentrating on these most profitable revenue pools, with approximately 40 percent of consumer-focussed FinTechs targeting the payments area (Exhibit 39). Payments company Square, for example, allows small businesses to bypass credit card transaction fees

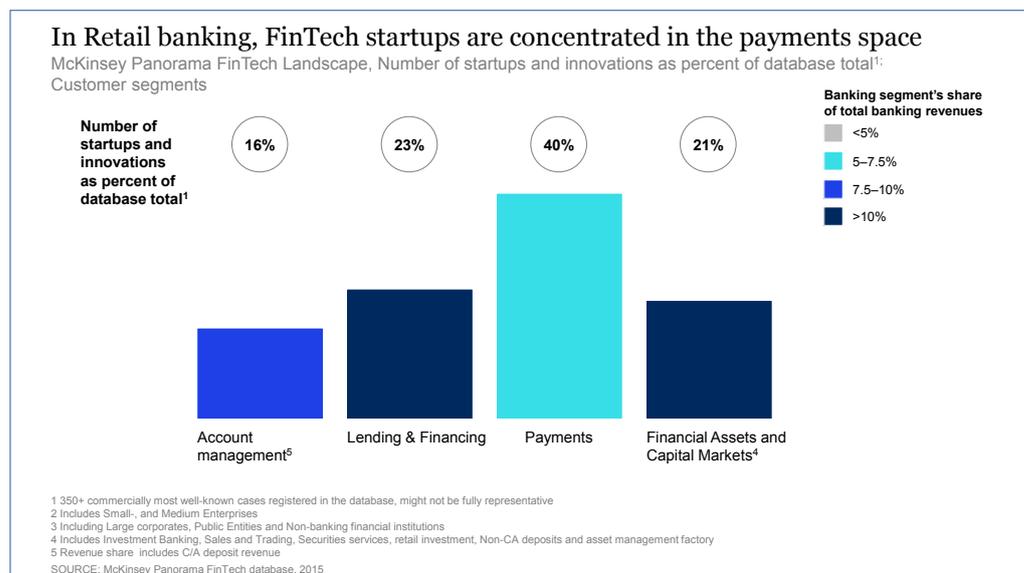
124 *A Brave New World for Global Banking: McKinsey Global Banking Annual Review*, McKinsey & Company, December 2016.

125 *The Fight for the Customer: McKinsey Global Banking Annual Review*, McKinsey & Company, December 2015.

126 McKinsey Panorama—Global Banking Pools, 2006-2015.

(which can include a range of fixed and variable charges), and directly receive money for a flat percentage of transaction value, making cashless payments economical for small scale transactions.

Exhibit 39



Disruption in payments will likely be further entrenched through the use of blockchain and other distributed ledger technologies. A blockchain is a distributed register used to store static records and dynamic transaction data without central coordination, instead using a consensus-based mechanism to check the validity of transactions. The integrity of the ledger is preserved by linking together data in ‘blocks’, which can only be added to once consensus is reached as to the validity of the transaction.<sup>127</sup> For example, a bank receiving a new mortgage application would be able to verify the customer’s identity by accessing a shared ledger of identity profiles rather than capturing and storing new customer information.

In retail banking, blockchain technology offers a significant opportunity for transactions that previously relied on central administrators or clearing houses for authentication, most notably in the area of international payments. In fact, banks are already working to test blockchain applications—the Australia and New Zealand Banking Group (ANZ) and Wells Fargo have recently concluded a 6-month pilot of a privately shared distributed network for cross-border payments.

While the majority of international payment fees result from B2B transactions, consumer transactions still earned nearly US\$40 billion dollars in revenue for the global payments industry.<sup>128</sup> Consumers are also likely to incur the greatest marginal costs on international transactions. While the average fee for cross-border payments is 2 to 3 percent, for low value payments the fee can exceed 10 percent of the transaction value.<sup>129</sup> Distributed ledger technologies, such as those used by payments and remittance company Ripple, allow consumers to transact directly without

<sup>127</sup> *Blockchain in insurance—opportunity or threat?*, McKinsey & Company, July 2016.

<sup>128</sup> Matthew Higginson, ‘How blockchain could disrupt cross-border payments’, *Banking Perspectives*, Quarter 4, 2016.

<sup>129</sup> Ibid.

incurring these fees. Transactions enacted through distributed ledger technologies also have the advantage of being faster and more transparent. Where the average time to complete a cross-border transaction is three to five business days, Ripple is able to confirm transactions within seconds, routing the payment through the most efficient foreign exchange pathway.

Set against this activity, the potential regulatory response of the government to technologies like blockchain adds uncertainty to the scale of disruption, with the response of government in the next 5 years crucial to shaping this opportunity. On this point, the Former Governor of the Reserve Bank of Australia Glenn Stevens has encouraged regulators to look to the experience with platforms like Airbnb for potential learnings and regulate appropriately.<sup>130</sup>

Australian banks are already facing up to these challenges, and are recognising the need to use digital to identify further cost and revenue opportunities. Commonwealth Bank of Australia (CBA) CEO Ian Narev has described competition from technology-driven players as an 'existential threat' and announced that the bank will continue to invest heavily in technology.<sup>131</sup> Other banks have made similar commitments. Westpac is the leading investor in local FinTechs through its Reinventure arm; ANZ has established a dedicated 'international technology and digital business advisory panel' to help shepherd the company through its digital transformation,<sup>132</sup> and National Australia Bank (NAB) CEO Andrew Thorburn has argued that major banks need to emulate the mindset and hunger of FinTechs.<sup>133</sup> The major areas of opportunity for retail banks in delivering on these digital ambitions are discussed in the following sections; the corresponding opportunities in personal lines insurance are discussed later in this chapter.

## There is significant opportunity from digital in the retail banking sector

Banks are already working rapidly to digitise their businesses. As the sector shifts and evolves around disruption, there are three key areas of focus that are ready for further innovation, with global best practice suggesting there are further digitally-enabled opportunities to aspire to:

- Increasing the use of digital channels for service and sales, as the role of branches shifts
- Increasing the automation of operations and business support processes
- Using advanced analytics and machine learning to optimise sales and reduce risk costs.

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130 Paul Smith, 'RBA governor Glenn Stevens backs blockchain and tech disruptors', *Australian Financial Review*, 16 December 2016.

131 James Eyers, 'Commonwealth Bank technology investment to keep fintech on backfoot', *Australian Financial Review*, 17 August 2015.

132 James Eyers, 'ANZ Banking Group sets up a tech panel to teach the board about IT disruption', *Sydney Morning Herald*, 10 August 2015.

133 Clancy Yeates, 'NAB's Andrew Thorburn: 'We are a fintech company'', *Sydney Morning Herald*, 28 June 2016.

## Australian retail banks can accelerate the shift to digital service and sales, with additional opportunity from rationalising and reimagining the branch network

Australians are avid users of digital banking, with 95 percent of Australians already using internet banking.<sup>134</sup> Increasingly, consumers are also engaging with banks through their mobile phones—smartphone banking doubled to 62 percent between 2011 and 2014.<sup>135</sup> This trend has been driven by the efforts of major Australian banks, which have been early innovators globally in mobile banking. CBA, for example, was one of the first large banks to allow customers to exchange funds using smartphones when it launched its ‘Kaching’ app in 2011. Other banks have created similarly sophisticated in-app experiences, with Westpac’s mobile app allowing customers to open new accounts in under 3 minutes.<sup>136</sup>

Exhibit 40



As seen in Exhibit 40, while there is some opportunity to bring Australia in line with New Zealand and Nordic states on digital service, the greatest opportunity lies in increasing the proportion of digital sales. Although Australia outperforms the global average in digital service by 25 percent, its digital sales percentage figures are average, reflecting a gap between Australians’ willingness to transact and purchase online. Although this phenomenon is a feature globally, in the McKinsey Asia Personal Financial Services Survey the gap between digital service and sales for Australian banks was the largest in developed Asia.<sup>137</sup>

Breaking this down, Australian banks underperform on digital sales percentages relative to global leaders in every product category except for credit cards (Exhibit 41). Even banks that have significantly invested in online journeys have not yet reached the top-quartile uptake of digital sales across product categories. For example, CBA, widely

<sup>134</sup> McKinsey Asia Personal Financial Services Survey, McKinsey & Company, 2014.

<sup>135</sup> Ibid.

<sup>136</sup> Richard Gluyas, ‘Westpac’s Brian Hartzler banks on a service revolution’, The Australian, 8 September 2015.

<sup>137</sup> McKinsey Asia Personal Financial Services Survey, McKinsey & Company, 2014. ‘Developed Asia’ includes Japan, South Korea, Australia, Hong Kong and Singapore.

considered to be a digital leader, saw just 12 percent of new transactions accounts opened through online channels in 2015, despite reducing the time to open an account to just 5 minutes.<sup>138</sup> Particularly striking is the very low proportion of digital mortgage sales (even considering the prevalence of brokers in the Australian market). A 2014 McKinsey survey of banking consumers indicated that Australians tend to research online and purchase in branch. For savings accounts and mortgages for example, there was up to a 60 percent drop off between surveyed customers who evaluated products online and those who ultimately purchased through an online channel.<sup>139</sup>

Exhibit 41

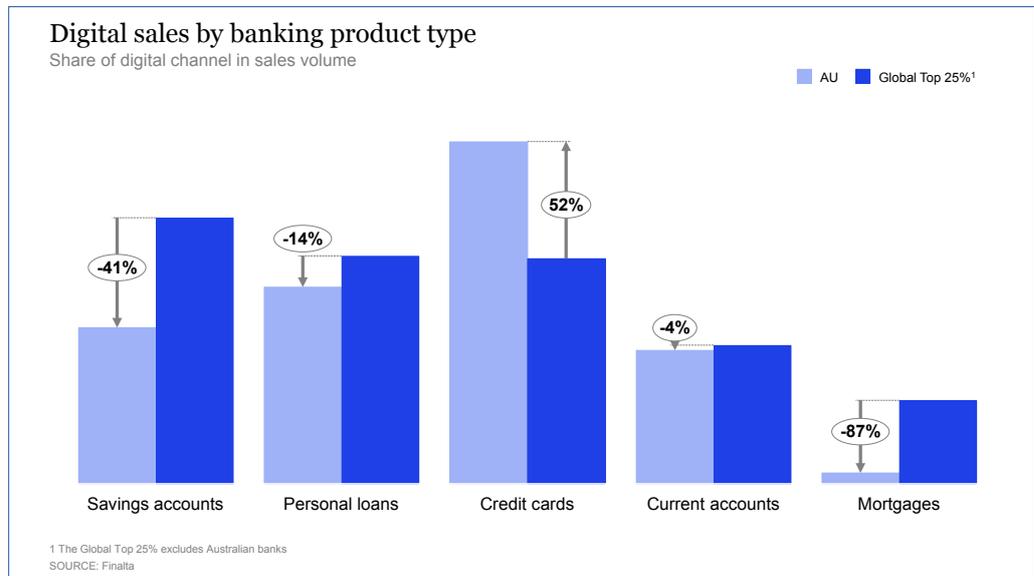
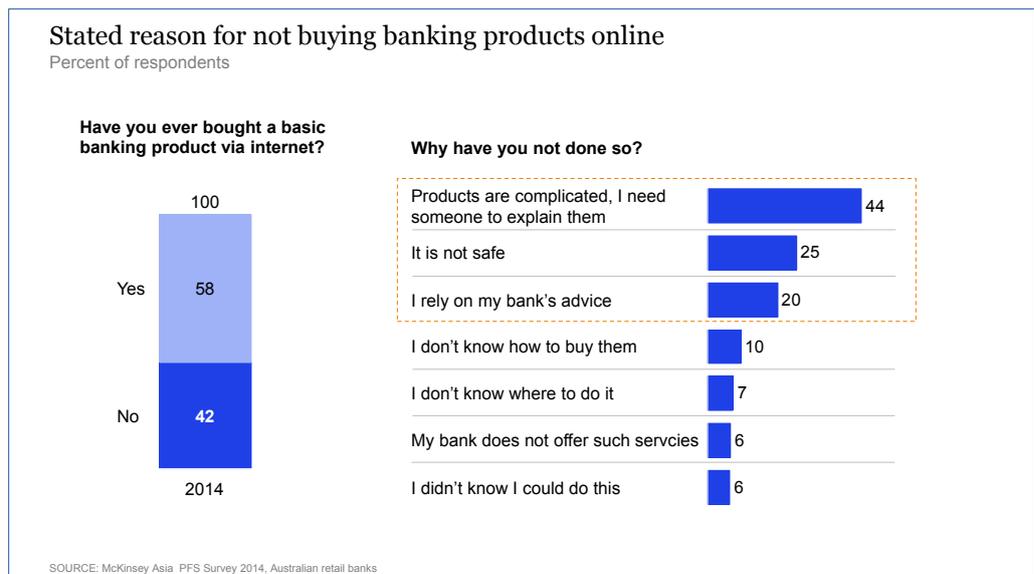


Exhibit 42



138 James Eyers, 'Commonwealth Bank technology investment to keep fintech on backfoot', *Australian Financial Review*, 17 August 2015.

139 *McKinsey Asia Personal Financial Services Survey*, McKinsey & Company, 2014.

The driving factor in this drop-off appears to be the perceived complexity of products, and a perceived lack of safety (Exhibit 42). Of non-digital purchasers,<sup>140</sup> 44 percent reported that banking products were complicated and required someone to explain them, while 20 percent relied on their bank's advice in purchasing products. Additionally, a quarter of respondents believed that purchasing products online was not safe.

Banks therefore have a real opportunity to better engage customers with digital offerings and build their confidence in using online tools. Increasingly, digital tools are able to support some of the 'advice' functions previously only performed in branch or over the phone. IPSoft's Amelia, for example, is an artificial intelligence program that can address customer enquiries through chat or voice calls. Sophisticated cognitive engines of this type build on Natural Language Processing used for virtual assistants like Apple's Siri to mimic human interactions, including interpreting emotional affect. The potential to utilise such technologies without diminishing customer experience is significant; in one test involving a major media company, Amelia was able to resolve 64 percent of enquiries without requiring human operator intervention.

In-branch educational programs have also started to affect consumers' willingness to engage with digital for both sales and service—nearly 20 percent of Australian consumers first ventured online after having digital transactions explained to them by their bank.<sup>141</sup> Best practice branch layouts can facilitate digital education conversations; the Allied Irish Bank for example, uses dedicated 'Lounge and Learning Zones' and 'Mobile Banking Zones' to introduce customers to their digital offerings. The 'Big 4' Australian banks also encourage staff to support online channels by tying incentives to self-service education.<sup>142</sup>

However, in driving towards increased digital sales, incumbent players need to balance the cost savings and potential for improved customer experience from digital channels against the strategic considerations of further exposing their products to comparison and commoditisation. This consideration is particularly critical with respect to mortgage rates and fees, which in Australia are still relatively personalised and a major driver of banks' margins. As noted earlier in this report, by leading in digital customer experience, Australia's major banks have thus far avoided a 'race to the bottom' of product commoditisation and price erosion (the dynamics that have occurred in, for example, the Western European telco industry)—striking this same balance in a further push to end-to-end digital engagement with customers will be key.

Likewise, whilst increased penetration of digital sales and service could help streamline call centre and back office operations and costs (as well as drive increased consumer loyalty driven by improved experience), the true unlocking of the cost reduction opportunity will only come from banks commensurately reducing the overhead costs associated with their physical branch networks, which are estimated to make up 40–50 percent of the current total cost base.<sup>143</sup>

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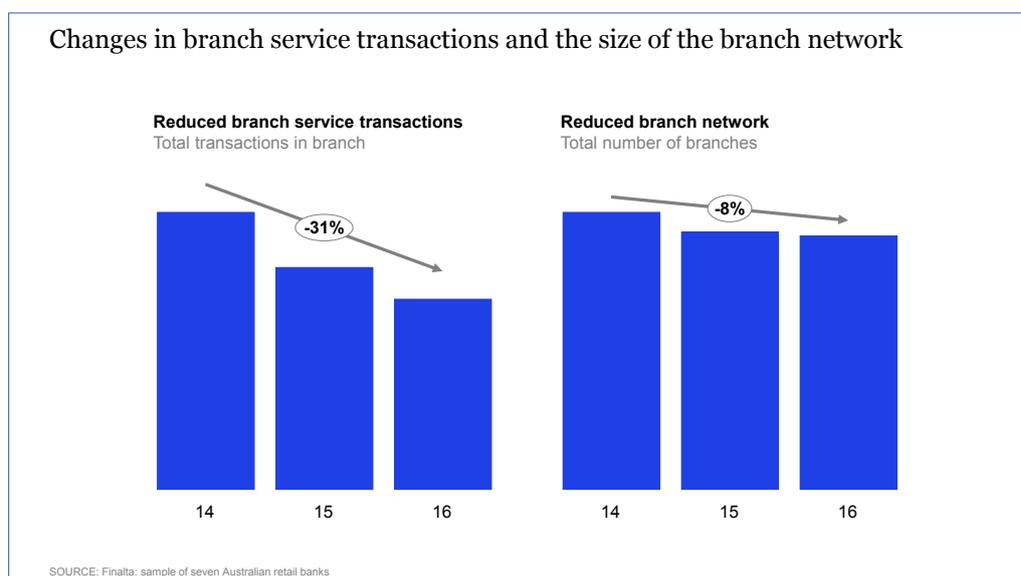
140 Consumers who have never bought a basic banking product online.

141 *McKinsey Asia Personal Financial Services Survey*, McKinsey & Company, 2014.

142 Edward Boyd, 'Performance targets for staff to teach customers on using mobile banking and ATMS', *The Courier Mail*, 7 September 2016.

143 McKinsey Cost Transformation benchmarks.

Exhibit 43



To date, despite significant innovation, particularly in digital service, such a reduction has not been seen in Australian banks' networks; in the last 3 years, Australian banks have only reduced their branch numbers by 8 percent, despite branch service transactions declining by over 30 percent (Exhibit 43).<sup>144</sup> By comparison, as a result of digitisation and market pressures, banks surveyed in Northern Europe are planning to reduce their branch networks by 46 percent by 2016, and markets like the UK are approaching closure rates of 50 percent. This difference cannot be explained by Australia's geographical dispersion (that is, the need to maintain branches in regional and remote locations). In fact, the number of full-service banks in Australia's major cities has decreased by only 0.1% over the last 3 years, with the majority of closures to date in regional and remote Australia.<sup>145</sup>

Network rationalisations obviously require careful strategic consideration, and it would be naive to advocate that the large incumbents' model will be completely replaced by online-only banking models. There are strategic reasons for banks to maintain their branch networks, for example, as a point of differentiation from the competition; to provide the cash services required by some small businesses; or to better serve the needs of elderly or disadvantaged communities who may not have reliable access to digital channels. Branch networks can also have a symbolic consumer awareness purpose (as demonstrated in the retail industry by Apple's flagship store strategy, and the recent opening of bricks and mortar flagship stores by online giants such as Amazon).

Reducing the branch network therefore requires a fundamental shift in the strategic view of the role of the branch, and consequent thought and investment in format remodelling of branches that are to be retained. Globally, branches are increasingly fulfilling differentiated roles, with some locations retaining their function as full-service community branches, while others operate as flagship stores or low-cost, small-format stores. Additionally, some banks have adopted innovative branch models to continue to deliver banking services following network rationalisations. The Royal

<sup>144</sup> Finalta's Digital and Multichannel Benchmark 2016.

<sup>145</sup> ADI Points of Presence, Australian Prudential Regulation Authority, June 2016.

Bank of Scotland, for example, has created mobile branches that serve over 350 communities in remote or under-served areas.

In short, embracing the opportunity from digital service and sales need not mean abandoning physical branches completely. Optimising branch networks, either through targeted closures or innovative small format stores, can reduce branch costs without significantly impacting customer experience.

### **Australian retail banks should increase end-to-end process automation for operational and business support functions**

McKinsey Global Institute research on automation suggests that current technology has the potential to automate 43 percent of activities in the finance and insurance sector.<sup>146</sup> This is primarily driven by the potential to automate approximately 70 percent of data-processing work (such as entering customer information), which makes up a third of the average finance and insurance worker's day. Frey and Osborne's 2013 study on the future of employment illustrates the shifting nature of labour requirements—six of the top fifteen occupations most at risk of automation occur in the banking sector: telemarketers, new accounts clerks, data entry keyers, brokerage clerks, loan officers and tellers.<sup>147</sup>

However, the effects of automation will likely extend beyond manual tasks and into the entire cost base of the banking industry. Where automation was previously confined to robotic process automation, which applies rules-based programming to routine tasks like data extraction, the next phase of digital is likely to see machine learning identifying patterns in data through supervised and unsupervised algorithms (such as decision algorithms in the credit risk function), and by using natural language processing to link customers with banking technology.

Acting on the automation potential in the short to medium term requires targeting the most common banking processes. This is not necessarily nearly as capital intensive and complex a problem as it may seem; experience suggests that just 5 percent of the most common back office processes account for 40 percent of costs, while the top 20 percent of processes account for a full 85 percent of costs, and these could be targeted as the key processes for automation up-front. Through end-to-end process redesign, one major Australian bank was able to reduce the costs associated with the mortgage origination process by 70 percent, while reducing the time to approve in principle from between 2 and 10 days to just 15 minutes.

In back office support, the audit and finance functions offer particular potential for automation. ANZ, for example, has applied robotic process automation to payments investigation. To effect a transaction between ANZ and another financial institution, the correct BSB must be identified from over 14,500 BSBs across 10 different channels.<sup>148</sup> 'Bots', programmed to apply rules to the data extraction process, are able to automatically sift through data, leading to the conclusion of 80 percent of investigations within the same day.

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<sup>146</sup> Michael Chui, James Manyika, and Mehdi Miremadi, 'Where machines could replace humans—and where they can't yet', *McKinsey Quarterly*, July 2016.

<sup>147</sup> Carl Benedikt Frey and Michael Osborne, *The Future of Employment: How susceptible are jobs to computerisation?*, Oxford Martin School, 2013.

<sup>148</sup> Allie Coyne, 'How ANZ bank is expanding its use of cognitive computing', *IT News*, 22 February 2016.

## Advanced analytics can create revenue opportunities and reduce risk costs

Leveraging the data held by banks and their partners offers both revenue and cost opportunities, with banks currently only realising 10 to 20 percent of the potential value of the data they hold.<sup>149</sup> Capturing the opportunity in this area requires banks to maintain strong data privacy protection. In order for customers to continue using banking services that collect personalised data, they must have confidence and trust that banks are using and storing their data appropriately.<sup>150</sup>

Not only do retail banks themselves hold a wealth of information on customer spending habits, but by building partnerships with other companies such as large retailers and telcos, banks are able to build even more detailed customer profiles. Banks and telcos, for example, have entered into data sharing agreements to create new products and better protect customers from fraud.<sup>151</sup>

Machine learning solutions are able to work through large data sets, testing combinations of variables in order to yield insights not available to analysts using traditional statistical techniques.<sup>152</sup> For example, where traditional statistical techniques attempt to map data to a predetermined 'shape' (whether it be linear, quadratic or logarithmic), machine learning applies a range of algorithmic approaches ranging from regressions to neural networks to spot and record patterns.<sup>153</sup> The opportunity for banks is substantial; at one European bank, the shift from pure statistical regression to machine learning for credit analysis increased mortgage collections by over 30 percent. The opportunities from advanced analytics in banking are manifold, but the two largest opportunities currently being developed are in optimising sales and in reducing risk costs.

## Advanced analytics can support sales optimisation models

As in other retail-based industries, banks can utilise advanced analytics to develop and offer personalised products for consumers, based on behavioural cues. Dynamic Next-Product-To-Buy (NPTB) models generate individualised, real-time recommendations that adapt to customer behaviour and context. Like well-known recommendation engines for online retailers such as Amazon, the logic behind NPTB is that similar clients require similar products. Once customers are classified on demographic factors such as turnover, risk rates, and international activity, their propensity to take up certain product offerings can be predicted and sales interactions prioritised, increasing banks' revenues or margins and also improving the consumer's satisfaction with the suitability of the product. Applying these tools,

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149 *The Fight for the Customer: McKinsey Global Banking Annual Review*, McKinsey & Company, December 2015.

150 *Financial System Inquiry*, Commonwealth of Australia, December 2014.

151 Nicolaus Henke, Jacques Bughin, Michael Chui, James Manyika, Tamim Saleh, Bill Wiseman, and Guru Sethupathy, *The age of analytics: Competing in a data-driven world*, McKinsey Global Institute, December 2016.

152 Dorian Pyle and Cristina San Jose, 'An executive's guide to machine learning', *McKinsey Quarterly*, June 2015.

153 Nicolaus Henke, Jacques Bughin, Michael Chui, James Manyika, Tamim Saleh, Bill Wiseman, and Guru Sethupathy, *The age of analytics: Competing in a data-driven world*, McKinsey Global Institute, December 2016.

leading banks have seen a 10 percent increase in sales of new products and 20 percent declines in churn.<sup>154</sup>

Products can also be offered based on known triggers, such as account balances or geolocation. For example, one Brazilian bank triggers travel insurance offers via SMS when international credit card transactions are registered, and has seen a tenfold improvement in their offering conversion rate. In Australia, Westpac introduced a similar service based on international travel, proactively offering information and services when customers travel to major city international terminals.

**Advanced analytics, often combined with machine learning, can reduce risk costs associated with credit losses and fraud**

In 2015 risk costs, such as credit losses, fraud exposure and compliance costs, amounted to nearly A\$3 billion for Australian retail banking divisions.<sup>155</sup> However by applying advanced analytics, often in collaboration with specialised FinTechs, banks can significantly reduce their exposure to risk.

Advanced analytics has the potential to reduce credit risk at both the underwriting and risk management stages. In the credit decisioning process, banks have partnered with large retailers or start-ups like Kabbage to access a greater variety of data sources on which to base a credit decision. In the professional loan context, insightful data can include social media reviews, analysis of online payment receipts and delivery shipping history. For personal loans, advanced analytics can quantify the risk associated with more qualitative, 'judgement-based' characteristics like locational information, withdrawals at casinos or timing of withdrawals.

At the risk management stage, advanced analytics can both predict and manage potential defaults. High-performing models can identify up to 80 percent of defaults 6 months in advance, allowing for early intervention strategies (such as transitioning the customer onto a managed payment program). At one international bank, advanced analytics revealed an increased tendency for default amongst customers who had suddenly shifted from using credit cards during the day to using them at night. Analytical insights were combined with strong customer relationships, allowing bank managers to provide financial counselling to at-risk customers and proactively introduce new credit limits.<sup>156</sup> Interventions of this kind therefore also have a customer experience benefit, with customers appreciating that banks are helping them to manage their finances.

Once a customer has failed to meet their obligations, behavioural segmentation based on customer account data and previous collections experience can identify the best approach to maximise the chance of recovery. For example, customers who are tagged as likely to self-cure may be contacted only to suggest that an automatic payment may not have been successful. Other segments, such as young people with irregular income, may be prioritised for financial education and frequent, multichannel contact. Using analytics in this way has allowed leading banks to reduce outstanding balances by 30 percent, and has led to 20 percent fewer relapses into default.

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154 Dorian Pyle and Cristina San Jose, 'An executive's guide to machine learning', *McKinsey Quarterly*, June 2015.

155 McKinsey Panorama—Global Banking Pools, 2015.

156 Dorian Pyle and Cristina San Jose, 'An executive's guide to machine learning', *McKinsey Quarterly*, June 2015.

Additionally, advanced analytics can reduce fraud and prevent money laundering. By applying a machine learning approach to financial crimes, banks can identify connections between transactions that might otherwise have not been detected. Additionally, partnerships with telcos can check irregular transactions against locational information. By incorporating a broader variety of sources and personalising transaction patterns, experience suggests that fraud analytics can increase fraud detection by 15 to 20 percent.

Finally, advanced analytics is already being deployed by banks and their FinTech partners to reduce compliance costs by proactively analysing data for potential regulatory breaches. While the ability to scan data proactively for regulatory breaches is particularly important for the institutional arms of banks, RegTechs (start-ups with a focus on issues surrounding financial regulation) are a potential area of growth for smaller Australian start-ups. Sydney-based start-up Red Marker, for example, has built an automated compliance program called 'Artemis', which is already being deployed by major Australian banks.<sup>157</sup>

## There is up to A\$11 billion at stake from digital levers for the retail banking industry

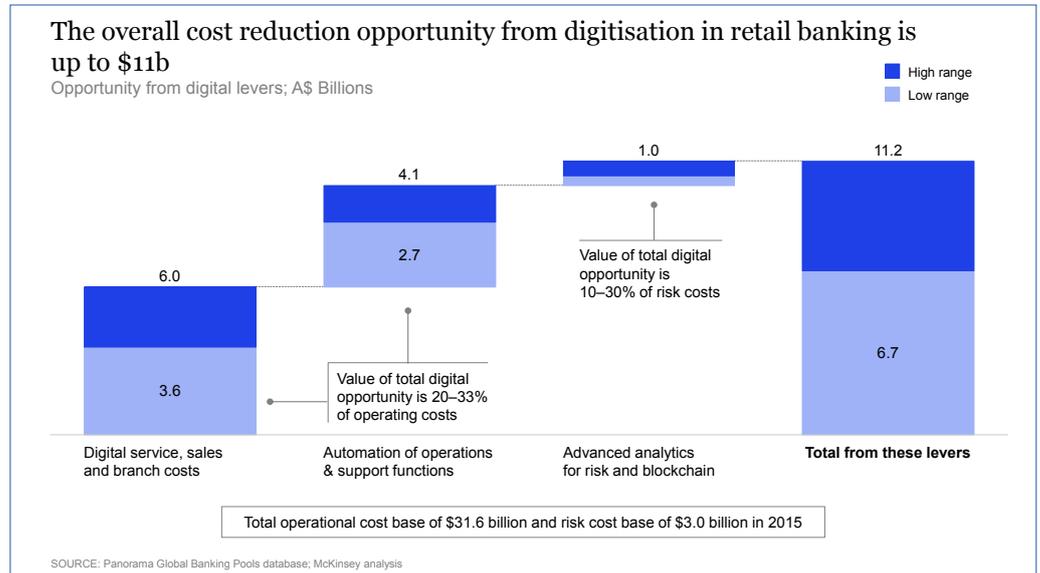
Taking the early returns achieved by banks by applying the digital levers discussed above, it is possible to estimate the potential opportunity for the Australian banking industry. Applying these levers to the spend bases of the Australian retail banking industry suggests that the full cost saving potential value from digital levers is approximately A\$11 billion based on today's baseline. Further upside is possible from potential revenue gains, which have not been included in the sizing. This reflects the fact that revenue improvements are likely to be zero-sum at the industry level, with most increases reflecting the transfer of market share between players.

The value at stake has been ranged to reflect a level of uncertainty associated with capturing the digital opportunity in banking. The lower range reflects best practice currently being achieved by retail banks. The upper range reflects the full potential of each digital lever and may, in some circumstances, require transformational change in order to capture the entirety of the opportunity. The role of the branch, for example, would need to change fundamentally to capture the savings seen overseas. Similarly, end-to-end process redesign combined with continued decreases in the cost of automation would be required to capture the full extent of the savings associated with back office process automation. The extent to which productivity improvements are captured as additional profits, reinvested in new product or service development, or passed on to consumers in the form of lower pricing will also depend on individual company decisions and competitive dynamics in the market.

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157 James Eyers, 'Red Marker Shows Banks the Regtech Way', *Australian Financial Review*, 14 November 2016.

Exhibit 44



## As in banking, digital offers significant opportunity for the Australian insurance industry

The level of digitisation in the insurance industry is strongly correlated with financial performance. Top quartile insurers in the McKinsey Digital Quotient (DQ) survey, which measures an organisation’s digital maturity against the four dimensions of strategy, capabilities, culture and organisational setup, grow their net premiums at 1.5 times that of the rate of the average insurer.<sup>158</sup> Increasingly, digitisation will be necessary for insurers to maintain their margins in the face of disruption, with research suggesting 30 percent of net profits are at stake in the next 5 years, and that many of these profits will be competed for by new digital players, which on average have 50 to 70 percent lower administration costs than established insurers.

Disruptive forces will likely affect the underlying business model of insurers. For example, peer-to-peer (P2P) insurance offerings are emerging supported by technologies such as smart contracts (blockchain-based programs that initiate certain actions when predefined conditions are met),<sup>159</sup> and are threatening to siphon profits from traditional insurers. For example, start-up InsurETH has tested P2P flight insurance which, in the event of an accident, releases funds automatically based on authenticated flight data sources. While blockchain is not an essential component of P2P insurance, it allows participants to quickly and simply authenticate events and payments without a third-party intermediary.

Leading insurers are well aware of the reality of disruption. Insurance Australia Group (IAG) CEO Peter Harmer has emphasised the need for insurers to be ahead of the curve in innovation, saying, “that means delivering products that make [customers’] lives better and safer and lead[ing] the change happening in their lives and industry,

158 Tanguy Catlin, Ido Segev, and Holger Wilms, *The Hallmarks of Digital Leadership in P&C Insurance*, McKinsey & Company, August 2016.

159 *Blockchain in insurance—opportunity or threat?*, McKinsey & Company, July 2016, 3.

not just be disrupted by it”.<sup>160</sup> Many insurers have effectively disrupted themselves through the creation of digital white label brands; for example Achmea in the Netherlands launched its digital brand InShared with a cost ratio just one third of the market average.

However, in Australia, the full digital potential of the insurance industry has yet to be realised. Australian insurers have to date enjoyed relatively high profits and lower levels of competition. The return on equity in the general insurance market, for example, is amongst the highest in the world at 15 percent.<sup>161</sup> The personal lines market is highly concentrated, with two insurers—IAG and Suncorp—holding over 60 percent market share.<sup>162</sup> Despite a significant push into the motor and home and contents insurance market, challengers Youi, Auto & General, Hollard, and Progressive hold less than 5 percent share. One notable indicator of the relative insulation of Australia’s insurance industry is that, unlike in the United Kingdom, comparator websites have not yet led to significant competitive pressure. The two largest Australian personal lines insurers, Suncorp and IAG, have not listed products on comparison sites, which, given their share of the market, has limited the degree of downward pressure on prices that often follows the introduction of comparators. This, however, may soon change, with calls from some politicians for a government-run comparison website, similar to the home insurance comparator site established for North Queensland after the 2015 cyclones. Improved use of digital tools and processes will therefore be an important consideration for insurers seeking to preserve margins in a competitive environment.

There are three key digital opportunities for the personal lines insurance industry, which are similar to those most relevant in retail banking. These are:

- Increasing digital sales and end-to-end digital service, including first notice of loss and supply chain management
- Automating operational and support functions
- Deploying advanced analytics on customer data to increase revenues and reduce fraud.

Additionally, and particular to auto insurance, there is a significant digital opportunity in leveraging the Internet of Things (IoT) via telematics (see Box 1).

### **Personal lines insurers can increase digital service and sales, with a particular opportunity in self-service claims**

Where banks, as discussed above, typically perform better on digital service, insurers have found greater success to date in driving online sales (Exhibit 45). Between direct online purchases and sales through online comparison websites, 31 percent of home insurance policies and 40 percent of motor insurance policies are purchased online in Australia.<sup>163</sup> There is, however, still room to bring Australian insurers to top

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<sup>160</sup> Nadia Cameron, ‘Data analytics drives IAG’s customer innovation efforts’, *CMO*, 19 August 2016.

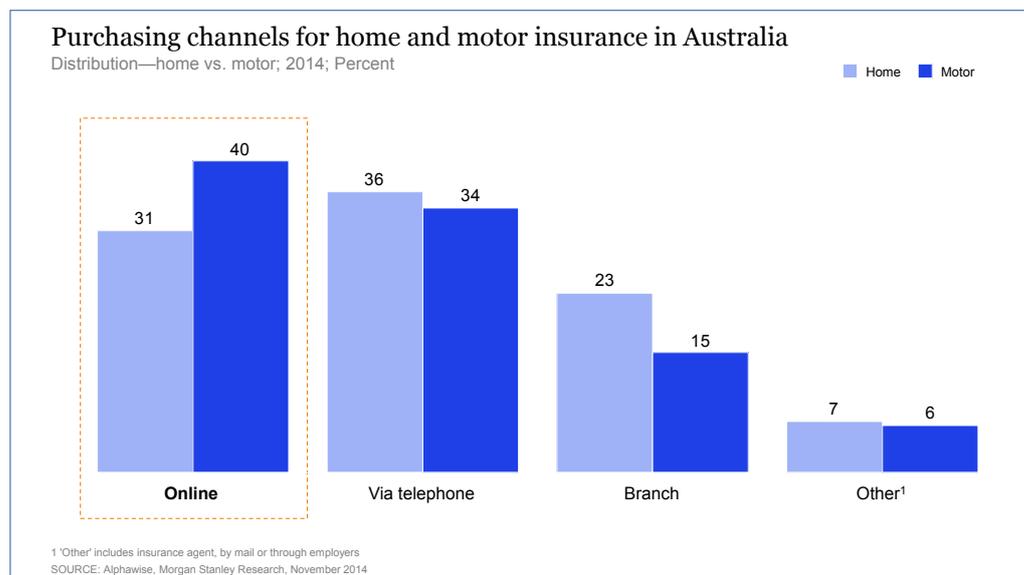
<sup>161</sup> McKinsey GIP analysis of Global Insurance Pools. Australian data sourced from the Australian Prudential Regulation Authority.

<sup>162</sup> Estimate based on Macquarie Research, September 2016; Australian Prudential Regulation Authority data; Australian Securities and Investments Commission company filings; *IBIS World Report 2015*.

<sup>163</sup> Alphawise, Morgan Stanley Research 2014.

quartile performance, particularly for home insurance. Top performing insurers on the McKinsey Digital Quotient typically see 47 percent of overall sales through digital channels.

Exhibit 45



Some insurers have also adopted innovative digital sales approaches. Trov, an insurance start-up, has created an online purchasing process to insure individual items. Customers can enter photos and receipts directly into the app, which also gathers information from third parties' data for valuation purposes. Targeted primarily at a younger market, Trov is an example of collaboration between traditional players and disruptors with Suncorp taking a A\$6.5 million stake in Trov's Australian operations and underwriting its claims. The easy-to-navigate platform makes it simple to insure small value, single items, which has expanded the overall number of items insured in the Australian market. Approaches such as these are important to industry growth prospects given the high proportion of underinsurance in Australia. A 2013 survey commissioned by the Insurance Council of Australia found that 83 percent of consumers believed they would be significantly out of pocket in the event of a crisis affecting their home. Providing a quick and easy way to add items to home and contents policies, through such a digital platform, is expected to improve rates of insurance and be additive to the overall insurance market.

Digitisation can also significantly improve the claims experience for customers (Exhibit 46). Digitally-advanced auto insurers are investing in reporting channels such as apps; for example Geico, Progressive and AXA in the US have built apps that allow customers to upload photos of damage, locate the closest partner garage, and track the progression of the claims process. Chinese insurer Ping An is able to approve claims within 24 hours based on just seven photos. This sort of rapid digital servicing significantly improves customer experience and, as a result, reduces customer churn. Direct insurer InShared, for example, processes 60 percent of its claims online and is a leader in customer satisfaction surveys.<sup>164</sup> Given that a key trigger of customer churn for insurance is the experience upon making a claim, the revenue opportunities here are significant—in the US market, customer experience leaders have 30 percent

<sup>164</sup> Achmea Annual Report, 2014.

higher profitability than insurers with inconsistent service, with satisfied customers 80 percent more likely to renew their policies.<sup>165</sup> In addition, digital straight-through processing and reduced call volume into service centres results in a 30 to 65 percent reduction in the service cost base.<sup>166</sup>

The next phase in digital service is likely to involve automated reporting of loss via telematics installed in cars. Once notified of loss, insurers can immediately begin the claims process, contract with repairers and send a rental car.

Exhibit 46



### Insurers can further digitise operational and back-office support functions

Automation has the potential to transform the underwriting and claims process. In a 2013 study from the University of Oxford on the automation of employment, seven of the top 20 most automatable jobs—telemarketers, insurance underwriters, new accounts clerks, insurance claims and policy processing clerks, brokerage clerks, insurance appraisers for auto damage, and tellers—were related to insurance.<sup>167</sup> Many of these roles require data-searching or rules-based application of policies, which are particularly suitable for automation. As in banking, capturing the majority of the benefit of automation does not require a full overhaul of all processes; just 20 to 30 core activities account for 30 to 40 percent of insurers' expenses.<sup>168</sup> In particular, insurers globally are making headway in automating operations functions such as underwriting and claims support, which typically represent 55 percent of the operating cost base.<sup>169</sup> The potential for automation is significant. One German insurer, for example, recently

165 Tanguy Catlin, Ewan Duncan, Harald Fanderl, and Johannes-Tobias Lorenz, *The Growth Engine: Superior Customer Experience in Insurance*, McKinsey & Company, April 2016.

166 Ibid.

167 Carl Benedikt Frey and Michael Osborne, *The Future of Employment: How susceptible are jobs to computerisation?*, Oxford Martin School, 2013.

168 Tanguy Catlin, Ido Segev, and Holger Wilms, *The Hallmarks of Digital Leadership in P&C Insurance*, McKinsey & Company, August 2016, 11.

169 McKinsey Insurance 360° Benchmarking.

announced it was targeting a straight-through processing rate of 80 percent in motor insurance.<sup>170</sup>

The potential for automation begins at the quotation stage. One European insurer's automation of underwriting and sales functions, for example, has allowed the company to provide quotes for motor insurance in just 10 seconds, and for bundled home, motor, and life insurance in 30 seconds. After the quotation period, optimised digital journeys (similar to those discussed for digital sales in banking) quickly prompt customers to purchase, increasing conversion and reducing processing costs. United States insurer Progressive allows consumers to fill out their entire application in-app, with identification requirements uploaded from a photo taken on a smart phone camera. Once the claim proceeds to underwriting, automated rule-based underwriting can significantly increase the accuracy and consistency of decisions. Insurers employing this methodology have seen up to 10 point improvements in the combined ratio (losses and expenses as a proportion of earned premium) over a 3 year period.

Automation also has the potential to transform the claims management process. Both the number and skillset of employees is likely to change, with fewer administrative roles but also more positions for highly qualified claims staff, such as those involved in decision algorithm modelling for automated segmentation of claims.<sup>171</sup> Simple, low value claims (for example, for damage to items like spectacles or mobile phones) may be targeted for automated approval, resulting in 90 percent efficiency gains.

### **The use of advanced analytics in insurance can encourage customers to take up and keep policies, and reduce total claims paid out**

A wealth of information is available to insurers through improved analysis of existing data, partnerships with other businesses and increasingly, by leveraging the data supplied by connected products (see break-out section). Again as in banking, applying advanced analytics not just to internal customer data but also to external data from social media and other sources can lead to better pricing of risk. Provided that insurers continue to protect the personal information of their customers, both insurers and customers can benefit from combining big data and advanced analytics.

Advanced analytics offers significant revenue opportunities ranging from boosting sales through to churn reduction. Multivariate analysis of agent performance, combined with Next Product to Buy models (discussed above in banking) have been shown to lead to a 5 to 10 percent increase in premium growth. On the retention side, applying advanced analytics to demographic and behavioural data can reduce the churn rate by 20 to 30 percent through targeted retention strategies. The timing of payments, for example, is highly predictive of churn rates, with policy holders who pay their bills late at particularly high risk.

Advanced analytics offers the additional opportunity in insurance to reduce claims exposure, either by shifting the risk curve towards lower risk customers or increasing the detection of fraudulent claims. By applying analytics to personalise a risk profile for individual customers, insurers can more accurately price risk, shifting the burden of higher premiums to more 'risky' users while making insurance more affordable for

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<sup>170</sup> *From Transparency to Insights: McKinsey's Insurance Cost Benchmarking 2016*, McKinsey & Company, June 2016.

<sup>171</sup> *Insurance on the Threshold of Digitization: Implications for the Life and P&C Workforce*, McKinsey & Company, December 2015.

‘safer’ customers. This type of pricing is most promising in the personal lines market, where unlike health insurance—where regulation provides for community-based risk models—insurers are able to price based on demographic factors and personal behaviours.<sup>172</sup> This is particularly beneficial to customers whose demographic factors would indicate that they are high risk, but whose personal behaviours in fact warrant lower premiums. For example, young male drivers with safe driving habits may be willing to let insurers collect personalised datasets in order to reduce their premiums. Telematics (see Box 1), can help insurers to generate the personal information required for these insights.

The final area of analytics applicability is in reducing fraud, which represents a significant cost to all insurers. An estimated 5 to 10 percent of all claims are fraudulent.<sup>173</sup> Advanced analytical techniques can detect fraud more quickly and more accurately than traditional systems, with some insurers experiencing a 10 to 20 fold improvement in fraud detection. Social network analysis, for example, can in some cases detect collusion fraud by analysing connections between claimants with higher than usual claim rates. One insurer used advanced analytics to identify a subset of new policy holders with claim rates up to six times the average, leading to a 10 percent improvement in profitability by preventing fraudulent payouts.

## Box 1: Telematics has the potential to shift the risk curve for insurers

The combination of the Internet of Things (IoT) and advanced analytics has the potential to shift the risk curve for insurance products and in some cases, change the nature of the risk insured against.

IoT refers to a system containing sensors and actuators, which is connected by networks to computing systems. Whilst the full range of applications of IoT in insurance is still in its infancy, there is particular potential for insurers in developing ecosystems around connected cars and homes.

Connected cars are one of the most developed areas of IoT already in operation.<sup>1</sup> By 2020, they are expected to be standard automotive equipment and included in over 90 percent of new cars.<sup>2</sup> QBE Insurance Group has launched the first Australian telematics product, ‘Insurance Box’. Insurance Box is a sensor device connected to a customer’s car, which records driving behaviours, such as number of kilometres driven and braking behaviour, to differentiated premiums—drivers recorded as adhering to safe behaviours evaluate risk. Based on this data, drivers are offered are offered savings of up to 30 percent. Unsafe drivers, on the other hand, are provided with safe driving tips, and, if they do not improve their risk profile, face increased premiums. On average, customers have saved 6 percent on premiums at their

172 The impact of big data on the future of insurance, Actuaries Institute (Australia), November 2016.

173 *Blockchain in insurance—opportunity or threat?*, McKinsey & Company, July 2016.

policy renewal, with the policy proving to be particularly popular amongst young drivers.<sup>3</sup> For insurers themselves, the full value of telematics is yet to be fully determined. However, early experience suggests that influencing driver behaviour holds real value: one UK insurer was able to reduce the number of claims by 30 percent through telematics, while another UK insurer saw a 53 percent reduction in accident-causing risky driving manoeuvres.<sup>4</sup>

Beyond telematics in cars, the total global impact from connected homes is expected to amount to A\$270 billion to A\$400 billion by 2025, with potential applications in energy management, security and chore automation.<sup>5</sup> McKinsey surveys and benchmarks indicate that home access and safety will drive a significant portion of this growth, with 17 percent of US broadband households already using internet-connected security systems. In Germany, Allianz has partnered with Panasonic to detect potential break-ins or water leakage through a system of in-home sensors. If an incident is detected, the customer receives an alert on their smartphone and Allianz's global service centre is notified. The service centre then works to mitigate damage, such as dispatching a tradesperson to the property, potentially reducing the ultimate cost of the claim.

Beyond these immediate applications, the full scope of IoT in insurance, and the disruptions it will enable, is still underexplored. Self-driving cars, for example, are expected to reduce dramatically the incidence of traffic accidents and the need to insure against them. IHS, a global research firm, expects self-driving cars to be available for purchase in/from 2025 and for almost all vehicles to be autonomous by 2050.<sup>6</sup> Trials for self-driving cars in Melbourne are planned for 2017. Self-driving cars will likely change the nature of the risk being insured against—as the Australian Actuaries Institute suggests, the need for insurance may shift from individuals (who are no longer 'driving'), to car manufacturers for product liability insurance if autonomous vehicles are involved in an accident.<sup>7</sup>

1 Markus Löffler, Björn Münstermann, Thomas Schumacher, Christopher Mokwa and Simon Behm, *Insurers need to plug into the Internet of Things—or risk falling behind*, McKinsey & Company, August 2016.

2 *Connected car, automotive value chain unbound*, McKinsey & Company, September 2014.

3 Ruth Liew, 'Embrace telematics or lose share, car insurers told', *Sydney Morning Herald*, 9 February 2015.

4 Richard Clarke and Ari Libarikian, *Unleashing the value of advanced analytics in insurance*, McKinsey & Company, August 2014.

5 James Manyika, Michael Chui, Peter Bisson, Jonathan Woetzel, Richard Dobbs, Jacques Bughin, and Dan Aharon, *Unlocking the potential of the Internet of Things*, McKinsey Global Institute, June 2015. Includes consumer surplus; converted to Australian dollars.

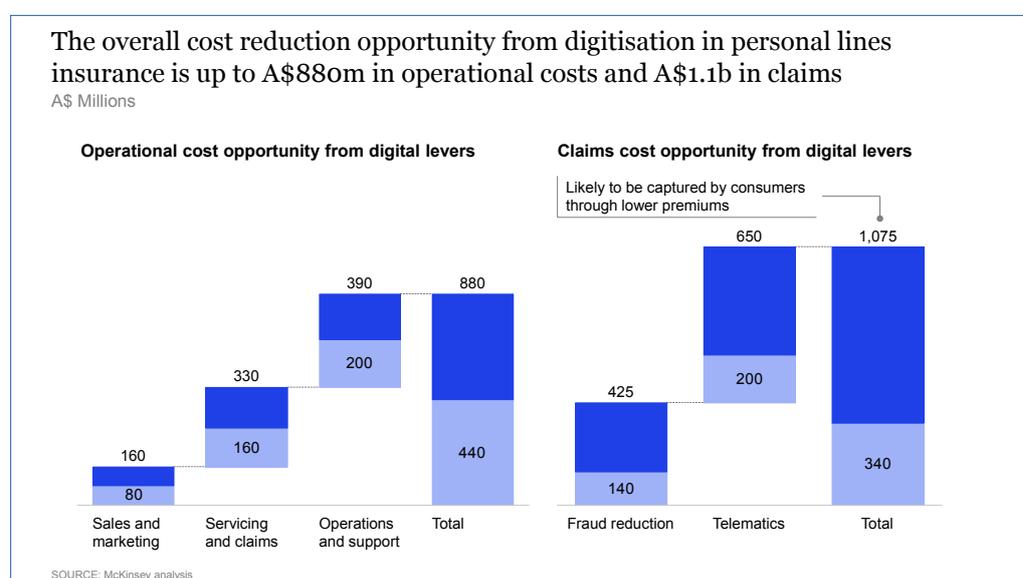
6 Matthew Claudel and Carlo Ratti, *Full speed ahead: how the driverless car could transform cities*, McKinsey & Company, August 2015.

7 *The impact of big data on the future of insurance*, Actuaries Institute (Australia), November 2016.

## There is up to A\$880 million in operational costs and A\$1.1 billion in claims at stake from digital in the personal lines insurance industry

The potential in each of the levers identified above—reducing the cost of sales through digital, online servicing and claims, automation of support functions and advanced analytics to support fraud detection and telematics—have been quantified to determine the potential opportunity from digital in reducing operational and claims costs.

Exhibit 47



On the operations side, the savings range from A\$440 million to A\$880 million or 12 to 25 percent of the operational cost base (Exhibit 47). Like in banking, much of the variation reflects the transformational change required to capture the full benefits of digital, particularly in digital claims and process automation. In each case, insurers would need to fundamentally redesign processes to capture the full benefit.

In claims, savings range from A\$340 million to A\$1.1 billion, or 2 to 8 percent of total claims. The variation is driven by uncertainty surrounding the full benefit associated with telematics. Based on competitive behaviour in the market, we expect a significant portion of the reduction in claims costs to be captured by consumers in the form of reduced premiums rather than as cost savings.

## Banks and insurers need to transform current business models and ways of working to capture the full digital potential on offer

The recent phase of digitisation in the banking and insurance sectors has centred on improving existing processes and ways of doing business. The next phase of digital transformation, however, will see fundamental changes in the expectations of consumers, the competitive environment and technological advancement.

To capture the opportunities presented by digital and prepare for further phases of digital disruption, there are three dimensions along which banks and insurers must act:

- Establishing the underlying IT platforms and talent required to move at digital speed
- Adopting digital ‘ways of working’
- Addressing the strategic threat posed by FinTechs.

### **Banks and insurers must decide on and invest in the IT underpinning and talent required to digitise**

For incumbents, digitising requires significant investment in both systems and people. Digital banking leaders have committed approximately 3 percent of annual turnover to their digital transformations. However, committing funds is not sufficient—experience suggests that most digitisation efforts fail to reach scale and only 24 percent of banking cost programs (which often involve significant IT upgrades) have successfully reduced the cost to income ratio.

Banks and insurers are well aware of the business and operational risks associated with transforming large legacy IT systems. In taking on and mitigating risk, banks and insurers need to consider three strategic questions:

- The scope and pace of the digital transformation
- IT architecture design
- The organisational structure required to support change.

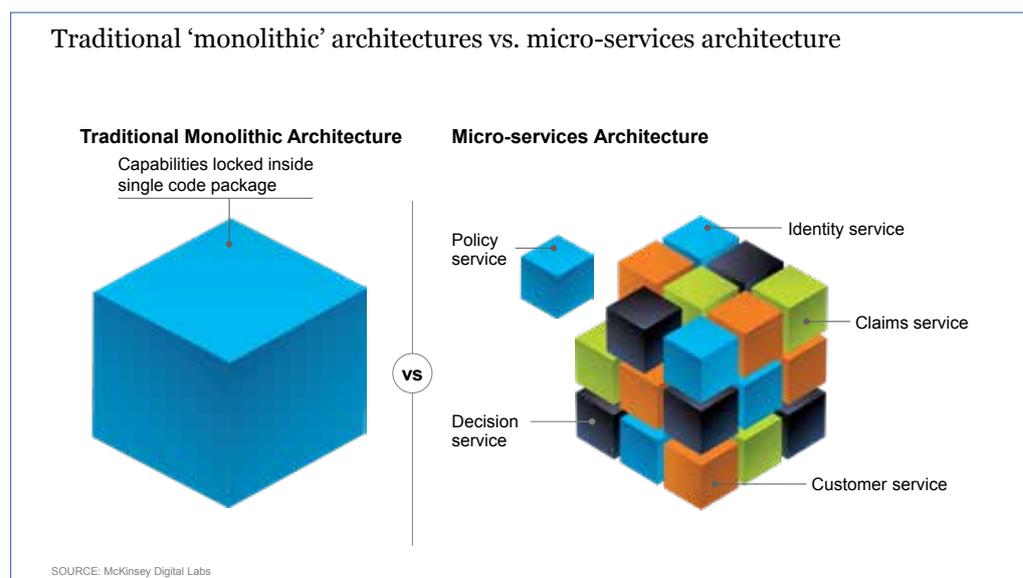
**Decide on the scope and pace of the digital transformation:** In committing to the scope and pace of digitisation, banks and insurers have typically been faced with two options—a ‘greenfield’ approach which rapidly implements a seamless front-to-back-end IT system, or a more gradual ‘brownfield’ approach that prioritises front-end customer and product needs and more slowly transforms core IT systems. Given the challenges surrounding full transformation of the legacy stack and of migrating the entire customer base across to a new system, the test for many banks and insurers today is to instead find an intermediate point between the two. This requires targeted end-to-end process redesign and selecting the processes or customer journeys which will drive the largest cost reduction or improvements to the customer experience.

In the context of rapid evolution in core systems technology, a key consideration in this process should be ongoing system flexibility. Cloud services, for example, have reduced in cost by over 50 percent over the last three years. While full migration faces a number of regulatory and operational obstacles, the cost advantages of the cloud suggest that any system changes should actively consider future cloud compatibility. Similarly, the potential for pure software-as-a-service models, while not yet implemented at scale, could form part of a hybrid model with existing modular platforms.

**Conduct targeted improvements to IT architecture design:** Successfully implementing a digital transformation requires up-front consideration of IT architecture design. Given the technical and operational complexity associated

with targeted IT infrastructure upgrades, an often-successful approach is to work backwards and rationalise APIs and backend infrastructure. A multiple-front-end to back-end platform, for example, can facilitate journey prioritisation and improvements. By using microservices architecture (Exhibit 48), companies can scale digitisation efforts from one customer journey, such as claims, to another, such as decisioning.

Exhibit 48



**Develop an organisational structure to support the transformation:** Banks and insurers can adopt a variety of organisational structures, ranging from centrally managed through to models that are separated from the core and encourage locally-set and managed agendas within centrally-set business goals.

Future digital banks and insurers also need to invest in the right talent to support a digital future. CBA has already started this move by building a digital team of 800 staff.<sup>174</sup> Increasingly, the capabilities of entire functions will need to adapt. Risk functions, for example, will likely shift from data processing units to advanced analytics teams. To support this transition, companies will need to develop employee capabilities around skills sets such as 'quants' who can apply advanced analytics methods and 'translators' who can turn insights into actions.<sup>175</sup>

### Adopt digital ways of working

Embracing digital opportunities requires digital ways of working. Zero-based design, for example, allows companies to redesign entire processes from a customer lens rather than seeking incremental (and typically less successful) improvements. In an environment where new digital attackers are redefining the aspiration for cost bases, considering a process afresh rather than with a view to improve existing systems is vital for transformational change.

While the ultimate goal is a streamlined end-to-end process, zero-based design

174 Clancy Yeates and James Eyers, 'Digital banking not killing off the branch, says CBA', *Sydney Morning Herald*, 1 June 2016.

175 Dorian Pyle and Cristina San Jose, 'An executive's guide to machine learning', *McKinsey Quarterly*, June 2015.

begins with careful prioritisation of journeys, starting with the most relevant viable journey. Relevance can be determined based on a number of factors: the percentage of customers affected, the relative impact on client satisfaction, economic impact and alignment with the strategic goals of the business.

Zero-based design can be complemented with agile ways of working, involving co-located, cross-functional teams working to test and improve products or processes. Applying agile has allowed some major banks to reduce development costs by 40 percent; and reduce product launch delays by 30 percent.

However, new ways of working need to be implemented in a coordinated manner. Agile done poorly can actually lead to a *decline* in productivity. Common pitfalls are the failure to effectively engage management and business partners and ‘agile’ becoming an excuse for poor planning and design. Successfully implementing agile at scale is likely a one-to two-year effort, with significant involvement from leadership to determine its scope and role.

### Rise to the challenge posed by FinTech competitors

As discussed earlier in this chapter, digitally-enabled FinTechs have the potential to erode the revenues of incumbent banks and insurers. Existing players essentially have two options—develop offerings that compete with the cost and customer experience advantages of their competitors, or integrate FinTechs into their businesses.

Many banks and insurers, seeing the potential for disruption from lower cost direct banks and insurers, have chosen to compete by creating their own white label direct brands. NAB, for example, established UBank in 2008, a white label brand operating under NAB’s banking licence that offers banking services over the Internet or phone. Overseas, BRE has shifted its entire business model across to its mBank brand, which was Poland’s first online-only retail bank, and there are many other examples.

In other instances, banks and insurers have partnered with FinTech attackers—more than 50 percent of banks globally have existing or nascent partnerships with FinTechs. As noted above in the insurance sector, Suncorp has taken a A\$6.5 million stake in Trove, an app which markets single product insurance to millennials, and Westpac has invested substantially in a range of FinTechs through its Reinventure arm. Metro Bank similarly entered into the peer to peer lending market with Zopa, effectively broadening the bank’s customer base. However, cooperation can have its pitfalls. Fidelity and Betterment’s partnership ultimately broke down after just one year, when Fidelity decided to compete and build in-house robo-advice capabilities.



The digital opportunity in the Australian banking and insurance sectors is substantial. While these sectors have been at the forefront of implementing existing digital technologies, particularly in digital customer experience, the industry also faces some of the most digitally-advanced attackers and hence continual innovation is imperative for players to retain profits and market share. This next phase of digitisation will require fundamental changes to the operational and business models of banks and insurers—including reconsideration of branch networks, back office set up, and management of risk. In order to capture these benefits, companies need to reassess their IT infrastructure and talent, operational structures and ways of working, and their strategic approach to digital start-ups innovating in the space.

## Digital in banking and insurance— takeaways:

- The banking and insurance sectors have been at the forefront of digitisation in Australia, but are yet to achieve best-in-class digital penetration in areas such as digital service and sales. Ongoing innovation is required to keep pace with disruption impacting the industry, which has introduced increased competition into some of the most profitable parts of the value chain, and in some areas, such as peer-to-peer platforms or self-driving cars, threatens existing business models.
- In the retail banking industry, increased competition from white label digital brands and price transparency from comparator sites has increased the need to reduce costs through further digitisation. There is opportunity to increase the role of digital in customer interactions, particularly in the sales process, and reduce reliance on the branch network. Additionally, banks can further automate operational and business support functions. Thirdly, advanced analytics can drive insights into customer behaviour, increasing sales and reducing banks' exposure to default and fraud.
- The potential opportunity from digital in retail banking is between 20 and 33 percent of the operating cost base and 10 to 30 percent of risk costs. This amounts to an EBITDA improvement of between A\$7 billion and A\$11 billion, although these savings may in part be captured by consumers in the form of lower prices or additional services.
- In the personal lines insurance industry, significant digital opportunity exists in expanding digital service and sales (particularly in the claims process), automating operational and business support functions, and deploying advanced analytics to drive sales, improve risk pricing and reduce exposure to fraud. Additionally, telematics offers insurers the opportunity to improve their loss ratio by encouraging safer driver behaviour and personalising risk profiles.
- The potential opportunity from digital in personal lines insurance is between 12 and 25 percent of operating costs and 2 to 8 percent of claims costs. This amounts to an EBITDA improvement of between A\$440 million and A\$880 million in operations costs and savings of up to A\$1.1 billion in claims costs. Much of the savings in claims costs however, are likely to be passed on to consumers in the form of lower premiums.



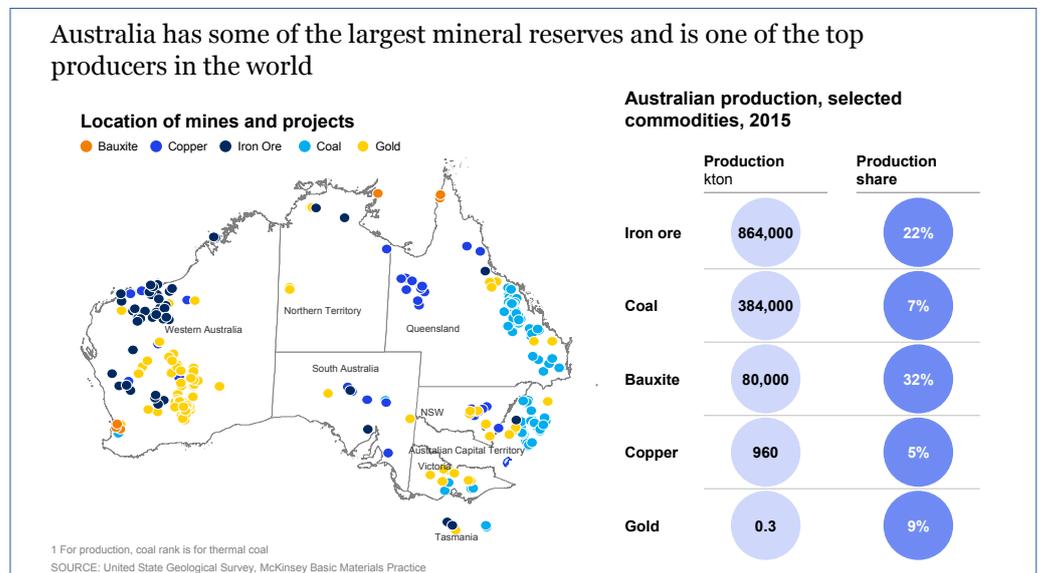


# Digital in mining

The mining sector is one of the most iconic and important sectors of the Australian economy. Mining is the second-largest GDP contributor (behind financial and insurance services), accounting for 6.3 percent of Australia's total GDP and 14 percent of the ASX200; it employs 1.3 percent of the nation's workforce; and is the largest exporter of goods and services in the economy, representing 30 percent of the total.

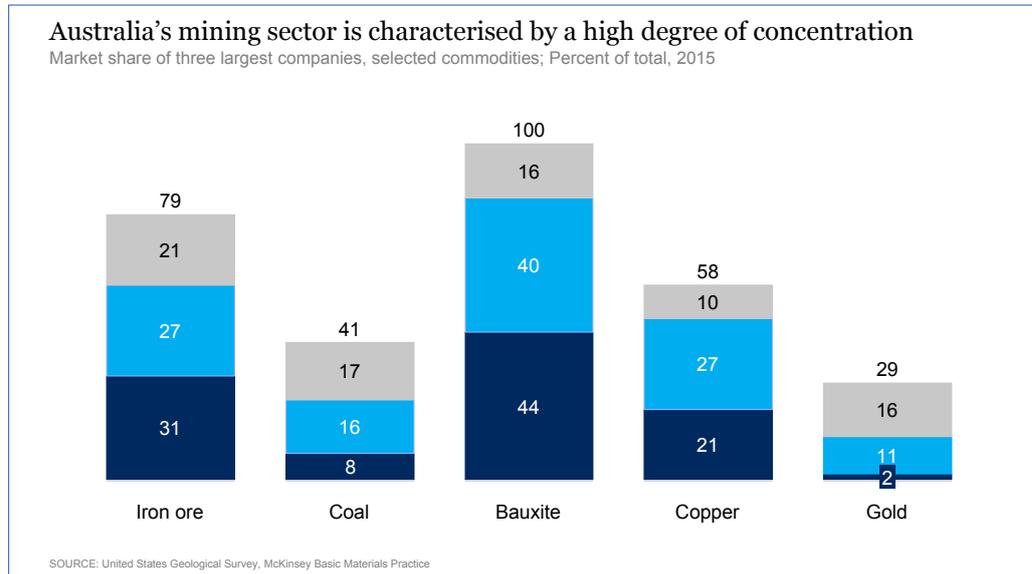
Globally, Australia possesses some of the largest resource reserves in the world, and ranks as the top (or consistently near the top) producer for multiple commodities (Exhibit 49). Within Australia, production is highly concentrated (Exhibit 50), which translates into a mining sector dominated by a small number of majors such as BHP Billiton, Rio Tinto and Newcrest—all in the top 50 companies in the world, by market capitalisation—and >15 'minors', typically operating at a much reduced scale.

Exhibit 49



At a high level, the mining value chain breaks into eight elements: sourcing and procurement, exploration, mine planning and development, drill and blasting, loading and hauling, processing and refining, outbound logistics, and B2B commercial sales. This chapter focusses in depth on the operational elements from exploration through to outbound logistics. As the digital opportunity levers relevant for the commercial elements of the mining value chain overlap with those applicable to B2B/B2C services industries and are covered to a significant extent in the utilities and banking and insurance chapters, they are not discussed here. Sourcing and procurement are covered in depth in the retail chapter, but also touched on briefly below.

Exhibit 50



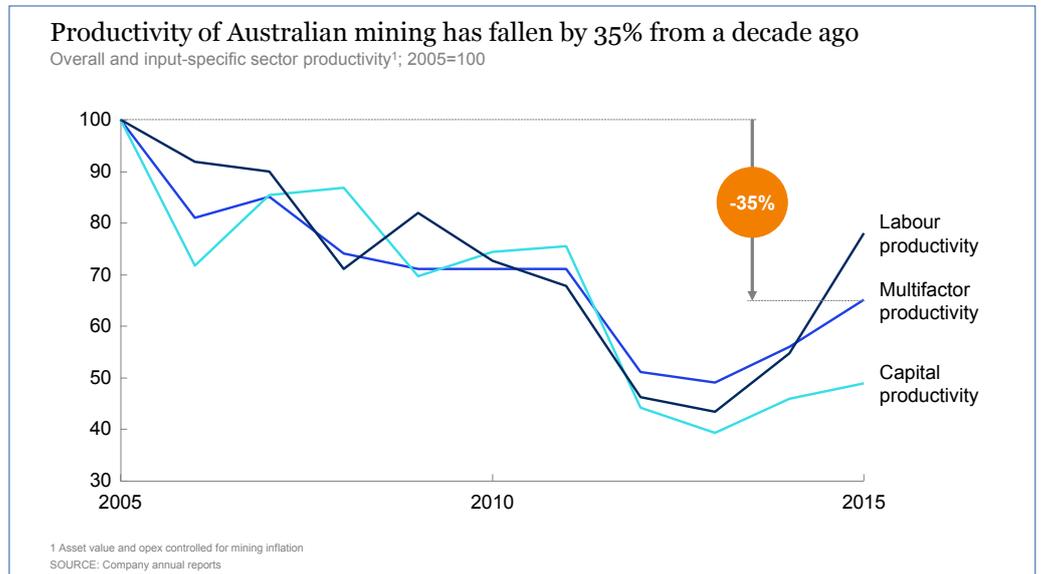
## Falling commodity prices and resource availability are creating a growing imperative to improve productivity

The global mining industry is under pressure. Falling commodity prices are squeezing cash flows—the iron ore price had fallen from US\$130/t in 2013 to roughly US\$55/t by 2016, during which time BHP Billiton and Rio Tinto's revenues had fallen an average of 32 percent. While prices have since recovered somewhat, the pressure on producers remains. On top of this, aging mine assets, and assets opened up during the period of high commodity prices have meant lower ore grades and longer haul distances from the mine face, thus increasing operating costs. These, along with other factors, mean that Australian mining is in general 35 percent less productive than a decade ago (despite improvements in the past 2 years),<sup>176</sup> even after adjusting for declining ore grades (Exhibit 51).

Further, the ability of companies to continue to tap into resources is slowing. Ore body replacement rates are in decline and new mine development times are increasing due to a combination of factors, including regulatory restrictions on some foreign operations owned by Australian companies, and a slowdown in the availability of capital.

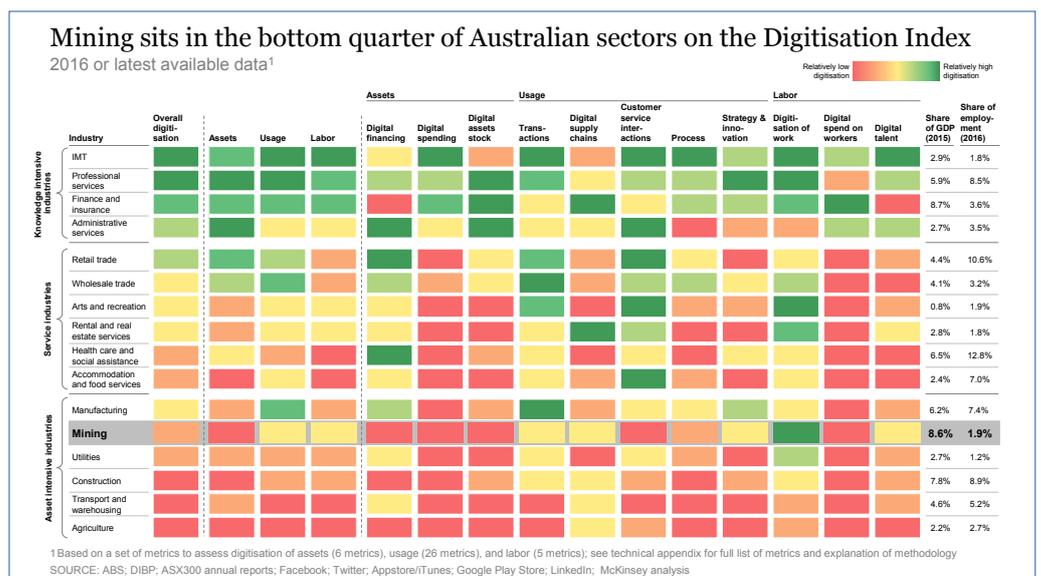
176 McKinsey & Company's MineLens Productivity Index.

Exhibit 51



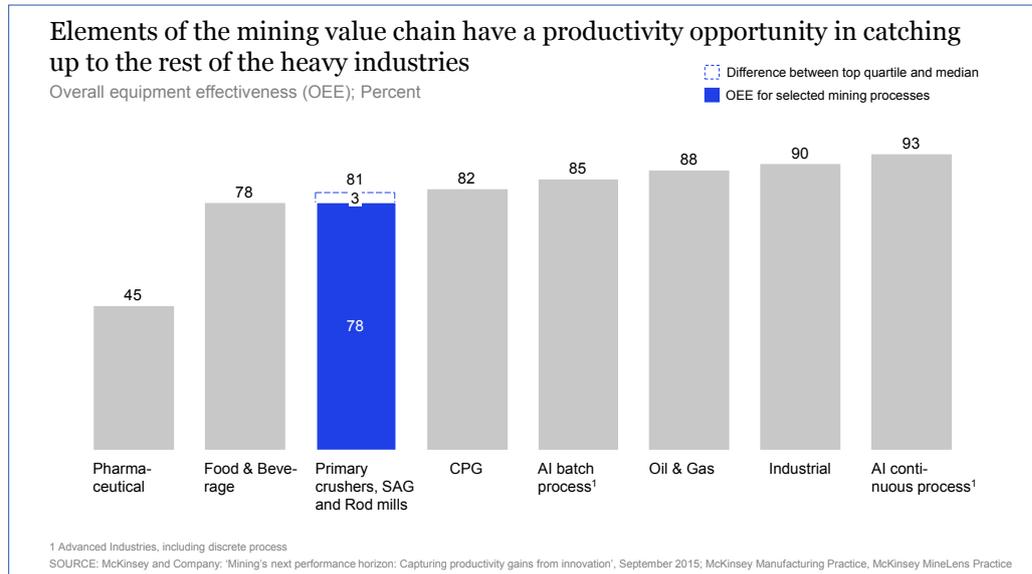
In response, the industry has shifted its focus to improving the productivity of existing assets—Rio Tinto, for example, announced it cut US\$3 billion from its recurring annual operating costs in 2013/14. The opportunity presented by digital and innovation represents a second, largely untapped, horizon of productivity. Our Australian Digitisation Index suggests mining is behind comparable heavy industries in terms of its degree of innovation—sitting in the bottom quarter of Australian industries in digital maturity (see Exhibit 52).<sup>177</sup> Some of this digital potential therefore lies in bringing the basic mining functions such as primary crushing, up to similar productivity outputs as adjacent industries (Exhibit 53).

Exhibit 52



177 Even after normalising for asset and capital intensity.

Exhibit 53



## Digital offers the potential for productivity uplift across the value chain

Although Australian mining currently scores relatively low on the digital maturity index, the largest companies in the industry in Australia (as well as globally) are increasingly recognising the inflection point at which the sector sits. Maturing digital technologies have the potential to unlock new ways of managing variability, enhancing productivity and triggering breakthroughs in productivity performance. These technologies sit in four clusters:<sup>178</sup>

- Data, computational power, and connectivity.** Embedding vast numbers of sensors in equipment, and in the ore body itself, that can capture large volumes of data for analysis, is an approach that is increasingly affordable and accessible. Likewise, connectivity and communication between machines via the Internet of Things is becoming increasingly common. For example, Rio Tinto's operations, the furthest along this path in Australia, already generate 30TB of data (or three times the estimated data contained in the printed US Library of Congress) per month. These scales of data do require a commitment to capex investment.<sup>179</sup>
- Analytics and intelligence.** Advances in analytics, from machine learning to improved statistical techniques for integrating data, help turn large data sets into insights about the probability of future events. A working example of this is the minimisation of routine maintenance costs, whilst maximising machine availability via predictive maintenance modelling. Both Rio Tinto and BHP Billiton

<sup>178</sup> See also Matthias Breunig, Jamie Cattell, Richard Kelly, and Dominik Wee, 'Industry 4.0: How to navigate digitisation of the manufacturing sector', McKinsey & Company, 2015.

<sup>179</sup> *Transforming our Iron Ore Business*, speech by then-Rio Tinto Iron Ore CEO Andrew Harding, November 2015; *Beyond the super-cycle! How technology is reshaping resources*, McKinsey Global Institute, February 2017.

have recently opened integrated remote operational centres, for example, with an average staff of more than 40 people.<sup>180</sup>

- **Human-machine interaction.** Consumer smartphones and other mobile devices have transformed the way people interact with devices, and applications are also spreading rapidly in the industrial field. Virtual reality ‘smart’ glasses or goggles, such as those recently developed by CSC, can feed real-time visual instructions to workers, for example, while sensors in clothing can transmit data about hazardous conditions and the physical condition of workers, improving safety outcomes. In operational control centres, intelligent machines can present operators with integrated, internally consistent operational scenarios to choose between, rather than simply presenting dashboards of information from the field.
- **Digital-to-physical conversion.** Advances in robotics are making fully autonomous equipment more affordable and effective.<sup>181</sup> In mining, the use of tele-remote and assisted control equipment is becoming common, and the deployment of fully autonomous equipment is taking hold in haulage, drilling, and other processes. Rio Tinto, which is in the late stages of implementing a fully-autonomous haulage system, reports a 13 percent reduction in loading and hauling operating costs, 14 percent increase in overall equipment efficiency (OEE), and 10 percent increase in production as a result of this digital adoption.<sup>182</sup>

Taken together, these technologies enable a fundamental shift in the way mining works: by harnessing the flow of information to reduce variability in decision-making, and by deploying more mechanised and centrally-controlled operations to reduce variability in execution. Opportunities to apply these technologies exist at all stages of the value chain.

### 1. Exploration and planning: gaining a deeper understanding of the resource base

In an ideal world, mine operators would know exactly what is in the ground within a resource body, and where. Even if data has been collected in full, however, the available information is often scattered across different business units, databases, and geological models, and therefore cannot be used to support short-term decision-making. The digital opportunity here comes from applying advanced analytical statistical techniques to firstly integrate different exploration data sources, and then to tease out more granular signals in the data.

Once mining has commenced at scale, the combination of small, durable, sensitive sensor technology and similar advanced analytics enables mine operators to refine their resource knowledge by combining ore-body model information with blast-hole drill data and sampling. This integration of geological information into a single, accurate, real-time model offers a number of advances: it can optimise drill and blast patterns, create an executable mine plan, and avoid quality issues at the source (Exhibit 54). With these enhancements, the requirement for time-consuming, and costly, traditional activities such as core logging, face inspections, and manual plant assays is dramatically reduced. Early indications suggest leveraging these technologies can represent an up to 3 percent improvement in both cost and throughput.

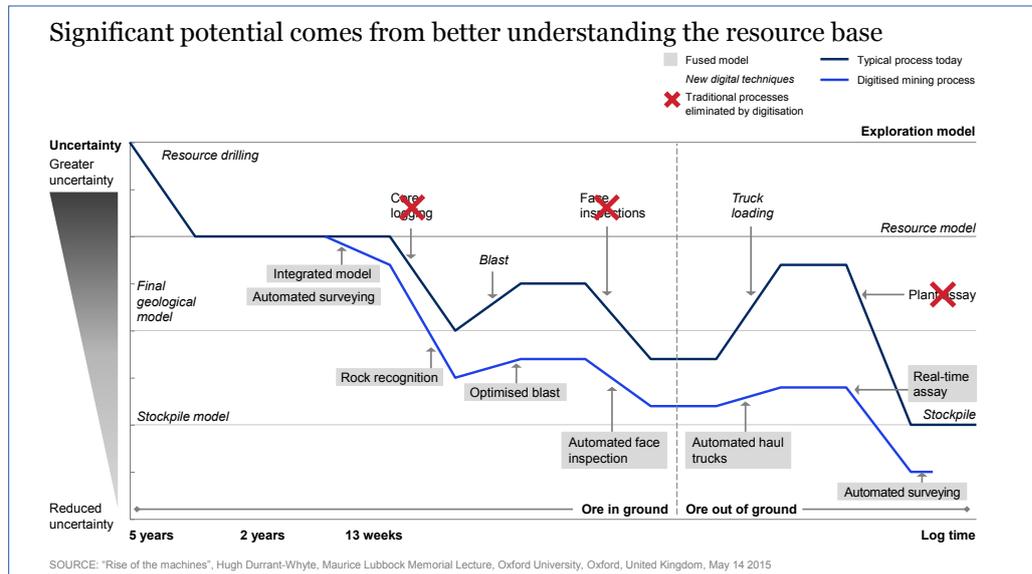
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<sup>180</sup> Rio Tinto Media release 25 June 2010.

<sup>181</sup> See also Mehdi Miremadi, Subu Narayanan, Richard Sellschop and Jonathan Tilley, ‘The age of smart, safe, cheap robots is already here’, *Harvard Business Review*, June 2015.

<sup>182</sup> ‘Rio Tinto shifts to driverless trucks in Australia’, *Financial Times*, 19 October 2015.

Exhibit 54



## 2. Mining and processing: optimising material and equipment flow

Tapping into technological advances in capturing real-time data and the development of better analytical engines will enable scheduling and processing decisions that maximise utilisation of equipment and yields. One example is in the mine pit, where combining traditional dispatch with smart algorithms can optimise machine movements for maximum efficiency. Another example can be seen in processing plants, where, instead of relying on plant operators to make decisions—often based on an incomplete understanding of the drivers of yield—decision support algorithms can unlock the second- or third-order variables that tap the final few percent of yield. For nickel, gold, phosphate, and other processed minerals, one global mining company has found that improvements of between 3 and 10 percent are possible within just a few months by using decision algorithms that ‘get it right’ each time, taking human operator judgement out of the calculation.

## 3. Mining and processing: reducing costs, improving operating discipline and safety via automation

Some technologies, notably automated haulage and drilling, have moved into full-scale commercialisation within the mining industry globally with companies such as Rio Tinto, Codelco, and Boliden leading the way. Rio Tinto, for example, currently runs around 70 autonomous trucks in the Pilbara region, transporting approximately 20 percent of the production at the mines they service. Other technologies, particularly automated blasting and shovelling, are in testing—for example the current autonomous shovelling tests underway by CRC Mining and CSIRO in Queensland. Despite the obviously significant upfront capex required, analysis suggests that the economics of automated haulage are sound, reducing the total cost of ownership by between 15 percent and 40 percent.

The improvement in unit cash cost can have further benefits, such as extending the lifetime of an asset by making it economically sound to extract lower grade material. Boliden has been able to extend the life of its copper mine in Aitik, Sweden by 13 years, by making the extraction of low-grade (less than 0.3 percent) copper profitable through automation. Autonomous vehicles and equipment offer indirect benefits, too—since

optimised fuel usage is an input into the algorithms driving autonomous trucks, the environmental impact is reduced—and so too is the number of people working in the areas considered most hazardous, with one European mining company managing to move 300 workers from underground to above ground tele-remote stations.

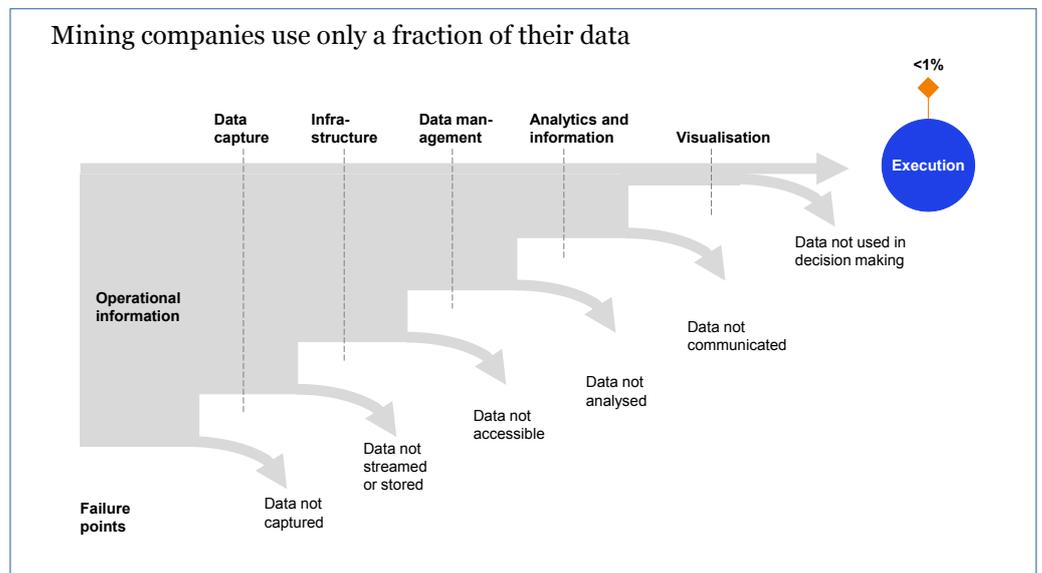
#### 4. Maintenance: improving anticipation of failures and performing preventative maintenance to avoid them

Mining companies are already digitally mature enough that they collect huge amounts of data from sensors embedded in drills, trucks, processing plants, and trains. However, this information is still used to well below its full potential—McKinsey Global Institute estimates suggest that less than 1 percent of the information collected from equipment is used to drive insight (Exhibit 55). For example, there is a significant opportunity to optimise maintenance costs and equipment uptime, and minimise costly unplanned downtime, by creating statistics-based predictive analytics to estimate the probability of failure of specific components, rather than using a traditional time-based approach to maintenance scheduling. Proofs of concept in mining contexts globally suggest the potential opportunity could be massive—with improvements of 20–30 percent of total maintenance costs, a 50 percent reduction in unplanned downtime and spare part inventory, plus 20–40 percent total machine lifetime.

More tactically, there is also much scope to improve the execution of maintenance itself—via digital support for maintenance crews (for example, mobile devices pre-loaded with requisite maintenance manuals, real-time alerts, virtual-reality support during maintenance tasks, etc.). Similarly, technologies like 3D printing enable ‘just in time’ inventory, reducing working capital and reducing equipment downtime.

While the four opportunities described above offer significant potential, it should be acknowledged that execution, particularly in a heavy industry such as mining, brings with it specific challenges. For example, end-to-end digitisation of equipment is a time- and capex-intensive process, and miners are typically choosing to digitise equipment incrementally to deal with capital constraints, technical complexity and implementation risks.

Exhibit 55

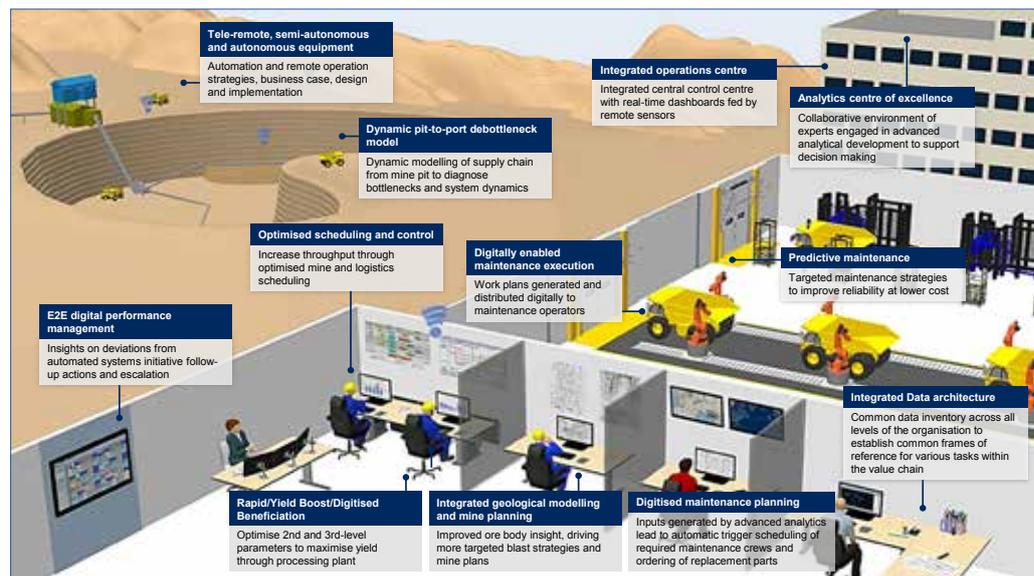


## The key to unlocking the digital opportunity in mining is end-to-end integration for real-time performance monitoring, optimisation, and control

Each of the digitally-enabled opportunities discussed above have significant potential in and of themselves. However the greatest impact, and the truly transformative opportunity for productivity, will only be unlocked by embedding these technologies and using the data they generate in an integrated way across the mining value chain. In an integrated approach, the physical technology, in the form of automation and sensors, provides a real-time flow of data, which is fed into analytical systems to form the foundation for better insights into the exact root cause of each variability, which in turn are then used to optimise the performance of the systems in real-time (Exhibit 56).

In such a model, mining operations focus on detailed, real-time monitoring of performance against plan, rather than conversations about monthly output. Control is moved to a sophisticated, analytically-enabled decision making capability at the centre of all operations, and the decisions made here are fed back to the operations in near-real time. Centralising control in this way allows actions to be taken to optimise operations across the whole supply chain, rather than in localised silos. Since so much of mining optimisation comes down to understanding and solving for downstream process bottlenecks, this end-to-end real-time visibility and optimisation is the true key to unlocking mining's digital potential.

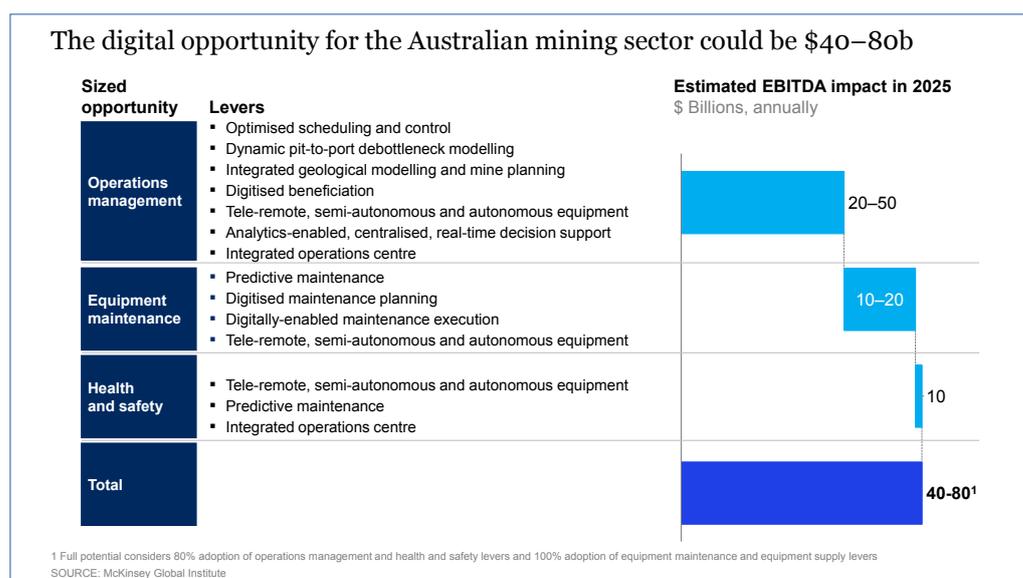
Exhibit 56



## The value of digital to the mining sector could be 30-60 percent uplift in sector profit and up to 20 percent reduction in average cost-per-tonne

Accounting for the improvement potential presented by each of the digital opportunities discussed above, the McKinsey Global Institute calculates the total impact of digitally-enabled innovation in the global mining industry as US\$296 billion to US\$370 billion per annum by 2025.<sup>183</sup> Scaled for Australia and factoring in Australian mining's current base of digital maturity, this represents an A\$40 billion to A\$80 billion per annum improvement in sector profit by 2025 (Exhibit 57)—a 30 percent to 60 percent improvement from EBITDA forecast.<sup>184</sup> Though of course the exact improvement potential varies across commodities and different forms of mining, this represents an average ~20 percent improvement in cost-per-tonne. Even more importantly, at its upper bound, the digital opportunity is estimated to represent a 50 percent reduction in the number of safety incidents, due to increased equipment reliability and the use of automated equipment in potentially hazardous areas.

Exhibit 57



## Capturing the digital opportunity in mining

As we have seen, mining is on the cusp of exploring the digital opportunity—leaders are testing the frontiers, but overall the sector, particularly in Australia, is a long way from capturing its full potential. Adopting digital innovation and capturing the opportunities it represents will require a significant cultural change for most mining companies. Given both the investment required, and the wholesale changes to processes and ways of working, it is a change that must be driven from the top.

183 James Manyika, Michael Chui, Peter Bisson, Jonathan Woetzel, Richard Dobbs, Jacques Bughin, and Dan Aharon, *Unlocking the potential of the Internet of Things*, McKinsey Global Institute, June 2015.

184 Scaled based on Australia's contribution to the global mining industry; 0.75 USD/AUD exchange rate applied; assumes constant commodity prices.

A key principle in driving digital transformation in mining is that digital is understood to be an enabler—albeit a critical one—rather than a replacement for operating excellence. Broken processes, for example, need to be replaced by well-defined standards before being automated. Insufficient data or poor data quality are roadblocks to digitisation which must be addressed before the full potential of end-to-end integration can be captured. When defining a ‘roadmap’ towards digitisation, organisations must take an objective view of their current level of process excellence, data leakage and data management maturity, and the degree to which they are able to generate insights from existing data.

Second, the rollout of any digitisation effort, particularly in an industry with a large front-line workforce less likely to already have digital skills, needs to include capability building. To take hold, digital tools being rolled out to operators must be user-friendly, and hence front-line personnel need to be involved in their development from the start—from ideation workshops, to user journey mapping, and prototype testing. Both from a usability, and also cultural credibility, standpoint, it is key to have respected technical superintendents or managers leading digital initiatives, and visible support and leadership from site GMs. Likewise, once developed, digital tools and digital KPIs should be embedded into the existing management systems and operational routines, such as daily huddles.

Third, mining companies should look to ensure they are capturing all sources of innovation—both from within the organisation, for example via crowd-sourced ideation platforms, and without. Anglo American’s ‘FutureSmart’ programme, for example, whilst still in the relatively early stages, includes partnerships with local universities and relevant suppliers. Rio Tinto for many years focused on ‘insourcing’ ideas from external partners in both industry and academia. Maintaining a diverse set of suppliers and leveraging and comparing their analytical capabilities is also key—and requires a flexible analytics platform.

Last, mining companies must remain aware of the potential for shifts in the strategic advantage as data becomes the key ‘resource’, and technology and IT solutions suppliers become increasingly vital to the operations of a digitised mine. Developments in the oil and gas industry bear this out—equipment suppliers, such as Schlumberger and Halliburton, are currently investing more on R&D and innovation than operators, so that the intellectual property and know-how is being developed upstream in the value chain. Increasingly, equipment is not ‘sold’ to oil and gas operators, instead suppliers are offering integrated contracts and taking on performance risks—in a model similar to the well-known ‘power by the hour’ model offered by Rolls Royce to aircraft operators. At a minimum, mining companies must build flow-of-data and system compatibility agreements into supplier contracts, and ensure suppliers comply with data standards.



The fully integrated and digitised mining value chain may not be universally realised in the near future. However, it is the logical end point in a series of technology deployments that mining companies, including the largest Australian companies, have already initiated, and the digital imperative in order to maintain productivity and competitiveness in the face of the growing cost and resource pressures the sector faces.

## Digital in mining—takeaways:

- Digital offers the potential for productivity uplift across the mining value chain:
  1. Exploration and planning: gaining a deeper understanding of the resource base by using sensor technology and advanced analytics
  2. Mining and processing: improving scheduling and processing decisions to maximise utilisation of equipment and yields, through the use of real-time data and analytical engines
  3. Mining and processing: reducing costs, and improving operating discipline and safety, via automation
  4. Maintenance: improving anticipation of failures and performing preventative maintenance to avoid them, through the use of sensor technology and statistics-based predictive analytics.
- The value of digital to the mining sector could be A\$40 billion to A\$80 billion improvement in annual sector profit by 2025
- The key to unlocking the digital opportunity in mining is end-to-end integration for real-time performance monitoring, optimisation, and control; this will involve significant capital investment, but also critically, capability building and operational leadership.

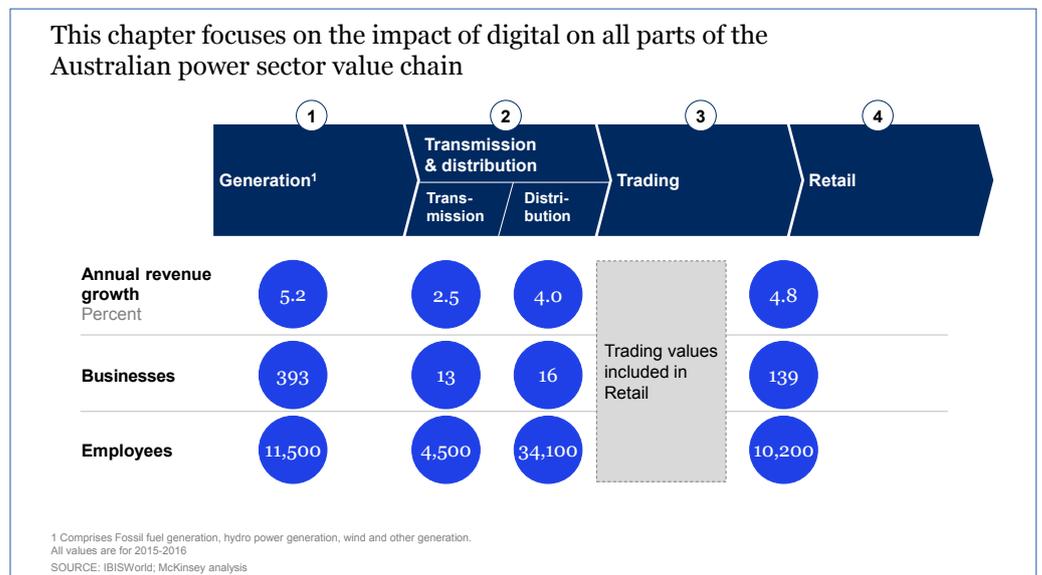


# Digital in utilities

The Australian utilities sector—power, natural gas, water and waste services—forms a critical backbone for Australia’s industries, businesses, and households. As such, its importance is significantly higher than its 2.7 percent contribution to overall GDP and 1.2 percent contribution to overall employment might suggest.<sup>185</sup>

Not only is the utilities sector critical to Australia’s economy, it is particularly relevant to the digital innovation discussion as it—most notably the electrical power sector—is in the throes of disruption driven by digital and technological forces. It will be important for incumbents to realise their full digital potential in order to survive and thrive amidst this disruption. This chapter focuses primarily on the electricity sector, which is the largest contributor within utilities in terms of GDP (57 percent share) and employment (46 percent share).<sup>186</sup> It addresses the digitally-enabled disruptive forces and digital levers, across the sector value chain (Exhibit 58).

Exhibit 58



## The utilities sector has significant untapped potential from digitisation

The Digitisation Index analysis presented in chapter 1 suggests that the utilities sector has significant scope for digital improvement. The sector is ranked thirteenth out of sixteen sectors in Australia, with low score’s across all three digital maturity dimensions—assets, usage and labour (Exhibit 59).

The digital potential for utilities is therefore significant. McKinsey Global Institute analysis suggests that, globally, utilities represent the leading sector in terms of the ease of capturing big data.<sup>187</sup> However, utilities have not yet fully realised the value

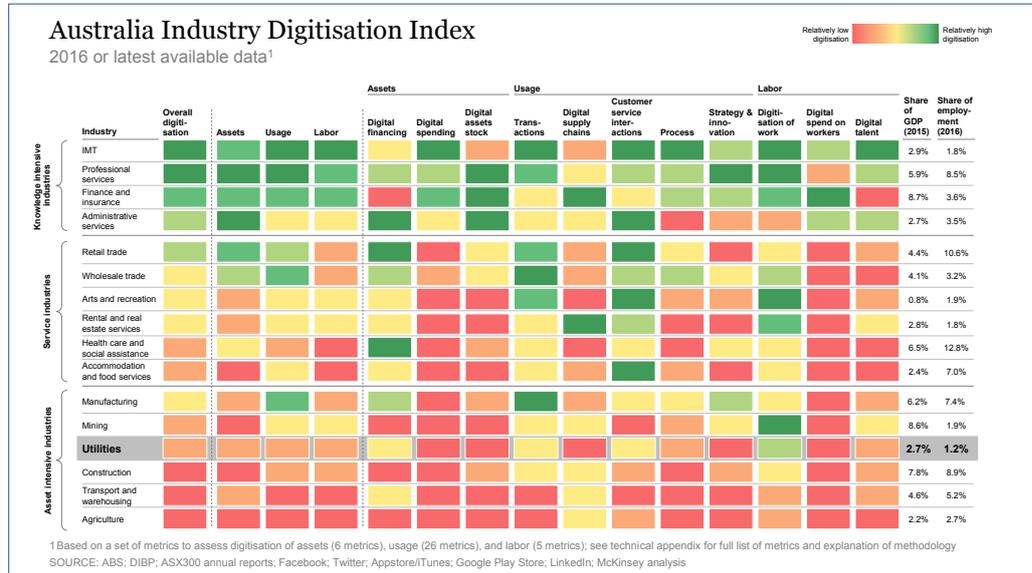
<sup>185</sup> ABS GDP and employment data.

<sup>186</sup> ABS, 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 06. Employed persons by Industry sub-division of main job (ANZSIC).

<sup>187</sup> James Manyika, Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh and Angela Hung Byers, ‘Big data: The next frontier for innovation, competition, and productivity’, McKinsey Global Institute, June 2011.

potential from data, let alone other digital levers, and it will be important for utilities to find ways of capturing this potential to survive in the future.

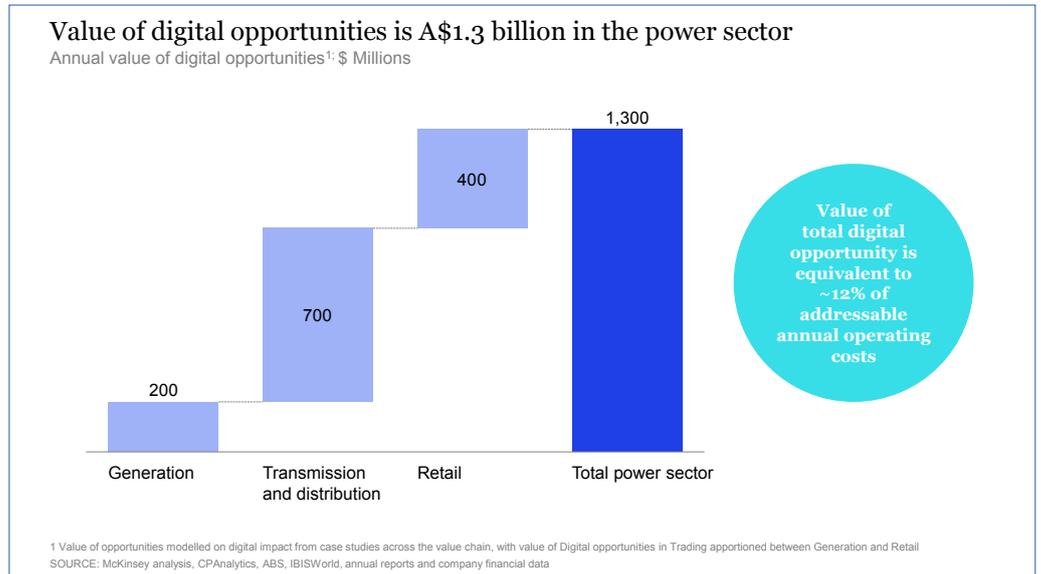
Exhibit 59



## The digital potential could be worth A\$1.3 billion per year for the electrical power sector alone

There are numerous digital opportunities across the electrical power sector value chain. The annual value of these digital opportunities is estimated to be A\$1.3 billion, which represents approximately 12 percent of the sector’s annual addressable operating costs (Exhibit 60). The opportunity is most significant for Transmission and Distribution (T&D; estimated at A\$700 million). T&D has the largest asset base and is the dominant employer of the power sector (employing 73 percent of the sector’s total workforce), so it can benefit greatly from digital asset optimisation opportunities, including digitally-enabled workforce opportunities. The opportunities in retail (estimated at A\$400 million) and generation (estimated at A\$200 million) are also significant. However, considering the nature of the retail market, in which a significant proportion of customers today switch providers based on price, it is possible that a significant amount of the benefit in this area will be returned to customers as price reductions or invested into improved customer experience.

Exhibit 60



## Digitally-enabled technology disruptions and opportunities exist across the power sector value chain

Digital in the utilities sector does not command the same headlines as digital in retailing and other B2C sectors such as telecommunications and banking, however the changes and opportunities are just as significant. The sector is facing a multitude of disruptive forces simultaneously—technological, regulatory, and demographic—with digital playing a role in each. We see three significant digitally-enabled disruptive forces across the value chain:

- Distributed generation and storage: home and business premises-based generation (primarily rooftop solar) and storage (primarily battery-based, for example, Tesla's Powerwall 2)—enabled by a digital smart grid that can deal with the complexity of two-way electricity flows and distributed control
- Virtual power plants (VPP) enabled by digital, cloud-connected control systems that intelligently enable batteries and other distributed energy resources to be directed in unison (see Box 1)
- Demand side management: enabled by smart meters/connected home solutions and the data they generate.

While digital fosters disruption, it also offers incumbents the opportunity to increase revenues and reduce costs. The most successful utilities will be able to capture the full range of these digital opportunities to lead (rather than suffer from) the disruption in the market, and to maximise their profitability and adapt their business models to the evolving environment. The remainder of this chapter explores these digitally-enabled disruptions and opportunities along the power sector value chain.

## Generation

Electricity in Australia is still produced mainly by burning fossil fuels, such as coal and gas, with hydro and other renewable generation playing a growing but smaller role.<sup>188</sup> The top 10 electricity generation companies account for almost two-thirds of total Australian installed capacity, and approximately 84 percent of all electricity generated is consumed by the National Electricity Market (NEM) states (New South Wales, Victoria, Queensland, South Australia, Tasmania and the Australian Capital Territory).<sup>189</sup>

### Digitally-enabled technologies are driving disruption in Generation

Traditional fossil fuel generation is undergoing disruption, driven to a large extent by digital technologies, which are impacting generators' profitability by 1) decreasing demand and saturating supply; and 2) smoothing the profitable demand spikes.

#### 1. Digitally-enabled technologies have the potential to decrease demand and saturate supply

Under a business-as-usual scenario, electricity demand in Australia is expected to grow by 1.2 percent per year to 267 terawatt-hours in 2030, driven by economic and population growth, and rising electrification.<sup>190</sup> Two technological forces could influence this outcome. First, digitally-enabled energy efficiency—smart meters and connected homes—could change the shape of end-consumer demand, and decrease energy consumption. Second, off-grid and distributed generation—combining renewables with battery storage and even virtual power plant technology (see Box 1) may change the shape of end-consumer demand and decrease total energy consumption. The combination of these technologies is forecast to increase the off-grid share of total power generation from 6 percent to 10 percent in 2030, under conservative assumptions.<sup>191</sup>

Moreover, modelling of the supply dynamics of the power sector suggests that no new fossil fuel power plants are likely to be built in future, and that after 2025 all new capacity on the NEM and the South West Interconnected System (SWIS) in Western Australia could come from solar. This is because solar photovoltaic (PV) generation is expected to become the lowest cost technology, based on its levelised cost of electricity (LCOE), within a decade.<sup>192</sup> Installed generation capacity is modelled to grow from 50 GW in 2014 to 61 GW in 2030 in the NEM, with several fossil fuel plants expected to be decommissioned (Exhibit 61). Based on this modelling, the share of electricity generated by renewables could increase from 8 percent in the SWIS in WA in 2014 to 40 percent in 2030, and from 4 percent to 26 percent in the NEM. This would be further accelerated if storage and virtual power plants become economically viable.

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188 In the NEM, annual generation in 2014/15 was 194 GWh in total, comprising the following fuel types: 50 percent black coal, 26 percent brown coal, 12 percent gas, 7 percent water and 5 percent other, excluding generation from rooftop solar PV systems. *AEMO Fact Sheet: The National Electricity Market*, AEMO, 2015.

189 *Energy in Australia*, UDI, Office of the Chief Economist, 2015, Table 4.5.

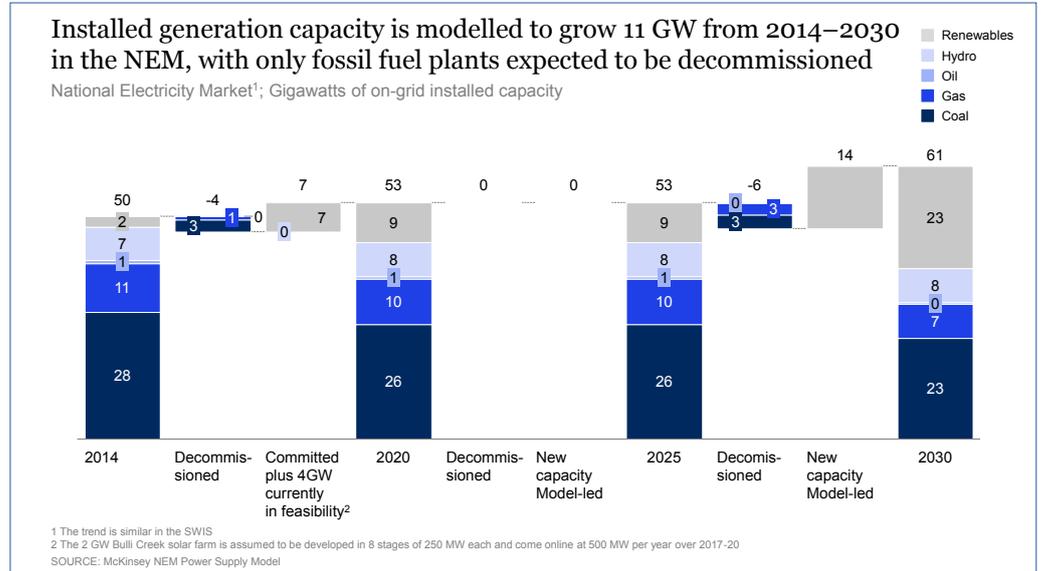
190 Christiaan Heyning and João Segorbe, 'The role of natural gas in Australia's future energy mix', McKinsey Australia and Energy Insights, June 2016.

191 *Ibid.* Assumes a business-as-usual scenario with a moderate continued uptake of off-grid generation, and off-grid generation includes both captive and distributed generation.

192 *Ibid.* Lowest cost technology not including subcritical black coal in the NEM, which may not be considered for new generation capacity due to its high CO2 emissions.

In such scenarios, incumbents who do not shift their generation mix face lower overall levels of utilisation of conventional generation assets, and thus lower profitability.

Exhibit 61



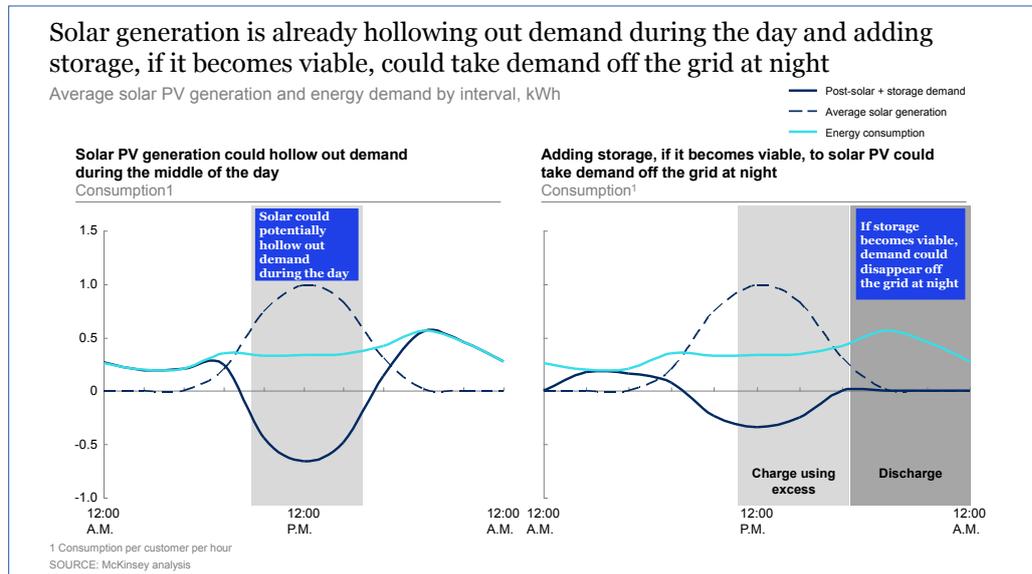
## 2. Maximum demand spikes could smooth out with the rise of digitally-enabled generation technologies and downstream digital advancements

Base load generators maximise their margins through high wholesale electricity pricing during times of peak demand. If, over time, digitally-enabled centralised storage or distributed storage become economically viable (allowing power generated by intermittent renewables to be held in reserve, to maximise profit and/or reduce the energy cost to the consumer), and the uptake is significant, there is potential to shave demand peaks—and thus fossil fuel generators’ profitability. Solar PV generation is already significantly reducing demand during the middle of the day; if storage becomes more economically viable at scale, this will also take demand off the grid during the traditional peak evening periods (Exhibit 62).

In a scenario with a high level uptake of solar PV, the potential added use of storage or virtual power plants could magnify the impact on fossil fuel generator profitability. Although Australia may continue to need traditional fossil fuel generation for security of supply, operating fewer hours and at lower overall levels of utilisation is likely to result in reduced profitability. Incumbents are already reacting by retiring capacity—particularly in South Australia, where renewables account for a larger share of overall generation than elsewhere in Australia, and most recently in Victoria, with the recently-announced closure of the Hazelwood power station.<sup>193</sup>

<sup>193</sup> *Sub-Critical Australia: Risks from market imbalance in the Australian National Electricity Market*, Institute for Energy Economics and Financial Analysis, May 2016, and Adam Morton, ‘Coal station closures inevitable, start planning: Labor and Greens’, *Sydney Morning Herald*, 28 November 2016.

Exhibit 62



Downstream digital advancements may also serve to further decrease maximum demand peaks in the future. The adoption of smart meters is increasing, enabling more consumers to better monitor and manage their electricity consumption. Retailers are already experimenting with incentives for consumers to use electricity at different times of the day. In the future, penetration of smart homes and connected energy management of buildings is expected to grow. This has the potential to lead consumers to change their behaviour further, shifting more of their electricity consumption from peak to off-peak times.

## Box 1: Virtual power plants

Virtual power plants (VPP) operate by integrating several types of power sources and battery storage systems, using a cloud-connected control system that ‘intelligently’ allows the batteries to be directed in unison. The majority of the time this enables consumers to tap into their stored solar power during times of peak demand. Connecting multiple batteries together at scale provides grid stability by discharging at a time that will be of greatest benefit for the customer.<sup>1</sup> VPPs are currently being piloted in Australia; in August 2016, AGL announced the pilot of the world’s largest virtual power plant, to be set up in South Australia. It will involve 1,000 interconnected batteries installed in homes and businesses and will be capable of storing 7 MWh of energy, with an output equivalent to a 5 MW solar peaking plant.<sup>2</sup>

1 AGL launches world’s largest solar virtual power plant battery demonstration to benefit customers AGL, AGL ASX Announcement, 5 August 2016.

2 Ibid.

## Generators must leverage digital to minimise the downside of disruption

Faced with these disruptive forces, incumbent generators must consider a broad range of options for their generation assets—including the imperative to maximise efficiency of their current assets. As noted above, the combined efficiency gains from digital levers are estimated to represent a A\$200 million annual opportunity for generators. The chapter on the mining sector in this report discusses a broad range of levers applicable across heavy industries that are also relevant to generation and form part of this opportunity—particularly predictive maintenance and automation of equipment, but also a digitally-enabled workforce and, ultimately, end-to-end analytics-driven monitoring and control across operations.

We therefore do not cover these technologies in detail here, except to note that these levers are already being deployed to varying degrees by generators. Overseas, for example, digital frontrunners have begun using advanced analytics to optimise generation efficiency and raw material inputs by improving dispatch patterns across generation sets, and improving ramp-up and ramp-down efficiencies. In these examples the utilisation of digital is two-fold: first, using advanced analytics to diagnose inefficiencies and quantify improvements via adaptive scenario modelling; and second, implementing automated decision making based on these optimised scenarios.

In another example, a European operator increased profitability by almost 4 percent by maximising combustion efficiency by optimising the location of air inflow into burners. More than 50 sensors capture emissions data, together with efficiency levels and temperatures. Advanced analytics is then integrated with the process control unit to provide forecasts as input values for a complex multi-variable optimiser, which is then linked back to the process control system for action.

## Transmission and distribution

Electricity transmission networks transport electricity from generators to customers over long distances. The NEM, for example, comprises five state-based transmission networks, with six cross-border connections linking the grid. Electricity distribution networks transport power from points along the transmission network to supply end consumers. The NEM has 13 major electricity distribution networks, with New South Wales, Victoria and Queensland each having multiple networks with monopoly providers in designated areas. The five largest electricity distributors account for over two-thirds of total market share. Ownership of transmission and distribution networks varies by state: the Queensland, WA and Tasmanian networks are fully government owned, the NSW networks are partially privatised, and Victoria and South Australia are either privately owned or privately leased.<sup>194</sup>

As power networks are a natural monopoly, they are regulated to manage the risk of monopoly pricing. The Australian Energy Regulator (AER) sets the amount of revenue that network operators can recover from customers using electricity networks in the NEM, the Northern Territory and, as of 2017, Western Australia.<sup>195</sup>

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<sup>194</sup> *State of the Energy Market 2015*, Australian Energy Regulator, 18 December 2015.

<sup>195</sup> *Ibid.*

## Digitally-enabled technologies are driving disruption in T&D

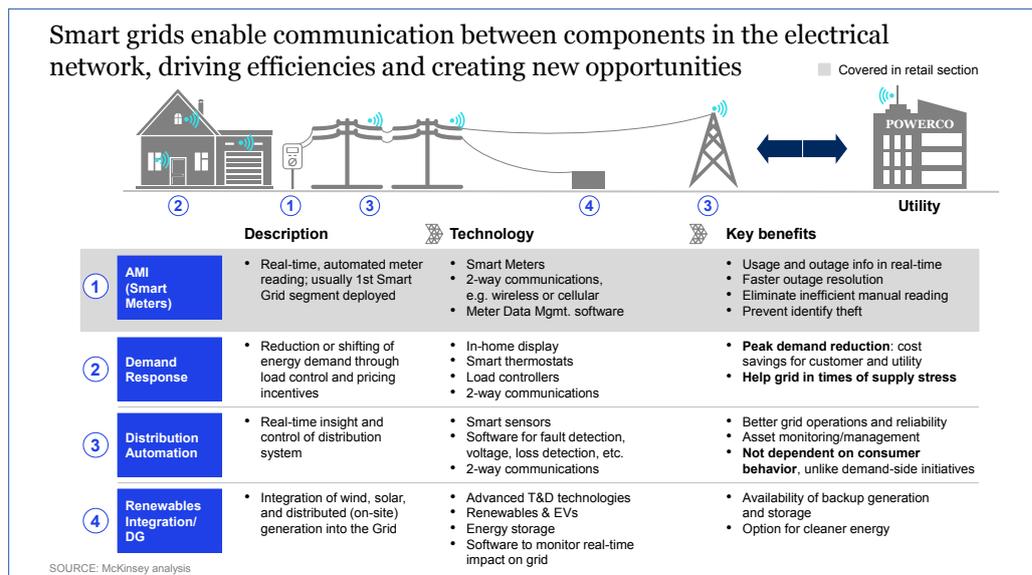
The same digital forces disrupting generation have the potential to disrupt T&D: solar PV, storage and VPPs, and downstream demand side management. For example, uptake of domestic solar and other renewables could lead to decreased aggregate demand for transmission and distribution networks, and thus lower revenues, and this could be further compounded if distributed storage or VPPs become prevalent. The imminence of these disruptions to T&D is evidenced by the fact that the AER has already built demand falls into its most recent 5-year revenue determinations.

Traditionally, T&D networks have provided a one-way flow of electricity, from distant centralised generators to passive electricity consumers. However, increasing complexity in grid management due to the increasing uptake of solar PV and stationary distributed storage and EV batteries may drive the need for a so-called digital or ‘smart grid’ solution. Further, T&D operators could face increasing load unpredictability from fluctuating solar power feed-ins and downstream effects such as demand side management, and complexities from solar feed-in frequency issues and the need for faster dispatch to maintain load balance. Operators need to ensure that their future networks can handle such added complexity.

## T&D operators must pursue digital opportunities and ensure their grids become increasingly ‘smart’

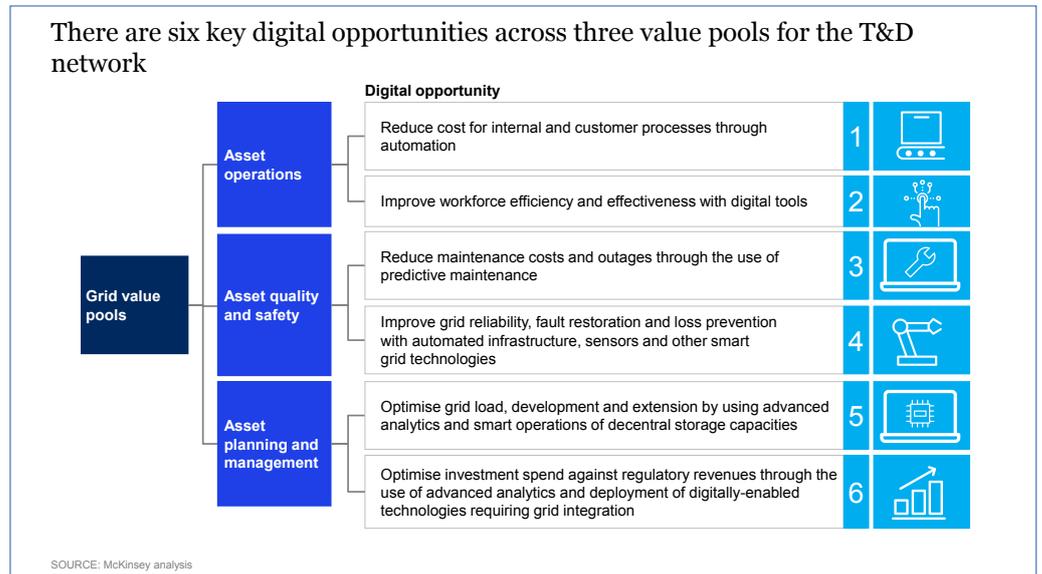
Globally, in response to this increasing grid complexity, network operators have started pursuing ‘smart grid’ solutions—which embed sensing technology along network lines. Smart grids are already changing traditional network dynamics, whilst enabling digital solutions across the value chain (Exhibit 63).

Exhibit 63



As previously noted, we estimate the annual value of the digital opportunity for Australia’s T&D network to be approximately A\$700 million in aggregate. The opportunities—many requiring smart grids—break into six main areas (Exhibit 64).

Exhibit 64



### 1. Reduced cost for internal and customer processes through automation

The electricity retail section of this chapter covers the use of automation for internal and customer processes. T&D grid operators, though to a lesser extent than retail operators, are also able to benefit from this digital opportunity, by improving their back-office processes through automation and by offering digital interactions with their customers to improve data availability and reduce inefficiencies.

### 2. Improved workforce efficiency and effectiveness with digital tools

Digitally-enabled workforce optimisation is an important opportunity for T&D operators, particularly as their workforce often needs to travel some distance to jobs, making tools (such as GPS based optimal routing) valuable.

### 3. Reduced maintenance costs and outages through the use of predictive maintenance

Predictive maintenance and downtime prevention is an important digital opportunity for transmission and distribution operators. Operators can reduce maintenance costs and downtime by applying predictive maintenance tools to perform maintenance when it is actually required, optimise maintenance to times when demand is lowest on parts of the grid through smart prediction of future demand, and increase grid availability by applying predictive outage prevention.

### 4. Improve grid reliability, fault restoration and loss prevention with automated infrastructure, sensors and other smart grid technologies

Traditionally, faults at the distribution level have been identified through MV substations or customer complaints, and isolated through manual inspection. Digital technology allows real-time communication with a control centre and embedded sensors, and can both provide alerts if the current stops as well as isolating the fault. Innovation in control software, and automation of breakers and switchers, can enable automated restoration of faults in a short amount of time, reducing repair costs and the need for operational decision-making.

The opportunity is not just in retrospective fault recovery; dynamic line rating, which remotely monitors line conditions through the use of sensors, improves reliability by decreasing risk of failure via tight control of conditions. Similarly, Volt/Volt-Ampere Reactive Optimisation (VVO) leverages control optimisation algorithms and remotely-controllable equipment to dynamically adjust properties through the feeder—improving energy conservation due to lower voltage level in the grid, and reducing technical losses due to a better power factor.

Some of the leading examples of automating grid reliability come from European operators. E.ON, a German-based electricity supplier, has piloted self-learning software in a smart grid control centre that can predict grid status up to six hours in advance, providing an early warning system and forecasting the location of errors on the grid.<sup>196</sup> Vattenfall, a Swedish utility, has piloted the use of software that proactively tests the network to identify, and automatically signal, power outages before customers call to report them.<sup>197</sup> In Australia, Ausgrid, as part of the Smart Grid, Smart City trial, has also tested smart grid technologies such as active volt-var control; fault detection, isolation and restoration; substation and feeder monitoring; and wide area measurement.<sup>198</sup>

In a final application, advanced metering also allows for two-way communication between a customer and a utility, which enables the use of anti-tampering alarms and use of last-mile analytics to predict energy theft.

##### 5. Optimised grid load, development and extension using advanced analytics and intelligent automated management of decentralised storage capacities

Operators can also apply data-driven solutions to decrease grid load and reduce the need for future grid extensions and consequent capex and ongoing operating cost. Network operators often incur significant capital expenditure based on system peak demand, which often occurs only on a few days of the year. This means that grid investment costs to ensure the network can cope with system peak demand are disproportionate. There are three digitally-enabled solutions to blunt this capital impact:

- Data-driven supply/demand matching to optimise planning for distributed energy resources.
- Demand-side management (DSM) mechanisms, to modify consumer demand for electricity through financial incentives and other methods, thereby reducing peak load on the grid. DSM has historically been used in many countries at the large industrial consumer level, with tailored programs for specific situations and typically used as a measure of last resort. Smart grid deployment—if at sufficient scale—could allow the extension of DSM to commercial and residential consumers, in an active or passive form.

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<sup>196</sup> E.ON website, accessed October 2016.

<sup>197</sup> Vattenfall website, accessed October 2016.

<sup>198</sup> *Smart Grid, Smart City: Shaping Australia's Energy Future*, AEFI consulting consortium, July 2014.

- Use of digitally-enabled decentralised storage, including VPPs, particularly once storage technology improves and is adopted at scale. For example, Oncor, a Texas-based transmission and distribution operator with 119,000 miles of transmission and distribution lines, has proposed building and owning 5 GW (equivalent to 7 percent of instantaneous demand) of batteries connected to the transmission and distribution grid, with some of the battery capacity to be used for grid-firming and to defer investments. Under its proposal, it would auction the remainder of the capacity to participants who can then sell the energy into the wholesale market. This opportunity, however, faces regulatory challenges which to date Oncor has not been able to overcome.<sup>199</sup>

#### 6. Optimised investment spend against regulatory revenues, through the use of advanced analytics and deployment of digitally-enabled technologies requiring grid integration

Transmission and distribution networks are regulated in the NEM states by the AER, which sets 5-year revenue caps based on expected costs during that period. Advanced analytical models could provide the opportunity to optimise investment spend against regulatory revenues for grid infrastructure investments. New investments, for example, are likely to be required in future to enable digital technologies such as storage and distributed generation, as well as electric vehicle charging, representing a potential source of regulatory-driven revenue.

#### Unlocking the opportunity in T&D

The implementation of smart grid technologies is the key unlock to the digital opportunity for T&D operators, with European operators already taking advantage (for examples, see Box 2). However, the feasibility of ‘unlocking’ the opportunities varies significantly between digital levers.

First, before asset operations can be automated end-to-end, it may be necessary to as a preliminary step adopt a combination of digital and non-digital processes. Meanwhile the implementation of digital tools for workforce efficiency may need to start with non-critical solutions, to gauge feasibility, before rolling out digital tools for critical jobs.

Second, in the area of asset quality, implementation of smart meters is a precondition for the majority of advanced analytics and advanced networking control mechanisms. Analytical capabilities will need to be built, and underlying IT systems upgraded, to enable data-driven automation. Full predictive maintenance of grid assets will require the use of near real-time sensors—however, value-adding prototypes can already be built where less data is available.

Third, in the area of asset planning and management, grid planning and grid steering capabilities need to be complemented with advanced analytic skills to build smart solutions, further reduce the need for asset extension, and to steer investments to maximise value.

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<sup>199</sup> Oncor website, accessed October 2016.

Fourth, to support the transition to deploying smart grid technologies, the development of supporting common IT platforms and interoperability standards will also be important.<sup>200</sup> Accordingly, broader collaboration will be required between federal and state governments, peak industry bodies, network operators, market operators and policy makers.

## Box 2: European operators have started taking advantage of ‘smart grid’ opportunities

Italy’s Enel, which has been a technological front-runner for some time (leading in smart meter roll outs in 2006) has gone on to deploy many of the digital grid technologies discussed above, including ‘voltage-var’ optimisation (VVO), distribution automation, and substation automation; it has also digitally-enabled its workforce. VVO allowed Enel to achieve a 4 percent per annum reduction in technical losses. Distribution automation decreased the average outage duration for each customer served by 11 percent per annum; substation automation has been deployed at more than 25 percent of its MV/LV substations allowing for remote control (Exhibit 65); likewise, Germany’s RWE has invested in ‘Kiwigrd’, a smart grid management platform, which provides the tools to integrate and manage distributed energy generators, storage systems, e-mobility and consumers, and provides value-added services (such as flex-tariffs, demand response and VPP).<sup>1</sup>

Exhibit 65

Italy’s Enel was a front runner in smart meter roll-out and has since continued deploying other digital grid technologies

|  |  |   |
|--|--|---|
| <p><b>Advanced network operation (manual VVO)</b></p> <p><b>4%</b> reduction of technical losses on annual basis</p> <p><b>Pioneer in smart meter roll out</b></p> <p><b>1<sup>st</sup> country</b> with full national smart meter deployment</p> <p><b>&gt;33 million metres</b></p> <p>Commercial losses reduced by <b>70%</b></p> <p><b>OPEX decreased at 6% p.a.</b></p> | <p><b>Distribution automation</b></p> <p>Automatic fault clearing procedures on 65% of medium-voltage lines</p> <p>Decrease SAIDI at <b>11% p.a.</b><sup>1</sup></p> <p><b>Substation automation</b></p> <p><b>2,000+</b> high-voltage/medium-voltage substations remotely controlled (100%)</p> <p><b>100,000+</b> medium-voltage/low-voltage substations remotely controlled (more than 25%)</p> | <p><b>Storage (pilot)</b></p> <p>Tests on a 2MW lithium-ion battery system at its 18 MW Potenza Pietragalla wind farm in southern Italy</p> <p><b>Digitally-enabled workforce</b></p> <p><b>5200 Enel’s teams</b> connected via GPRS with GPS location</p> <p>All processes through mobile applications</p> |
|--|--|---|

<sup>1</sup> System Average Interruption Duration Index (SAIDI)  
SOURCE: Enel company website and annual reports

<sup>1</sup> RWE website, accessed October 2016.

Last, while regulatory pressure on T&D operators to increase efficiencies will naturally lead to T&D operators pursuing select digital opportunities that enable them to become more efficient, any full-scale rollout of a smart grid in Australia will require significant government and regulatory backing.<sup>201</sup> To achieve the full smart grid potential, T&D operators' investments will need to be encouraged and de-risked, potentially by allowing their smart grid capital investments to form part of their regulated asset bases. Regulatory resets for network businesses in the NEM will next occur in 2019-2020, and network businesses will usually wait for their regulatory reset in order to put forward a business case for additional capital investment, including smart grid technologies. This disincentivises current investment in smart grid technologies by network businesses, as the businesses would be investing at their own financial risk by foregoing the regulated return on their investment for the remainder of the current regulatory period (and potentially beyond, if the AER should determine that such capital investment is not a prudent investment).

## Trading

Wholesale electricity spot prices can be volatile, both across seasons and within a given day; however retailers offer consumers a relatively stable price. In order to manage the price risk associated with this volatility, retailers either enter into hedging arrangements with generators or manage the risk internally through vertical integration. Either way, retailers typically engage in significant trading activity as part of their business models. Several digitally-enabled technologies are having impact on these trading businesses:

- First, traders are using big data and sophisticated advanced analytics algorithms to optimise both their trading decision-making and risk management
- Second, the increased uptake of solar and digitally-enabled decentralised storage impact volatility in the spot market prices
- Third, smart meters not only provide the opportunity for more sophisticated demand management, they have also opened the door to new and potentially disruptive retailers, whose business model is premised on passing on the full wholesale price volatility to customers. Smart meters enable this by generating real-time consumption data, which can be tied directly to the spot price. While only in their early stages, Mojo Power (in Australia) and Flick Electric Co. (in New Zealand) charge a flat subscription fee for the electricity service they provide, and pass on the wholesale electricity price direct to the consumer.<sup>202</sup>

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201 Energy Networks Australia (the national industry association representing Australian electricity networks), in partnership with the CSIRO, is currently developing an Electricity Network Transformation Roadmap, with the stated aim of guiding the transformation of Australia's electricity networks over the 2017-27 decade.

202 Mojo Power website, accessed November 2016, and Flick Electric Co website, accessed November 2016.

## Retail

Electricity retailers buy electricity in wholesale markets and package it with network services for sale to customers. Charges may be flat, or vary according to the time of day or season, but, as discussed above, they usually insulate a customer from movements in wholesale electricity prices.

In Australia, electricity is consumed mainly by manufacturing, commercial and residential customers, with small customers comprising 98 percent of all electricity connections by number but less than 50 percent of sales by volume.<sup>203</sup> In the NEM, full retail contestability applies allowing each customer to enter into a contract with their retailer of choice, and over 70 percent of electricity retail market share (small customers) is, in aggregate, held by Origin, AGL and EnergyAustralia. However, their market share has been declining in the face of competition from smaller retailers, with new, often digitally-enabled entrants acquiring 7 percent of customers from Origin, AGL and EnergyAustralia from 2012 to 2015.<sup>204</sup> In the SWIS, Synergy is the leader with over sixty percent market share.<sup>205</sup>

### Digitally-enabled technologies are driving disruption in retail

Retail is subject to the same digitally-enabled technological disruptions as the rest of the value chain. Uptake of distributed solar, as well as distributed storage or VPPs (if they become prevalent), could decrease overall demand for retail electricity and thus electricity retailer profits. Although there is a potential benefit to retailers from demand side management—through reduced hedging costs due to potentially lower wholesale spot price volatility and better predictability of demand—this benefit is unlikely to offset the expected profitability decline from decreased overall demand for retail electricity.

In the future, peer-to-peer electricity also has the potential to become a significant disruption. However, forecasts suggest this is unlikely to be disruptive until at least 2025, as peer-to-peer transactions are complex and economic benefits are currently low.<sup>206</sup> One company in Australia is already sowing this seed—Power Ledger, which uses blockchain technology to couple a tracked energy transaction with a financial one, enables the sale of surplus renewable energy generated at residential and commercial developments, homes and businesses connected to existing electricity distribution networks, or within micro-grids.<sup>207</sup>

### The digital opportunity for electricity retailers

The threat of oncoming disruption is driving retailers globally to pursue digital opportunities. In Europe and the US, electricity retailers' digital transformation is well underway. Its benefits include improved efficiencies, an expanded customer base, and potentially new business models. Many of these digital opportunities apply broadly across B2C service retailing (like telecommunications or retail banking), but utility retailers have in many cases been slower than peers in other industries to grasp them, and thus still have much to gain from doing so. Capturing these opportunities

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<sup>203</sup> *State of the Energy Market 2015*, Australian Energy Regulator, 18 December 2015. Sale by volume includes gas small energy customers.

<sup>204</sup> Ibid.

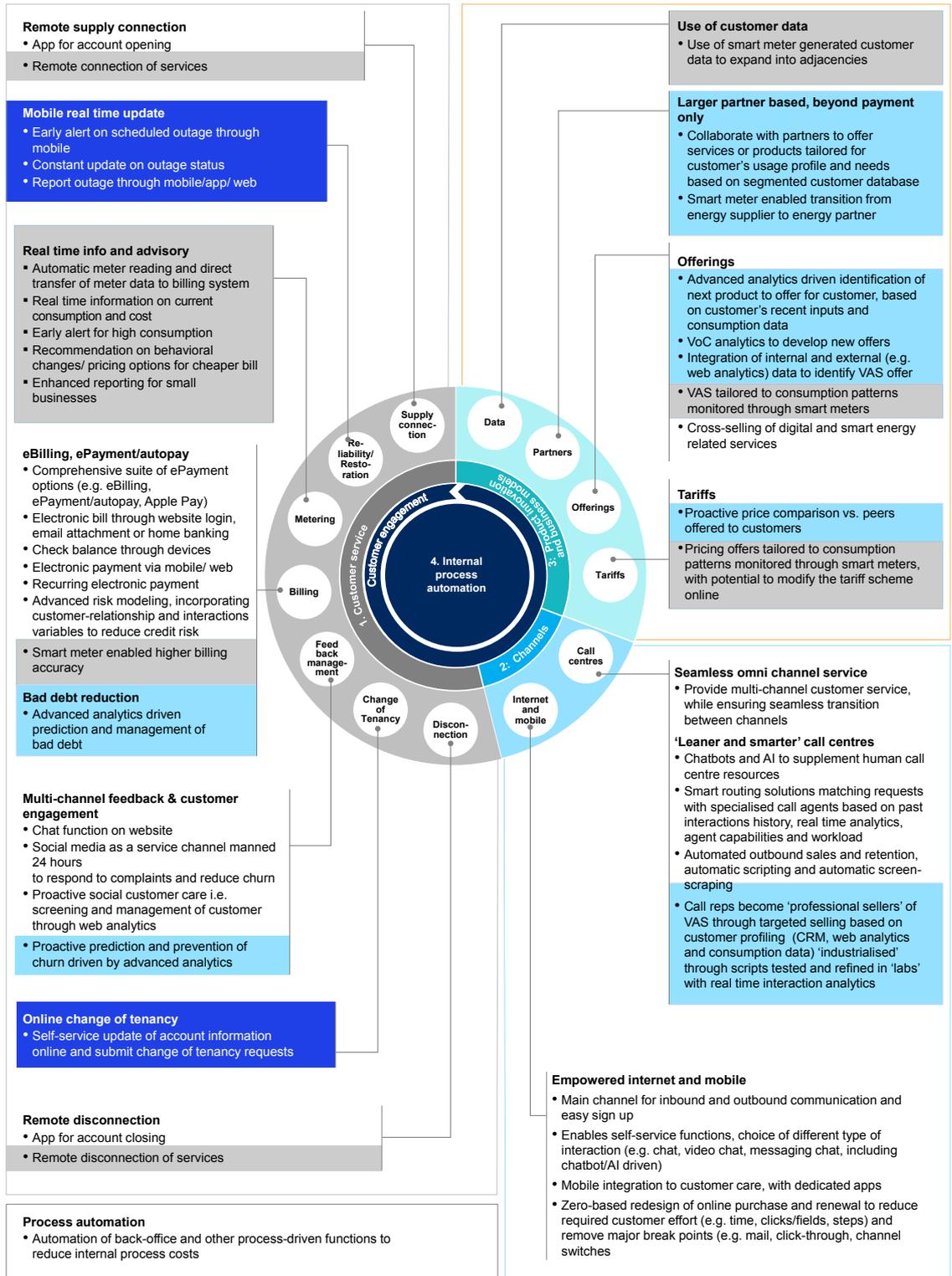
<sup>205</sup> *Electricity market review: Discussion Paper*, Electricity Market Review Steering Committee, July 2014.

<sup>206</sup> McKinsey EPNG practice.

<sup>207</sup> Power Ledger website, accessed November 2016.

## Key digital opportunities in the retail power sector

- Opportunity unique to utilities sector, not significantly affected by smart meter adoption
- Higher potential opportunity with customer consumption data from smart meters
- Requires smart meters



will result in benefits at both the sector level (for example, the entire sector can achieve cost savings by shifting customers to lower-cost digital channels), and the individual retailer level for those most able to capitalise on them (for example, by increasing market share).

Other digital opportunities are unique to electricity retailers, for example those dependent on smart meters and the customer consumption data they provide (which can be leveraged to enrich customer profiles, improve advanced analytics and tailor services and pricing). The full suite of digital opportunities we see available to electricity retailers is detailed in Exhibit 66. As noted earlier in this chapter, the aggregate annual value of the digital opportunity for Australia's electricity retailers is expected to be approximately A\$400 million, in addition to the effect of profit shifting between players as different players take advantage of digital disruption at different paces and relative market share positions change (though some of this opportunity is expected to be returned to consumers through reduced prices and improved services).

The remainder of this section emphasises the subset of these digital opportunities that are unique to electricity retailers, across customer service, channels, product and business model innovation, and internal process automation.

### 1. Customer service

Current annual rates of consumer churn are high in Australia—for example, 22 percent in NSW and 30 percent in Victoria, both higher than churn levels in Germany or the UK.<sup>208</sup> By digitising customer service, retailers have an opportunity to simultaneously lower costs and improve satisfaction. For example, customer connections and disconnections are being automated. Retailers are empowering customers to submit their own meter readings by uploading photos taken on their phones or other devices, while automatic meter readings, through the deployment of smart meters, promises to save 50 million manual meter readings in Australia annually once fully deployed.<sup>209</sup>

Advanced analytics combining customer data—including real-time usage data from smart meters—and external data (such as social media data) offers retailers the ability to predict customer behaviours such as churn and/or churn-triggering events (for example, changes of address) and make tailored save interventions. In another example, advanced credit and collections algorithms can identify which customers will need help to avoid default; one European utility developed a bad debt early warning machine learning model that achieved a 10 to 25 percent reduction in volume of new provisions and a 10 to 15 percent reduction of lost gross margin.<sup>210</sup>

### 2. Channels

Digital channels (such as online or mobile signup and account-management portals) afford electricity retailers the opportunity for leaner and smarter call centres, and if implemented well can provide customers a more convenient and less time-consuming experience. While some electricity retailers have begun focusing on digital channels, penetration remains low. In customer service, for example, so-called 'chatbots' operating by text/webchat, such as IPsoft's Amelia, have the potential to achieve >95

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208 Over the period 2012/13 to 2014/15. *State of the Energy Market 2015*, Australian Energy Regulator, 18 December 2015, and *Retail Energy Markets in 2016*, Ofgem, 3 August 2016.

209 McKinsey EPNG practice.

210 McKinsey EPNG practice.

percent answer accuracy/consistency, with just a three second average wait time for customers and 50 percent savings in service operations costs.<sup>211</sup>

Digitising only part of a customer's journey can have the opposite effect, however, by creating frustration when the customer drops out into a traditional, manual process. Leading retailers are instead focussed on delivering streamlined, digitally-enabled end-to-end journeys for their customers. This includes developing an omnichannel platform that seamlessly connects their interactions across all channels—online, mobile, call centre, and local sales. Online or mobile interfaces, however polished in isolation, that do not interface with back-end systems will not drive the same customer satisfaction or internal efficiency gains. Furthermore, a seamless omnichannel platform is a requirement for the ability to track customers through the entire customer journey and therefore capture meaningful customer data to drive analytics.

High-performing overseas electricity retailers have used this approach to drive 20 percent increases in customer satisfaction, 15 to 20 percent lower cost to serve, 10 to 15 percent revenue growth through reduced churn, upselling and customer acquisition, and 20 to 30 percent increases in the engagement of employees.<sup>212</sup>

### 3. Product and business model innovations

Smart meters have the potential to unlock new tariff structures and product and service offerings. Near real-time consumption data allow retailers to offer (predictive) pricing tailored to consumption patterns, while the vast amounts of data from smart meters present retailers with the ability to add analytically-driven services to product offerings. Examples include 'smart alerts' notifying customers of unusual or costly energy usage based on individualised use profiles, and real-time notifications of ways to reduce energy costs—both particularly useful for SME customers for whom electricity can be a significant proportion of operating costs. Further, customer stickiness can be increased through the provision of accurate real-time bill notifications to customers (which could reduce end-of-quarter bill shock and the propensity of customers to switch suppliers), and through enhanced reporting to small businesses.

In practice, smart meter-enabled product innovation has had only limited success to date and has failed to achieve mass appeal (for examples, see Box 3). Whether this represents an ongoing customer trend and consequent inability to drive revenue directly from smart meter-enabled products is yet to be determined. Regardless, electricity retailers must develop the capabilities to deal with the massive influx of data from smart meters, in order to drive the indirect revenue opportunities from a data-driven understanding of the customer.

This rapid expansion in the availability of data via smart meters—and the next generation of digitally-enabled products such as smart appliances (with embedded sensors tracking and controlling energy consumption)—represent a strategic threat to electricity retailers who do not react rapidly. Technology advances will also inevitably lead to greater volume and richness of customer data. For example, researchers at MIT have recently developed a stamp-sized sensor that can accurately identify the electric consumption of every device in a home based on spikes and patterns in the voltage and current—although this technology is still at the lab stage and has not yet

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211 *Amelia*, IPsoft, accessed December 2016.

212 McKinsey EPNG practice.

reached deployment.<sup>213</sup> It will be important for retailers to maintain control of customer data and the corresponding ability to drive the customer relationship to avoid disintermediation, even as new entrants, led by Google with its ‘Nest’ technology, are already emerging and cherry picking select areas within the value chain in which to compete.

## Box 3: Smart meter rollouts and smart meter-enabled product innovation are yet to widely scale in Australia

As discussed in this chapter, smart meters present a unique opportunity to electricity retailers. However, with the exception of Victoria, which has achieved a near 99 percent smart meter deployment through a mandatory rollout, the penetration of smart meters in Australia is low across all States and Territories.<sup>1</sup> This is consistent with experience globally, where in the absence of government driven rollouts, smart meter uptake has been minimal.

Perhaps in consequence, the uptake of products which rely on smart meter-enabled innovation has been muted worldwide: Powershop, an online electricity retailer that provides smart meter fed usage information to its customers via an app or online, has gained significant attention in the industry but is yet to become a major force, having only 78,000 customers in Australia as at December 2016, after four years of operations.<sup>2</sup> The same is true globally: for example, Flick Electric Co., a New Zealand electricity retailer that gives customers access to wholesale spot prices for electricity, only had eight thousand customers as at February 2016 after launching two years earlier,<sup>3</sup> and British Gas, which offers customer active heating (control of heating and hot water from smart phone, with ‘holiday mode’ and geolocation tags for leaving and returning to the home) and active plug (control of home appliances via a smart phone) solutions only had a penetration of 2 percent of installs as of 2015, after having offered the first of these range of solutions in 2013.<sup>4</sup>

Clearly, more work is needed to increase the penetration of smart meters and, as part of this develop viable product propositions leveraging their capabilities that can achieve mass appeal.

1 *Case study of Victorian Smart Meter Rollout*, New Zealand Smart Grid Forum, August 2015.

2 *Annual Report 2016*, Meridian Energy Limited, December 2016, and Powershop website, accessed November 2016.

3 Flick Electric website, accessed November 2016.

4 Centrica website, accessed October 2016, and *About Us*, Hive, accessed October 2016.

213 David Chandler, *What’s wasting power at home? Ask your app!*, MIT News Office, 1 August 2016.

As technologies continue to evolve rapidly, it will be increasingly important for retailers to ensure, via partnerships or acquisitions, they have a stake in the ecosystem of new products/technologies. For example, Australian retailers are already entering partnerships with battery manufacturers, with EnergyAustralia and Origin each teaming up with Tesla to offer customers the Powerwall, and a Powerwall 2 offering is expected soon. Similarly, many European utilities already offer smart heating solutions, in addition to selling a range of smart home products and services. Electric vehicle (EV) uptake presents another avenue to pursue, with Vattenfall in Sweden selling EV charging stations and Enel in Italy already offering special tariffs for home charging stations for EVs.<sup>214</sup> Retailers can also consider strategic partnerships that leverage the behavioural data electricity usage provides—for example partnering with delivery companies and, based on their customers’ real-time consumption data, informing their delivery business partners when customers are home so as to be able to receive deliveries. Given the limited number of large players in many Australian industries, electricity retailers who move first to establish such partnerships may establish a significant competitive advantage.

One European utility already has a mutually beneficial energy loyalty scheme with a retailer, which enables it to offer its customers significant discounts on their electricity, gas, LPG and petrol purchases. This retailer relies on a data platform that enables cross discounting, and uses detailed information on consumption, domestic behaviour and movement patterns to drive significant value in marketing. The interaction with customers is 100 percent digital, and the value accrued in the programme, promotions, past consumption, and machine learning, is all digitally based—with great success in keeping costs low. More and more targeted offers, seamless customer experience, and a wealth of information leveraged for cross-sell, has the potential to more than offset discounts in energy products—with the additional benefit of breaking the cycle of price wars that has been shrinking the size and scope of utilities’ retail activities across more mature markets.

Australian electricity retailers may also be able to profit from smart business, smart industry and smart city opportunities in the future. Overseas, many utilities already offer solutions for networked energy management that include the remote control of buildings, while municipal, regional, and national governments are launching smart-city initiatives aimed at promoting technical innovation and systematic applications of the Internet of Things in urban landscapes. Overseas, utilities are partnering with cities and builders to implement sensing technology and data analytics in ‘self-learning’ buildings, as part of integrated municipal energy and environmental planning. For example, France’s Engie has extended its services to building management and control systems to maximise energy management and efficiency, while Enel has partnered with municipalities in Italy and Spain to implement and manage public lighting systems and perform energy audits on fuel consumption points at clients.

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214 Vattenfall website, accessed November 2016, and Enel website, accessed November 2016.

#### 4. Internal process automation

Given the multiplicity of distributors, tariffs, and products, administrative processes (such as customer switching, billing, processing of payments, etc.) in utilities are relatively complex and currently highly manual. Adding to the overall complexity are distributed generation (for example, accounting for solar feed-in tariffs) and increasing channel complexity. The rewards from internal process standardisation and automation are therefore growing—overseas examples in the utilities sector suggest 20 percent reduction in process costs within the first year after automation. One example of automation is Robotic Process Automation (RPA), a technology where autonomous multi-skilled software robots execute rules-based administrative transactions within retailers' systems. Australian utilities have the potential to follow other industries across the globe in implementing RPA solutions.

## Digital in utilities—takeaways:

### Generation:

- Traditional fossil fuel generation is undergoing disruption, driven to a large extent by digitally-enabled innovations, which could impact traditional generators' profitability by:
  1. Decreasing demand and saturating supply
  2. Smoothing profitable demand spikes
- Generators must leverage digital opportunities—predictive maintenance, advanced analytics, improved energy efficiency, and digitally-enabled workforce optimisation—to minimise the downside of disruption.
- Improved efficiencies and decreased operating costs from these digital opportunities is estimated as a A\$200 million annual opportunity for Australian generators.

### Transmission and distribution:

- Digitally-enabled technologies are driving disruption in T&D. The uptake of domestic solar and other renewables could lead to decreased aggregate demand for T&D networks, and thus lower revenues, and this could be further compounded if distributed storage, or VPPs become prevalent.
- To minimise the downside of decreased aggregate demand, T&D operators can leverage the six digital opportunities set out in Exhibit 64, which are estimated to be worth A\$700 million in aggregate, annually.
- The key unlock to the digital opportunities for T&D operators is the proper rollout of a smart grid; full implementation will require significant government and regulatory backing, including allowing T&D operators' reasonable smart grid capital investments to form part of their regulated asset bases.

### Retail:

- Retail is subject to the same digitally-enabled technological disruptions as the rest of the value chain. Uptake of distributed solar, as well as distributed storage or VPPs, could decrease overall demand for retail electricity and thus electricity retailer profits.
- To minimise the threat of coming disruption, retailers can pursue numerous digital opportunities within the areas of customer service, channels, product innovation and business models, and internal process automation (see Exhibit 66), which are estimated to be worth A\$400 million in aggregate, annually.
- End-to-end digitisation of customer journeys is key to capturing these benefits to provide a seamless omnichannel experience. A significant portion of the digital opportunity in retail also requires the wider uptake of smart meters. With the exception of Victoria, the penetration of smart meters in Australia is low and, based on global experience, is unlikely to grow significantly without a government driven rollout, limiting the ability of retailers to capture the full potential of digital and analytics-driven innovation.



# Seizing the digital opportunity

The pace of digital disruption is accelerating in every sector of the Australian economy we have studied. This disruption is bringing with it both opportunities (for those able to move swiftly and focus their investments where the returns are greatest) and threats (for those who lack the ability or the resolve to challenge their existing orthodoxies at sufficient pace and scale).

Digitally-enabled innovations are disaggregating value chains and lowering barriers to entry while at the same time empowering customers and raising their expectations for engagement and service delivery. To prosper in this new environment requires much more than technology investment; it requires organisations to work in fundamentally different ways—for example, embracing agile, design thinking, rapid test and learn product development and zero based design.

The implication is that capturing the full potential of digital and analytics requires organisations to commit to a journey of reinvention, both in the capabilities they hire and develop, and in the ways they think and work. Today, Australia has pockets of impressive digital performance, leading the world in mobile banking engagement, mine automation deployment, and certain government transactions. Nevertheless, the untapped opportunities from digitally-enabled innovation are vast, and capturing them would deliver an A\$140 billion to A\$250 billion boost to the economy annually by 2025.

These benefits will be critical to our continued competitiveness on the world stage, for the drivers of Australia's recent economic success can not continue indefinitely. The commodity boom is long over, competition for new investment is fierce, and demography will become a liability, as an aging population weakens labour inputs and puts pressure on government resources.

Doing this will require sustained, bold and targeted action—the 'unlocks' are specific to each sector and must be carefully navigated to avoid low ROI on digital investment. In this final chapter we set out specific recommendations for industry and options for government that should help Australia maximise the benefits realised from the digital revolution.

## Recommended actions for industry

In this report we have highlighted the specific opportunities and threats facing players in seven different sectors of the Australian economy. As these chapters show, the particular levers that matter most and the 'unlocks' required to capture them vary substantially from industry to industry (and in many cases from player to player).

However, while the degree of disruption expected, the level of urgency to act, and the actions required may vary from sector to sector, what is consistent across every industry we examined is the existence of a substantial opportunity to capitalise on digitally-enabled innovation, ranging from how organisations interact with their customers, right through to back-end processes.

Capturing the full digital opportunity is not straightforward, for a number of reasons. These include the 'curse of incumbency' (the difficulty organisations have in disrupting themselves); the need to build new capabilities at scale while focussing investment where it will have greatest impact; the need to shift cultures and ways of working rather than just systems and tools; and the ability of (typically not digital native) leaders to understand and act on the opportunity.

To date these challenges have meant that while many companies are making progress on applying digital and analytics in their businesses, most are also struggling to achieve the paradigm shifts that digital can enable. In this section we discuss each of these challenges and what companies can do to address them.

### 1. Set a strategic ambition and do not be held back by the 'curse of incumbency'

As touched on in the introductory chapter of this report, digital has the potential to disrupt market structures fundamentally, by shifting the nature of demand and supply. Australian companies cannot head off this disruption indefinitely, but in most cases they can still, by their actions, help shape what the new market structure looks like and how the digital surplus is apportioned between value they are able to capture, value returned to consumers (via convenience, experience, and lower prices), value lost to in-market competitors, or value shifted out of the traditional ecosystem to digital attackers (as happened to bricks-and-mortar retailers with the rise of Amazon, for example).

France's telecommunications market, for example, headed into a 'race to the bottom' on pricing once Free Mobile, a digital attacker offering a radically lower-priced offering underpinned by a lean operating model, entered the market. Within a year, Free had captured 8 percent of the market, and the two major incumbents, Orange and Bouygues, saw 33 percent and 8 percent declines in their share prices respectively.<sup>215</sup> By contrast, within Australia's retail banking sector, incumbents have to date been on the front foot and the digital battle has instead been primarily fought around the ability to offer distinctive customer experience, whilst better protecting profit margins.

In many industries, we are seeing digitally-enabled innovations in companies' business models creating a winner takes all (or most) dynamic. This can occur when the cost and speed of a marginal digital transaction/production cycle dramatically undercuts the old processes, allowing early movers to scale rapidly while competitors scramble to catch up. Digital scale becomes a virtuous cycle—driving the capture of customer/process data and the ability to derive insights from it, which in turn unlocks further improvement in marketing and sales and production optimisation. Likewise with recruiting in a digital talent-hungry market; in-demand digital talent tends to gravitate toward the early digital winners, further widening the capability gulf their competition has to overcome. The challenge is for incumbents to be at the forefront of this trend, rather than reacting to it. That can mean trying to develop new capabilities and business models in-house, but equally it can mean moving quickly to acquire good ideas or businesses as they emerge in the marketplace (a strategy employed by Google and Facebook themselves now they have become incumbents).

One common pitfall along the way is to confuse digitisation activity with having a true digitally-informed strategy. Companies should not regard digitisation as an end in itself, but instead tie it to specific customer or business outcomes. A good starting point is to develop an ingoing view (recognising this will inevitably evolve over time) of the business model and value proposition required to compete effectively in the future—be it superior customer experience and brand, lean operations, or other bases of competition. A common characteristic of all digital winners we have studied is that they obsess about the customer, and place a customer-back view of what is required

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<sup>215</sup> Nick Wood, 'Total Telecom, Iliad's Q4 revenue surges 64% on Free Mobile growth', 1 March 2013; Yahoo Finance, 23 January 2017.

to win at the heart of their strategies and investment decisions. They then commit to delivering on this end state, even if it means substantially disrupting the way they have done business to date. For example, Netflix, in its relatively short corporate lifetime, has transformed its business model twice, from DVD-by-mail to streaming, and again by moving into producing original content—an example of willingness to fundamentally challenge an existing way of doing business in light of changing customer behaviours and shifts in where value aggregates in the industry chain.

This is of course the rub for incumbents—in any era of strategic disruption, incumbents typically come off worse for wear, as they are rendered less agile by their legacy core.<sup>216</sup> In B2C services, for example, legacy products are often complex, bundled, and sold at price premiums through expensive physical channels, whereas successful digital products tend to be simpler, direct, modular, and cheaper—for example streaming services like Hulu and Netflix, which offer month-to-month, customisable subscriptions at lower cost and without the physical hardware required by traditional bundled cable television packages.

Without a plan for transitioning customers from the old to the new model and retiring legacy operations and systems, the growth of digital platforms will hollow out the revenue base for legacy fixed cost platforms and therefore sharply increase their unit costs. Unprepared incumbents face being forced into cutting prices on legacy products to compete with digital offerings, whilst continuing to pay for their fixed cost base. At some point the cord will need to be cut on part or all of this fixed infrastructure—for example, as the growth of digital sales naturally cannibalises other channels, physical and third-party distribution networks will need to be reimagined. Apple has used its limited brick-and-mortar footprint in an innovative way, by using its flagship stores and highly rationalised pop-up mini stores to sell physical devices, ultimately driving online sales through its iTunes store. In an example from heavy industry, players are starting to mothball legacy manufacturing or power generation assets and move to microfactories or virtual power plant models. For example, GE's nearly century-old appliance division, which has recently been sold to Haier, has long had a 700,000 square metre factory in Louisville, Kentucky, but now that same city is also home to the division's 3,000 square metre microfactory, which produces products, at small scale, designed and financed through its 'FirstBuild' online crowdsourcing community.<sup>217</sup>

Successful digital transformers need to embrace this self-cannibalisation. For example, in the (already disrupted) newspaper business, Schibsted, a Norwegian media group, made the decision to offer classifieds online for free, thereby cannibalising its main revenue stream, in order to capture share in the European classifieds market. After making this decisive move toward a digital channel, it had to deal with running two parallel business models in a shrinking revenue pool. This meant reallocating resources from the old, and at the time still highly profitable, business to an (at the time) unproven and less profitable business, with Schibsted explicitly encouraging its new digitised products to cannibalise legacy products. The cannibalisation was so successful it 'ate' the old business and today Schibsted

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216 Chris Bradley and Clayton O'Toole, 'An incumbent's guide to digital disruption', *McKinsey Quarterly*, May 2016.

217 First Build website, accessed November 2016, *Our Company*, GE Appliances, accessed November 2016, and *Big Ideas, Small Scale: How GE Is Using The Wisdom Of Crowds To Design Better Appliances*, Forbes, 20 July 2015.

derives more than 80 percent of its profit from advertising revenue generated by its online classifieds.

As business models undergo these kinds of fundamental shift, the metrics leaders use to measure and manage their businesses also need to evolve. For example, in B2C industries where many services that used to be pay-per-use have become freely available (for example free online translation services), revenue models shift to alternative sources like advertising. Traditional metrics like revenue per user for a particular product or service in many cases become less relevant, being replaced by measures such as customer lifetime value that take into account customer loyalty resulting from improved experience and engagement, and hence the opportunity to monetise that value further over time.

## 2. Underpin the digital journey with digital capabilities, while focussing on ROI

In the past many companies have fallen foul of a technology-led, ‘build it and they will come’ approach to digitisation efforts—that is, investing in state-of-the-art IT infrastructure and, once it is complete, looking for business applications. This has several downsides, not least of which are long lead times (typically in the order of several years) during which the digital opportunity goes begging. But the greater risk is that, after a multimillion dollar IT investment, its specific functionalities are not fit-for-purpose for the desired customer or process outcomes, so that anticipated revenue or efficiency upside is not realised.

The optimal IT infrastructure solution differs from company to company—successful approaches can include taking a targeted approach to core systems changes or designing vertical stacks of infrastructure on a customer/user journey-by-journey basis. Increasingly, companies are moving to the use of a ‘services layer’ which decouples front-end (for example, customer or frontline user-facing) ‘systems of engagement’ from back-end ‘systems of record’ (for example, billing, CRM and SCM) to increase flexibility, drive faster time-to-market, and reduce costs of future changes, by increasing the likelihood that functionality can be added without requiring substantial changes to the underlying systems and infrastructure. Companies are also moving from owning their own physical data storage infrastructure to flexible cloud-based storage models. Assuming any data sovereignty or regulatory requirements can be managed, this has the potential to substantially drive down costs while enabling data-driven advanced analytics opportunities.

The key to success is to ensure any investment in IT capabilities is very clearly linked to delivering specific customer outcomes that can be tracked at a granular level. In practice many organisations are therefore moving to agile delivery models where much of IT activity is centred around agile, cross-functional teams (combining SMEs from all relevant parts of the business), delivering regular drops of functionality that are driven directly from specific customer needs. In this way, digital initiatives can be managed as a portfolio, with investment staged rather than allocated up-front, and resources flexibly juggled between different initiatives as required.

### 3. Shift cultures and ways of working, not just tools and systems

One of the most common failure modes in digital transformation is the inability of organisations to shift ways of working at scale, away from traditional ways of doing business to enable the speed and pace of digitally-enabled innovation. Research by McKinsey's Organisational Practice shows that the most agile companies have a two-times higher chance of above-average performance.

Wide ranging organisational change, however, is not easy, and a successful digital transformation demands a high level of coordination and a whole new set of capabilities. Silos that have been in place for many years may need to be dismantled in order to capture the full benefits of streamlining processes. However, structural changes to the organisation should be approached carefully—for example centralising digital often serves to even further remove the solution team from the understanding of the problem. Nonetheless, many organisations have had success with a model of GM/EGM-level roles being accountable across the 'horizontal' of end-to-end solutions, and or creating digitisation factories led by the business, with dedicated, cross-functional teams containing business SMEs, designers, developers, agile coaches and advanced analytics experts working in horizontal 'workcells', cutting across the organisation.

Companies also need to consider how to integrate new digital cultures into their existing organisational culture—particularly when they acquire digital businesses or recruit digital teams on a large scale. In some instances, digital teams are initially 'ring fenced' in order to retain talent and keep digital ways of working prevalent—Walmart, for example, has ring fenced its WalmartLabs 'idea incubator', and thereby its culture, by locating it in Silicon Valley, rather than at Walmart's headquarters in Arkansas. Once these cultures are established and producing demonstrable results (be they in product development, customer experience, or operational streamlining), the rollout of agile practices can begin more widely throughout the business.

Additionally, companies are increasingly shifting from traditional line reporting and an internal focus, to leveraging new collaborative models, such as crowdsourcing, data-sharing initiatives and virtual collaboration, to boost innovation and productivity. GE has released open source code for Predix, its software platform for the collection of data from industrial machines, for external application developers; and AstraZeneca's Open Innovation platform invites academics, non-profits and other partners to participate in drug discovery.<sup>218</sup> Companies are also holding competitions, 'hackathons', and increasingly starting their own venture capital funds to identify and acquire innovation.

### 4. Build the leadership capacity to drive the digital transformation

Navigating the many barriers to successful digital transformation requires making myriad difficult trade-offs over time (e.g. where to build versus partner versus buy; where to invest and in what sequence; whether to transform the core or build anew). It also requires counter-intuitive thinking in many instances—for example moving away from traditional models of solution design, development, and delivery to a rapid test and learn approach that uses iterative customer feedback on minimum viable products as the yardstick of progress.

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218 *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

The implication of this is that companies require not only strong, committed leaders who are willing to stay the course, but also that these leaders know how to make these trade-offs and operate in these new ways—essentially requiring that there are a sufficient number of ‘digital natives’ driving decision making. This creates tension when organisations rightly want the transformation to be owned by line leaders, who seldom come from such digital backgrounds. For this reason, appointing a Chief Digital Officer (CDO) is insufficient to drive change at scale—whilst a growing number of organisations outside of the tech industry have added CDOs (Australia as at 2014 had more CDOs than any other country except the US and the UK),<sup>219</sup> the role is not a panacea. A CDO can provide expertise and challenge to their executive peers, act as an organisation’s radar to stay up-to-date with new digital advancements, start-ups and disruptive developments that could affect the business, and coordinate and manage the integrations of digital into the business.<sup>220</sup> However, a full digital transformation must be led from within the business and individual executives must take responsibility for driving the digital imperative in the areas within their remit. There are multiple ways to increase the level of comfort and skill in areas such as digitisation, agile and advanced analytics within executive teams—companies have trialled ‘challenge sessions’ inviting start-ups to describe how they would disrupt the incumbent’s business model; one-day coding courses for the entire executive; ‘reverse mentorship’ programmes linking executives with young, ‘digital native’ hires; and ‘go and see’ trips to innovation hubs (typically Silicon Valley) to experience digital and agile practices live.<sup>221</sup>

Successful digital transformation also takes more than sound leadership at the top; most organisations will need to build their talent down through the business. This ranges from design, to agile, advanced analytics, data engineering, DevOps, and other related roles. For example, many companies are attempting to make use of the large volume of unstructured data at their disposal, but do not have the data science and data engineering capabilities to generate game-changing insights. The McKinsey Global Institute estimates that demand for deep analytical talent in the US could be 50 to 60 percent greater than its projected supply by 2018, and the shortages in Australia are expected to be at least as acute.<sup>222</sup> Further, a McKinsey global survey in 2014 found that 28 percent of executives surveyed rated finding talent (functional and technical) as their greatest challenge in digital transformation.<sup>223</sup> While some talent can be hired on an individual basis and cultivated internally, in order to bridge a large talent gap, companies may need to bring in an outside partner with complementary digital talent, or pursue acquisitions to bring across entire teams or businesses. Woolworths, for example, has done so, in 2013 taking a 50 percent stake in Quantium Group, a data analytics company, to use Quantium’s data and analytical services to boost its existing customer analytics capabilities.<sup>224</sup>

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219 *Number of Chief Digital Officers Doubled in 2013; Seven CDOs Became CEO and Four CDOs Became Board Directors*, CDO Club, 11 May 2014.

220 Tuck Richards, Kate Smaje and Vik Sohoni, ‘Transformer-in-chief: The new chief digital officer’, McKinsey.com Insights & Publications, September 2015.

221 Kate Smaje, Chris Wigley, ‘Five habits for executives to become more digital’, McKinsey.com Insights & Publications, November 2014.

222 James Manyika, Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh and Angela Hung Byers, ‘Big data: The next frontier for innovation, competition, and productivity’, McKinsey Global Institute, June 2011.

223 *The digital tipping point*, McKinsey Global Survey results, June 2014.

224 *Woolworths invests \$20m in data analytics*, The Australian, 2 May 2013.

Companies also have a significant opportunity to use digital and analytics tools to select and hire talent, through the use of online talent platforms and social media for recruiting, (one of the 37 metrics in our Australian Digitisation Index). Companies can leverage screening tools with sophisticated algorithms to reduce unconscious biases in the hiring process.<sup>225</sup> Google is also applying technology to talent management, with its People Analytics department using rigorous testing and statistical analysis to augment human judgment on workforce decisions.<sup>226</sup> Digital tools can also be used to maximise employees' performance, for example, Appical (a Dutch start-up that uses digital games) and LearnUp (which provides digital training programmes for candidates) create tools to make the induction of employees more productive.<sup>227</sup>

## Options for government to drive the capture of the digital opportunity

The promise of digital has a number of implications for governments globally, and Australia is no exception. The first is the clear opportunity to capture the efficiencies digital affords the public sector, as discussed in the public sector chapter of this report. Second, there is a need to encourage participation in the digital economy, so that no Australian businesses or demographic sectors are left on the wrong side of a widening divide between 'digital haves' and 'have nots'. Third, government needs to be prepared to shape policy and legislate against a challenging backdrop of new digitally-enabled business models such as Airbnb, and other complex issues resulting from fast-paced digital advancement. Finally, there is an opportunity for government to formally track an aggregate Australian 'digital maturity' index, such as to the Digitisation Index introduced in the first chapter of this report, and use it as an input to the policy debate on fostering digitally-enabled innovation.

### 1. Capture the digital opportunities in the government sector

The Australian Federal Government's digitisation efforts compare well with international counterparts today, with its 'digital government' offering ranked second in the world in the UN E-Government Survey 2016, behind only the UK.<sup>228</sup> It is focused on continuing to leverage digital, with the Digital Transformation Agency (DTA) tasked with leading Australia's digital transformation agenda. Notwithstanding this favourable comparison to peers, significant scope still remains for capturing the full potential of digitally-enabled innovation and productivity. As set out in detail in the public sector chapter of this report, digital holds the promise of both direct and indirect financial benefits to the government, with digital savings for transaction processing and support function spending alone potentially accounting for between 4 and 15 percentage points of the Commonwealth's annual departmental spend.

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<sup>225</sup> *A labor market that works: Connecting talent with opportunity in the digital age*, McKinsey Global Institute, June 2015.

<sup>226</sup> Laszlo Bock, 'Work rules! Insights from inside Google that will transform how you live and lead', Twelve, 2015.

<sup>227</sup> [apical.net](http://apical.net); [learnup.com](http://learnup.com)

<sup>228</sup> *United Nations E-Government Survey 2016*.

We see four primary areas of opportunity in the government sector, as discussed in the public sector chapter. In summary these are:

- Government interactions with citizens—while some government interactions are already digitised (for example, myGov.au provides a single access portal to many government services), there is further opportunity to digitise and streamline citizen-facing transactions across all agencies. In this area, Australia can learn not only from international government practices, but also from the private sector where leading organisations are reinventing customer interactions and journeys end-to-end
- Internal operations and processes—here the opportunity is much broader than simply digitising paper-based systems, it extends to the consolidation and automation of back office processes, a journey that is just beginning for most governments around the world
- Decision making and administered spending—we see significant potential to build on existing initiatives to use analytics to improve allocation of large spending pools such as welfare and Medicare, and for targeted advanced analytics to shape policy priorities
- Data sharing—continuing to build upon, and incorporate a broader range of data into, the Commonwealth’s existing data infrastructure.

## 2. Encourage participation in the digital economy

Addressing the ‘digital divide’ within Australia’s citizenry will be key to capturing the full opportunity for economic growth and improved citizen experience.

At the most fundamental level this starts with connectivity; whilst Australia’s level of internet penetration is high amongst developed nations at 88 percent, three million Australians still remain offline.<sup>229</sup> The Australian digital divide also exists at economic and social levels. The Australian ‘Digital Inclusion Index’, created by Swinburne University of Technology, Swinburne Institute for Social Research, and Telstra, profiles digital participation in the Australian population across three dimensions: access, affordability and digital ability.<sup>230</sup> The index shows a clear divide between capital cities and country locations (driven by both access and affordability), and across employment and education levels (12.2 index points difference between the unemployed and full-time employed, and 15.4 index points difference between the tertiary-education and those Australians with less than secondary-level education, relative to a national average of approximately 55 points).<sup>231</sup> Other demographic groups, such as the disabled, the Indigenous population, and the over 65s also lag well behind the national average.<sup>232</sup>

These Australians are at a disadvantage in two ways: as workers, their prospects are narrower, and as consumers, they are at risk of missing out on significant savings,

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229 Digital in 2016, We Are Social, January 2016, *Spring 2015 Global Attitudes Survey*, Pew Research Center, June 2015, and *Measuring Australia’s Digital Divide, The Australian Digital Inclusion Index 2016*, Swinburne University of Technology, Swinburne Institute for Social Research and Telstra, 2016.

230 *Measuring Australia’s Digital Divide, The Australian Digital Inclusion Index 2016*, Swinburne University of Technology, Swinburne Institute for Social Research and Telstra, 2016.

231 Ibid.

232 Ibid.

convenience and access. Each individual who is not online also represents a missed digital engagement and transaction opportunity for Australian businesses and government. Encouraging and enabling these individuals to participate in the digital economy begins with providing access and infrastructure, but requires more than this—it also requires enhancing digital literacy, increasing the awareness of digital tools, and encouraging their adoption.

Government does not necessarily need to play a full implementation role to encourage participation in the digital economy, it can instead choose to take on a co-ordination role in targeted areas. For example, the UK Government has taken this approach under the ‘Go On UK’ initiative, which is a partnership with private sectors and charities, under which organisations can apply for £15 million to deliver digital skills training.<sup>233</sup> The initiative has developed a standardised assessment for an individual’s digital skills to identify communities with high ‘digital exclusion’, and is backed up by a set of targeted initiatives, with the aim of reducing those ‘digitally excluded’ to less than 10 percent of the UK’s adult population by 2020.<sup>234</sup>

Significant progress is being made on the access and infrastructure front in Australia, most visibly with the deployment of Australia’s National Broadband Network (NBN), which as at December 2016, had progressed to over 3.5 million premises ready for service.<sup>235</sup> By 2020 the workplace participation impact of NBN-enabled telework has been estimated to have the potential to grow annual GDP by A\$3.2 billion and create the equivalent of an additional 25,000 full time jobs.<sup>236</sup> Meanwhile, overseas cities are pushing the frontier on the use of free public infrastructure, which Australia has the opportunity to emulate. Cities, such as Cambridge under the UK Government-funded Super Connected Cities Project, are creating city-wide free WiFi zones to give the public superfast connectivity.<sup>237</sup>

At the same time, complementary investments in digital skills will be needed to power an increasingly digital economy. In particular, many workers will need the support of government as they retrain and adapt to the changing digitally-driven employment landscape. Digital skills will need to become a core part of education curricula; and as more tasks become automated, jobs at all skill levels will be redefined, meaning new training, and re-training, pathways and institutional responses will need to be updated to continuously keep pace. Already, there is an opportunity to develop targeted tertiary or continuing education programmes to fill critical talent shortages, for example, for roles such as data scientists. Further, there is an opportunity to apply advanced analytics techniques to educational outcomes, skills and career paths themselves, to design a much more effective education and training system.<sup>238</sup>

Last, government also has a potential role to play in unlocking digitally-enabled innovation through greater investment in R&D. This is particularly important given the wide variance in R&D expenditure between sectors highlighted in the Australian

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233 *Policy Paper, Government Digital Inclusion Strategy*, Cabinet Office, The Rt Hon Lord Maude of Horsham and Government Digital Service, 4 December 2014.

234 *Ibid.*

235 *NBN*, NBN Co, accessed November 2016.

236 *Creating Jobs Through nbn-Enabled Telework*, Department of Communications, Colmar Brunton and Deloitte Access Economics, 2012.

237 *Connecting Cambridgeshire*, Cambridgeshire Council, accessed November 2016.

238 *Digital Europe: Pushing the Frontier, Capturing the Benefits*, McKinsey Global Institute, June 2016.

Digitisation Index. For example, the financial services sector scores 10 times higher on this metric than the mining sector. Government has an opportunity not only to promote R&D through financial incentives, but also to promote strong relationships between universities, investors and entrepreneurs.

### 3. Face the challenges of legislating and shaping policy in a digital age

With the rapid pace of evolution of digitally-enabled business models, the background against which governments find themselves required to legislate is becoming increasingly dynamic. The growing penetration of digital brings to the fore difficult issues such as consumer privacy and data sharing, and opens up legislative grey areas as new, particularly peer-to-peer, business models emerge. For example, increasing mobile data use and the rise of IoT usage requires a flexible approach to the management of competing spectrum priorities. The *Radiocommunications Act 1992* is currently undergoing rewriting to allow it to become more adaptive to demand shifts (including those driven by as-yet unknown technologies) for spectrum bandwidth.<sup>239</sup> The trend of legislative challenges in the digital age will increase in the future—for example, the introduction of the first autonomous cars on the road will introduce the need to address associated safety, insurance, and liability issues amongst others.

Data privacy and security have long been complex issues, but the complexity of these issues is now being further compounded by the growth of IoT, which is predicated on capturing vast amounts of data about what companies and individuals are doing at any point in time, and exchanging that data among systems. Government can help to make choices about data collection, access, usage, and consent, especially for data generated in public spaces, and create frameworks for liability against data theft and hacking.<sup>240</sup>

Furthermore, facilitating the development of common standards and guidelines is an important priority for unleashing industry innovation and capturing more of digital's economic potential. In the US, the Transportation Department has already proposed guidelines to encourage uniform rules for the broadcasting of data from one driverless vehicle to another, to decrease automotive accidents and deaths.<sup>241</sup> In an Australian example, electronic medical records (EMRs) have the potential to unlock nearly a quarter of the digital productivity opportunity in healthcare (as detailed in the healthcare chapter of this report), yet many of these benefits depend on the interconnectivity of EMRs from different clinical settings. As such, government could look to encourage common standards to ensure these systems interact effectively, and encourage uptake.

There is also an opportunity for government to use targeted digital policies to boost efficiencies in select parts of the economy. Small-to-medium-sized-businesses (SMEs) are a prime candidate for such policies, given that (as outlined in the retail chapter of this report) they are a significant contributor to the Australian economy,<sup>242</sup> but face capital and scale constraints that could hinder them benefiting from the same

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239 Australian Federal Department of Communications and the Arts, 2017

240 *Who's not online and why*, Pew Research Centre, September 2013.

241 Cecilia Kang, 'Self-Driving Cars Gain Powerful Ally: The Government', *The New York Times*, 19 September 2016.

242 8155 - Australian Industry by Subdivision, Division F, Retail Trade, Australian Bureau of Statistics, and 8165 - Counts of Australian Businesses June 2011 to June 2015, Australian Bureau of Statistics.

digital opportunities as larger businesses. Several countries have already enacted digital policies which focus specifically on improving efficiencies in SMEs—such as ‘Mittlestand-Digital’ in Germany, which promotes the use of software for enhancing business processes among SMEs.<sup>243</sup>

Last, employment regulations and policy will need to keep abreast of fast-evolving labour markets, which are becoming increasingly important as global competition moves to the level of individual jobs. Australia, like the rest of the developed world, is experiencing the rise of a digitally-enabled ‘gig economy’ as more and more individuals abandon the traditional employment model in favour of working independently on a task-by-task basis for multiple employers. It will be pivotal for policy makers to ensure legislation supports a digitally-enabled labour market.

#### 4. Track digital maturity

As discussed in the opening chapter of this report, digital maturity appears to be an increasingly important indicator of economic performance and the ability of Australian companies to compete on a global basis. The Australian Government could consider tracking Australia’s digital maturity on an annual basis as an economic indicator, as doing so will allow it to better identify, target and track the progress of digitisation across sectors, as well as better understand how Australia’s technological competitiveness compares with other countries, and inform policy development.

The Australian Digitisation Index introduced in the opening chapter of this report, which relies on publicly-available data, could be a starting point for tracking Australia’s digital maturity, and could be supplemented with additional metrics going forward—such as the digitisation of analogue assets, in future.



The promise of digitally-enabled innovation to the Australian economy is vast: we estimate a potential of between A\$140 billion and \$250 billion in GDP uplift annually by 2025, and potential uplifts of up to 15 percent of individual sectors’ total EBIT. This report has explored the digital opportunities available in seven key sectors of the Australian economy, based on technologies that are known and at least in trial phase today, and identified the sector-specific factors required to ‘unlock’ that potential. Capturing the opportunity will require focussed investment in capability building, courageous leadership from organisations willing to disrupt themselves and commit to working in very different ways, and clear policy leadership from government. Successful execution can be expected to unleash a wave of growth and profitability, and help Australia substantially increase its competitiveness in the global marketplace. Capturing the potential of this Fourth Industrial Revolution is an opportunity we cannot afford to miss as a nation.

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243 *Future of the German Mittelstand Action Programme: New edition 2016*, Federal Ministry for Economic Affairs and Energy, May 2016.

# Conclusions—takeaways:

## Implications for industry

- 1. Set a strategic ambition and do not be held back by the ‘curse of incumbency’:** Digital has the potential to fundamentally disrupt market structures, which has led to the decline of traditional players in numerous industries. However, incumbents have real advantages to exploit and an opportunity to emerge as market leaders by being willing to disrupt their own business models and pursue digitally-enabled innovations in a focussed and vigorous way.
- 2. Underpin the digital journey with digital capabilities, while focussing on ROI:** Leading organisations are moving away from ‘build it and they will come’ approaches to digitisation and the supporting IT infrastructure. To ensure ROI, investments should be clearly linked to delivery of specific customer outcomes tracked at a granular level. Many organisations are moving to agile delivery models with cross-functional teams delivering regular drops of functionality driven directly from customer needs, with staged investment and regular rebalancing across a portfolio of initiatives.
- 3. Pay close attention to culture:** Organisational agility, including breaking functional silos via cross-functional teams with end-to-end ‘horizontal’ accountability, collaborative models (for example, crowdsourcing, data-sharing and virtual collaboration), and fostering and incubating a ‘digital culture’, are key cultural steps for companies to drive sustainable digitisation.
- 4. Build a digital organisation with digital leadership and talent:** Digital drive and ambition should be communicated from the top down, and whilst a growing number of companies have added CDOs, individual executives must take responsibility for driving the digital imperative within their remit. Further, companies cannot afford to fall behind in the market for digital talent, and in addition to hiring individuals, may need to recruit entire teams, partner with complementary external organisations, or even pursue acquisitions to close their digital talent gap.

## Implications for government

- 1. Capture digital opportunities in the government sector:** There are four areas of digital opportunity in the government sector: (1) government interactions with citizens, (2) internal operations and processes, (3) decision making and administered spending and (4) data sharing, which are each explored in detail in the public sector chapter of this report.
- 2. Encourage participation in the digital economy:** Bridging the ‘digital divide’ within Australia’s citizenry is critical to capturing the full digital opportunity for economic growth and improved citizen experience—this can be achieved through improving infrastructure, enhancing digital skills, and unlocking innovation through greater R&D investment.
- 3. Face the challenges of legislating and shaping policy in a digital age:** Digital evolution is introducing new complexities in the areas of consumer privacy, data sharing and other legislative grey areas, such as peer-to-peer based business models (for example, Uber and Airbnb). There is an opportunity for government to better shape and guide these areas through bold and timely policy and legislation.
- 4. Track digital maturity:** As digital maturity becomes an increasingly important indicator of economic performance and the ability of Australian companies to compete globally, the Australian government should track and report it so as to better identify, target and observe progress across sectors and inform policy development.

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