Reinventing Australian enterprises for the digital economy
Report by IBM Australia incorporating new research commissioned from the National Institute of Economic and Industry Research.

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Letter from NIEIR</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Executive summary</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Section 1 – Ensuring Australia’s competitiveness in the digital economy</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Lifting productivity and competitiveness</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Entering a new era</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Section 2 – Sector analyses</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Financial services</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Retail</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Mining</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Telecommunications</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Public administration</td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>Healthcare</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Higher education</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Section 3 – Shaping success for your enterprise</td>
<td></td>
<td>64</td>
</tr>
<tr>
<td>Building a transformation agenda</td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>Methodology</td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>Endnotes</td>
<td></td>
<td>74</td>
</tr>
</tbody>
</table>
Welcome to IBM’s latest research into the impact of digital technology on business and government in Australia, and the changes that are coming in the near future.

In 2012, we looked at the macro effect that information and communications technology (ICT) – including high-speed broadband – will have on Australian industries, workplaces and society over the next 40 years. That report – *A Snapshot of Australia’s Digital Future to 2050* – revealed just how important it will be for organisations to transform the way they operate if they are to survive and prosper in the digital age.

This year, we move from the macro to the micro and look at what this digital transformation means for individual enterprises. What is at stake for organisations? What trends will determine their future? What metrics do boards, CEOs and other executives need to monitor and improve? What will success look like in an increasingly digital economy?

To answer these questions, IBM commissioned original research from the National Institute of Economic and Industry Research (NIEIR) to form a view of the future for Australian enterprises across seven key sectors: financial services, retail, mining, telecommunications, public administration, healthcare and higher education. We focused on these sectors because they make up almost half of our economy and because IBM’s previous research has shown that each will be substantially reinvented by digital technology.

This report reveals that over the next decade we will see significant gaps open up between enterprises that proactively transform their operations for the digital age and those that continue with business as usual. These gaps can quickly become worth billions of dollars in value for large companies, or can represent sharp differences in the cost and quality of public services governments deliver.

This research also makes it clear that Australia’s competitiveness will depend on getting smarter in the way we work, do business, live and govern. In fact, at IBM we think of the coming digital age as the era of “smart” – a time when success will be driven by how effectively enterprises can harness the power of technology and data to deliver unique value to customers and citizens with the speed, efficiency and ubiquity they demand.

Enterprises must act urgently and significantly change their business models to ensure they remain successful and effective over the next decade and beyond. But this is not just about survival. While NIEIR’s modelling shows that many ‘followers’ will fall behind and even fail in the digital age, it also suggests that leading organisations – those that embrace change and pursue the right strategies for this new environment – are likely to enjoy outsized gains.

I hope you find this report useful as you consider the future of your enterprise. We look forward to discussing the implications of this work with you.

Andrew Stevens
Managing Director
IBM Australia & New Zealand
I want to commend IBM for taking the initiative to commission this strategically significant research. The Australian economy is facing a period of generational change, particularly in the way Australian businesses operate and compete locally and internationally.

Information and communications technology (ICT) sits at the very heart of this business and economic transformation. The purpose of the research and modelling conducted by NIEIR is to demonstrate how important it is – for individual firms and for Australia’s economic performance – to focus on achieving best practice ICT standards. In today’s context, this also means integrating ICT at the very heart of business models and future strategies.

The outcomes from our modelling work are startling. We analysed seven sectors in detail, based on interviews with senior industry executives, a detailed review of each industry’s metrics and the performance of individual firms or organisations in each sector. We conducted further research using international best practice models. Using NIEIR’s modelling systems and economic databases, we then projected different ICT strategies based on leader and follower firms in each industry sector.

The report has important messages for individual firms and organisations, their industry associations, and the governments that provide the structures and policy environments in which they operate.

One of these lessons is that strategically integrating ICT into best-practice business models improves productivity, which in turn increases the profitability and competitiveness of individual firms. Furthermore, effective ICT strategies can open up new markets in Australia and internationally.

Each industry sector selected for the study makes a significant contribution to society and the economy. Leader firms in each sector have already improved their productivity, costs and services. As such, it is likely they will create a range of opportunities for a new generation of Australian firms to be competitive, build employment and find growth in their industries around the world.

The most striking message from this research is that it will become increasingly difficult for followers to regain their market position once they lose it to leaders that race ahead with more sophisticated customer and supply chain integration, and superior productivity. In turn, the research tells us that there is a real first-mover advantage for companies that act sooner rather than later when taking a leader position.

Dr Peter Brain
Executive Director
National Institute of Economic and Industry Research
Executive summary

M any business and government leaders recognise that digital technologies are creating significant changes in the economy and society. They have access to the internet, fixed and wireless broadband, smartphones, social media, the cloud, big data, sensors, machine-to-machine communications and now even computer systems that learn for themselves. These innovations are all reinventing the way we live and work.

Yet it remains incredibly challenging for senior executives and board members to foresee exactly how these technologies will affect their individual enterprises. In turn, this makes it hard to decide how and how much to change their strategies – especially if the organisation is currently very profitable or running smoothly.

IBM recognises this dilemma and has commissioned this report to help leaders consider the potential futures of their enterprises. It discusses how digital technologies are changing the business and government landscape, as well as the critical link between those technologies and Australia’s competitiveness. It then uses sophisticated modelling to show potential paths for enterprises in seven sectors likely to be reshaped by digital technologies. Section 3 discusses potential next steps leaders can take.

AUSTRALIA’S COMPETITIVENESS AND DIGITAL TRENDS

The rapid rise of digital technologies comes at a time when Australia’s growth in productivity is weak and its international competitiveness is slipping.

Annual labour productivity growth has languished at below 1 percent a year for the past decade, and over the same period Australia fell from being the seventh to the 20th most competitive nation in the World Economic Forum’s global rankings. While some unusual factors have affected our productivity statistics – especially the mining boom, the breaking of the drought and the fact we retained a relatively large number of jobs during the global financial crisis – various government and business leaders have acknowledged that there is an urgent need to address Australia’s productivity if we are to regain our competitiveness.

Transforming our major business and government enterprises to maximise the potential value offered by digital technologies – and to counter the threats they also present – will play an important part in reversing this slide. However, this will only happen if Australian enterprises take action and understand the fundamental changes these technologies are fuelling.
Six of the changes that are already occurring and which will become even more significant between now and 2025 are:

1. **Heavy dependence on digital technology**
   Broadband internet access is becoming faster and more ubiquitous. Cloud computing, mobile devices and other innovations are also reinventing the way businesses and governments work and relate to customers.

2. **Close connections with and between customers**
   New technologies have supported the development and adoption of social media, enabling unprecedented real-time connectivity between organisations and customers, and among customers. Technology is also making it possible for large enterprises to form more personal and tailored relationships with individual customers.

3. **Customers and employers have new demands**
   As digital technologies make it possible to deliver value, interact with customers and work anywhere at any time, individuals increasingly expect to have this constant connectivity. These expectations will shift even further as today’s children – the ‘digital natives’ – become consumers and workers.

4. **Organisations are becoming flatter and more agile**
   As information flows grow, automation increases and speed becomes critical, organisations are dismantling traditional hierarchies in favour of flat and flexible structures.

5. **Big data is changing decision making**
   Organisations are gathering and analysing more data to help them make better decisions more quickly.

6. **Sources of competition are increasing**
   Digital technologies make it easier for Australian organisations to expand nationally and internationally, and to leverage global infrastructure such as cloud computing facilities. The flipside is a sharp rise in competition within Australia, as domestic groups expand and foreign groups can more easily sell to local customers.

**MODELLING FUTURE PATHS FOR LEADERS AND FOLLOWERS**

Our research forecasts how these and other trends will affect seven key industry sectors – financial services, retail, mining, telecommunications, public administration, healthcare and higher education – which together represent approximately 45 percent of Australia’s economy. The research then shows two potential future paths for enterprises within those sectors: the path of a leader or the path of a follower (in the commercial sectors), and a business-as-usual versus an accelerated response (in the government sectors).

As information flows grow, automation increases and speed becomes critical, organisations are dismantling traditional hierarchies in favour of flat and flexible structures.

The National Institute of Economic and Industry Research (NIEIR) has mapped these paths to show how ‘gaps’ or ‘digital divides’ will open up between enterprises depending on how they adapt their business models for the digital age. The following tables list examples of these gaps for sample banks and universities. In each case, the two model enterprises start from a similar position, then their performance diverges more and more as we move towards 2025. See the Methodology for a detailed discussion of this modelling.
Financial services
Gaps between two banks based on digital strategy from 2012 to 2025.
Potential futures for two banks, each starting only slightly apart in 2012.

SALES (gross product)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$15</td>
<td>$32</td>
</tr>
<tr>
<td>Follower</td>
<td>$12</td>
<td>$17</td>
</tr>
</tbody>
</table>

MARKET CAPITALISATION

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$35</td>
<td>$69</td>
</tr>
<tr>
<td>Follower</td>
<td>$27</td>
<td>$22</td>
</tr>
</tbody>
</table>

PRODUCTIVITY (total factor)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>1.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Follower</td>
<td>1.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>
**Education**

Gaps between two universities based on digital strategy from 2012 to 2025. 
*Modelling for two mid-tier universities, each starting with 35,000 students in 2012.*

<table>
<thead>
<tr>
<th>STUDENT NUMBERS</th>
<th>Leader</th>
<th>2012</th>
<th>35,000</th>
<th>2025</th>
<th>45,608</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follower</td>
<td>2012</td>
<td>35,000</td>
<td>2025</td>
<td>36,848</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REVENUE</th>
<th>Leader</th>
<th>2012</th>
<th>$770</th>
<th>2025</th>
<th>$930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follower</td>
<td>2012</td>
<td>$648</td>
<td>2025</td>
<td>$626</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERCEIVED QUALITY</th>
<th>Leader</th>
<th>2012</th>
<th>1.0</th>
<th>2025</th>
<th>1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follower</td>
<td>2012</td>
<td>1.0</td>
<td>2025</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>
Differences in market capitalisation for sample leaders and followers by 2025.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Market capitalisation – leader in 2025</th>
<th>Market capitalisation – follower in 2025</th>
<th>GAP in 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINANCIAL SERVICES</td>
<td>$69</td>
<td>$47</td>
<td>$22</td>
</tr>
<tr>
<td>RETAIL</td>
<td>$78</td>
<td>$76.5</td>
<td>$1.5</td>
</tr>
<tr>
<td>MINING</td>
<td>$130</td>
<td>$92</td>
<td>$38</td>
</tr>
<tr>
<td>TELECOMMUNICATIONS</td>
<td>$102</td>
<td>$54</td>
<td>$48</td>
</tr>
</tbody>
</table>

**TOTAL GAP** $269.5 billion
Quantifying these gaps and then adding them together across a range of sectors starts to give a sense of the value at stake as Australia’s economy goes digital. For instance, the combined difference in market capitalisation for leaders and followers in financial services, mining, retail and telecommunications could total $269.5 billion within 13 years (see the table opposite). Put another way, by 2025 the leaders could have a combined market capitalisation of $379 billion and the followers $109.5 billion. And that only considers model enterprises from four sectors of our economy.

CHOOSING BETWEEN A VIRTUOUS CYCLE OF GROWTH OR A RAPID DECLINE

This study provides a unique lens through which to consider the potential future not only for major enterprises but for Australia as a whole. The analysis produced a number of key observations and implications, including the following points.

1. Success quickly compounds
A striking feature of our modelling is how quickly the gaps between leaders and followers grow and eventually become almost impossible for the followers to bridge. Leaders pull ahead with superior digital business models, and generate larger profits or surpluses which they then use to consolidate and extend their leads through further investment in elements such as innovation, high-quality staff and better customer service. In this virtuous cycle, small gains in early years compound to become significant differences.

2. Winners will increasingly take all
The difference between the performance of an organisation that has a suitable business model for the digital age and one that doesn’t can be so great that followers are more likely to fail completely. Alternatively, they may merge into more successful groups rather than settle into a comfortable second or third place in their marketplace. This is the consequence of the compounding benefits discussed above, and means we can expect to see more digitally driven groups like Amazon dominate a market segment, while competitors like Borders fail completely. Public sector organisations will not be immune either; where agencies’ costs become too high or their services become unattractive, governments may decide to outsource their functions to more efficient or effective private sector organisations.

3. The public sector can deliver improved services within cost constraints
For most health, education and public administration agencies, the future will involve doing more with less. However, our modelling demonstrates that this needn’t mean delivering fewer – or lower-quality – services for citizens, as long as public sector agencies can achieve a step change down in cost levels and increase their reach and effectiveness through new digital business models.

4. We face a challenge to create new high-value jobs
Australia has a long history of using technological innovations to enhance its wealth. However, this has also created a need to develop new business models and reskill our workforce to ensure we maintain high-value jobs for Australians. As our economy has become more services-oriented, it has increasingly focused on delivering higher-value services. The digital revolution will be the same. Our modelling shows that many leading enterprises will use technology and smarter business models to grow their sales or service outputs faster than they expand their workforces. In turn, we will need to develop new areas of business and increase exports to create new, high-paying jobs for Australians. The Australian Bureau of Statistics (ABS) forecasts that the number of jobs in Australia will rise from 11.6 million to 13.9 million by 2025, so our challenge is to ensure that as well as more jobs, there are more high-paying, fulfilling roles.

5. The time to act is now
This research highlights how much more change will be driven by digital technologies. The dramatic shifts we have seen in highly exposed industries such as media and music are just the beginning. We are at a tipping point between an analogue world and a digital one, and Australia’s future prosperity will depend on transforming our major enterprises to ensure they remain relevant and successful in this new era. This means ensuring we maximise the number of leading enterprises in Australia and address the shortcomings of those that might become followers. As we highlight in Section 3, by 2015 most of our major business sectors will be substantially affected by the digitisation of the local and global economy. Almost all will be heavily reshaped by 2018.
Section 1
Ensuring Australia’s competitiveness in the digital economy
Ensuring Australia’s competitiveness in the digital economy

In last year’s A Snapshot of Australia’s Digital Future to 2050, IBM and IBISWorld provided an in-depth view of how digital technologies will transform Australia’s economic and social landscape. That report found that ubiquitous, high-speed broadband, for example, would be a new utility that offered transformative and potentially positive outcomes for all but 15 of the 509 industry sectors that make up the Australian economy. It also found that the increasing influence of broadband and other technologies would make the services sector an even more significant part of Australia’s economy.

However, Australia doesn’t have a monopoly over new technologies; indeed, international comparisons show we are slipping behind in deployment and adoption. For instance, the World Economic Forum’s 2013 Global Information Technology Survey placed Australia 18th in the world for the availability, usage and impact of ICT – compared to our ranking of 17th in 2012 and ninth in 2004. This makes it critical for Australia to use our available ICT as intelligently and effectively as possible, paying particular attention to the business models we use to operate our major companies and government agencies.

In this section, we explore the productivity and competitiveness challenges facing Australia, and how our economic and social landscape will continue to rapidly change with the further spread of digital technologies. We also consider the extent to which Australian enterprises have already been transformed by digital developments, and how much further they have to go.

LIFTING PRODUCTIVITY AND COMPETITIVENESS

New business models, enabled by advances in digital technologies, offer the potential for significantly enhanced productivity in Australia’s business and government sectors. This will in turn support our capacity to maintain our international competitiveness in business, and to continue delivering high-quality services to citizens. Adopting new business models is critical, because our productivity growth and competitiveness have both been slipping in recent years.

Productivity growth trends

Australia has enjoyed phenomenal economic growth over the past 22 years. Not only have we not had a recession, our annual income per capita increased to US$59,570 in 2012 – around the fifth highest in the world. The key drivers of this prosperity have been our access to natural resources and the extraordinary prices paid for them during the mining boom, and our successful program of micro-economic reform before that.

However, the resources boom is slowing, our productivity growth has been poor over the past decade and we face the additional problem of an ageing population. The Federal Government’s 2010 Intergenerational Report predicts that the proportion of Australians over 65 will grow from just over 10 percent of the population now to more than 20 percent by 2050. This means we need those who are working to be as productive as possible.

Australia’s most recent period of strong productivity growth came in the decade from 1993 to 2003, when multi-factor productivity grew around 1.9 percent a year. The Reserve Bank has noted that this growth was supported by
our investment in personal computers. However, from 2004 to 2012 our labour productivity in particular rose only 0.6 percent a year.

To some extent, Australians were shielded from this low productivity growth (statistically speaking) by the very high levels of export earnings resulting from the commodities boom. However, the shift in our terms of trade following lower demand for commodities means that real income growth is expected to slow unless we address our productivity challenge. There are signs of productivity improving and this is clearly a current focus for a number of industries. In mining and other areas of the resources sector, the focus is on driving efficiencies. For the rest of the economy, it will mean investing in innovation and business transformation – things that have been difficult for most organisations to achieve while stuck in the slow lane of Australia’s two-speed economy.

International competitiveness
Australia’s international competitiveness has declined in recent years. The World Economic Forum ranked Australia as 20th out of 144 nations for international competitiveness in 2012–13 – down from seventh just a decade ago.

This places Australia one step above France in international competitiveness, but below our Asian neighbours including Singapore, Hong Kong and Japan; major Western economies including the United States and the United Kingdom; and other natural resources powers such as Canada and Norway. This partly reflects the growing economic power and competitiveness of Asia, which is a key region for our export sales and increasingly a rival to Australia in areas beyond low-cost manufacturing.

ENTERING A NEW ERA

A Snapshot of Australia’s Digital Future to 2050 explored the potential impact of digital technologies in coming decades. This included how our society and economy will be reshaped by the spread of fast, ubiquitous broadband combined with the rapid growth in computing power and data storage capabilities.

In the same way that previous innovations such as the steam engine and medical breakthroughs paved the way for radical social and economic changes, these digital changes are ushering in a new era. This digital age will feature the following six characteristics, which business and government leaders must understand and adapt to if their organisations are to remain relevant and competitive over the next decade and beyond.

1. **Heavy dependence on digital technology**
   Individuals and organisations now rely on digital technologies in almost every aspect of their day-to-day activities. This dependence will only become more pronounced as these tools continue to grow in power and capacity. Three of the most important of these enabling technologies are broadband, cloud computing and mobile devices.

2. **Ubiquitous, high-speed broadband**
   In Australia, the roll-out of the National Broadband Network (NBN) and the continued expansion of mobile phone networks is significantly increasing access to broadband connectivity for businesses and consumers. In addition to satellite links, it is increasingly possible for individuals to obtain a high-quality connection to the internet or other networked resources anywhere, at any time. By 2025, we expect that fast, high-quality broadband services will be available almost universally across Australia and in developed economies around the world.

Cloud computing
‘Cloud’ is a generic term that describes the practice of organisations moving from owning and operating their own computing processing and data storage facilities, to buying this capacity on demand from specialised providers. This shift is also being facilitated by the growth of broadband. Cloud computing offers buyers a range of advantages, such as allowing them to quickly adjust the amount of computing capacity they are purchasing, and move that spending from being a capital expense to an operating expense. Cloud computing also enables organisations to hold less specialist computing skills inhouse. Analyst firm Gartner predicts a 17.7 percent compound annual growth rate for public cloud services through to 2016. Small businesses will be a part of that uptake figure, because using cloud allows them to be more competitive by providing access to infrastructure and applications typically reserved for larger companies.
Ensuring Australia’s competitiveness in the digital economy

Mobile devices
The number of smartphones and tablet computers used globally is expected to surpass the total number of PCs used by the middle of 2013. These devices provide individuals with convenient and portable access to the powerful computing resources that now reside online – from social media sites and email to corporate applications. Mobile devices are a key element enabling many of the new digital business models discussed in this report – from making office employees more productive, to allowing students to watch lectures on tablets from any location.

As discussed in A Snapshot of Australia’s Digital Future to 2050, there is a range of other technologies on the horizon, which will also drive significant change. These include haptic devices that make it possible for machines to replicate our sense of touch, and holographic technologies that bring the virtual world to life in three dimensions.

2. Close connections with and between customers
As the growth of services such as Facebook and LinkedIn has shown, new technologies are changing the way people interact. This is driving rapid growth in the kinds of systems that help individuals share information and transact, directly and as part of larger groups.

Like email, these platforms are allowing people to communicate and work together in rich new ways, and at low cost. They are also cutting travel costs and breaking down traditional barriers between groups.

This shift is having a range of profound impacts on business. Importantly, these technologies are putting consumers in the driver’s seat when it comes to directing organisations’ choice of which products and services to provide. They have opened the way for an unprecedented level of connectivity – not only between enterprises and their customers, but among customers themselves. For example, customers can now use social media to give feedback on a restaurant or product, sending a message not only to the supplier but also to other customers. As a result, customers can be included at many more points in the process of designing products.

This greater level of communication between individuals is also enabling ‘collaborative consumption’, where consumers share a product or service between themselves, often mediated through an online, electronic platform. An example is the way mobile technologies are making it easier for consumers to share cars; United States (US) automakers saw demand for new cars among 18–34 year olds halve between 2007 and 2011. Author Rachel Botsman, who popularised the term ‘collaborative consumption’ in her book What’s Yours is Mine, says this is due to shifting perceptions about the nature of ownership. Today’s consumer, she says, prioritises access over ownership and much of that comes from the spread of ICT and powerful platforms that bring consumers together.

3. New expectations among customers and employees
As a result of being better connected but informed, people are coming to expect more – or are expecting organisations to offer new capabilities. In turn, they may be harder to please but also more prepared to spread the word – good or bad – to others via social media.

Customers increasingly expect companies and government organisations to be available around the clock, either through physical sites and call centres or via websites and mobile applications. They also expect value and – empowered by digital technology – can quickly check the price of a product or reports on others’ experiences.

In the workplace, employees want access to new tools such as cloud applications and infrastructure, to boost productivity and allow them to work from anywhere. Furthermore, they expect to be able to use their own smartphones, tablets and even laptops. In turn, they are pressuring organisations to adopt bring-your-own-device (BYOD) policies and develop mobile apps.

These changes are most pronounced among the ‘millennial generation’, the members of which are currently entering the workforce and becoming consumers. This is the generation of young people who grew up using social media and smartphones. They expect technology to work, and they get upset when they aren’t treated as individuals or provided with the right information and services on the right platform.

4. Fast, data-based decision making
In today’s enterprises, a reliance on gut feeling is being augmented (or replaced) by hard data. This shift is being enabled by the growth of ‘big data’ – the collection and analysis of new data sets which were previously inaccessible either because they didn’t exist or because the cost to access and process them was prohibitive. International Data Corporation (IDC) predicts the market for big data technology and services will grow at a 31.7 percent compound annual growth rate in the four years to 2016.
The combination of fast broadband and the cloud allows us to link data sets, while mobile devices and online customer interaction allow researchers to more quickly and easily collect data. New technologies also allow this data to be processed rapidly, in real time, and made available for use by analysts, decision-makers and front line staff. This makes it possible to more accurately predict behaviours, risks, maintenance requirements and causation, which in turn facilitates the targeted allocation of enterprise resources. Display technologies such as interactive dashboards – much like a car’s – provide at-a-glance insights for executives, and increasingly investors, into how a business is tracking against its objectives and competitors.

5. Changes in organisational structures and agility
Digital technology is enabling organisations to operate using flatter structures, meaning fewer layers of middle management. This is helped by modern social media and collaboration platforms that have continued the trend that began with the first corporate internal phone systems and printed directories designed to bring employees and management together.

Social modes of doing business extend to building working groups using cloud services, creating on-the-fly teams that can collaborate on pressing business opportunities or respond to threats. In the case of organisations such as global coffee maker Starbucks, this creates a matrix structure where workers and contractors (and sometimes consumers and suppliers) collaborate on projects across functional barriers and irrespective of nominal lines of reporting or traditional notions of hierarchy.14

At the same time, smart organisations are working to become more agile by combining economies of scale with the ability to evolve rapidly while quickly and effectively responding to threats and opportunities. For instance, organisations are leveraging machine-to-machine communications to automate business processes. They are also starting to implement so-called cognitive computing systems, such as IBM Watson, which can not only access a vast array of text- and image-based data to improve decision making and service delivery, but can also learn over time.

The use of intelligent and automated systems is rapidly moving beyond traditional areas such as manufacturing into fields like mining, agriculture and some service sectors. Examples include deploying remote-controlled trains at mine sites, installing sensor-driven irrigation systems on farms and using cognitive computer systems to support the delivery of complex financial advice.

6. Growth in competition

Customers increasingly expect companies and government organisations to be available around the clock, either through physical sites and call centres or via websites and mobile applications.
Section 2
Sector analyses
The financial services sector comprises banks, insurers, superannuation funds and other wealth management organisations. It employed 431,000 full-time equivalent employees in 2012 and had total annual net revenue of approximately $138 billion, generating 10.1 percent of Australia’s gross domestic product (GDP).

The industry has long been a pioneer in embracing new technologies to drive speed, efficiency and customer service. This can be seen in innovations such as automatic teller machines (ATMs), internet banking, real-time transaction settlements and computer-driven, high-frequency share trading. Financial services is now among the first sectors to implement cognitive computing systems.

We expect the financial services sector to maintain robust growth from now to 2025, but that declining margins will force institutions to find significant revenue growth and productivity gains to maintain shareholder returns.

According to the Nielsen Global Survey of Investment Attitudes (2012), 70 percent of Australian consumers had used the internet for banking services or investment transactions in the past three months, and 14 percent had used mobile banking. Uptake was even higher among younger consumers; 40 percent of respondents aged 21–29 years had used mobile banking services in the past three months.

These dynamics will be reinforced and accelerated over the next decade as today’s children and young adults – the digital natives raised with the internet – become new financial services customers. They will also take on new dimensions. For example, the internet is making it possible for individuals to borrow directly from investors without the help of a bank. An example of this peer-to-peer lending is Society One, an Australian group that has surpassed $1 million in loans, adopting a similar model to larger overseas groups such as the Lending Club in the US. This amount is tiny relative to the more than $2 trillion currently lent by banks in Australia, but it highlights how digital technology is continuing to open new possibilities.
New competitors
We also expect to see an increase in competition. North American and European groups will regain their strength after the global financial crisis, and new players will emerge in Asia. But the most dangerous threats are likely to emerge from other sectors, in the form of airlines, utilities and supermarkets that are offering more financial services.

Global players with new business models – like PayPal and Google – will also become larger threats, as will major mobile device manufacturers such as Apple and Samsung.

Global players with new business models – like PayPal and Google – will also become larger threats, as will major mobile device manufacturers such as Apple and Samsung.

This impending rise in competition and shifts in technology are all expected to place pressure on the fees and interest margins that Australian financial institutions can charge. For the purposes of our modelling, we forecast that real fee income generated by financial institutions will decline by 3.8 percent a year on average from now to 2025. In practice, we expect that fees for some transactions will fall very sharply, but that institutions will find profits in areas where they can add significant and unique value.

This may seem to be a radical contention. While Australia’s four major banks have recently seen some falls in fee income from consumers, they have secured increases from business customers. In 2012, bank fees from households declined 0.3 percent to $4.1 billion but fees from business customers rose 7.0 percent to reach $7.3 billion.18 Even so, sectors that are highly electronic and exposed to competition from new online players and new internet technologies – such as music and media in the past – have experienced profound falls in income.

In finance, we saw share broking commissions fall heavily at the consumer level.

Net interest income as a percentage of net assets is also expected to fall as competition rises. We forecast this to decline by 4.7 percent a year, bringing Australian banking back from having some of the highest interest rate ‘spreads’ in the world and more towards global norms. In wealth management, trends towards self-managed super funds will also put pressure on the major funds to show that their fees and net interest margins are competitive.

Working smarter
These income declines will force organisations to find ways to cut costs and increase productivity. A key tool for achieving this will be to further increase the use of electronic channels, such as mobiles and tablets, as a way to reach customers cost-effectively and sell a wider range of products. This can already be seen, for example, in the fact that NAB’s face-to-face interactions with customers declined by 16 percent from 2009 to 2012, and in the bank’s plans to increase the number of its internet-based, self-service products from 10 to 100.19

Another key shift will see financial institutions seek to simplify interactions for customers – such as streamlining loan applications and financial advice – by reengineering processes and increasing the amount of intelligence embedded in their systems. Institutions will also continue to enhance their ability to use customer and market data to tailor offers to customers at the right time, and to better cross-sell products and services.

These are areas where we expect to see new cognitive computing systems play a key role. These systems can absorb and analyse large amounts of disparate information about customers and the marketplace, so institutions can provide faster, more personalised and more accurate services. A simple example that is already available is the ability to prefill forms for customers, using information that the institution has within its systems. These next-generation computing systems will also be used to augment financial advice.
Financial services

We expect to see banks and other institutions maintain significant branch networks but they will be reconfigured to smaller outlets that deliver complex or specialised services.

Internally, financial institutions will continue to reconfigure their operations to cut costs and move from fixed to variable expenses. For instance, the Commonwealth Bank has moved much of its computing infrastructure requirements to third-party cloud-based providers. The bank’s Chief Information Officer, Michael Harte, has said that core IT infrastructure spending now makes up 26 percent of the bank’s $1.6 billion annual technology budget. Infrastructure spending previously took up three-quarters of this budget.20

Australia’s major financial institutions are also outsourcing some process and customer contact work to local and offshore providers, to manage costs and improve customer service. This will help banks, for instance, drive their cost-to-income ratios from around 45 percent to below 40 percent by 2025.

Another significant transformation in coming years will be the breaking down of silos between the many divisions within financial institutions, to drive true integration across enterprises. Those organisations with international operations will also seek to create standardised regional or global operating platforms. This will drive further efficiencies and help institutions realise more value from the many process and technology improvements they have already made. It will also be critical to their ability to keep pace with global competitors and new entrants, many of which have been built from the ground up for the internet era.

We expect to see banks and other institutions maintain significant branch networks but they will be reconfigured to smaller outlets that deliver complex or specialised services. For this reason, branches are still a significant part of our capital spending assumptions. This approach will allow Australian institutions to retain two of their key sources of competitive advantage: strong brands and the ability to offer customers ‘real world’, personalised services.

Outlook for leaders and followers

The leaders in the new business environment that emerges over the next decade will be those financial institutions that can make the required investments and manage the risk associated with transitioning from analogue to ‘digital first’ business models.

Leaders have closer customer relationships and a lower cost base, and they successfully grow their transaction businesses in a way that delivers superior customer insights and opportunities for new products. They will be able to withstand competition from new players that arrive in this market, without legacy commitments such as paper-based business processes, large teams and significant capital investments in bricks-and-mortar facilities.

To achieve this, leaders will use digital tools to strip legacy costs out of their business. Figure 2.1.1 shows the potential performance of a bank that successfully pursues a digital transformation agenda over the next 12 years. This would involve effective action on the factors described above, and could be expected to deliver results that include:

- increasing revenue from $15 billion to $32 billion (in today’s dollars), an annual growth rate of 5.7 percent
- growing market capitalisation from $35 billion in 2012 to $69 billion in 2025
- boosting productivity growth from 1.6 percent to 2.7 percent per annum
- reducing building and capital equipment assets by 1.0 percent a year
- increasing ICT and research capital assets by 12.6 percent a year.

The future looks very different for those institutions that don’t make substantial changes to their business models. Figure 2.1.1 compares the same performance measures listed for the successful enterprise above with one that starts slightly weaker and then steadily falls even further behind as it fails to effectively change its business model.
Leaders have closer customer relationships and a lower cost base, and they successfully grow their transaction businesses in a way that delivers superior customer insights and opportunities for new products.
# Financial services

Gaps that emerge between leading and following financial institutions from 2012 to 2025, based on pursuing different business models in the digital economy.

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th>Follower</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SALES</strong> (gross product)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$billion (2012)</td>
<td>$15</td>
<td>$12</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>$32</td>
<td>$17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th>Follower</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRODUCTIVITY</strong> (total factor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>1.56</td>
<td>1.03</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>2.7</td>
<td>1.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th>Follower</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICT AND RESEARCH CAPITAL STOCK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$billion (2012)</td>
<td>$1.9</td>
<td>$1.9</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>$8.9</td>
<td>$3.0</td>
</tr>
</tbody>
</table>
### PROFITABILITY (net surplus as % of net assets)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>3.7%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Follower</td>
<td>3.7%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

### MARKET CAPITALISATION ($billion)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$35</td>
<td>$69</td>
</tr>
<tr>
<td>Follower</td>
<td>$27</td>
<td>$22</td>
</tr>
</tbody>
</table>

### COST MARGIN (Ratio)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>0.67</td>
<td>0.63</td>
</tr>
<tr>
<td>Follower</td>
<td>0.67</td>
<td>0.85</td>
</tr>
</tbody>
</table>
The internet continues to drive significant change and open up new sources of competition for retailers, but they must innovate to remain successful.

Consumers gain more power, category boundaries blur, all retailers effectively go online, and major players blend the strengths of online and bricks-and-mortar facilities.

The fortunes of two model retailers that both start with $25.5 billion in revenue in 2012 quickly diverge. By 2025, the leader has $106.2 billion more in sales, sells 40 percent of its goods online and delivers a 34.4 percent higher return on capital for shareholders.

Digital technologies have already transformed the retail industry – and the process is by no means finished. Online retail continues to grow quickly. Consumers are becoming even more informed and empowered. Competition is fierce and increasing from all corners of the world. Categories are blending and whole market segments are being reinvented. In some cases, the boundary between wholesaling and retailing is disappearing.

However, there are still significant growth opportunities for Australian retailers, provided they can transform their business models to suit today’s operating environment – and the fast-evolving digital environment that is coming over the next decade and beyond. While digital channels will become even more vital, bricks and mortar will remain highly relevant.

There are still significant growth opportunities for Australian retailers, provided they can transform their business models.

The successful major retailers of 2025 will have reinvented themselves compared to the way they did business at the turn of the century. They will have transformed from product-centric businesses to truly customer-centric enterprises. They will have moved beyond the multi-channel approach, fully integrating their digital and bricks-and-mortar assets into a seamless, omni-channel experience for their customers.

By contrast, the retailers that don’t adapt and transform their business will struggle. As time passes, they will fall further behind the leaders by every key measure. What’s more, catching up will become more difficult as their antiquated operating models will cause cost structures to balloon.

Our modelling for this sector is based on these two extreme but realistic scenarios.

Towards the omni-channel model
A dominant new retail business model is emerging for major retailers. This model takes the strengths of digital and traditional models, and melds them into an omni-channel model that can cater for the consumer’s every whim.

Under this model customers will, for example, be able to quickly access product information online, make informed decisions, and either locate nearby stores or buy online and pick up goods from a convenient distribution centre. Where permitted, retailers will analyse data gathered through interactions to provide relevant experiences to their customers. Groups such as Tesco are pioneering this approach in the United Kingdom (UK) and major Australian supermarkets are already moving down the same path.
An example is the Woolworths Click and Collect online service, which offers shoppers three options: direct delivery, ‘click and collect’ at 84 supermarkets nationally, or a new drive-through service.

The new model will have far-reaching consequences. Large, monolithic supermarkets and department stores look set to be replaced by a greater number of smaller, conveniently located distribution centres that offer drive-through facilities, parking or both. These networks of smaller stores will be backed by sophisticated warehouse systems.

The showroom of the future
At the same time, bricks-and-mortar showrooms will remain important for many consumers and retail segments. This includes consumers who browse products instore but then purchase online, sometimes from a different retailer. Currently, these ‘showroomers’ account for only a small proportion of all shoppers, but their influence is growing. Nearly half of all online purchasers are showroomers and 65 percent of them plan to buy online for their next purchase.21

Clearly, the online retail industry is largely fuelled by shoppers who first visit a store to view products. However, rather than seeing showrooming as a threat, omni-channel retailers will take advantage of mobile device capabilities to improve consumers’ instore experience.

Retailers’ mobile apps and other instore digital technology are taking hold in markets such as the US and UK. In Australia, retailers would like to allow their customers to integrate mobile, social and other internet-enabled technologies into their bricks-and-mortar experience. To complement this approach, omni-channel retailers may move towards smaller showrooms in more locations to actively encourage showrooming – with the aim of capturing sales directly in those facilities or through their online channels at a later point.

The rewards for retailers will be considerable; multi-channel shoppers generate 20–25 percent more profit than the average single-channel customer. The large part of it all – online
While bricks and mortar will still be important for many retailers – to varying degrees – there will be a few universal trends: digital channels will become even more vital, and online shopping will continue to grow quickly.

As time-poor consumers change their shopping habits, online will become an integrated part of all shopping experiences. Retailers that are predominantly bricks and mortar with a complementary website will need to transform into omni-channel retailers.

The effects of omni-channel retail on the retail operating model will be dramatic. Pricing will become more transparent. Flexibility will be vital, because retailers will need to make changes much more regularly than in physical stores. The retailer’s maxim of presentation and price will take on a new meaning.

Scale will also gain a new meaning. Retailers will expand even further across geographic boundaries and categories, as the major grocery chains have already done by selling credit cards, petrol and liquor, for instance. More than that, the whole concept of retail will change, as the border between retailing and wholesaling melts away and the new omni-channel model is adopted.

The customer-centric enterprise
The omni-channel retailer will be able to cater for – and attract – consumers no matter how or where they shop. This will require many retailers to comprehensively alter their structures and attitudes. While everyone knows the customer is king, it’s another thing to have the determination, discipline and resources to transform from today’s product-focused retailer into a customer-centric enterprise.

However, this shift will become critical. With some notable exceptions, where regional distribution is still enforced, consumers will have the flexibility to purchase at any time and increasingly from anywhere. In a sense, any digitally enabled retailer anywhere in the world that is equipped to distribute to Australia will become a new entrant in our marketplace.

As well as being better informed and more empowered, customers are becoming more sophisticated. Consumers who are used to dealing with Amazon and online retailers that have powerful recommendation engines expect more and more personalisation. These large online retailers provide a rich, consistent experience by deeply understanding each of their customers, so consumers lose patience when the shopping experience with traditional retailers is fragmented, impersonal and inconsistent across channels.

By contrast, the omni-channel retailer will be able to offer a consistent, highly personalised shopping experience integrated across all channels – in real time.

Retooling for the future
To move towards this new model, major retailers will need to invest heavily over the next decade – in both bricks and mortar, and in information technology
as they increase their digital presence. In fact, leading companies are already significantly increasing their capital investment to retail sales ratios. A large part of this investment involves reconfiguring bricks-and-mortar stock so that it is compatible with the retailer’s online channel.

Companies with assets that are compatible with this model – or those that have the cash flow to secure the necessary assets quickly – will have a big advantage. Others are taking steps now to help them restructure for the future. Tesco, for example, recently wrote down the value of its property portfolio by £800 million because it had invested in real estate for stores that it now says will never be built.24 It is finding many of its customers order online and pick up at a convenient local, smaller store, or have their groceries delivered.

Investment in technology will also be critical to streamlining and enhancing every link in the retail supply chain, from the online customer experience – including mobile interactions – to delivery or pickup. Analytics have been a key part of retailing for some time, but will become even more important as the increased use of online and cashless transactions generates huge volumes of data. Woolworths, for example, recently acquired a 50 percent stake in data collection company Quantium to help advance its data collection and analysis capabilities.

The omni-channel retailer will need strong customer relationships and will have to better anticipate customer desires. Big data will be important for gaining a competitive advantage, enabling retailers to maximise clicks and transactions by better understanding their customers, operations and supply chains. Technology investment will also be critical in increasing efficiencies in the back-office, supply and warehousing network.

The need to invest and restructure is urgent because doing so later will become much more difficult. As time goes by, the leading retailers will move further ahead, while those left behind will struggle with ballooning cost structures and falling customer satisfaction.

Exposed segments
The evolution of retail is progressing at varying rates, with some segments such as books and music already feeling the full effects of market transformation. Others, such as supermarkets and big-box retailers, are yet to feel the full impact but are ripe for change.

The days of only ‘going shopping’ at a supermarket will disappear as some time-poor consumers take up the option of making their everyday purchases on tablets or mobile phones. Consumers may still have their favourite supermarket and price will be a factor in their choice, but so too will be the convenience of interacting with the virtual supermarket.

Similarly, retailers of electronics, homewares and office supplies will become vulnerable as the big-box model changes. Currently, these goods are based almost solely on low prices. However, the next-generation big-box approach will strip out large floor areas and replace them with direct delivery from the warehouse.

Meanwhile, as major bricks-and-mortar retailers restructure and become more competitive, online-only enterprises will need to keep innovating to maintain their edge, either by having the best price, offering home delivery, developing physical presences or partnering with groups that can provide them with distribution capabilities.

OUTLOOK FOR LEADERS AND FOLLOWERS
To model potential future paths for major enterprises in the retail sector, we take the example of two $25.5 billion-a-year retailers, where one has a head start in a few key areas. For example, the leading group already secures 11 percent of total sales through online channels, compared with the follower company’s 4 percent. The leader is also investing approximately $1 billion a year in business assets – double that of the follower.

However, assuming the leader will at least maintain this momentum, it will surge further ahead of the less progressive retailer across every key indicator. Figure 2.2.1 shows the potential metrics for a retailer that successfully adopts the new model and embraces the digital side of its business.

Under these conditions, the leading retailer could be expected to deliver results in 2025 that include:
• sales of $123.9 billion (in today’s dollars), based on 12.9 percent annual growth
• 11.6 percent annual growth in fixed assets, increasing the company’s assets to $37.8 billion (in today’s dollars)
• 18.5 percent annual growth in investment, to reach $9.2 billion a year (in today’s dollars)
• a rise in gross operating surplus of 15.3 percent per annum to $15.6 billion
• an increase in gross return on capital stock from 26.9 percent in 2012 to 41.3 percent.

Apart from growth in sales, the measures here show the increases in investment and fixed assets. However, this assumes the leader continues to invest wisely in technology and to reconfigure its bricks-and-mortar stock. The following metrics will be indicative that the company is on the right track in 2025:
• online sales comprising 39.8 percent of total sales, after an annual growth rate of 10.4 percent
• sales per square metre of retail space increasing 61 percent compared to 2012
• technology capital increasing by a multiple of 9.8 compared to 2012
• staff numbers increasing 8.4 percent per annum, to a total of 215,670 employees.

By comparison, the follower retailer hangs on for too long to its old bricks-and-mortar business model and continues to lose ground to the more progressive leader. It may still see customers in its stores but the question is whether they are buying or just looking prior to buying online from another retailer. As the follower attempts to offer products similar to those of the leader to keep its customer base, its outdated operating model will introduce higher costs, which will make it harder to deliver competitive prices.

If the follower still exists as a stand-alone entity in 2025, our modelling forecasts that it would be more than $100 billion (in today’s dollars) behind the leader in terms of sales, $33.4 billion behind in its fixed asset position and employing more than 169,000 fewer staff. These differences are shown in detail in Figure 2.2.1.

Figure 2.2.1: Retail sector performance measures – leader and follower

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–25 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total sales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>25,515</td>
<td>123,913</td>
<td>12.9</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>25,515</td>
<td>17,674</td>
<td>-2.8</td>
</tr>
<tr>
<td><strong>Cost composites</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>16,840</td>
<td>109,811</td>
<td>15.5</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>17,350</td>
<td>16,780</td>
<td>-0.3</td>
</tr>
<tr>
<td>Goods and services costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>3,470</td>
<td>17,493</td>
<td>13.3</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>3,266</td>
<td>2,348</td>
<td>-2.5</td>
</tr>
<tr>
<td>Wages and salaries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>2,760</td>
<td>13,095</td>
<td>12.7</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>3,312</td>
<td>2,822</td>
<td>-1.2</td>
</tr>
<tr>
<td>Gross operating surplus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>2,445</td>
<td>15,614</td>
<td>15.3</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>1,587</td>
<td>303</td>
<td>-12.0</td>
</tr>
<tr>
<td>Total revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>25,515</td>
<td>156,013</td>
<td>14.9</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>25,515</td>
<td>22,253</td>
<td>-1.0</td>
</tr>
<tr>
<td><strong>Factor inputs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed assets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>9,073</td>
<td>37,765</td>
<td>11.6</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>7,258</td>
<td>4,357</td>
<td>-3.8</td>
</tr>
<tr>
<td>Employment (FTE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>Number</td>
<td>76,000</td>
<td>215,670</td>
<td>8.4</td>
</tr>
<tr>
<td>Follower</td>
<td>Number</td>
<td>91,200</td>
<td>46,473</td>
<td>-5.1</td>
</tr>
<tr>
<td>Investment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>$million (2012)</td>
<td>1,018</td>
<td>9,202</td>
<td>18.5</td>
</tr>
<tr>
<td>Follower</td>
<td>$million (2012)</td>
<td>509</td>
<td>205</td>
<td>-6.8</td>
</tr>
<tr>
<td>Gross return on capital stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader</td>
<td>%</td>
<td>26.9</td>
<td>41.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Follower</td>
<td>%</td>
<td>21.9</td>
<td>6.9</td>
<td>-8.4</td>
</tr>
</tbody>
</table>
Gaps that emerge between leading and following retailers from 2012 to 2025, based on pursuing different business models in the digital economy.

<table>
<thead>
<tr>
<th></th>
<th>TOTAL SALES</th>
<th>ONLINE SALES SHARE</th>
<th>TECHNOLOGY INNOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$million (2012)</td>
<td>%</td>
<td>Index</td>
</tr>
<tr>
<td>Leader</td>
<td>$25,515</td>
<td>11.0%</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>$123,913</td>
<td>39.8%</td>
<td>9.8</td>
</tr>
<tr>
<td>Follower</td>
<td>$25,515</td>
<td>4.0%</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>$17,674</td>
<td>21.6%</td>
<td>1.4</td>
</tr>
</tbody>
</table>

2012-2025
## GROSS OPERATING SURPLUS

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>$million</td>
<td>$2,445</td>
<td>$15,614</td>
<td>$1,587</td>
<td>$303</td>
</tr>
</tbody>
</table>

## REVENUE PER CUSTOMER

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>Index</td>
<td>1.0</td>
<td>2.4</td>
<td>1.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

## EMPLOYMENT (FTE)

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>Number</td>
<td>76,000</td>
<td>215,670</td>
<td>91,200</td>
<td>46,473</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>$million</td>
<td>$2,445</td>
<td>$15,614</td>
<td>$1,587</td>
<td>$303</td>
</tr>
</tbody>
</table>

## REVENUE PER CUSTOMER

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>Index</td>
<td>1.0</td>
<td>2.4</td>
<td>1.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

## EMPLOYMENT (FTE)

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th></th>
<th>Follower</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2025</td>
<td>2012</td>
<td>2025</td>
</tr>
<tr>
<td>Number</td>
<td>76,000</td>
<td>215,670</td>
<td>91,200</td>
<td>46,473</td>
</tr>
</tbody>
</table>
Mining will shift its focus from building capacity to driving efficiencies and performance in production and exploration.

A new generation of managers will drive a step change in business models, making much more use of digital technology such as data analytics, tools for operating mines from remote locations, and systems for improving visibility and agility from pits to final customers.

The model leader and follower enterprises each start with revenues of $8 billion in 2012. By 2025, the leader has more than twice the sales, almost triple the profitability and more than three times the market value of the follower.

We expect to see the construction boom give way to a ‘digital boom’ as mining companies seek to work smarter to remain competitive and wring maximum value from their assets.

**FORECAST FOR SECTOR**

**A focus on efficiency**

The mining industry is highly cyclical. In this cycle, periods where demand exceeds supply result in expansion and new project investment. Supply builds as marginal operations are brought into production – or brought back into production in response to higher prices. As supply and demand come into balance, prices typically level and then dip. This exposes higher-cost operations, making them marginal or uneconomic.

For these reasons, the industry revolves around two basic phases: a capital investment phase and a capital efficiency phase. The recent passing of the leadership baton at the world’s major mining houses is symptomatic of the passage from the investment to the efficiency phase for much of the Australian mining sector. The immediate impact will be a reining in of capital expenditure; new investment will cease (except for very low-cost operations where the additional capacity will not result in a negative demand–supply impact), overheads will be severely pruned and companies will seek other low-risk cost reductions.

This phase will see the most pronounced digital transformation. In fact, we expect to see the construction boom give way to a ‘digital boom’ as mining companies seek to work smarter to remain competitive and wring maximum value from their assets.

For example, mining groups are already implementing systems to gain better visibility of their supply chains and improve their ability to respond to customer needs. This is allowing them to optimise profit margins in line with fluctuating demand, exchange rates,
extraction costs and market prices, rather than only raising production. It also addresses a shift in the global mining sector that is coming with the vertical integration of traditionally separate mining and commodity trading businesses (such as Glencore and Xstrata), significant changes in buying behaviours from long-term contracts to short-term and spot contracts, and the growth of liquidity in global ore commodity trading.

These changing market behaviours are driving a change in focus from ‘pit to port’ to ‘pit to pay’, and forcing new thinking to balance dynamic short-term and strategic long-term resource exploration, extraction and shipping options. Mining groups are also increasing data gathering and analysis to optimise their operations and make it possible for management teams to predict and pre-empt events.

Another trend is automation, which includes remote monitoring and management. By 2025, driverless and remote operations will be mainstream for larger operations. Sensors and new drilling techniques will also mean resource bodies are understood and modelled in multiple dimensions in real time. Waste will be minimised and equipment use will be optimised.

In some cases, mines will not be seen, but will be operated remotely underground through small portals that automated equipment can enter. Further, automation, sensing and modelling will cease to be individual processes and will become fully integrated mine management systems. These will be operated by people with higher skill levels who live in cities that act as hubs for innovation and skill development.

Rio Tinto has been prominent in promoting remote operations, automation and robotics to enhance productivity. It operates aspects of its Pilbara mines from a remote operations centre in Perth. It has also introduced driverless trucks and is preparing to introduce driverless trains. Other mining companies have been deploying sensing technology to better distinguish between valued minerals and waste during mining production.

The globalisation of markets for products such as iron ore will also drive the introduction of more mature commodity trading approaches. As the system comes to revolve around dynamic market-based pricing, arbitrage strategies and spot markets, mining companies will need to implement more advanced planning, supply chain management and trading systems.

Mining companies will also pay extensive attention to their back-end operations and seek to further reduce costs through standardisation, as well as creating more shared service centres. Combined with data analysis initiatives, the goal will be to create truly globally integrated enterprises that are efficient and highly responsive to changes in market conditions.

**Exploration challenges**

The next decade will be particularly challenging for mining because new resource deposits are becoming harder to find, more remote, costlier to extract, more complex and often lower in quality. The industry needs to deal with these issues in the face of greater scrutiny from governments and stakeholders about how its operations affect communities and the environment.

Geophysical sensing will also allow operations to explore near misses, and multiple deviation holes will allow a deposit to be mapped without the need for multiple drill holes and the associated ecological and social costs incurred when drilling under lakes or other sensitive sites, including cities.
Driving transformation

Another major challenge for the mining sector will be adjusting its business culture in terms of the performance indicators used to guide and incentivise managers, as well as less tangible factors such as the extent to which companies are prepared to trust digital technologies.

In moving from a capital expansion to a capital efficiency phase, the industry will find that, by and large, it will be doing this with a generation of junior and middle managers who have only known an environment of growth. This same generation of leaders will need to drive a digital transformation period that will move into full swing over the next two to three years.

Managers will need to adjust and adapt their thinking. This will require a staff development effort at a time when managers will also be dealing with cost reductions, labour relations issues and threats to the viability of some operations.

Most significantly, these managers will often be starting with mine technology systems that date back to the 1990s or before. As the mining industry’s dependence on digital technology grows, mining companies may also need to acquire more telecommunications capacity. In particular, there will be a growing need for advanced trunk line capacity that extends to distant mine sites and allows the industry to expand productivity through automation and remotely controlled operations.

Outlook for leaders and followers

Larger global mining firms have the people, skills and capital to lead digital transformation in the sector. They are investing in innovations for the future but face a challenge in bringing their people with them along the digital transformation path. Smaller organisations will struggle to find the capital and the people, although it will not be impossible for them to be close followers due to the distribution of knowledge throughout the sector.

The followers will be those that lack vision in the investment and efficiency cycle, and have less capital and fewer people. Limited access to communications infrastructure will put them at an additional disadvantage. Followers will not reap the full cost benefits of digital technology, which will in turn move them higher up the cost curve. Depending on where they started, they will lose profitability, markets or both. Increasing use of technology – and the need to access hard-to-reach deposits – will raise barriers to entry, enhancing the position of the market leaders.

Between 2012 and 2025, we forecast that the mining sector as a whole will experience:

- sales growth of 4.3 percent a year, from $211 billion to $363 billion (in constant 2012 dollars)
- strong growth in technology investment, which rises 6.9 percent a year from $4.0 billion to $9.5 billion
- modest growth in exploration investment and a 4.7 percent a year fall in investment in construction, plant and equipment as miners move from building to production
- a 2 percent a year fall in total employment, from 298,000 positions to 229,000
- a 1.9 percent a year fall in real returns on capital after depreciation, from 18.4 percent to 14.2 percent.

CASE STUDY: MINING WITH BIG DATA

Australia’s Information Communications Technology Research Centre of Excellence NICTA is leading one project that is paving the way for applying big data techniques to existing data sets. It will use data-related and machine learning to discover new insights in the field of natural sciences. The project will combine publicly available geological data from Geosciences Australia with technology used to predict stock market movements, to help picture what Australia was like 1.5 billion years ago and how its rich mineral deposits were formed.27

Professor Dietmar Muller from the University of Sydney will lead the geosciences, earth dynamics and tectonics component of the project. “Part of the exciting potential of this project is that by applying algorithms used to predict stock market movements to the detailed data sets we have on Australia’s geology, we hope to uncover regions with the highest likelihood of having mineral deposits buried hundreds of metres under weathered rocks.” These deep deposits would otherwise be inaccessible or uneconomic to explore using conventional surface or exploratory drilling techniques.
To model the potential paths for a leader and follower, we start with two major mining companies with sales of just over $8 billion in 2012. The leader already enjoys lower costs on most fronts, has slightly higher gross profits ($2.7 billion compared to $2.2 billion a year for the follower) and invests almost twice as much in assets as the follower ($3.3 billion compared to $1.7 billion per annum). The leader builds on these strengths by investing in streamlined processes, optimising its supply chain and sales effectiveness, and exploiting technologies to automate its mining operations and improve the success rate of its exploration activities.

The effectiveness of this strategy can be seen in the gap that opens between the leader and follower over the next 13 years. By 2025, the leader has:
- more than double the sales, at $23.7 billion compared to $11.6 billion for the follower (in 2012 dollars)
- almost triple the gross profits, at $10 billion compared to $3.5 billion (nominal)
- more than twice the debt, at $45.2 billion compared to $17.4 billion (nominal)
- more than triple the market capitalisation, at $129.7 billion compared to $38.1 billion (nominal).

Further detail is shown in Figure 2.3.1.

Larger global mining firms are investing in innovations for the future but face a challenge in bringing their people with them along the digital transformation path.

### Figure 2.3.1: Mining sector leader vs. follower

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–2025 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sales</td>
<td>Leader $million (2012)</td>
<td>8,037</td>
<td>23,720</td>
<td>8.7</td>
</tr>
<tr>
<td></td>
<td>Follower $million (2012)</td>
<td>8,037</td>
<td>11,574</td>
<td>2.8</td>
</tr>
<tr>
<td>Total gross profits</td>
<td>Leader $million</td>
<td>2,733</td>
<td>9,977</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>2,151</td>
<td>3,466</td>
<td>3.7</td>
</tr>
<tr>
<td>Total debt</td>
<td>Leader $million</td>
<td>5,835</td>
<td>45,239</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>7,304</td>
<td>17,375</td>
<td>6.9</td>
</tr>
<tr>
<td>Market capitalisation</td>
<td>Leader $million</td>
<td>49,967</td>
<td>129,705</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>34,221</td>
<td>38,124</td>
<td>0.8</td>
</tr>
<tr>
<td>Fixed assets, exploration and technology</td>
<td>Leader $million (2012)</td>
<td>36,598</td>
<td>54,125</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>Follower $million (2012)</td>
<td>31,718</td>
<td>21,970</td>
<td>-2.8</td>
</tr>
<tr>
<td>Employment (FTE)</td>
<td>Leader Number</td>
<td>3,256</td>
<td>3,810</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Follower Number</td>
<td>3,831</td>
<td>3,017</td>
<td>-1.8</td>
</tr>
<tr>
<td>Gross return on fixed, technology and exploration assets</td>
<td>Leader %</td>
<td>9.7</td>
<td>13.3</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Follower %</td>
<td>8.8</td>
<td>12.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Mining

Gaps that emerge between leading and following miners from 2012 to 2025, based on pursuing different business models in the digital economy.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SALES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$million</td>
<td>$8,037</td>
<td>$23,720</td>
<td>$8,037</td>
<td>$11,574</td>
</tr>
<tr>
<td><strong>GROSS PROFITS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$million</td>
<td>$2,733</td>
<td>$9,977</td>
<td>$2,151</td>
<td>$3,466</td>
</tr>
</tbody>
</table>
### MARKET CAPITALISATION

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$49,967</td>
<td>$129,705</td>
</tr>
<tr>
<td>Follower</td>
<td>$34,221</td>
<td>$38,124</td>
</tr>
</tbody>
</table>

### FIXED ASSETS, EXPLORATION AND TECHNOLOGY

<table>
<thead>
<tr>
<th></th>
<th>2012 (2012)</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$36,598</td>
<td>$54,125</td>
</tr>
<tr>
<td>Follower</td>
<td>$31,718</td>
<td>$21,970</td>
</tr>
</tbody>
</table>
Telecommunications

The telecommunications industry is expected to continue growing sales by 4.1 percent a year, but faces challenges in achieving an adequate return on investment.

The largest enterprises in the Australian sector are Telstra, SingTel Optus and Vodafone. Other market players include large mid-tier providers such as iiNet and TPG Internet; numerous smaller firms; and more recently the Australian Government, which is re-establishing a direct presence through its construction of the NBN.

Leaders will be those that can meet expectations for network performance, expand value-added services and leverage big data, while controlling costs.

The model leader and follower enterprises each start with sales of $15 billion in 2012. By 2025, the leader is more than twice as profitable and has a $53 billion greater market capitalisation.

The telecommunications industry is key enabler of the new economy, and is being reinvented by the digital technologies it supplies. These range from internet connectivity, mobile phones and satellite links, to cloud computing capacity and tools that help individuals and businesses enhance their security in the virtual environment.

The fastest growth has been in mobile devices; there are now three times more mobile broadband users (2.1 billion) than fixed broadband users (688 million).
This is why the telecommunications industry often struggles to gain an adequate return on investment. Current business models rely on growth in connections – rather than data transmission – for growth in profitability. One recent study of 78 operators internationally (which collectively invested US$200 billion a year) found their return on investment was 3 percent below the cost of capital. The Australian industry largely mirrors this global picture, with the volume of data downloaded increasing by 52 percent in the year to June 2012.

Telstra has achieved strong returns in recent years and its long-term arrangement with NBN Co will give it a 30-year cash flow for the use of infrastructure and the disconnection of copper wire services. Other providers, notably SingTel Optus and Vodafone, have faced slowing revenue from mobile services, with profits and shareholder returns down as a result. The industry has seen a number of mergers and acquisitions, reflecting a maturing sector and an effort to retain profitability through consolidation. We expect the industry to continue down this path, with the number of entities falling by about another 15 percent by 2025.

Telstra has responded to the maturing market with a multi-pronged strategy focused on enhancing customer relationships, improving cost efficiency by simplifying processes, and offering new value-added services. Reducing the cost to serve customers has considerable potential for lowering the overall cost base and, through the use of digital innovations, improving customer service. To do this, Telstra is developing a range of self-serve apps and crowd-sourcing strategies to help it understand and efficiently respond to customer inquiries, issues and concerns.

The company is also using digital technology to improve its internal operations and efficiency.

SingTel Optus has a similar strategy to Telstra, although it has a predominantly mobile focus in the Australian market and is supported through its group’s operations in the growth markets of Asia and Africa. For the future, the company is focused on attracting and retaining customers by offering an improved experience, a quality 4G network in capital cities, lower costs, and enterprise solutions for business and government customers.

In summary, Australia’s telecommunications industry is facing a dilemma familiar to others around the globe. Demand for data, driven by new devices and new content, is fueling the need for ever-larger pipes to deliver data-intensive content such as video. At the same time, any failure to meet expectations can lead to a rapid loss of market share, as Vodafone recently discovered when its mobile network investment fell behind that of Optus and Telstra.

However, this infrastructure is expensive to provide, and returns can fall short of the cost of capital. To date, the business model has been based on selling more connections, but the slowing rate of increase in connections means this model cannot deliver the income growth required to meet future customer and shareholder expectations. The industry may also see constrained revenue from services such as mobile roaming and excess data usage as it seeks to offer consumers greater certainty and reduce dissatisfaction from ‘bill shock’. These factors are all creating significant pressure for telecommunications providers to transform their operations.

Future paths

The telecommunications business model will evolve in two key directions: providers will further reduce the cost of delivering a retail fixed-line service and an integrated mobile service; and they will provide add-on services that compete with independent vendors and are often delivered in conjunction with clients and third-party partners. In the process, the nation’s fixed and mobile networks – and the increasingly intelligent systems operated by telecommunications carriers – will become something of a smart middle layer within Australia’s digital economy.

The industry will need to make these changes in an environment that is becoming more competitive, with lower barriers to entry for competitors (particularly for fixed-line services, where NBN Co is committed to offering a neutral platform). To do this, companies will need to strip out legacy processes and assets, and simplify their business models. Costs will need to be globally competitive to deal with a more accessible domestic market. To gain entry to the trade in services, businesses will need to take advantage of offshore opportunities that may emerge through multilateral negotiations.

Fixed-line speeds and quality will improve as a result of NBN Co’s optical fibre network; this will affect existing carriers’ business models but will also have an impact on mobile services by raising expectations of speed and quality, and encouraging local, high-speed wireless nodes as an alternative to mobile. The pressure to continue investing in the development of wireless networks may also encourage greater sharing of infrastructure between mobile networks. It is quite likely that the provision of lines and pipes will remain unprofitable, but that companies will be able to leverage
their positions as network providers to draw sufficient profit from higher-value services.

This will mean developing value-adding services that build on the customer insights and contacts generated when providing lines and pipes. To do this, companies will have to develop sophisticated big data capabilities to analyse and better understand their customers. This process will be assisted by the increasing amount of information customers can access using their devices, such as smartphones and tablets capable of running apps.

An early goal is likely to be the provision of add-on services to business clients, as can already be seen in the launch of outsourced computing and storage services – or “cloud” offerings. Operators are also likely to offer services such as analysis of the traffic generated by their business, industry or sector; advanced customer engagement tools such as mobile apps; and next-generation intelligent services such as those based on knowing the location of mobile subscribers. It is likely that telecommunications providers will offer plenty of business extension services through partnerships with third parties.

In the consumer market, the major network owners will need to compete with sophisticated global operators, clever start-ups and often even with their own customers in the retail and financial services sectors. This will include competing to provide services such as e-wallets, personalised apps, music, video and online shopping services.

On the cost side, carriers will look for step changes in costs, by introducing innovations such as software-defined networking. This will enable them to slash some capital costs by reconfiguring their networks electronically rather than by changing physical equipment. They may also make more use of shared services and other new business models to further streamline back-end and customer service operations.

OUTLOOK FOR LEADERS AND FOLLOWERS

In telecommunications, leaders will be distinguished from followers by their ability to:

- offer low-cost, internationally competitive infrastructure to business and residential customers
- generate additional value from customers through the leader’s position as an infrastructure provider
- use deep customer insights that they are in a unique position to collect and analyse.

With fixed-line services moving to a pure retail basis as a result of the NBN, leaders will be those that can attractively package their fixed-line offerings. Given that fixed-line and mobile services may compete in some areas, leaders will be able to seamlessly integrate the two options into a single package that best meets customer needs – so customers see fixed and mobile as a combined service. This part of the business model is relatively basic and almost a precondition to continue operating in the market.

The main point of difference between leaders and followers will be their ability to generate more value for customers and shareholders. The leaders will be those that can successfully create add-on services for customers, increasing the underlying profitability of the organisation and contributing to infrastructure costs (because simply providing the infrastructure is unlikely to generate an adequate return). Leaders will also be distinguished by their better understanding of customers, gained by using data analytics. This will empower market leaders to package products that meet Customer needs, thereby maximising revenue and profitability.

The effect of these differences can be clearly seen in our modelling and the diverging paths of leaders and followers in the industry. Overall, we expect the industry to continue growing total sales at 4.1 percent a year, from $85 billion in 2012 to $143 billion in 2025 (in today’s terms). However, we foresee further downward pressure on prices, which we expect to decline by 1.1 percent a year from now to 2025. A key source of pressure will be new entrants – especially over-the-top players – that deliver low-cost services using carriers’ broadband infrastructure.

As telecommunications companies reinvent their business models, we expect them to favour investment in computer software and artistic assets – that is, any assets other than equipment and buildings, including technology systems, digital service platforms and brands. Our modelling assumes that investment in computer software and artistic assets will surge 8.4 percent a year from 2012 to 2025, while investment in construction, plant and equipment will grow by 3.1 percent each year.

Our analysis suggests that to remain viable and competitive, telecommunications companies will need to grow their investments in new value-added service products at twice the rate of their sales growth. These investments are also likely to take telecommunications operators further into new and unfamiliar product areas, such as selling advertising, distributing video-based products, handling financial transactions and (where permitted...
by law and with customer consent) selling some types of real-time customer data to commercial partners. This will in turn require them to develop new capabilities.

Our model leader and follower each start with sales of $15 billion a year in 2012, but the leader is already more profitable and has a stronger balance sheet. This gives it a greater capacity to invest in maintaining network quality and launching new services.

By 2025, the gap between the leader and follower has become pronounced. The leader’s annual sales are $37.2 billion compared to the follower’s $24.5 billion, its total gross profits are 110 percent higher ($18.5 billion compared to $8.8 billion) and it is able to invest $10.4 billion a year compared to the follower’s $5.6 billion. The leader’s market capitalisation has also risen to $101.7 billion, more than double the follower’s value of $48.3 billion.

The leader is also more successful in reducing costs, in part because it keeps a tight handle on overhead costs. While the leader and follower both reverse the industry’s history of allowing costs to rise (at about 8 percent a year on average from 1990 to 2012), the leader manages to reduce its cost of business as a percentage of sales from 58.5 percent in 2012 to 43.7 percent in 2025.

If telecommunications enterprises can – like the leader in our model – maintain core revenue, create new value-added services and develop associated new competencies while reducing costs, we believe they can rebuild return on capital to the industry’s traditional levels.

---

**Figure 2.4.1: Telecommunications – the gaps between leader and follower**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–2025 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sales</td>
<td>Leader $million (2012)</td>
<td>15,000</td>
<td>37,222</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Follower $million (2012)</td>
<td>15,000</td>
<td>24,502</td>
<td>3.8</td>
</tr>
<tr>
<td>Total gross profits</td>
<td>Leader $million</td>
<td>4,170</td>
<td>18,484</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>1,895</td>
<td>8,775</td>
<td>12.6</td>
</tr>
<tr>
<td>Investment</td>
<td>Leader $million</td>
<td>2,347</td>
<td>10,384</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>3,013</td>
<td>5,605</td>
<td>4.9</td>
</tr>
<tr>
<td>Market capitalisation</td>
<td>Leader $million</td>
<td>22,935</td>
<td>101,662</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>Follower $million</td>
<td>17,059</td>
<td>48,263</td>
<td>8.3</td>
</tr>
<tr>
<td>Employment (FTE)</td>
<td>Leader Number</td>
<td>21,401</td>
<td>27,597</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Follower Number</td>
<td>29,573</td>
<td>31,519</td>
<td>0.5</td>
</tr>
<tr>
<td>Gross return on fixed, technology and artistic assets</td>
<td>Leader %</td>
<td>34.2</td>
<td>36.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Follower %</td>
<td>8.4</td>
<td>26.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Revenue per customer</td>
<td>Leader $(2012)</td>
<td>3,522</td>
<td>5,913</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>Follower $(2012)</td>
<td>2,722</td>
<td>3,361</td>
<td>1.6</td>
</tr>
</tbody>
</table>
Gaps that emerge between leading and following telecommunications companies from 2012 to 2025, based on pursuing different business models in the digital economy.

### TOTAL GROSS PROFITS

<table>
<thead>
<tr>
<th></th>
<th>2012 (million)</th>
<th>2025 (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$4,170</td>
<td>$18,484</td>
</tr>
<tr>
<td>Follower</td>
<td>$1,895</td>
<td>$8,775</td>
</tr>
</tbody>
</table>

### MARKET CAPITALISATION

<table>
<thead>
<tr>
<th></th>
<th>2012 (million)</th>
<th>2025 (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$22,935</td>
<td>$101,662</td>
</tr>
<tr>
<td>Follower</td>
<td>$17,059</td>
<td>$48,263</td>
</tr>
</tbody>
</table>
GROSS RETURN ON FIXED, TECHNOLOGY AND ARTISTIC ASSETS

<table>
<thead>
<tr>
<th></th>
<th>Leader</th>
<th>Follower</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 2025</td>
<td>34.2% 36.5%</td>
<td>8.4% 26.0%</td>
</tr>
</tbody>
</table>

REVENUE PER CUSTOMER

<table>
<thead>
<tr>
<th></th>
<th>2012 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$3,522 $5,913</td>
</tr>
<tr>
<td>Follower</td>
<td>$2,722 $3,361</td>
</tr>
</tbody>
</table>
Public administration

Governments are facing revenue and expenditure pressures that will only intensify in the coming decades as the Australian population ages. This is creating an urgent need to reduce costs, particularly in non-frontline areas such as administration. At the same time, the public sector is at a crossroads of how services have been delivered in the past and how they will be delivered in the future. It is also facing structural changes, such as an increasingly mobile workforce and more complex service delivery channels.

To deal with these cost pressures and impending structural changes, governments will need to fundamentally change their policy-making and regulatory frameworks, and their approach to service delivery. Adopting digital technologies will be central to solving these problems, but it will also require comprehensive reforms to the public sector. However, such reforms are not just about cutting costs. Improvements to public sector efficiencies and effectiveness, and reduced administration costs can also flow on to a healthier national economy and enable improved services in areas such as health and education.

The economic modelling for this chapter encompasses public administration across all levels of government but not public services such as healthcare and education, which are dealt with on pages 50 and 58 respectively.

**FORECAST FOR SECTOR**

In Australia in 2012, the public administration sector (comprising state and federal administrative agencies and areas of justice, education and health administration) employed approximately 728,000 people and cost $71 billion to run. Based on current trends, this annual cost is expected to more than double by 2025. However, as revenue and expenditure pressures on governments will increase, it seems unlikely that the current trend in administration costs will continue.

Cost pressures and efficiency drivers

Adding to these pressures will be Australia’s ageing population as baby boomers move into retirement and the proportion of working-age people decreases. This changing demographic will dramatically affect government revenue, expenditure and demand for services, as explained in the healthcare chapter on page 50.

At the same time, public expectations of government will continue to rise in terms of efficiency, speed and convenience of service; transparency; and responsiveness. Online won’t be for everyone, but it will serve an increasing share of the population.

Governments’ increasing commitment to digital

The Federal Government has already shown a strong commitment to digital technologies, for example by making continual improvements to the online tax return process and statistics collection, in the form of e-tax and eCensus respectively. Digital efforts by the states will also be important, given they mostly fund the big budget areas of healthcare and education, followed by public order and safety, transport, social welfare, housing and community services.
In addition, new opportunities for using digital technologies to improve services continue to emerge. For example, the Federal Government announced in May 2013 that it planned to be a leader in the use of cloud services as a way of achieving greater efficiency and generating more value from its ICT investments. That was followed by the government’s Advancing Australia as a Digital Economy Strategy Update in June. This paper includes 24 initiatives to enhance Australia’s digital capabilities. One initiative is the whole-of-government Digital First policy, which aims to have 80 percent of service transactions online by 2020.

All levels of government will benefit from increased use of cloud services and big data. These services will remove the need for agencies and councils to employ significant numbers of highly specialised technical staff. It may also provide a cost-efficient and much enhanced alternative to market research.

There is a host of emerging ways to use big data to improve service delivery and internal productivity by providing probability analysis about risks and demand so that limited government resources can be allocated more efficiently. This analysis can be applied in a range of situations including maintenance operations, emergency services and health services.

For example, the Department of Human Services, which is responsible for three high-transaction services – Centrelink, Medicare and the Child Support Agency – is moving to an ‘uber-agency’ model, the Alliance Framework, to present a single portal to clients.

Public administration at all levels stands to benefit significantly from the roll-out of the NBN and other advances in ICT. As in the education sector, these developments will significantly enhance government engagement with a geographically dispersed populace.

**Self-service and automation**

Digital technology that enables self-service and automation will generate substantial productivity and cost benefits. For example, the Australian Taxation Office (ATO) is developing the capacity to populate citizens’ tax returns on their behalf, taking in earned income, bank interest, investments, student assistance payments and so on. It can already automatically factor in child support, higher education payments and family payments.

Through big data, the ATO’s e-tax system will collate 50 million pieces of data belonging to individual taxpayers. Further down the track, the ATO will have the capacity to harvest data on point-of-sale GST and other business transactions. Within 10 years, the automation process will mean a major staffing change in the organisation. Role-taking will all but disappear and will be partially replaced by people with sophisticated analytical abilities and the skills needed to manage large databases.

This shift to digital tax arrangements won’t just benefit the ATO. The time and resources individuals and businesses need to deal with tax commitments will decrease dramatically. Tax returns, activity statements and similar requirements will become automated and embedded in day-to-day, real-world activities and transactions.

**Reinventing the public sector**

As digital technologies mature, the public sector is facing some major changes to its work practices and structures. For example, as the workforce becomes more mobile and teleworking becomes more commonplace, administrations that have traditionally been very hierarchical will likely be challenged. These challenges, plus cost pressures, will result in internal structures becoming flatter and more inclusive of private sector and community-based partners.

New systems will need to have the flexibility to encompass external partners and an increasingly mobile workforce, but also to hold them accountable to their targets. The accelerating use of digitally based services will bring other challenges too, such as the need to avoid waste that results from over-servicing some groups, while ensuring others are not under-serviced. The old methods of delivering services are giving way to more efficient and effective approaches. For example, advanced new systems can use digital technologies such as self-managed servicing and automated low-risk interactions to target individuals who do not need high levels of service, while ensuring those who may be disadvantaged and need additional support receive the services they need.

In the future, policymakers and regulators will be able to use big data and analytics as predictive tools, rather than reactive factors, to assist in their decision-making process. Significant gains in productivity will be possible – for example, using big data to access and collate digital footprints, possibly eliminating the need to conduct a census.
The accelerated trend will be led by departments, agencies and councils that can move away from the traditional service model to a new model that has online as the core channel.

The problem of integration
One breakthrough digital initiative is the Single View of Citizen, which will involve implementing a single authentication number or other identifier for each person who wishes to engage with government agencies. A proposal under consideration at the national level suggests using third-party authentication, outside of government itself. There is already wide acceptance of the ‘100-point check’ used by banks and other entities, and a similar process could be undertaken at an arm’s length from government.

Other initiatives are being implemented to simplify governments’ interactions with citizens and develop a ‘one-stop shop’ approach. Through the single-login myGov website, Australians can already access the services of six major agencies: Medicare, Centrelink, Child Support, Veterans’ Affairs, eHealth and DisabilityCare.

There are also efforts afoot within the Council of Australian Governments (COAG) to develop national databases that can be linked by broadband. Another initiative involved providing a single online portal for all three levels of government, to facilitate service inquiries and expedite processes such as planning applications.

This would prevent applications and inquiries being redirected, and would reduce duplication and increase efficiency for all levels of government.

Despite these initiatives, implementing a single authentication system will be a challenge for policymakers, mainly due to privacy concerns. While such systems are commonplace in other countries, it has been a cultural issue for Australians since the failure of the Australia Card referendum in 1988.

OUTLOOK UNDER THE ACCELERATED SCENARIO

We have modelled two scenarios for total spending on public administration in Australia: 2025 forecasts based on the current trend, and on an accelerated trend. Under the accelerated trend, governments increase their efforts to reduce administration costs and increase productivity by embracing structural change and digital technologies.

Governments have already done a reasonable job of keeping costs under control. The total cost of public administration as a share of nominal GDP has decreased from 5.1 percent to 4.8 percent over the past two decades. To help achieve this, public sector agencies increased investment in technology by 9.4 percent per annum during the 1990s and then by 4.0 percent a year from 2000 to 2012.

However, more needs to be done to reduce costs and improve productivity. Under our accelerated scenario, government leaders make the necessary reforms and embrace digital technologies to achieve the key target of reducing total costs (gross product public administration) from a 4.8 percent share of nominal GDP to a 3.9 percent share in 2025. This is 1.2 percent below the current trend.

The accelerated trend will be led by departments, agencies and councils that can move away from the traditional service model to a new model that has online as the core channel, along with the capability to deal with customers that are unable to make the transition. They will make extensive use of mobile services to reduce travel times and eliminate duplication. Increased use of the cloud and big data will reduce computing and market research costs.

There will be a reduction in process staff and increased efficiency for case workers and other mobile staff. Cost reduction will not come at the expense of customer satisfaction – in fact, it should improve with the implementation of solutions that can deliver improved service levels through the use of big data and analytics, and digital integration.

To achieve our forecast cost reduction target, by 2025 governments will need to have achieved:

- 1 percent per year growth in total factor productivity – 0.7 percent higher than the current trend
- lower full-time employment (or equivalent) growth than under the current trend, reaching 826,000 employees
- increased investment in technology from $2.9 billion per year to $5.6 billion (in 2012 dollars)
- increased capital stock in technology increasing from $11.0 billion to $20.9 billion.
OUTLOOK UNDER THE CURRENT TREND

The current trend will remain in place if departments, agencies and councils are largely unable to make the transition to a lower-cost and predominantly digital model. This may occur because their clients are not able to make the transition, or because of political pressure or governments failing to make the necessary investment.

For example, the accelerated scenario will be much more difficult to achieve if governments are unwilling to allow the public sector to develop a single authentication reference for all clients across the three levels of government. However, in areas concerning the use of big data by governments, it will be important to ensure that privacy issues are properly addressed.

In 2025, the current trend could be expected to deliver performance (in comparison to the accelerated scenario) that features:

- total costs (gross product public administration) increasing to 5.1 percent share of nominal GDP
- annual growth in total factor productivity of just 0.3 percent
- full-time employees (or equivalent) increasing from 728,000 to 1.01 million
- $2.1 billion less investment in technology (in 2012 dollars) per annum
- $7.1 billion less capital stock in technology.

Cost reduction will not come at the expense of customer satisfaction – in fact, it should improve with the implementation of solutions that can deliver improved service levels through the use of big data and analytics, and digital integration.

Figure 2.5.1: Public administration performance – accelerated and current trends

<table>
<thead>
<tr>
<th>Trend</th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–25 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross product public administration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>$billion</td>
<td>70.0</td>
<td>136.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Current</td>
<td>$billion</td>
<td>70.0</td>
<td>175.0</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Gross product public administration share of nominal GDP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>%</td>
<td>4.8</td>
<td>3.9</td>
<td>-1.5</td>
</tr>
<tr>
<td>Current</td>
<td>%</td>
<td>4.8</td>
<td>5.1</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Capital stock – buildings and equipment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>$billion (cmv)</td>
<td>159.3</td>
<td>181.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Current</td>
<td>$billion (cmv)</td>
<td>159.3</td>
<td>208.0</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Capital stock – technology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>$billion (cmv)</td>
<td>11.0</td>
<td>20.9</td>
<td>5.0</td>
</tr>
<tr>
<td>Current</td>
<td>$billion (cmv)</td>
<td>11.0</td>
<td>13.7</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Employment (FTE)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>Thousands</td>
<td>728</td>
<td>826</td>
<td>1.0</td>
</tr>
<tr>
<td>Current</td>
<td>Thousands</td>
<td>728</td>
<td>1,014</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total factor productivity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated</td>
<td>Index</td>
<td>1.20</td>
<td>1.36</td>
<td>1.0</td>
</tr>
<tr>
<td>Current</td>
<td>Index</td>
<td>1.20</td>
<td>1.24</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Gaps that emerge between the current trend and the accelerated path for public administration from 2012 to 2025, based on different digital strategies.

**GROSS PRODUCT PUBLIC ADMINISTRATION SHARE OF NOMINAL GDP**

2012
- Accelerated: 4.8%
- Current trend: 4.8%

2025
- Accelerated: 3.9%
- Current trend: 5.1%

**CAPITAL STOCK – TECHNOLOGY**

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accelerated</strong></td>
<td>$11.0</td>
<td>$20.9</td>
</tr>
<tr>
<td><strong>Current trend</strong></td>
<td>$11.0</td>
<td>$13.7</td>
</tr>
</tbody>
</table>
### INVESTMENT – TECHNOLOGY

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerated</td>
<td>$2.9</td>
<td>$5.6</td>
</tr>
<tr>
<td>Current trend</td>
<td>$2.9</td>
<td>$3.5</td>
</tr>
</tbody>
</table>

### EMPLOYMENT (FTE)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerated</td>
<td>728,000</td>
<td>826,000</td>
</tr>
<tr>
<td>Current trend</td>
<td>728,000</td>
<td>1,014,000</td>
</tr>
</tbody>
</table>

### TOTAL FACTOR PRODUCTIVITY

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerated</td>
<td>1.20</td>
<td>1.36</td>
</tr>
<tr>
<td>Current trend</td>
<td>1.20</td>
<td>1.24</td>
</tr>
</tbody>
</table>
Healthcare

The total cost of Australia’s healthcare system has been increasing at an unsustainable rate. Further financial pressure is expected as baby boomers move into retirement and the proportion of working-age people decreases.

Other challenges include the increasing incidence of some chronic diseases; staff and skills shortages; and Australia’s complex, politicised healthcare system.

If the healthcare system undergoes fundamental reform and accelerates its digital transformation, by 2025 Australia could increase the average life expectancy by 0.34 years and increase citizen satisfaction with the healthcare system by 5.52 percent, at only 3 percent greater cost.

FUTURE CHALLENGES

Australia has a high-quality healthcare system that performs well by international standards, but there are challenges on several fronts.

The increasing cost of healthcare

The Australian Institute of Health and Welfare calculated that the nation’s healthcare costs totalled $121 billion in 2010, of which $116 billion was recurrent and about $5 billion was capital expenditure.

For a developed country, Australia’s health spending is not high by international standards, but it has been growing steadily as a proportion of GDP, from 7.9 percent in 2000 to 9.4 percent in 2010. Expenditure on pharmaceuticals has more than doubled over the past decade, with government expenditure accounting for all that growth.

The cost of running the health system has grown by 130 percent over the past decade. The largest growth has been in the share of costs met by health insurance funds, reflecting policies aimed at increasing the uptake of private health insurance.

Australians pay a relatively large proportion of total health spending as out-of-pocket costs, compared to most other Organisation for Economic Co-operation and Development (OECD) peer countries. One impact of this is that disadvantaged groups defer accessing health services, which in turn creates more significant and expensive health problems that need to be dealt with later.

Less obvious but just as critical are the hidden costs. For example, direct expenditure on mental health services reached $13.8 billion in 2010–11, but that...
doesn’t include indirect expenditure, such as income support and aged care, which totalled at least $14.8 billion.\textsuperscript{32} Even this latter figure doesn’t account for losses in productivity and other flow-on effects to the economy.

**Ageing population and increasing chronic diseases**
Compounding the growth in health costs is Australia’s ageing population. This will create further financial pressure as baby boomers move into retirement and the proportion of working-age people decreases.

The ABS estimated that in 2011, there were more than 3 million Australians, or 14 percent of the population, over 65 years of age.\textsuperscript{33} By 2031, it expects this proportion will grow to between 19 and 21 percent.\textsuperscript{34} With a greater share of the population using more health services and a smaller share active in the workforce, this is expected to create a significant fiscal problem for governments over the next decade.

The ageing population can be expected to affect the makeup of health problems facing the nation. Although, on average, Australians’ life expectancy compares favourably with other OECD nations, some chronic diseases are already relatively prevalent. For example, Australia’s mortality rankings for coronary heart disease and diabetes are still mediocre and its ranking in chronic obstructive pulmonary diseases, such as asthma and emphysema, has fallen.

**Skills shortages and cultural challenges**
Along with the increasing demand for health services, the sector is facing chronic staff and skills shortages, especially in rural and remote areas.

Staff shortages in remote areas will also constrain the roll-out of telehealth services. While these services give patients access to doctors and specialists in other areas, they often require clinical staff at the local end too.

Another important challenge facing healthcare is cultural, including both the workforce and patients. The health workforce tends to be older than average and is dominated by unionised staff or independent practitioners. Although they typically embrace innovation for understanding and treating medical conditions, these groups often don’t have the time or inclination to focus on productivity improvements.

Patients’ attitudes are also a potential problem for the sector. The prevailing attitude to confidentiality, for example, places strict controls over how patient records can be used and passed on. This will need to change if big data is to be used to enhance productivity and collaboration across medical services.

Patient resistance to new technology such as telehealth services has been observed in trials, particularly for those in rural and remote areas who need these services the most. However, this resistance could be expected to dissipate over time as people become more familiar with the service.

**A fractured system**
Australia’s healthcare system is largely publicly funded. Of the total cost, federal and state governments contributed 70 percent in 2010, including the Commonwealth’s two major subsidy programs: Medicare and the Pharmaceutical Benefits Scheme.

However, the dependency on public funding, along with political tension between federal and state governments, exacerbates flaws in the system. For example, funding is often targeted towards high-profile traditional outcomes, such as increasing the number of available hospital beds. As long as the political focus remains on bricks-and-mortar solutions, less funding is available for new technologies that can produce longer-term medical and productivity solutions.

Complicating this environment are the many competing interests within the multi-layered healthcare system, comprising regional, state and federal organisations, along with a private sector that ranges from individual practitioners to large companies.

**FORECAST FOR SECTOR**
The real annual growth of expenditure on Australia’s healthcare system has averaged 3.7 percent per person over the 12 years to 2012. This rate of growth is unsustainable and will be further exacerbated by the challenges outlined above.

However, there are some options that can help to alleviate these pressures. As can be seen in our modelling below, these include increasing capital investment, particularly in ICT and research. That said, extra funding will not necessarily stave off the looming healthcare crisis.
Technology advancements can deliver significant improvements in the early diagnosis and treatment of diseases. To invest in these long-term improvements, a greater focus on improving productivity and reducing unnecessary costs will be required.

The top priority is to improve the system itself so that governments can invest in strategies that will deliver better health outcomes in the long term, such as earlier diagnosis and more effective treatments, especially on chronic and increasingly prevalent conditions such as diabetes and heart disease.

**Towards a new healthcare model**

As the healthcare system nears the fiscal crunch, pressure will continue to mount on the budgets of healthcare organisations and facilities. Medicare and health insurance gaps will widen, resulting in even higher out-of-pocket expenses for patients. The nation is fast approaching a tipping point at which governments will be forced to overhaul the healthcare system, following the example of countries such as New Zealand and Denmark.

Whatever the makeup of the new system, it will need to provide much more co-ordinated, efficient and holistic healthcare services. Prevention will be a key focus, as well as integrated end-to-end systems that enable new frontline technologies such as remote monitoring and telehealth.

**Prevention**

The looming fiscal crisis in health services has been exercising the minds of government for several years. A series of reports have highlighted likely strains on the system, the connection between pressure on hospitals and the primary healthcare system, and the need for primary healthcare services to broaden their services and hours of operation.

The first point of contact between individuals and the healthcare system, primary healthcare, is mainly provided through GPs and community health centres. The effectiveness of primary healthcare will influence demand for other parts of the healthcare system – for example, by addressing preventable hospitalisations.

Improvements in primary healthcare were a component of the 2011 COAG National Health Reform Agreement, which established a range of new bodies, including Medicare Locals, to better coordinate primary healthcare in 62 regions. New indicators were developed to better identify potentially avoidable presentations at public hospitals, to deal with the impact of shortcomings in primary healthcare in hospital emergency departments.

Hospitals, medications and medical services represent almost three-quarters of the $116 billion of recurrent spending on health. Public hospitals are the largest item, representing almost one-third of recurrent expenditure. The recurrent cost of Australia’s public and private hospitals is just over $46 billion – more than twice Australia’s defence budget. Given this, the savings from potentially preventable hospitalisations could be in the order of $3 billion to $5 billion per annum, depending on the cost of alternative treatments.

Remote monitoring

A range of new technologies is emerging to assist in both the prevention and management of chronic illnesses. These include sensors that can be linked to remote monitoring stations that use the internet and mobile networks to monitor a range of conditions.

Some examples include self-administered electrocardiograms (ECGs) and more sophisticated continuous glucose monitoring kits to provide real-time data to doctors. New data analysis techniques can also be used to evaluate isolated measurements, such as blood oxygen and ECG results, and deliver a probability-based diagnosis.

Next-generation technologies are also in development. For example, the Center for Digital Health Innovation at the University of California is working on a communications platform for integrating emergency teams, clinical care teams, patients and families using paging, texting and social networking. Also in development is a new paradigm in clinical research: an e-Heart program that uses social media, mobile technology and cardiovascular sensors to study a large population in real time.

At the core of these programs will be the ability to apply big data, sensor technology and ubiquitous broadband technology to monitor, evaluate, diagnose and treat patients. While there will be costs in acquiring equipment, and in the monitoring and other application stages, it is possible these costs will be more than offset by lower hospitalisation rates and a reduced need for subsequent medical care overall.
**Telehealth technologies**

While there is currently some resistance to telehealth technologies among patients, it is expected that this will dissipate over time as people become more familiar with the benefits and convenience of these services. By 2025, it is expected telemedicine will be a core part of Australia’s health delivery system. Patients will learn to use these services in much the same way they use airline booking systems now. Specialists and other experts will be linked on a call, avoiding the need for double appointments when a patient is referred to a specialist.

This will encourage more collaborative relationships between primary care providers, specialists and ancillary health service providers.

Remote technologies will also allow further development of services, such as Victoria’s Nurse on Call service, to incorporate video so nurses can see and talk to patients remotely. Eventually, monitoring systems will allow a near-complete offsite triage service.

If Australia was to develop a leadership position in the delivery of high-quality remote medical services, it is conceivable this could become an export industry. On the other hand, Australian providers could access overseas specialists for expertise or to manage shortages in the medical workforce.

**Integrated patient e-records**

Big data and online collaboration tools will be vital in providing productivity and medical benefits to the sector. However, to leverage those technologies, concerns about patient confidentiality will need to be addressed.

It will be a considerable time before the full medical supply chain – including primary healthcare workers, specialists, hospitals, diagnostic services and allied professions – can use integrated patient records. Even so, the transition to integrated patient data is beginning with the aggregation of medical services found in larger GP practices and Medicare Locals.

The National E-Health Transition Authority (NEHTA) also is developing a Personally Controlled Electronic Health Record system. The system will allow doctors, hospitals and other healthcare providers to view and share patient health information, where patients have consented. This is the technical equivalent of a patient agreeing to share a hard copy X-ray with medical practitioners who are providing services to them.

NEHTA has been putting the infrastructure in place and obtaining participation agreements from healthcare providers and patients. However, participation in the e-health records system remains voluntary.

By comparison, Singapore has a clear goal of ‘one patient, one record’, and has managed concern over confidentiality by developing a shared commitment to the benefits of the system and a clear governance approach. Other countries are also developing strategies to promote the use of electronic health records.

---

**CASE STUDY: THE DIGITAL HOSPITAL OF THE FUTURE**

St Stephen’s Hospital, being built by UnitingCare at Hervey Bay in Queensland, provides an insight into the digital hospital of the future. Due to open in August 2014, the $87.5 million, 96-bed hospital is aiming to showcase how technology can transform healthcare for patients and clinicians.

Advanced wireless technologies will generate efficiencies and improve safety and clinical outcomes. All medical records, X-ray and pathology results will be accessible by doctors and nurses anywhere in the hospital via tablets, mobile phones, laptops or mobile computers on wheels.

As well as medical records, nurse call systems, the hospital’s phone systems, and patient medical devices such as blood pressure machines and infusion pumps will be integrated. Better accessibility to patient records and other data will improve information sharing, enable faster and more efficient decision making, and reduce the time spent trying to find other staff or equipment.

UnitingCare also intends to integrate the new hospital with other services in the region, including Blue Care residential facilities.
OUTLOOK UNDER CURRENT AND ACCELERATED SCENARIOS

As health is largely publicly funded, we have taken an industry-wide focus and modelled two scenarios for the health sector: 2025 forecasts based on the current trend, and an alternative scenario in which there’s a more accelerated response to meeting the nation’s challenges – one that includes fundamental industry reforms and a more extensive pursuit of digital transformation. Our goal with the modelling is to achieve the same or better outcomes without increasing nominal healthcare expenditure as a share of GDP.

Under the accelerated response scenario, governments and private companies in the sector collectively increase their efforts to continue improving the health of Australia’s ageing population. This will be needed, because based on the current trend, life expectancy and the public’s perception of quality of life will show little improvement.

In the end, the health sector is judged by how much it costs and the overall health of the nation. The latter can be judged quantifiably – using average life expectancy – but perhaps just as important are our perceptions of our health and quality of life.

In comparison with the current trend, for example, by 2025 the accelerated scenario could be expected to deliver:

- an increase in life expectancy of an extra 0.29 years, for an average of 83 years
- a 5.5 percent higher proportion of citizens being ‘pleased and delighted’ by the healthcare system, at 66.1 percent instead of the 60.6 percent expected under current trends.

These forecasts and detail on potential health spending per capita are shown in Figure 2.6.1.

Required investment and real costs

The improved health system will require significant investment. By 2025, real health expenditure under the accelerated scenario is forecast to be $1,434 per capita more (in 2012 dollars) than under the current trend (see Figure 2.6.2 opposite).

However, the real cost of healthcare is another story. Whereas household and government expenditure is calculated from the national accounts as the amount both those sectors pay toward healthcare, the cost index is constructed from actual cost movements within the sector. The real health cost index is forecast to increase only marginally from 2012 to 2025, compared with 40 percent under the current trend.

To achieve these outcomes, the accelerated scenario predicts:

- ICT and research capital stock increasing by an average of 8.1 percent every year to $10.8 billion (in 2012 dollars)
- average annual growth of 4 percent in building and equipment capital stock, to $159.9 billion (in 2012 dollars)
- average annual growth of 8.8 percent in health industry exports, to $1.7 billion (in 2012 dollars)
- total factor productivity index increasing by an average of 0.5 percent annually.

Figure 2.6.1: Healthcare system outcomes – accelerated and current trends

<table>
<thead>
<tr>
<th></th>
<th>Trend</th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–25 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real health expenditure per capita</td>
<td>Accelerated</td>
<td>$ (2012)</td>
<td>5,514.7</td>
<td>7,317.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>$ (2012)</td>
<td>5,514.7</td>
<td>5,884.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>Accelerated</td>
<td>Years</td>
<td>82.2</td>
<td>83.0</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>Years</td>
<td>82.2</td>
<td>82.7</td>
<td>0.05</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>Accelerated</td>
<td>Pleased and delighted (%)</td>
<td>59.0</td>
<td>66.1</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>Pleased and delighted (%)</td>
<td>59.0</td>
<td>60.6</td>
<td>0.2</td>
</tr>
</tbody>
</table>
The cost of keeping the same course
Compared with the accelerated scenario, by 2025 the current trend is forecast to deliver:
• an increase in the real health cost index of 40 percent from 2012 to 2025
• an increase in nominal household and government expenditure on healthcare as a share of GDP of 0.2 percent
• $5.6 billion less (in 2012 dollars) in ICT and research capital stock
• $29.6 billion less (in 2012 dollars) in building and equipment capital stock
• total factor productivity index falling by an average of 0.3 percent annually.

Figure 2.6.2: Healthcare system – accelerated and current trends, selected modelling

<table>
<thead>
<tr>
<th></th>
<th>Trend</th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Average annual growth rate 2012–25 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household and government expenditure</strong></td>
<td>Accelerated</td>
<td>$billion (2012)</td>
<td>125</td>
<td>198</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>$billion (2012)</td>
<td>125</td>
<td>159</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Real health expenditure – share of GDP</strong></td>
<td>Accelerated</td>
<td>%</td>
<td>8.6</td>
<td>9.6</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>%</td>
<td>8.6</td>
<td>7.7</td>
<td>-0.9</td>
</tr>
<tr>
<td><strong>Nominal health expenditure – share of GDP</strong></td>
<td>Accelerated</td>
<td>%</td>
<td>8.6</td>
<td>8.4</td>
<td>-0.2</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>%</td>
<td>8.6</td>
<td>8.9</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Real health index</strong></td>
<td>Accelerated</td>
<td>2012=1</td>
<td>1.0</td>
<td>1.0</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>2012=1</td>
<td>1.0</td>
<td>1.4</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td>Accelerated</td>
<td>$billion (cmv)</td>
<td>0.6</td>
<td>1.7</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>$billion (cmv)</td>
<td>0.6</td>
<td>0.8</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Building and equipment capital stock</strong></td>
<td>Accelerated</td>
<td>$billion (cmv)</td>
<td>96.2</td>
<td>159.9</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>$billion (cmv)</td>
<td>96.2</td>
<td>150.3</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>ICT and research capital stock</strong></td>
<td>Accelerated</td>
<td>$billion (cmv)</td>
<td>3.9</td>
<td>10.8</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>$billion (cmv)</td>
<td>3.9</td>
<td>5.2</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Total factor productivity</strong></td>
<td>Accelerated</td>
<td>index</td>
<td>1.06</td>
<td>1.12</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Current</td>
<td>index</td>
<td>1.06</td>
<td>1.02</td>
<td>-0.3</td>
</tr>
</tbody>
</table>
Gaps that emerge between accelerated and current approaches in healthcare from 2012 to 2025, based on the extent of use of digital technologies and system integration.

**REAL HEALTH COST INDEX**

- **Accelerated**
  - 2012: 1.0
  - 2025: 1.0

- **Current**
  - 2012: 1.0
  - 2025: 1.4

**LIFE EXPECTANCY**

- **Accelerated**
  - 2012: 82.2
  - 2025: 83.0

- **Current**
  - 2012: 82.2
  - 2025: 82.7

**CUSTOMER SATISFACTION**

- **Accelerated**
  - 2012: 59.0%
  - 2025: 66.1%

- **Current**
  - 2012: 59.0%
  - 2025: 60.6%
### TOTAL FACTOR PRODUCTIVITY

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accelerated</strong></td>
<td>1.06</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>1.06</td>
<td>1.02</td>
<td></td>
</tr>
</tbody>
</table>

### BUILDING AND EQUIPMENT CAPITAL STOCK

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
<th>$billion (cmv)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accelerated</strong></td>
<td>$96.2</td>
<td>$159.9</td>
<td></td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>$96.2</td>
<td>$130.3</td>
<td></td>
</tr>
</tbody>
</table>

### ICT AND RESEARCH CAPITAL STOCK

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
<th>$billion (cmv)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accelerated</strong></td>
<td>$3.9</td>
<td>$10.8</td>
<td></td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>$3.9</td>
<td>$5.2</td>
<td></td>
</tr>
</tbody>
</table>
Higher education

Key findings

As a knowledge-intensive and increasingly global industry, higher education stands to be significantly transformed by digital technologies over the next 13 years.

Education will continue moving from the classroom to the internet and will become more connected to other ‘classrooms’ around the world. Institutions will also gain new options for sourcing academic talent and curriculum material, and will use technology more extensively to cut operating costs.

In our modelling, two universities start at a similar scale in 2012. By 2025, one more effectively masters the new education environment to secure 8,760 more students, $229.8 million more in surplus funds and $1.77 billion more in building, IT and network assets.

This chapter focuses on the teaching (or non-research) component of higher education and vocational education and training. It covers universities, technical colleges (including TAFE) and private higher educational facilities. These organisations account for around a third of educational spending in Australia.

As a knowledge-intensive industry, higher education stands to be significantly transformed by digitisation. At the same time, Australia’s capacity to invest in higher education in particular is likely to decline if we shift our national investment to primary and secondary education, and as we grapple with other challenges such as an ageing population and growing healthcare costs. This will place more cost pressure on our universities, TAFEs and other higher educational facilities.

Over the period from 1990 to 2012, government and household spending on all forms of education rose 4.8 percent to 5.5 percent of GDP (in nominal terms). However, going forward the total spend will need to be constrained at around 5.25 percent and, as we note, primary and secondary education are expected to receive a larger slice.

Forecast for sector

Between now and 2025, there will be an emerging disconnect in education between those organisations that embrace digital transformation and those that don’t. Leaders will need to be more innovative, recruit the right people and be willing to invest. The learning experience will be more flexible due to improved mobility, and access to leading and diverse educators will be easier as distance becomes less relevant.

A key change is that delivery of education services will increasingly move from physical lecture theatres and tutorial rooms to the online environment. Courses may also be increasingly delivered by a blend of physically present and remote lecturers (within the same facility, elsewhere in Australia or even from overseas), using a mix of live and pre-recorded materials.

The winners in this new environment will be those institutions that capture more students and grow their resources. The losers will gradually become less valuable in the eyes of students, academics and research clients, and will either stagnate or be incorporated into larger and more sophisticated institutions.

Reducing distance to zero

Distance education is not a new phenomenon but the way it is used is set to change. MOOC – massive open online course – is the buzz word of the moment in education. While the idea of universities having online classes of unlimited size is gaining attention, the concept is constrained by how large numbers of students can be assessed against a common standard; how that standard could meet local certification criteria for professional registration in multiple jurisdictions; and whether the business model is financially sustainable.
For instance, would students pay for a course that uses informal assessment or no assessment at all? And would employers accept educational achievement gained through MOOCs?

In the immediate future, the MOOC concept is more likely to find a home as part of a structured course program offered by an established Australian institution. For instance, a course may be offered as part of a degree program featuring a lecture series from a respected thought leader who is based at another campus or university. The efficiency benefit of such a model is already being exploited in American universities, where departments are reducing the number of professors and offering courses that rely on MOOC-type lectures.

Sharing leading academic staff could also benefit multi-campus structures, or groups of universities that hold a common affiliation and agree to share their academics. We may also see Australian universities link with brand-name international universities to pool thought leaders and more efficiently offer world-standard, dual-branded degrees.

At a lower level, it may be that the best teachers are pooled for lectures, so on-campus staff provide tutoring support and perform assessment against a common standard. In vocational education, courses may be offered at venues where there is a demand for training but local teachers are not available. This change will drive efficiency gains but, unlike some other areas, it will require the use of higher-value staff.

Anywhere, anytime
How the learning experience is delivered will be affected by ubiquitous broadband, mobile and cloud computing technology. It will build on products such as the high-quality videoconferencing facilities used in the corporate sector, and computing systems that enable organisations to share electronic assets in a controlled manner over enterprise and public networks.

Students will learn using high-resolution images of the lecturer or teacher, and other interactive teaching modes and materials. Again, this technology builds on what is already available, but the development of ubiquitous broadband strengthens the offer.

Scale will also be less of an issue, allowing niche courses to be offered through multiple institutions. Remote or mobile devices will allow lectures and tutorials to be conducted online, and will also enable small-group or one-on-one supervision while in the field rather than sitting at a desktop or laptop.

This will bring online services into teaching students more practical skills and fieldwork. For example, a trade teacher may be able to efficiently see what his or her students are doing with their on-the-job learning rather than just in the classroom.

However, it is important to keep in mind that this same rise in the quality and ubiquity of communications will also make it easier for foreign educational institutions to deliver services directly to students in Australia. This could see our higher education facilities face increasingly direct competition from brand-name public sector universities and private groups such as management schools from around the world.

Crunching the numbers
Tertiary institutions, especially universities, deal with large numbers of people, a significant number of transactions, and masses of data and information. Over the next decade, cloud and big data systems will present opportunities to efficiently manage and derive value from this information to increase cost efficiency, improve responsiveness to citizens’ needs (those of regulators, students, staff and other customers) and to offer value-added services.

This will be seen in student administration both within institutions, and between institutions as the other technology initiatives mentioned above drive closer collaboration. It will be seen in how institutions manage their substantial reporting requirements. And it will be seen in performance indicators such as the ratio of administrative staff to teaching staff and students.

For instance, analysis of student records will help in marketing and outreach activities, and will improve tracking of student and staff performance. It should also provide a powerful tool for reducing attrition rates, as institutions do a better job of tailoring education to meet students’ needs and preferences, and identifying issues before students decide to leave.

Managing the change process
One of the biggest challenges for educational institutions over the next decade will be managing the organisational change and developing or acquiring the skills that will be needed to implement the initiatives discussed in this chapter. Even today, many schools, TAFEs and universities report having enough technology to improve delivery of the learning experience but with a teacher population that lacks the skill to use it effectively.
Higher education

Our modelling suggests that a leading university, for example, might outsource as much as 18 percent of its academic requirements to third parties by 2025. While this is likely to enable such a progressive institution to deliver a high-quality educational experience to students, it would represent a significant change in operating model and working arrangements for staff.

OUTLOOK FOR LEADERS AND FOLLOWERS

In our modelling, we compare the outlook for two mid-size universities: one that adapts its business model for the digital age and one that sticks to business as usual. The results indicate that it will be feasible for major educational institutions to increase the quality of their output without increasing costs to the nation, as long as they are prepared to invest in productivity-raising technologies and to change their business models.

The universities start with 35,000 students each and one is in a moderately stronger position than the other, in terms of revenues, surplus and assets. Both face a 1 percent per year decline in the amount of government money available to them, forcing them to reverse historic cost growth of 2 percent a year, and become more successful in attracting fee-paying students and funding for research activities from non-government sources.

Over time, the stronger university more aggressively adopts the range of the business model changes discussed above, including:
- reinvesting surpluses to hire higher quality academic and non-academic staff
- outsourcing to online and foreign academics
- sharing resources and facilities with other institutions
- investing in technology to reduce overheads
- reinvesting surpluses in fixed assets.

We find the path of these two institutions diverges strongly. By 2025, the leader has 8,760 more students as candidates are drawn to its superior reputation. The leader also has $229.8 million a year more in surplus funds and $1.77 billion more in fixed assets. In practice, this ‘surplus’ is unlikely to materialise as the institution would invest it fully in further improving the quality of its facilities or staff capabilities – or it would reflect the funding that the university did not need to receive from government or other sources.

Of the $1.77 billion increase in fixed assets, about $400 million would go to traditional buildings and equipment, $600 million to information technologies and $700 million to communication technologies, facilities and associated equipment.

Figure 2.7.1 presents a detailed comparison of the outlook for the two universities and also touches on key performance indicators such as the number of foreign students, research income and cost inputs. Among the most important of these measures is the difference in perceived quality. This starts at the index level of 1 in 2012 and increases to 1.8 by 2025 for the leader, indicating students feel they are receiving 80 percent more value. For the follower university, the increase is only 11 percent over the period.
Figure 2.7.1: Comparison of income metrics for a leading vs. a following university

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>2012</th>
<th>2025</th>
<th>Annual growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total student numbers</strong></td>
<td>Leader</td>
<td>Number</td>
<td>35,000</td>
<td>45,608</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>Number</td>
<td>35,000</td>
<td>36,848</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas students</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>170</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>140</td>
<td>144</td>
</tr>
<tr>
<td>Domestic fees</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>49</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>Research and consultancy</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>95</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td>Government contribution</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>456</td>
<td>521</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>426</td>
<td>394</td>
</tr>
<tr>
<td><strong>Total revenue</strong></td>
<td>Leader</td>
<td>$million (2012)</td>
<td>770</td>
<td>930</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>848</td>
<td>626</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic staff</td>
<td>Leader</td>
<td>Number</td>
<td>1,540.0</td>
<td>2,207.4</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>Number</td>
<td>1,330.0</td>
<td>1,933.9</td>
</tr>
<tr>
<td>Academic staff (average cost)</td>
<td>Leader</td>
<td>$thousand (2012)</td>
<td>141.0</td>
<td>199.2</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$thousand (2012)</td>
<td>129.0</td>
<td>158.9</td>
</tr>
<tr>
<td><strong>Total academic staff costs</strong></td>
<td>Leader</td>
<td>$million (2012)</td>
<td>2,171</td>
<td>2,352</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>171.6</td>
<td>172.5</td>
</tr>
<tr>
<td>Non-academic staff</td>
<td>Leader</td>
<td>Number</td>
<td>1,610.0</td>
<td>1,483.5</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>Number</td>
<td>1,610.0</td>
<td>1,486.6</td>
</tr>
<tr>
<td>Non-academic staff (average cost)</td>
<td>Leader</td>
<td>$thousand (2012)</td>
<td>108.0</td>
<td>133.0</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$thousand (2012)</td>
<td>111.0</td>
<td>136.7</td>
</tr>
<tr>
<td><strong>Total non-academic staff costs</strong></td>
<td>Leader</td>
<td>$million (2012)</td>
<td>173.9</td>
<td>197.3</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>178.7</td>
<td>203.3</td>
</tr>
<tr>
<td>Surplus funds</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>139.0</td>
<td>220.5</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>372</td>
<td>-9.3</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>Leader</td>
<td>$million (2012)</td>
<td>1,100.0</td>
<td>2,842.2</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (2012)</td>
<td>900.0</td>
<td>1,075.5</td>
</tr>
<tr>
<td><strong>Selected performance indicators</strong></td>
<td>Leader</td>
<td>Number</td>
<td>0.044</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>Number</td>
<td>0.038</td>
<td>0.038</td>
</tr>
<tr>
<td>Revenue per student</td>
<td>Leader</td>
<td>$million (cmv)</td>
<td>0.022</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>$million (cmv)</td>
<td>0.019</td>
<td>0.017</td>
</tr>
<tr>
<td>Outsourced academic services</td>
<td>Leader</td>
<td>% of total</td>
<td>0.00</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>% of total</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Index of education quality per student</td>
<td>Leader</td>
<td>Index</td>
<td>1.0</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>Follower</td>
<td>Index</td>
<td>1.0</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Gaps that emerge between leading and following universities from 2012 to 2025, based on pursuing different business models in the digital economy.

<table>
<thead>
<tr>
<th></th>
<th>TOTAL STUDENT NUMBERS</th>
<th></th>
<th>TOTAL REVENUE</th>
<th></th>
<th>SURPLUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td></td>
<td>$million (2012)</td>
<td></td>
<td>$million (2012)</td>
</tr>
<tr>
<td>Leader</td>
<td>2012: 35,000</td>
<td>2025: 45,608</td>
<td>$770.0</td>
<td>2015: $930.1</td>
<td>$139</td>
</tr>
<tr>
<td>Follower</td>
<td>2012: 35,000</td>
<td>2025: 36,848</td>
<td>$647.5</td>
<td>2015: $625.7</td>
<td>$37.2</td>
</tr>
</tbody>
</table>

Gaps that emerge between leading and following universities from 2012 to 2025, based on pursuing different business models in the digital economy.
### FIXED ASSETS

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>$1,100.0</td>
<td>$2,842.2</td>
</tr>
<tr>
<td>Follower</td>
<td>$900.0</td>
<td>$1,075.5</td>
</tr>
</tbody>
</table>

### ACADEMIC STAFF PER STUDENT

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>0.044</td>
<td>0.048</td>
</tr>
<tr>
<td>Follower</td>
<td>0.038</td>
<td>0.038</td>
</tr>
</tbody>
</table>

### INDEX OF EDUCATION QUALITY PER STUDENT

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader</td>
<td>1.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Follower</td>
<td>1.0</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Section 3
Shaping success for your enterprise
The clear message from our analysis is that enterprises cannot afford to stand still as digital technologies continue to redefine the business and government landscape.

Leaders will only maintain and enhance their position if they use their strength to invest in strategies that will enable them to consolidate and strengthen their lead in the digital age. Because this era will be defined by information technologies, future competitiveness will depend on organisations setting the right ICT strategy and executing it effectively.

Followers must find ways to match those investments or radically change direction through restructuring and other transformations.

These sharp divergences reflect how digital technologies are accentuating the gains available to those organisations that implement successful strategies, and reducing the margin for error for those that fall behind. Faster broadband, more sophisticated electronic commerce systems and other digital innovations are exposing Australian organisations to unprecedented competition from domestic and internationally, and from international players better able to operate regionally and nationally, and from international players able to cost-effectively reach Australian customers.

These trends are being seen prominently in the retail and media sectors. Retail and media are also showing the often ‘winner takes all’ nature of competition in the digital age. Take the example of Amazon.com and Borders in the United States and globally. Whereas two major booksellers might have once settled in to hold disproportionate but fairly static market shares – like Coke and Pepsi – we have instead seen Amazon.com power ahead with a superior online-only business model. Amazon.com has also reinvested its gains to consolidate its lead, by broadening into other product segments and, more recently, whole other industries such as cloud computing. Borders, on the other hand, entered bankruptcy in 2011 after staying too long with a mainly bricks-and-mortar, single-channel approach.

BUILDING A TRANSFORMATION AGENDA

Organisations that recognise there is a need to change their business models in response to digital technologies can take at least five key steps right now. These start with assessing their positions, then developing and executing the right strategies for the next decade and beyond.

1. Establish your position quickly

The first step for most organisations will be to establish whether they are leaders or followers within their markets, both domestically and against global benchmarks. This should involve reviewing standard business and operating metrics such as market capitalisation, profitability (or ability to generate surpluses) and so on. However, it should also include measures that focus specifically on how the organisation is positioned to compete in the digital age.

These digital economy metrics and issues might include items such as:

- productivity measures, such as income per hour worked
- brand recognition among customers in online and offline environments
- the number of new products or services introduced each year
- the time required to launch new products or services.

2. Clarify timing

After identifying their position, organisations should consider how important leadership could prove to be within their sector. If a competitor has a greater capacity to invest in digital business transformation, what initiatives might it undertake and how much further ahead could it move? Furthermore, is it likely that the stronger organisation can develop such a powerful value proposition that any followers effectively fail or are acquired?

Before setting strategy, it will also be essential to consider time. The first question is how quickly digital transformation might affect your sector. In A Snapshot of Australia’s Digital Future to 2050, IBM estimated that most of the major sectors in our economy would experience significant disruption from digital technologies by 2015 and that almost all sectors would have been substantially reinvented by 2018 or shortly afterwards.

Internally, organisations should consider how quickly they can change. How many months or years would the enterprise need to complete a major transformation program aimed at ensuring competitiveness in the digital age? Given that most enterprise change programs are measured in years and most sectors are expected to feel the full force of digital changes by around 2015, it is clear that organisations must commence their transformation programs as soon as possible.
3. Identify levers for action
The third step in building a transformation agenda is to review which levers are available to the organisation to drive change. As discussed throughout this report, the following seven levers are likely to be the most important to any change program.

Customers
The digital age is driving significant changes to customers and how organisations reach and serve those individuals. For example, it is shifting the dynamics between suppliers and customers, such as taking businesses from ‘pushing’ products out to customers to instead responding to the ‘pull’ of consumer demand. Enterprises must understand the relationship they have with their customers and consider how that is changing.

People and culture
How can an organisation reinvent its work practices and incentives systems, empower individuals and change its culture as it expands its use of digital technologies? Are there opportunities to make workforces more inclusive and mobile, or to expand teams well outside the walls of the traditional office? As they consider transformation, organisations must also examine their own culture and people’s willingness to change.

Costs
Like previous periods of changing technology and business processes, the shift to digital opens up many avenues for reducing costs. However, organisations need to carefully weigh potential cost improvements against the need to meet the requirements of increasingly well-informed and interlinked groups of customers.

Technology and assets
One of the biggest drivers of future productivity will be investing in the right assets. A key challenge will be finding the right balance between technology and intellectual property assets, and fixed physical assets such as real estate. Even within the technology domain, organisations will need to consider how much they ‘own’ systems, compared to leveraging the scale offered by cloud and other new utility-style providers.

Capital productivity
Closely tied to cost and asset levers is how effectively organisations are deploying their capital. This will determine their capacity to reinvest in digital business transformation, which will drive shareholder returns or value delivered back to citizens.

Product and service innovation
To remain competitive and distinct in the digital economy, enterprises will need to continually innovate to deliver unique sources of value to customers. If a product or service can be commoditised and delivered at scale, it probably will be.

Stakeholder engagement
Enterprises will need to ensure they maintain the support of key stakeholders as they reinvent their processes, business models and portfolios for the digital age. Beyond customers, staff and investors, these stakeholders include regulators, not-for-profit groups and the media.

At the same time, enterprises must recognise that digital technologies greatly expand the range of individuals and organisations that could be described as stakeholders. Social media, YouTube and other new communications platforms make it vastly easier for individuals and organisations to track and publicise the activities of companies and governments.

4. Set priorities
While each of the above levers is likely to be important, enterprises will need to decide where to focus their transformation efforts – and in what timeframes.

This will depend on the organisation and its situation, but all enterprises should consider how various actions would relate back to their overall transformation objectives. They should also review competitors’ plans and calibrate their initiatives accordingly.

Once these priorities have been established, enterprises will need to identify the specific business metrics that will enable them to track their progress against their digital transformation objectives.

5. Develop a transformation narrative
Enterprises that are going through change need a transformation narrative – a ‘story’ that clearly expresses their current position, the need for change and their plans for the future. This narrative should be compelling at a high level as well as the detailed level of business levers. It should also convey the timeline developed above, explain how change will be managed and set targets that can later be used to define success.

Enterprises must recognise that digital technologies greatly expand the range of individuals and organisations that could be described as stakeholders.
Methodology

**Approach to this study**

The quantitative analysis referred to in this report was prepared for IBM by the National Institute of Economic and Industry Research (NIEIR) in the first half of 2013.

Our analysis reviews the transformative business models that are emerging in seven key industry sectors in the Australian economy as a result of digital innovation, and the opportunities they present for potential productivity gains. The sectors were financial services, retail, mining, telecommunications, public administration, healthcare and higher education. Together, these contribute about 45 percent of Australia’s GDP.

This report also considers constraints and drivers in the business environment and the capabilities of major firms. NIEIR analysed published data from 81 ASX 200 listed companies, public sector organisations and international comparator businesses and organisations. We also interviewed almost 40 technology leaders in the seven sectors for their perspectives on future opportunities and constraints.

We then modelled scenarios for the period 2012 to 2025, using stylised organisations based on existing companies or agencies, to understand the potential for enhanced economic outcomes for those that lead compared to those that lag or are left behind.

**Digital transformation pathways**

The study first asked what digital transformation pathways are available for Australian companies and public sector agencies. An IBM Institute for Business Value (IBV) study by Saul Berman and Ragna Bell describes three pathways for enterprises to achieve digital transformation. These pathways are illustrated in Figure I. They are based on whether an organisation starts by transforming its customer value proposition or its operating model, or attempts to transform both. Berman and Bell do not argue that one approach is better than another; rather, they suggest that the best path will depend on an organisation’s industry context, strategic objectives, competitive pressures and customer expectations.

**An industry evaluation approach**

To assess the potential impact of digital innovation, NIEIR examined innovation in the context of organisational capabilities and the business environment of each sector. This analysis highlighted how the ability of organisations to implement digital innovation opportunities will be influenced by the availability of infrastructure, the business environment and organisations’ internal capabilities. These elements will then be affected by the productivity and economic outcomes achieved, with enhanced economic outcomes driving further changes in the business environment, encouraging further innovation and creating a virtuous cycle of industry leadership.

**Technology megatrends**

A core element of this modelling involved assessing the impact of six major technology changes on the business and government environment. These are high-speed broadband (which forms the basis of Australia’s digital infrastructure and underpins many other changes), cloud computing, big data technologies, mobile devices and networks, new communications and collaboration systems, and intelligent systems such as robotics and sensors.

**Business environment**

The business environment for each sector is a key driver of innovation.

Our analysis adopted Michael Porter’s ‘five forces’ as a broad framework for considering the competitive influences that will drive innovation and business change. These relate to rivalry within the industry and include the threat of new entrants, the threat of substitute products and services, the power of the supplier and the power of buyers. These forces are framed within the overall market environment for each sector. The business environment will drive innovation, infrastructure and the organisations’ internal capabilities.

**Business capability**

Internal enablers include the enterprise’s leadership, which encompasses preparedness to manage risk of change and creative destruction; capabilities and skills; structures and processes; and the culture of organisations and industries. These elements are important factors in any change management process. Organisations that cannot manage change become victims – rather than drivers – of competitive forces.

**Leaders and followers**

To evaluate the potential impact of different approaches to digital transformation, NIEIR created two stylised organisations within each sector: a leader and a follower. While the follower does embrace an element of technological enhancement, it does so after change is imposed on it rather than embracing the future and leading the change process. By contrast, leaders prioritise innovation and investment in new technology.

But being a leader is not just about investment. Leaders have a clear view of the future and how their businesses need to evolve to embrace it. They have a view of competitive forces that is broader than just their immediate competition, and they understand that disruptive change is likely to come from competitors that may not
Leaders are capable of responding to rapid change in their business environment and have the financial capacity and the right people to make the most of the opportunities that arise.

**Value levers**

To create a framework of performance metrics that would illustrate the leader and follower case, NIEIR worked with IBM to adapt its Smart Business Model typology. This model establishes a set of seven Smart Value Levers: customer connections, people capability, cost efficiency, leveraging technology, product and service innovation, stakeholder engagement and capital productivity. Data was not always available for each of these levers, but where it was, NIEIR used it to shape the industry performance measures.

The series is in constant dollars, that is, chain volume measure (cvm). The base year for the constant dollar/cvm for this study was 2010–11. Significantly for the purposes of this study, the capital stock and investment data is available in a number of categories, including:

- non-dwelling construction
- machinery and equipment
- research and development
- computer software.

For mining exploration, capital stock is available, while for telecommunications and information services, ‘artistic originals’ capital stock is also available.

Additional industry information was required outside the National Accounts. This was mainly employment and hours worked data, which was taken from ABS *Labour Force* data. NIEIR used its database of economic statistics (which dates back to 1949) to obtain consistent longer-term time series back to 1975.
Methodology

In general, there were two KS\textsubscript{j,i}: the sum of non-dwelling construction plus the equipment and machinery capital stock or the traditional capital stock; and the sum of research and development plus computer software capital stock or IT capital stock. For the mining and telecommunications sectors, the explanation and artistic originals capital stock were treated as a third capital input into the estimation of the production function.

The variables to be determined for each industry to 2025 included:

- sales (or value of output) in real and cvm terms
- goods and services inputs in real and cvm terms
- gross product (or the difference between sales and goods and service inputs) in cvm terms
- output (sales), or real gross product, which determines the factor inputs of capital, labour and disembodied technological change
- the nominal and real cost of industry output or services. The real cost of industry output or services is the nominal price index divided by a general deflator such as the Consumer Price Index (CPI).

The industry performance indicator

\[
\ln(GP_i + HW_i) = \alpha_1 + \alpha_2 \ln(HW_i) + \alpha_3 \ln(KS_{j,i} / HW_i) + \alpha_4 \ln(KS_{k,i} / HW_i) + \alpha_5 \ln(KS_{l,i} / HW_i) + \alpha_6 \text{TIME}
\]

Where:
- \(GP_i\) = gross product of industry \(i\) in $million (cvm)
- \(HW_i\) = hours worked for industry \(i\)
- \(KS_{j,i}\) = capital stock of type \(j\) in industry \(i\) in $million (cvm).

Digital disruption: the core industry performance indicator

Once the industry modelling framework and database were specified, the next step was to set the quantitative performance targets that digital disruption is likely to impose on each industry by 2025 compared to 2012. These targets were set after considering the forecast for each sector’s operating environment from now to 2025.

Figure II profiles the performance targets each industry is expected to achieve.

As shown in Figure II, some of the performance requirements imposed on an industry are severe, such as the requirements on the finance sector. At the other end of the spectrum is the retail sector, where only a 10 percent decline in the real cost of a retail service is specified. However, it would be wrong to conclude that the retail sector will be less affected by digital disruption than the finance sector.

The requirement for the health sector to keep constant nominal health costs as a percentage of nominal GDP is also a very large demand given the historical outcomes. However, the demand for health services is income elastic (per capita health expenditure increases more than per capita income) and some increased demand for health services with the ageing population will make it very difficult to maintain the share of nominal health expenditures as a percentage of nominal GDP at near current levels.

It will also be difficult to maintain satisfactory profitability in the telecommunications industry. Telecommunications enterprises will have to establish new competencies and target value-added services in areas where they can use their databases of current customer information to gain a competitive advantage.

In the historical context, the requirement that the cost of public administration as a share of nominal GDP falls by 1 percentage point over the next 13 years is also severe. Its share of nominal GDP over the last quarter-century has remained constant at around 5 percent, despite large-scale efforts to reduce its share.

Historically, as a share of nominal GDP, the education sector has increased its relative share almost as fast as the health sector – from 4.8 percent in 1990 to 5.5 percent in 2012. Recent education reforms will increase the real share of education expenditure in GDP by approximately half a percentage point over the next decade. To do this and maintain the nominal share of government and household education expenditure in GDP at near or below 2012 levels is a large demand. However, like healthcare and public administration, it is a demand that governments will make – driven by taxpayer expectations of a good value proposition in terms of their tax payments – in the knowledge that these expectations can be met if they realise the full potential of digital technologies.
In 2011–12, Australia’s commodity prices were at near historical highs. They will fall significantly from 2012 levels as commodity supply growth – as a result of the 2007–12 worldwide commodity investment boom – is realised. World economic growth between 2012 and 2025 will also be slower than previously expected, placing added downward pressure on commodity prices. In this context, unless the mining sector launches a digital boom to follow the current investment boom, the sector’s returns on capital performance is likely to fall to very low levels.

The modelling methodology

Given the performance indicators in Figure II, the modelling methodology is straightforward. It is to use the stylised industry models with the estimated production function at its heart to:

(i) determine the level of investment and
(ii) the structure of investment and
(iii) therefore the capital stock growth by type, which
(iv) will combine to drive labour productivity growth from the equation (1) and
(v) in conjunction with non-investment technological change from mergers, sharing of overheads and network capacity and supply chain integration, and on that achieve the performance target indicator by 2025 for an industry specified in Figure II.

The key coefficient in the modelling is the estimated elasticity between ICT capital stock and research and labour productivity. For most industries, these were found to be relatively high: between 0.2 and 0.6. That is, increasing expenditure on ICT was a relatively powerful lever for driving growth in productivity.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Between 2012 and 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial services</td>
<td>Real transaction fees 40 percent decline</td>
</tr>
<tr>
<td></td>
<td>Interest margins 50 percent decline</td>
</tr>
<tr>
<td>Retail</td>
<td>Real retail cost index 10 percent decline</td>
</tr>
<tr>
<td></td>
<td>Significant increase in the value of a retail service</td>
</tr>
<tr>
<td>Healthcare</td>
<td>Share of nominal GDP No more than 9 percent of GDP</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Real translation fees 14 percent decline</td>
</tr>
<tr>
<td></td>
<td>Accelerate revenue growth from value-added services</td>
</tr>
<tr>
<td>Mining</td>
<td>Real dollar per tonne 18 percent decline</td>
</tr>
<tr>
<td>Public administration</td>
<td>Share of nominal GDP 1 percentage point decline</td>
</tr>
<tr>
<td>Higher education</td>
<td>Share of nominal GDP No more than 2012 share</td>
</tr>
</tbody>
</table>

Next, by generally standardising enterprise revenue at a common value, the profit and loss and balance sheet was constructed using the identified leader and follower actual profit and loss, and balance sheet differentials. Once the 2012 data was established, NIEIR ran the enterprise models, with the leading enterprises overachieving and the following enterprises underachieving in terms of industry outcomes.

However, an enterprise’s ability to achieve any outcome depended on its investment effort, which in turn was constrained by internal cash flow and the historical ratio of average investment to internal cash flow. This mechanism in particular is the most important in explaining the tendency for leading and following enterprise projections to 2025 to diverge steadily in relative terms.

ASX 200 enterprises that are industry leaders in terms of digital transformation, and those enterprises that are laggards.
Methodology

For the mainly public sector areas of healthcare and public administration, it was not practical to adopt the leader and follower enterprise model. These sectors required a two-scenario approach to industry projections. For tertiary education institutions, it was appropriate to adopt the leader and follower enterprise model.

**The macroeconomic feedback effects**

From a macroeconomic perspective, the core methodology of this study has been to:

(i) take a model baseline projection of the Australian economy to 2025 and the outcome by industry
(ii) adjust the industry for the impact of demand for relative price impacts as for the improved performance targets
(iii) take the real and nominal industry outputs from (ii) and adjust for the composition of capital inputs, productivity and so on to obtain at least minimum acceptable profitability given the targets set.

In general, adjusting (iii) involved more employment losses than the points involved in (ii). The final step of capturing the full feedback effects of digital transformation at the industry level and the final macroeconomic outcome has not been done. This would require another study, as the channels of adjustment are diverse and complex, and the digital transformation of all industries would have to be considered.
Endnotes

27. Sirca, Big data comes down to earth as NICTA launches $12 million natural sciences project 5 June 2012.