

The Australian Industry Group
NATIONAL CEO SURVEY

Ready or Not?

Technology Investment and Productivity
in Australian businesses



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Principal contact person for the report:

Kate Pounder

Principal Adviser – Technology and Public Policy

The Australian Industry Group

Direct Tel: 03 9867 0258

kate.pounder@aigroup.asn.au

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Foreword

This report explores the relationship between technology investment and productivity in Australian companies. It draws from several sources: the Australian Industry Group's 2013 National CEO Business Prospects Survey of nearly 350 CEOs, facilitated discussion groups with business leaders, and in-depth interviews with innovative companies from the manufacturing, services and construction sectors. The Report examines the extent of Australian companies' investment in new technologies and research and development, the success factors and barriers involved, and the impact of these investments on productivity.

Australian businesses have been keen technology adopters over the last two decades. At a company level, this has had a positive impact on productivity, with new research undertaken for this report confirming that companies which invest in new technologies are significantly more likely to experience improved labour productivity than those that do not.

Since the Global Financial Crisis, however, business investment in new technology has been broadly flat, and further weakness looms in the short-term. Over the past decade Australia's ranking has fallen in international measures of technology adoption and competitiveness.

Looking further ahead, business anticipates new opportunities for collaboration, innovation and productivity gains from investment in new digital technologies and infrastructure. However, despite a bipartisan political commitment to rollout ubiquitous high-speed broadband, this Report finds concerning gaps in the capability of SMEs, and some industry sectors, to take full advantage of first-rate broadband infrastructure.

Australian businesses face tremendous opportunities over the coming decades: serious investment in fixed and mobile broadband infrastructure; escalating technological innovation, particularly in the information and communication technologies; and Australia's proximity to the growth and innovation of Asia.

Taking advantage of these opportunities will be the foundations for improvements in productivity and Australia's standard of living. The vision provided by the National Digital Economy Strategy is a good start. But Australia is not as ready as it needs to be. And ready or not, Australian businesses will have serious challenges to rise to over the next decade. The pace of global business is only accelerating, while our population ages and the mining boom peaks. Improving productivity will be vital if Australia is to remain prosperous and competitive.

Achieving higher productivity needs a concerted effort from business and governments to break down the barriers to investment and ensure Australian businesses lift their productivity and innovation capabilities. This Report recommends significant new policy initiatives, including development of a national workforce skills strategy for the digital economy; a standing taskforce of industry and government representatives to help drive Australia's digital productivity; and new initiatives to increase collaboration between businesses and research institutions.

With the support of the Federal Government's Productivity and Education Training (PET) Fund, the Australian Industry Group is also rolling out a multi-year program of research and training initiatives to help businesses improve workforce productivity and performance. This report was supported through the PET fund and will help shape those activities.

Innes Willox

A handwritten signature in blue ink that reads "Innes Willox". The signature is fluid and cursive, with a long horizontal line extending from the end of the name.

Chief Executive
Australian Industry Group

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Key Report Findings

PRODUCTIVITY

New Ai Group research confirms a link between business investment in new technology and productivity growth.

- ▶ The Australian Industry Group's (Ai Group) 2013 Business Prospects Survey of 350 CEOs found that in 2012, 33% of businesses that invested in new technologies reported labour productivity improved compared with 16% of businesses that did not invest.
- ▶ Nearly three times as many businesses that intended to invest in new technologies in 2013 expected labour productivity to improve compared with businesses that did not plan to invest (54% and 20% respectively).
- ▶ New analysis undertaken by Ai Group shows that Australia's most innovative and ICT intensive industries (financial and insurance services, wholesale trade, and information, telecommunications and media) are also Australia's most productive. These high-tech leaders experienced labour productivity gains of 40- 45% in the last decade, compared to the average for all industry sectors of 13%
- ▶ A range of factors affect the productivity gains that businesses realise from technology investment, but workforce skills are the most significant. Employee knowledge and skills was the second highest influence on decisions to invest in new technology, cited by over 60% of businesses in the Business Prospects Survey.
- ▶ Of businesses that reported productivity growth in 2012 in the Business Prospects Survey, 40 per cent said the main contributing factor was increased staff skills and capabilities, followed by process improvements (29%) and capital investment (17%). These findings suggest that skills, innovation and technology investment will be critical to lifting business productivity over coming years.

TECHNOLOGY INVESTMENT

Technology investment helped lift Australia's productivity over the last decade, but investment faltered with the GFC and may fall again in 2013 due to growing concerns about the economy amongst Australian businesses.

- ▶ From 2000 – 2008, Australian companies made significant investments in new technologies but investment fell overall with the GFC (Global Financial Crisis), although investment in ICT remained steady.
- ▶ Despite a recent pick-up in investment, new Ai Group research shows businesses are more pessimistic in 2013. The 2012 Business Prospects Survey showed a ten percentage point drop in companies intending to increase spending on new technology and a fifteen percentage point rise in the number expecting spending cuts compared with 2012.
- ▶ Increased conservatism is due to pessimism at an uncertain economic outlook and rising cost pressures, with the outlook for business conditions the biggest influence on businesses' decision to invest, reported by 82% of respondents to the 2013 Business Prospects Survey.
- ▶ Investment in ICT may have been less affected than other categories of spending because of the lower upfront costs and because it enables the greater business efficiencies that tough economic conditions demand.

- ▶ Supply chains and technology vendors are critical to technology investments, partly because clients and suppliers are the most common source of information for businesses regarding new technologies. Supply chain partners and customers are also a source of inspiration, innovation and collaboration, with the demands of clients or suppliers often providing the impetus or confidence for business partners to invest.

DIGITAL READINESS

Australia is making significant public and private investments in broadband infrastructure but there are concerning gaps in the readiness of businesses to take advantage of them.

- ▶ Results from Ai Group's 2013 Business Prospects Survey show that fewer than 50% of companies are confident in their capability to take advantage of opportunities afforded by access to high-speed broadband.
- ▶ Small to medium enterprises (SMEs) are the least confident, with only 40% of medium sized companies and 47% of small companies expressing confidence compared with 70% of larger companies.
- ▶ Highlighting that improving digital readiness is not as simple as a one-size-fits all approach, there are significant differences in the way that different industry sectors are investing and using ICT related technologies. Automation and control equipment dominated technology expenditure in the mining (40%) and manufacturing (37%) sectors in 2012 but in the services sector, internet and cloud based software are most popular category (49%) of investment.
- ▶ Businesses anticipate that improved collaboration will be the key benefit of access to high-speed broadband infrastructure. The ability to reduce transaction and communications costs, and better support for applications like cloud computing, video conferencing, remote monitoring of operations and sending and accessing large files is also important.



Recommendations

1. ENCOURAGING TECHNOLOGY INVESTMENT AND DIGITAL READINESS

To take full advantage of the rollout of high-speed broadband, Australia needs a more strategic, sophisticated, and efficient approach to improving the digital readiness of businesses. Ai Group recommends that industry, in partnership with all tiers of Government:

- ▶ Conduct an audit of digital capability program delivered by State and Federal Governments and private providers to rationalise and coordinate service delivery.
- ▶ Designate a single online point of information where businesses can get information about these initiatives.
- ▶ Develop more detailed metrics to assess progress against the National Digital Economy Strategy's goal that by 2020 Australia will rank in the top five OECD countries in the portion of businesses and not-for-profit organisations using online opportunities to drive productivity.
- ▶ Produce sector specific training materials and case studies, such as the Federal Government's Digital Business Kits program for specific industry sector, recognising the different technology investment patterns and opportunities available to different industry sectors.
- ▶ Champion innovative new models for skills and knowledge development that make better use of the resources and expertise of industry and create opportunities for businesses to learn from other businesses.
- ▶ Better target initiatives to companies most at risk of falling behind, such as small family-owned firms who often have less access to skills, information, support and financing.
- ▶ To lead the implementation of these initiatives, Ai Group recommends the creation of a standing digital productivity taskforce spanning all tiers of government and industry leaders.



2. SKILLS

Workforce skills are a critical determinant of Australia's success in a technology rich environment.

Ai Group recommends that industry and Governments work together to:

- ▶ Develop a comprehensive workforce skills strategy for the digital economy defining key areas of workforce skills needs.
- ▶ Review the management and leadership development model in Australia to make sure it is fit for the needs of a digital economy and the Asian Century.
- ▶ Form a high powered working group to improve participation in science, technology, mathematics and engineering (STEM) disciplines and ensure graduates have industry relevant skills.¹

3. INNOVATION

Australia can reap more benefits from collaboration and innovation by:

- ▶ Rebalancing the pattern of incentives operating in Publicly Funded Research Organisations (PFROs) to facilitate greater focus on successful collaboration.
- ▶ Expanding funding for the Enterprise Connect Researchers in Business (RiB) program.
- ▶ Removing regulatory barriers to innovative financing options such as crowd sourced equity funding (CSEF).
- ▶ Systematically reducing business compliance costs through more rigorous use of Regulatory Impact Statements; the introduction of more efficient and timely assessment that costs associated with new regulations are reasonable, and adoption of best practice regulator principles.
- ▶ Creating appropriate incentives for regulators and administrators to deliver reduced regulatory burdens. These should be linked to clear performance measures based on the compliance costs borne by business. Public reporting against the measures should highlight areas of success and areas for improvement.

¹ See the recommendations in Ai Group's *Lifting our Science, Technology, Engineering and Maths (STEM) Skills* Report for more details.

Executive Summary

This report explores Australian businesses' experience in lifting productivity through investment in new technologies and their readiness to do so in the future.² It highlights findings from a major new Ai Group survey of nearly 350 CEOs across major Australian industry sectors; seven facilitated discussion groups with business leaders conducted in metropolitan and regional Australia in February 2013, and in-depth interviews with three innovative firms from the manufacturing, services and construction sectors.

The study's objectives were to:

- ▶ Analyse current and planned technology investment and research and development (R&D) activity in Australia.
- ▶ Examine the experience of Australian businesses with technology investment and R&D, including success factors and barriers to investment such as workforce skills, management and culture, innovation, access to financing and partnerships, supply chains and collaboration.
- ▶ Explore the link between technology investment and productivity at a firm, sector and economy wide level.
- ▶ Consider the readiness of Australia and Australian businesses to capitalise on technology investment to achieve productivity gains and participate fully in the digital economy.

TECHNOLOGY INVESTMENT AND PRODUCTIVITY

Lifting productivity is the key long-term economic challenge for Australia.

There has been a broad-based slowing in labour productivity growth in Australia since the second half of the 1990s. While labour productivity growth has strengthened over the past year or so, it is traditionally highly cyclical and the pick-up remains well short of what is required to make up for the substantial legacy of the previous decade and a half. In coming years, with mineral prices anticipated to decrease, and the population set to age relatively rapidly, Australia will be increasingly reliant on increased productivity to maintain improvements in economic performance and broader standards of living.

Investment in new technologies has an important role to play in lifting productivity, with new Ai Group research identifying a positive relationship between companies that invest in new technologies and labour productivity growth.

According to Ai Group's 2013 Business Prospects Survey, one third of businesses that invested in new technologies in 2012 reported their labour productivity improved, while only 16% of those businesses that did not invest in new technologies reported labour productivity increases.

Of those businesses that intended to invest in new technologies in 2013, 54% expected their labour productivity to improve, while only 20% of businesses that did not expect to invest in new technologies anticipated labour productivity would increase. This may reflect that the companies continuing to invest are higher performing or more innovative as these companies often experience better than average labour productivity.

² For the purposes of this report, technology is broadly defined to include assets such as computer software, machinery and equipment and telecommunication equipment. Where the report refers to new technology it means technologies that are new to a business as distinct from the replacement of existing technology.

The link between labour productivity growth and technology investment and innovation also holds true at a sector level.

New Ai Group analysis also shows that the industries that lead in ICT adoption and innovation, such as the financial and insurance services, wholesale trade, and information, media and telecommunications sectors, are also Australia's most productive. While these high-tech leaders experienced average labour productivity gains of 40- 45% in the last decade, the average for all Australian industry sectors was just 13%.

But improving productivity remains elusive for many companies and sectors

Despite widespread agreement about the importance of increasing productivity, CEOs are pessimistic about short-term productivity gains within their business.

In the short-term, many businesses do not anticipate labour productivity improving. More CEO respondents to Ai Group's 2013 Business Prospects Survey from the manufacturing, services and construction sectors predicted a decline in labour productivity in 2013 than an increase. Mining CEOs were on balance more confident of labour productivity improving.

TECHNOLOGY INVESTMENT BY AUSTRALIAN BUSINESSES

While business investment in new technologies grew strongly from 2000 – 2008, investment since the GFC has been broadly flat and appears to be faltering again in 2013 due to lingering economic unease and a drop-off in investment in the mining sector. The exception to this trend is ICT investment, which has generally grown strongly throughout the last decade.

New Ai Group analysis of data from the Australian Bureau of Statistics (ABS) shows that business investment in new technologies grew sharply across most sectors of the Australian economy between 2002 and 2008 but fell off and then flattened during the GFC and its aftermath.

Worryingly, continuing cost pressures, reduced profitability and concern over economic conditions means fewer businesses intend to invest in new technologies in 2013 compared with 2012.

The change is most stark in the mining sector, with 57% of mining companies reporting that they increased investment in new technologies in 2012 but just 29% intending to do so in 2013 and a third intending to decrease spending on new technologies compared with just 5% in 2012.

Confirming reports that investment and growth in the mining sector is starting to ease with other sectors yet to pick up the slack, the manufacturing and services sectors also expect technology investment to decline, with only construction companies expecting investment to remain steady.

Similar conservatism is also evident in R&D spending, with 10% of companies decreasing R&D spending in 2012 but 17% expecting to do so in 2013.

One area of healthy growth over the last decade is the IT category. Between 1999/00 and 2006/07, IT investment grew at an average annual rate of 20 to 30% across the key manufacturing, services, construction and mining sectors. Spending on IT continued relatively unabated during and after the GFC, although growth rates have shown variation between industries with IT investment remaining broadly flat in the manufacturing sector since 2006/07 while investment in the mining sector has continued to grow at an average annual rate of close to 20%.

The business outlook is the critical factor affecting company decisions to invest in new technologies

Business sensitivity to economic conditions helps explain the drop-off in capital investment intentions in 2013, with the outlook for their own business conditions cited by over 80% of respondent as a key influence on technology investment decisions.

The 2013 Business Prospects Survey found CEOs expect a tougher trading year compared with 2012 and remained concerned about slowing demand across the economy; the high value of the Australian dollar, the challenge of global competition; and rising business costs. Discussion group participants described how uncertain economic conditions and a hangover from the GFC were prompting extra conservatism in investment decisions, particularly for large capital expenditure items.

Increased conservatism around larger items may also explain why spending on machinery and equipment dropped off significantly from the GFC onwards while spending on IT equipment, which generally have lower capital costs, was less affected.

But tough economic conditions are also spurring innovation and investments

Discussion groups confirmed that some businesses are actively engaging in technology adoption alongside innovations in products, processes, organisational and marketing practices.

For these companies, innovation and investment have been an essential part of survival and growth strategies since the GFC and in the face of continuing competitive pressures. This is consistent with OECD research showing that process and organisational innovations, which often focus on cost-control, were less affected by the GFC than product and service innovation.

ICT and automation investments are particularly attractive technology investments for the greater business efficiencies they enable.

And not all industries invest alike

There are distinct differences in the spending patterns of individual industries. According to Ai Group's 2013 Business Prospects Survey, automation and control equipment dominated technology expenditure in the mining and manufacturing sectors in 2012, while investments in internet and cloud based software was the major expenditure area for the services sector.

Sector differences in investment patterns have important economic and policy implications. While ICT adoption has been linked with better labour productivity, the scale and rate of this investment varies significantly across sectors and may affect the share of gains experienced by individual industries. These results also highlight that improving digital readiness is not as simple as a one-size-fits all approach. Policy and program design should be sensitive to the different technologies adopted in each sector to ensure appropriate targeting of policies and the relevance of information and training materials.

BROADBAND AND DIGITAL READINESS

Australia is in the early stages of one of the most significant public investments in high-speed broadband infrastructure in the world. However, new Ai Group research shows that the majority of businesses lack confidence that they can take advantage of the opportunities that high-speed broadband will bring.

Fewer than 50% of companies surveyed in the 2013 Business Prospects Survey are confident in their capability to take advantage of high-speed broadband. SMEs are the least confident, with only 40% of medium sized companies and 47% of small companies expressing confidence compared with 70% of larger companies. Confidence also varies by sector, with just 43% of manufacturing companies expressing confidence compared with 71% of mining companies.

These figures show an almost halving in confidence levels since 2008 when Ai Group first surveyed businesses on this point. At that time, 81% of businesses expressed confidence in their ability to take advantage of high-speed broadband.

However, lower business confidence may have a bright side if it means businesses are becoming increasingly aware of their capability gaps.

Confirming the central role that existing workforce skills will play in determining business readiness, 73% of businesses plan to prepare for the rollout of the National Broadband Network (NBN) by training existing staff, compared with 14% who would hire new staff.

Businesses anticipate that improved collaboration is the key benefit of high-speed broadband infrastructure.

Discussion group participants anticipated that the greatest benefit to their business from high-speed broadband would be increased collaboration, both across multiple sites within their business and with external partners.

The ability to reduce transaction and communications costs, and better support for applications like cloud computing, video conferencing, remote monitoring of operations and sending and accessing large files were also nominated.

But mobile technologies dominate investment in the here and now.

Businesses from multiple industry sectors spoke positively in discussion groups about their investments in mobile technologies with many talking about investments that were currently being rolled out.

Improvements to sales and marketing activity, and better connectivity throughout the business, were the key drivers to invest. The main impediments to adopting wireless and cloud technologies are security, intellectual property and privacy concerns and business processes that have not kept pace with technological innovations.

SUCCESS FACTORS AND BARRIERS TO IMPROVING PRODUCTIVITY THROUGH TECHNOLOGY INVESTMENT

At a company level, there are a range of factors aside from economic conditions that influence business decisions to invest in technologies. These include employee skills and knowledge, collaboration within supply chain partners, customer and vendor relationships, innovation and management capabilities, access to financing and the regulatory environment.

Workforce skills and capabilities have a major impact on productivity and technology investment

Workforce skills are integrally linked to technology investment and productivity. Employee knowledge and skills was the second highest influence on decisions to invest in new technology, cited by over 60% of businesses in Ai Group's 2013 Business Prospects Survey.

Once the investment is made, workforce skills also impact on a company's ability to leverage the investment, both through effective utilisation of the technology and the introduction of complementary innovations in other parts of the business. The introduction of new technologies can also be a spur to upskill the existing workforce or hire new staff with relevant expertise. Workforce skills in general have a significant impact on workplace productivity, with increased staff skills and capabilities cited by 40% of businesses that reported labour productivity growth in 2012 in Ai Group's Business Prospects Survey as the main factor contributing factor to this improvement.

The increasing prevalence of technologies within the workforce is contributing to skills shortages, particularly in the technician and trade category. It is also changing the skills required from workers, with discussion group participants across industries noting the importance of workers who could integrate systems or combine two different types of skill sets, particularly in STEM related disciplines. The Australian training system appears to be struggling to meet this need as a number of discussion group members expressed concern that training courses were too specialised.

The adoption of new or complex technologies is also creating a need to draw on specialist workers from overseas, including on a temporary skilled migration visas (457s). The skills shortages arise because technologies being deployed are new or rare in Australia, there is a lack of suitably qualified employees in the area, or a project requires a new skill which the Australian training system does not cater for. In addition to filling skills shortages, these workers are often a valuable source of training and mentoring for other employees.

Innovation, management and culture are also important

Innovation, management and leadership capabilities and company culture also have a significant relationship to technology investment and productivity. Well-managed, high performing organisations are more likely to be productive and to adopt relevant and current technologies and integrate them into company strategy and processes.

Innovative businesses are also more likely to invest in new technologies and to achieve superior productivity and performance compared with non-innovative companies. Investments in ICT in particular can lead to greater business efficiencies which free up company time or funding for innovation. ICT investments may also lead to improved productivity and facilitate innovative behaviours, such as greater collaboration internally and externally.

Supply chains are a critical source of inspiration, innovation and collaboration

The influence of supply chains on technology investment decisions has repeatedly come through in Ai Group CEO Surveys, in part because supply chains are the most common source of information on new technologies

for businesses. In Ai Group's Business Prospects Survey, the majority of businesses (53%) learned about new technologies from a client or supplier.

Supply chain partners and customers are also a source of inspiration, innovation and collaboration, with the demands of clients or suppliers sometimes providing the impetus or confidence for partners to invest. Changes in supply chains, such as greater global integration, smaller and more customised shipments and pressure for just-in-time deliveries were consistently nominated as influences on technology investment decisions.

Vendors are important sources of support and skills, especially for SMEs. Businesses are overwhelmingly more likely to purchase technology from an external supplier than develop it internally. The most common way for businesses to acquire new technologies in 2012 was to modify technology purchased from an external supplier. Just over 50% of businesses surveyed in the 2013 Business Prospects Survey reported that they had acquired technology this way, with larger businesses, in particular, more likely to adapt technology to suit their business. Close to 47% of businesses that invested in new technologies during 2012 reported that the technologies were simply purchased off-the-shelf from an external supplier.

These findings suggest that the use of more innovative modes of service delivery, including opportunities for greater partnerships between Governments, technology vendors and industry associations and better use of online and face-to-face service delivery, may be important to give SMEs the support they need to develop digital capabilities.

Collaboration between businesses and research institutions offers room for improvement

Collaboration between businesses and research institutions provoked mixed reactions within discussion groups. Incentives faced by researchers and Publicly Funded Research Organisations (PFROs) are often barriers to greater collaboration. Academic rewards are weighted in favour of publication and to a lesser extent teaching well ahead of collaborative relationships with business and other potential partners. PFROs often develop internal policies governing intellectual property rights that are excessively complex and do not permit the degree of flexibility required to do a deal. Despite these barriers, some discussion group participants spoke positively about their experiences collaborating with PFROs, although they noted the need for patience, relationship building and shared goals.

Company structure and size matter

The influence of overseas parent companies impacts on decisions to invest in new technologies by Australian subsidiaries. Some companies noted an increasing push to adopt common systems across global operations, which affected the autonomy and the decisions made by the Australian subsidiary. A parent company can also be a valuable source of funding and technical support in the implementation phase.

By contrast, family owned Australian SMEs had less access to funding or knowledge and were more reliant on technology vendors or other external partners for support.

Access to funding is a challenge, particularly for SMEs

Around 20% of respondents to the Business Prospects Survey cited access to affordable capital as a factor in their decision to invest in new technologies. This concern was also raised in discussion groups with some SMEs reporting that technology investments had to be funded from within the business as access to external funding had all but dried up.

Regulatory barriers are impeding businesses' capacity to innovate and invest

Regulatory costs are both driving and impeding technology investment. Multiple companies in discussion groups said decisions to invest in automation were linked to high labour costs in Australia relative to other markets. However, regulation is also impeding innovation and investment, both directly by preventing access to innovative sources of funding and slowing down the time to market of products, and indirectly by adding to overall cost pressures in the business environment.

Chapter one:

Technology Investment and Productivity

1.1 TECHNOLOGY INVESTMENT AND PRODUCTIVITY

Productivity is typically measured in terms of labour productivity (volume of output per hour worked, or more approximately, per worker employed) or multi-factor productivity (volume of output per units of all inputs including labour, capital, land and raw materials). Along with population growth and labour participation, productivity growth is a key long-term driver of growth in GDP, national income and household incomes.

Productivity growth tends to wax and wane in cycles, typically picking up pace directly after a recession (as businesses and workers gear up again) and then slowing progressively through the down side of the economic cycle. It can also accelerate or spike in response to individual policy changes, technology improvements and other factors.

Productivity estimates for Australia by the ABS indicate that there has been a broad-based slowing in labour productivity growth for some time following a period of relatively rapid productivity growth – particularly in the early and mid- 1990s (Chart 1). A similar deceleration is evident across most OECD countries over the same period. The causes of this slowdown are now the subject of much debate among Australian academics and policy-makers, as are the appropriate policy responses.³

Lifting the pace of productivity improvement will take on greater importance if Australia is to maintain or improve living standards. Declining productivity growth has so far been offset, at the aggregate level, by the impact on GDP of high commodities prices associated with the mining boom. However, with mineral prices anticipated to decrease in coming years, and increased workforce participation and population growth offering limited opportunities for further per capita GDP gains, Australia will be increasingly reliant on increased productivity to maintain GDP growth and improvements in living standards.

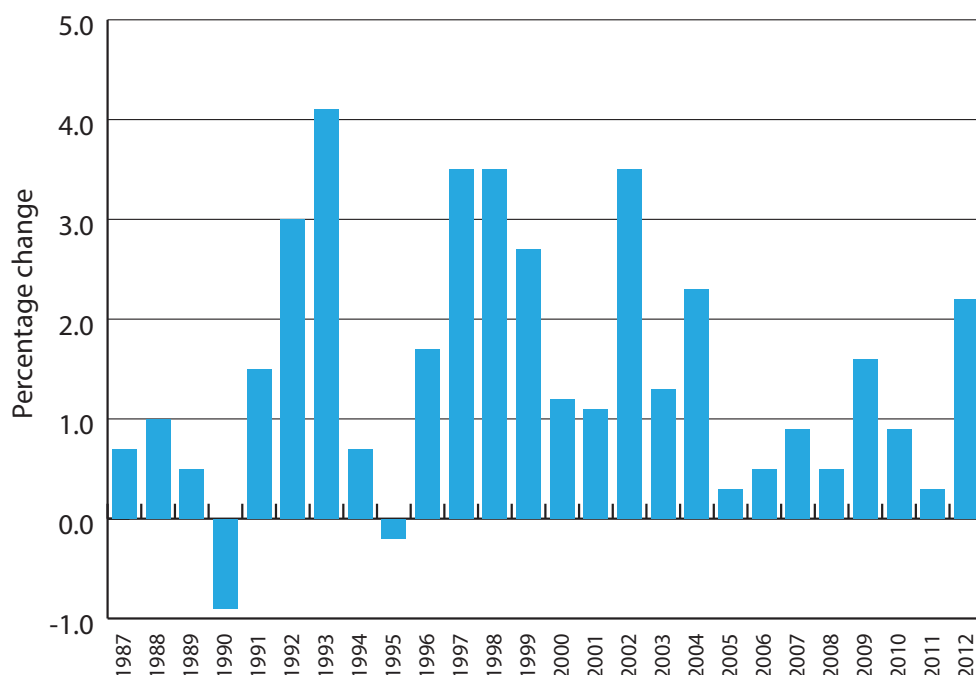
More recently, there has been tentative evidence that labour productivity growth is starting to recover. In 2012, the average level of Gross Value Added (GVA) per hour worked across the economy increased by 2.2%, the highest rate of growth recorded since 2004. This is in line with output starting to flow from the expanded mining sector and wide-spread reports, including Ai Group's research, showing businesses in the non-mining sector reducing labour demand and becoming more innovative in response to very challenging business conditions.

However, even with the recent increase in productivity, Australia still has a substantial way to go before productivity gains make up for the long period of low improvement. Further, in the short-term, many businesses do not anticipate labour productivity improving. More CEO respondents to Ai Group's 2013 Business Prospects Survey from the manufacturing, services and construction sectors predicted a decline in labour productivity in 2013 than the number who predicted an increase, although mining CEOs were more confident of labour productivity improving. Respondents to the Telstra Productivity Indicator 2012 (TPI 2012) were also significantly more pessimistic about improving productivity in their company in 2013 compared with 2012.⁴

³ See for example, Eslake, S and Walsh M, 2011, *Australia's Productivity Challenge*, Grattan Institute, Melbourne.
⁴ Telstra, *Telstra Productivity Indicator*, 2012.

CHART 1: AUSTRALIAN LABOUR PRODUCTIVITY GROWTH, ALL INDUSTRIES⁵

GVA per hours worked, annual percentage change



Sources: Calculated from ABS *National Accounts*, December 2012 and *Labour Force, Detailed Quarterly*, February 2013.

In economic theory, the maximum rate at which national productivity can improve is governed by the 'technology frontier' (that is, the latest world-class technologies available at the time). Technical change results from improvements in physical goods or improvement in knowledge. The productivity impact from adopting technology also depends on technical efficiency, or the extent to which technology is employed to its maximum potential. Technical efficiency is influenced by policy and practice at a government, industry and individual business level.

Ai Group's 2012 *Business Investment in New Technology* Report asked CEOs to estimate the extent of the contribution that investment in new technologies had made to productivity improvements in their business. Respondents reported that investment in new technologies contributed an average of 16% of productivity gains in their business from 2009-2011. Manufacturing and service businesses investing in new technologies estimated that these investments had accounted for approximately 17% of their productivity gains over recent years, while construction businesses estimated that the figure was closer to 10%.⁶

The link between new technology and productivity was also explored through analysis of Ai Group's 2013 Business Prospects Survey data. The analysis compared the labour productivity performance of businesses investing in new technology with those that had not. Close to one-third of businesses that invested in new technologies in 2012 reported that their labour productivity improved, while only 16% of those businesses that didn't invest in new technologies reported that labour productivity increased (Table 1).

⁵ Calculated from ABS *National Accounts*, December 2012 and *Labour Force, Detailed Quarterly*, February 2013.

⁶ Australian Industry Group, *National CEO Survey: Business Investment in New Technologies*, 2012.

TABLE 1: LINK BETWEEN TECHNOLOGY & LABOUR PRODUCTIVITY

Investment in new technology (2012)			
Labour productivity (2012)	Down	No change	Up
Down	21.9	13.4	16.3
No change	62.5	74.2	51.0
Up	15.6	12.4	32.7
Total	100	100	100
Investment in new technology (2013)			
Labour productivity (2013)	Down	No change	Up
Down	27.4	8.0	10.3
No change	52.1	66.1	35.6
Up	20.5	25.9	54.0
Total	100	100	100

Source: Ai Group

Of businesses that expected to increase investment in new technologies in 2013, 54% also expected their labour productivity to improve, while only 20% of businesses that did not expect to invest in new technologies anticipated their labour productivity would increase.

A notable feature of these results is that more than 50% of companies intending to invest in new technologies in 2013 also expect labour productivity to increase, but just a third of companies that actually invested in new technologies in 2012 experienced labour productivity gains. Given that overall businesses expected to reduce investment in new technology in 2013, companies continuing to invest may be higher performing or more innovative and therefore have better than average labour productivity.⁷

Another explanation may be that businesses can experience a lag before realising financial or productivity benefits from technology adoption, which they may not fully anticipate when making the investment. Research from Australia and overseas has found that productivity gains from ICT investment can take up to 5 – 15 years to realise⁸ and one third of Australian businesses do not report benefits from their investments in innovation for the year in which the investment was made.⁹ The delay in realising results can be due to the time required to train and familiarise staff with new equipment or techniques and to make complementary changes such as process or organisational innovations.

In a series of discussion groups held around Australia in 2013, senior business executives discussed the impact of technology investments on productivity within their company and noted such a delay in experiencing benefits.

We've found that as we've invested in a lot of the ICT stuff, we've exposed the weaknesses of our people and we've then had to re-invest more...you...think, "Here's the efficiency opportunity", but...we... have to either upskill our people or have a level of more skilled person in to help manage that successfully....

A lot of companies have got these post-reviews, whether it be 12 months, 18 months, two years later where you go back and... confirm the returns were what you originally thought. Sometimes they are in the first six months and then they fall off for whatever reason. Sometimes you've got to go back and reconfirm that it's still doing what it was originally intended to do because some things can change.

⁷ Boedker C., Vidgen R., Meagher K., Cogan J., Mouritsen J., and Runnalls J. M, *Leadership, culture and management practices of high performing workplaces in Australia: the high performing workplaces index*, October 2011.
⁸ Basu, S. and Fernald, J, *Information and Communications Technology as a General-Purpose Technology: Evidence from U.S Industry Data*, December 2006.
⁹ ABS, 8158.0: *Innovation in Australian Businesses*, 2010-2011, 2012.

Trying to quantify the productivity benefits from technology investments can be challenging for companies. Discussion group participants generally agreed that measuring the productivity impacts from technology investments was important, in part to support the business case for future investments, and some had established measures in place to do this. However, they also recognised that accurate measurements could be difficult, particularly for service industries, R&D investments or where benefits were intangible or realised over a long timeframe.

We have a number of initiatives in the production area and we do track them quite closely and report... to the executive in terms of the return on investment.

Investing in R&D and then looking at the outputs in our industry is really difficult...because your development cycle is maybe three, five years. Sometimes 10 years. So we...look at what are best practices, how should we divide our portfolio in terms of long term investments, short term investments... looking at the leading indicators [rather] than the impact on revenue, which is inherently a lagging indicator and by the time you've found out, it's 10 years too late.

No...there's only 10 of us and we just...say, "Well, obviously that's quicker" but it's only in the brain...we don't stand there with a stopwatch or anything.

In some cases, technology investments enabled data to be collected for the first time, which improved business insight going forward but did not always enable benchmarking against performance prior to the investment.

We have a sales force of 40 to 50 that you're giving better tools to make sure that they are more efficient and what we're doing there is simply gradually putting a level of transaction analysis in there for the teams to use – not for us to monitor, but for the teams to use to see what works and what doesn't work.

A lot of our investments are purely to establish some of those feedback loops...so the question is from having no measure, we've now got measures and hopefully, they're going to provide the foundations of the next round [of investments] driving forward.

1.2 PRODUCTIVITY AND ICT INVESTMENT

Information and communication technologies are generally regarded to have the characteristics of a general purpose technology, akin to public utilities, which enables innovations or productivity improvements in other sectors.¹⁰ ICT investments have positive impacts on productivity by enabling greater business efficiencies and encouraging complementary innovations or investments in businesses (for example, changes to organisational structures or processes or increased staff training) which also improve the quality of services delivered.¹¹

Increased business investment in ICT has contributed to productivity gains in recent decades, with more impact in Australia compared with other markets. The OECD estimates ICT investment contributed over one-third of the growth seen in labour productivity seen over 2000-09¹² (Chart 2). A similar level of contribution was found in other countries; however, ICT investment was relatively more important in Australia because other factors made lower contributions. The OECD also estimates that Australia had the equal third highest contribution of ICT investment to GDP growth in the same period out of twenty countries surveyed.¹³ A 2012 econometric study by the OECD examined the contribution of three types of ICT investment (computer equipment, communications equipment and software) to value added growth in industries in 18 countries from 1995-2007. It found the highest contribution in Australia, where ICT investment made an average contribution to value added growth of 1%. Investment in computer equipment accounted for most of contribution.¹⁴

10 See Kretschmer, T. "Information and Communication Technologies and Productivity Growth: A Survey of the Literature", *OECD Digital Economy Papers*, No. 195, OECD Publishing, 2012.

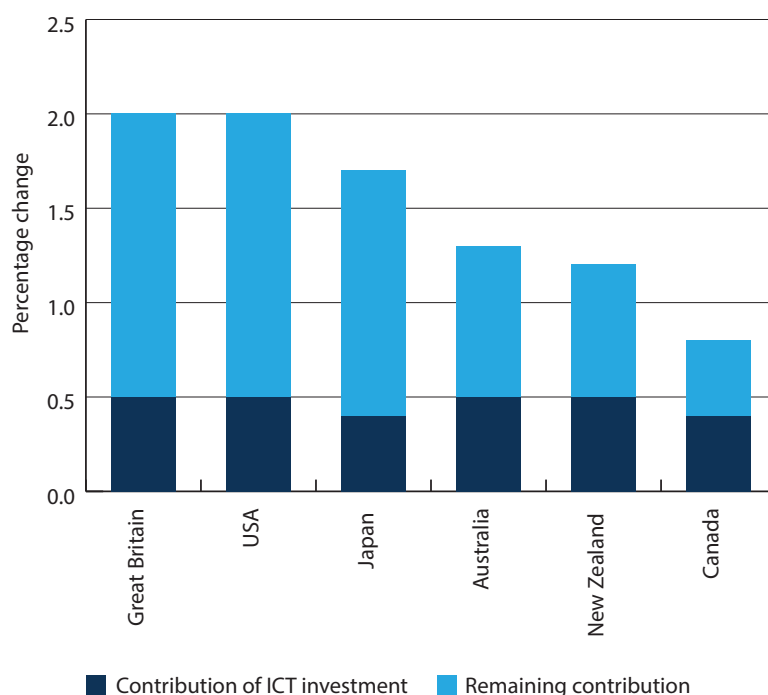
11 See Basu et al and Brynjolfsson, E and Hitt, L, 'Beyond Computation: Information Technology, Organizational Transformation and Business Performance', *Journal of Economic Perspectives*, vol. 14, no. 4, Fall, 2006.

12 OECD, Science, Technology and Industry Scoreboard, 2011.

13 OECD, Key ICT Indicators, 2012.

14 Spiezia, V, "ICT investments and productivity: Measuring the contribution of ICTs to growth", *OECD Journal: Economic Studies*, Vol 2012/1, http://dx.doi.org/10.1787/eco_studies-2012-5k8xdhj4tv0t, 2012.

CHART 2: CONTRIBUTION OF ICT INVESTMENT TO LABOUR PRODUCTIVITY GROWTH, 2000-09



Source: OECD; Science, Technology and Industry Scoreboard, 2011

This analysis is consistent with labour productivity data for Australian industry sectors, which have broken into three distinct streams of labour productivity growth in the 2000's (Chart 3). The higher growth group of industries includes the information, telecommunications and media, financial services and wholesale trade sectors, who have achieved an aggregate labour productivity improvement of 40-45% since 2000.

These sectors have the common features of being more innovative relative to other industries and above average adopters of ICT. ABS data shows the information, media and telecommunications and wholesale trade sectors are more likely to have a website and place and receive orders online compared with other industry sectors.¹⁵ A European study similarly found the finance and insurance sectors were the most likely to practice information sharing within and outside their firm, followed by the ICT and wholesale and retail trades sectors.¹⁶ They were also sectors most likely to have intranets and extranets in place. Wholesale and retail trade and the information, media and telecommunications sectors also rate as the most innovation-active sectors in Australia.¹⁷

In fact, the relationship between ICT intensity and productivity in these sectors has been established for some time. A 2001 paper published by the Productivity Commission (PC) reported evidence from the United States of productivity acceleration in ICT intensive industries such as wholesale trade, retail trade and finance, insurance and real estate. Analysis by the PC in Australia found that the new contributors to productivity growth in the 1990s were the wholesale trade and finance and insurance industries due to their ICT intensity, unlike the 1970s and 1980s where productivity growth was driven by the agriculture, mining, manufacturing, utilities and communications sectors.¹⁸

By comparison to the high-productivity sectors, the average majority of Australian industries have experienced slow and sporadic labour productivity growth adding to a total of 10 to 20% since 2000. The mining and utilities sectors are special cases and have seen large declines in labour productivity due to very large and lumpy capital investment, drought, natural disasters and other factors. For miners, very large resource price increases have more than made up for this sharp, but likely temporary, drop in productivity, while utilities nation-wide have responded with very large price increases.

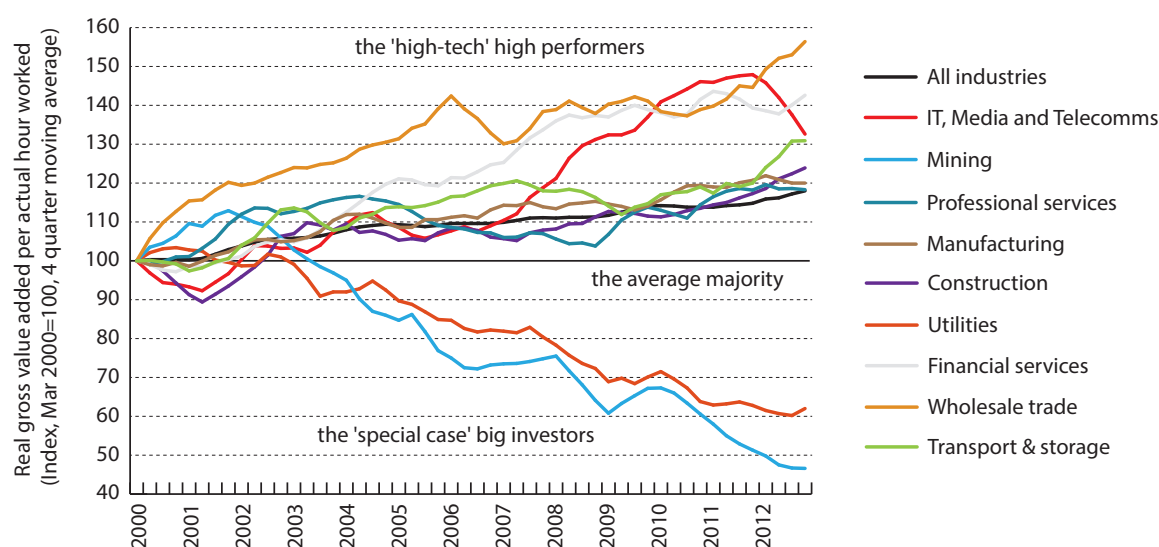
¹⁵ ABS, 8167.0: Selected Characteristics of Australian Businesses, 2012

¹⁶ OECD, Internet Economy Outlook, 2012

¹⁷ ABS, 2012

¹⁸ Parham, D, Roberts, P and Sun, H *Information Technology and Australia's Productivity Surge*, Productivity Commission, Staff Research Paper, 2001.

CHART 3: AUSTRALIAN LABOUR PRODUCTIVITY, BY SECTOR



Sources: Calculated from ABS National Accounts, December 2012 and Labour Force, Detailed Quarterly, February 2013.

The TPI 2012 asked senior managers and technology decision makers to estimate the contribution of ICT to improved productivity at their company in the last month. It found that 34% of senior managers and 49% of technology decision makers felt that ICT investments had improved productivity. Executives from companies that performed strongly on productivity measures rated mobile technologies (23%), data management and business analytics (23%), e-commerce capabilities (15%) and cloud computing (13%) as the ICT investments most likely to improve productivity.¹⁹ These companies were also more likely to have invested in cloud computing and video conferencing and collaboration solutions in the past and most interested in e-commerce and managing, distributing and receiving high-definition video content in the future.²⁰

While ICT adoption has been important to Australia's performance in the last decade, Australia has begun to slip recently in international measures of competitiveness and technology adoption. The 2013 World Economic Forum's (WEF) Global Information Technology Report 2013, which measures the availability, usage, and impacts of information technologies within countries, ranked Australia 18th out of 144 countries, down from 9th in 2004. Australia also remained at 20th place in the 2012-13 edition of the WEF Global Competitiveness Report.

In the Global Information Technology Report 2013, Australia performed well in key basic IT measures such as business internet sales to consumers (9th), government online services (9th), intensity of competition in local markets (6th) and secure internet servers per million of population (6th). However, for business use of ICT Australia ranked 25th, while usage by the Australian community ranked 15th and Government usage 19th.²¹

Australia scored least well on ICT affordability and some measures of Government procurement and promotion of IT. Australia ranked 58th for government procurement of advanced technologies, down from 36th in 2010-11, 46th for ICT use and government efficiency, down from 31st in 2010-11; and 39th for government success in ICT promotion, down from 32nd in 2010-11. Australia ranked 97th on IT affordability, with mobile phone and broadband tariffs reported to be well above OECD averages. In particular, Australia slipped to 121st for mobile cellular tariffs, down from 114th in 2010-11; 94th for fixed broadband internet tariffs, down from 17th in 2010-11; and 63rd for internet and telephony competition. This may have hampered IT adoption by households, businesses, and government with Australia slipping to 67th for mobile phone subscriptions, down from 45th in 2010-11; and 25th for broadband internet subscriptions, down from 21st in 2010-11.

¹⁹ Telstra 2012.

²⁰ Telstra 2012.

²¹ World Economic Forum, *Global Information Technology Report*, 2013.

There is also evidence that Australia is not experiencing as many economic benefits from the digital or internet economy as other countries. A 2012 analysis of the contribution of the Internet economy to G20 nations by Boston Consulting Group found that the Internet economy made a net contribution of \$41 billion to Australia in 2011, representing 3.3% of GDP, compared to average of 4.1% contribution to GDP for G20 nations. The report also predicted that Australia would fall comparatively further behind other G20 nations in medium terms, estimating that the Internet economy would contribute 3.7% of GDP in Australia by 2016, compared to an average of 5.3% for G20 nations.²²



²² The Boston Consulting Group, *The Internet Economy in the G-20*, 2012.

Chapter Two:

Australian Business Investment in New Technologies

2.1 BUSINESS INVESTMENT IN NEW TECHNOLOGIES

In late 2012, Ai Group surveyed nearly 350 CEOs about their investment in new technology in 2012 and their intention to invest in 2013. This information was sought in part to understand the potential for technology investment to contribute to productivity growth in the short term to medium term.

Overall, the survey showed growing caution amongst businesses due to uncertainty about economic conditions. Around 32% of businesses indicated that spending on new technologies went up in 2012, 11% indicated that spending was cut, and 58% reported that they expected investment spending to remain unchanged (Table 2).

Businesses were more pessimistic in their intentions for 2013. Only 22% of businesses reported they expected investment in new technology to rise in 2013 while 26% expected spending cuts.

The survey broke out responses by four major industry sectors: manufacturing, mining, construction and services. Across all sectors, fewer companies reported that they were likely to increase investment in new technology in 2013 compared with 2012 and more companies reported they would decrease investment.

This change was most stark in the mining sector. In 2012, 57% of companies reported that they increased investment in new technologies in 2012 but just 29% reported that they intended to increase investment in 2013. Similarly, while only 5% of mining companies reported that they decreased investment in new technology in 2012, a third of the companies surveyed reported that they intended to do so in 2013.

In the manufacturing, services and construction sectors, businesses most commonly reported no change in their level of investment in new technology in 2012. Companies in manufacturing and services were more cautious in their intentions for 2013, with fewer companies reporting their investment would be maintained or increased compared with 2012. Only construction companies' spending intentions remained on par with the previous year.

TABLE 2: ACTUAL AND EXPECTED SPENDING ON NEW TECHNOLOGY

2012 actual investment	Manufacturing	Services	Construction	Mining
Per cent of respondents				
Up	28.1	33.9	22.7	57.1
Down	19.0	21.0	27.3	4.8
No change	52.8	45.2	50.0	38.1
2013 expected investment	Manufacturing	Services	Construction	Mining
Per cent of respondents				
Up	23.2	32.8	14.3	23.8
Down	31.6	29.7	28.6	33.3
No change	45.1	37.5	57.1	42.9

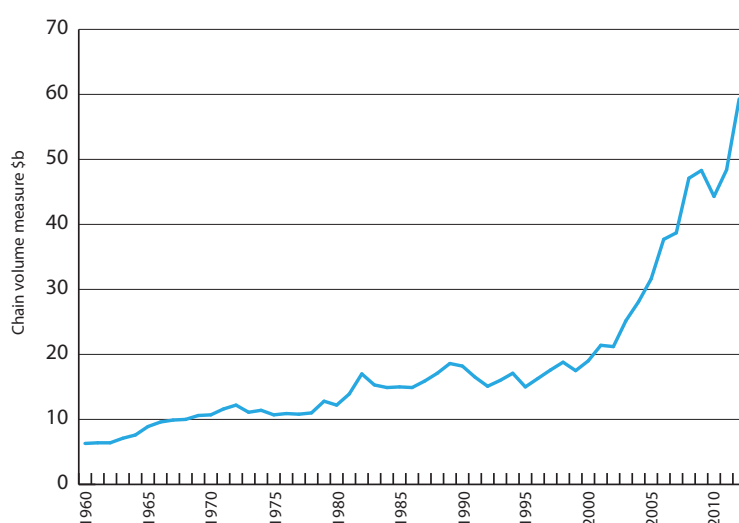
Source: Ai Group

Data from the ABS provides a longer term context for technology investment by Australian businesses. To gauge how business spending on new technology has changed over time, we have created a proxy measure that combines data on gross fixed capital formation of 'computers and peripherals', 'electrical and electronic equipment' and 'industrial machinery and equipment' from the Australian System of National Accounts.

This analysis shows that business investment in new technologies grew sharply across most sectors of the economy between 2002 and 2008 in line with rapid advances in ICT technologies and strong corporate income and profit growth (Chart 4). However, since the onset of the GFC, business investment in new technologies remained broadly flat at close to \$48 billion and fell sharply across the manufacturing and construction sectors.

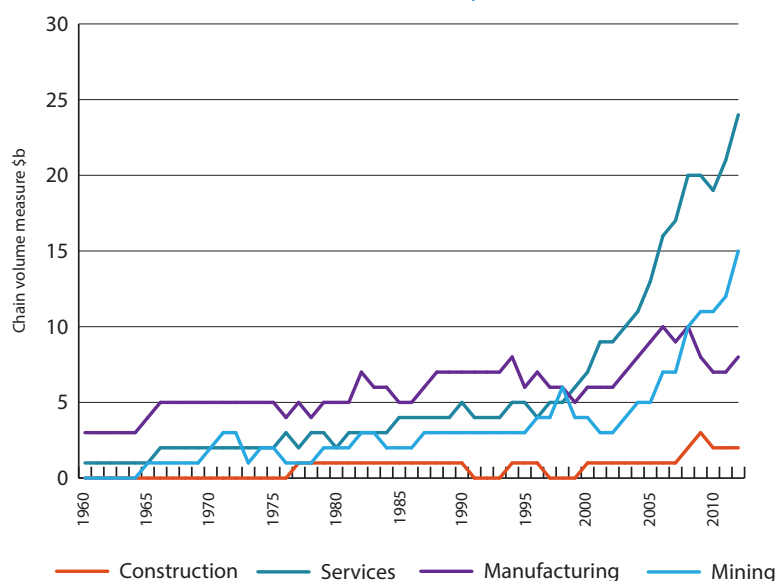
The latest data from the Australian System of National Accounts suggests that investment in new technologies rose solidly in 2011/12, driven by activity in the mining and services sectors (Chart 5), although the Ai Group survey results indicate that this growth may not be sustained in the short-term.

CHART 4: AUSTRALIAN INVESTMENT IN NEW TECHNOLOGY ²³



Source: ABS, *Australian System of National Accounts*, Cat no. 5204.0, 2011/12

CHART 5: AUSTRALIAN INVESTMENT IN NEW TECHNOLOGY, BY SECTOR



Source: ABS, *Australian System of National Accounts*, Cat no. 5204.0, 2011/12

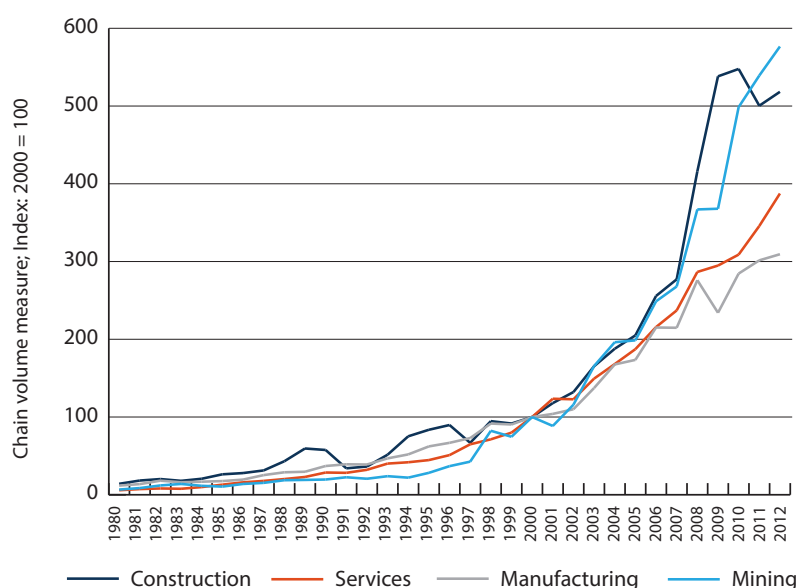
²³ Technology is defined as 'computers and peripherals', 'electrical and electronic equipment' and 'industrial machinery and equipment'.

2.2 BUSINESS INVESTMENT IN ICT

A large proportion of business spending on new technologies in recent years has focussed on information technology. Between 1999/00 and 2006/07 IT investment grew at an average annual rate of between 20 to 30% across four key industry sectors. More recently, growth rates have shown variation with IT investment remaining broadly flat in the manufacturing sector since 2006/07 while investment in the mining sector has continued to grow at an average annual rate of close to 20%.

Since 2000, the strongest growth in information technology investment has been seen across the construction and mining sectors, while investment in the manufacturing and services sectors has been more modest following the global financial crisis (Chart 6).

CHART 6: INVESTMENT IN INFORMATION TECHNOLOGIES



Source: ABS, Australian System of National Accounts Cat no. 5204.0, 2011/12

Data from the ABS suggests some variation in the composition of investment in information technologies across these sectors. In 2012, investment in information technology in the mining sector focused on computer software (41.2%) and electrical and electronic equipment (38.2%). In the manufacturing sector, investment in information technology focused on computer software (43.8%) and computers (38.0%). In the services sector, investment in information technology focused on computer software (38.5%) and computers (33.3%). In the construction sector, investment in information technology focused on computers (38.9%) and electrical and electronic equipment (36.7%).

TABLE 3: INVESTMENT IN INFORMATION TECHNOLOGY, 2011/12

	Computers	Electrical & electronic equipment	Computer software
Per cent of total investment in IT			
Mining	20.7	38.2	41.2
Manufacturing	38.0	18.1	43.8
Services	33.3	28.2	38.5
Construction	38.9	36.7	24.4

Source: ABS, Australian System of National Accounts, Cat no. 5204.0, 2011/12

Significant variations in technology spending patterns across sectors were also evident in Ai Group's 2013 Business Prospects Survey. Expenditure in the mining sector focused on automation and control equipment (40.4%) and computer hardware and telecommunications (20%; Table 4). In the manufacturing sector, investment was also dominated automation and control equipment (37.2%) and other ICT related machinery and equipment (24.6%).

By contrast, in the services sector internet/cloud based computer software (48.6%) dominated, and was the third highest category of investment in the construction sector, behind computer hardware and software.²⁴

The volume of expenditure also differed significantly by sector, with mining having the highest average expenditure on technology and construction having the lowest average expenditure. This meant, for example, that while investment in Internet / cloud based computer software accounted for 49% of total expenditure in the services sector but just 2% in the mining sector, the amount invested by the mining sector on Internet and cloud based software was still a quarter of the actual spend of the services sector.

TABLE 4: INVESTMENT IN ICT RELATED NEW TECHNOLOGIES 2012

	Manufacturing	Services	Construction	Mining	Total
Per cent of total investment in new technologies					
Computer hardware & telecommunications	18.6	25.9	33.2	20.0	20.9
Computer software	10.5	11.3	35.3	7.1	9.2
Internet/cloud based computer software	2.9	48.6	28.2	1.9	11.5
Automation and control equipment	37.2	7.3	0.0	40.4	32.5
Instrumentation and electronics	6.2	3.9	3.1	15.4	10.3
Other ICT related machinery & equipment	24.6	3.0	0.3	15.2	15.5
Total	100	100	100	100	100

Source: Ai Group

Sector differences in investment patterns have economic and policy implications. While ICT adoption has been linked with better labour productivity, the scale and rate of this investment varies significantly across sectors and may affect the share of gains experienced by individual industries. Policy and program design should also be sensitive to the different technologies adopted in each sector to ensure appropriate targeting of policies and the relevance of information or training materials.

2.3 BUSINESS CAPABILITY TO TAKE ADVANTAGE OF HIGH-SPEED BROADBAND

Australia is in the early stages of a significant investment in a ubiquitous high-speed broadband network. The productivity gains achieved from that investment will depend in part on whether businesses can use the infrastructure to achieve greater business efficiencies and develop new product and service offerings and other business innovations. Understanding the readiness of businesses to take advantage of high-speed broadband is important to gauge the potential for productivity gains related to the rollout.

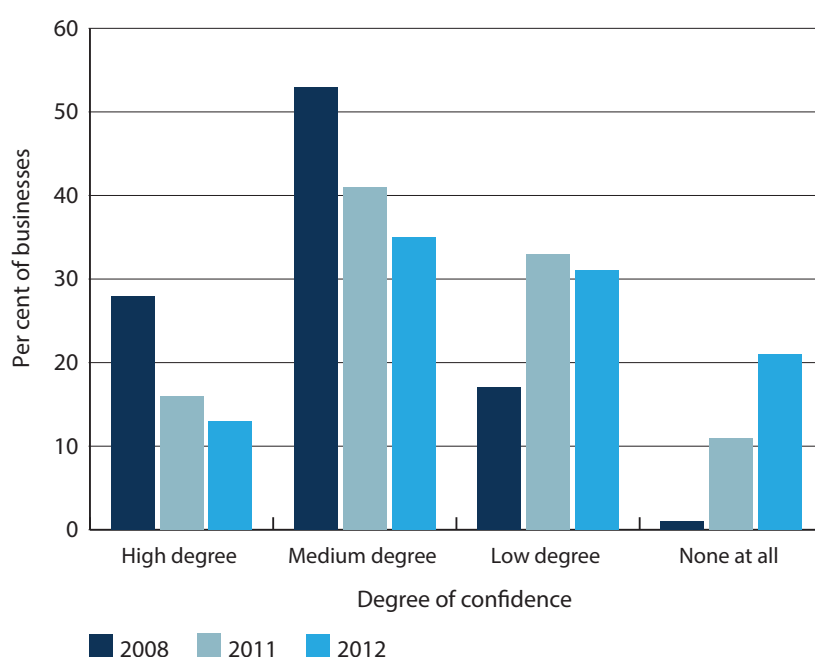
²⁴ There is ongoing debate about which services should be included within the cloud computing category and the term may hold different meanings for individual users. This information should be treated with some care and interpreted as a general trend towards Internet based services rather than an indication of investment in particular applications or services.

As part of Ai Group's 2013 Business Prospects Survey, CEOs were asked about the degree to which they believe they have the skills and capabilities to take advantage of high-speed broadband. The same question was asked as part of Ai Group's *Business Investment in New Technology* Report in 2011, and in 2008 as part of the *High Speed to Broadband: Measuring industry demand for a world class service* Report.²⁵

Overall, businesses reported less confidence in their ability to take advantage of a national broadband network in 2012 compared with 2008 and 2011 (Chart 7). This finding suggests that as the prospect of high-speed broadband and the services and applications it enables become more of a reality for businesses, they have started to consider their capability in more concrete terms, and identify capability gaps.

Confidence varied significantly depending on company size. Over 70% of large companies had confidence that they had the capabilities to take advantage of high-speed broadband, compared with 41% of medium-sized businesses and 47% of small firms.

CHART 7: BUSINESS READINESS FOR HIGH-SPEED BROADBAND



Source: Ai Group

Confidence also varied by sector, with manufacturing companies least likely to express confidence and mining companies the most likely (Table 5).

TABLE 5: BUSINESS CONFIDENCE IN CAPABILITY TO TAKE ADVANTAGE OF HIGH-SPEED BROADBAND BY SECTOR

	Not confident	Confident
Manufacturing	57%	43%
Mining	29%	71%
Construction	45%	55%
Services	44%	56%

Source: Ai Group

²⁵ Some caution needs to be applied in directly comparing the results from the three surveys as the respondents and sample size differed but the results are useful for assessing trends in business attitudes.

Discussion groups were asked about the impact high-speed broadband on their company and industry. On balance, more participants were positive about the need for improved infrastructure and its impact on their business, although there were a considerable range of views.

Some businesses voiced strong support for the rollout of high-speed broadband infrastructure

There's no question the National Broadband Network is an essential utility for the country

Other businesses endorsed the rollout of high-speed broadband but not the NBN model.

There's a difference between the technology and the national broadband network itself. We agree with the technology but we don't actually think the National Broadband Network...is...the most efficient way of doing it

A further set of businesses were genuinely unsure of whether the investment was sound or if the technology would be obsolete by the end of the rollout.

I hope it's relevant in 10 years. Seriously. It could be finished. It could be the slowest thing on earth. It could be the greatest white elephant of all time or it might be fantastic. I don't know.

Business attitudes to high-speed broadband were influenced by the weight placed on higher bandwidth relative to other service improvements.

We still have problems with drop outs and slow downs and stuff like that, so if we were just able to get the current speeds 24 hours a day, seven days a week, that would be a big improvement for us.

The internet speed that we have in the office – it would be nice if it would be faster, but I'm not sure that it would necessarily enable me to do anything any differently. However, having four black spots on the way to Melbourne...yeah, that's relevant.

Participants also noted the importance of connectivity varied by industry and occupation.

For X per cent of the population being highly connected all day during their job is critical, but there's probably quite a few million of the workforce out there where it means nothing. So how do we make sure that we get that balance right, that we don't overinvest as a country in providing an infrastructure which allows some of the population to be more productive, but actually does nothing for a very large majority of ...the workforce as well?

The main benefit businesses saw from the rollout of high-speed broadband was increased collaboration, both across multiple sites within a business and with external partners.

How we engage with that supply chain and to what level will be...greatly enhanced through the rollout of the network...just the difference between going and having a teleconference versus a video conference – that kind of dialogue and extra feedback, it just will help that rapport and...design reviews

We use fairly low end systems to communicate around the country to other offices and I'm hoping that the NBN will...allow us to just use the infrastructure that's generally there without having specialised fibre...to improve our communications and...transfers.

the collaborative tools... will allow us to communicate a lot more and get multiple sites...up to the same level.... And also culturally, making sure that everyone feels part of the team and it's not just head office.

This meant that even businesses with existing fibre connections supported the rollout of high-speed broadband because they saw the benefits of better connections to their customers and supply chain.

[The benefits are] not on the internal side because we probably have most of that [fibre] in place already, but in the way we can provide tools for the end customer and differentiate ourselves versus the competitors, it is absolutely key. And then we just have to hope that the literacy on the customer end would be there.

The recognition that realising benefits would depend on the capability of customers and suppliers to get online was echoed by other focus group participants, along with an acknowledgement that suppliers and customers were often important catalysts in getting other business to invest.

A lot of customers are just still mum and dad businesses and they're the ones that don't have the websites and stuff like that and it's not that long ago they didn't even sort of communicate through email. So you've got to be pulling them up with you all the time as you go.

Businesses also cited the need for better infrastructure to support cloud computing applications, sending large design files and for remotely monitoring and controlling machinery.

If we're going to use... cloud based services in delivering the latest incarnations of those technologies and to be on the front edge of what's happening, we're going to need the infrastructure to support it.

I need the connectivity to [remotely connect to machinery] from wherever I am so when a problem occurs, I can tap into the machine and find out exactly what's wrong.... I don't want to be sat watching a machine 24/7.... I need... that real-time speed so I can speak to other engineers and work through the problem, rather than leave it to be a catastrophic failure and take us offline.

We're limited to the capacity of our current system to upload a 3D file and give a customer a quote.... it's going to be a major help... to get a quote out.

The opportunity for cost savings was also important.

We spend \$150,000 a year on data and telco costs, so that should come right down, because all we pay is one fee and we do all the VoIP stuff

We'd probably look at moving to a cloud type environment.... we were quoted originally \$64,000 for a [software] package and now we can get it for five grand connection to the cloud.

Transactional costs should come down a lot because ordering and payment cycles should be just automated... that should be more of an equaliser because...small companies can be on par with big companies. You don't have to spend a lot of money on infrastructure.

Few businesses anticipated negative impacts as a result of the rollout of high-speed broadband. The exception was businesses in the services sector that were already experiencing digital disruption. Some participants also noted the potential for service jobs to move offshore to countries with lower labour costs.

Other studies support the focus group comments on the type of applications businesses anticipate using on high-speed broadband services. A study into the potential for SMEs and community organisations located in NBN early release areas to take advantage of the NBN found businesses anticipated using applications such as transferring and remotely accessing large files, monitoring staff and stock via GPS, onsite data uploading and cloud computing. They were also interested in improved service reliability and cost savings from VoIP.²⁶

Business interest in applications like cloud computing, sharing large design files and remote operation and monitoring of sites has implications for the design of a high-speed broadband network, as these applications rely on being able to send potentially large amounts of critical data in real-time. While much of the NBN debate has focussed on download speeds, technical characteristics like upload speeds, latency (the delay in receiving information) and contention ratios (the extent to which adding more users reduces the bandwidth available to all) will also be important to the network's ability to support common business uses. The importance of collaboration to businesses suggests that the ubiquity of the network will be key to realising productivity benefits.

Gaps in SME readiness have also been confirmed by other research. ABS data shows that SMEs are far less likely to have a website, or place orders online, compared with large businesses (see Table 6). The OECD reports that in all countries and across all measures of ICT indicators small companies lag compared with larger ones.²⁷ Furthermore, while advanced broadband applications are already being contemplated by some businesses, for many SMEs basic applications are still the core appeal of Internet activity. The 2012 Sensis e-business report, which looks at online activity by SMEs, found that emailing, internet banking and getting information and conducting research were the most important reasons for SMEs to use the Internet.²⁸

²⁶ The Allen Consulting Group, Opportunities for small business and community organisations in NBN first release areas, 2011.

²⁷ OECD, *Internet Economy Outlook*, 2012.

²⁸ Sensis, *e-Business Report*, 2012.

However, web usage and digital engagement varies considerably amongst SMEs with the type of industry a key indicator of sophistication and engagement. A recent study found businesses in the tourism sector had a greater web presence compared with manufacturing and construction companies.²⁹

TABLE 6: BUSINESS USE OF ICT BY EMPLOYMENT SIZE

	Proportion of businesses with:		Proportion of businesses which:	
	Internet access	Web presence	Placed orders via the Internet	Received orders via the Internet
Employment size	%	%	%	%
0–4 persons	89.1	33.2	43.8	24.4
5–19 persons	93.3	53.8	59.5	32.3
20–199 persons	98.2	73.9	68.7	38.4
200 or more persons	100	97.3	81.1	38.2

Source: ABS, 8167.0 - *Selected Characteristics of Australian Business, 2010-11*

Indicators of more sophisticated online behaviour, such as receiving orders online and the percentage of revenue earned from Internet income, show a lesser capability gap between SMEs and large companies. This may reflect Australian businesses lower overall performance on these measures. A 2012 OECD report, for example, rated Australia twenty-third out of twenty-five countries surveyed for the percentage of business turnover generated from Internet revenue.³⁰

Many small companies are also failing to take full advantage of existing applications and services. VoIP services can realise significant telecommunications cost savings for businesses but a recent report found that only 16% of SMEs use them.³¹ Anecdotal reports from the Australian Taxation Office suggest that many small companies that use financial software are not making full use of automated features, which could reduce the level of manual transactions the business is required to make and also minimise the complexity of administering taxation and superannuation obligations.³² Only a third of small companies have a website.³³

Cost and time constraints are the main barriers to SMEs taking advantage of high-speed broadband,³⁴ in part because SMEs find maintaining existing IT services expensive and time-consuming. SMEs may also lack the time or money for complementary innovations to take advantage of the technology investment, for example, the development of new products, processes, marketing or organisational practices. Given that many of the productivity benefits from ICT investments are known to stem from complementary changes to business practices, or increases in staff skill levels, the lack of time or expertise to make these changes or skills investments may be the real barrier to realising value from the rollout of high-speed broadband for SMEs. Technical issues, information gaps and behavioural issues, such as company culture and skills availability, are also obstacles.

The lack of internal expertise means technology vendors are important sources of support. The *Smart.Digital.Connected* Report found that 80% of businesses surveyed saw telecommunications service providers as valued sources of advice about the creation of future digital business models.³⁵ The importance of vendor support was also raised in discussion groups.

²⁹ The Allen Consulting Group, 2011

³⁰ OECD, *Internet Economy Outlook*, 2012.

³¹ Market Clarity, *Small Business Telecommunications Service Use and Experience*, 2013.

³² Australian Taxation Office, *Commissioner's Small Business Consultative Group minutes*, 12 March 2013.

³³ ABS, 8167.0 - *Selected Characteristics of Australian Business*, 2010-11, 2012.

³⁴ The Allen Consulting Group, 2011.

³⁵ Alcatel-Lucent, *Smart.Digital.Connected*, 2012.

Because we're an SME.... we're very reliant on people outside of the organisation so that's a major part of the purchase decision.

While some smaller companies had informally tried to develop systems in house, this sometimes presented later risks to the business.

There was a young IT student that had worked on [the IT system]... And this guy was great. He was changing all these... little things, but it made such an improvement in such a short space of time and... I thought, "Hey, this is fantastic". [Then we started]... looking at CRM side of things. It had been about six months and I tried ringing him and couldn't get a hold of him. It was 18 months before I could get a hold of him and that whole time, I'm thinking, "If this falls over – if something goes – this is the lifeblood of the business, and if it stops, we're back to writing on exercise books", you know? So I thought, "Well, that is a real risk

This experience is not unusual amongst SMEs. A recent study of SMEs in five countries described the 'Involuntary IT Manager' syndrome, whereby the most technically savvy staff member becomes the default IT manager within a business. The study, commissioned by Microsoft, found that IT adoption and maintenance in Australian SMEs was diverting an average of 160 hours of staff time per year away from core business activities. One solution suggested by the study was the use of cloud computing services by SMEs, which allow them to cost-effectively outsource IT functions.³⁶

These experiences suggest that there is a need for greater industry and Government action to assist SMEs to develop the capabilities to take advantage of high-speed broadband. Many programs to do so have been rolled out in Australia at a State and Federal Government level, as well as internationally. Before creating new programs, it would be prudent to conduct an audit of existing approaches to identify the most effective and to find opportunities to avoid duplication and improve coordination in service delivery across tiers of Government and the public and private sectors.

Such work could also consider options for more innovative modes of delivery for these support programs. As Chapter Three discusses, supply chains, technology vendors and employees are the most common sources of information and support for SMEs, although SMEs do sometimes have concerns about the independence of the advice they receive and therefore often appreciate recommendations from other businesses or conduct their own research online to verify information. There may well be more opportunity for Governments to play a facilitative or coordinating role in partnership with technology vendors and industry associations. This approach was taken by New York City with the release of the *Digital Roadmap: Progress and Innovation in 2012*, which combined Government³⁷ action with activities delivered directly or partnership with leading technology companies. It recognises that the skills and support of technology companies are a valuable resource that the Government and SME community can draw upon. Better use may also be able to be made of different models of service delivery, such as online and face-to-face development opportunities.

2.4 BUSINESS PREPARATION FOR HIGH-SPEED BROADBAND ROLLOUT

The 2013 Business Prospects Survey also asked businesses how they intended to prepare for the rollout of high-speed broadband in 2013. Around 75% of businesses reported they intended to train existing staff in order to improve the skills/capabilities required to take full advantage of a new broadband network. Most remaining businesses indicated that they intend to hiring additional staff, with or without the use of labour hire services. Larger businesses were more likely to intend to employ additional staff than smaller businesses.

These results do not necessarily mean that a large portion of businesses have begun preparing for the NBN as the survey did not include the option of no preparation. Many respondents indicated none in the comment box on the survey, or noted that the NBN would not be coming to their area in the next year and therefore the business had not begun to prepare. These attitudes are not surprising given that the NBN rollout will occur

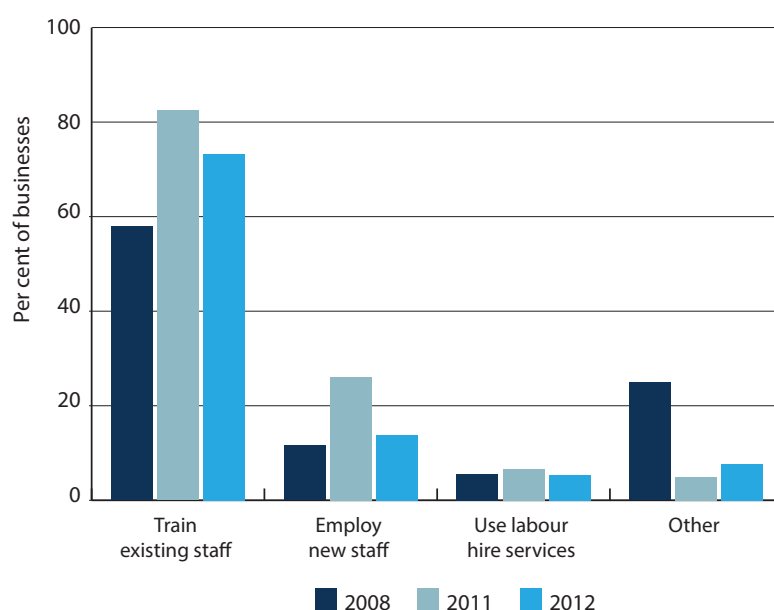
³⁶ AMI-Partners, *Involuntary IT Manager Study*, 2013.

³⁷ New York City, *New York City's Digital Roadmap: Progress and Innovation*, 2012.

over ten years and will not reach its peak ramp-up rate until FY2015 so most businesses do not currently have access to it, nor will they do so in 2013. A similar sentiment was expressed in the NBN early release area study where participants noted that the NBN was perceived as being a long way off so businesses had not begun preparing for it. Participants also commented that it was difficult to visualise what the NBN would allow until they had experienced it, which affected their ability to plan.³⁸

What these results may show is that businesses are significantly more likely to train existing staff to improve skills within the business. This parallels results from Ai Group's 2012 *Business Investment in New Technology* Report, which found over 80% of businesses intended to train existing staff to acquire the skills needed to take advantage of high-speed broadband. (Chart 8). The results suggest that lifting the skills of the existing workforce will be critical to skills policy and planning related to the rollout of high-speed broadband.

CHART 8: BUSINESS PREPARATION FOR HIGH-SPEED BROADBAND



Source: Ai Group



38 The Allen Consulting Group, 2011.

2.5 IMPACT OF MOBILE TECHNOLOGIES

Discussion group participants were asked about the impact of mobile and other digital technologies, such as tablets, smartphones and social media, on their business. Unlike high-speed broadband, many businesses had experience using these technologies and could talk about them in more tangible and immediate terms than high-speed broadband. ABS data on the type of broadband connection used by businesses confirms the sentiment in these reports, as fibre-to-the-premises connections are the least common type of broadband connection for businesses, reported by just 1.5% of businesses. The majority of businesses (75%) connect via ADSL. Around 6% of businesses have a cable or fixed wireless connection with 3% connecting by satellite and 8.6% connecting via mobile wireless.³⁹

There has been significant growth in the use of mobile technologies and social media in recent years amongst SMEs. From June 2011 to June 2012, smartphone use by SMEs rose from 46% to 63% and tablet use rose from 16% to 29%.⁴⁰ The number of SMEs using social networking channels for business rose from 18% to 27%. The rising use of these technologies was evident when discussion group participants were asked about the impact of mobile and digital technologies on their business.

[Mobile technologies are having a] massive impact on my business. We're a very mobile business. At the moment, 95% of my users have laptops and they travel...I think that all of those devices will be replaced in the not too distant future with mobile devices.

It makes anyone that's working outside of the office more mobile and more flexible and then they can get back to people, so the communication is more instantaneous.... We tend to find ourselves on some fairly remote sites so sometimes the communication is not very good there, so we're hoping that will improve.

Many businesses described the impact of mobile or digital technologies on their sales and marketing activity.

We're directing a significant proportion of our sales and marketing resource and spending into driving technology.... making sure the website services are there to attract the customers, making sure that when they come to the website, we're just making all the website iPhone-friendly

We've seen a lot of our customers...access our information now on mobile devices

Yesterday we had the... national sales force in and rolled out iPads and iPhones so now all the brochures, documents and everything are on their iPads when they make a sales call, they don't have to come back to the office. It's a massive efficiency

[The] approach to marketing and communication strategy 10 years ago...[was] just a traditional TV ad... it's now...social media and being able to manage your customer base...and actually have specific messages for them. [That requires] a whole new skill set...and...technology and IT...to...enable that to happen.

The main impediments to adopting wireless and cloud technologies are security, intellectual property and privacy concerns and business processes that have not kept pace with technological innovations.

We use the cloud...but...we're running into problems now with [customers questioning]...the security... it's becoming a real business challenge for us....They're also asking a lot harder questions, some of which we just can't answer because we don't know what levels of security we're dealing with and we're not in a super security conscious world in terms of our data. We like the cloud but we've got to convince our clients to love it too.

Cloud [activity is] inhibited because we deal with government...and they have rules that says we can't take that data and we can't put it in a certain spot.

[There's] this thing called bring your own device, where people are bringing their own [devices to work]... the thing...I'm seeing in a lot of businesses is that all of their HR systems, their pay systems et cetera are still on the PC. And that's a real problem.... every company should be able to look at their corporate directory, to do their payments while they're on the train.

39 ABS, 8167.0 - Selected Characteristics of Australian Business, 2010-11, 2012.

40 ACMA, Australia's Progress in the Digital Economy: Participation, Trust and Confidence, 2012.

CASE STUDY: JOHN HOLLAND

John Holland's Melbourne office could easily be mistaken for a technology company rather than a construction business, with its open plan office, communal staff spaces and clever integration of tablet, television and video-conferencing technology. But this design is no accident and embodies a company culture built on integrity, collaboration, innovation, accountability and care.

As a leading engineering, contracting and services provider to the infrastructure, energy and resources and transport services sectors connectivity is "fundamental and the air to the organisation. If we are not connected the work is not done" explains David Banger, John Holland's Chief Information Officer. This means connecting the executive to employees, enabling collaboration between employees, and being better connected to customers and communities.

Tablets and smartphones have been adopted by many areas of the businesses, including engineers who use them to access drawings and safety documentation onsite. Tablets also mean the ability to immediately assess and report on project management goals and write onsite reports. This saves time and red tape and supports the company's commitment to ensuring quality and safety on site.

The rollout of these technologies is supplemented by innovative and targeted training resources to help employees make the most of technologies. As technologies are rolled out, the IT Department records and adapts to employees' real-life applications of the technology.

Consistent with research on high-performing companies' ICT use, John Holland's ICT strategy is based on enabling the business' needs and providing employees with a high quality and seamless experience, rather than a fixation on particular technologies. As David Banger says, "part of our IT strategy is being the best Australian contractor by putting the employee at the centre of everything we do."

2.6 RESEARCH AND DEVELOPMENT ACTIVITY

Research and development is another important means by which companies acquire new technologies, although less common than purchases of existing technologies. Like technology investment, R&D spending in Australia increased strongly between 2002 and 2008, but fell back following the onset of the GFC. This was typical of other markets, with around one quarter of EU firms decreased spending on R&D in the immediate post GFC period, while half managed only to maintain their spending.⁴¹ The GFC had a strong negative impact on business innovation worldwide, reducing access to a range of different financing options, causing sluggish growth in business expenditure on research development, reducing demand for innovative products and creating greater uncertainty about future demand.⁴²

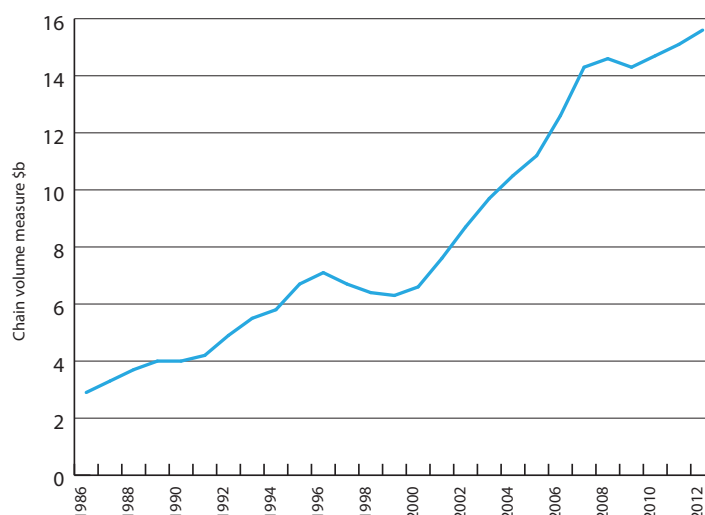
More recently R&D spending has increased, though at a more modest rate (Chart 9).⁴³

41 Kanerva, M.; Hollanders, H., 'The Impact of the Economic Crisis on Innovation: Analysis Based on the Innobarometer 2009 Survey', in *InnoMetrics*, 2009.

42 OECD, Science, Technology and Industry Outlook, 2012

43 Of course, business may conduct research and development for purposes other than developing new technologies.

CHART 9: AUSTRALIAN R&D SPENDING



Source: ABS, Australian National Accounts: National Income, Expenditure and Product, Cat. No 5206.0, Dec 2012

In the mining sector, the value of R&D spending rose by 2.9% in 2010-11 but remains close to 10% below the peak level seen in 2009-10, suggesting the developmental (or experimental) stage of investment in this current mining investment cycle has peaked. The value of R&D spending in the manufacturing sector rose 11.7% in 2010-11 to \$4.8bn, which in nominal terms was higher than the spending seen in the services, construction or mining sectors. R&D spending in the services sector rose by 5.2% in 2011, after falling by 3.1% in 2010, while the value of R&D spending in the construction sector rose by 14.6% in 2011, after declining by 7.1% in 2010.

When asked about actual and expected R&D spending in Ai Group's 2013 Business Prospects Survey, fewer businesses indicated that they were likely to increase investment in 2013 compared to 2012. Close to 22% of businesses indicated that R&D spending went up in 2012, 10% indicated that spending fell, and 68% reported that spending to remain unchanged (Table 7). By comparison, 22% of businesses reported that they expected investment spending to rise in 2013 while 17% expected spending cuts. The reduction in the proportion of CEOs expecting investment growth was most clearly seen in the construction and mining sectors.

TABLE 7: ACTUAL AND EXPECTED R&D SPENDING

2012 actual spending	Manufacturing	Services	Construction	Mining	Total
Per cent of respondents					
Up	23.8	18.0	19.0	18.2	22.1
Down	9.3	14.8	9.5	9.1	10.3
No change	67.0	67.2	71.4	72.7	67.7
2013 expect spending	Manufacturing	Services	Construction	Mining	Total
Per cent of respondents					
Up	20.3	26.2	15.0	23.8	21.2
Down	16.5	19.7	20.0	19.0	17.4
No change	63.3	54.1	65.0	57.1	61.4

Source: Ai Group

Challenging conditions for R&D investments were raised in discussion groups.

At the moment, our R&D investments are worth 15% of our revenues, which is probably about three per cent higher than where we'd like it to be. We'd like to be at 11%. So we try to protect our investments but the Australian dollar certainly makes it pretty hard for us to do.

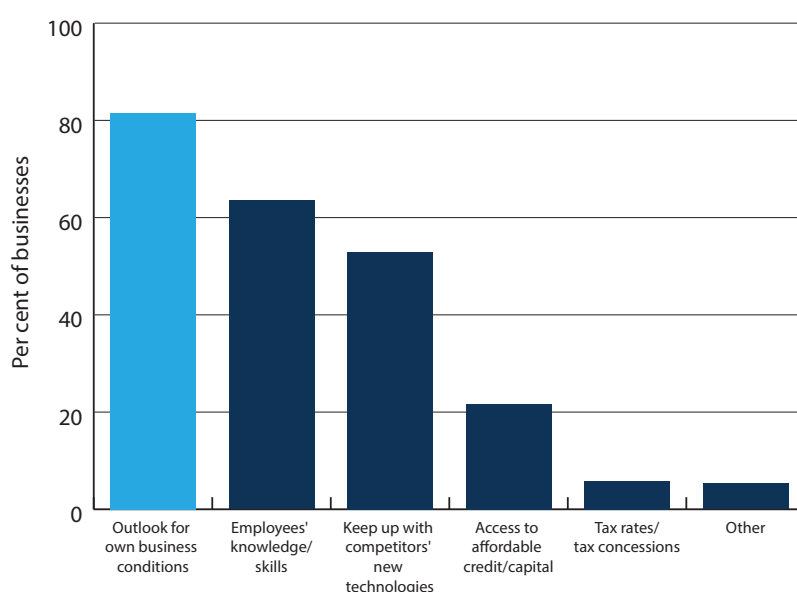
Chapter Three:

Factors Affecting Investment and Productivity Outcomes

3.1 BUSINESS OUTLOOK

Ai Group's Business Prospects Survey also sought to understand the factors affecting business decisions to invest in new technology. The factor most cited by CEOs was the outlook for their own business conditions, reported by over 80% of respondents (Chart 10). Employee's knowledge and skill, and keeping up with competitors who were implementing new technologies were also reported by over 50% of businesses.

CHART 10: FACTORS AFFECTING INVESTMENT IN NEW TECHNOLOGY



Source: Ai Group

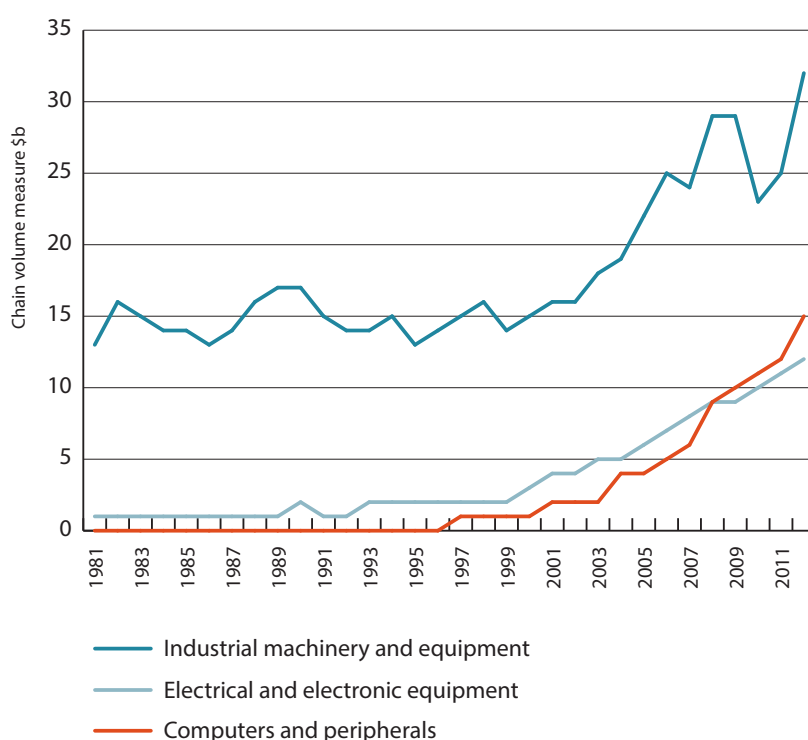
Business sensitivity to the outlook for business conditions partly explains the drop-off in capital investment intentions in 2013. The 2013 Business Prospects Survey found CEOs expect a tougher trading year compared with 2012 and remained concerned about slowing demand across the economy; the high value of the Australian dollar, the challenge of global competition; and rising business costs. Discussion group participants described how uncertain economic conditions and a hangover from the GFC were prompting extra conservatism in investment decisions, particularly for large capital expenditure items.

Any investment in an uncertain environment is something that most companies consider much more than they used to. And business conditions have been pretty tough.... Certainly, our organisation hasn't stopped investment....[but] there are some things that we have scrutinised and said, "Maybe now's not the time"

Over the last couple of years, it has impaired our ability to invest in innovation. We haven't ramped up again, but we're looking for the right opportunities to invest, where we are going to make sure that we maximise the innovation investments.

Increased conservatism around larger purchase items may also explain variation in spending patterns for different categories of technology investment during and after the GFC. While spending on machinery and equipment dropped off significantly in this period, spending on IT equipment continued to grow (Chart 11).

CHART 11: AUSTRALIAN INVESTMENT IN NEW TECHNOLOGY



Source: ABS, Australian System of National Accounts, Cat no. 5204.0, 2011/12

Another explanation provided by focus group participants was that difficult business conditions have been a spur to innovate and improve efficiencies, particularly in services and systems, which often involved ICT investments.

When you're in a highly competitive market like we're in, you have to differentiate. And you can't do it with products because your products are very similar in the main..... most of our investment has been in efficiencies in the warehouse...we're able to offer that as a differentiator to our...distributors and customers. And then the other major investment has been in systems, and they truly are differentiators on things like inventory management, stock turns, on time delivery, order fill.

Broadening the product range, keeping it innovative, putting money into R&D, has helped us. It's got us through, but it's very tight at the moment and margins are being shaved...if we hadn't put the investment in, in the last few years...we'd be in a lot worse position that we are now. And having put the investment in, we're still looking to the future for payback. Things are very tight at the moment.

We wouldn't have survived if we hadn't invested in technology when the economy essentially died.

We see a lot of pressure around rising labour costs and increasing costs in supply chain and in compliance... So for us, it's been really about trying to invest to keep ahead of the challenges that are presented, and to maximise the returns that we're getting on the sales we've got.

OECD research shows that process and organisational innovations, which tend to focus on cost-control, were less affected by the GFC than product and service innovation.⁴⁴ Companies with increased competition, lower price-cost margins, who export or are experiencing downward pressure on profit margins, are also more likely to be innovative.⁴⁵ For some discussion group participants, a decision to invest forced the company to continue to focus on growth to fund the original investment and related costs such as employing new staff, undertaking training or upgrading other systems or processes.

It's invest, grow, invest, grow... just to sustain our basic returns.

Keeping up with competitor's technologies was cited by over 50% of survey respondents as a factor affecting investment decisions and also came up in focus groups.

You're certainly watching each other on what machinery... they put in, and that helps drive you to want to improve.... So if somebody puts in something really smart, you go, "Bugger. Better get one of those myself."

But for many businesses, deciding when to invest and when to defer expenditure remains difficult in an uncertain economic environment.

I don't really know what the answer is to that. Do you go out and do you hit it hard or do you concentrate on keeping your cash in-house and only looking at the things that really are going to create revenue? Bring work in or keep the current work happening?

CASE STUDY: SYMBION

Symbion is a major wholesale operator in Australia's healthcare sector offering manufacturing, logistics and healthcare services to the pharmaceutical industry.

The combination of a Government decision to lower the level of subsidies for medicines covered by the Pharmaceutical Benefits Scheme (PBS), and high labour costs, placed cost pressure on the company, catalysing a series of innovative capital investments to improve the efficiency of Symbion's operations. These included a new distribution centre, automation and RFID technology.

While the need for efficiency drove the investment, other benefits have included substantial quality improvements and a better service offering to customers.

The investments have also transformed aspects of Symbion's workplace and lifted the skill level required of employees. This increased need has been met through a mix of internal staff development and targeted hiring of new skilled staff for specialist positions. However, skill shortages amongst technicians able to operate the new equipment remain a concern.

The investments have also led to noticeable improvements in the business efficiency and productivity of Symbion's operations, with Alvin Fernandes, National Warehouse Optimisation Manager for Symbion, observing both immediate and longer term lifts in productivity from the investment.

⁴⁴ OECD, Science, Technology and Industry Outlook, 2012

⁴⁵ Soames, L.; Brunker, D.; and Talgaswatta, T. *Competition, innovation and productivity in Australian businesses*. Productivity Commission and Australian Bureau of Statistics joint research paper, 2011.

3.2 SUPPLY CHAINS, PARTNERSHIPS AND COLLABORATION

The influence of supply chains on technology investment decisions has repeatedly come through in Ai Group CEO Surveys. One reason for this influence is that supply chains are the most common source of information on new technologies for businesses. Ai Group's *Business Investment in New Technology* Report, published in 2012, found that 70% of respondents sourced information on technologies from within their own business or within their supply chain. The sources least utilised by businesses were research organisations and government agencies.

In Ai Group's most recent CEO survey, the majority of businesses (53%) reported that they learned about the new technologies from a client or supplier. Larger businesses, in particular, were found to be more likely to source information from within their supply chain.

ABS and OECD data shows nearly three quarters of Australian businesses source inspiration and information for innovation from outside of the business. The most commonly used sources include organisations within a company's supply chain; competitors and businesses within the same industry; and written and electronic publications and consultants. The value of supply chains as a source of inspiration and innovation was confirmed in discussion groups.

You'll often find that they're [suppliers] a source of innovation in your company, whether it's in terms of actual product or building block innovation or whether it's in terms of process innovation.

Technology allows us to have a really effective relationship without a high cost and so we can draw on [international suppliers] inspiration, technology, ideas and developments that we can utilise here

The demands of clients or suppliers can catalyse technology investments by companies in the same supply chain. For smaller companies in particular, demand for new technologies or enhanced services from suppliers and customers can be crucial to investment decisions. This demand is important to give companies the confidence to invest, but can also place pressure on businesses that may be uncertain about the need or value of the investment to their business or concerned that a major client will not support the investment.

How your customers want to use technology,... how your supply chain wants to use technology... becomes the driving influence for the consideration of upgrading and modifying the use of technology within your own firm.... So probably for us, it hasn't really been the external environment so much, but customer demand that has actually brought us into investment, and wanting to keep our business at the forefront of the technology.

When we did this [major capital investment] going back a year and a half ago... we started researching it and we approached [major client] with an idea... and it was very streamlined and very quick. They said, "No. No. No. We like the way we're doing it." And then probably a month ago, they raised it with us and said, "Well have you thought about this?" and we said, "Well, we did raise it with you a year and a half ago. Now we've made this investment." So there's always that worry of getting your return on investing more and then how the market's going to change.

Changes in supply chains, such as greater global integration, smaller and more customised shipments and pressure for just-in-time deliveries were consistently nominated as influences on technology investment decisions.

Increasingly, it's the systems integration within a transport business that's differentiating our offering... in many cases, the actual physical size of each consignment is reducing and the frequency is increasing, and all of those various consignments have anything up to a 20 minute delivery window within any of the retail facilities and if you miss those windows, the client or the freight owner gets whacked. So it's pretty critical that you can know where all of your freight is at any given time and whether you've planned it appropriately so that the four or five different consignments on each vehicle are going to be delivered to their various endpoints at the right time.

Some of our collaborations have changed... through vendor-managed inventory. We now don't own the components until well after we use them...Where [Australian suppliers]... had advantages of shorter sort of supply chain, shorter lead times on supply, maybe returnable containers ...those advantages have greatly reduced

Customers were also cited as important collaboration partners in discussion groups.

We've got customers who are now approaching us saying, "We want to invest in your business." So a more collaborative approach on how your business has got to move forward and what technologies you've got to put in to develop the product that we want that their customers want. So when they first approached us with that, it got us thinking, "That's quite left-field from everything they've thought before" and thought, "Are they serious?" But I think if you do take them seriously and you do collaborate with your customer...there's definitely a lot of advantage

We used to make products, fill a warehouse and then worry about how they sold. And we've gone right to the other end of the market, right to the other end of the channel now, or the supply chain, and we now work more closely with end users....Rather than just innovating and pushing it out there and hoping for the best, we spend a lot of time analysing real end user needs now, otherwise we just fill warehouses around the world.

Discussion group participants also mentioned the influence of overseas parent companies on decisions to invest. Some were experiencing an increasing push to adopt common systems across global operations, which affected the autonomy and the decisions made by the Australian subsidiary.

More and more decisions are being driven by head office, which means that a lot of the investments, we don't determine locally any more

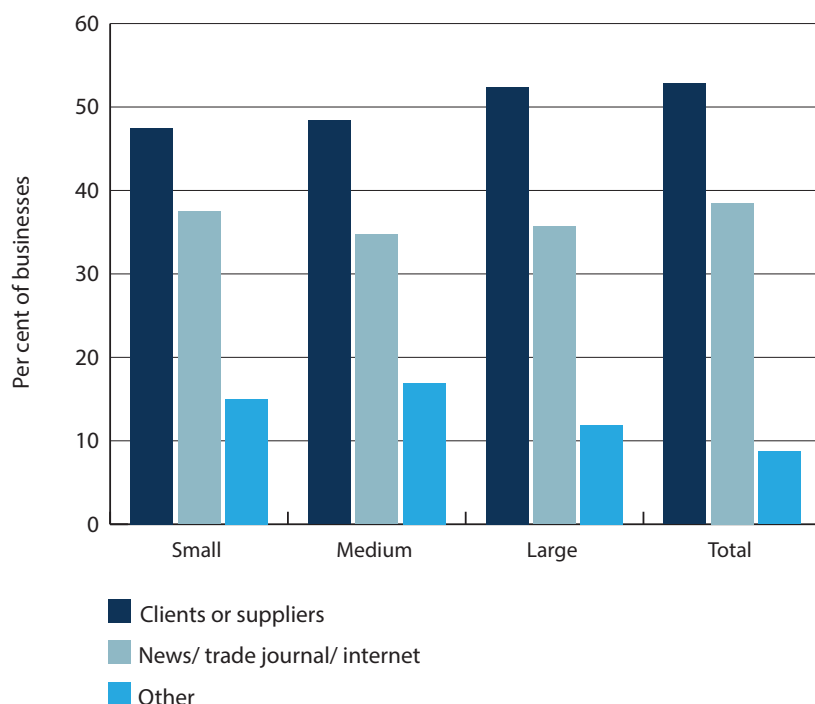
While a parent company might direct a company to make investments it would not otherwise make, it also provides valuable support in the implementation phase.

With new systems, what we find is the skills that are in our organisation, we don't necessarily have them here so when we get these new systems coming across, whether they be the hardware systems or the processes, they're [parent company] very, very helpful to our organisation.

Vendors are also important to technology investment decisions and their implementation. According to Ai Group's 2013 Business Prospects Survey, the most common way for businesses to acquire new technologies in 2012 was to modify technology purchased from an external supplier (Chart 12). Just over 50% of businesses reported that they had acquired technology this way, with larger businesses, in particular, more likely to adapt technology to suit their business. Close to 47% of businesses that invested in new technologies during 2012 reported that the technologies were simply purchased off-the-shelf from an external supplier. Apart from purchasing technology from an external supplier, a small number of businesses reported that they developed new technology internally.

This is similar to findings from the 2012 *Business Investment in New Technology* Report, which found that 44.6% of technologies were acquired from an external supplier but modified for the business, 43.7% acquired technology externally off-the-shelf, 25.7% of businesses developed technologies internally and 7.9% developed technologies in collaboration with a research organisation.

CHART 12: SOURCES OF NEW TECHNOLOGIES ⁴⁶



Source: Ai Group

Fewer than four per cent of Australian businesses use public sector organisations as a source of information and inspiration for innovation, a finding that is typical of most countries.⁴⁷ Collaboration with research institutions provoked mixed reactions within discussion groups. Some businesses felt it was too hard because of a lack of common goals or incentives or an excess of red tape.

These guys are paid to get research grants. They're paid to publish papers.... they're not promoted on the basis that they've spent time and developed a product....

I wouldn't participate in... the ARC linkage. ...the university applies, it's a really long lead time, it's a relatively low success rate and the university controls all the money and the IP.

Other participants were more positive about their experience of collaborating with research institutions, although they noted the need for patience, relationship building and shared goals.

You need to have a common need and agree on a common goal

Proximity to the university is really important, and developing... informal relationships and collaborations are absolutely key because I don't think you'd get a formal collaboration that works without going through the informal first.

Incentives faced by researchers and Publicly Funded Research Organisations (PFROs) are often barriers to greater collaboration. Academic rewards are weighted in favour of publication and to a lesser extent teaching well ahead of collaborative relationships with business and other potential partners. PFROs often develop internal policies governing intellectual property rights that are excessively complex and do not permit the degree of flexibility required to do a deal.

A recent initiative to help overcome barriers to collaboration between businesses and PFROs is the Enterprise Connect Researchers in Business (RiB) program. It is a successful example of industry-driven arrangements that facilitate greater levels of collaboration between publicly funded research institutions and businesses

⁴⁶ Businesses were classified as 'small' if they employed less than 20 staff; 'medium' if they employed between 20 and 100 staff; and 'large' if they had more than 100 employees.

⁴⁷ OECD, *Science, Technology and Industry Scorecard*, 2011.

and provides a model for a new pattern of research/business collaboration. Facilitators connect businesses with researchers that have specific expertise relevant to the needs of the business, including in the areas of: product, process and marketing innovation, as well as environmental sustainability. This program was cited favourably by discussion group participants and Ai Group recommends that its funding is expanded.

Participants also valued the ability to learn from other businesses, and suggested moderated discussion groups when asked what initiatives they would like to see from Government and non-governmental organisations.

It [would] be great if I could...get a heap of people in a similar situation to us in one room.... everyone has got the same issues and it's refreshing...to realise that....you can go and sit through seminars. You can do courses. ...but it's at the coalface where you get people's experience that's going to assist you.

3.3 SKILLS

Workforce skills are integrally linked to technology investment and productivity. Employee knowledge and skills was the second highest influence on decisions to invest in new technology, cited by over 60% of businesses in Ai Group's 2013 Business Prospects Survey. More generally, of businesses reporting labour productivity growth in 2012, 40% said the main factor contributing to this improvement was increased staff skill and capabilities.

Moreover, once the investment is made, workforce skills affect a company's ability to leverage the investment, both through effective utilisation of the technology and complementary innovations in other parts of the business. Research from the UK suggests that technology investment can also be a driver for increasing workforce skills, with high performance organisations that invested in ICT finding that they also needed to invest in a more highly skilled and flexible workforce to realise productivity or competitive benefits from the investment.⁴⁸ This was noted by discussion group participants

When you...think of investment, you tend to think of products or process... but the big thing that drives productivity is generally people themselves. So we're putting some energy into how do we retrain...[and] upskill people...

Workforce skills also affect the innovative capacity of businesses. A lack of access to skilled persons was the second most important impediment to innovation in 2010-11, rated by 20% of businesses, and the most important impediment in innovation in 2009-10.⁴⁹ A further four per cent of businesses described lack of access to knowledge or technology to enable development or implementation as a barrier to innovation.⁵⁰ Research into the quality of management practices in Australian manufacturing firms found that 64% of managers in high-performing companies had university degrees, as did 20% of staff in non-management roles, compared with 3% and 1% respectively for the lowest performing firms.⁵¹

Workforce skills have also been identified as a key enabler of success in the digital economy. Innovation and Business Skills Australia has identified three critical e-skills categories for Australia to take full advantage of the NBN and digital economy:

- > **foundation skills** within the adult workforce, such as literacy, numeracy, problem-solving and basic IT skills.
- > **digital literacy and innovation skills** (or e-skills) required across the general workforce;
- > **specialist skills** in areas like STEM.⁵²

Foundation skills are critical in a complex, technology-rich workplace environment but there are significant issues amongst the existing Australian workforce. A major survey of adult literacy and lifeskills conducted in 2006 found that 46% of adult Australians have literacy skills below the level considered necessary to function successfully in the workplace. Fifty-three per cent had numeracy skills and seventy per cent had problem-solving skills below the level considered necessary to function well in the workplace. These results do not

⁴⁸ Australian Industry Group, *High Performance Organisations: Maximising Workforce Potential*, 2012.

⁴⁹ ABS, *8167.0: Selected Characteristics of Australian Businesses*, 2012.

⁵⁰ ABS, *8158.0: Innovation in Australian Businesses, 2010-2011*, 2012.

⁵¹ Green, R. et al, *Management Matters in Australia: Just how productive are we?*, November 2009

⁵² Innovation and Business Skills Australia, *Impact of the Digital Economy and the National Broadband Network on Skills*, 2011.

mean that workers lack these skills entirely but rather that a worker may struggle to understand an instruction manual, communicate complex ideas via email or interpret information displayed in a graph or chart.⁵³

Preliminary findings have been released by the ABS about the follow-up survey, the Programme for the International Assessment of Adult Competencies (PIAAC), Australia, 2011-2012.⁵⁴ These findings include the information that 44% of Australians aged 15-74 years had literacy skills below the required level and 55% had numeracy skills also below the required level. In short, there has been no substantive progress since 2006.

Basic IT skills are also an important foundation skill for many workers. In a 2009 survey undertaken by Ai Group, over a third of companies (34.7%) identified shortages in basic IT skills. Manufacturing firms were most likely to report IT skills shortages (35.4%), followed by the services sector (30.4%) and the construction sector (27%). In the Ai Group National Workforce Literacy Project a number of pilot programs identified the need to address the ICT skills of existing workers within the context of literacy programs. This was also the case in the delivery of Workplace English Language and Literacy (WELL) programs. The National Foundation Skills Strategy for adults, released in 2012, also includes recognition of digital literacy and employability skills like collaboration and ICT.

Low levels of foundation skills can limit upskilling of workers or graduates. Ai Group research indicates that employers report 25% of apprentices have low levels of literacy and numeracy – the second highest occupational group. This in turn impedes their capacity to acquire STEM skills. This has a significant economic impact as technicians and trade workers is an area of acute skills shortages in Australia. The Department of Education, Employment and Workplace Relations (DEEWR) reports that 18 occupations within the technicians and trades area have national skill shortages, far exceeding any other occupation category.

Ai Group's Survey of Workforce Development Needs 2012 asked employers if they had experienced difficulties recruiting specific occupations with STEM skills. Across industries, technician and trade workers (41%), professionals (26.6%) and managers (26.3%) were the occupations with the highest STEM skills shortages. The difficulty in recruiting individuals with STEM skills were reported by multiple industries. The highest skills shortages were for technicians and trade workers in the manufacturing sector (44%). A shortage of technicians and trades workers with STEM skills was also reported by 39% of construction industry and 35% of services sector respondents. There are also skills shortages in the ICT area, as commencements in tertiary ICT courses have declined by 53% between 2001 and 2011, while completions declined by 58% in the same period.⁵⁵

The OECD reports that demand for workers with STEM skills is being driven by growing use of ICT, greater need for innovation within businesses and a shift towards more knowledge intensive industries. A similar theme emerged in discussion groups.

Five years ago, my labour force was the guy with the fluoro shirt who came into work at 6 o'clock in the morning and left at 2 o'clock in the afternoon.... He came into work, picked on the line, went back home. He was happy with his life. My labour force changes from a fluoro shirt guy to a warehouse technician. His job now is he comes in at 6.30 and he looks at knobs and switches and PLCs....The whole mindset of my skill set is gone.

Ten years ago, we had a guy working on a machine. Nowadays, we have the same guy, but he's able to work 20 different machines and he's happy to change from one to another. Flexibility, higher knowledge and obviously, higher pay.

Focus group participants across industries noted the importance of workers who could integrate systems or combine two different types of skill sets, particularly in STEM related disciplines. There was a strong view that the Australian training system struggled to meet this need because training courses were too specialised.

You tend to get people that are experts in their field, but they can't see left and they can't see right of what they've actually done...in engineering... you have to be able to look to the left and to the right to be able to put things together

53 The Council of Australian Governments Standing Council on Tertiary Education, Skills and Employment, *National Foundation Skills Strategy for Adults*, 2012.

54 ABS, 4228.0 - *Programme for the International Assessment of Adult Competencies, Australia, 2011-2012*, 2013.

55 Australian Workforce and Productivity Agency, *ICT Skills Forum presentation*, November 2012.

When you look at a lot of the engineering schools... what they tend to do is they... send these engineers out with these very narrow, siloed technical skills... What we have found that we need, because things are getting very complex, is you need this layer [called] architects

IT people have got to be more business savvy and the business people have got to be more technology savvy.

The scarcity of workers that could integrate different systems also created risks for businesses.

Well, it's SPOK syndrome – single point of knowledge. ... My guy developed the systems and knew it all and it was really great because he was... close to the floor and he would customise things all the time, but then once you get a bit bigger and then you realise, "Well, hang on. What if this guy gets hit by a bus?" He's the only one that knows it

There was also concern about a disconnect between the skills of tertiary graduates and practical business needs.

There's not enough graduates graduating in IT and therefore we have a skills shortage, therefore a capability gap.

I don't know what tertiary institution you can send someone to and they'll graduate... with a degree in production line management.

These concerns were echoed by respondents to Ai Group's Survey of Workforce Development Needs 2012, with key barriers to recruiting staff with STEM skills including lack of workplace experience (24.4%) and qualifications not being relevant to business needs (18.3%). One solution suggested in focus groups was the retraining of experienced older workers. While participants debated whether different generations of workers were more or less comfortable with adopting new technologies, older workers were recognised as having the practical experience that recent graduates may lack.

Some of the best people for retraining are older people, because they have a much more practical view of the way things really work... if they've physically done something in a lot of different ways over a period of time, to then take that and automate it... they can actually be really, really important. Having a uni graduate who has got X degree in automation or programming to come and try to design a production line, for instance, would be a disaster

And some discussion group participants contested whether it was the sole responsibility of training providers to produce work ready graduates, recognising businesses had a role to play.

Increasing the industry engagement... That is key to us getting the right people coming on board with the skills

Businesses need to invest in their staff and train them and develop them

However, responses to Ai Group's Survey of Workforce Development Needs showed a low-level of industry engagement in actively promoting STEM opportunities and skills outside their business and there may be opportunities to do more.

More than one discussion group linked the adoption of new or complex technologies with the need to employ specialist workers from overseas, including on a temporary skilled migration visas (457s). The skills shortage arose because the technology was new or rare in Australia, there was a lack of suitably qualified employees in the area, or a project required a new skill which the Australian training system did not cater for. In addition to filling skills shortages, these workers could be a valuable source of training and mentoring for other employees.

I'm literally flying in people from Europe to fix equipment because that skill set does not exist in this country

Why did we go to 457s? Because Australians didn't want to work or we didn't have people... qualified in those trades. I've got a guy now who is a key employee... he runs our CNC section... This guy came from the British aerospace background in the UK and he runs rings around anyone who comes in, yet anyone that comes in and is worthwhile training... he will groom them and they become fantastic people... But this guy is on a 457 [and] because of a technicality he can't get off that. So when I hear things about they're starting to crack down on 457s, I... think, "Well, am I going to potentially lose this guy?" because if I do, I don't know what I'd do.

I need three developers with specific development experience... you just can't find that in Australia so we had to send it to an agency in Russia

3.4 MANAGEMENT AND CULTURE

Numerous studies have identified a link between the culture and management of companies, productivity and technology adoption. A study of the Australian services sector found that high-performing workplaces (HPW) have 12% higher total factor productivity compared with low performing workplaces.⁵⁶ The same study found that high-performing workplaces were associated with effective use and the quality of ICT systems, in particular practices like strong alignment between business and ICT strategy and strategic and operational uses of ICT. The study concluded that “The use of ICT in HPWs has little to do with the types of technology [nor] spending money on ICT and implementing new technology... rather, it is the use, quality and deployment of ICT that seems to make a difference to performance.”⁵⁷

Ai Group’s *High Performance Organisations: Maximising Workforce Potential* Report noted high performance organisations were more likely to adopt relevant and current technologies, including ICT, and integrate them into company processes. The study found high-performing organisations typically have flat management structures, involve staff in decision-making and share business information. They use performance-related reward and recognition systems and are characterised by teamwork, lean production and quality management.⁵⁸ It also noted that companies that implement multiple high-performance strategies (i.e. employee involvement schemes, total quality management and ICT adoption) are often more productive. However, it is unclear whether their better productivity stems from implementation of the initiatives or a pre-existing successful culture which makes them open to trying the strategies.⁵⁹

The TPI 2012 compared the responses of productivity leaders (companies that measure productivity and reported significant productivity increases) to productivity followers (companies that did not measure productivity and did not report significant productivity gains in the previous 12 months). It found that productivity leaders had significantly increased their focus on R&D and innovation in 2012 and attracting and engaging staff. Productivity leaders were also more likely to invest in ICT to improve productivity and rate collaboration within the business and with partners more highly.⁶⁰

A 2009 study of management practices in Australian manufacturing firms found that the quality of management practices affected labour productivity. A number of factors determined management performance including company size and ownership structure, international exposure, education and skills levels amongst the workforce, and high-performing organisational practices, such as flatter management structure and participatory decision-making. Multinational companies (MNCs) performed more strongly than domestic companies. Australian public-listed companies also performed well, as did Australian subsidiaries of overseas companies. Family run businesses performed least well. This accords with comments in Ai Group discussion groups where companies with an overseas parent company praised the relationship as an important source of information, support, skills, technology and financing.

Discussion groups agreed that management attitudes and organisational culture were important to initiating technology investments and to realising productivity gains from technology investments. The alignment between strategy, vision and leadership practices were consistently cited as necessary preconditions for innovation and major technology investments.

We went right back to the bases, the market, the customers, the end users, all of that and then developed the strategy and... aligned everything behind the strategy.

The challenge is you get a clear idea of where you want to go with the business and what your challenges are, then the technology’s over here. It’s actually being able to bring [people with expertise and technology] together.

56 Boedker C., Vidgen R., Meagher K., Cogin J., Mouritsen J., and Runnalls J. M., *Leadership, culture and management practices of high performing workplaces in Australia: the high performing workplaces index*, 2011.

57 Boedker et al, 2011, p. 56

58 Ai Group, *High Performance Organisations: Maximising Workforce Potential*, 2012.

59 Ai Group, *High Performance Organisations: Maximising Workforce Potential*, 2012.

60 Telstra, 2012.

If we look 10, 15, 20 years ahead, we believe that 30% plus of our turnover will come from technologies we don't even know about today. So we can't ignore that. We have to invest and be part of that today.

Management involvement in technology decisions was also important to ensure that complementary innovations or changes in the business were made that would increase the benefits of the investment.

Management [is]... intimately linked to the technology investment because... you don't do that in isolation of also re-looking at your underlying business processes and operating frameworks.

The involvement of management may also be important because senior managers can have different business priorities to technology decision makers. The TPI 2012 found that senior executives placed more importance on increasing revenue (85% versus 69% of technology decision-makers) and attracting and engaging staff (86% versus 66%) while technology decision-makers were more likely to prioritise decreasing costs compared with senior executives (74% to 57%).⁶¹

Discussion group participants also saw organisational culture as a critical element in the decision to invest in new technologies and the success of the investment.

Most of the time [innovation] is held back [by] culture - not to take a risk. And innovation, by its very nature, has a level of risk attached to it so I think the culture of the business is the most important thing... you've got to have a leap of faith and trust people who are truly innovative, but then allow them to make mistakes.

Culturally, you've got to have people that actually want change, that actually look forward to it and respond positively to change and see that it's a benefit for both them and their organisation and the customer. If they don't have that belief at the start, then it becomes a challenge.

Discussion group participants were also asked if new technologies were changing the management and leadership skills required by businesses.

I think so... you're more aware you need that entrepreneurial component in your management team.

There's a lot more emphasis now on soft skills as management.... People are more emotional these days and... you need to nurture people in an organisation and work really hard at that corporate culture. I've found the last 10 years has changed a lot.

Leadership is... not about authority any more. It's... about influence, and that influence comes through insight. So it is actually about being informed about what's going on with a new organisation, what are the industry trends and what does that actually mean?

Your employees... all have different needs. They all need to be trained and developed in slightly different ways, depending on their backgrounds and skill set. But collaboratively, if you've got the right resources, then they collectively give you a great outcome, but it takes time and investment to get all of your personnel developed effectively.

Another aspect of workplace productivity and technology is the change to workplace practices that technology enables. A number of discussion group participants raised these changes unprompted and discussed the management implications of an increasingly available, flexible and mobile workforce.

Two of my team are three day a week mums and for me, one of the issues is they get every email on their days off and trying to get them to understand when you're being mum, I want you to be mum.... I have to really manage the way I communicate with them.... I'll delay that email till tomorrow morning because I know that they don't need to know about it today, but if they do, they'll do something with it.

People tend to be available to work all the time so that's just something we've started to think about in terms of managing people.... Some of them are starting to get a little bit jaded or a little bit tired or aren't very good at managing their own selves

Some participants noted that technologies were having a positive impact on team structure, collaboration, flexibility and productivity, although others questioned the extent of change throughout the workplace.

⁶¹ Telstra, 2012.

Technology also has helped in terms of [the] virtual office....Our customer service centre is somebody sitting in Geelong, somebody sitting in Bendigo and a few here in Ballarat, as opposed to them all being independent companies and whoever walks in the door is their customer.... they're all a team and they all now operate far more effectively as a team, rather than someone's doing their own thing and someone else is doing their thing in a...disjointed manner.

We can trust employees to work remotely and with ICT today, you can do that extremely effectively.

There's a million people employed in manufacturing in this country today... and a lot of them probably aren't connected all day, every day, and don't need to be. Absolutely, the business needs to be. You know, we're getting an order from [customer] every few seconds as a[product] goes down the line as to what we've got to make for them. That's really important and the connectivity of that will be brilliant for our business, but how do we get that balance right between personal productivity and...information productivity?... that's the big question in my mind... I don't hear the discussion more broadly around that.

3.5 INNOVATION

There is a significant relationship between innovation, technology investment and productivity.

An innovative culture can make a business more open to considering investments in new technology. Investments in ICT can lead to greater business efficiencies which free up company time or funding for innovation. ICT investments may also lead to improved productivity and facilitate innovative behaviours, such as greater collaboration.⁶² Certainly, in 2010-11, around 35% of innovation-active businesses in Australia reported an increase in productivity compared with the previous year compared with 18.4% of non-innovation active businesses.

Discussion group participants noted that a relationship between technology investment and complementary innovations such as process or product improvements.

We invested in some software for reporting systems so we could get greater detail around volume profitability and our distribution network and as a result... that led to us changing our distribution channel strategy. So what five years ago was Excel spreadsheets and a couple of guys churning through it all to get to the facts can now be produced in two minutes and you can drill down a lot more effectively and quickly so that you can take action in a more timely manner to get a better outcome for the business.

That's the key thing, the process. Applying the technologies, keeping up with the Joneses, but it's the investment in process that keeps you ahead.

⁶² Tiy, L., Berry, O., and Taylor, D. 1351.0.55.042 – ABS Research Paper: Business Innovation and the Use of Information and Communications Technology, 2013.

CASE STUDY: SEELEY INTERNATIONAL

Seeley International is Australia's largest air-conditioning manufacturer and a world leader in energy efficient heating and cooling products. Seeley's phenomenal success has accelerated in the past few years since the Chairman, Frank Seeley, shared his vision of becoming a \$1 billion business with Managing Director, Paul Proctor. This vision is rapidly becoming a reality based on the quality of Seeley's products and the size of the global market. Frank & the Board backed the company to achieve the ambitious task of tenfold growth in five to seven years through innovation, product development and business transformation.

Seeley's approach highlights the symbiotic relationship between investment, efficiency, innovation and productivity. Developing innovative products is central to Seeley's growth plan, but financing that work requires a lean, efficient and profitable organisation that generates the cash flow to fund future investments. This means Seeley is continuously investing in innovations across its products, processes, organisational structure and marketing tactics.

Seeley also employs many of the organisational characteristics of high-performing workplaces. Every week, its plant stops for one hour to allow teams to come together and pitch ideas for improvements. To date over a 1000 have been implemented. This collaborative approach has improved the outcomes from the many technologies that Seeley has implemented in the last five years as staff has been part of the change process and has contributed ideas for complementary innovations and process improvements. The company has also created a section called Imagineering which develops innovative blue sky ideas.

The commitment to innovation, combined with an agile management culture, allows Seeley to seize opportunities that many other businesses might overlook. Managing Director, Paul Proctor recounts that "when Mitsubishi went out of business, we bought one of their dormant production lines at a hugely discounted rate. I think it cost more to ship it from their plant than buy it. Now we've got the line up and running and we're using it to assemble products that at the time we hadn't even designed. But Frank Seeley had the vision that these products were coming through, so he bought the equipment ahead of time."

There is a particularly strong correlation between ICT use and innovation. The *Global Information Technology Report 2010-11*⁶³ found that ICT technologies were engaged in approximately 60% of product and service innovations and three quarters of all process innovations. Analysis conducted by the ABS has found that Australian businesses that use ICT more intensely are also more innovative. For example, 63% of businesses with a website undertook innovative activity, whereas just 35% of business without a website were innovation-active. The same study found that the likelihood of a company innovating increased with ICT intensity (i.e. the extent and sophistication of ICT use).⁶⁴

As there are a number of other business factors that correlate with innovation activity, for example, the level of competition in a market, export activity, collaborative R&D and foreign ownership, the study also conducted a regression analysis to isolate the impact of ICT intensity alone. Modelling found that a small company in the manufacturing industry, that did not export, had no competition, had less than 50% foreign ownership and no collaborative R&D arrangements, but moderate ICT intensity (i.e. a broadband connection and a web presence) would be approximately eight percentage points more likely to innovate than an identical business with low ICT intensity (broadband connection only).⁶⁵

⁶³ World Economic Forum, *Global Information Technology Report, 2010-11: Transformations 2.0*, 10th Edition, 2011.

⁶⁴ Tiy, L et al, 2013.

⁶⁵ Tiy, L. et al, 2013.

An international study drawing on data from a number of countries similarly examined the level of innovation undertaken by companies that rated highly in their use of sophisticated ICT applications. It found these companies were more likely to undertake innovations across each of the four major innovation categories, with particularly strong correlations with product and marketing categories. However, the international study found that sophisticated ICT use did not increase the inventive capacity of companies as there was no increased probability that the company would introduce a product that was new to the market or develop a product in-house. It also concluded that sophisticated ICT use did not increase the probability that a company would cooperate on innovation. This finding is interesting given improved collaboration is one of the key benefits ascribed to ICT and the main benefit of high-speed broadband nominated by Ai Group discussion group participants.⁶⁶

Innovative businesses are also more likely than non-innovation active businesses to invest in IT (see Table 8). In 2010-2011, over 70% of innovation-active businesses increased or maintained IT expenditure compared with less than 50% of non-innovation active businesses. A third of innovation-active businesses increased spending on IT compared with fewer than 10% of non-innovation active businesses.⁶⁷ Innovation-active companies are also twice as likely as innovation inactive companies to have a website and place and receive orders online. The correlation between innovation and technology use holds true across sectors and company size. More broadly, the most frequently reported form of expenditure for the purpose of innovation is the acquisition of machinery, equipment and technology.

TABLE 8: PROPORTION OF BUSINESSES INVESTING IN ICT

	Internet Access	Web Presence	Placed Orders via Internet	Received orders via the Internet
All businesses	91.2	43.1	50.8	28.0
Innovation-active	96.8	63.5	69.5	40.9
Innovation-inactive	87.6	30.0	38.8	19.7

Source: ABS, 8167.0 - Selected Characteristics of Australian Business, 2010-11.

In discussion groups, participants noted that tough or uncertain economic conditions forced companies to innovate.

When times get tough, there are some who are not going to make it, and therefore you've got to find a point of differentiation So it's through innovation. Productivity also, but mainly we've found innovation in terms of taking our existing product group and trying to find other markets for it and improving our product range and improving our products.

The product line that we sold most often, when I joined their business, which was eight years ago, is almost dead now. It's been superseded by other things and different market pressures. But without that innovation, we'd be another casualty.

As discussed in section 3.1 of this Report, the need to introduce these innovations is often a catalyst for technology investments to support the development of new products, processes or marketing strategies.

⁶⁶ Spiezia, V. 'Are ICT users more innovative? An analysis of ICT-enabled innovation in OECD firms', *OECD Journal of Economic Studies*, Vol 2011/1.

⁶⁷ ABS, 8158.0: Innovation in Australian Businesses, 2010-2011, 2012.

3.6 ACCESS TO FUNDING AND INVESTMENT

Around 20% of respondents to Ai Group's 2013 Business Prospects Survey survey cited access to affordable capital as a factor in their decision to invest in new technologies. This concern was also raised in discussion groups.

Probably the biggest constraint that we've... faced in our business is that conservatism of financial institutions when it comes to supporting investment for new ideas - the ratios that they expect you to operate under. So our thinking towards innovation or investment has not changed because of the climate, the economic climate. We still see a lot of opportunities, but our ability to execute the opportunities is much more dependent on our own ability to generate our own funds because the financial institutions have become much more conservative.

A lack of access to additional funds was rated by Australian businesses as the greatest barrier to innovation in 2010-11. Its significance as a barrier to innovation increased from 2009-10 to 2010-11.⁶⁸ During the GFC, innovation was more negatively affected in SMEs and new start-ups than in larger, more established firms as the latter tend to have greater access to external sources of finance and greater financial reserves.⁶⁹ Innovation-active small businesses are 2.25 times more likely to report lack of access to additional funds as a barrier to innovation than large businesses.⁷⁰ The particular difficulties facing small businesses were repeatedly raised in discussion groups.

We don't even bother talking to anyone any more. It's just a waste of our time, unless you put up real estate or something to back it up as a small company, unless you're publicly listed or the like, you have virtually no chance of borrowing anything. We have no borrowings at the moment.

Despite these experiences, OECD data indicates that debt financing is a common source of financing for small, young companies. Australia remains one of the easiest countries in which to obtain bank loans.⁷¹ However, banks and other debt-holders are often reluctant to lend when a project involves substantial R&D investment rather than investment in plant and equipment. R&D investment presents increased risk in comparison to investments in capital. Moreover, investments in R&D need to be sustained over a period of time to ensure a return on investment.⁷² Discussion group participants also noted the impact of the GFC and the high Australian dollar on R&D expenditure.

The GFC...strangled revenues...which then affected our investments in innovation.... We're coming out of that now, so the revenues are going back up again, but it's sort of difficult to ramp up and invest.

Around four per cent of innovation-active businesses receive funding for innovation from Australian Government organisations, with businesses with more than 20 employees receiving the majority of this funding in 2010-11.⁷³ Government expenditure on R&D grew by 10% a year in real terms between 2004 and 2008 to 2.24% of GDP; however, as a share of total research funding, research funding by government decreased by 34% over the decade to 2008, while industry's share increased by 62%.

Australian Governments provide a moderate level of direct public finance for business expenditure on R&D (BERD) when compared to other OECD countries. This is allocated predominantly to companies with fewer than 50 employees.⁷⁴ Most of the government funding for R&D is indirect support through R&D tax incentives with low levels of direct support for R&D relative to other OECD countries.⁷⁵ Of the direct government funding for R&D, 60% is allocated through competitive funding.

Equity seed capital, including angel investment and venture capital is an important source of financing for innovative start-ups and high-growth companies.⁷⁶ But access to venture capital differs significantly among countries and is very sensitive to market cycles in terms of the amounts invested and stages of investment. When

68 ABS, 8158.0: Innovation in Australian Businesses, 2010-2011, 2012.

69 OECD, Science, Technology and Industry Outlook, 2012

70 ABS, 8158.0: Innovation in Australian Businesses, 2010-2011, 2012.

71 OECD, Science, Technology and Industry Outlook, 2012

72 Hall, BH & Lerner J. *The Financing of R&D and Innovation*, National Bureau of Economic Research Working Paper 15325, 2009.

73 ABS, 8158.0: Innovation in Australian Businesses, 2010-2011, 2012.

74 OECD, Science, Technology and Industry Scorecard, 2011.

75 OECD, Science, Technology and Industry Outlook, 2012.

76 OECD, Science, Technology and Industry Scorecard, 2011.

market environments are uncertain, venture capitalists are more likely to invest in later stages of innovation and business establishment, leaving gaps at the pre-seed and seed stages of innovation, where profit expectations are less clear and the risks are higher. In these circumstances, angel investors, who are less risk averse, become more important as a source of early stage funding.⁷⁷ Venture capital is often restricted to certain sectors (usually high-tech) and venture capitalists tend to only be interested in making investments of a certain size that may be too large for start-ups in some sectors.⁷⁸ Fierce global competition, and Australia's geographic isolation, also impact on the ability to attract investment. This experience was affirmed in focus groups.

As a global multinational and me sitting in Sydney wearing an Australian hat, it's extremely difficult to get any attention to make investments here.

In 2007, Australia was the second largest source of seed and start-up venture capital funding globally with approximately 17% of global funding behind the USA with approximately 30% of global venture capital funding.⁷⁹ In 2009, Australia was in the top ten countries globally for venture capital investment in Australia as a percentage of GDP.⁸⁰ However, a relatively small portion of Australia's total venture capital was seed/start-up or early stage venture capital.⁸¹ Venture capital investment was significantly affected by the GFC and, in 2011, was still well below pre-GFC levels.⁸²

Company structure and maturity affected the ease and speed of internal financing for many focus group participants. Large companies, and Australian subsidiaries of overseas multi-national corporations (MNCs), often had more financial resources to draw on. Some participants felt privately owned companies made more nimble investment decisions, or were more prepared to continue to innovate and invest in R&D despite difficult economic conditions.

Being part of a larger group, we have access to a reasonable bucket of funds, but also we've had a strong balance sheet over a number of years so we've been able to internally fund most of our innovation.

Often if you're in a publicly listed company, you have to bring the whole company along or a very large section of it and everyone wants to cover their arse and it really is a battle compared with a privately owned company, where you do maybe a quarter of the analysis and then people say, "That's enough. Let's just try it. Let's give it a go."

[A privately owned company noted] We've taken a different approach. We have, as a rule, invested four and a half per cent of our global turnover, and that's four billion in R&D. But we've actually ramped it up to five and a half per cent in the last couple of years. We have a fortunate situation....We don't have any debt. We have a net cash deposit that we need to find a place to invest.

Acquisition by a larger company was also attractive to small companies for the improved access to capital it allowed. One focus group participant described acquisition as "the only way to get investment into the company."

77 OECD, *Science, Technology and Industry Scorecard*, 2011.

78 Hall and Lerner, 2009.

79 Hall and Lerner, 2009.

80 OECD, *Science, Technology and Industry Scorecard*, 2011.

81 OECD, *Science, Technology and Industry Scorecard*, 2011.

82 OECD, *Science, Technology and Industry Outlook*, 2012

3.7 REGULATORY ENVIRONMENT AND GOVERNMENT INCENTIVES

The regulatory environment impacts business investment in new technologies in a number of ways creating both incentives and disincentives for technology investment.

In some cases, regulatory costs trigger technology investments. Multiple companies in discussion groups said decisions to invest in automation were linked to high labour costs in Australia relative to other markets.

As one of the highest labour cost countries in the [company's] group, we have as much automation and new technology as practically any other factory.

However, regulation can also impede investment, either directly or indirectly by imposing greater cost pressures on the business operating environment. In 2010-11, government regulations, compliance and adherence to standards were rated by 17% of businesses as being an impediment to innovation. Small businesses were around 2.3 times more likely to list government regulations, compliance and adherence to standards as a barrier to innovation than large businesses.⁸³ This experience was confirmed in discussion groups. General business pressures arose from high labour costs, rising energy prices and competition from imports that did not meet Australian standards. Participants also cited OH&S regulation, payroll tax and a lack of harmonisation across states as examples of excessive regulation. The level of certainty provided by the regulatory and political environment, and costs associated with regulatory change, were also issues.

The lack of certainty surrounding everything is debilitating. It's affecting business investment, it's affecting consumer sentiment. ... For goodness sake, work it all out, tell us what it is, stick to the plan. ... don't just go for the next 24 hour news cycle. ... have a plan. Have a vision. We'll vote for whoever has one.

Approximately five per cent of respondents to Ai Group's 2013 Business Prospects survey nominated tax concessions and incentives as a factor in their investment decisions.

I've gone...from being a small start-up all the way through to a large organisation now. So I've gone through the whole gamut of programs from COMET through to R&D start grants, now through the Enterprise Connect grants as well. It really helps a small company.

However, businesses often debated whether the cost and time associated with applying for Government incentives outweighed the value of the support.

Small amounts of money, but you know, it's useful... [but] that's a trade-off... Because some of the schemes, you can spend an inordinate amount of time preparing something without certainty of success for a small amount of money.

Some focus group participants commented that Government incentives were too heavily weighted towards research and development rather than commercialisation.

There's a lot of opportunity and I don't think the government...gets that. They think that it's all about the research side of things and they put money into that, but...you put \$1 into research, you put \$10 into making the product and \$100 to get it to market.

Simply finding information was a frustration for some businesses.

I had a look on the state government website to...find a summary of all the grant schemes they have because I know there are lots of them, but I couldn't find it. So I know they're there, but I can't even find the ones that I know about.

The whole how do you get money is a complicated thing if you're a small... it can kill you just to find out where you get funding from.

83 ABS, 8158.0: Innovation in Australian Businesses, 2010-2011, 2012.

Conclusion

Australian businesses have been keen technology adopters over the last two decades, which has had a positive impact on productivity. Achieving further gains from technology investment will be vital if Australia is to remain prosperous and competitive and ready for the challenges and opportunities that lie ahead.

Achieving this vision requires concerted effort from Governments and business to break down the barriers to investment and ensure Australian businesses lift their productivity and innovation capabilities.

This Report recommends significant new policy initiatives, including development of a national workforce skills strategy for the digital economy; a standing taskforce of industry and government representatives to help drive Australia's success in the digital economy; and new initiatives to increase collaboration between businesses and research institutions.

With the support of the Federal Government's Productivity and Education Training (PET) Fund, the Australian Industry Group is also rolling out a multi-year program of research and training initiatives to help businesses improve workforce productivity and performance. This report was supported through the PET fund and will help shape those activities.



METHODOLOGY

The findings in this report are based on a desktop literature review, an original Ai Group survey of almost 350 CEOs conducted in November 2012, company case studies and discussion groups conducted in Adelaide, Ballarat, Melbourne and Sydney in February 2012. Ai Group commissioned Ipsos Social Research Institute consultants to facilitate the group discussions and to assist Ai Group to analyse the findings. Ai Group also supported Enterprise Learning events conducted in Melbourne, Wollongong and Brisbane.

DEFINITION OF TECHNOLOGY

For the purposes of this report, technology is broadly defined to include assets such as computer software, machinery and equipment and telecommunication equipment. Where the report refers to new technology it means technologies that are new to a business as distinct from the replacement of existing technology.

The study has a focus on ICT because of the enabling potential of these technologies; their broad application across a range of sectors; and the prospect of significant future growth and innovation in this category.

While the ICT category is generally understood to include technologies that are used for communications or information processing, such as computers, software and mobile devices, it covers a broad range of goods and services.

This includes goods used for information processing and electronic communication, transmission and display. It also includes technologies that use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process. Examples of ICT goods can include hardware and machinery (i.e. computers, remotely operated equipment, robotics, touch screens and sensing equipment) and software. ICT services include Internet based services such as cloud computing and data analytics.

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Ai GROUP OFFICES

Ai GROUP METROPOLITAN OFFICES: Sydney 51 Walker Street North Sydney NSW 2060. PO Box 289 North Sydney NSW 2059. Tel 02 9466 5566 Fax 02 9466 5599 **CANBERRA** L2, 44 Sydney Avenue Forrest ACT 2603. PO Box 4986 Kingston ACT 2604. Tel 02 6233 0700 Fax 02 6233 0799 **MELBOURNE** 20 Queens Road Melbourne VIC 3004 PO Box 7622 Melbourne VIC 8004. Tel 03 9867 0111 Fax 03 9867 0199 **BRISBANE** 202 Boundary Street Spring Hill QLD 4004. PO Box 128 Spring Hill QLD 4004. Tel 07 3244 1777 Fax 07 3244 1799 **ADELAIDE** L1, 45 Greenhill Road, Wayville SA 5034. Tel: 08 8394 0000 Fax: 08 8394 0099 **REGIONAL OFFICES: ALBURY/WODONGA** 560 David Street Albury NSW 2640. PO Box 1183 Albury NSW 2640. Tel 02 6041 0600 Fax 02 6021 5117 **BALLARAT** L1, 1021 Sturt Street Ballarat VIC 3350. PO Box 640 Ballarat VIC 3353. Tel 03 5331 7688 Fax 03 5332 3858 **BENDIGO** 87 Wills Street Bendigo VIC 3550. Tel 03 5440 3900 Fax 03 5444 5940 Newcastle Suite 1 "Nautilus" 265 Wharf Road Newcastle 2300. PO Box 811 **NEWCASTLE** NSW 2300 Tel: 02 4925 8300 Fax: 02 4929 3429 **WOLLONGONG** L1, 166 Keira Street Wollongong NSW 2500. PO Box 891 Wollongong East NSW 2520. Tel 02 4228 7266 Fax 02 4228 1898 **AFFILIATE: PERTH CHAMBER OF COMMERCE & INDUSTRY WESTERN AUSTRALIA** 180 Hay Street East Perth WA 6004. PO Box 6209 East Perth WA 6892. Tel 08 9365 7555 Fax 08 9365 7550 www.aigroup.com.au

