StartupAUS

ECONOMY IN *TRANSITION*

Startups, innovation, and a workforce *for the future*

EXPERT360 CODECAMP

May **2016**

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From StartupAUS

StartupAUS is Australia's national startup advocacy group. We are a not-for-profit organisation with a mission to transform Australia through technology entrepreneurship. In practice, that means making Australia a world-leading place to start and grow a technology company.

The Prime Minister, Malcolm Turnbull, recently said at the launch of Australia's national cyber security strategy, that 'the Internet is the most transformative piece of infrastructure ever constructed'. The Australian workforce is not immune from the sweeping global changes brought on by both the internet and advances in technology elsewhere. Indeed, the effect of these changes on how we work, and in what roles, has increasingly become a matter of vital national economic importance.

Vast new opportunities have opened up in the digital era, and we must position ourselves to take full advantage of those opportunities. We must also be prepared to meet the inevitable challenges brought about by swift and sweeping technological advancement.

This report highlights the breadth and depth of Australia's impending economic transformation. It brings together the best thinking internationally on how technology will change the way we work. The report highlights the importance of innovation and entrepreneurship in building an economy of the future. And it does so in a uniquely Australian context, informed by case studies from startups and technology companies right at the leading edge of Australia's new economy.

It concludes that new high-growth ventures are powerful job-creators, and that the jobs they create are future-facing, based on current or emerging technology. By fostering a culture of entrepreneurship, nurturing a workforce with a forward-looking skill set, and establishing the infrastructure to support innovation, we can be well-positioned to ensure the future of work in Australia is a bright one.

Alex McCauley

CEO, StartupAUS

Executive summary

The future of work has recently become a topic of intensive study as changes in global economic dynamics have begun to impact national economies. These changes have not escaped the attention of political and business leaders, who have become increasingly aware that profound changes to the nature of how and why people are employed are just over the horizon. These changes are now being seen by the public, as companies like Uber, Airbnb, Xero, and Netflix disrupt industries across the economic spectrum. This trend is likely to continue as a new generation of digital startups extend their reach and impact.

The impact of rapidly developing technology, disruptive new business models, and increasing global connectedness will fundamentally alter the employment opportunities available globally, the skills in greatest demand, and the structure of employment arrangements.

Much remains uncertain here, though we can certainly say that substantial numbers of jobs will transfer between industries and that workers with digital skills will be in high demand.

"The impact of rapidly developing technology, disruptive new business models, and increasing global connectedness will fundamentally alter the employment opportunities available globally, the skills in greatest demand, and the structure of employment arrangements."

In this report, we have sought to address two central questions:

- How is workforce demand being changed by the rise of the digital economy and improvements in technology?
- How can Australia develop a workforce that absorbs the challenges and thrives in a changing economy?

In Part I we discuss three dominant themes impacting employment:

- Shifting technology driving automation and leading to obsolescence of traditional roles, and an increase in the importance of workers with entrepreneurial, STEM, creative and social skills.
- Innovation hubs as a nexus for the transition to new business models, where clusters of innovative companies create resilient jobs while supporting other industries and delivering economic growth.
- Independent work becoming increasingly important to our economic structure, and what this means for employment models.

In Part II we discuss how Australia can help position itself for a vibrant future:

- Why we must accelerate the establishment of Australia's innovation hubs.
- How a healthy innovation environment, creating many new startups, can deliver sustainable growth in employment.
- The crucial skills that Australia needs to develop, including by encouraging entrepreneurship, digital literacy, and other science and technology skills.

PART ONE

How the nature and structure of employment is being affected by technology

Shifting technology

Since the beginning of the industrial revolution the concern that substantial numbers of jobs could be lost due to technological advances has arisen time and again.

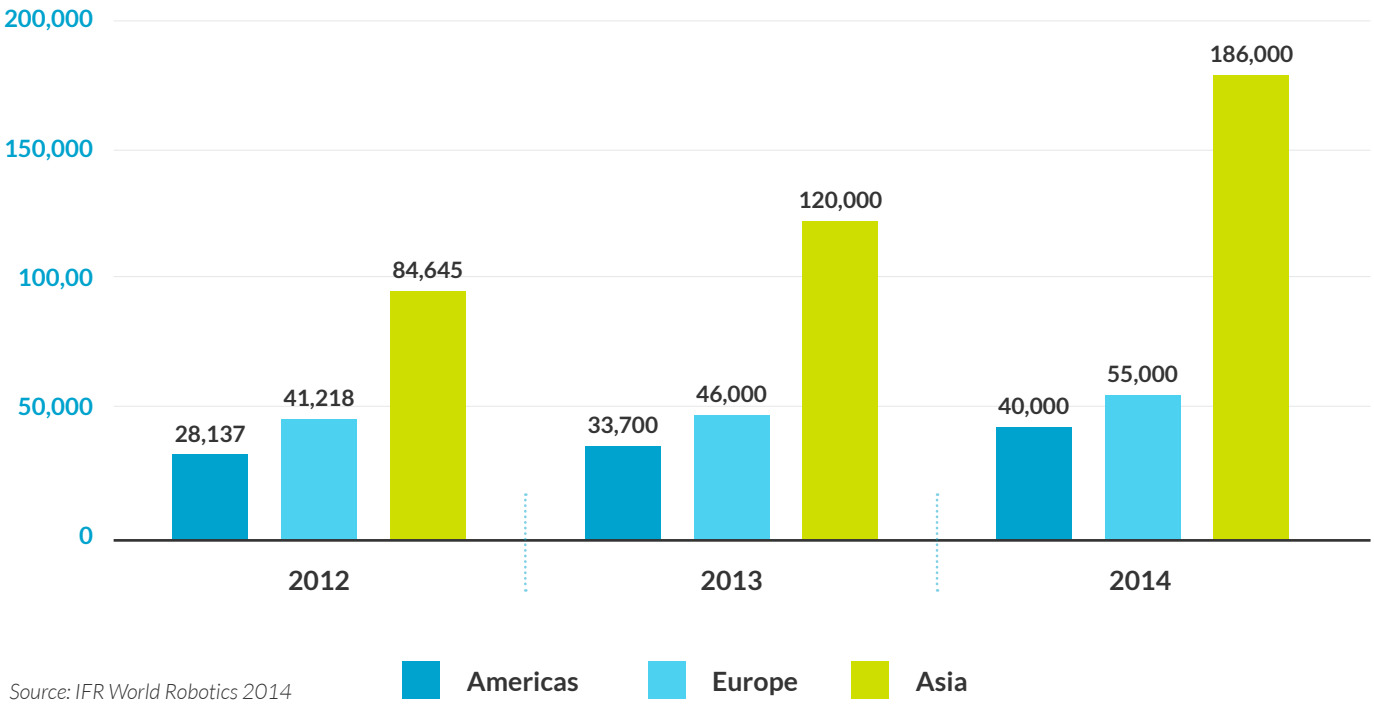
History shows that these concerns have been largely overstated, with technological developments leading not just to obsolescence, but also to new employment opportunities in novel areas. For example, average real incomes more than tripled between 1875 and 1975 due to these substitution effects, despite the ongoing impact of industrialisation and a dramatic reduction in agricultural jobs.

How, then, is this time different? For the first time it is not only manual labour that will be displaced, but intellectual labour, and this presents a more complex challenge. This is driven primarily by exponential improvements in computer power and advances in technology such as artificial intelligence, robotics, big data, cloud computing and the internet of things. These technologies are now being applied on an industrial scale.

It is difficult to overstate the importance of taking an active role in this transition. Some 47% of jobs in the United States are likely to become obsolete in the next 10-15 years, according to leading research from Oxford University. In Australia, work based on this methodology indicates the figure could be around 40%.

The same research also suggests that jobs that require high levels of entrepreneurial, technological, creative or social skills will be far more resilient to technological change.

FIGURE 1: ANNUAL SUPPLY OF INDUSTRIAL ROBOTS BY REGION



Source: IFR World Robotics 2014

Robotics

Robotics is perhaps the area of technological advancement that comes most easily to mind when considering workforce displacement. The first industrial revolution was driven in large part by our efforts to use machines to reduce the need for human physical labour, and new advances in robotics technology are allowing industrialists and manufacturers to further automate the assembly line.

Advances in precision manipulators and control software are giving machines finer motor skills, and sensor technology is allowing robots to work more safely around human operators. Most importantly, in a theme we see time and again when examining technology-driven disruption, costs are declining even as capability increases, making robotic capability more widely available for mainstream commercial and industrial use.

Research suggests the most significant sectors to be affected by robotics globally will be manufacturing and supply chain logistics. Manufacturing robots are getting cheaper and the economic and technical barriers to their adoption are falling, leading to much deeper penetration within manufacturing hubs. By the 2030s, the real cost of a typical spot welding robot in auto manufacturing is expected to decline by more than 30%, according to a report published last year by the Boston Consulting Group.

Far from shying away from this disruptive force, the world's leading manufacturers are taking steps to be at the forefront of this revolution. In Germany, a manufacturing industry initiative led by government dubbed 'Industrie 4.0' is helping German firms reimagine their approach to manufacturing by using technology (Australia has recently established an 'Industry 4.0 Taskforce' along similar lines). China, too, is ramping up automation and is becoming the largest and fastest growing robotics market in the world - despite labour in China remaining inexpensive by global standards.

As a result, traditional jobs in manufacturing globally are set to be replaced by opportunities for robotics designers, engineers, and technicians. That transition will require a new approach to education and training.

ROBOTS ARE ALSO HAVING A PROFOUND IMPACT ON LOGISTICS AND SUPPLY CHAIN MANAGEMENT. THIS IS AN AREA IN WHICH DIGITALLY ADEPT COMPANIES SUCH AS AMAZON HAVE BEEN AT THE FOREFRONT, INTRODUCING SYSTEMS TO AUTOMATE ENTIRE WAREHOUSE OPERATIONS.

We also expect autonomous (driverless) transport to be introduced progressively over the coming decade. In controlled environments such as mining operations, autonomous vehicles are already in standard use. It is likely that widespread adoption of autonomous vehicles on public roads will take decades, but advances that will enable the rollout of self-driving, roadworthy vehicles are being made rapidly.

Driverless cars provide a powerful example of how simultaneous advances across several technological areas are making applications possible that seemed almost impossible a few years ago realistic over the medium term. Driverless cars rely on an accurate internal map of road surfaces, as well as an array of sensors to gather precise readings of their surrounding environment in real time, and software that allows a vast quantity of static and dynamic data to be interpreted and acted upon near-instantly. Progress in the field therefore relies on a combination of fast computing, advanced sensors, data analysis, and experiential machine 'learning'.

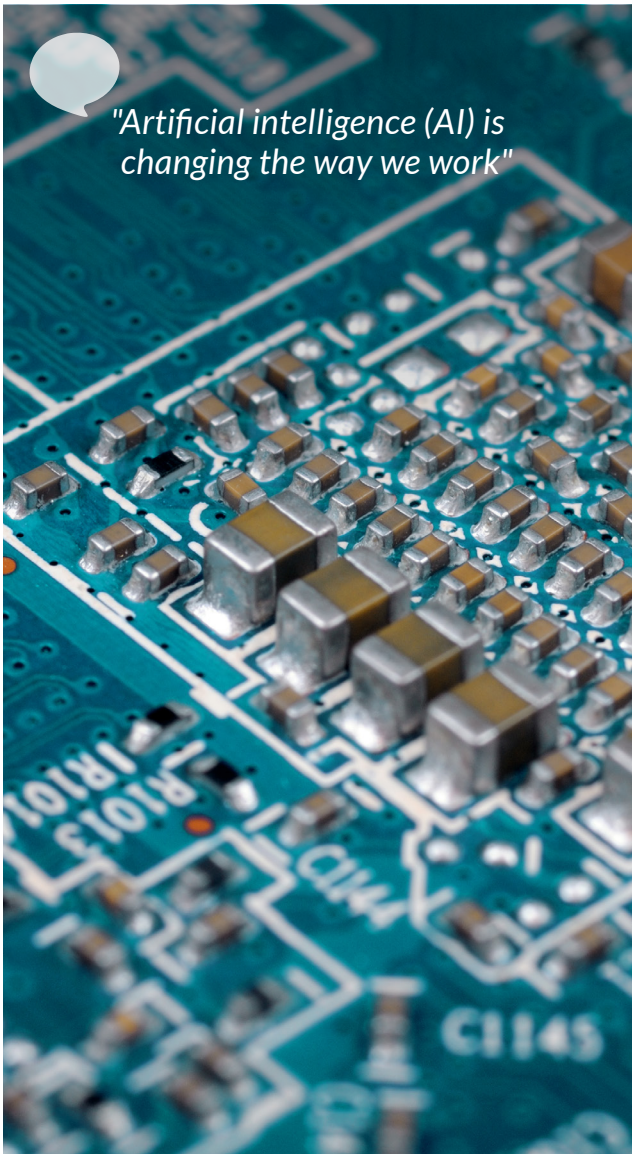
Artificial Intelligence

Even at its current, early stage, Artificial intelligence (AI) is changing the way we work. At its core, AI involves developing algorithms which simulate the sophisticated pattern recognition capabilities of the human mind. The field was built on established mathematical techniques to calculate the conditional probability of an outcome, given a set of 'training' data. Machines are thus able to 'learn', improving the quality of outcomes over time.

While early computers lacked the power to work effectively with these large data sets, today's software, processors and network infrastructure allow far more computational power to be devoted to these problems. Firms such as Google, Facebook, Amazon and Baidu have developed advanced AI programs, often by acquiring promising startups in the field. Often-cited successes include Facebook's DeepFace, which can recognise individual human faces in images 97% of the time, and Google's AlphaGo, which recently made headlines when it defeated Lee Sedol, a leading Go Grandmaster, at the incredibly complex board game. Many experts had predicted software was more than a decade away from being capable of the feat. AlphaGo was developed by DeepMind, a British AI startup that Google acquired in 2014.

While computers do not yet have the fluid ability to deal with uncertainty and ambiguous, incomplete data in the same way as the human mind, there are a wide range of applications for AI that are likely to displace some traditional areas of employment. For example, 'natural language processing' capability is being used to develop increasingly sophisticated personal assistants which can recognise commands and provide a link to tasks performed by other technologies. Most smartphones now take advantage of these technologies.

Perhaps AI's greatest advantage is in using large volumes of information to inform decision-making. An emerging application is in medical decision-support systems, which access detailed patient data, prior diagnoses, and published medical information and can perform diagnoses that in some cases exceed the accuracy of experienced doctors. The same ability to identify and arrange large amounts of data is being harnessed in industries classically thought to be resistant to technological disruption, such as law and accounting.



"AN EMERGING APPLICATION IS IN MEDICAL DECISION-SUPPORT SYSTEMS, WHICH ACCESS DETAILED PATIENT DATA, PRIOR DIAGNOSES, AND PUBLISHED MEDICAL INFORMATION AND CAN PERFORM DIAGNOSES THAT IN SOME CASES EXCEED THE ACCURACY OF EXPERIENCED DOCTORS."

Impact: Jobs and industries

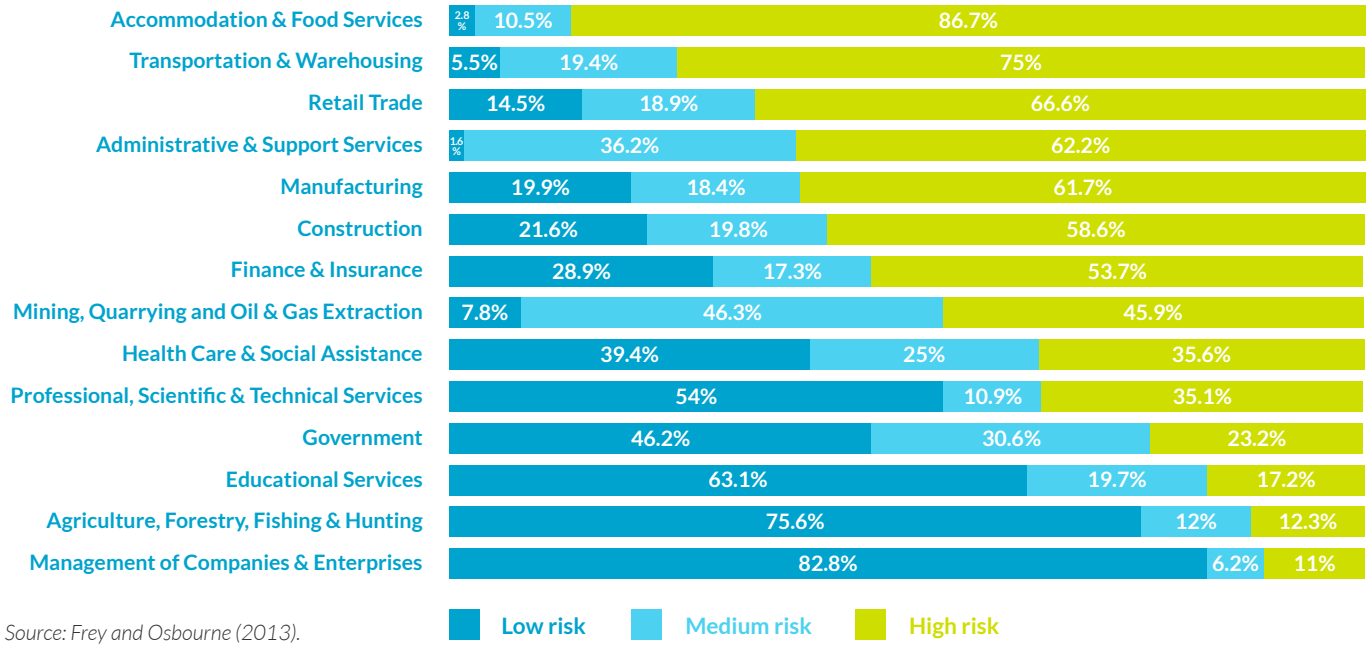
Few jobs will be protected entirely from this powerful confluence of technological advancements. Profound impact will be felt in sectors from manufacturing and supply chain management to research, analysis, and customer service. The potential impact on other industries such as food service and retail is less obvious, though even here a range of technologies may combine to limit the need for large numbers of staff. Australians now regularly self-serve at supermarkets and make a huge range of purchases online without interacting with employees. These trends show no sign of slowing, and as industrial technology supply chains become more sophisticated we will see impacts in more traditionally physical industries such as manufacturing and logistics.

According to research done by Frey and Osbourne from the Oxford Martin Institute, the least affected jobs will be those that involve high levels of human creativity or social intelligence. Skills such as entrepreneurship and business building, and technology skills that involve complex, creative problem solving, stand out clearly as important in this field.

Technology experts, and the entrepreneurs that turn technological advancements into real-world products, will be in high (and increasing) demand as we adapt to the digital transformation ahead.

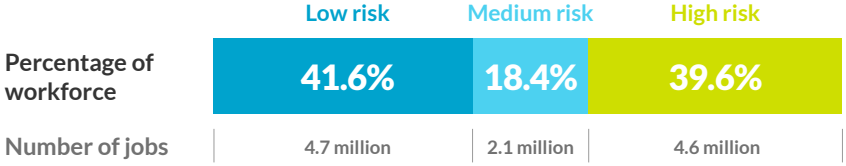
In other areas, the jobs that prove resistant to these transformative forces will involve high degrees of social interaction and empathy within fields that may otherwise see significant job obsolescence. Examples might include finance and managerial roles which involve negotiation skills, or health and care giving roles where human interaction is important to patient care.

FIGURE 2: EMPLOYMENT SHARE AT RISK FOR SELECTED INDUSTRIES



Source: Frey and Osbourne (2013).

FIGURE 3: IMPACT OF AUTOMATION ON JOBS IN AUSTRALIA



Source: Based on findings published by Durrant-whyte 2015, using the Frey and Osbourne methodology.

In the medium term, Australia is expected to be slightly less affected by automation than the United States and below the OECD average due to the fact we have already transitioned from manufacturing to a largely service-based economy. However, as shown in Figure 3 the total number of jobs at high risk is approximately 4.6 million, with a further 2.1 million at medium risk. Disruption caused by technological change will be will be global and significant, and Australia must adapt.

Innovation hubs

In this sense, innovation hubs are physical locations where innovative businesses cohabit, or cluster, usually quite densely. A large and growing body of research over the last two decades has shown that attracting talent to startup and innovation clusters is critical to employment outcomes.

The first key reason is that startup clusters exhibit strong network effects. Once they reach a critical mass they act like magnets drawing in additional talent, companies, and service providers.

The second key reason is that there are strong multiplier effects on the central business-building and technology roles that form the basis of startup hubs. Leading research by a Professor at Berkeley University, Enrico Moretti, has shown that for every job in innovation, 5 more jobs are created. For example, while Microsoft directly employs only 40,000 workers in Seattle, it's growth has directly created 120,000 regional jobs for services workers with relatively basic skills (e.g. cleaners, carpenters, hairdressers) and another 80,000 jobs for workers with college degrees (teachers, nurses, doctors, lawyers, architects). Moretti's research indicates that startup jobs produce three times as many ancillary service jobs as traditional manufacturing.

Research also suggests that the higher economic performance of innovation hubs flows even further: into better social outcomes across areas such as education, justice, marriage, and health.

Why do startup and innovation clusters form in hubs?

It may seem counter intuitive that geographic proximity is still so important to innovation given that technology has improved global communications so much. However, a large body of research has shown strong concentrations of innovative people in tightly clustered geographies remains critically important.

One of the key drivers is what economists call 'external economies of scale'. In essence, strong startup clusters build up a common infrastructure which can be leveraged by all firms within the network. For example the presence of large numbers of startups encourages the development of high quality supporting services such as venture capital firms, patent attorneys, lab services, and networking events.

The availability of talent is also a crucial part of the puzzle. Economists call this the thick labour market effect. If you have a specialised set of skills, you want to be in a labour market where there are a lot of employers looking for that skill, and a lot of people with those skills looking for employers. The relationship between employer and employee becomes more productive in thicker labour markets, as employees and employers can find or fill roles with people with well-aligned skills, inspiring creativity and driving innovation.

Lots of talented people clustered together also leads to 'human capital spillovers' - like bumping into (talented, like-minded) people in the cafe. People learn a great deal from others through accumulated social encounters and information exchange. The information can range from job openings to innovative financing structures or technological breakthroughs.

The development of an attractive social community also plays a key role. Economist Richard Florida explains that creative class individuals such as entrepreneurs, engineers, professors, and designers want to live in nice places, enjoy a culture with tolerance for new ideas, and most of all want to be around other creative class individuals.

All of the dynamics above are subject to positive reinforcing network effects, so the larger the startup cluster becomes, the more positive the effects. The result is that the leading clusters become magnetic, and start to increasingly dominate.

Why does this matter so much to other workers?

Innovation jobs at the centre of these networks have strong multiplier effects. One reason is that workers in thriving innovation hubs tend to be compensated very well. As personal income increases, so does a worker's ability to spend on personal and local services. Creative workers with high discretionary incomes will tend to drive the creation of an array of adjacent services that act as a further draw for other creative workers.

Startups, and the established technology companies they become, also engage a broad array of professional services - from IP lawyers to consultants. Again there is a clustering effect: once an innovation hub achieves critical mass and begins to attract high-tech workers, there is a snowball effect for talent attraction, which creates an environment in which it is increasingly easy to form and build innovative companies.

So, developing a core of innovation jobs is critical to capturing and maximising the opportunities presented by digital transformation.

'Creative class individuals want to live in nice places, enjoy a culture with tolerance for new ideas and weirdness, and most of all want to be around other creative class individuals'

Richard Florida

The rise of the creative class, 2002

Independent work

Specialisation is a core principle which underpins our economic system and is a driving force behind today's complex, unbundled, global supply chains. The next phase of economic development will see that principle extend to the jobs of ordinary workers.

In the last two decades, improvements in global digital infrastructure have led to the creation of new digital business models that have created opportunities for independent workers.

One category of disruptive businesses driving this change is employment marketplaces, which match discrete assignments to workers. The model has been applied to a wide range of service areas, from on-demand chauffeurs, to home-help, to professional services. Some platforms have grown very rapidly and are set to contribute to a significant rise in independent work. Australia, with its highly connected workforce and strong technology penetration rates, boasts a thriving ecosystem of successful talent marketplace businesses. Leading Australian-grown platforms include Freelancer, 99Designs, DesignCrowd, Redbubble, Airtasker, Envato and Expert360. Many of these are significant players globally.

Online goods marketplaces like eBay and Amazon are also enabling independent Australian merchants to reach customers overseas with ease. Online advertising on platforms such as Google and Facebook allows Australian businesses to market their products to a global audience. AirBnb and Uber are also using technology to fundamentally change the way millions of workers think about the way they work and the sources of their income.

Prior to sophisticated technology platforms, "flexibility" was a bothersome term in the corporate arena, conjuring thoughts of compulsory quarterly HR meetings filled with quotas, agendas and the like. Pre-tech, it was difficult for companies to unleash the business value in the ability to systematically bring talent and expertise in and out of their organisation. It was just super tough and costly. That has changed.

Bridget Loudon

CEO and Founder, Expert360

Why is independent work increasing?

The key benefits of contingent work for the purchasers of services are quality, speed, cost, and flexibility. For example, when firms purchasing professional services offer the opportunity to perform a discrete task to a wide net of well qualified workers, they are often able to source deeply experienced, specialised skills and experience that might otherwise be difficult or costly to obtain. This drives both quality and speed. In addition, the efficiency of the marketplace model and absence of expensive overheads helps reduce cost. Purchasers also enjoy the flexibility to engage workers with these specialised skills as and when required.

Workers also report benefits through greater flexibility - both in terms of what they do, and when they do it. In many instances the ability to connect workers directly with customers also increases the value that workers can capture. This effect often results in higher pay for workers and simultaneously lower cost for consumers.

An important consequence of the model is that workers are now specialising more specifically in particular skills, a trend which MIT's Thomas Malone, writing for the Harvard Business Review in 2011, termed 'hyper-specialization'. Workers are incentivised to specialise more so that they can offer more value to employers through deep skills and experience in specific fields. The rise of contingent work also presents some significant policy challenges. Workers' entitlements and protections may be harder to regulate if they are decentralised. And, inherently, a shift in the structure of the economy presents a variety of difficult problems for labour-market policy-makers to grapple with.

These new models and dynamics also have implications for corporate structure. Some tasks previously ascribed to a role might be outsourced, or entire job categories and processes transformed. Another hypothesis is that workers will operate across a portfolio of skills that they select. Attracting contributions from the most talented workers will become a critical success factor for businesses as hyper-specialisation becomes more common. In this respect, talent marketplaces have a powerful advantage in enabling on-demand access to those workers with deep, specialised talent.

A number of studies have shown that contingent work is likely to continue to increase significantly, both globally and in Australia. In the United States, figures suggest 34% of the workforce is already made up of independent workers, and some predict this could begin to approach 50% within a decade. In the UK, self-employment has also increased sharply, accounting for two-thirds of job growth since 2008. This trend is also expected to be borne out in Australia, where self-employment stands at only around 20% of the workforce, but the number of independent contractors has been increasing steadily. Industry experts suggest a significant portion of corporate jobs in Australia require key skills but do not need to be permanent, traditional positions. That figure could already be as high as 40%, according to Expert360 founder Bridget Loudon.

PART TWO

How can Australia position itself better?

Accelerating the establishment of startup and innovation hubs to attract and retain talent

Establishing cohesive, multi-layered startup and innovation hubs will increasingly be seen as essential in order to sustainably attract and retain talent.

Multilayered interdependence is critical here - hence the proliferation of the term 'ecosystem' in recent years. For example, improvements in education might help develop more entrepreneurs, but without similar efforts elsewhere it may remain difficult to raise capital, hire technical talent, and grow a successful business. The result would be that Australia would produce more entrepreneurs, but they wouldn't be able to flourish here.

On the other hand, if we are successful in establishing a strong reputation globally as a vibrant startup and innovation ecosystem we will benefit from the dynamism of innovation hubs, and acquire a significant amount of the talent required in the medium term (both local and imported). Figure 4 shows movement of global talent as determined by LinkedIn research and data analysis. This illustrates a key point very clearly: talent is very fluid in the modern marketplace, but the number of true 'talent hubs' remains limited.

Mastering these dynamics and becoming one of the 'winners' in the global startup and innovation landscape is a goal we must focus on because the prize is compelling. Due to progressive education policies in many Asian countries, large volumes of highly skilled workers are expected to become available. For example, By 2030, China and India are expected to provide nearly half of all people with tertiary education aged 25-34 in the world and over 60 per cent of the STEM qualified workforce for the G20 nations. Australia needs to be in a position to benefit.

Current progress

When it comes to developing innovation hubs, Australia is underperforming. None of our major cities have substantial, dedicated innovation precincts. International comparative rankings of Australia's cities suggest we have work to do across an array of important areas to build thriving ecosystems. Nevertheless, there are pockets of strength we can build on.

The Global Innovation Index (GII) measures a broad range of factors related to the strength of a country's innovation system. Australia is ranked 17th. This is reasonably consistent with specific, observable measures.

'Around 70% of Silicon Valley software developers are foreign born'

Silicon Valley Competitiveness and Innovation Project 2015 Report

FIGURE 4: GLOBAL TALENT MOVEMENTS

Source: LinkedIn

Current progress (continued)

For example, the amount of angel investment per capita per annum in Australia is roughly one eighth as much as in the United States. When it comes to venture capital funds invested per capita, Australia substantially lags leaders like Singapore, Israel, and the United States. In addition, Australia's Gross Expenditure on Research and Development (GERD) as a proportion of GDP is just 2.1%, below the OECD average of 2.4% and well below leaders such as South Korea, at 4.3%, and Israel, at 4.1%.

Federal and State governments in Australia have recently moved to help boost some of these numbers. Federal tax incentives for angel investors will come into effect from 1 July 2016 and are expected to provide a boost to that segment. Substantial new private venture capital funds have also been raised in recent months, with superannuation funds beginning to commit funds to the area. These efforts (and resulting trends) will need to be sustained over a significant period if Australia is to start to compete with the most effective innovation ecosystems in the world.

Australia has also lagged behind the competition in terms of the establishment of innovation precincts in key cities. In their paper, the Rise of Innovation Districts, Katz and Wagner describe how the establishment of innovation areas in attractive urban locations is becoming an effective means for cities to foster innovation hubs. The trend was evident in the establishment of the 48,000m2 precinct 'GRID AKL' in Auckland, and 140,000m2 'MaRs' district in Toronto.

Governments around Australia are starting to recognise the need here. There has been a recent concerted effort on this front in Sydney, and less substantial initiatives are either planned or under discussion for the development of innovation precincts in a number of other major Australian cities.

Such initiatives are overdue. Ambitious innovation precincts are critical in positioning these cities as innovation centres.

FIGURE 5: GLOBAL STARTUP ECOSYSTEM RANKINGS, 2015

	Rank	Performance	Funding	Market Reach	Talent	Startup Exp
Silicon Valley	1	1	1	4	1	1
New York City	2	2	2	1	9	4
Los Angeles	3	4	4	2	10	5
Boston	4	3	3	7	12	7
Tel Aviv	5	6	5	13	3	6
London	6	5	10	3	7	13
Chicago	7	8	12	5	11	14
Seattle	8	12	11	12	4	3
Berlin	9	7	8	19	8	8
Singapore	10	11	9	9	20	9
Paris	11	13	13	6	16	15
Sao Paulo	12	9	7	11	19	19
Moscow	13	17	15	8	2	20
Austin	14	16	14	20	5	2
Bangalore	15	10	6	20	17	12
Sydney	16	20	16	17	6	10
Toronto	17	14	18	14	15	18
Vancouver	18	18	19	15	14	11
Amsterdam	19	15	20	10	18	16
Montreal	20	19	17	16	13	17

Source: Compass 2015 Global Startup Ecosystem Ranking.

The role of startups

Emerging industries are, for the most part, led by emerging businesses. Young firms develop or commercialise new technology, building industries in novel market segments. That process is inherently job-creating. And the jobs created are new economy jobs - based on emerging technologies with long forward horizons. In other words - startups create the jobs of the future.

SUPPORTING THESE COMPANIES IS THEREFORE CRITICAL

Numerous studies have highlighted the important role startups play in driving job creation. In the UK, a study by the Centre for Economics and Business Research found that high growth companies (those with more than 20% growth per year) generated 256,000 new jobs 2012-13, or 68% of the total new jobs created in that period, whilst only accounting for 1% of all UK businesses.

Australia's strength in marketplace businesses (labour and otherwise) highlights our ability to produce strong global contenders in an emerging market segment. The leading marketplaces in Australia are set out below in Figure 6.

Much is made of breakaway success stories in the startup narrative. 'Unicorns' (startups valued at over $1 billion) are rightly celebrated. Australia's most recent fairy-tale story, Atlassian (which went public in December 2015 and is now worth around AUD 6 billion), served to reiterate that Australian tech companies were capable of joining that elite club. However, these standouts are in fact the result of strength across a wider base.

Australia needs to foster an innovation system which creates thousands of highly successful startups in order to produce a meaningful number of truly global successes.

FIGURE 6: LEADING FREELANCE PLATFORMS IN AUSTRALIA

Company	Year founded	Product
freelancer	2009	Marketplace for freelancers working across a very broad range of professional fields.
envato	2006	Portfolio of marketplaces with creative assets for web designers, including themes, graphics, video, audio, photography and 3D models.
Airtasker	2012	Marketplace enabling users to outsource everyday tasks including cleaning, cooking, and home-maintenance.
EXPERT360	2013	Marketplace for high-end business consultants across strategy, corporate finance, project management, market research and marketing.
99designs	2008	Online graphic design marketplace. Connects freelance designers with customers around the globe.
DesignCrowd	2008	Marketplace for logo, website, print and graphic design services.
REDBUBBLE	2006	Marketplace enabling artists to provide designs for t-shirts, wall art, iPhone cases and other design led products.

Talent – a workforce for the future

Skills —Essential skills for a modern, innovation-driven economy include:

- Entrepreneurship and business building;
- Technology skills; and
- Science and research.

These skills are vital because they are needed to support the core of the innovation system. If we can create a tipping point such that we are able to attract leading global talent, while simultaneously increasing the output and retention of high-quality local graduates in these fields, we will succeed in creating the right dynamics for sustainable, innovation-led growth.

Countries that have successfully fostered high levels of entrepreneurship and technical capability typically have government policy settings that strongly support a startup ecosystem. Starting early is important - teaching skills such as digital literacy coding, and entrepreneurship in schools. Leading innovation economies also tend to recognise the role of universities as drivers of both technological advancement and entrepreneurial culture.

To address this need, some Australian universities are seeking to develop programs to foster and enhance these new economy skills. The University of Technology Sydney (UTS), for example, is developing programs focussed on integrating entrepreneurship better with traditional disciplines. It has recently launched a one-year MBA in entrepreneurship designed to deliver the skills, knowledge and networks needed to successfully launch businesses, and has sought to support the outcomes of the program by fostering strong networks with industry. Professor Roy Green, Dean of UTS's Business School, emphasises that the program was designed collaboratively with the startup community. Indeed, many universities around the country are gradually beginning to develop programs in this area.

'We need to develop more people with cross-cutting skills who have strong core problem solving skills and can deal with ambiguity'

Professor Roy Green *- UTS*

The importance of universities in developing thriving startup ecosystems is a clear unifying theme on which much of the research agrees. It is no coincidence that some of the world's strongest startup and innovation clusters have sprung up around leading innovation universities such as Stanford in Silicon Valley, MIT and Harvard in Boston, the Munich Technical University in Germany, and the Weizmann Institute and Technion in Israel. Stanford alumni and faculty are estimated to have created nearly 40,000 companies and 5.4 million jobs with annual revenues of $2.7 trillion.

While leading universities are developing refreshed entrepreneurship programs with close connections to the startup community and industry, other programs are being developed to introduce school students to technology in a more engaging way. In 2012, Estonia's government backed a project to teach coding to 7-year olds, and there are now companies in Australia starting to offer similar opportunities.

'We want to help make students passionate about coding and innovation and provide a stepping stone to further development of technical or entrepreneurial skills.''

Ben Levi *- Code Camp*

Code Camp, a Sydney-based startup, seeks to teach school children key coding skills through a project-based learning system. The founders stress that even those who do not go on to become technical specialists gain a strong understanding of how technology can be developed and utilised, as well as project management and problem solving skills. This 'digital literacy' element is a critical part of the skills development process that StartupAUS has long advocated: technology moves fast - as a result it's important at a young age to be a technology generalist rather than necessarily developing advanced specialist skills.

Companies such as General Assembly are doing for adults what Code Camp are doing for kids. General Assembly offers intensive courses designed to re-train workers for technology jobs. Programs of this sort will be increasingly in high demand, as skills change and the workforce shifts. Data provided by LinkedIn suggests technological skills are already the most in-demand skills in Australia, and yet the number of Australian graduates in STEM fields is well below that of international benchmarks. The percentage of graduates completing computer science (or related) qualifications in Israel and India is 4.2% and 4.7% respectively, while in Australia the figure is just 2.3%.

This skills shortage is not just a matter of statistics and benchmarks. It has real-world consequences. A number of promising high growth Australian businesses are moving overseas, at least partially as a result of a talent shortage in Australia. Jodie Fox, the founder of Shoes of Prey (a breakaway success born in Australia that moved to the US in 2015), links her company's move explicitly to its ability to access superior talent overseas: "We are still growing the expertise and talent pool in Australia around these sorts of companies, whereas here [in the US] it has been around for a while. Rather than developing the whole role from the beginning you can find someone who has done it before."

This is a common story for Australian startup founders. Mike Cannon-Brookes, co-founder of Atlassian, is outspoken on this point. It is a theme which resonates strongly across the sector. In its most recent annual survey of startups, Startup Muster underscores this point, concluding that the single biggest challenge facing Australian startups is the availability of technical talent.

Immigration

Immigration plays a central role in the development of a cohesive skills base, particularly in emerging sectors. Immigrants have played a crucial role in the development of California's technology sector. Recent research from the National Foundation for American Policy suggested more than half of current US startups valued at $1bn or more had at least one immigrant founder.

Immigration forms a critical part of the skills equation in Australia for two key reasons: developing home-grown talent has a long lead-time, and much of our home-grown talent will inevitably seek offshore experience.

We have seen that education and training are vital in developing an Australian labour market with the right skills. In time, these efforts can re-mould the workforce. They won't address the skills shortages in the market right now, however. LinkedIn data suggests that 16 of the 20 most in-demand skills in Australia right now are technology-related. To address that need, we need to be open to importing talent from overseas.

We must also accept that skilled Australians will move overseas. They are in high demand in the US, and have unparalleled access to the US market thanks to the E3 visa. Australian engineers are highly prized in Silicon Valley, and they can earn as much as double what their Australian counterparts are making. Even as our technology ecosystem develops, Australians will want to gain international experience - we can't stop them, nor should we seek to. Instead, Australia must continue to develop a pro-active, well-targeted, ambitious immigration regime to bring top talent from elsewhere to fill the gaps. To make this talent stream most effective, high-growth startups should be given hassle-free, priority access.

Conclusion

Technological changes are likely to continue reshape the job market in a relatively short period, both in Australia and globally. This will present some challenges as well as a broad array of opportunities. How well we are prepared will determine whether and to what extent we are able to minimise downside and maximise our gain.

The research we have canvassed here suggests there are some critical elements: forward-looking economies will embrace technological advancement and the skills it requires, foster thriving innovation hubs, and will support entrepreneurs in their efforts to build the firms of the future.

If we succeed, Australia will begin to shape for itself an economy capable of rapidly adapting to take advantage of vast new opportunities.

Research resources

Books:

Enrico Moretti, "The New Geography of Jobs", 2013

Brad Feld, "Startup Communities – Building an Entrepreneurial Ecosystem in your City", 2012

Richard Florida, "The rise of the creative class", 2002

Anna Lee Saxon, "The New Argonauts: Regional Advantage in a Global Economy", 2006

Papers:

"Fostering a Startup and Innovation Ecosystem", UP Global, 2014

"Startup Compass ", 2015.

"The Big Idea: The Age of Hyperspecialization", Thomas W. Malone, Robert J. Laubacher, Tammy Johns, Harvard Business Review, July 2011.

"The future of employment: How susceptible are jobs to computerisation", Frey CB & Osborne MA Oxford Martin School, University of Oxford, 2013.

"The impact of computerisation and automation on future employment", Hugh Durrant-Whyte, Lachlan McCalman, Simon O'Callaghan, Alistair Reid and Daniel Steinberg, 2015. Chapter 1.4 of CEDA Report, Australia's future workforce, 2015.

"The Future of Jobs", World Economic Forum, 2016

"Digital globalization: the new era of global flows", Mckinsey Global Institute, 2016

Colin Pohl

About the author

Colin is an independent consultant, delivering strategy and M&A advice to leading Australian companies. He has extensive experience in both investment banking and management consulting in Australia and New Zealand. In those roles, and as an independent consultant, Colin has advised both national and state governments. He is intimately involved in startups in Australia, both as a passionate startup advisor and an active angel investor.

Supporters

In producing this report, StartupAUS is thrilled to have had the support of two Australian startups passionate about the future of work. They generously provided expertise, case studies and limited financial assistance.

StartupAUS also thanks LinkedIn for its support in putting this report together.

Expert360 is Australia's leading marketplace for connecting top-tier independent consultants with the country's best businesses.

Since our founding in 2013, we have been revolutionising the way that businesses engage with highly-skilled freelance consultants and shaping the future of work in Australia. Through our ground-breaking online project management technology, we have been able to democratise access to top-tier independent consultants to businesses of all sizes.

The global shift towards contingent and on demand work was the catalyst for Expert360's creation. Our co-founders (ex-Bain and Company Senior Consultants) Bridget Loudon and Emily Yue, had noted that an increasing number of management consultants and top-tier professionals had begun working independently, but were struggling to engage with clients. Recognising the opportunity to shape the future of work in Australia, Loudon and Yue set about creating an online platform for connecting these white collar professionals to Australia's most innovative businesses.

In three years, we have emerged as one of Australia's fastest growing startups, with over 1000 business clients and 7000 highly-vetted, top-tier consultants using our online project management software to complete project-based work.

We teach kids to code.

Code Camp was founded in December 2013, when tech startup entrepreneurs Ben Levi and Pete Neill set out on a mission to create a solution which could provide every Australian school student with the opportunity to learn to code and build their very own apps. Their aim then, as it is now, was to transition a generation of young Australians from consumers of technology to the creators of it.

Today, Code Camp is Australia's leading school holidays program teaching students to code. With over 180 incredibly passionate teachers, they have now taught and inspired over 4,000 students in Sydney, Melbourne and Brisbane at many of Australia's most prestigious private and public schools, including many girls' schools. Code Camp has also recently grown to include after-school coding and in-school sessions.

Learning to code is more than 'becoming a developer'. Learning to code allows students to be creative with technology, develop logical thinking and problem solving skills, and build an understanding of computational thinking and the digital world around them. In addition, through 'app building' Code Camp also focuses on game design, the psychology of user experience, and the entrepreneurial mindset. These skills can be adapted to any role in any industry.

Code Camp is proudly sponsored by Westpac, run pro-bono courses with the Starlight Foundation and Cerebral Palsy Alliance, and have been featured on centre court of Westfield Centres.

Code Camp's priority is always student engagement, empowering and equipping schools and delivering incredible results; to schools, teachers, and, of course, to students and parents.

By developing the Economic Graph, the world's first digital map of the global economy, we are realizing LinkedIn's vision to create economic opportunity for every member of the workforce.

A crucial factor that will influence the strength and stability of that global economy will be governments' willingness to set policy levers that encourage entrepreneurism, risk taking and innovation; in doing so allowing a vibrant start-up community to flourish.

LinkedIn was delighted to work with StartupAUS to share our in-depth Economic Graph analysis to uncover unique insights into the profile of Australia's startup environment.

Acknowledgements

Economy in transition: Startups, innovation, and a workforce for the future *by Colin Pohl*

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