The Future of Work

Australia is being forced to reconsider its economic strengths.

Where does technology fit in the answer?

Jobless growth: what's next on the CV

An algorithm may be about to take your job. Your next one might not even have been invented, writes **Jacob Greber**

Four centuries ago, William Lee, the clergyman son of an English yeoman farmer, built a knitting machine and nervously demonstrated his invention to Queen Elizabeth 1, hoping to secure a patent.

When he handed Her Majesty a newly woven woollen stocking from the machine she recoiled in horror: "Consider thou what the invention would do to my poor subjects. It would assuredly bring to ruin by depriving them of employment, thus making them beggars."

Economic historians say the Queen's opposition in 1598 – which forced Lee to flee England for France – was symptomatic of resistance among trade guilds concerned the invention would make their artisans obsolete. It took another two centuries, until the Industrial Revolution, to replace those artisans with textile factories that mass-produced affordable stockings – in effect giving ordinary people a rise in living standards and real wage increase.

The story has been repeated in various guises ever since – from Henry Ford's car factory that wiped out blacksmiths and farriers to the emergence of mass computing and communications that made typists and telephone operators a thing of the past.

In recent years, this virtuous cycle of destruction and renewal – or "digital disruption" in today's jargon – is again becoming contested. Just like Queen Elizabeth 1400-odd years ago, policymakers are again worried about the dangers posed by technological advance.

New research – including a celebrated study that suggests almost half of all occupations in the United States are vulnerable to computerisation – has raised questions about whether modern economies are adapting fast enough to replace jobs lost to accelerating technology.

Talk abounds of "robot overlords" consigning generations to "technological unemployment". Of computers this year for the first time passing something known as

the “Turing test” for artificial intelligence mimicry, named after a paper published in 1950 by British mathematician Alan Turing.

Bill Gates in March warned that “software substitution” was progressing, whether for taxi drivers, waiters or nurses.

“Technology over time will reduce demands for jobs, particularly at the lower end of the skill set,” he told the American Enterprise Institute. “Twenty years from now, labour demand for lots of skill sets will be substantially lower. I don’t think people have that in their mental model.”

An Australian government report estimated in December that as many as half a million accountants, supermarket cashiers, secretaries, typists and bank tellers = many of them in what are regarded as white-collar jobs – could be threatened by automation.

The Economist has produced major features on “the third great wave” of the digital industrial revolution, warning it includes more losers than winners and is “opening up a great divide between a skilled and wealthy few and the rest of society”.

With that come the inevitable fears of how this trend – if it eventuates – will change societies accustomed since the Second World War to broad increases in living standards.

For a taste of how such a bleak future might manifest itself, look no further than the troubled regions of the Middle East or the Horn of Africa, where violent anti-statist movements have found fertile soil for radicalisation among their unskilled unemployed and impoverished populations.

The debate over whether robots will replace human workers is particularly prominent in Europe and the US, where labour markets are still recovering from the turmoil of the global financial crisis.

In the US, despite a strong rebound in hiring over the past two years, many fret that participation rates are still low – suggesting something fundamental is shifting in the world of work.

In their widely cited 2011 book, *The Second Machine Age; Work, Progress and Prosperity in a Time of Brilliant Technologies,* Erik Brynjolfsson and Andrew McAfee have tapped into that sense of unease, arguing the world is at an inflection point that offers both opportunities and thorny challenges for societies and workers. “There’s never been a worse time to be a worker with only ‘ordinary’ skills and abilities on offer, because computers, robots and other digital technologies are acquiring these abilities at an extraordinary rate,” they say.

In Australia, similar fears are emerging fed by anxiety over the end of the biggest resources boom since the 1850s. Many are asking what comes next and whether the pain that the North Atlantic economies has suffered since 2008 will soon arrive here, having been merely delayed by China's now waning appetite for iron ore and coal.

Fundamentally, Australians are being forced to reconsider their economic strengths – and whether technological change has undermined those while attention was focused on the mining and energy boom.

"We're not really destroying jobs," says Patrick Llewellyn, chief executive of a graphic arts related business in Melbourne. "We're creating jobs. We're in a space that no one's inhabited before."

99 Designs, in Richmond in the city's inner-east, connects customers in need of logos, websites or a new corporate look with a pool of designers.

It is a cross between Facebook and eBay. The customers describe their needs on the site, designers tender for a job, and the business selects the one they want. 99 Designs keeps track of all the work and does the financial transactions.

At one level, the company bypasses a whole industry of large-scale designs enterprises, so there's clearly an element of job destruction. On the other hand, it represents a new employment market, unlocking otherwise idle labour. Many of its designers are freelance operators working in the suburbs. Others bring their cats and dogs to work in the vast converted space – a perfect pets' playground. There are also sole-person businesses tendering for and getting work in the US, Europe and Asia.

"What we do is make connections where it wasn't possible before," Llewellyn says. "We've got stay-at-home mums, people with disabilities, people living overseas or in rural Victoria who can access work."

The company signs up between $2.5 million and $3 million of design work a month and directly employs 115 people. That's up from just eight staff when the business started six years ago. It operates in seven languages and has offices in Berlin, Rio de Janeiro and San Francisco.

It has bypasses many legacy businesses that used to service the old design conglomerates. "We use Skype for our phone calls. We're customers of Amazon's cloud service for IT storage. We utilise Google Docs and Gmail. We use Slack – that's a cloud service for company chat, topic rooms and communication," Llewellyn says.

The company's headquarters is a sign of the times: an old warehouse representing ancient manufacturing and inventory practices has been polished up and equipped with

high-powered computers and Wi-Fi. It also has the obligatory tech firm accoutrements, such as table-tennis tables and been-bags.

Like William Lee in the 16th century, 99Designs has discovered a new way of working more efficiently, unlocking value and contributing to productivity. Armies of people now work in jobs unimagined by their parents or grandparents. It's not just designers. Astonishingly sophisticated technical occupations include new healthcare jobs, biomedical engineers, IT consultants, computer game creators – the list is endless.

Most are also in what are broadly classified as services industries that have growth on the back – and have been made possible solely because – of advances in cheap information and communication technology.

According to most official estimates, such jobs now account for well above 70 per cent of employment and a similar level of economic growth. Without their emergence and the income they product, Australia would have been a far poorer place and the past two decades of continuous economic expansion a near impossibility.

With hindsight, the growth of new ways of making a living from the 1970s and 1980s couldn't have happened at a better time.

Back then, the traditional source of work for most of the nation's lower and middle income households was manufacturing yet within a few decades, after Paul Keating floated the dollar and dismantled the tariff wall, hundreds of thousands of manufacturing workers lost their jobs to lower-cost Taiwan, South Korea and mostly china.

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Michael Osborne, researcher.

While brutal for those who were too old or unable to retrain, the decline of manufacturing freed up labour and allowed a freak wave of educated young Australians to be absorbed into the burgeoning ranks of new professionals that have sustained comfortable middle-and upper-class lifestyles ever since.

The sons and daughters of textile workers who plied the "dark Satanic Mills" across the inner streets of Melbourne and Sydney moved into new suburbs and built homes from pay packets earned as accountants, mortgage brokers, paralegals and retail workers.

Living standards – and the material wealth that goes with affluence – have never been higher. Both sides of politics have been forced to target and appeal to this new middle class and its concerns, and to expectations that are worlds away from the traditional

industrial base of previous decades. The clearest manifestation of this political transformation can be seen in the end of federal government subsidies to the Australian car industry.

Yet one of the deepest fears to merge from the looming "robot age" debate it that this new Australian middle class may well be its biggest victim as new technologies hollow out previously safe middle and higher skilled work.

If search robots armed with blisteringly fast and sophisticated algorithms can instantaneously scrutinise millions of pages of court evidence for the nugget that swings a case, why employ tens of thousands of junior lawyers to do the same?

Accountants are headed in a similar direction as software replaces many of the profession's more routine and mundane operations.

In their 2013 paper, *The Future of Employment: How Susceptible are Jobs to Computerisation,* Oxford University researchers Carl Frey and Michael Osborne conclude that about 47 per cent of the 702 occupations in the US are vulnerable to being replaced by technology. High on their list are jobs such as loan officers, auditors and insurance appraisers and archivists.

"If your job basically relies on you being able to sift through large amounts of information and pull out the right bits of it, I'd be quite worried because that is something algorithms are increasingly capable of doing," Osborne says.

Likewise, people involved in administrative or retail work will be in trouble, if they're not already; as such services shift online or to low-cost countries such as India.

Even sophisticated but largely manual activities are in danger, including restaurant waiters or professional drivers. Just 10 years ago – as Brynjolfsson and McAfee point out in their book – the concept of an advance such as Google's "self driving car" was considered forever beyond the reach of technology because of the sheer complexity of navigating busy and unpredictable roads safely. Yet just this month a team from the University of NSW took out first prize at the three day national competition for driverless cars in Geelong, with a GPS and sensor-laden vehicle named Buttercup.

Suddenly jobs such as bus drivers are replaceable, let along the more dirty and dangerous occupations such as welding, or repetitive but welcome sources of casual work for lower-skilled Australians – such as supermarket checkout operators.

Steve Sargent, chief executive of GE Australia, argues Australia will need to find new ways of adapting to such changes and that a decade of jobless growth appears likely.

“We saw that during the Industrial Revolution, where mechanical and electrical energy replaced muscle power, and …. it certainly appears that we may well see that again as you see digital technology augment brain power.

“What you will see as a result of that is for a fairly short time, a decade – which is what we saw after the Industrial Revolution – you’ll start to get economic growth. But you won’t see much in the way of jobs growth, and it’ll be somewhat subdued.”

Yet for all the doom and gloom there are many reasons for retaining a healthy optimism about the future. In the past, the dire predictions of widespread unemployment and impoverishment – usually from groups with a vested interest in protecting those jobs – failed to eventuate.

Each industrial evolution painfully cost some individuals their employment, but the losses were always offset with new occupations, often with higher wagers to match the increases in skills and productivity.

Frey and Osbourne’s paper suggests there are sill many jobs that machines will find difficult or impossible to replicate. Robots struggle with autonomous manipulation, or the concept of undertaking tasks in random environments without human oversight. Jobs such as dentistry, Recreational therapists, surgeons, farm hands and hairdressers are future-proof.

And Osborne argues that teachers, public relations workers, courtroom lawyers and statisticians will also continue to do well.

“If your occupation involves a great deal of creativity or social intelligence – the ability to interact with people to negotiate or persuade, we think your job is relatively safe.” he says.

“These are skills that machines are not immediately going to replace humans with.”

Another reason to shun many of the dire warnings about the loss of jobs to technology is that many of tomorrow’s jobs don’t exist yet – a lesson first learned during the industrial revolution.

Professor Bruce Chapman, an economist at the Australian National University, says the biggest contributor to employment is not actually technological change”.

“It’s demand driven,” he says.

“If the computers make the world more efficient through greater productivity, that’s wealth-creating and the people who get the wealth spend it and spend it on new things.

“These changes in technology will change the state of what’s produced and services offered, but they’re not growth replacing,” he says.

Chapman challenges studies such as those of Frey and Osborne, saying unless their modelling includes how technology creates new – hitherto unknown – occupations, their findings will inevitably exaggerate concerns about losses.

Move to Orange an injection of energy and commitment

Most people don't associate the central-western NSW town of Orange with cutting-edge information technology, let alone a globally competitive business in the field of big data.

Yet, Phil Dodds says, the town – better known for its orchards, vineyards and status as a locavore's nirvana – is the perfect place for his cloud-based data-crunching business.

Dodd's established his IT company, Phocas, in Sydney in 2006 but, in 2014 he expanded to downtown Orange. From a small office opposite the railway station, he and his 30 staff serve clients throughout Australia, the United States and Britain.

The company produces what Dodds calls "business intelligence software", or the management, analysis and manipulation of cloud-based data.

Clients include Beyer, Westfarmers, Reece Plumbing, Repco and Russell Athletic.
It's an injection of fresh energy for what was originally a convict settlement established in the 1820s and bracing for the closure in late 2015 of an Electrolux whitegoods factory employing more than 500 people. Dodds's team are doing jobs that didn't exist a generation ago – and would have been beyond the wildest imagining of the farming families that have dominated the district for most of the past two centuries.

Indeed, Dodds says many of the staff in the new headquarters are originally from the area and have returned after years of studying and working in places such as Sydney. Many others are living out a classic "tree change". "It's been the best thing we've ever done," Dodds says of the move – which was made possible because of the arrival in recent y ears of fast and low-cost internet connectivity.

Dodds cites benefits including huge gains in morale among staff no longer condemned to Sydney's commuting horror and – for management – the happy paradox that once staff make the move out west, they are no longer vulnerable to being lured away.

"There's the wanting to be part of something; they're not looking at other jobs ow where to go next or moving up some hierarchy," he says.

Imagine a salesman about to visit a customer and who wants to study last month's order and figure out what needs to be replaced.

Until recently that information was stored in Lever-Arch folders stuffed with computer printouts. Now, they do it on an iPad, using software that's been built and maintained by Phocas's country staff.

In a sense, Phocas has made redundant the jobs of people who once managed those cumbersome folders – but it has also brought to life new skills and productivity.

The company is also a prime example of why rapid technological change need not be feared – even if it is happening far more quickly than many expected. Among those caught by surprise were consultants at Deloitte, who warned two years ago in their report *Digital Disruption – Short Fuse, Big Bang?* that two-thirds of the Australian economy – both public and private - would experience "significant" digital disruption within the next five years.

"The stark reality is that it has been more like five months for 65 percent of the economy – including Deloitte's own professional services sector – to realise we are in the crosshairs of digital disruption," the firm said early in 2014.

The speed of change unnerves many people but need bot be cause for despair.

Jacob Greber