Submission No 5

INQUIRY INTO IMPACT OF TECHNOLOGICAL AND OTHER CHANGE ON THE FUTURE OF WORK AND WORKERS IN NEW SOUTH WALES

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Technology, Standards and Democracy

Submission to:
Select Committee on the Impact of Technological Change on the Future of Work and Workers in New South Wales

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About the Centre for Future Work

The Centre for Future Work is a research institute associated with the Australia Institute (Australia's leading progressive think tank). We undertake and publish research into a wide range of labour market, employment, income, and related issues. We are independent and non-partisan. A list of reports particularly relevant to this Select Committee is in the references section of this document. Please see our website to access any of our reports, at http://www.futurework.org.au/.

Introduction & Summary

The Centre for Future of Work is grateful for the opportunity to provide a submission to the Select Committee on the Impact of Technological Change on the Future of Work and Workers in New South Wales. We are hopeful that this Select Committee can contribute to developing a strategic understanding of, and leading legal framework for, changes in the nature of work and the labour market. These issues have increased in importance in the context of the economic crisis, and the resulting weakness in the labour market, associated with the COVID-19 pandemic.

Workers in most industries and occupations worry about the effects of accelerating technological change on their employment security and prospects. New digital technologies are being applied to an increasingly diverse and complex array of tasks and jobs – including artificial intelligence and machine learning technologies which can exercise judgment and decision-making powers. Some studies suggest that as many as half of all jobs may be highly vulnerable to automation and computerisation in coming decades.

Of course, concerns about technological unemployment are not new. Since the industrial revolution, workers have always worried what will happen to their jobs when machines can do the work faster, cheaper, or better. But the historical record shows that technology has not produced mass unemployment or impoverishment – although dislocation and adjustment to technological change can be severe for some groups of workers, and some regions.

The impacts of technology are always filtered through social and political processes; competing sectors of society naturally endeavour to protect and advance their own respective interests, as technology evolves. Will technology be used to enhance mass living standards and make work more efficient and pleasant? Or will it be used to enrich a small elite, while undermining the economic well-being and political rights of the majority? The answer depends on how technology is implemented, managed, and controlled, and whose interests prevail as the process unfolds.

Some theorists suggest that automatic market mechanisms – supply and demand forces – will ensure that displaced workers are reassigned to other, more productive jobs, and that society will be better off accordingly. The role of policy, in this view, is limited to facilitating transition (through retraining and mobility assistance). Anyone who questions technology, or tries to interfere with its application in workplaces, is depicted as fruitlessly trying to stop 'progress'. But this faith in the self-adjusting capacity of the labour market is not credible. In reality, labour markets never function so smoothly or efficiently: unemployment and underemployment can persist for long periods of time (especially under conditions of crisis, such as those we are presently experiencing due to COVID-19), displaced workers may not be successful in transitioning into alternative roles, and income losses from restructuring can be substantial and long-lasting.

Thanks to their power over investment and production, employers tend to implement particular kinds of technology, in specific ways, to enhance their power and profits: not just to boost output, but also to intensify work effort, monitor and discipline workers, and restructure the terms of employment. These negative trends are not inherent outcomes of technology itself. Rather, they are

the result of power imbalances in employment relationships, in the context of an economy that is shaped and directed by the profit-maximising actions of private firms.

Below we discuss several reasons why the impact of technology on both the quantity and quality of future employment is indeterminate, and highly dependent on the policy choices that are made as the process of labour market evolution unfolds. While some workers will face heightened risk of job loss due to new technology, we nevertheless firmly reject the notion that work in general can somehow 'disappear' – even in sectors which seem ripe for the application of labour-saving or labour-replacing technologies. And we reject the implication that workers will somehow be 'disposable' in a brave new automated world. The reality is that productive human labour, broadly defined, is still the driving force behind all production and value-add. This is true even in an economy utilising automation and other technology-intensive methods of production. We must be aware of the risks and challenges posed to workers by accelerating technological change, but without resigning ourselves to a dystopic high-tech future in which workers have no power, no agency, and no security. Instead, our response to the challenges posed by technology can be grounded in a complete and balanced assessment of the threats and opportunities associated with new technology.

The rest of this submission is organised as follows:

- Part I, 'Technology and Work: What changes are at play?' identifies changes – and continuities – in the world of work in which technology plays a role.
    - This includes a subsection, 'Electronic Surveillance in the Workplace' on the incidence of this type of surveillance by employers in – and beyond – the workplace, using results from the Centre for Future Work's 2018 survey on the incidence and impacts of such surveillance.
- Part II, 'The Macroeconomic and Social Context for Technological Change', considers the broader political-economic factors contributing to how we use and regard technology in the workplace. Many of the changes often ascribed to technology are better identified as social or political matters, mediated through or exacerbated by technology.
- Part III, 'Technology and the Quantity of Work' discusses technology's impacts on the quantity of work available. We note that the uptake of technology by employers is in fact surprisingly lower than what many analysts have predicted – further evidence that technology's effects on the work of work are mediated by social and political factors.
- Part IV, 'The Technology of Production and the Organisation of Work', further teases apart the distinction between technology as a discrete set of tools, and the social organisation of work, such as precarious employment. There is an interaction and overlap between the two but consideration of the set of challenges under this Select Committee's Terms of Reference is lent more rigour by identifying the distinctions, too.
- Part V is set of recommendations, under the title 'Best Practices for Managing Technological Change. These seek to support the goal of maximising the benefits of technology, while reducing and ameliorating its social costs.
- The submission concludes by reiterating that it is not technology specifically, but rather our systems of laws, institutions and social expectations overall that will determine the future of work.

Technology and Work: What changes are at play?

At its simplest, 'technology' simply refers to the accumulated human knowledge that allows us to produce a broader range of goods and services, utilising more efficient and productive methods and tools. In a broad sense, 'technology' does not replace labour: rather, technology allows us to work more effectively. By using more sophisticated and complex tools, machinery, and inputs in our work, humans can produce a broader range of goods and services – and produce them in greater quantities – than if we worked only with simple tools and our bare hands. So the process of technological change, whereby we use more complicated tools and techniques to enhance our capacity to produce, is as old as humanity. Modern technology affects how we work, and leads to more indirect labour (that is, the production of inputs, tools, and other intermediate products) rather than direct labour (the immediate production of a final good or service). But it cannot, in a general way, replace labour.

The ongoing process of technological and economic development presents society with key options and choices, regarding how the benefits of technology should be realised. Technological progress (and the accumulation of the physical capital stock which embodies technology) can support a higher material standard of living, reflected in higher incomes and higher rates of consumption (including public services and collective consumption, as well as private consumption). Since each hour of labour can now produce more output, new technology can also facilitate ongoing reductions in working time. Historically, workers have fought for (and won) both higher incomes and shorter working time – although in recent decades, under a more aggressive mode of economic governance (often called neoliberalism), those gains have been resisted and (in some cases) rolled back by employers and employer-friendly governments. Society also faces a fundamental choice regarding how the benefits of new technology (including higher incomes and/or shorting working hours) will be shared. Income gains can be distributed broadly through society, or captured mostly by a small elite at the top. Similarly, working hours can be reduced for all workers (so all can enjoy more leisure time), or worktime reductions can be concentrated in the form of unemployment and underemployment affecting a segment of the labour force (while others work as much as ever).

None of these outcomes is predetermined by 'technology'; they all reflect choices made by society. And in turn, those social choices reflect the balance of power between competing constituencies within society. It is not inevitable that 'technology' must reduce the incomes earned by so-called 'low-skill' workers, nor lead to the expansion of insecure, precarious forms of work. Technology may interact with the evolution of social relationships and power balances, as respective groups enlist technology to advance their respective interests. Since employers control investment and production, they obviously have the upper hand in this regard. But it is ultimately human beings – not machines – who determine how we work, what tools we use, what we produce, and how we share the fruits of our labour.

While the general process of technological development is not new, there are some ways in which the current wave of technological change does differ from those that preceded it – and hence the labour market impacts may also be different. More specifically, current innovations in computing and automation can undertake new kinds of tasks, that in the past were not amenable to machine-aided production.

Table 1 The Growing Reach of Automation		
Type of Task➔ **Form of Work⬇**	**Routine**	**Non-Routine**
Manual	Routine/ Manual	Non-Routine/ Manual
Cognitive	Routine/ Cognitive	Non-Routine/ Cognitive
Source: Adapted from Autor et al. (2003).		

Traditionally, computer-assisted automation required programmers to specify very precise tasks, in a controlled environment. Computer code could instruct a computer or machine to perform an intricate and complex set of functions; but the functions being automated had to be routine and precisely describable. These functions could include manual tasks (involving the movement of objects) or cognitive (involving the manipulation of data). But in either case, automation was only relevant for routine and replicable functions. This set of tasks is indicated in the middle column of Table 1.

New applications of computing power, in contrast, are allowing the automation of non-routine tasks. Thus the scope of automation is extending rightward in Table 1, to include non-routine tasks that require judgment, flexibility, and decision-making capacity, even in non-controllable or unpredictable environments. Applications that extend the scope for computer-controlled work include machine learning (ML), data mining, machine vision, computational statistics, artificial intelligence (AI), and mobile robotics. In every case, computers draw on analysis of large databases of past experience, developing the capacity to make best judgments in the face of unpredictable circumstances. Tasks in the right-hand column of Table 1 (non-routine manual and cognitive jobs) now face the prospect of partial or complete automation.

Since machine learning and other new computing capacities allow a wider range of tasks to be computerised, the potential impacts on employment will be magnified. Researchers, using an approach pioneered by Frey and Osborne (2013), have conducted detailed skills audits of various occupations, to judge their likelihood of automation. This approach underpins the now-famous prediction that close to half of jobs in developed economies are highly vulnerable to computerisation. This does not mean that half of jobs will disappear: there are many countervailing forces that will limit the impact of technology on total employment, as the process of automation unfolds, discussed further below. But as an indicator of the large number of workers whose work lives are likely to be fundamentally changed by the new wave of automation, the Frey and Osborne results are insightful. Other studies have been more cautious, suggesting that the share of jobs vulnerable to automation is much lower; for example, the OECD (2016) estimates that only 10 percent of jobs in industrial economies are likely to be automated in coming years.

Researchers have also identified some sectors which seem highly vulnerable to computerisation (including transportation, sales, office and administration, and general service functions), and others which are less likely to experience widespread automation (including human services like education and health care, management, and technical functions). Moreover, there is no obvious or consistent

correlation between the 'skill' or qualifications of specific jobs, and their vulnerability to automation. Many traditionally high-skill occupations will soon be automable (such as certain medical, legal, engineering, and other highly-qualified jobs); and there are many others considered 'low skill' (or at least requiring fewer formal qualifications) that will not likely be computerised (including many support functions in human services, hospitality and personal services). So it is wrong to assume that only 'low skill' jobs will be affected by automation, nor that the way to 'protect oneself' against technological displacement is simply to acquire more skills.

In addition to the changing nature of technology itself (including artificial intelligence and machine learning), the employment effects of the latest wave of technology may differ because of the different economic, social, and political context of work. Since the ascendance of neoliberal economic governance over the past four decades, the realm of private business decision-making has grown (especially for large global firms), and the capacity of policy and regulation to constrain the actions of businesses has been eroded. Other economic changes – such as the development of more complex, integrated global supply chains, and lacklustre macroeconomic performance (experienced acutely during the current COVID recession), also accentuate the impact of new technology, and make it harder to manage the effects of technological change. Once again we see that it is not technology itself that is the problem: rather, it is a mode of economic governance which privileges the power and mobility of private businesses over the interests of workers in steady, decent work, that explains the deterioration of work for so many.

Electronic surveillance in the workplace

Monitoring and surveillance of workers by employers has been an integral aspect of the waged employment relationship for centuries. Employers generally hire labour in units of time: a certain payment per hour, per day, or per week. But employers *actually* desire something different: productive expended labour effort by those workers. The distinction between what they are paying for, and what they want, gives rise to an ongoing preoccupation with converting time as fully and completely into expended effort as possible. Finding ways to manage paid labour to elicit maximum effort and productivity, and hence reduce unit labour costs of production, is thus a central priority for employers.

In 2018, the Centre for Future Work surveyed workers on the forms, prevalence, impacts and implications of electronic and digital monitoring and surveillance in Australian workplaces (Henderson et al. 2018).

The results reveal that it is not just that work is being *extended* into greater portions of our days (through unpaid overtime, the use of mobile phones and computers to reach workers at any time, pressure to not fully utilise annual leave, and similar trends). In addition, even *within* the work day, time pressure is *intensified* with the expectation that every moment of work time must be used for productive purposes – an expectation that is increasingly reinforced through omnipresent systems of monitoring, performance measurement, and surveillance. The result of these twin forces is an overall inability for people to escape from the demands of work: neither at the workplace (even for short periods), nor away from it.

Electronic monitoring and surveillance (EMS) methods include the use of location tracking technologies, monitoring of emails and social media content, the 'gamification' of work, digital methods of performance monitoring, and even electronic systems for employee discipline and dismissal.

Many forms of workplace surveillance are now encompassed within employees' use of ICT in their jobs – such as systems which automatically monitor web, email, social media, and text activity. Other strategies involve the application of dedicated surveillance systems such as GPS and closed-circuit video equipment.

Table 2 **Diverse Forms of Electronic Monitoring and Surveillance**
Automated systems to collect consumer ratings and staff evaluation
Biometrics (such as finger scans, facial recognition, retinal scans)
Closed Circuit Television (CCTV) surveillance
Digital badges to track location, tone of voice, frequency and content of conversation
Digital performance and quality management in production systems
Digital profiling and social media history compilation and screening
Electronic time-stamp and attendance systems
Gamification: use of game-like techniques to boost attendance and work effort
Global Positioning System (GPS) tracking in vehicles, ID cards, etc.
Location tracking for off-site contractors and other mobile workers
Microchipping employees to track location and activity
Monitoring email content
Monitoring keystrokes
Monitoring telephone calls
Monitoring social media content
Monitoring web browsing
On-call systems operationalised through text, mobile phone, or e-mail
Radio Frequency Identification (RFID) tracking
Swipe cards to track attendance and location
Time-motion data compilation to track output and activity
Wearables (such as Fitbit or chip implants) to track activity and location
Source: Henderson et al. (2018)

New digital businesses – the 'platform' or 'gig' economy – have developed some particularly invasive, though often subtle, forms of modern EMS. Companies use a diversity of digital and app-based technologies to track their workers' location, activity, and output. Sophisticated digital tools also aim to motivate (some might say manipulate) workers on a psychological level, including by making work more 'game-like' (gamification).

And in the case of US-based online retailer Amazon, workers under systematic workplace surveillance reported feeling under extreme pressure to meet their benchmark pick rates, with some avoiding taking bathroom or water breaks for fear of falling behind and, potentially, losing shifts. And as with performance, location and attendance criteria, failure to meet expectations regarding being 'always available' to employers may result in negative consequences for employees.

The consequences for workers of EMS include heightened stress on the job, potential safety issues (related to workload, repetitive strain and other risks), and the extension of the realm of work into greater areas of general life.

It should also be noted that the proliferation of technologies that permit this additional level of employer EMS can, under some conditions, benefit employees. For example, they may allow flexible working arrangements, such as working from home, that enhance workers' employment experience.

The problem is not the technology itself, therefore, but rather the power relations and regulatory environments within which they are used and implemented.

Henderson et al. (2018) reported that:

- Modern information and communication technologies (ICT) facilitate omnipresent and low-cost electronic monitoring and surveillance – not just in the workplace, but often outside of it, as well.
- Employers can harness the reach and diversity of new technologies to enhance the scope and detail of their knowledge of employee behaviour, attitudes and performance.
- A central motivation of EMS is to enhance the degree of knowledge and control of employers regarding the activities of their employees when they are on the job – and, in some cases, when they are not.
- Digital EMS techniques can also directly accelerate production and heighten productivity, for example by controlling the speed at which workers are digitally assigned new tasks.
- In some cases, digital and electronic surveillance may serve more positive functions, such as contributing to safety and security in workplaces.
- There is no comprehensive data available regarding the extent of EMS systems in Australian workplaces today. There is no doubt, however, that the number of workers being digitally monitored, and the range of techniques through which this monitoring occurs, have expanded rapidly over the last two decades.
- Australia's patchwork system of privacy and workplace laws has, to date, provided only minimal protection to Australian workers against modern EMS. In general, email monitoring is expressly excluded. At the State and Territory level, New South Wales and the Australian Capital Territory are the only jurisdictions which have passed statutes explicitly regulating electronic monitoring and surveillance of employees.
    - The NSW Workplace Surveillance Act (2005) covers optical surveillance, computer surveillance and tracking surveillance. Surveillance cannot occur without notice to employees. Surveillance is prohibited in sensitive areas (like change rooms, toilets, or showers). Surveillance cannot be imposed on employees outside of their work. Covert surveillance is generally prohibited (without approval from police or equivalent authorities). This Act also limits how employers can restrict access by employees to email and internet facilities while at work.
- Among Australians currently working, 70% said their workplace uses one or more methods of electronic or digital surveillance. On average, this group reported 3.2 different types of surveillance being used. This confirms that digital forms of monitoring are widely used in Australian workplaces.
- Only 20% of respondents in work said their workplace did not use any form of digital or electronic surveillance. The remaining 10% did not know.
- The most common forms of digital surveillance were employer monitoring of web browsing (43%), followed by monitoring the contents of emails (38%).
- 18% of all workers experience digital surveillance by their employers outside of their workplace.
- 10% of all workers said they had been personally penalised or disciplined as a result of digital or electronic surveillance.
- There was overwhelming agreement (92%), and majority strong agreement (59%), that employers should notify employees when any form of surveillance is being used. And almost three-quarters (73%) thought there should be legal restrictions limiting how employers can use these technologies.

- Nearly three-quarters of workers (71%) believe these technologies reduce privacy for workers, and 60% said it reduces trust between workers and employees.
- A majority of workers (52%) believe that the use of EMS reduces the quality or pleasure of work.
- Only a third agreed they are a good way to make workers more efficient and work harder (37%); most disagreed (53%) with that sentiment.
- Only about one-third of workers (35%) said they would prefer to work in a workplace that uses EMS technologies. Nearly half (46%) disagreed with that sentiment.

The declining cost and growing use of digital surveillance techniques can thus likely help to explain the deceleration of wage growth in Australia's overall labour market in recent years. Employers are less concerned with motivating and retaining employees on the basis of positive incentives (like job security, promotion, and wage increases). Digital surveillance and freedom to fire give them greater power to elicit compliance in workplaces with the threat of negative sanction. Combined with chronically weak labour market conditions (marked by widespread underemployment, especially among certain groups of vulnerable workers such as migrants and youth), this can compel workers to accept relatively low wages while still meeting desired effort and productivity benchmarks. This effect will have been exacerbated by the COVID-19 crisis, with the ratio of jobseekers to available jobs so high.

The legal and regulatory context (including constraints on employer actions that may be imposed by labour law and/or collective agreements) determines how and where employers can collect information of employees; and what they can do with it. More specifically, strong employment security provisions in labour law or collective agreements limit the ability of employers to sanction or discharge workers they deem uncompliant, and hence limit the effectiveness and value of intense surveillance. The question for law-makers, the judiciary, trade unions and workers is how to regulate the 'employer's eye' in the 21st century.

A key conclusion regarding the protection of employees in relation to modern EMS in Australia is the inconsistency and inadequacy of current laws at the Commonwealth and State/Territory levels; in that regard NSW has an opportunity to develop model legislation.

To prevent these technologies from contributing to a dystopian work culture marked by omnipresent and punitive surveillance, and to ensure that ongoing technological change translates into rising living standards (not just more intense exploitation), these issues should be placed squarely on Australia's, and NSW's, labour policy agenda.

We provide several recommendations regarding better regulation and restrictions on EMS in the section 'Best Practices in Managing Technological Change', below.

The Macroeconomic and Social Context for Technological Change

The implementation of new technology takes place within a broader economic and political context, which has been dramatically restructured over the past three decades – in ways that have systematically enhanced the power and profitability of employers and financial investors, while undermining the position of workers and their organisations. This altered playing field helps explain why the ways technology is introduced into workplaces, and its impacts managed, have been unduly one-sided in favour of employers. Technological change would be experienced very differently by workers, if the broader economic and political environment was more amenable to workers' concerns and demands. These epochal changes which have empowered employers and investors to more ruthlessly promote their interests (including through new technology) include:

Macroeconomic stagnation and labour market slack: A key feature of neoliberal governance is a commitment to use active policy interventions to restrict economic growth when needed, and ensure a continuing cushion of unemployed and underemployed labour that keeps workers insecure and compliant. This policy approach has been more complicated in the years since the Global Financial Crisis, due to the continuing weakness across most of the global economy of growth and job-creation trajectories – a weakness which has been dramatically underlined and exacerbated by the COVID-19 pandemic and associated economic crisis. In light of these events, central bankers have been forced to undertake unconventional measures to try to stop inflation from falling too low (or tipping into outright deflation), and to stimulate some growth in employment and purchasing power. These include central banks buying bonds in the secondary market to add liquidity (known as quantitative easing). Very weak levels of business capital spending in most countries (despite strong profits and falling company taxes) have further weakened the macroeconomic environment. The credibility of neoliberal macroeconomic policy has never been weaker. But its legacy lives on, in the form of underutilised labour markets, persistent unemployment and underemployment, and continuing macroeconomic stagnation. Employers can capitalise on the resulting desperation of workers, to introduce ever-more insecure work practices and employment relationships: including casual and contract work, irregular hours, the misuse of independent contractors, and 'gig' jobs mediated via digital platforms. With chronic levels of slack in labour markets, they face no pressure to improve the standards and stability of work in order to attract workers.

Fiscal austerity: The misplaced emphasis of most national governments and international agencies on reducing budget deficits and scaling back public spending since the Global Financial Crisis has further damaged global macroeconomic performance. Despite the loss of millions of jobs and the collapse in confidence and purchasing power after the crisis, many governments harshly cut many public programs. One example of austerity's manifestation in NSW is public sector wage restraint, which in turn has knock-on effects onto wages and macroeconomic conditions across the broader NSW economy (see Henderson and Stanford, 2017; in addition, the NSW Department of Treasury recently stated the problem themselves, identifying that public sector wage freezes would deepen and lengthen the COVID-19 recession; see Visentin, 2020). This austerity has further enhanced employers' power in the labour market (including the power to implement new technologies without constraint or resistance). In a more austere macroeconomic environment, workers face ever-greater vulnerability – and are less empowered to confront employer demands (including in the realm of technology) that are unfair and exploitive.

Globalisation and free trade agreements: The global economy is being run according to a deliberately business-friendly set of rules and practices. The neoliberal vision of globalisation implies maximum protections for business interests: granting them freedom to move capital and production as best suits their profits, with minimal constraints from government policy, and little accountability

to communities affected by their actions. In some cases, these rules completely contradict the vision of ‘free trade’ which supposedly motivates this whole approach. Consider, for example, the prominent role played by stronger patent laws and other property rights within modern trade agreements: these provisions explicitly restrict trade, rather than enhancing it, and deny the benefits of life-saving pharmaceuticals and other innovations to millions of people who need it. These lopsided features of globalisation are not inevitable; they reflect the deliberate efforts of trade negotiators to construct a business-friendly global economic ‘constitution.’ But the unique mobility and protections enjoyed by employers under this form of globalisation have clearly enhanced their capacity to manage technology in ways that undermine workers’ power and enhance their own profits.

These continuing changes in the broader economic and political environment make it more difficult and complicated to advance an agenda for decent work, fair treatment, and sustainable and inclusive growth. In the realm of technology, we cannot understand the one-sided impacts of recent technological changes without understanding the pro-business shifts in the broader economic and political landscape. And hence we cannot hope to win a more balanced and worker-friendly vision of technology and innovation, without confronting the overall neoliberal direction of economic, political, and social policies.

Technology and the Quantity of Work

It is easy to conclude that any technology-driven increase in the average productivity of labour, other things being equal, should reduce the number of workers employed. After all, employers develop business plans based on expected levels of demand for their output, and then staff their operations to fulfil those plans. Few employers (certainly not in the private sector) face compulsion to maintain employment levels unless they are immediately applying engaged labour in production. In this framework, if technology allows a target level of output to be produced with fewer workers, then that is sure to be the outcome.

But the relationship between technology and labour demand is more complicated than this; there are many countervailing factors which blur the impact of higher labour productivity on employment. For various reasons, new technology is not translating into higher realised labour productivity as quickly as many observers have expected; in fact, recorded labour productivity growth has slowed down since the GFC, not accelerated. And even if and when productivity does begin to grow more rapidly, several factors will serve to moderate the resulting impact on total employment:

Barriers to implementing new technology: New techniques that can be demonstrated in controlled or laboratory settings (such as driverless vehicles, in the transportation sector) may not be commonly applied in real-world settings for many years, for various reasons. Regulations may have to be amended to allow for the safe or reasonable use of new technology. Social attitudes and consumer acceptance will take time. The capital investment requirements associated with new technologies may delay installation of new machinery and equipment, especially in sectors characterised by smaller, relatively undercapitalised firms. For all these reasons, the expected uptick in labour productivity growth that should be the aggregate result of labour-saving technology is not broadly visible.

Work embodied in new technology: Technology itself is not some exogenous force that transforms our work. Technology reflects human effort to develop new, more productive ways of producing goods and services. And technology itself requires large inputs of human labour: in innovation, engineering, design, manufacture, operation and maintenance of new machinery and equipment, for example. The introduction of new technology therefore generally creates some new tasks and jobs, even as it eliminates others. (There is never any guarantee, of course, that those two opposite effects will be equal in magnitude.) The two-sided nature of these employment effects highlights a key priority for managing technological change: proactive efforts are required to facilitate mobility and adjustment from jobs eliminated by new technology, into the new jobs that are created.

New goods and services stimulated by new technology: Similarly, another whole category of new work may be created thanks to new production opportunities opened up by the introduction of new technology. Cost reductions arising from new technology may stimulate new demand for goods and services; and entire new industries may become technically feasible as a result of new technology. Here, too, mobility and transition measures to support displaced workers in seizing these opportunities for new work are especially important.

Changes in total demand for output: Aggregate demand conditions are another factor that may influence the total quantity of output in the wake of technological change – thus moderating the impact of higher productivity on labour demand. Past episodes of rapid technological advance often sparked strong business investment, as firms rushed to take advantage of profit opportunities opened by the new technology. Strong capital spending, in turn, can strengthen job-creation even as productivity accelerates. (Examples of this pattern include the introduction of railroads in the nineteenth century, the expansion of mass production in the mid-twentieth century, and the

microcomputing boom of the 1990s.) In today's stagnant macroeconomic environment, however, business capital spending has been very weak – so this source of potential job-creation may be less relevant. Higher personal incomes could also stimulate more consumer demand, led by demand for technology-intensive consumer goods and services. However, the capacity of rising consumer spending to counter technological job losses is simultaneously undermined by the austerity, wage stagnation, and general insecurity that have been imposed in most economies in recent years – most recently by the COVID-19 crisis, and the gaps in Commonwealth and state governments' response to it. In contrast, government spending to stimulate job-creation in the face of accelerating technological change could provide another cushion for total employment. Here, too, the ideology of austerity (which values deficit reduction ahead of job-creation) exerts a strong and negative policy influence. It is particularly important not to conflate the economy and the budget in the context of COVID-19; other than government, there is simply no other sector of the economy that will support the economy.

Organisational priorities: Conceivably, workers freed up from existing tasks by new technology could be reassigned to perform other tasks within their respective organisations, even with no change in the total volume of production. In such cases, organisations would make continuing full use of its workforce, even though technology would conceivably allow a reduction in headcounts. This would require a commitment by management (perhaps guided by a public policy mandate) to preserve jobs. A similar example would be a decision by an organisation to avoid any redundancies in the course of adjusting to technological change – choosing instead to facilitate downsizing through attrition, early retirements, and other more gradual means. (In this case total employment will decline, but gradually and with less negative impact on existing workers.) These strategies require the elevation of other goals, such as better service or the maintenance of good jobs, above cost minimisation or profit maximisation in the decision-making of organisations. Many employers will reject these priorities (especially in the private sector), but it is certainly possible for organisations to implement new technologies while protecting employment levels – if they choose (or are compelled) to.

In light of these various countervailing factors, it cannot be assumed that the introduction of new technologies will cause a general decline in demand for labour – and very dramatic predictions of widespread job loss and mass technological unemployment are not likely to be realised. Moreover, there are many jobs in the current economy (including in many service-sector occupations) that will not be dramatically affected by automation and mechanisation. This is not to disregard the challenges posed by new technologies in particular industries, occupations, and regions. And the application of technology within workplaces (including highly intrusive forms of automatic surveillance, monitoring, and oversight) could undermine job quality and the rights of workers in far-reaching ways. This analysis suggests, on balance, that new technology cannot replace work, in a general way, and is not likely to dramatically affect the overall level of labour demand. It will certainly change the nature of jobs, and the quality of work, in negative or positive ways. Our social strategy strategy, therefore, should not be to try to 'stop' technology (a far-fetched goal in any event), but rather to focus our power to influence how technology is applied: maximising its benefits for workers and society, limiting or preventing exploitive applications (such as technologies that intensify or degrade work), and winning compensation and transitional support for workers who are negatively affected.

The Technology of Production and the Organisation of Work

It is important to distinguish between changes in the technology of production (which enhance our capacity to produce a greater quantity and quality of goods and services) and changes in work practices and employment relationships (which determine how work is motivated, organised, managed, and compensated). Technology is driven by science, whereas the organisation of work mostly reflects social processes. Negative recent trends in the modern world of work are often 'blamed' on technology – such as the stagnation or decline of real incomes for workers, the growth of precarious or insecure work, and the more recent advent of digital platform work or 'gigs'. But these trends are not strictly driven by technology; instead, they reflect evolution in the social relationships and power hierarchies that shape the organisation of work.

Work in all sectors has been transformed in recent years by the growth of insecure or precarious employment (Standing, 2011; Lambert and Herod, 2016). The general phenomenon of precarious work comes in many specific forms: including temporary or casual jobs, greater reliance on nominally independent contractors and other forms of self-employment, and the use of digital or on-line platforms to recruit and deploy labour. The growth of precarious work poses fundamental challenges to the traditional model of employment – and to traditional methods for regulating work and ensuring minimum standards. For example, traditional labour regulations often exclude temporary or independent workers; and it is certainly harder to effectively enforce those standards in a free-wheeling, digital economy. In some cases, evading traditional regulations and employment responsibilities motivated the growth of precarious employment relationships in the first place.

But this process should not be seen as technologically-determined. Instead, the desire and ability of employers to access contingent or insecure labour, shift costs and risks to workers, and evade traditional employment obligations and responsibilities, is the driving force of change. New forms of technology may facilitate this effort by employers – but that does not mean the changes in work organisation were caused by technology.

It is important to carefully examine what is actually new about these new models of insecure work, and to distinguish between true technical innovations and other factors causing changes in work organisation. In fact, the major features of modern precarious work are not novel. These practices have been used regularly in paid employment for hundreds of years: since the dawn of wage labour in the early days of the capitalist economic system. And it is equally wrong to conclude that the more recent resurgence of insecure work has been driven by new technology. Instead, the growing precarity of jobs, including work associated with digital platforms, primarily reflects the evolution of social relationships and power balances, not technological innovation in its own right.

Consider the major characteristics of modern precarious work:

- Work is performed on an on-demand or as-needed basis. Producers only work when their services are immediately required, and there is no guarantee of ongoing engagement.
- Work is compensated on a piece-work basis. Producers are paid for each discrete task or unit of output, not for their time.
- Producers are often required to supply their own capital equipment.
- The entity organising work is often distinct from the end-user or final consumer of the output, implying a triangular relationship between the producer, the end-user, and the intermediary (such as a labour hire agency or a digital platform).
- Some form of digital intermediation is often utilised to commission the work, supervise it, deliver it to the final customer, and facilitate payment.

Other than the use of digital devices for organising and managing the employment relationship, all of these features have a long history in competitive labour markets. Their use has increased or decreased during previous decades, depending on a wide range of economic, political, social and technological factors (Stanford, 2017). But they cannot be seen as 'new.'

Several factors have facilitated the expansion of precarious forms of employment (including independent contracting, self-employment, casual or temporary jobs, and digital platform work) in recent years. To be sure, technology has played a role: by allowing employers to more easily tap pools of underutilised labour, assign them to tasks, and supervise and compensate them. Broader economic conditions have also been important. In particular, the ongoing existence of a large pool of underutilised labour (visible in high numbers of unemployed, underemployed, and discouraged workers) is a precondition for insecure staffing strategies on the part of employers. If they were not so confident that labour resources could be quickly and effectively recruited when needed, employers would feel more pressure to offer more secure and permanent jobs. Another factor facilitating precarious work has been the generally passive, inconsistent application of labour regulations and minimum standards. Regulators have been slow to recognise the risks posed to the quality of work by the expansion of precarious work and the evasion of traditional labour regulations; they have failed to adapt regulatory models to encompass workers in these growing categories of insecure, nominally 'independent' work.

The blurred overlap between new technology, and new employment relationships, is clearly visible in the well-known case of Uber (and other participants in the growing ridesourcing industry). These businesses are displacing traditional taxi work on the strength of an effective digital dispatch system and lower prices. Drivers are not considered employees, but are usually self-employed contractors (although that status is being contested through legal actions in several countries). Uber sets the fare; collects payment from the customer (using its proprietary app; cash payments for Uber rides are not permitted in most jurisdictions); supervises, disciplines, and discharges drivers; and compensates drivers with a portion of revenue based on pre-determined distance and time factors. In sum, Uber exercises a great deal of direct control over work and production, undermining its claim that its workers are truly 'independent'. Again, this pattern of 'dependent contracting', whereby large firms effectively employ workers without accepting the normal obligations typically associated with employment, has a long history in other industries (think of the day labour associated with the 'Hungry Mile' in the docklands of Sydney during the Great Depression).

The actual production process in ridesourcing is not fundamentally different from a traditional taxi: a driver collects a passenger in a vehicle and delivers them to a chosen destination. The on-line dispatch app is more convenient, for many users, than traditional systems (such as manually hailing a taxi, or phoning a dispatch office). But taxi services could readily employ a web-based dispatch system, without adopting the same precarious labour strategies as Uber (in fact, many traditional taxi companies have also implemented similar dispatch technologies). What fundamentally distinguishes Uber from traditional taxi companies is the organisation of work within its business. Uber drivers provide their own vehicles, pay for all related expenses (including amortisation, fuel, and maintenance), and are compensated by Uber on a per-fare basis (with no guarantee of hourly or daily income). This model allows Uber to appropriate profits from provision of taxi services, but without the capital outlays associated with owning and operating vehicles, purchasing licenses, and other input costs. Its centralised control over the dispatch service, which drivers need to find customers, gives the company the power to capture this revenue. The development of this new business model is thus based on the power of a private employer to use a new technology in ways that enhance its profit, while undermining the incomes and stability of the workers producing the

service. In short, the disruptive effect of Uber on taxi work should not be ultimately ascribed to its technology. The same distinction between pure technology, and the nature of employment relations, is visible in other digital businesses.

Employers in all guises continue to develop new strategies for mobilising insecure labour on a 'just-in-time' basis, without incurring the risks and obligations associated with the traditional employment relationship. The implications of the resulting precarity are experienced by workers, their families, and communities along many dimensions: lower and more variable incomes, greater family stress and instability, disharmonious work-life balance, poorer health outcomes, and more (Lewchuk et al., 2015).

The broad shift to non-standard and precarious forms of work is likely to continue in coming years, absent major changes in the direction of business strategy, macroeconomic conditions, and labour regulations. And this trend will undoubtedly put downward pressure on effective wages, working hours, and conditions. But technology is not the only factor in this continuing shift toward more fragmented and competitive industrial structure, and a more unstable organisation of work. Weak labour market conditions facilitate the process by ratifying firms' adoption of contingent staffing strategies, and undermining workers' ability to demand greater stability in their employment relationships. And the stance of regulatory agencies toward the recognition and enforcement of minimum standards throughout the supply chain, regardless of the specific ownership structures associated with various stages of the work, has been ambivalent.

Best Practices in Managing Technological Change

We have argued that threats to the quality and stability of work should not be understood as being driven primarily by technology. Instead, it is changes in the relationships between employers, workers, governments, and regulators, and the evolving balance of power between these groups, that explain the direction of change. The ways in which technology is applied to work are contestable. Modern technology, including mechanisation and automation, can be applied in ways that enhance the well-being of workers (as well as customers, and society as a whole). This would require the elevation of criteria to guide the process of technological adoption other than the current narrow focus on cost minimisation and profit maximisation. And that, in turn, will require the efforts of thoughtful, focused, and strategic good government: one which wields its ability to influence policy to achieve a more balanced and beneficial vision of a high-tech economy.

To support the goal of maximising the benefits of technology, while reducing and ameliorating its social costs, we can identify several principles which governments, on behalf of workers, need to put in place as we confront continuing economic and social disruption:

1. **Protections for workers in unconventional employment arrangements:** The growing insecurity of work, and the expansion of non-standard and precarious employment relationships, are already challenging standards of job quality, entitlements, and compensation – quite distinctly from the impacts of new technology. A desire to evade traditional employment responsibilities and requirements has motivated employers to utilise non-standard employment forms more commonly. This harms all workers: those filling non-standard roles are denied access to normal protections and entitlements, while those in traditional employment situations see their employment security and bargaining power undermined by the growth of precarious employment practices. Workers in contingent, contractor, and 'gig' positions should be protected by the same provisions regarding unfair dismissal, even if they are not considered 'employees' according to traditional legal definitions. These workers have been especially vulnerable to the misuse of digital performance management (including dismissal on the basis of digital data). They must be protected on the same principles as traditional employees.
2. **Facilitating mobility:** It is clear that some existing jobs will be eliminated by new technologies, and others will be significantly changed. But there will also be significant new work associated with new technologies. An obvious response to this dichotomy is to assist displaced workers to fill new positions which arise. This means providing notice, support, and access to training and adjustment programs, so that workers can adapt their capacities in line with the emerging opportunities. Financial support from employers and governments will be important, given the increasingly precarious incomes of many workers.
3. **Establishing benchmarks for skills and qualifications:** New technology-intensive jobs will require a wide-ranging suite of new skills – including design, programming, operation, data management, maintenance, and more. The more that the specific requirements and certifications associated with those skills can be formalised and regulated, the higher-quality and more stable will be the resulting jobs in these new vocations. Sector stakeholders should work closely with curriculum and standards bodies to specify and catalogue the requirements for new jobs. Transferable certifications will assist workers and employers in identifying and acquiring needed skills, and developing a ready supply of qualified workers who can work in different firms and sub-sectors. Rebuilding the vocational education and apprenticeships systems are critical dimensions of preparing for new skills requirements.
4. **Facilitating decent retirement:** Downsizing or restructuring of employment patterns can be managed in part by facilitating the exit from the sector by workers who are not interested or

able to undertake retraining and adjustment. Bridging benefits and early retirement incentives, with government support, could help to ease this transition to retirement for many workers, and avoid involuntary job losses that would otherwise occur.

5. **Negotiating technological change:** Adaption to change is more feasible and successful when all parties – governments, workers/unions, and businesses – have a genuine say in how it is implemented and managed. It is important for there to be a structured process of information sharing, consultation, and negotiation over the process of technological change. Workers and their unions should be notified of company plans for new technologies, even at the conceptual stage of planning. Discussions should occur within workplaces regarding the timing, scope, and effects of new investments in technology. Opportunities should be provided for early input from workers regarding how that change will be managed; often innovation programs will be all the stronger thanks to the ideas and concerns expressed by workers. Enterprise bargaining should include the terms of technology and its application, providing an opportunity for employers and unions to dialogue and come to agreement over the main features of technological change (including fiscal allocations for training and adjustment programs, rules regarding mobility to new positions, and other dimensions of workplace technological change).
6. **Regulating electronic monitoring and discipline:** In the wrong hands, and wielded for the wrong purposes, digital technology can cause intolerable deterioration in working conditions. If unconstrained by labour laws, privacy laws, and social censure, employers may use technology to unduly intensify the production process, and impose tighter surveillance on workers, with negative impacts on health (including mental health), safety, and dignity. Campaigning to prohibit abusive and intrusive forms of monitoring and surveillance, and to protect workers against 'digital punishment' (and protecting due process in supervision and discipline), will be an increasing priority as the application of monitoring and speed-up technologies expands.
    a. Workers' privacy should be protected through limits on the location and times of workplace monitoring. Employees should not be subject to digital or electronic monitoring practices when not conducting directly compensated labour, and their digital activities while off the job should not generally subject them to punishment and sanction from their employers.
    b. The application of normal employment security rights and processes (including right to notice, representation, progressive discipline, and protection against unfair dismissal) must not be undermined through the use of digital monitoring systems.
    c. Workers need more effective rights to negotiate the terms of digital workplace monitoring and performance evaluation through the collective bargaining process. This will require more attention to these issues from both management and unions – and a resuscitation of collective bargaining capacity for workers, countering the rapid decline of collective agreement coverage (especially in the private sector). The NSW Government can set an example in its own bargaining and policy with regard to its own employees.
7. **Reducing working hours:** Rising labour productivity creates the economic foundation for the reduction of lifetime working hours. And the risks posed to some jobs by new technologies reinforces the importance of revitalising the labour movement's traditional demand for shorter work time. Shorter working time, broadly shared, could offset at least some of the labour-displacing effects of new technology, while enhancing the quality of life of working people – and supporting environmental goals at the same time (since leisure time is a non-polluting way to capture the benefits of increased productive capacity). Lifetime working hours can be reduced through many different strategies: including a shorter work day or work week; expanded annual

leave; access to extended leaves for education, child-rearing, caring responsibilities, and other life events; and early retirement.

Conclusion: A Question of Social Choices, Not Predetermined Technological Outcomes

It is clear that the future of work depends on how effectively social and economic policies reflect the need to support decent, secure jobs. New technologies hold out potential for expanding productivity, enhancing the safety and comfort of work, reducing working hours, and boosting incomes. But there is no guarantee that any of those potential benefits will flow automatically to workers.

Work will be dramatically affected by technology in coming years. Yet technology is not an exogenous, uncontrollable force, and its impacts on work are in no way inevitable or pre-determined. The directions of new discovery reflect the priorities and interests of those who fund and manage innovation, so new technology is always non-neutral and contested.

And how technology is applied in the workplace is even more open to debate, negotiation, and struggle. We reject the claim of employers and governments that technology somehow requires workers to give up things, and make do with less. To the contrary, technology should open the prospect of better lives, with more security, higher incomes, and more leisure time. Technology can be mis-used in ways that damage the lives of many people (including workers), but those uses reflect deliberate human choices, not the innate characteristics of the technology.

It is impossible to predict the impact of technology and automation on labour demand. Some jobs will be eliminated, some jobs will be changed, and some jobs will be created. There is no reason to expect any 'balance' between the number of jobs lost and the number of jobs gained; and no reason to expect that a deregulated, competitive labour market can ensure displaced workers are reallocated to other productive functions. Also, there are many jobs that will be relatively unaffected by new technology.

History suggests that technological change by itself is unlikely to cause mass unemployment. But history also suggests that epochs of rapid technological change are associated with major social and economic changes (both good and bad). The economic, political, and social context of technological change is therefore crucial to determining whether it enhances the lives of working people, or is used to undermine it. At the macroeconomic level, is policy committed to robust expansion and job creation, thus making adjustment to technological disemployment much easier? Do labour laws and regulations compel employers to negotiate the timing, process, effects, and responses to technological change with workers, or can they make all the decisions unilaterally? Do broader laws protect workers against abusive applications of technology, including intrusive surveillance and monitoring, other forms of undue work intensification, and unsafe practices? Workers need power – at the workplace, in their industries, and in society as a whole – to participate meaningfully in debates and choices around technological change in order to enhance their benefits for workers, and to reduce or ameliorate the costs.

Many of the changes affecting work today do not result from technology in the narrow sense, but rather reflect negative changes in work organisation and employment relationships – changes which may be facilitated by new technology, but which are not inherently pre-determined by technology. This is particularly obvious in the case of digital platforms and their link to the growth of insecure work, contingent work, 'gig' jobs, and other forms of precarity. The legal and political context allowing companies to use platform businesses to undermine job security, stability, and compensation, and shift risk and cost to workers, is not a 'technological' outcome. It is important for workers and governments to appreciate the difference between technology and work organisation.

It is not feasible to ‘stop’ new technology, nor would we want to try – although the direction of innovation can certainly be challenged and influenced. But we can clearly influence how technology is used, and how our jobs are affected. We must choose, politically, how technology is managed, to protect labour standards in the face of technological and organisational innovations, to reduce working hours over time to enhance workers’ quality of life, to prohibit abusive and intrusive misuses of technology, and more.

We must demand, and achieve, a hopeful vision: a technologically-intensive, forward-thinking, and socially accountable world of work.

Previous relevant research by the Centre for Future Work

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