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# A review and agenda for examining how technology-driven changes at work will impact workplace mental health and employee well-being

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## Abstract

The mental health and well-being of employees is an increasingly important issue, both in terms of the financial costs to the Australian economy and human costs to society. This review examines two major technology-driven trends in the workplace and presents evidence for their impact on mental health, both positive and negative. First, we consider *how we work*, with a focus on changes which have been driven by automation and advanced technology in the workplace. Next, we consider *where and when we work*, with a focus on flexible work arrangements afforded by changes in telecommunication technology. Finally, we look forward with a critical lens to examine the implications for future research and for industry, government and education.

JEL Classification: **I31**

## Keywords

Future of work, mental health, technology, well-being, work design

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## I. Introduction

It is estimated that approximately 20% of Australians of working age experience a formally diagnosed mental illness each year (National Mental Health Commission, 2019). In addition, many others experience mental illness symptoms such as sleep problems and fatigue. While these symptoms do not meet the criteria for a diagnosed mental illness, they nevertheless impact people's capacity to function effectively in the workplace (Lelliott et al., 2008). There are significant personal, societal and economic costs associated with poor mental health, which is now the leading cause of reduced work performance, sickness absence and long-term work incapacity in developed nations (Black, 2008; Harvey et al., 2009; Whiteford et al., 2013). In Australia, the total economic cost is estimated to be AUD $60 billion each year (National Mental Health Commission, 2019) with costs to the global economy reaching an estimated US$1.15 trillion per annum in lost productivity (Chisholm et al., 2016). These costs are growing at alarming rates (Harvey et al., 2017) and it is important to examine whether technology-driven changes in the workplace are part of the problem or part of the solution.

First, we review literature on mental health in the workplace and how it has changed over the last few decades. We then outline why it is important to consider mental health within the context of the future of work. Next, we outline two major trends in the workplace and the evidence for their impact on mental health, both positive and negative. The first trend is automation and advanced technology such as artificial intelligence in the workplace and how it is changing *how we work*. The second trend is the increase in flexible work arrangements afforded by changes in telecommunication technology and how it is affecting *where and when we work*. We also consider the effects of both these changes on workplace culture and the social fabric within workplaces and how these effects may negatively and positively impact employee mental health. After reviewing these trends and their potential effects on mental health, we consider the implications for future research and for industry, government and education.

The World Health Organization (2007) defines mental health as 'a state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community'. Over the last 30 years, researchers have explored the role work plays in enhancing well-being – and how the workplace can help a person's recovery from mental health difficulties (Joyce et al., 2016). A growing body of research supports the theory that being employed is beneficial to long-term mental health and well-being (Claussen et al., 1993; Modini et al., 2016; Waddell and Burton, 2016). Given the average employee spends about a third of their waking hours at work, the nature of a person's work is likely to play a significant role in the overall quality of their physical and emotional health.

Similarly, research into the experience and causes of unemployment also highlights the importance of work for well-being. Unemployment is associated with many symptoms of mental disorders. For example, a meta-analysis of 42 studies concluded that mental ill health symptoms are often the result of, rather than the cause of, unemployment (Paul and Moser, 2006). However not all work is good work and not all unemployment is bad (Johnson and Jackson, 2012). There is likely to be a continuum, with effectively designed work within a supportive context providing the greatest opportunity for well-being, whereas poorly designed and unsupported work can exacerbate or even potentially cause poor mental health (Butterworth et al., 2011; Harvey et al., 2017).

Individuals with poor mental health and their caregivers are some of the most stigmatised and marginalised groups in the workplace. They often miss out on the many benefits good work can offer, as many employers regard individuals who experience mental health issues as being incapable of successfully engaging in work (Paul and Moser, 2006). Indeed, mental illness is now the leading cause of workers compensation claims and long-term disability (Harvey et al., 2017). Figure 1 shows the rapid increase in psychological and psychiatric conditions as the basis for disability support pensions (DSPs) in Australia. While the majority of common mental

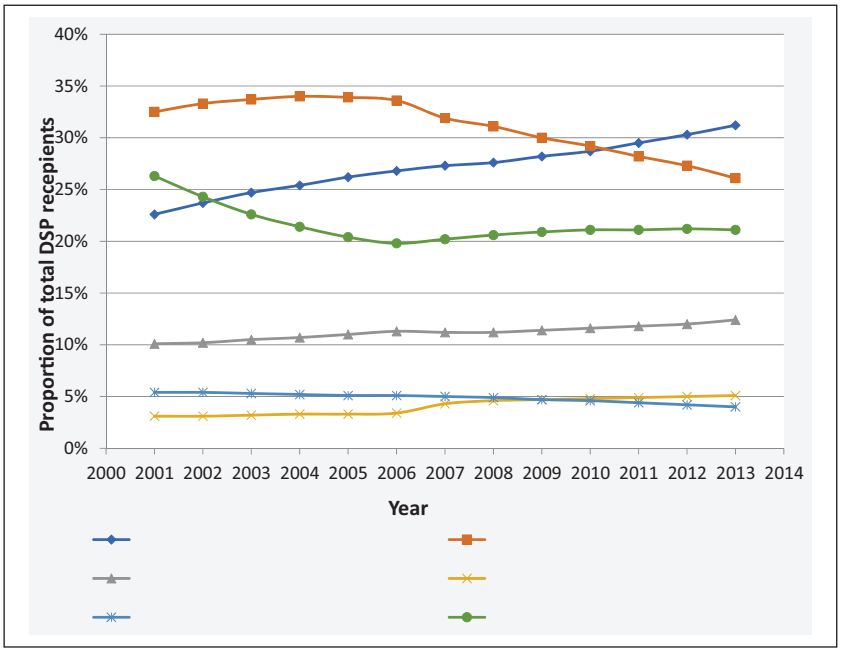


**Figure 1.** Changes in disability support pensions by medical condition.

health conditions such as anxiety and depression are treatable, these conditions remain widespread and now account for 34% of all DSP recipients, overtaking musculoskeletal and connective tissue conditions (Harvey et al., 2017).

Governments, organisations and policymakers are now grappling with this complex issue, seeking both academic guidance and pragmatic solutions. A considerable body of academic literature has emerged, examining workplace mental health risk factors and related interventions (Harvey et al., 2017; Joyce et al., 2016). Based on this literature, we know that organisations can be a force for good and, while the mental health of their employees may not be their primary goal, all organisations have both a legal and moral responsibility to protect their employees from both physical and psychological harm.[1] As the recent Royal Commission into banking misconduct in Australia highlighted, meeting the letter of the law is not the same as meeting community standards.[2] Managers and leaders within organisations need to consider how the rapid changes that are taking place in workplaces not only create opportunities for profit and growth but also have consequences for the mental health of their employees. All organisations face unique challenges and there is no one size fits all solution or recipe for creating a mentally healthy workplace. However, within any organisation, there are likely to be both risk factors that can be mitigated and protective factors that can be enhanced (Harvey et al., 2017). The challenge for organisations is to identify these factors and manage them within the complex workplace ecosystem (Harvey et al., 2017; Petrie et al., 2018).

## 2. Automation and advanced technology changing how we work: the effect on mental health

In the past few decades, there have been significant advances in automation, digitisation, machine learning, artificial intelligence and other technology (Makridakis, 2017). Rapid advances in artificial intelligence, also referred to as machine intelligence, have expanded what is now possible with

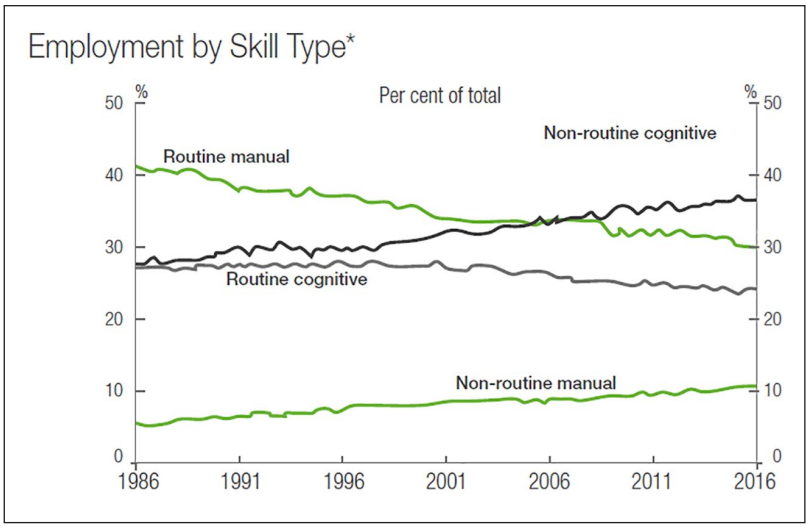


**Figure 2.** Changes to the nature of employment by skill type.[a]
[a]Non-seasonally adjusted (sources: ABS; RBA).

automation and robotics (Frank et al., 2019). These developments have changed manufacturing industries, with automation changing or replacing many manual labour roles. For example, in Australia, as recently as the 1990s, manufacturing was the largest industry sector with 15% of the workforce. Today, it employs 7%, less than six other industry sectors (Department of Jobs and Small Business (DJSB), 2018).

Developments in technology have not only changed the jobs available to us but also changed the nature of work performed. Jobs have become increasingly service-focused and cognitively complex and demanding. A large proportion of employees are now working as knowledge workers or in a service context. For example, the US Central Intelligence Agency (2017) estimates that 63% of the world's GDP is created through the service industry. Research by the Australian Bureau of Statistics (ABS) (2011, 2017) shows that from 1997 to 2017 there has been a significant increase in white-collar jobs in Australia, consisting of community and personal services workers, professionals and managers with professionals representing almost 25% of the Australian workforce (DJSB, 2018). Clerical and administrative workers have experienced the greatest decline in Australia over the last 5 years, with advertised vacancies around half the number in 2007, and a similar trend for machinery operators and drivers (DJSB, 2018). Figure 2 displays the changes in employment by skill type in Australia since the mid-1980s, which clearly shows the decline in routine work and the increase in non-routine work, both cognitive and manual (DJSB, 2018).

Technological advances have enabled the workforce to access unlimited amounts of online information, to rapidly complete routine cognitive tasks (e.g. via data analysis software), to deliver services in-person or remotely (e.g. remote education) and to have dynamic collaborations with individuals or teams across different time zones around the world. Overall, technology has increasingly set the pace and method of work, even in industries which traditionally had far greater decision latitude – such as finance, science, education and health.

The disruptive influence of technology in changing workplaces has also played a role in the shift from the tradition of one job and employment setting to the new 'boundaryless' career (Rodrigues and Guest, 2010). Through the advantages of technology, organisations are becoming increasingly fluid, interconnected and global, resulting in a significantly higher likelihood of movement both

across and within organisational boundaries during an employee's working life. Advances in technology also mean that job roles and tasks are regularly being redesigned, resulting in greater expectations for employees to update or acquire new skills for different roles across their career.

## 2.1. Negative impact on mental health

This section examines the evidence for the impact of these changes on the mental health of employees. We look at how the four changes explored above (types of jobs, types of tasks, pace and breadth of work, and career pathways and patterns) affect characteristics of the workplace at the individual and group or collective level and the negative effect on mental health. We then explore how, if designed and implemented effectively, changes in technology could improve workplace mental health.

Technology in workplaces is typically designed to increase productivity and improve organisational outcomes, with often little consideration of the impact on employees. For example, the pervasive presence of technology can produce a 'norm of responsiveness' which has been linked to increased perceived demands, unrealistic performance and productivity expectations, and feelings of increased mental exhaustion (Perlow, 2012). Studies have shown that technology can accelerate work pace to the extent of increasing employee stress, overload, exhaustion and burnout (Barley et al., 2011; Chesley, 2014; Maier et al., 2015; Murray and Rostis, 2007; Su and Mark, 2008). For example, in a recent study (Chesley, 2014), technology use in a nationally representative survey of US employees was linked to higher levels of workplace strain and distress through increased work pace, multitasking and work interruptions. Barley et al. (2011) also found that increased email use was associated with employee strain through increasing work demands. The study found that employees reported feeling pressure to respond to emails even if it required them to take work home or to work outside of their paid hours.

The pervasive use of technology in the workplace is also accompanied by an increase in screen time and sedentary workplace behaviour (Waters et al., 2016; Yang et al., 2017) which has been linked to poorer physical health outcomes, such as the increased likelihood of developing physical health problems like diabetes, heart and cardiovascular disease, musculoskeletal disorders and obesity, often with concurrent mental health issues (Duncan et al., 2012; Ford and Caspersen, 2012; Wilmot et al., 2012). Prolonged screen time and sedentary workplace behaviours have also been found to be directly linked to mental health issues including increased self-reported symptoms of depression and anxiety (Machav et al., 2017).

Organisations are also increasingly using artificial intelligence technologies to complete work previously performed by humans. For example, many organisations now use automated 'intelligent self-service' systems, designed to enable the customer or client to co-produce the service, with the assumption that customers have the skills, training or support to do so. Examples include ordering food via mobile phone apps, checking in baggage at the airport, booking accommodation online and using self-service checkouts at the supermarket. While many customers appreciate the convenience and time saved, the systems do not always function as designed and are generally only useful for standard customer requests and needs. As a result, it is not uncommon that in many service roles, when the customer or client interacts with the employee, customers are more likely to experience high levels of frustration, anger and often thwarted expectations (Groth and Grandey, 2012). This increases the demands employees experience, as they are likely to have to manage customer mistreatment and engage in emotional labour (Groth et al., 2019). These additional demands, both internal and external, can significantly deplete personal resources and resilience and place employees at greater risk of burnout and poorer mental health (Schaufeli et al., 2009), as well as increasing employee withdrawal behaviours such as increased sick leave (Nguyen et al., 2016), turnover (Goodwin et al., 2011), and employee sabotage against customers such as abruptly ending a service call (Wang et al., 2011).

There is also research that perceiving technological change such as advances in artificial intelligence and the 'disruption' of the traditional career pathway as a threat to one's job security can negatively impact employee well-being (Brougham and Haar, 2018). Common reasons for employee resistance to workplace technological change include anxiety that artificial intelligence technologies will create services which replace one's job function, such as retail self-checkouts and driverless vehicles, and the fear of not having the skills needed for the work of the future (Brougham and Haar, 2018; Vieitez et al., 2001), which may be exacerbated with an ageing workforce. Employees who believe that smart technology, artificial intelligence, robotics and algorithms could replace their job also report higher levels of depression and cynicism (Brougham and Haar, 2018) as well as state and trait anxiety (Vieitez et al., 2001). Similarly, a recent study found that employees who believe that technological change posed a threat to their job security also reported experiencing more anxiety-related mental health problems (McClure, 2018).

In addition to the effects on individual employees' experiences of work, technology can also deplete the quality of interpersonal relationships between employees and the social capital within organisations. For many employees, the interactions within an organisation are increasingly mediated by systems and technology. For example, we log work health and safety issues on a portal; we do not call a person and emails are generated by systems accounts with 'do not reply' and no contact information. This is likely to be particularly detrimental when employees most need support.

The evidence is clear that social support and being part of a supportive community in the workplace is important (Grant et al., 2010). A review of 14 longitudinal studies found that high psychological demands and low social support were the strongest and most consistent factors associated with an increased risk of depression (Netterstrom et al., 2008). In addition, low work-related social support is associated with an increased likelihood of mental health problems and/or prolonged sickness absence (de Lange et al., 2003). A prospective cohort study of 9631 male employees of France's national gas and electricity company found that low satisfaction with social relations and low social support at work was associated with a 10%–26% increase in sickness absence which persisted over 6 years (Melchior et al., 2003). Poor work relationships have been found to be associated with an increased risk of poor mental health and reduced physical health. In contrast, positive human interactions have been associated with healthier patterns of cardiovascular, immunological and neuro-endocrine responses (Heaphy and Dutton, 2008).

Overall, technology is negatively impacting mental health in the workplace in many ways by increasing demands, reducing resources and changing how employees view the future, which all have hidden and direct costs to employers and employees. Considerable research now highlights that work factors such as poor job design, high job demand, low job control and high effort–reward imbalances are associated with a greater risk of developing common mental health conditions (Harvey et al., 2017). Job design theories such as the job characteristics model (Hackman and Oldham, 1980) and Job Demands and Resources theories (Schaufeli et al., 2009) stipulate that, to enhance mental health, we need to design jobs that have resources to help balance or respond to high demands. Resources such as control, support, high-quality feedback and learning opportunities are all positively associated with work-related well-being. Fortunately, there are many ways in which technology can, and has been, used to successfully design work to help safeguard the mental health of employees. We now review the ways in which automation and advances in technology have had a positive impact on workplace mental health and employee well-being.

## *2.2. Positive impact on mental health*

When well-designed and implemented to consider the impact on how people do their work, technology systems can function to reduce demands. When automation alleviates cognitively taxing work such as literature searches as well as repetitive administrative tasks such as data entry tasks,

employees may experience less fatigue and spend more time on autonomous, creative, deep-thinking work or engage in meaningful interactions with customers and clients. For example, nurses can spend less time recording and filing patient data and more time providing quality care to their patients. Household, Income and Labour Dynamics in Australia (HILDA) survey data show that the most easily automatable job tasks, such as assembly line work and data entry, were also the tasks employees rated as least satisfying to complete (AlphaBeta, 2017). Automation has the potential to reduce job dissatisfaction and potentially enhance well-being by freeing up time for employees to use their creative, transferable and non-automated skills.

Automation has also improved workplace safety and reduced the risk of physical workplace injuries (Horton et al., 2018). In most countries including Australia, automation has replaced many physically dangerous and tedious tasks previously completed by hand such as repetitive heavy lifting work (Horton et al., 2018). The decrease in physical workplace injuries should simultaneously reduce the likelihood of employees incurring psychological problems stemming from such injuries, including the mental health sequelae of injuries, poor motivation to return to work, isolation, frustration and anger (Duncan et al., 2012; Ford and Caspersen, 2012; Wilmot et al., 2012).

Technology can also promote good mental health practices. One of the major benefits from recent advances in technology is eHealth and proactive workplace mental health interventions. In the past decade, research has proliferated in eHealth where interventions are supported by electronic and technological processes and digital communication. eHealth interventions with evidence-based therapeutic techniques can support and create significant improvements for those with common mental health conditions such as depression and anxiety. For example, meta-analytic evidence suggests that mindfulness-based eHealth interventions can reduce symptoms of common mental health conditions among employees (Stratton et al., 2017). Similarly, another recent review and meta-analysis found that digital mental health interventions delivered in the workplace can improve psychological well-being and work effectiveness among employees (Carolan et al., 2017).

An additional benefit of eHealth interventions is providing accessible and easily disseminated material to workplaces regardless of their size or geographical location. For example, a cluster randomised controlled trial (RCT) of 24 Fire and Rescue and Hazmat Stations across NSW found that a training programme delivered completely online enhanced psychological resilience, a feature of a mentally healthy workplace (Petrie et al., 2018), among active first responders at 6-month follow-up along with overall mindfulness, optimism, active coping and seeking support from others (Joyce et al., 2019).

Another example of a proactive workplace mental health initiative delivered solely online is mental health training for managers. A recent RCT (Gayed et al., 2019) found that an online manager training programme resulted in significant improvements in managers' confidence and led to changes in responsive and preventive behaviours of initiating conversations and redesigning work that are important in creating a mentally healthy working environment for staff. This type of online mental health training appears to be an effective and scalable way to improve managers' confidence and workplace practices around mental health to support the mental health needs of their direct report employees.

However, technology is not only affecting the work we do but also creating opportunities to change where and when we work. The next section examines these changes and evidence on how they may influence mental health.

## 3. Blurring the boundaries between work and home (where and when we work): the effect on mental health

'Flexible working', 'telework' and 'remote work' refer to the use of information technology to work from home or any other location outside of the office (Spreitzer et al., 2017).[3] In planning

the National Broadband Network (NBN) in 2012, the Australian federal government estimated that 12% of the working population would be regularly working remotely by 2020. However, a large-scale global survey conducted in 2019 by the International Workplace Group found that across 100 nations over 50% of employees work in some capacity outside of their main office locations for 2.5 days a week or more. The same survey found that about 74% of the Australian respondents considered flexible working to be the 'new normal' (International Workplace Group, 2019). In addition, based on 2005–2016 US Census Bureau data, working from home (among non-self-employed employees only) increased by 140% (Global Workplace Analytics, 2018).

According to ABS data, 11% of employed Australians (1 million) worked all or most of their working hours at home in the year 2000. Census data from 2016 show that the proportion has increased, with almost one-third of all Australian employees (3.5 million) regularly working from home. This upward trajectory is likely to continue at a more significant rate. In Australia, reasons for an increasing number of employees with flexible working arrangements include the rise of a 24/7 global economy, the National Broadband Network (NBN) rollout, an ageing population, and growing numbers of dual-income households and employees looking for more flexible work arrangements due to caring responsibilities (Horton et al., 2018).

Flexible working is often posited in the management literature as a win–win: employers have a more productive workforce which uses less space and is cheaper to house, and workers have a better work–life balance, increasing job satisfaction and organisational commitment (Bloom et al., 2015). However, this common representation of flexible work ignores potential negative outcomes, such as inadequate recovery from work at home and disruption of social connections and isolation (Bloom et al., 2015). Flexible working may have major implications for employees' well-being. The literature on the relationship between flexible working and employee mental health is complicated and findings to date are mixed. However, the general pattern of findings suggests that flexible working can be used to improve employee mental health through mechanisms such as increased autonomy and flexibility. If, however, it is not managed well, flexible working can be a significant risk to employee mental health.

### *3.1. Negative impact on mental health*

Despite being physically disconnected from work colleagues and office space, employees who work flexibly may not be able to mentally disconnect from their work during their personal time. The flexible work literature notes that without clear boundary planning, issues with work–home interference (WHI) or conflict are likely to arise. For example, one study found that information and communication technology use at home negatively impacts the quality, quantity and consistency of sleep disrupting the process of psychologically disengaging from work, but only among those who did not establish boundaries around work-related technology use at home (Barber and Jenkins, 2014). Working from home can reduce the typical cognitive, emotional and physical restorative effects of being at home (Baines and Gelder, 2003; Geurts and Sonnentag, 2006; Hartig et al., 2007).

Working from home or other remote locations may increase feelings of social isolation and loneliness by limiting opportunities to develop meaningful relationships with colleagues and lead to a deterioration of social relationships at work (Golden, 2006; Monge et al., 1985; Nardi and Whittaker, 2002). Employees who perceive higher levels of workplace exclusion tend to have lower levels of well-being (Hitlan et al., 2006) and higher levels of distress (Wu et al., 2012). Feelings of loneliness are also a source of chronic stress, and associated with poorer sleep, dysphoria, depression and anxiety (Cacioppo et al., 2002; Campione, 2008). The decrease in visibility and social interactions with colleagues in the traditional workspace has also been shown to lead to

anxiety around being perceived as less involved or committed to work, of being left out of social opportunities and important organisational decisions, and fears about career stagnation (Desrosiers, 2001; Duxbury and Neufeld, 1999; McCloskey and Igbaria, 2003).

Interestingly, there is evidence to suggest that workers are increasingly blurring the psychological and physical boundaries between work and family life as a result of the increase in employee workload in recent decades (Allen and Shockley, 2009; Kossek and Michel, 2011). There is, however, evidence that combining the work and home environment can increase conflict between work and home roles (Butts et al., 2015; Glavin and Schievman, 2012; Mann and Holdsworth, 2003; Mirchandani, 2000; Sullivan, 2003). For example, one study found that time spent responding to emails outside of work time has been associated with greater levels of negative emotions (e.g. anger) and, in turn, predicted increased work–non-work conflict (Butts et al., 2015).

### *3.2. Positive impact on mental health*

While flexible working has been associated with increased work–family conflict, there are also findings suggesting the contrary. Flexible working can allow individuals to align work hours and demands with the requirements and schedules of family members such as child care hours and school pick-up times, which can help to reduce time-based conflict and work–family conflict (Duxbury et al., 1998; Kirchmeyer, 1995; Raghuram and Wiesenfeld, 2004). Increased flexibility around work hours, such as start and end times, has been associated with more positive employee mental health outcomes (Joyce et al., 2010). This is consistent with evidence that greater levels of control over where, when and how employees complete their tasks can enhance their feelings of autonomy (Elsbach, 2003; Hackman and Oldham, 1976; Standen, 2000), which has been linked to higher levels of psychological well-being (Park and Searcy, 2012).

Working flexibly might also help to protect employees from mental health issues which can arise during work-transition periods by allowing a more gradual (as opposed to abrupt) retirement process and more gradual return-to-work transitions for those employees who have experienced mental health difficulties and are unable to immediately return to the office, as well as new parents who want to spend some of their working hours at home. Buffering the transition back into or out of work can help minimise anxiety, distress or depressive symptoms from abrupt changes to work life (Allen and Shockley, 2009).

Flexible working can also help bring employment opportunities to individuals living in rural or remote areas, where mental health-related issues such as high rates of depression, unemployment and suicide are typically more prevalent (Harvey et al., 2017). A 2012 survey of Australian workers (Colmar Brunton Research and Deloitte Access Economics for the Commonwealth of Australia, 2013) found that 70% of those living in regional and remote Australia and not currently working would engage in flexible working if given the opportunity. Organisations which offer flexible work opportunities might also signal to employees their willingness to adjust the work environment to cater to employee needs. Scandura and Lankau (1997) also suggested that organisations who allow employees to work from home signal that they care about protecting employee well-being. This messaging could partly explain why flexible working can reduce turnover intentions (Rhoades and Eisenberger, 2002).

There are also likely to be additional benefits of flexible work such as reducing stress associated with the time, costs and hassles of commuting to and from work. The time saved by not commuting might also provide more time to engage in other activities such as sports classes, meditation and recreational activities with family and friends which can help to mitigate work-related stress (Greenhaus and Beutell, 1985; Konradt et al., 2003). Figure 3 provides an overview of the changes in the future of work, and the effects on the workplace and workplace mental health.

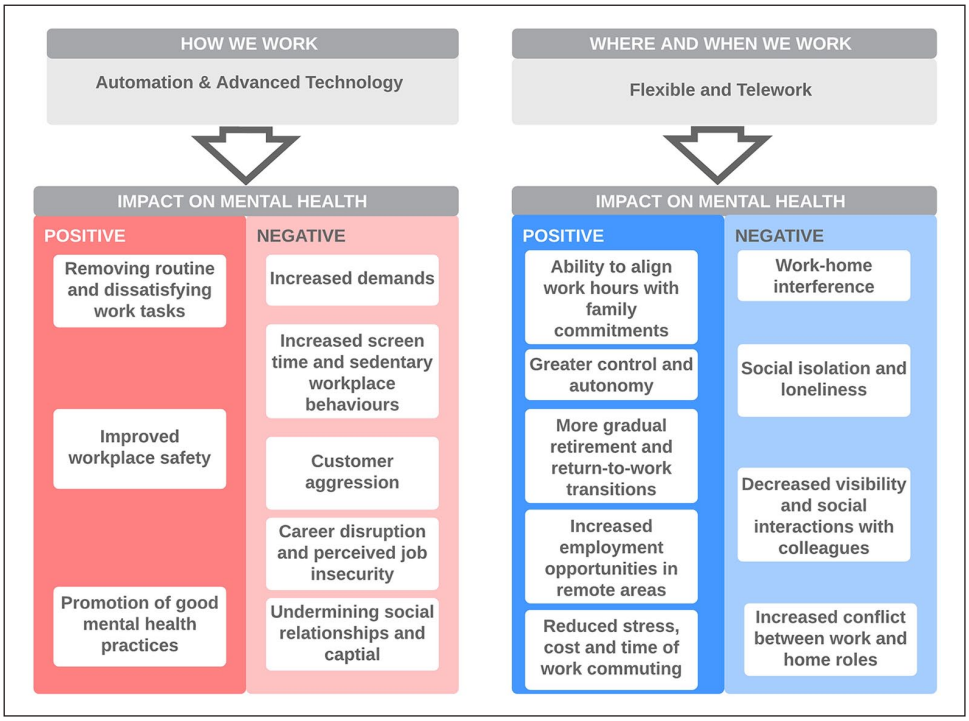


**Figure 3.** The effects of technology-driven changes to the workplace and mental health and well-being.

We now consider the way forward. The next section outlines a research agenda to advance our understanding of the effects of technology on the individual employee's experience of work and the associated effects on mental health. We then present some practical recommendations for addressing the two challenges we identify: changes to *how we work* and *when and where we work*.

## 4. Looking forward: research implications and recommendations

As technology continues to create 'affordances' or possibilities for how/where we work, it is important that we research the impact of these possibilities on mental health. The influence of technology on workplace mental health depends on how it is implemented, organisational norms around its use, and employee perceptions of its effect on their role. To create workplaces where employees benefit from technology, we need a closer collaboration between researchers, psychologists, user experience specialists, industry and government bodies to gain a better understanding of the impact of technology through multiple lenses – not just the lens of productivity. This collaboration would benefit from a preventive focus, guided by principles of good job design.

We also call for more longitudinal research to examine the effects of technology on mental health over time, as many studies in the extant literature rely on cross-sectional data. This is particularly problematic with mental health outcomes due to the common problems of negative response and attribution bias. People with poor mental health are more likely to report perceiving negative environmental effects leading to reverse causality.

We also need more rigorously designed intervention studies. For example, while an increasing number of organisations are placing employees in flexible work arrangements (Shin et al., 2000),

the effects of this type of work arrangement are difficult to research as individuals adopting (or being offered) flexible opportunities are likely to self-select (Gajendran and Harrison, 2007). To date, only one trial has randomised employees to a working from home condition (Bloom et al., 2015) and this was conducted in China with a very specific group of employees/work roles. Employees are also likely to vary in how they use flexible work arrangements, and more needs to be understood about 'dose' effects and the impact of the work design, organisational leadership and individual differences.

Researchers could investigate whether giving employees choice about the design/uptake of flexible working arrangements might moderate changes in well-being. In addition, researchers could consider implementing more robust methods such as the stepped wedge design where all participants receive the 'treatment or intervention' in waves or steps. This is particularly effective for evaluating staged geographical or sectoral rollouts of changes or where it is not possible or desirable to randomly assign participants into a 'control condition' (for example where the intervention is expected to have positive outcomes or the intervention is a scarce resource) as all participants will be switched randomly from control to treatment condition at different time points. These design techniques–which are often used in large-scale health service and implementation science – can improve the quality of evaluations beyond pre-post and case studies (Bauer et al., 2015).

Research is also needed to effectively establish norms around mindful use of technology both in the workplace and at home, especially for young employees entering the workforce with ingrained habits of technology use. Such research could not only investigate adjusting behavioural practices around technology use but also investigate the effects of incorporating features within technology-based work platforms such as pausing the delivery of work messages at critical times (at night or after hours of continuous use) or prompting awareness of problematic technology usage. It would also be beneficial to research the benefits gained from the flexibility technology affords, such as using digital resources in the workplace for what would previously have been done during leisure time (shopping, social media etc).

Experience/event sampling methods (ESM) can also provide a rich, dynamic, continuous assessment of an employee's experience and mental health, particularly when coupled with psychological and biophysical markers such as cortisol levels and heart rate variability. Indeed, new technology offers opportunities for research using non-invasive wearable devices or everyday technology such as smart phones to deliver micro-interventions. For example, detecting when mental health is deteriorating and using Just-in-Time adaptive interventions to provide support, promote behavioural change (Lind et al., 2018; Nahum-Shani et al., 2017) or prompt early help seeking behaviour (Gärtner et al., 2013) can be of enormous value. However, while this passive mobile sensing approach has many advantages (unobtrusive, individualised and scalable), it is not without challenges as this approach can be costly, involve risks (Goldman et al., 2018) and raises privacy and security concerns, such as who is in control of the data, particularly in the workplace. Thus, to conduct this much-needed research, there also needs to be clear processes around informed consent, how the data is managed, how data is shared and what action flows from it.

Finally, workplace mental health interventions, if used in conjunction with well-designed RCTs with longer follow-up periods, can provide much-needed insight into the long-term benefits of these initiatives. Cost–benefit analyses (using absence/productivity data) will also help establish the potential return on investment for organisations. At present, a significant challenge in implementing research within the workplace is obtaining organisational buy-in, as organisational leaders do not always value high-quality research. Therefore, to improve collaboration with organisations, researchers need to be more effective in communicating the importance of high-quality research, what it involves, how potential disruptions will be mitigated, and the likely costs and benefits.

### 4.1. Practical implications and recommendations to address the challenge of automation and advanced technology changing how we work

As technology continues to be integral to work, we expect to see an increase in technology-related mental health work health and safety issues and compensation claims. Organisations need to review their current practices to assess how to minimise the negative effects of technology on mental health, move towards preventive measures, invest in the introduction and further development of employee assistance programmes (EAP), and provide access to tailored intervention programmes where necessary. The costs of managing workplace mental health issues are far greater than the costs of taking steps to prevent these issues emerging in the first place (Australian Human Rights Commission, 2010). In light of this, a growing number of campaigns and initiatives have emerged in Australia to promote better workplace mental health. For example, Mentally Healthy Workplace Alliance was established in 2012, the Heads Up campaign launched in 2012 and the Australian Mental Health Leaders Fellowship created in 2018. It is important to note, however, that the critical role of technology in influencing workplace mental health is often underexamined as part of these initiatives. Our review shows many technology-related workplace mental health issues arise from poor technology and work design. Thus, to maximise the impact of these national initiatives, there needs to be a stronger collaboration between researchers, psychologists and organisations to better design the use of technology at work in order to help promote good mental health practices.

There have been several systematic reviews and meta-analyses on the design of work and the effects on mental health. For example, West et al. (2016) found two factors had clinically significant effects on physician burnout, specifically reduced working hours (demands) and participant involvement in developing modifications to clinical work processes (participatory practices). A systematic review by Egan et al. (2007) on participatory interventions in organisations on mental health outcomes found support for the 'demand–support–control' model (Karasek and Theorell, 1990) particularly where control over work was increased. Similarly, Tsutsumi et al. (2009) found mental health improvements from a cluster randomised controlled trial of a team-based, problem-solving participatory intervention. This research suggests that involving employees in the design of the technology–work interface is important for mental health outcomes.

Organisations could consider hiring cognitive, organisational and human factors psychologists to design and implement initiatives which promote more 'mentally healthy' use of technology at work. Within Australia, there are a growing number of mental health research institutions – such as the Black Dog Institute and Beyond Blue – as well as smaller businesses which offer consulting services to organisations. These consulting services include partnering with organisations to help encourage the use of more 'mentally healthy' practices at work. Workplaces across Australia could benefit from making use of these services. A recent survey found that within NSW only 8.8% of workplaces have integrated sustainable practices aimed at promoting employee well-being and mental health (Donnelly and Lewis, 2017).

Organisations could also consider adopting an e-Health approach to implement prevention-focused employee well-being programmes. There is a need for more training programmes to teach employees how to engage in good mental health practices, whether it is the importance of taking work breaks, trialling technology-free focused thinking sessions, or disabling unnecessary e-notifications. This form of an e-learning approach is becoming an increasingly attractive option to organisations as it enables training to be delivered universally across workforces in a consistent, timely and cost-effective manner. Online training on workplace mental health can also assist many organisations to overcome issues related to cost, availability, accessibility and other factors which may otherwise make training unviable.

Change management strategies can also play a key role in mitigating adverse mental health effects associated with introducing new technology to the workplace. As indicated by Vieitez et al. (2001), it is not uncommon practice for senior management to implement new technology systems without seeking input from their employees. Employee participation in and perceptions of technological change in the workplace can play an important role in employee mental health, particularly how they perceive the new technology will impact their job security and whether they have the skills to adapt to its use (Brougham and Haar, 2018; Vieitez et al., 2001). In line with evidence from longitudinal research, when organisations introduce new technology to the workplace, management can maximise employees' psychological adjustment to the change by providing open and realistic communication about how the new systems will impact work tasks, and by delivering clear and timely training around its use (Petrie et al., 2018; Schweiger and Denisi, 1991).

Considering the pace and scale at which technology is redefining workplace practices, targeted action is needed to equip current and prospective employees with a future-proof skill set. The World Economic Forum (2016) noted an ability to understand and use data – both critically and creatively – will be imperative in an age of increasing computing power. A large proportion of future jobs will also require science, technology, engineering and mathematics (STEM)-related skills (Office of the Chief Scientist, 2013). However, analyses of future workplace trends are increasingly highlighting that future employees will need a balance of both technical and non-technical skills to succeed in a technology-heavy, global, competitive job market (Torii and O'Connell, 2017). To demonstrate a competitive advantage over others, employees will not only need to show psychological flexibility in readily adjusting to technology-related workplace changes but also demonstrate skills which machines cannot easily replicate (Manyika, 2017). Patterns across survey findings suggest that employers will increasingly value employees who demonstrate high levels of interpersonal skills, emotional intelligence, self-management, problem-solving, adaptability and mental stamina (World Economic Forum, 2016).

With another 6.2 million people expected to join the Australian workforce by 2030 (ABS, 2017), educational institutions and organisations will need to invest in programmes which equip employees with the right combination of knowledge and skills. School curricula will need to be more agile to reduce the likelihood of students receiving training on outdated skills (Zagami et al., 2018). Given the exponential rate of technological and economic change, the World Economic Forum (2016) has called for education systems to teach students how to better 'collaborate, innovate, self-direct and problem-solve'. Beyond the schooling system, there also needs to be better access to education and training after employees first enter the workforce. A recent report indicated that up to 70% of young Australians will commence jobs which will be significantly redesigned over the next 10–15 years due to developments in technology (Foundation for Young Australians, 2017). Considering this, we also recommend pathways for employees who have already entered the workforce to upgrade their knowledge and skills. Organisations could also embed systems for lifelong employee learning including options for in-house training and upskilling programmes (Committee for Economic Development of Australia, 2015).

Despite popular belief, the rapid changes in technology are unlikely to leave millions of workers without jobs. However, these technological advancements are likely to present more risk of unemployment for some groups. Specifically, low skilled and older employees are at risk of unemployment if the government fails to invest resources in retraining and job transition programmes (Horton et al., 2018). Ignoring the needs of workers at high risk of unemployment could be dangerous, potentially pushing 20% of them into joblessness (Horton et al., 2018). Mature employees will be part of the workforce for longer than previous generations and lower-skilled older employees, in particular, will need considerable support. Government and organisations need to provide more targeted assistance by mapping out education pathways, providing financial assistance for further

training, and support for job transitions. Such efforts will help high-risk employees acquire the necessary skills to find a new role and protect them from the harmful psychological effects of low job security and unemployment (Johnson and Jackson, 2012).

### *4.2. Practical implications and recommendations to address the challenge of technology changing where and when we work*

It is important for organisations that offer flexible working arrangements to recognise that work practices that are designed for co-located work groups may not work for their flexible working employees. It is arguably more important for organisations to critically examine and formulate work practices for their flexible workers than for their co-located work groups, given that flexible workers cannot rely on learning via social observation and modelling at the office, or via communicating with others on a regular but informal in-person basis.

Organisations also need to establish clear norms for flexible workers to assist in mitigating the mental health issues flexible workers have reported as challenging (Allen and Shockley, 2009). For example, organisations could consider working more closely with researchers and psychologists to understand how to best establish a psychosocial safety climate in their workplace. A psychosocial safety climate helps to communicate to employees that management is interested in protecting the well-being and mental health of their workers (Harvey et al., 2014). Creating a psychosocial safety climate for flexible workers includes establishing expectations on availability during non-working hours and setting reasonable boundaries around work-related technology use at home. Organisations could also consider collaborating with psychologists and researchers to trial initiatives such as those tested by the Boston Consulting Group where employees were given a smartphone-free night during the week (Perlow, 2012). Such formal practices may give employees licence to better detach and recover from the stresses of work, which is particularly important for flexible workers whose work–home boundaries are already more blurred than those of the average co-located worker. Organisations could also consider pairing employees who are new to flexible work with a more experienced flexible worker as a peer buddy. Grant et al. (2013) conducted in-depth interviews with teleworkers to identify factors which influence their well-being and work–life balance. Based on their findings, they suggest that pairing experienced flexible workers with less experienced flexible workers could enable role-modelling of skills and behaviours which may help the less experienced flexible workers to adapt.

Organisations could also consider offering relationship-building resources for their flexible workers. A recent study found that organisational social support is associated with reduced psychological strain in flexible workers and that this relationship was mediated by the level of social isolation from other employees (Bentley et al., 2016). Other studies have also pointed to the importance of social support for employee well-being (Daniels and Guppy, 1994; Desrosiers, 2001; Thompson and Prottas, 2006). Considering these findings, organisations could periodically coordinate work lunches, informal social gatherings and office networking opportunities to help flexible workers build relationships with other flexible workers as well as co-located workers.

Organisations could also invest in innovative and collaborative technologies to ensure their flexible workers are able to easily maintain knowledge-sharing and social connectivity with their colleagues (Belanger and Allport, 2008; Dery and Hafermalz, 2016; Greer and Payne, 2014; Manca et al., 2018). Instant messaging software can help to mimic brief incidental conversations which normally occur in the office (McAdams, 2006). A growing number of organisations are also using enterprise social networking services, such as Microsoft's Yammer (http://www.yammer.com), which enable real-time communication over text, voice and video and are designed to facilitate

engagement with others in the organisation.[4] In addition to mitigating feelings of isolation, relationship-building resources can help to manage career progression concerns flexible workers may have about a diminished physical presence in the organisation (Chapman et al., 1995; Taskin and Bridoux, 2003).

Several studies have highlighted that a central hallmark of good management of flexible workers involves allowing for autonomy while also maintaining close communication and providing support when and as needed (e.g. Frolick et al., 1993; Grant et al., 2013; Richardson, 2010). Managers could embed systems for routinely checking in on the well-being of their flexible workers, particularly due to the absence of in-person cues. Managers are also advised to explicitly encourage flexible workers to set reasonable boundaries around work-related technology use at home (Barber and Jenkins, 2014). It is also important that managers express reasonable expectations around response times and availability during non-working hours. In Australia, while there are excellent online frameworks and guidelines on how to best manage the well-being and mental health of remote workers (Comcare, 2013), there has not yet been much assessment of whether these guidelines are in fact implemented by organisations.

Governments need to invest in developing more evidence-based policies around the responsibilities of organisations in safeguarding mental health of teleworkers. In 2013, in the lead up to the National Broadband Network (NBN) rollout, the Australian Public Service Commission commenced a telework trial to inform policy development (Colmar Brunton Research and Deloitte Access Economics for the Commonwealth of Australia, 2013). The key performance indicators assessed for the trial included productivity, costs and savings associated with flexible working, as well as ease and efficiency of flexible working. Future trials could consider including indices of mental health and employee well-being (e.g. self-perceived levels of isolation, depression and other more objective indicators); the outcomes on such indicators need to play a critical role in the development of flexible work policy. Flexible work policies need to have comprehensive coverage of Occupational Health and Safety legislation issues for working at home or other non-regulated locations, including job design, hours of work, breaks and leave entitlements, as well as links to resources for support including employee assistance programmes (Australian Telework Advisory Committee, 2006). Government bodies could also assist organisations in developing their own company policies, in compliance with relevant state and federal legislation. Company flexible work policies are valuable in establishing expectations for both managers and employees and are important in regulating the risks associated with flexible work (Comcare, 2013; WorkCover NSW, 1996). For example, we recommend organisations clearly articulate in their flexible work policies that flexible workers have access to the same level of entitlements and career progression opportunities as their office-based colleagues (Huws et al., 1997).

Given the high likelihood that most employees will work flexibly at some point in their career, educational institutions need to equip students with skills which will help them best adjust to flexible work. Employers perceive a range of skills as important to flexible working, including an ability to work independently, time management and technology-management skills (Sharit et al., 2009). In addition to ensuring schools and universities teach prospective employees critical flexible working skills, programmes (e.g. in-house training) are also needed for existing employees. These programmes enable existing employees to upgrade their skills and capabilities in managing the evolving requirements of flexible work, for example, in the use of communications technology and collaborative online software (Huws et al., 1997; World Economic Forum, 2016). Considering the ageing workforce, organisations, researchers and software developers could collaborate further to design technology and training programmes which accommodate the skill level and limitations of older employees (Fisk et al., 2009; Sharit et al., 2009).

## 5. Conclusion

Employees' mental health is an increasingly important topic in management research and in the workplace. There is great interest among academics, practitioners and policymakers to better understand how fundamental changes in when, where and how we work in rapidly changing workplaces with evolving technological developments and demographic shifts is impacting the mental health and well-being of employees in Australia and globally. This article progresses the agenda on workplace mental health by examining the literature on mental health and workplace trends. We assessed current mental health in the workplace and discussed how it has changed over recent decades. We discussed the implications for mental health when we are experiencing unprecedented changes and exceptional challenges in the world of work. We discussed why it is important to consider mental health within the context of the future of work and outlined two major trends relating to how we work (in the context of automation and advanced technology in the workplace), and where and when we work (in the context of technology enabled telework arrangements).

In reviewing the potential impact on mental health, both positive and negative, and implications for future research and for important stakeholders such as industry, government and universities and schools, this article makes an important contribution to the existing literature as there has been a general lack of integration across the different literatures on mental health. We integrated relatively disparate literatures on mental health in psychiatry, psychology, occupational stress, management and future of work literature to advance the research and practical agenda for workplace mental health. The future of workplace mental health can initially seem disheartening, as technology increases the pace of work, blurs the boundaries between work and life, and potentially increases social isolation and loneliness, yet much about the future of workplace mental health is bright with many positive opportunities.

A central theme is the important role that organisations play in shaping and maintaining the mental health and well-being of employees. However, currently few organisations use the findings of existing workplace mental health research to inform work design. Although our review demonstrates that there is much that workplaces can do to enhance employee mental health and well-being, it also demonstrates that there are significant research questions still to be investigated to better understand the impact of these key workforce trends on mental health. There is a clear need for more cross-discipline collaboration to address these important issues.

Overall, to address future challenges, mental health needs to be higher on the work agenda. New and fascinating questions will continue to emerge, but the real future of workplace mental health lies in how work is designed and embedded in the future, to continue to give people meaning and purpose in their work.

### Key practical and research implications

**Organisations:** Involving employees through participatory practices when designing and implementing changes to the technology–work interface protects their mental health and improves well-being at work.

**Educational institutions:** Equipping current and prospective employees with a future-proof skillset including how to better collaborate, innovate, self-direct and problem-solve, will provide them with the tools to proactively navigate technology challenges and help prevent poor mental health.

**Government:** Mapping out education pathways and providing financial assistance for support and training during rapid technology transitions – particularly for low skilled and older

employees, who are at a higher risk of unemployment - will be important to improve mental health outcomes.

**Policy:** Implementing Work Health and Safety Laws that explicitly cover the prevention of mental health harm and provide guidelines on the psychologically 'safe' use of technology at work is a critical for improving mental health and well-being at work.

**Research:** Utilizing sophisticated research designs and technology for unobtrusive, individualised and scalable just-in-time interventions and to track employee mental health in real time - while being cognisant of potential ethical challenges - can provide evidence about how to implement technology in ways that do no harm, and could do good.

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## Notes

1. In Australia, and internationally, there is excellent guidance and advice to organisations on how to manage mental health at work, such as Safework NSW (https://www.safework.nsw.gov.au/safety-starts-here/mental-health-at-work-the-basics/mental-health-@-work/home) and the Mental Health Commission's mentally healthy workplace alliance (https://www.mentalhealthcommission.gov.au/our-work/mentally-healthy-workplace-alliance.aspx).
2. The final report of the Royal Commission into misconduct in the banking, superannuation and financial services industry can be accessed at: https://treasury.gov.au/publication/p2019-fsrc-final-report.
3. Flexible work, telework and remote work are often used interchangeably in the management literature. For consistency, we use the term flexible work.
4. It is acknowledged that the widespread use of social media in workplaces can have a significant role in influencing workplace mental health and employee well-being. The impact of social media, particularly in its potential use for bullying and harassment, strategies for managing inappropriate communications, and ethical obligations of employers and employees, is an important area for in-depth examination and discussion, albeit outside the scope of this review paper. Future research could consider reviewing this topic.

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