



Future risk

Impact of work on health, safety and wellbeing

A literature review
February 2018

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Foreword by British Safety Council

In its 60-year history, the British Safety Council has always made sure it has the most up to date information on the risks that people experience at, or bring to, work. To argue for change, evidence must be at the heart of everything we do and, in the context of rapid changes to how we live and work, we are pleased to see 'Future risk: Impact of work on health, safety and wellbeing,' by RobertsonCooper.



Mike Robinson FCA
Chief Executive
British Safety Council

“This report will help us influence change for the better”

Some commentators are calling this period an Industrial Revolution 4.0, but however we categorise it, radical change in the workplace will have to be reflected in radical change in the British Safety Council if we are to stay relevant. This report will help us identify how we can influence these changes for the better to enhance, not undermine, our health, safety and wellbeing.

We know Great Britain has changed into a mostly service economy since the Health and Safety at Work Act was introduced in 1974, and that skilled and knowledgeable people should be at the heart of the modern British economy. We also know that this economic change and our regulatory framework has driven a large reduction in accidents and safety issues. It is a very positive story and one our country can be rightly proud of.

However, with today's 12,000 deaths a year from work-related lung disease largely stemming from historic ignorance about certain hazardous substances, this valuable report from RobertsonCooper will enable us – and others – to prepare for future risks, for example the potential breathing risks associated with new materials like nanotechnology, and mitigate them.

There are many other consequences for our health, safety and wellbeing covered in this report. Some are positive, for example how new technology can give us more flexibility in our work that can improve our sense of wellbeing. But whether it's 24/7 working, the platform or 'gig' economy, or the drive towards automation, our mental and physical health, even our very sense of self, is at risk. Safety has not gone away either in the future world of work, with the physical risks of working in close proximity with robots calling for new thinking in design, training and regulation.

RobertsonCooper have produced a report that tells us about how the economy is changing and the state of the research on the risks we can expect to face. It also gives all of us a map to plot a course towards safer, healthier and happier work in the future.

Foreword by RobertsonCooper



Sir Cary Cooper CBE
Founding Director
RobertsonCooper and
Good Day at Work

*Professor of Organisational
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Over the last decade, we've seen significant changes in the nature of the workplace and workforce, and they're not showing any signs of stopping. As such, the topic of the 'future of work' is one that, naturally, is very much growing and dominating the conversation amongst health, safety and wellbeing professionals. Many industry think-tanks, conferences and thought leadership pieces are centred on the future of work and what that could look like – yet there has been less of a focus on what this might mean for our health, safety and wellbeing.

Organisations, big and small, now know that their competitive edge depends on engaged, healthy and proactive employees and that cultures that promote this kind of environment will deliver to the bottom line, as well as sustaining the health of their employees. There is a wealth of research – some of which I have led – that demonstrates the benefits that focusing on employee health and wellbeing can deliver for businesses. We now also see that 45% of companies have a clearly defined wellbeing strategy (REBA, 2017), enabling them to ensure their efforts are delivering the right results for them.

But health and wellbeing are by no means at the heart of current working practice and culture. The last five years has seen increases in stress-related illness and presenteeism, which have had an impact on productivity, talent retention and attraction. In 2016 only 30% of companies had a wellbeing strategy, so whilst we're moving in the right direction, there's still progress to be made.

My concern is that companies are gearing themselves up to focus on health and wellbeing for the here and now, rather than setting themselves up to be ready for the complexities of the future. And by that, I mean, are businesses creating a culture that promotes wellbeing, with managers who create positive work environments and employees who take responsibility for their own wellbeing? We know that work is changing which is why there is much conversation about the future of work but we know less about the risks this might bring to the health, wellbeing and safety of employees, so it's a challenge for businesses to prepare for this.

“My concern is that companies are focussing on the here and now, rather than getting ready for the complexities of the future”

The future of work, at least for the next 10 or 20 years, was set by the recession. It has had a prolonged impact that has created a workplace where there are fewer people doing more work, working longer hours and feeling intrinsically insecure. We're seeing more contractors and people on short term contracts with the rise of the gig economy, an increase in technology creating an 'always on' culture, an ageing workforce and, ultimately, a very different psychological contract between employers and employees for the future.

As such, we are seeing loyalty between employers and employees decreasing, which means that retaining healthy, high performing employees is even more important. Work has a future, but one that will provide individuals with the opportunity to do things differently, which brings both risks and opportunities to the health, safety and wellbeing of our workforce.

My experience over the last forty years has been about working with organisations to develop a culture that prioritises employee wellbeing as a key driver for increased performance. Organisations of the future need to trust their employees and manage by praise and reward – if employees are clear about what is required of them and are achieving their objectives, why does it matter where, when or how they deliver their work?

I'm pleased that the British Safety Council and RobertsonCooper are focusing on these complex issues and shining the spotlight on the importance of the health, safety and wellbeing of our employees in these changing times. This report brings together the latest thinking and insights and I'm looking forward to being part of the critical conversations and action it encourages.

Recommendations

The literature review has confirmed that we are living through fundamental and potentially disruptive change to how we live and work. There are a number of recommendations we can now make to government, business, trade unions and educators to ensure that we will be better prepared to face any health, safety and wellbeing risks that are likely follow these changes.

“Organisations of the future need to trust their employees and manage by praise and reward. If employees are achieving their objectives what does it matter where, when or how they deliver their work?”

Promote good work and better-quality jobs

1

Though change is inevitable, how we respond to the changing world of work is not. Government and businesses in particular need to make sure they have the right policies to ensure that work is safe, healthy and rewarding. The state of our children’s and workers’ mental health in the UK continues to be a concern, and there is strong evidence to show that good work makes for healthier and more productive workers. New technology can do a lot to help by giving workers more tools for self-determination, and enable older workers to stay fitter for longer. We urge that businesses, trade unions and others share their experience of good work and work design as the UK Government implements its Industrial Strategy.

Build resilience

2

The ability of workers to cope with the mental pressure of a changing world of work, including increased collaboration between workers and intelligent machines and robotics, is going to be a key attribute in the future. Worker health and wellbeing demands it and, at a macro level, if we are to have a sustainable and productive economy, then we must do more to help workers build their resilience. Government needs to look at incentives (such as tax breaks) for employers to introduce health and wellbeing programmes, schools should include resilience and wellbeing in their curricula and employers should test innovative approaches and wellbeing programmes in consultation with workers and trade unions.

Ensure education is relevant and forward thinking

3

There is a risk that changes to the world of work could leave 'educators' behind. If we create a more insecure and inexperienced workforce (who are therefore more likely to suffer injury or ill-health), risk education before work along with induction and training at work will become even more important. Schools and training bodies need to focus on both 'soft-skills' such as collaboration, creativity and leadership (workers can take these skills with them as they change jobs, these skills are less prone to automation and will boost resilience) and skills associated with new technology, such as working in collaboration with intelligent machines and robots. Occupational safety and health professionals, as well as Safety Representatives and HR professionals, should include in their development such training, with a larger emphasis on how to reduce 'stressors' and promote wellbeing and resilience. What's key to the ability to do this is adaptability; educators are required to have a flexible mindset focused on supporting individuals, from school education through to workforce development, to thrive in an ever-changing environment.

Keep the regulatory system up to date

4

Changes to the world of work presents challenges for how our legal and regulatory systems operate. With working networks, including between humans and machines, sometimes operating across borders, there is a question about where ownership of the risk lies – who should take responsibility if something goes wrong? This also leads us to a question about liability when things go wrong. The cost of ill-health remains high, with PWC estimating in 2013 that sickness absence costs UK businesses an estimated £29bn (*The Rising Cost of Absence*). As contracts between employers and workers become more diffuse (where people in the 'gig' economy are often not classified as workers), businesses might increasingly avoid the costs of sickness absence or employer's liability insurance. Government should do more through its Industrial Strategy to enable gig-workers to take certain minimal social protections and rights with them, wherever they work. Good work must be for all.

Extend the understanding of the future risks

5

The report has highlighted some of the sweeping changes to work we are facing. It is vital that determining the risks of the future is a key role for the research community and people practitioners. Existing research strongly indicates that there needs to be a greater emphasis on soft skills such as leadership, communication and innovation to face these future risks. However, research on the risks of new technologies, new materials and new ways of working is quite thin in places. For example, research into the risks associated with real world applications of nanomaterials and the impact on mental and physical health of those people working as co-bots would contribute to a more coherent view of current and future risks to worker health, safety and wellbeing.



Part 1: Research Summary

The world of work is rapidly changing. With this comes the opportunity for improved wellbeing and equality, but also new risks for health, safety and wellbeing.

“We’ve focussed on what the future of work might look like. Yet there has been less of a focus on what this might mean for our health, safety and wellbeing”

The future landscape of work

This report provides a succinct overview of the landscape of work; focusing on the likely changes that employers and workers alike will experience over the next two decades, before exploring the risks that these changes may present for the health, safety and wellbeing of the workforce. Finally, we explore what this may mean for businesses, trade unions, education and regulators.

The future of work is a topic that has gained momentum in recent years amongst practitioners and thought leaders working in health, safety and wellbeing. People are living and working for longer, tasks are becoming automated and the nature and location of work are rapidly shifting. With these significant changes on the horizon, and many already taking shape, the risks associated with work are changing too; and for that reason, it is vital to understand and respond effectively to these new challenges.

This research report is the culmination of a literature review carried out between October and December 2017 on this topic. This first part of the report summarises the research and key findings, and Part 2 provides a more detailed literature synthesis.

The future of work requires us to consider some huge questions about the nature of work going forward. Will jobs still require people? Where is “work”? What will be the relationship between employers and employees?

The limited research that is available highlights four main themes which capture the future landscape of work. Technology dominates much of the insights on the topic, but there is much more to it than technology alone as we explore in the following section, providing an overview of these key themes. More detail on the research behind these themes can be found in Part 2 of the report.

Part 1: Research Summary

“Predictions indicate that 11 million jobs may become surplus in the next 20 years”

Technological advances

The research is heavily weighted towards the impact of Artificial Intelligence (AI) and job automation, looking at whether – and how – tasks that humans perform will be replaced by machines. It also centres on real-time technology creating an ‘always on’ culture creating difficulties for people to integrate their work and life. Areas explored in part 2 include:

- **AI and job automation:** Automation is already a core part of work in industries such as the automotive and electronics industries, but predictions from the Health and Safety Executive indicate that by 11 million jobs may become surplus in the next 20 years
- **Co-bots and collaboration:** In industries where automation is already well adopted, it is now becoming less essential, putting manpower back onto the line – but requiring collaboration with machines as the collaborative robot, or co-bot
- **Immersive technologies:** The rise of augmented reality (AR) and virtual reality (VR)
- **Information and communication technologies (ICT):** How technology that facilitates a modern way of working has led to an ‘always on’ culture in some professions
- **The internet of things (IoT) and cyber security:** As the number of devices connected to the internet is expected to grow to anywhere between 20 – 300 billion in next five years, what does this mean for the security of these devices?

Labour market – demand

Research suggests that atypical forms of work are increasing. At the same time, there is uncertainty around demand for labour from Brexit and its aftermath. Areas explored in part 2 include:

- **Increase in gig economy and decrease in the stability of work:** As the number of contractors and freelancers rises and is projected to continue rising, the job market is likely to become more fluid and agile, changing the balance of power between employees and employers
- **Skill requirements:** Will employers of the future require the skills of now? As the ‘gig workforce’ grows, this means a change in skills will be required, as well as how people develop these skills
- **Economic uncertainty:** In the UK and Europe, Brexit creates economic ambiguity and the impact of that is far from understood.

“The number of physical devices connected to the internet is expected to grow by up to 300 billion in the next five years”

Labour market – supply

A range of factors will affect labour demand. At the same time there are likely to be changes in labour supply. Areas explored in part 2 include:

- **Demographics:** People are working for longer as the state pension age rises
- **Location:** Focusing on how housing has not kept pace with digital/industrial developments, leading to rising house prices and the geographical definition of ‘work’ changing
- **Skill shortages:** How an emphasis on homegrown talent is likely to reinforce the trend of a short-term skills shortage
- **Global shifts:** How resourcing talent online can deliver value for money for businesses for a range of roles.

Environmental changes

Research shows that we are moving towards an “increasingly unstable and unsustainable world” that will impact the supply chains of all businesses. Areas explored in part 2 include:

- **Climate change and international instability:** How rising global temperatures will impact how and where we work in the future
- **Resource scarcity:** Why current consumption levels of natural resources may create an unsustainable future.

Part 1: Research Summary

“We’re seeing a rise of the gig economy, an increase in technology creating an ‘always on’ culture, an ageing workforce and, ultimately, a very different psychological contract in the future”

A framework for considering risk

In this section, we set out the risks that these factors which epitomise the future of work could pose to the health, safety and wellbeing of workers. To do this, we have used RobertsonCooper’s six Essentials framework. More detail on the risks in each of the six areas is included in part 2.

Table 1. A framework for considering risk

Resources and communication	The gig workforce are likely to require a different kind of training and development, and the introduction of technologies could disrupt work as we know it.
Control	A reduction in the amount of control employees of the future may have, in particular when, where, how and until when they work, ultimately changing the psychological contract between employee and employer.
Balanced workload	The creation of over-engagement with work and the potential for neuroenhancement drugs to become commonplace.
Job security and change	Insecurity encouraging employees to work when they are ill, reinforced by the threat of automation.
Work relationships	The risks for remote workers and how generations will be required to work together.
Job conditions	Organisations may struggle to keep pace with approaches to support employee health and wellbeing of workers, in particular the needs of an ageing workforce and a closer relationship with technology.

“There is a risk of an over-engaged workforce with neuro-enhancement drugs becoming commonplace”

Mitigating risks

Whilst there is research – academic or otherwise – focusing on the future of work and the potential risks this could bring, there is much less research available into what could be done to mitigate these risks. Much of the literature that is available on this topic is from leading think-tanks, based on their experience and knowledge rather than grounded in academia.

The final section of Part 1 concentrates on that, and how businesses, trade unions, education and regulators/governments can act to mitigate the impact these risks may have in the future.

Businesses

Organisations are already starting to take employee health and wellbeing more seriously – REBA (2017) found that the number of organisations with a wellbeing strategy grew 20% in 2017, taking it to 45%. But this is a relatively new move for businesses, as 75% of strategies have been in place for less than three years. The fact that organisations looking at health and wellbeing as a strategic issue is still in its’ infancy is likely to be contributing to a lack of sophistication in the approaches taken. Employee assistance programmes (EAP), health screening and discounted gym membership are the top three initiatives on offer, and only a quarter of businesses are measuring the effectiveness of their initiatives.

Clearly, the focus on employee health and wellbeing is going to grow, with predictions that half of those without a strategy will implement one within the next 12 months. But its vital that these are sophisticated approaches and go beyond providing traditional support services like EAPs and health screening. Ensuring that the effectiveness of any work on health and wellbeing is measured and reported is crucial to both enabling organisations to deliver the impact they set out to, and to safeguard budgetary commitments in the future by demonstrating the return on investment to senior stakeholders.

As businesses do focus on health and wellbeing more, they must also take a forward-thinking view in their strategy. The risks and opportunities that strategies are built to tackle now are unlikely to be the same as those of the future, and so a data-driven approach will prove hugely valuable for businesses to ensure they focus on the right areas. As new risks emerge in a constantly changing world of work, organisations will require cutting-edge data to act in a targeted way.

“Flexible working can deliver a range of benefits, including lower home/work conflict and increased job autonomy”

Over the next two decades, it is inevitable that jobs will be designed and redesigned by organisations to meet the challenges they face. The most forward-thinking businesses will build protections into these processes and the changes made, ensuring that they take a balanced view to the associated risks and benefits. A pertinent example of this is flexible working, discussed in the previous section, as a potential risk for the future as the nature and location of work change. Risks could include inescapability of work, a lack of detachment from work, and poorer work relationships (Hislop et al., 2015), however, flexible working can deliver a range of benefits for employees and employers, including lower home/work conflict and increased job autonomy. So, it's important that organisations consider the protections in place to deliver these benefits and mitigate the risks. This could include creating optimal levels of remote working (e.g. 14-15 hours per week; Hislop et al, 2008), positive leader-worker relationships and building high degrees of trust.

Despite the predictions about job automation and AI, the future of work will still need workers. Although some roles may move close to 100% automation, knowledge workers are unlikely to be replaced. This will put an emphasis not only on supporting employees once they are inside organisations (whether as employees or contractors), but also on effective recruitment. In a report looking at the 'competing forces' in the future of work, PWC (2017) highlight the future need for pivotal people – individuals who contribute vast and critical value to their organisation. Workers who perform tasks which automation can't yet – or may never – perform will become more pivotal, meaning that finding and retaining such people will become a challenge for businesses.

In a survey of CEOs, they found that whilst exploring the benefits of automation is already underway for just over half of businesses, increasing the headcount in the next 12 months was also on the agenda for the majority. They highlighted automation as something that would change the future skill needs for their businesses, and as such finding skills like problem-solving, adaptability, collaboration, leadership, creativity and innovation are top of the list.

“Top of the list for skills that are needed in the future will be problem-solving, adaptability, collaboration, leadership, creativity and innovation”

Finding people with these skills may be made easier through the use of Virtual Reality in selection, though. Many employers are now using this to advance their current recruitment and selection processes, and as Gen Zs make up larger proportions of the workforce in the future, such technologies are likely to align with their expectations. Additionally, focusing on creating a compelling Employee Value Proposition (EVP) will be an important step to allow companies to attract the best talent to them.

Retaining such people will be challenging for businesses, too. Looking after people with the key skills required to succeed will be important, and providing them with the flexibility that they are likely to warrant going forward. The shift in the labour supply and demand dynamic – explored earlier in this report – may also mean that reward and benefits will become even more important than they are today, where employees vital to company success are able to negotiate higher rewards more easily.

Finally, there are several factors contributing to an emerging situation where the average age, and working lifetime, are increasing. In the UK, the retirement age is on a gradual rise from 65 to 68 by 2037, and by 2022 there will be 700,000 fewer people aged 16 to 49 in the country. In contrast, 3.7 million more people will be aged between 50 and state pension age. So as elders remain in the workforce, some research suggests the need to retain older workers in order to gain a competitive advantage (Gordon, 2018). As such, companies of the future should support continuous learning and development (Nikolova, Van Ruysseveldt, De Witte & Syroit, 2014) in a bid to create the conditions for lifelong learning (Taylor, 2017).

Trade unions

For many years the trade unions have played an important role in economies, including through their Safety Representatives, to reduce accidents and injury, and promote safer and healthier workplace cultures. If there is a further reduction of their influence on the workplace, it is not clear who or what would replace the role that they play.

“Workers in precarious employment need to be protected and represented”

Membership in trade unions has declined rapidly over the past four decades. In the 1980's, 50% of employees were members of a trade union, and in 2016 this had dropped to 24% (TUC, 2016). The age profile of typical members has also changed considerably, with older workers making up a much higher proportion of members than previously, as two in five union members are over 50.

Yet, TUC also found that one in 10 workers are in 'precarious jobs', including in the gig economy where workers have less access to sick pay, redundancy and job protection, and those on zero-contract hours earning significantly less than typical employees. So, with the trend of people who the TUC would consider in precarious jobs set to continue growing and union membership declining, this raises uncertainty about where future efforts to represent worker health, safety and wellbeing will come from.

The future of the labour market is likely to be fragmented, with increasing individual contributors and lower strength in numbers. Representing workers and creating labour standards for such workers will become an increasing challenge, for regulators and enforcement bodies, but also for unions.

Unions can only operate within the regulations set at a national or international level, and as such may be in a powerless position with decreasing membership numbers – especially amongst younger workers – and outdated regulations that don't match the make-up of the workforce.

However, it is expected that such legislations will change which could strengthen the position of Unions. Taylor (2017) calls for Government legislation, enforcement and strategy for quality work that is fair, decent and has realistic scope for development and fulfilment. The European Commission is currently considering two legislative measures on the protection of rights for those employed on short-term contracts, including the gig economy and zero hours contracts, which may affect the UK depending on how trading continues beyond 2019 and the UK's agreement with the European Union.

The first is the 'Access to Social Security Initiative,' which looks to ensure similar social protection rights for similar work, regardless of how a person is employed, and the transferability of acquired social protection rights.

“A huge proportion of the workforce of the next two decades are still in education”

The second is the ‘*Written Statement Directive*,’ where all workers, irrespective of their employment status and contract type, are entitled to the same information on their contract of work, and that core labour standards are upheld. This may include rights to contracts with a minimum number of hours set by previous average hours worked, the right to training, notice periods in case of dismissal and access to impartial dispute resolution if required. Clearly, this kind of legislation could have a huge effect on how organisations resource work and treat their employees and workers in the future.

Even as legislations change, unions need to transform too. Membership numbers have been declining and the reasons for that do not all lie with the rising gig economy, which shows the need for transformation, yet the expected rise in the gig economy creates an even bigger need. The Office for National Statistics (ONS) predicts that the number of self-employed workers will soon overtake the number of public sector workers, raising even more questions for the future of unions.

As the balance shifts over time, workers in these so called ‘precarious’ positions need to be protected and represented, but protection will need to be very different to that of thousands of employees working for one organisation all represented by the same union.

Education

The focus of business and trade unions is employees – those already in work who need to be supported, protected and represented. However, a huge proportion of the workforce of the next two decades are still in education. Whilst – as discussed earlier in this report – what the future of work will entail is still unknown, it’s almost certainly going to be different to that of today.

One of the factors that underpin work and workers now is mental health – stress, anxiety and depression is the leading cause of absence from work (HSE, 2016), and despite the best efforts of businesses, work is still a contributor to these problems. But mental health for young people is also a growing concern – rates of depression and anxiety among teenagers have increased 70% in the past 25 years according to RSPH, and so with an already present issue around mental health in the workplace, this is a cause for concern for the future.

The UK government has recognised this as an issue, and a 2017 House of Commons report called for schools to take a ‘whole school’ approach to embed mental health and wellbeing inside the curriculum and called for its consideration as part of Ofsted inspections. It’s vital that schools are funded in a way that enables them to act on such recommendations, given that the report also highlighted that half of all mental illness starts before the age of 15, giving schools a huge responsibility.

“Educating people on how to work with co-bots will be fundamental to their acceptance inside society and workplaces alike”

However, to address the potential risks of the future workforce, education must not be limited to the compulsory education system. As the risks to employee health, safety and wellbeing change, educating employees to create an awareness of these and how to manage for themselves will be important. Yet, health, safety and wellbeing are not solely the responsibility of employers or governments; they must create the right environment for employees to then make the right choices which maximise their health, wellbeing and safety.

As such, part of this education must be on building responsibility for health, safety and wellbeing amongst employees themselves. Understanding their individual risk factors and being educated on how to act on these will become a pre-requisite for all organisations, who must also ensure that they are creating the right conditions for their people to do this.

One key risk factor in the future, which is already coming into play for businesses, is that of employees working with co-bots. Research (Hollinger, 2016) shows that those already working with robotic and collaborative robots would continue to choose to do so, but they are mostly established in industries such as automotive, however as they become more commonplace in other industries, ensuring they are implemented in the right way will be vital.

Educating people on the way to work and interact with co-bots will be fundamental to their acceptance inside society and workplaces alike. It is likely that such training will benefit from utilising Virtual Reality (Matsas, Batras & Vosniakos, 2012).

However, as the relationship between employers and employees changes with a rising gig economy, where the responsibility to provide education and self-development opportunities lies is likely to change. As discussed in the previous section, consideration of the Written Statement Directive means that the right to education and training may soon be extended beyond employees only. Irrespective of that, there may be a responsibility for employers to provide such access, but in a world where automation threatens to replace human input in many jobs, it requires employees themselves to take ownership of their own education and development in order to thrive.

Regulators and governments

A number of references have been made throughout this report to action from regulators and governments. As the nature of work changes though, it's vital that governments and such bodies have a mindset grounded in adaptability. What exactly work will be and look like over the next decade is unknown, and it is impossible to predict what lies ahead. Making linear predictions about the impact that a particular change may have is much more modest, however

“Changes to policy can often be made long after societal impacts are felt by people”

is unlikely to give an accurate representation. So, adaptability to change will be fundamental to success for businesses. This is as much about businesses needing to adapt as it is individuals, who will need to adapt to organisational change, be willing to acquire new skills and experiences, try new tasks and re-train mid-career (PWC, 2017).

Yet businesses can only operate within the frameworks and conditions set for them, so adaptability amongst regulators and governments is of equal importance. Changes in policy can often reach the agenda long after their impact is being felt by society, and once there can take time to be implemented, so in the future there is a need for flexibility as the basis of quicker action. This could include easing the routes to training and retraining, and encouraging and incentivising adaptability and the critical and increasingly valued skills of leadership, creativity and innovation.

One particular area this will be required is around technology developments. The HSE (2016) emphasise the need for guidance, regulation and regulatory frameworks in this area. Another debate that regulators and governments will need to host is around the ethics associated with robotic and autonomous systems, including driverless cars. PWC (2017) emphasise the need for governments and businesses to collaborate in developing a

responsible approach to this, along with policies that govern the impact of technology and automation on jobs.

This collaborative effort between governments, regulators and businesses is not limited to technology however. As the risks to health, wellbeing and safety grow in a somewhat unpredictable fashion, these will continue to negatively impact businesses and in turn GDP. One potential role for the governments in this is to incentivise employers to act to mitigate the risks on health, wellbeing and safety of their workforce. One example of this already taking place in the public sector is the NHS Commissioning for Quality and Innovation (CQUIN) funding, whereby NHS Trusts must demonstrate positive action on health and wellbeing (amongst other areas) to receive parts of their funding from commissioners.

Finally, the role of the government is not limited to those in work – it is likely that the increased use of automation inside some roles, along with increased reliance on technology more generally, will drive unemployment. PWC (2017) suggest that governments could test social safety nets such as universal basic income, recently piloted on 2,000 people in Finland, and identifying new sources of income for citizens.



Part 2: Literature Review

The world of work is rapidly changing. People are living – and working – for longer; many tasks are being automated; modern communication technologies are dissolving the work/home divide and place 24/7 demands on people’s attention; new materials like nanotechnology and new techniques can present new risks; and the more ‘flexible’ contracts under which an increasing number of people work can reduce the clarity of who owns the risk.

“It is important to understand new challenges in order to respond effectively”

With these deep and fundamental changes to work, the risks associated with work are also changing. The increasing pace of innovation, insecurity and drive for efficiency is putting more pressure on people that can lead to stress; older workers have different needs for safety and health at work; environmental risks from work activities are growing; and risks can emerge unexpectedly when new ways of working combine humans with technology, robotics and artificial intelligence that connect people across the globe.

At the same time these changes can be the trigger for improved workplace wellbeing programs. In the context of a more mobile and flexible workforce, employers will likely have to compete for talent and do more to create working environments where people feel valued and trusted. However, the changing world of work is also likely to increase inequality – at least in the near term (defined as the next 20 years) – and there will be many less skilled workers who will not benefit from such changes.

At a time when the world of work is undergoing a major process of change it is important to understand and respond effectively to these new challenges. The International Labour Organization’s ‘Future of Work Centenary Initiative’ and their Global Commission provides a global perspective on the issues to advance its mandate for social justice. Together with this is a pressing need to have a more strategic view on what the research says about the future of work and risk in the UK, and how these two issues are related.

This research report is the culmination of a literature review carried out between October and December 2017 on these topics. The literature review commenced with a brief survey of current expert opinion pieces and consultancy reports. These provided the key themes to explore across the topic of the future of work, the consequences for worker health, safety and wellbeing and mitigations to these risks.

Part 2: Literature Review

“The lens for this review is firmly that of impact and relevance to the future worker in the UK”

These key themes were subject to iterative searches using universal linked databases (e.g. Discover, Google Scholar) to source primary and meta-analysis data available in each case. The searches were extensive although not exhaustive; the review did not exclude EU and international research and opinion, although the lens for this review is firmly that of impact on and relevance to the future work in the UK. A full reference list and bibliography is provided for future consultation.

The report is structured in three sections:

- The first section addresses the future landscape of work – what are the likely changes that employers and employees will experience over the next 20 years? Predictions about the ‘future world of work’ have been made throughout history; some of these have come to pass, others have not. This does not prevent speculation about the future of work, but should make us circumspect about the magnitude and/or speed of change.
- The second section considers what risks these changes might pose for the health, safety and wellbeing of individuals.
- The third and final section sets out the main ways in which employers might play a key role in anticipating and mitigating future risks to achieve a healthy, happy and productive workforce.

The future landscape of work

This section explores four main themes of the future landscape of work: technological advances; the supply and demand of labour and environmental changes.

“The automation of jobs dominates the literature”

Technological advances

Technological change continues at pace. For the world of work, Artificial Intelligence (AI) and the automation of jobs dominates the literature, with media headlines asserting that both the cognitive and physical tasks that humans perform will in future be replaced by machines. The impact of ICT developments in creating an ‘always on’ culture and a work-life imbalance continues to be a key topic. Less prevalent is the focus on other technological advances, such as Immersive Technologies, the Internet of Things and nanotechnologies.

AI and job automation

The HSE Foresight Report (2016) suggests that by 2025 AI could permeate daily life and that many medium skills jobs will disappear. It is also estimated that seven million jobs in the world’s largest economies (particularly those associated with low skill and repetitive tasks) are likely to become superfluous due to automation over the next five years. Other reports suggest that 11 million UK jobs could be automated in the next two decades. Table 1 shows a recent world share of robotics at work (Powley, 2015).

Table 2. Use of robotics by industry

Industry	%
Automotive	39
Electronics	20.3
Metal work	9.2
Plastic and chemicals	8.2
Food and beverage	3.5
Education and R&D	0.5
Other	19.4

Co-bots and collaboration

However, the picture is much more complex than the notion that robots will replace humans and jobs will become obsolete, and not only because costs are often prohibitive, especially for SMEs.

Early adopters of automation and robotics are moving to a more collaborative base, as the very things that robots are good at, such as standardisation, become less important. Goldhill (2016) reports that Mercedes-Benz is phasing out some of its automation, and putting humans back into the production line, precisely because humans are more flexible and can customise. Much manufacturing is undertaken through collaboration between humans and robotic devices (Rendall, 2016).

The future landscape of work

“Mercedes-Benz is phasing out some of its automation because humans can customise and be more flexible”

As such, humans and machines often end up working together (rather than machines replacing humans completely), giving rise to the collaborative robot, or co-bot, particularly in manufacturing and construction (Hollinger, 2016). There is a literal example of this from Australia, where the use of exosuits by the workforce enable greater weights to be shifted using robotic frames to support the body, and work can continue in extreme weather conditions (Quezada, Bratanova, Boughen & Hajkowicz, 2016).

Other examples of collaborative working include the use of drones. Operated by a human handler, drones with cameras, and other kinds of remote sensors, help with land and crop management, utility support and maintenance, and in the care and maintenance of offshore windmills to help with sustainable energy supplies. It is expected this will grow in use, especially for tasks that are unsafe or impossible for humans to perform alone.

Immersive technologies: Augmented reality and virtual reality

HSE (2016) defines Immersive Technology as bringing the physical and digital world together to create a sense of immersion for the user. They distinguish between Augmented Reality (AR) - where a real-time view of surroundings is enhanced by computer-generated information and displayed through tech including hand-held devices, wearable tech (e.g. head mounted displays) and VDU screens - and Virtual Reality (VR) - immersion into a 3D computer generated environment, through head-mounted equipment, glasses, or even a whole-room CAVE system).

AR applications include displaying the inner working of a system, supporting communication and directing users through a task. VR applications include training and simulation for high-risk high-cost roles (e.g. flight simulation). HSE (2016) suggest that rapid ongoing development in this area is likely to pervade many industries.

“There is a move away from a 9–5 job structure and towards workers having multiple jobs (or ‘gigs’)”

Information and communication technology

Advances in ICT have revolutionised how, where and when we work. In the 1980s and 1990s there was a belief that videophones would make people stop attending face-to-face meetings. Whilst this has not been borne out, ICT developments have facilitated virtual meetings, high speed broadband and mobile networks. There is a move away from a 9 to 5 job structure and toward workers having multiple simultaneous jobs (or ‘gigs’); for increasing numbers work is now something we do wherever and whenever we like (HSE, 2016).

This has led to an ‘always on’ culture for some professions. ICT developments have also contributed to the ‘information explosion’ – the rapid increase in the amount of information available, which can result in overload. The utilisation of ICT in the workplace looks set to continue, with applications developing all the time (e.g. gamification of job assessment, virtual interviews, providing work samples using virtual reality).

The internet of things (IoT) and cyber security

The phenomenon of the Internet of Things is expected to play a major role in reshaping work; the number of smart devices connected to the Internet grew from approximately 0.5 billion to over 13 billion in 2013 and it is anticipated that by 2022 it will reach somewhere between 20 to 300 billion (HSE, 2016). With the pervasive use and increasing reliance on ICT systems comes rising challenges for cyber security; there has been a doubling of national security cyber-attacks (HSE, 2016). For example, Cobb (2015) details the discovery, by IBM Trusteer researchers, of a variant of a piece of malware, called Citadel, that was being developed to target Middle Eastern petrochemical companies. Mostly the wider public do not get to know about these attacks, because the costs to company reputations are enormous (Loukas, 2015). These challenges also tend to be underplayed in the visions of future work.

The future landscape of work

“Nanotechnologies are expected to be the basis of much technological innovation in the 21st Century”

Nanotechnologies

Nanotechnologies are an emerging field and they are expected to be the basis of much technological innovation in the 21st century. The HSE website states the following: nanotechnologies involve the creation and/or manipulation of materials at the nanometre (nm) scale (one nanometre is 10^{-9} m or one millionth of a millimetre). Nanoparticles are naturally occurring and are also a by-product of many long-standing processes, such as fires, diesel engines and high energy manufacturing processing such as welding or grinding. The manufacture of engineered nanomaterials is a rapidly developing area, with a wide range of applications in many different industries. For example, a biologist may use a nanomaterial in their work producing life-changing medicines or a builder may incorporate a self-cleaning window, coated with a nanomaterial, into a new house.

Nanotechnologies offer potentially huge benefits to society, industry, the environment and health. They can help us improve our quality of life and respond to some of the key issues of the day, such as climate change by cutting greenhouse gas emissions. Other potential benefits include contributions to improved energy storage and efficiency, better diagnosis and treatment of disease, faster computer systems and remediation of polluted air, soil and water.

Labour market – demand

The main focus of the literature is on atypical forms of work that are thought to be on the increase and likely to dominate the future landscape of work. There is in-depth data and research on these forms of work (Taylor, 2017). A lesser known quantity is the impact that Brexit will have on UK labour market demand, with some reluctance to speculate on the future in this time of uncertainty.

Increase in the gig economy and decrease in the stability of work

Full-time permanent work continues to make up the majority (63%) of employment in the UK; however, there has been a noticeable shift towards more flexible forms of working, with changes in levels of self-employment and part-time working in particular. Key areas of atypical work encompass: part-time, self-employment, agency, temporary, zero-hours, multi-jobs and the gig economy, including online platforms (Taylor, 2017). In the UK the top specialism sought via the online gig economy is ‘Creative and Multi-Media’, and Professional Services outsourcing (accounting, legal services and business consulting) is dominated by the UK, with 22% market share (Oxford iLabour Project - <http://ilabour.oii.ox.ac.uk/>).

“The gig-economy and short-term contracts may affect most the younger worker and their long-term career prospects”

Gig working is expected to grow quickly (Taylor, 2017). The number of ‘on-demand’ workers is anticipated to double by 2020, by which time the majority of the UK workforce will be more flexible. It is also anticipated that by 2030, jobs and organisations may become increasingly fluid as people move from project to project or from one job to the next (HSE, 2016). The Taylor Review (2017) found that flexibility works for many people and that an agile labour market is good for protecting employment.

However, this type of working can lead to poorer outcomes for some. The main issue is in the imbalance of power that might lie between the employer and the individual. Where the employer holds more of the power, this can lead to little employment choice, poorer working conditions and lower wages (Taylor, 2017).

Together with this, trades and guilds to support lone workers and agency staff may also rise. There already exists a gig economy union, the Independent Workers Union of Great Britain, and they seek the right to collective bargaining with the University of London, rather than the facilities management company that the university uses to employ them (BBC, 2017). Where there are large groups of workers, whether co-located for work or not, this is likely to continue.

Skill requirements

The gig economy and short-term contracts may affect most the younger worker and their long-term career prospects. Many will already be carrying debt burdens for higher education, and see the possibility of a home and a family of their own receding into the far distance. Traditionally qualities such as ‘home life stability’ have been sought by employers (regardless of relevance to work performance, reliability or work commitment, see Correll, Benard & Paik, 2007) and these attributes may be viewed as much less desirable due to the changing nature of jobs.

A related change is how a gig workforce continues to develop and upskill. Expecting potential workers, who have unpredictable income to pay for their own development, is not likely to be practical, and would require agencies or other organisations to hold information on the level of skill or knowledge that a person possesses (Oxford iLabour project - <http://ilabour.oii.ox.ac.uk>).

The future landscape of work

“Skill shortages and cost-cutting have driven the development of robotics and AI systems such as carebots”

Automation and the extended use of ICT may reduce the need for certain skills that can be more efficiently and effectively automated. Indeed, labour force skill shortages and cost cutting have driven the development of robotics and AI systems, such as carebots in Japan and New Zealand (Robinson, MacDonald, Kerse & Broadbent, 2013).

Conversely it is predicted that there will be an increase in the demand for skills that continue to advance ICT and for skills that are not easily replicated by, or are complementary to, ICT. This includes creativity, social skills, resilience and flexibility (HSE, 2016). Cyber security is becoming more salient (Cobb, 2015) in a world where possible breaches have unprecedented consequences for national security, and people with the knowledge and skills to address this are likely to be in demand.

Economic uncertainty

The future demand for UK goods and services and the location of key industries/businesses remains uncertain due to Brexit, and therefore the impact on labour market demand for UK workers is currently unknown. As the Institute for Employment Studies recognises it is too early to speculate: “The overall impact of Brexit on employment and the wider labour market in the UK will depend not just on migration flows, but also on broader economic factors, such as trade patterns and business location decisions. The full impact will take time to emerge and will not become clear until the negotiations develop and we know what trade and labour migration arrangements we agree with our erstwhile European partners.” Their ‘Brexit Observatory’ offers employers and organisations with updates on the situation (<http://www.employment-studies.co.uk/brexit-impact-workforce/brexit-observatory-labour-market>).

“Men and women will be expected to work longer”

Labour market – supply

There is quantitative data available in the literature to paint a partial picture of the demographic landscape of the future of work; however, uncertainty over Brexit, changes to immigration legislation and new models of international online gig working are more speculative.

Demographics

In the UK both women and men will be expected to work longer, as the forced retirement age no longer exists and the age for state pension continues to increase. This is coupled with a temporary dip in the youngest workers entering the workforce, as the birth rate reduced early in the 21st century (ONS, 2017). Employers and universities will therefore soon be chasing the same talent pool, and employers seeking the best of future talent will need to be attractive to this cohort.

Location

Urbanisation and the greatest growth of UK cities occurred in the 19th century. The problem faced in Britain now is that of housing co-located to work; the housing stock has not kept pace with the development of towns and cities, and so the cost of housing in the areas of greatest industrial and digital development has gone beyond the salaries of all but the highest paid. Most point to London and the South East as major pressure points, but many of the areas where industries and R&D are located share the same housing shortage problem (Parliament, 2015). This necessitates long commuting journeys, disrupting family and personal life, and increasing daily hassles and life stress, before a day's work is done (Bissell, 2014; Hennessy, 2008; Mahudin, Cox & Griffiths, 2011).

Towns and cities with one or more universities in the locale also experience tidal demographic changes because of large temporary shifts in the available, low skilled, young workforce (Green, Atfield & Purcell, 2016). These shifts can be expected to fluctuate depending on the rate of growth and expansion of UK HEIs.

The future landscape of work

“The Apprentice Levy has yet to show any positive changes in recruitment”

Skill shortages

Attempts by Government to change patterns of training, such as the implementation of the new Apprenticeship Levy in April 2017 (Gov.uk, 2017) to assist in reducing current and future skill shortages, partly brought on by the ageing of the Baby Boomer population, have yet to show any positive changes in recruitment to train (Dickinson, 2017).

Where once companies and organisations might have assumed that they could import the talent required, it must now be home grown, as Government in the UK seeks to drive down immigration levels and Brexit changes the flow of workers. This may have a particular impact on agency workers, as approximately 40% of this workforce are not British Nationals; 22% are European Nationals and 17% are from the rest of the world (Kollewe, 2016).

Global shifts

On the other hand, the rise of the online gig economy means that short-term contract work can be outsourced globally to international sources of talent, and often at a cheaper rate. Data suggests nearly a quarter of all outsourced gig work is done in India, with more than half of all software development undertaken there also (Oxford iLabour Project - <http://ilabour.oii.ox.ac.uk>). Technical outsourcing occurs for research and development to highly talented workers in China, and other Asian countries (Coates & Morrison, 2016). There are risks in sharing intellectual property with others, but this can be done when appropriate legal support is hired within the jurisdiction.

Environmental changes

There is growing recognition in the literature that we are heading for an “increasingly unstable and unsustainable world” that will locally impact the supply chains of all organisations. New strategies, business models and mind-sets – that respect our environment – will be required for corporate sustainability (Maskell, 2017, p. 23).

“Changes to precipitation has led to China to switch back to coal”

Climate change and international instability

It is forecast that there will be an average global temperature rise of between 1.5 and 6 degrees Celsius by the end of the century. Extreme changes in the weather, brought on by climate change, may affect how we all do our work in the future, albeit in different ways. Those who work at a specific site – for example, on a production line, a construction site, a distribution centre, farmland or in a research facility – may be adversely and differentially impacted by increased snowfall, storm weather, high winds and drought. Time lost on a construction site, or at an automobile plant or goods lost on an agricultural farm may increase the anxiety of the worker considerably.

Changes in precipitation in China have already caused the country to switch back to coal-powered power stations, as water surges from floods make pressures too high for hydro-electric plants, affecting the health of Chinese workers, and increasing carbon burden for the world as a whole (Reuters, 2017). These kinds of feedback loops are likely to increase, making more movements of economic migrants across the globe greater, as homes and jobs are literally under water.

Resource scarcity

The Global Footprint Network (2014) estimated that we would need three planets to sustain our current consumption levels, if everyone in the world were to consume natural resources as the same way as an average European. New business models are being developed to ensure the long-term efficient use of resources and energy (e.g. a circular economy – see www.ellenmacarthurfoundation.org/publications).

UK supplies of rare metals, such as lithium, may bring large capacity battery manufacture into the country. As mentioned previously, China has reverted to using coal-powered power stations; as a non-renewable energy source, countries that either possess this resource or can provide new alternative sources of energy will be in demand.

Waste management industries might also expand in the UK, since the value of extracted materials has gone up and this can be retained through recycling inside the UK. Historically these hazardous and ‘dirty’ tasks were carried out abroad, where the health risks were taken less seriously (Pimenta & Pinho, 2011).





The risks to health, safety and wellbeing at work

This section explores what changes to the world of work might pose for the health, safety and wellbeing of the workforce.

A framework for considering risk

Research has shown that there are ‘six essentials’ of workplace wellbeing that add up to healthy, happy and productive time at work (RobertsonCooper, 2012), as detailed in Table 3.

Table 3. The ‘six essentials’ of workplace wellbeing

Resources and communication	Resources includes everything from specialised training to IT systems – making sure all employees are equipped to do their job properly. Communication is about knowing what’s going on in organisations, and getting feedback on how employees can play their part.
Control	A strong sense of autonomy is linked to positive wellbeing. Employees need to feel that they have some say over how things are done and what happens around them (think living in a democracy, rather than a dictatorship). Feeling in control will also help with handling other pressures, like difficult working relationships or a heavy workload.
Balanced workload	This is how fair and reasonable workload is and the extent to which it impacts employees’ home life. There are two aspects to a balanced workload: having a good work life balance – being able to enjoy other activities outside of work, and not being asked to complete too much work, or work that is too hard.
Job security and change	This is about how relevant and valued employees’ roles and skills are and the extent to which they think they’ll have a place in the business moving forward. Some people embrace change, others recoil from it, but when our sense of job security is threatened it can be difficult for nearly all of us. While the situation can’t always be avoided, you can always ensure that it’s dealt with effectively and help to keep wellbeing levels and performance on track.
Work relationships	Good working relationships are one of the most important sources of wellbeing, while a relationship that’s turned bad can be hugely draining. Work relationships are at their best when they are a healthy mix of challenge and support.
Job conditions	Job conditions are the elements that add up to a sense of job satisfaction. This can be everything from having the right work environment, to feeling the pay is fair.

Potential risks to the six essentials of wellbeing due to changes to the world of work are now categorised against this framework.

“Autonomous driverless cars are expected to be on UK roads by 2025”

Resources and communication

Training for short contracts and the gig economy

As early as 2006, Whysall noted that moving to shorter contracts could mean that workers are not given the same level of health and safety training. Data held by the HSE shows that the first four months in a new job is the peak time for injury per hour worked. Any online training that is given to individuals who work from online platforms, rather than in physical buildings, needs to be carefully regulated and checked. Even when undertaken by external agencies this can have its pitfalls; for example, construction training agencies were caught fixing online tests by giving the correct answers when the tests were being taken (Lynn & Davey, 2015). Fear of job loss, or not finding a contract could affect health and safety behaviour, such that the passing of the training is more important than the purpose of the training.

Disruptive technologies

There is general agreement that Immersive Reality and automation will offer improvements for health and safety at work as they provide improved guidance, the opportunity to learn and practice hazardous operations in a virtual environment, and the removal of workers from hazardous environments (HSE, 2016). However, there may also be less desirable outcomes.

The safe development and operation of robotic and autonomous systems will require effective management and control of the risks associated with the deployment of this technology. This includes the use of autonomous/driverless cars, which are expected to be on the roads by 2025. Whilst they may bring business benefits including higher efficiencies and improved productivity, they also introduce risks for health and safety (HSE, 2016).

Virtual information may lessen the perception of reality, leading to negative consequences such as falls. Prolonged use of devices may cause discomfort and musculoskeletal problems (HSE, 2016). There has long been an understanding that VR movement without body movement causes ‘cybersickness’ which is very similar to feelings of motion sickness for real world experiences. However, there is evidence that increased experience reduces this, as does the delivery method; for example, headsets are less problematic than screen simulations (Sharples, Cobb, Moody & Wilson, 2008).

Remote technologies (e.g. Cloud storage) may increase the anxiety of some due to fear of how and where data is stored, and fear of being held responsible for the security of information.

The risks to health, safety and wellbeing at work

“Virtual information may lead to falls and create ‘cyber-sickness’ or motion sickness”

Control

Job instability

Increased flexibility in the labour market is expected, and even desirable, to keep participation rates high. However, one major point of concern is that employers must not use flexible working models simply to reduce costs. Employers must consider the impact of flexible working on their workforce; for example, arrangements that make it difficult for someone to meet their financial obligations and/or fear of unemployment may lead to poor physical and mental health (Taylor, 2017).

It is theorised that perceived lack of control can play an explanatory role in the negative effects of short term work. Vander Elst, Van den Broeck, De Cuyper & De Witte (2014) found that job insecurity increases the perception of uncontrollability, which in turns leads to various negative health and wellbeing consequences. Instability and short-term work casts a long shadow into retirement (Barrech, Baumert, Emeny, Gündel & Ladwig, 2016) – exposure to job insecurity during working life negatively influences subjective wellbeing after retirement, on average 20 years later.

Moreover, Barrech et al., (2016) suggest that there is a long-term effect of physiological arousal, which impacts physical health and wellbeing in the longer term. The effects are similar to those of actual unemployment (Clark, Georgellis & Sanfey, 2001). It is also important to note that those with the jobs of lowest status typically suffer most from instability at work, due to the reduced control and support they have (Marmott, 2010). These individuals may already have lower quality of health and wellbeing before the risks of job instability are added (Cheng & Chan, 2008).

Additionally, the HSE Foresight Report (2016) anticipates that the predicted growth in flexible working that is non-standard, poorly paid and insecure may weaken the effectiveness of regulatory oversight and may increase injury rates, hazard exposures and self-reported health issues.

Working lifetime

Older workers may be forced to work later than they wanted to, or planned to do so (Cribb, Emmerson & Tetlow, 2013); conversely, they may be forced to exit without choice, whether due to organisational downsizing, or perceived ill health (Hofaecker, Schroeder, Li & Flynn, 2016). This lack of choice may have an impact on mental health and wellbeing.

“Remote technologies may increase anxiety due to the fear of how and where data is stored and of being held responsible for its security”

So far, the UK Government has taken a light-touch with encouraging organisations to adapt to this, whilst others, such as Japan, are using structural methods to help keep older workers employed (Flynn, Schröder, Higo & Yamada, 2014).

Balanced workload

Over-engagement with work

Worsened by the gig economy, and fear of job loss, the automation of some highly cognitive jobs develops, mobile technology, and the Bring Your Own Device (BYOD) mentality causes many more workers to over-engage with work and lose downtime – leading to the ‘always on’ culture. This can lead to permanently high levels of arousal, and an inability to relax when away from work. This brings risks to safety and damages health and wellbeing (e.g. Demerouti, Taris & Bakker, 2007). Taken to its extreme this can be viewed as workaholism, and shows similar effects to any addiction (Griffiths & Karanika-Murray, 2012).

Human enhancement technologies

A long-known risk of automation is pacing – it can be hard work (if not impossible) to keep pace with a machine (Arai, Kato, & Fujita, 2010). There are examples of public sector workers using neuroenhancement (NE) drugs to extend their working day (Farr, 2014). Modafinil (Provigil in the USA) has been developed to help to treat sleep disorders, and its use moved over, off-label, to the military to keep operatives alert on night time operations.

In 2007 the HSE thought that the use of NE drugs might be an issue in the UK by 2017; but such use has not been widespread in Europe (Maier, & Schaub, 2015). Students do seem to show some willingness to use NE for their studies (e.g. Liakoni, Schaub, Maier, Glauser & Liechti, 2015; Zelli & Mallia, 2015). We can assume that some workers would be willing to use such drugs to enhance their work performance too.

The liabilities, should employers insist that employees take such drugs in the future, would need to be considered, since no treatment is without risks, or side effects. Some sectors might wish to exclude workers who have used such treatments precisely on safety grounds, if such substances have not been checked when individuals are using heavy plant, or other machinery.

The risks to health, safety and wellbeing at work

“Many more workers over-engage with work and lose downtime – leading to an ‘always on’ culture”

Other research focuses on ‘human enhancement technologies’ (HETs), such as gene therapy, tissue engineering, and nutritional and lifestyle changes. This normalises the idea of “working extremely” – enabling people of talent to work longer hours, with greater effort, and with increased attention (Bloomfield & Dale, 2015).

Job security and change

Presenteeism

Fear of job loss, instability, threats to chances for promotion, or even the opportunity to do more interesting work can drive people to attend work, when they should not really do so (Collins & Cartwright, 2012; Miraglia & Johns, 2016). This ‘presenteeism’ is the behaviour of turning up to work, or being on-call for work, when one is not really fit to be there.

This lack of fitness can be due to physical reasons, and may reduce productivity for the individual concerned. For example, the common cold impairs a person’s hand-eye co-ordination and physical motor tasks, thus it might affect someone operating machinery at work.

Influenza impairs the ability to detect and respond quickly to unexpected, or unpredictable changes in the environment; any tasks that require responding quickly to changes in the world around people are at risk, from driving folk-lift trucks, to surgery (Smith, Thomas, Perry & Whitney, 1997; Smith, Tyrrell, Al-Nakib, Coyle, Donovan, Higgins & Willman, 1988). Physical ill-health can also affect others in the same workplace, and so can be a public health issue.

Presenteeism can also occur when workers are suffering from mental health problems, and the stigma that surrounds this (e.g. Nielsen & Einarsen, 2012; Willness, Steel & Lee, 2007).

AI and automation of roles

On the plus side, AI and automation of roles can lead to efficiencies and remove human error; physically demanding and boring tasks may also be removed, making way for more interesting work. However, changes to role may present as a stressor for some. For example, systems that replace people for calculating the economic risks of mortgage loans to customers mean that people become part of sales teams, rather than the numerate case writers and checkers that they used to be. This not only changes the job that people do, but may also limit their chances of having a clear career path.

“Prescriptive measures on the wellbeing of workers do not encourage people to be open about their health”

Work relationships

Remote workers

The most recent available data shows that there are 4.2 million home workers, equivalent to 13.9% of the workforce. Of these, 1.5 million are employed people, working within their own home or grounds, and 2.7 million use their home as a base but also work from other places (ONS, 2014). This figure is expected to rise due to the increase in the gig economy and the instability of work. Given that a sense of belongingness and social contacts are cornerstones of wellbeing, attention needs to be paid to those employees or workers who may be at risk of isolation. Particular attention may need to be paid to older workers; for those aged 16 to 24 the home working rate stood at 5.1%, compared with 13.9% for all workers; for those aged 65 and over, it was 38.3% (ONS, 2014).

Generational dynamics

The raising of the pension age in the UK means that many, especially women, will be working into later years. This will require productive relationships between workers of different ages, and structures to manage the fact that some older workers will move to less prestigious positions, because they are winding down in their careers, and others, with less life experience in the job, will be managing them.

Job conditions

Immature organisational approaches to health, safety and wellbeing

Taylor (2013, p.37) identified that “a raft of prescriptive measures have been introduced for when workers go sick, such as the ubiquitous ‘return to work’ interview (RWI), detailed reporting systems and home visits, accompanied by the widespread utilisation of metrics, absence scores and trigger points that alert managers to employees’ supposedly excessive absence.”

Measures of this kind (e.g. the Bradford Index) do not encourage people to be open about their health and they also encourage presenteeism. Such policies do not automatically aid the disabilities discrimination legislation either. Better methods are needed; instead of systems of calculation, active management by line managers who know their fellow workers is required (Collins & Cartwright, 2012).

An evolving psychological contract

A considerable number of the ‘Future of Work’ viewpoints seem to consider workers as ‘resources’, rather than people, which is probably why the counter-reports by ACAS, and the Trade Unions more widely, focus more on the ‘human’ model. The issue of worker loyalty and commitment is seldom mentioned, and there is a move towards the transactional rather than the relational contract (Grimmer & Oddy, 2007; Svensson & Wolvén, 2010).

The risks to health, safety and wellbeing at work

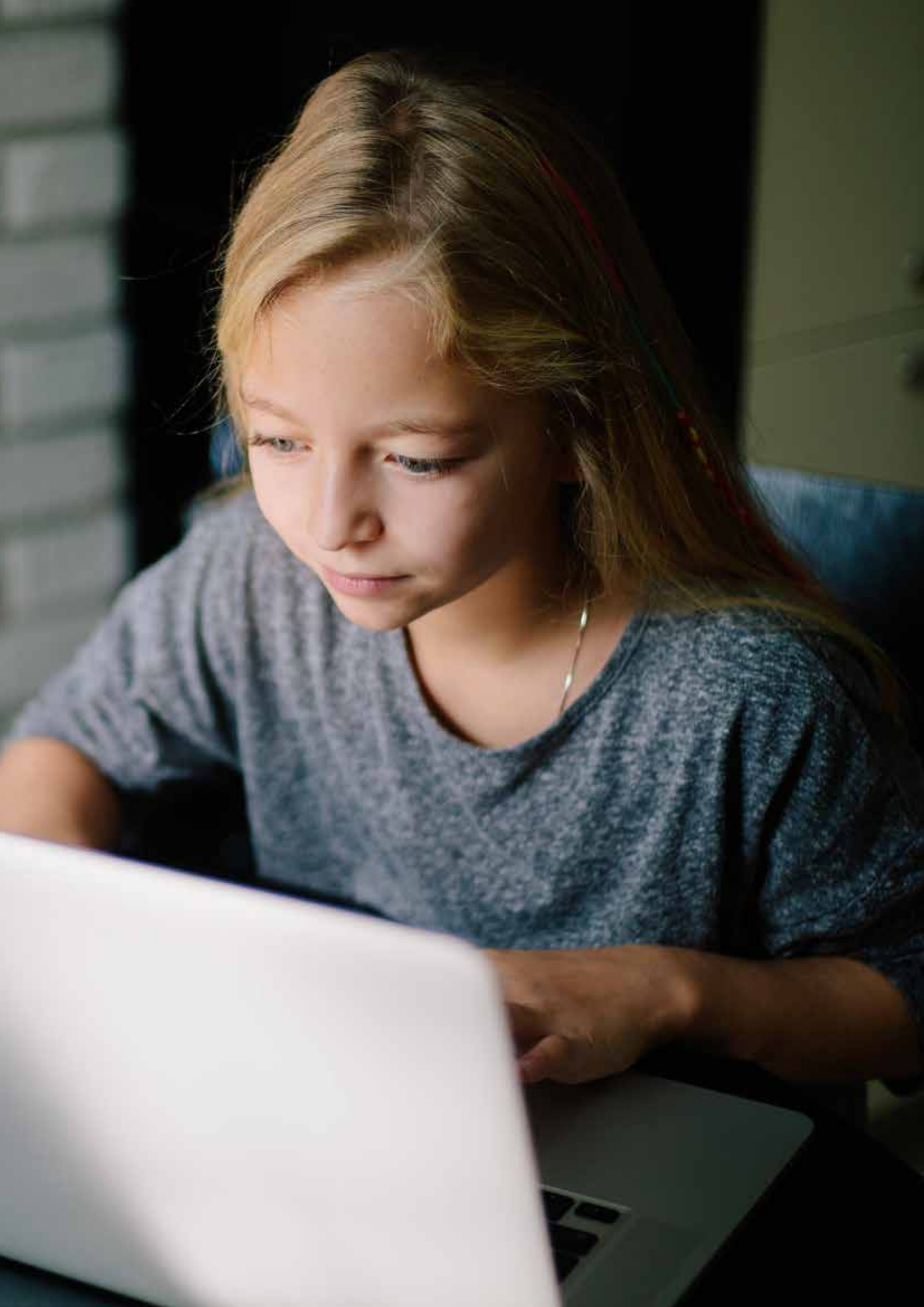
“A sense of belongingness is a cornerstone of wellbeing”

Ageing workforce and risks to physical health

Due to the changes to the retirement legislation and the raising of the pension age it is expected that people will be working for longer. There are physical changes that occur as we age; for example, bone density decreases, cardiovascular function and aerobic power reduces by up to 50%, there is a loss of lean muscle tissue and muscular strength, skeletal muscles become less flexible, level of stored water is reduced, and blood pressure rises. This leads to questions about physical safety in the workplace, depending on the type of work available.

New technologies and potential health concerns

The HSE has identified that for those working in conditions with nanotechnologies, there come uncertainties as to whether the unique properties of engineered nanomaterials pose an occupational health risk. Assessment of health risks arising from exposure to nanomaterials or other substances requires an understanding of the intrinsic toxicity of the substance, the levels of exposure (by inhalation, ingestion or through the skin) that may occur and any relationship between exposure and health effects. More data is needed on the health risks associated with exposure to engineered nanomaterials.



Mitigating risks

The previous section outlined the risks that future changes to work may pose for the physical and mental wellbeing of individuals in the workforce. This third and final section aims to provide a range of interventions to mitigate these risks.

“Legislation aimed at the rights of ‘gig’ workers could have a massive impact. However, a lack of a common definition for work in the digital economy may cause delay”

Legislation, regulation and strategy

Taylor (2017) calls for Government legislation, enforcement and strategy for quality work that is fair, decent and has realistic scope for development and fulfilment. The European Commission is currently considering two legislative measures on the protection of rights for those employed on short-term contracts, including the gig economy and zero hours contracts, which may affect the UK depending on how trading continues beyond 2019.

The first is the ‘Access to Social Security Initiative’, which looks to ensure similar social protection rights for similar work, regardless of how a person is employed, and the transferability of acquired social protection rights. The second is the ‘Written Statement Directive’, where all workers, irrespective of their employment status and contract type, are entitled to the same information in their contract of work, and that core labour standards are upheld.

This may include “the right to reference hours within which working hours may vary under very flexible contracts to allow some predictability of working time, the right to a contract with a minimum number of hours set at the average level of hours worked during a preceding period of a certain duration for very flexible contracts, the right to request a new form of employment (and the employer’s obligation to reply), the right to training, the right to a reasonable notice period in case of dismissal/early termination of contract, the right to adequate redress in case of unfair dismissal or unlawful termination of contract and, finally, the right to access to effective and impartial dispute resolution in case of dismissal and unfair treatment.” (Garben, 2017, p.5).

Clearly, this kind of legislation could have a massive effect on how organisations resource work and treat their employees and workers. It needs to be noted that the lack of common definitions of work in the ‘digital economy’ may cause some delay in implementing changes.

“Where co-bots are in use, things work better when the collaborative robots are reactive and not just forcing the pace”

The HSE (2016) emphasises the need for guidance, regulation and regulatory frameworks in relation to ICT developments. For example, with the safe development, roll-out and operation of robotic and autonomous systems, including driverless cars. They also point to the UK Government’s National Cyber Security Strategy to deter and defend against cyber-security threats.

Training and development

Developing skills and affinity with automation and co-bots

Research from 2008 indicates positive perceptions of working in collaboration with robotic/automated delivery agents (Takayama, Ju & Nass, 2008) and studies with those already working with robotic and collaborative robots (co-bots) would choose to continue to work in this way (Hollinger, 2016). For many automotive manufacturers safe practice has already been established for robotic processes, and co-bots in their plants.

For organisations not already using robotics or for those looking to extend their use, what is important to bear in mind? Where co-bots are in use, things work better when the collaborative robots are reactive, rather than just being worked around, or always forcing the pace or the action of the human worker (Lasota & Shah, 2015). Additionally, safety features that support both physical and psychological wellbeing are well-received (Nakhaeinia, Laferrière, Payeur & Laganière, 2015).

The more human-like the movements of the robot, the easier it is to work with, facilitating social acceptance by reducing the perceived stress by humans in human-robot co-existence (Zanchettin, Bascetta & Rocco, 2013). Perhaps paradoxically, care must be taken to avoid the ‘uncanny valley effect’: where the more ‘person-like’ a robot is, the more it causes feelings of discomfort when it behaves in a way that is non-human (Mori, MacDorman & Kageki, 2012). Guidance is available for reducing this effect in movement design and behaviour programming (Rosenthal-von der Pütten & Krämer, 2014).

Mitigating risks

“Younger workers may be *au fait* with the notion of self-care, but the concept needs to be promoted to build resilience for all”

Opportunities should also be created to involve the human team in the development of co-bots (Tsarouchi, Makris & Chryssolouris, 2016). Training and guidelines to help support the individuals working with co-bots are essential (Gombolay, Bair, Huang & Shah, 2017). This training could take place in a controlled, safe environment through the form of Immersive Virtual Reality training; for example, where the worker is removed from the assembly line to train with the co-bot via a headset and simulations (Matsas, Batras & Vosniakos, 2012).

Increased personal responsibility for wellbeing

As referenced in the introduction, a good deal of responsibility for general health, safety and wellbeing across the world is placed on the shoulders of employing organisations, and healthy and safe practices at work remain the responsibility of the employer. However, with the move to leaner permanent staffing, and greater reliance on temporary/on-line platform/gig workers, there is a shift to increasing individual responsibility for personal wellbeing.

Younger workers may already be *au fait* with the notion of self-care (Baruch and Bozionelos, 2011). However, wellbeing for older workers may need to be promoted by workplaces, especially for those over 40, who are likely to have entered the workforce before the ideas self-care and much shorter stays with employers began to become the norm (Lyons, Schweitzer, Ng & Kuron, 2012). There is increasing acceptance of the notion that everyone is going to need to be flexible, and willing to train and retrain across the lifespan.

Retention of older workers and continuous development across the lifespan

As healthier elders remain in the workforce, there is an extended view of talent management (Ariss, Cascio & Paauwe, 2014; McDonnell, Collings, Mellahi & Schuler, 2017) and a recognition of the need to retain older workers for competitive advantage (Gordon, 2018). Methods are needed to encourage workers to stay and add value, providing a sense of satisfaction for the individual. Support for continuous learning and development should be offered (Nikolova, Van Ruyseveldt, De Witte & Syroit, 2014), particularly in training a variety of cognitive skills (Borella, Carretti, Riboldi & De Beni, 2010; McEdwards, 2014).

“Support for continuous learning and development should be offered, particularly for developing cognitive skills”

Where individuals were once employed to perform physical tasks that are no longer safe, alternative forms of work should be offered. Increased opportunities for, and participation in, lifelong learning will be paramount (Taylor, 2017). Attention should also be paid to removing the stereotyping of both older and younger workers (Cox and Coulton, 2015; da Silva Oliveira, 2017), perhaps through well-managed integration of older and younger workers (Bal & De Lange, 2015).

Supporting remote workers

Remote working, which has been made possible by the revolutionary advances of ICT (see page 23), has multiple reported benefits for wellbeing. Remote workers report more favourable work-life balance (Fonner & Roloff, 2010; Madsen, 2003) and a greater ability to fulfil their dependent care responsibilities at home (Major, Verive & Joice, 2008). They also report less stress from interruptions while they are working (Fonner & Roloff, 2010), more job satisfaction (Kelliher & Anderson, 2010), and frequently have more flexibility and control over their daily schedules (Sardeshmukh, Sharma & Golden., 2012).

It may be that because of these positive benefits that their needs are often overlooked; the large research on successful remote working shows that individuals need more, and not less, formal support than those working from an office base. As Bentley, Teo, McLeod, Tan, Bousa & Gloet (2016) noted it is likely that the amount of informal training and support that occurs naturally in a fixed workplace is not realised. Greer and Payne (2014, p.89) give the following advice for remote workers: “Teleworkers need high quality reliable equipment to work, and online access to work materials, databases, and file stores; quick and effective communication systems with colleagues, and by implication good broadband connections. There is a need to help people to plan the activities that they will do whilst teleworking, to ensure their work role has boundaries. Ensuring individuals are not isolated and have social support is vital.”

Mitigating risks

“Cyber security training becomes more urgent as more teleworking occurs in public places”

The implication here for the future is that with an increase in remote workers – and especially remote temporary workers – provision will need to be made to ensure they are supported to be effective contributors. There are also indications that as teleworking takes staff to public places (such as coffee-shops), it becomes necessary to provide more training on cyber security. For example, in the use of closed WIFI for commercial communication, ensuring screens are not visible, and avoiding commercially sensitive telephone calls that might be overheard.

Harnessing technology: The internet of things (IoT) and wearable technology

Advances in technology can provide innovative ways to protect people at work (when balanced with regard to people's privacy needs). The HSE (2016) suggest that there is opportunity to enhance workplace productivity and health through the IoT – specifically, wearable technology. This includes common smart devices (such as glasses, watches, mobile phones); smart clothes (gloves, helmets and shoes) and tiny cameras and sensors embedded in contact lenses and temporary tattoos. By gathering and analysing real-time health data (such as heart rate or chemical exposure), risks and accidents such as falls, manual handling injuries, stress and fatigue can be anticipated and prevented. Additionally, devices can provide tutorials and prompts that contribute to improved workplace health and safety.

“ Most interventions failed to raise physical activity enough to have a discernible health benefit, although they may have a general wellbeing effect”

Increasing focus on the physical environment and impact on wellbeing

How might the physical space in which someone works contribute to their health, safety and wellbeing at work? Ideas for driving physical activity (Young, Davis, McNeill, Malhotra, Russell, Unsworth & Clegg, 2015) at work tend to be associated with plans around the use of ‘nudge’ as developed by Thaler & Sunstein (2008). In its most basic terms, this is about helping people to take care of their health, safety and wellbeing, by making the intended choice the best choice. For example, putting fruit, water and nuts at the checkout in cafeteria; making the stairs more accessible than the lift. There is some evidence for this approach (Marteau, Ogilvie, Roland, Suhrcke, Kelly, 2011), but it is not clear if such effects are sustained, or due to novelty. Malik, Blake & Suggs (2014) found that most interventions failed to raise activity enough to have a discernible health benefit, although they may have a general wellbeing effect.

For the remote worker, the employer has less influence over the choices they make on a daily basis.

Wearable tech, such as fitness trackers and pedometers, might offer a solution.

Bravata, Smith-Spangler, Sundaram, Gienger, Lin, Lewis & Siraid (2007) found a reduction in body mass index and blood pressure, at least initially, when staff were given a goal for number of steps per day. This needs to be balanced with the issues of confidentiality, personal privacy in the use of information from wearable technology (Damman, van der Beek & Timmermans, 2015).

Open plan work environments are commonplace and ubiquitous. However, research has found that they may be unhealthy spaces for both physical and psychological wellbeing. For example, such workplaces can be more subject to absenteeism due in part to the likely spread of communicable diseases (Pejtersen, Fèveile, Christensen & Burr, 2011). Kim and DeDear (2013) found that enclosed private offices out-performed open plan and the benefits of interaction were less than the costs of noise, lack of privacy and the proximity of others. Those in single offices, even if two or three people shared the area, were more conducive to work, without losing the contact advantages.

Davis, Leach and Clegg (2011) advise that all changes to office layout, and service delivery, be subject to proper evaluation when they are undertaken, and suggest that it is advisable to think carefully about the purpose of the space.

Conclusion

“In terms of recruitment, there is a very acute message that if we do not do something pretty quickly we’re not going to have a specialist occupational health workforce”

Professor John Harrison
Council for Work and Health

This report has synthesised the literature to produce a broad landscape of the possible future of work in the UK, with a specific lens on the impact these changes may have on the health, safety and wellbeing of the workforce. A report by the Council for Work and Health (2016) notes that there are insufficient trained professionals able to assist workplaces with these issues, and there will be too few for a considerable time going forward.

It will rest with organisations and employers to work with their people to ensure happy and healthy days at work; as such, the final section of this report suggested ways in which future risks might be tackled. Whilst there may be considerable challenges ahead, there is much that can be anticipated and done to make the future of work a tool for raising the health not only of individual workers, but of communities and society also.



**AUTONOMOUS
DRIVE**

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