THE FOURTH INDUSTRIAL REVOLUTION AND SOCIAL INNOVATION IN THE WORK PLACE

Introduction

The changing nature of work, the workforce and the workplace make social innovation and empowerment of the individual increasingly important for future occupational safety and health (OSH) regulations and governance. This will require a shift in focus from controlling organisations towards supporting individuals as they navigate an increasingly complex working environment across a longer working life. Megatrends — such as technological development, acceleration and complexity, network, society, globalisation, commercialisation and economic growth — are driving the fourth industrial revolution, which is rapidly transforming work and workplaces and the conditions under which social innovation will operate.

The current wave of automation — ubiquitous high-speed mobile internet, self-learning systems, data analytics, distributed ledger technologies (the technology behind bitcoin and blockchain), robotics and robotic process automation, and augmented and virtual reality, among others — is automating routine knowledge work and is pointing towards the transition to the innovative society. This society is characterised by the liberation of labour for work involving innovation, creativity, research, development and similar tasks that cannot yet easily be automated or put in formulas (CIFS, 2017b). The fourth industrial revolution and the emergence of the innovation society lead to a shortening of corporate lifespans and the emergence of new organisational and leadership forms. These changes will increase pressure on the population to reskill and upskill themselves on an ongoing basis and will increase pressure on employers to rethink and enable the motivation, engagement and well-being of their employees.

These developments will affect the workplace and social innovation and so the risks related to occupational safety and health (OSH). According to EU-OSHA (2012), OSH risks include increasing ergonomic risks due to the increase in online working in non-office environments, risks associated with new human-machine interfaces, cybersecurity risks due to an increase in the interconnectedness of things and people, and increasing numbers of workers treated as self-employed (EU-OSHA, 2018). According to a study by Frank Pot et al. (2012): '"social" innovation in the context of [the workplace] refers to non-technical innovations and emphasises good quality jobs and employee participation … Social Innovation assumes that people in need take the initiative to address social problems … Participation through work enables participation in society. Such participation is designed through the pr ocess of bottom up innovation' (Pot, 2012; Oeij, 2017). These topics are of growing concern for occupational safety and health as emphasised by the latest EU-OSHA study, *Foresight on new and emerging occupational safety and health risks associated digitalisation by 2025* (EU-OSHA, 2018).

Shortening of corporate lifespans and new organisation forms

Technology development is unleashing an accelerating pace of change on increasingly distributed work. Companies are combining these and other technologies to create new business models, develop new technology deployment strategies, and transform value creation, as companies harness technology to garner greater efficiencies and increased recyclability, enter new markets, and compete for increasingly digitally competent consumers and workers (World Economic Forum, 2018). At the same time, companies are also rethinking their human resources strategies (increasing their use of outsourcing, offshoring and new partnering models) and deploying platform-based solutions (CIFS and ISS, 2012). It is also changing the nature of competition. Important OSH risks related to increased online work include how online workers tend to work alone. This increases the risk of both pre-existing and new OSH risks, both physical and psycho-social, including visual fatigue and musculoskeletal problems as well as risks of isolation, stress, information overload, burn-out, cyberbullying and insecurity due to uncertain payment and blurring of work-life boundaries (EU-OSHA, 2017).

To weather the changes, organisations are developing resiliency as well as making greater use of non-routine work practices, anticipatory processes, flexibility, agility and organisational modularity, and they are transferring more fixed costs to variable costs. For example, organisations make greater use of consultants and contract workers than regular employees, outsource non-core tasks, and rent instead of owning facilities (CIFS, 2016a). This development still needs further assessment, regulation and intervention in an OH context, as OSH regulations and unions often do not protect freelance workers and contingent workers. This is because the basic OSH regulation is based on employees and employers, and either does not or cannot cover these workers unless reforms are made (EU-OSHA, 2018).

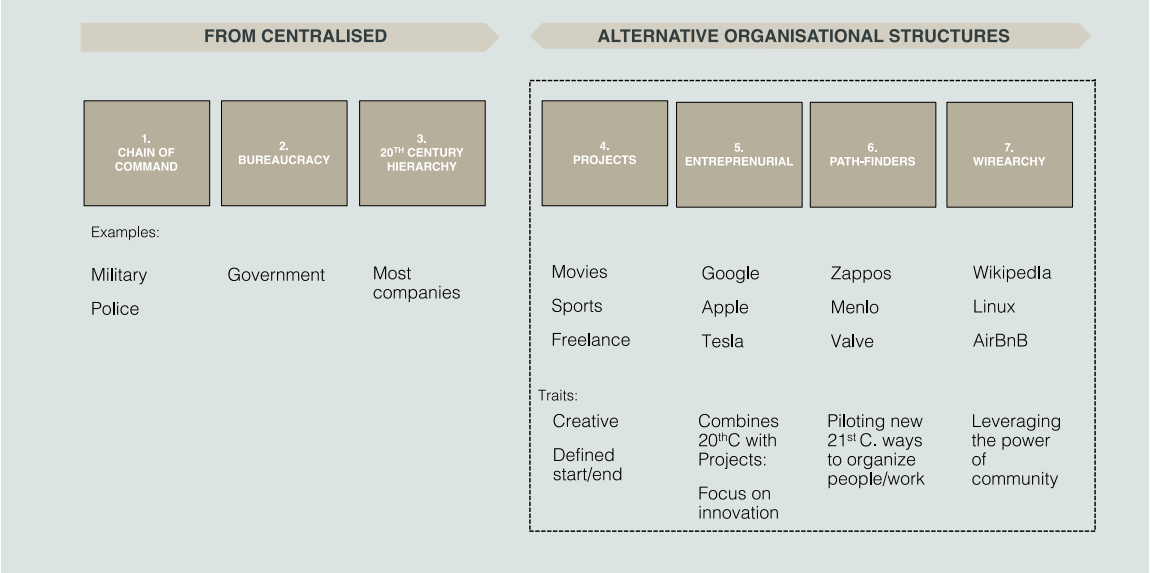
Governments, OSH organisations and unions will need to better assist individuals during this transition by focusing on upskilling and reskilling people to adopt and adapt to technology as well as to learn how to collaborate with technology (use new devices and interact with AI bots, for example) and with other people. The World Economic Forum estimates that: 'by 2022, no less than 54 % of all employees will require significant re- and upskilling. Of these, about 35 % are expected to require additional training of up to six months, 9 % will require rTeskilling lasting six to 12 months, while 10 % will require additional skills training of more than a year' (World Economic Forum, 2018). This task will be challenging because of the accelerating pace of change, which may demand continuous upskilling (World Bank, 2018), and because government-sponsored job reskilling programmes are often ineffective, either failing to deliver as promised (Selingo, 2018) or failing to target those who are most in need (Kinder, 2018).

Individuals will also have to develop the ability to adapt, change and prosper in a complex world. Individual resilience is the ability to recover from and adjust to misfortune and to align with others to create positive change. The resilient mindset helps individuals deal with the challenges in their professional and personal lives by managing personal struggle, coping with future changes with minimum losses, remaining optimistic, finding opportunities, and developing the skills needed to survive and prosper. In the resilient mindset, shocks and misfortunes are opportunities for positive adaptation and benefit (CIFS, 2016a). These could cause stress and anxiety for workers due to increased pressure, and the need to conform or have the ability to perform well enough to meet societal and organisational expectations. OSH organisations will have to shift focus and develop mechanisms for preparing and assisting individuals for a much more dynamic work life (EU-OSHA, 2018).

As technology development and an accelerating pace of change continue to erode organisational barriers and create a network society, organisations and workers are becoming more mobile and empowered, while some workers are becoming precarious (see the box below on **'**Proficians' and 'precariats'). New organisational forms and leadership formats are emerging to accommodate both online work and non-routine work, and to integrate different forms of expertise through increased use of networking and interpersonal meetings. This is leading to flatter, more open and more agile organisational structures. The impact of these developments on OSH will be mixed. On the one hand, agile structures could enable empowered workers to engage in social innovation by improving the opportunities to participate in more diverse teams and new projects, and by improving learning opportunities for employees. On the other hand, the emergence of alternative organisational structures could diminish opportunities for formal on-the-job training and could further the development of increased unpaid internships in the hope of developing better competences better competence development.

The Copenhagen Institute for Futures Studies (CIFS) created a taxonomy of organisations looking ahead to 2030 (see Figure 1). This taxonomy places organisational structures on a continuum, starting with more hierarchical command and control organisations on the left and continuing on to digital and distributed wirearchy organisations on the right. As we move from left to right, organisations become flatter and more reliant upon innovative and collaborative cultures to succeed. These different organisational structures either already exist in today's business landscape or are emerging as viable options (CIFS, 2017a).

Figure 1 Taxonomy of organisational structures



Hierarchical organisations tend to be slow to adapt and are often ill-suited to deal with increasingly dynamic competition. This provides opportunities for alternative structures — which are based on dynamic flows of power, trust, information and authority among coordinators and staff and which are enabled by interconnected technologies and people — to outcompete their more hierarchical rivals, as alternative organisational structures can scale quickly up or down (CIFS, 2017a). New business models — especially wirearchy firms — can evolve rapidly from a start-up to a global behemoth, in terms of revenues, profits and market share, often with relatively few employees or tangible assets (World Bank, 2018).

An example of a new type of organisation form is the project-based organisation. This organisation form is attractive to many companies, as it increases agility. The project-based organisation often does not offer much in the way of on-the-job training: employees are expected to show up with the required skills and experience. This makes it difficult for newcomers to break into an industry, as they cannot document any experience in the field. As a result, many newcomers work as unpaid interns to get the necessary documented experience, in the hope of getting paid employment later. Employers, therefore, begin to expect that they can draw on a reserve of unpaid, skilled workers, which reduces the need to hire paid employees for many tasks.

This, along with the emergence of the platform economy, is polarising the future labour market between two classes of workers – the 'proficians' and the 'precariats' (Standing, 2011). The proficians have the mindsets and tools necessary to adapt to changes in the economy and even develop products and services to challenge established organisation (McKinsey Global Institute , 2018), while the precariat class of workers will have little hope of long-term employment or financial security (Standing, 2011). The precariat class of workers will include not only low-skilled workers, but also well-educated and highly skilled workers, who still face an uncertain future (CIFS, 2017b). For further information, please see the text box.

At the same time, value chains are being replaced by value networks, where customers, suppliers, partners, competitors, volunteers and freelancers all contribute to innovation. These complementing interests form competitive ecosystems that span geographies, organisations, industries and time. Increasingly, we see geographical barriers eroding because of urbanisation, digitisation, faster transportation, and the deliberate mixing of different functions in innovation hubs such as Silicon Valley and in co-working hubs such as WeWork that provide shared workspace, community and services for freelancers, start-ups and small businesses (CIFS, 2017b).

These new organisations and value creation networks, however, pose policy questions in the areas of employment, privacy, competition and taxation, to ensure a well-functioning social contract, where workers can access stable wage employment, social safety nets, educational opportunities as needed, as well as being able to maintain a competitive economy (World Bank, 2018). These regulations will have to expand to include new organisational structures and employment practices. This will require new thinking when it comes to OSH regulation and governance at national and EU levels. OSH should increasingly shift its focus from regulating and controlling organisations towards supporting individuals (advice on ergonomics, dealing with social exclusion, etc.) across the range of organisations and networks that they will be working in throughout their working lives. For example, OSH regulators will be challenged to support workers who work in an increasing number of non-workplace situations with small organisations that may not have operations in the European Union other than the support offered by a European freelance worker.

'Proficians' and 'precariats'

In a recent McKinsey Global Institute study, 20-30% of the working-age population in the United States and the 15 pre-2004 Member States of the EU, up to 162 million individuals, engaged in the freelance economy, a figure that could grow to 50% by 2030 in some economies. The McKinsey study finds that independent workers largely fit into four segments (the proficians constituting the first two, the precariats the last two):

- *free agents*, who actively choose independent work and derive their primary income from it;
- *casual earners*, who use independent work for supplemental income and do so by choice;
- *reluctants*, who make their primary living from independent work but would prefer traditional jobs;
- *the financially strapped*, who do supplemental independent work out of necessity (Manyika et al., 2016).

The future of the workforce — implications for social innovation and OSH

The implications of changes to the future workforce will have profound effects on social inclusion and innovation. Social innovation is dependent upon workers feeling empowered to participate in creating betterment in a workplace context (Oeij, 2017). Social innovation in the workplace is challenged by the lack of engagement and sense of fulfilment derived from work. A significant number of workers are disengaged and/or feel that their work does not provide them with a sense of purpose or meaning. According to a YouGov poll of the British people in 2015, 37 % of people did not think that their jobs made a meaningful contribution to the world. In the Netherlands, 40 % of respondents believed their jobs had no reason to exist (Heller, 2018).

Along with a general sense of malaise about the meaning of work in workers' lives, technology is changing not only how workers will be selected, but also the social elements of work. Organisations are developing and improving artificial intelligence (AI) tools for assessing employee applications, to ensure that a more diverse labour pool can be tapped by employers (CIFS and ISS, 2016). Workers will also need to be prepared to work with AI systems as much as they will need to work with other employees (Lohr, 2018). This development will pose new OSH challenges in terms of new interface challenges, as well as cognitive stresses and loads.

New ways of organising and ensuring workers' well-being will have to be developed for the growing number of freelance and contingent workers. Researchers noted that the workers who were most successful in freelance work developed four coping strategies to help them navigate the ups and downs associated with freelance economy work. These coping strategies were to develop a connection to place, maintain routines, establish a sense of purpose and sustain a connection to people (Petriglieri et al., 2018). OSH organisations need to identify ways to address and support these needs among this growing element of the workforce.

Ageing will remain a key challenge. Government, pension and OSH regulations will need to develop new ways to ensure that older workers can work as long as they want to. This will become

increasingly important in rapidly ageing economies — Japan, Germany, Italy and Spain, for example. As Professor Lynda Gratton of the London Business School points out, the future of work is changing, and careers have become 'more fluid, flexible and multi-staged'. Employers will need to change the lenses through which they perceive older workers, and workers will need to reassess their career trajectories (Pillany, 2018).

On a structural level, legislative and related regulatory frameworks should make it easy and attractive for older workers to continue working in the labour market after the retirement age if they would like. Options include flexible retirement plans that could provide seniors who have reached the statutory retirement age the possibility of being part-time employees and part-time retirees, who can draw on part of their pensions, according to their wishes and needs (CIFS and PFA, 2018). Organisations will have to shift their focus on talent away from a bias towards younger workers to recognising the valuable contribution that older workers can provide. OSH will increasingly need to target its innovation towards the needs of older workers in the workplace.

The future of workplace — implications for social innovation and OSH

The workplace used to be a place where people came to work. As a result of digital technologies, most employees can now work from anywhere at any time. This development has now also become a potential tool to drive behavioural and cultural change among employees to better achieve an organisation's goals. As a result, the workplace's role in driving innovation, well-being and inclusion is becoming recognised and promoted. New technologies are enabling the workplace to deliver these goals — the question will then become how far we are willing to let organisations go in their ability to monitor and intervene in the daily lives of their workers.

As work patterns and processes change, the role that the workplace plays in value creation and how it is defined, designed, operated and utilised will continually change over the coming decades (Jaspers, 2017). Work is becoming increasingly distributed across geographies and time zones, and the need to come to a centralised place to achieve the tasks one needs to accomplish is declining — especially for office workers. Office workers can work at the office or at home, the airport, a café, a co-working location, etc. Workers now work from all over the place and take the workplace with them (CIFS, 2017b).

Organisations are increasingly adopting a work now strategy. A work now strategy recognises that employees can work from anywhere and need to be supported across a diverse range of work settings. For some organisations, especially wirearchy-based ones, the physical workplace has stopped being a central element of their work now strategy. This change will need to be increasingly reflected in OSH regulations.

An example of a company taking such a distributed, networked approach is Automattic Inc., which runs web-services WordPress, WooCommerce, Jetpack, and more. As of November 2018, the company had 717 employees, called Automatticians, in 54 countries, speaking 77 different languages, and working from their homes or from other locations. Automattic Inc. no longer has a headquarters because, on average, fewer than three employees came to the office (CIFS, 2017a). Project management, brainstorming and water-cooler chat take place online. The company created a collaborative culture, using WordPress.com as its digital hub (Berkun, 2013).

However, for many organisations, the workplace is becoming the tool and location for fostering and reinforcing an organisational culture and for driving innovation. They are turning their workplaces into locations that attract workers to them. The workplace is therefore becoming a place for socialising and informal knowledge sharing, where the exchange of information may not be directly connected to the task at hand but still is of immense value (CIFS, 2017a; Saunders, 2018). However, this also puts workers at risk when work-life boundaries are increasingly blurred, which could lead to stress for some workers who are not able to cope with this change.

The workplace as an experience and its role in innovation

As the role of the workplace shifts towards an experience that attracts workers to its location, there are several challenges that need to be overcome, and opportunities that need to be seized. Many workers find that their workplaces do not support the way they need to work and that they are noisy. New technologies, user-centric data analytics and alternative approaches to workplace management are allowing workplaces to develop user-centric workplace design and management that are fit for purpose.

Many workplaces — especially open-plan offices — perform poorly. According to Leesman's database, only 67 % of respondents report that their workplace enables them to work productively, with OSH consequences such as constant distractions and stress, which means that there is significant room for improvement (Oldman and Rothe, 2017). Despite the belief among many companies that large, open-plan workspaces help collaboration, unless relevant team members are near each other, they behave as if their colleagues are in another country. If the organisation has been more focused on cost-cutting than on investment in performance, research has shown that putting workers too close together can cause them to 'clam up, as if being stuck in a lift together'. Open-plan offices tend to be a one-size-fits-all model that fulfils no one's needs (Knapton, 2017).

There has been an increasing focus on improving employee experiences due to an increasing desire to promote belongingness and a sense of a strong organisational culture (Turnbull and Redlein, 2017). The workplace has become a place where mobile employees can learn, seek inspiration and work passionately to develop solutions to increasingly complex problems. The employee experience is the user journey of all the interactions an employee has with an organisation. It starts when people first find and apply for a job, and ends when they leave and includes everything in between (CIFS and ISS, 2017).

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