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Foresight on new and emerging occupational safety and health risks associated with digitalisation by 2025

1 Introduction

A connected Digital Single Market (DSM) has been made one of the European Commission's key priorities (EC, 2015). Digitalisation, including ICT-enabled technologies (ICT-ETs) such as robotics and artificial intelligence (AI), are likely to have major impacts on the nature and location of work over the next 10 years. Technologies are diffusing much faster than in the past and many people are talking about a 'Fourth Industrial Revolution'. It is expected to fundamentally change where we work, how we work, who will work and how people will perceive work.

Current European Community strategic documents (EC, 2014; EC, 2017) identify the need for a proactive approach to identifying future risks to workers' safety and health in a continuously changing world of work. The European Agency for Safety and Health at Work (EU-OSHA) looks out for challenges to occupational safety and health (OSH) that are emerging as a result of changes in the workplace in order to better anticipate them and shape healthier and safer workplaces of the future. This report summarises EU-OSHA's project 'Foresight on new and emerging risks associated with information and communication technologies by 2025' (EU-OSHA, 2018).

The basis of foresight is an understanding that the future can evolve in different directions, which can be shaped by the actions of various stakeholders and decisions taken today.

This project aimed to provide EU decision-makers, Member State governments, trade unions and employers with the information they need on changes in relation to digitalisation and ICT-ETs, their impact on work, and the emerging challenges to OSH that they may bring.

2 OSH implications

The trends and drivers indicate that by 2025 ICT-ETs will have changed the equipment, tools and systems that can be used to organise, manage and deliver products and/or services across most occupational sectors. Developments include continuing advances in the automation of work processes that become increasingly complex, interconnected and autonomous in that they self-organise, self-learn and self-maintain. 3D and 4D printing and bio-printing, autonomous vehicles (including drones), robotics (including collaborative robotics), algorithms, Artificial Intelligence (AI), virtual reality (VR) and augmented reality (AR) will increasingly be used for work purposes, and innovation in these technologies will continue. Robots will become uncaged, mobile, dexterous, close to workers, collaborative and increasingly intelligent, bringing automation to previously inaccessible tasks. Even jobs that are not replaced by robots will change considerably, as workers will work with, use and interact with a wide range of digital technologies. There is also a clear trend towards the miniaturisation of ICT-ETs, which are increasingly 'smart' and connected to the internet (referred to as 'the Internet of Things' — IoT). These, along with bionics or exoskeletons, will be worn to enhance or monitor human performance, generating considerable amounts of data. There will be ongoing development in human-machine interfaces that allow humans to interface with machines and one another remotely via ICT-ETs in ways that are much more similar to how humans interact face to face. The trends indicate that by 2025 direct brain-to-machine interfacing may have begun to emerge but will not be particularly widespread.

The extent of innovation in and adoption of the ICT-ETs described above and their impact on OSH will depend on the social, economic, environmental and political trends and drivers that exist between now and 2025.

3 OSH challenges and opportunities that could emerge as ICT-ETs change

3.1 Work equipment, tools and systems

Workstation ergonomics: mobile ICT-ETs allow people to work anywhere. Hand-held mobile devices are not ergonomically suitable for use for long durations and can cause injury to the upper limbs, neck and back. Homes, public places or transport may not be ergonomically suitable for work purposes either. It is not possible for employers to control such environments and how people work in them. Interfacing by gesture, voice or eye could improve ergonomics and also make work more accessible to a wider range of people with certain physical impairments or who do not have the skills to use today's devices. However, more frequent use of gestures, the voice or the eyes for this purpose may result in overloading certain body parts, which could lead to new types of and/or an increase in health disorders such as eye and voice strain. Such interfaces may also involve the use of head- or handsets, potentially leading to musculoskeletal disorders (MSDs).

3.2 Organisation and management of work

Flexibility, availability and blurring of work/private life boundaries: ICT-ETs can allow people to work any time and anywhere. This could lead to a blurring between people's work and private life in terms of both their activities and their safety and health, including a negative impact on mental health and well-being. ICT-ETs' ability to enable working at any time could lead to a real or perceived need to be available all day every day (24/7). For example, people may need to work with colleagues in a different time zone. There are also concerns that people may suffer from addiction to the use of mobile devices and wearables such that the user suffers from severe anxiety if separated from the device or if it stops working — also referred to as digital addiction, separation anxiety, fear-of-missing-out syndrome and nomophobia. This could increase as such devices become more widespread, advanced and necessary for work or life in general. Availability 24/7 could have similar OSH impacts to shift working, such as cancer, particularly when people work nights (IARC, 2007), diabetes and

cardiovascular disease (Research EU Results Magazine, 2017). Some workers may consider being seen to be available 24/7 a sign of being successful but nonetheless suffer from ill health, stress and/or burnout as a result.

3.3 Business structures, hierarchies and relationships

Lone working: lone working could increase as human peers are replaced by ICT-ETs. Dehumanisation of work and relationships will make jobs less satisfying as the human/social aspects are lost and tasks become less varied. Doctors and nurses will lose contact with patients with the introduction of care robots, diagnostic robots and surgery robots. Even in the service and public sectors, service robots are expected to take over tasks involving contact with customers. As ICT-ETs enable many jobs to be done remotely, people could increasingly work alone without anyone knowing or being able to assist when they have an accident or suffer the sudden onset of a serious health problem. Lone workers in public places and delivery drivers could also be vulnerable to physical violence or verbal abuse from third parties. However, ICT-ETs can be used to reduce risk, for example wearable devices can monitor vital signs and GPS location and be used to communicate with the emergency services if needed.

3.4 Workforce characteristics

Extended working life: ICT-ETs could enable workers to retire at a much older age as the use of autonomous vehicles, bionics and exoskeletons, or on-line platform work enable an ageing population to continue to work. This could mean that they may be exposed to work-related risks for much longer. This could increase the probability of their developing the type of health problems that are caused by cumulative exposure to these types of hazards. In addition, although older workers tend to have fewer accidents, their injuries are often more severe.

3.5 Skills, knowledge and information

New skills and training needs: workers, as well as needing to know how to use the technology, will need to have the relevant skills for the new ways of working that ICT-ETs bring. Workers are likely to need to be self-reliant, flexible, adaptable, resilient to changing jobs frequently, culturally sensitive and competent to work across multiple disciplines. Furthermore, they are likely to need to have interpersonal skills suitable for collaborating virtually, and to have the necessary skills to manage their workloads in a way that is healthy and safe. The approach to education and training may, therefore, need to be different, less academic and fact-based and more about developing personal skills and how to learn, exchange knowledge and cope with change.