IMPACT OF ARTIFICIAL INTELLIGENCE ON OCCUPATIONAL SAFETY AND HEALTH[1]

Artificial intelligence applications in the workplace

Artificial intelligence (AI) offers the potential for innovative and exciting developments in the workplace through the increasing availability of data and big data and the capacity to process data through algorithms, leading to widespread and profound changes in how work is done. AI is used in a range of applications and tools for assisted work and data analytics, allowing the automation of increasingly complex tasks, as well as automated or semi-automated workplace decision-making and management. The applications of AI in working processes range from cobots[2], wearable technologies and assistive tablets on production assembly lines, chatbots in factories, warehouses and call centres, and smart personal protective equipment (PPE), to algorithmic processes in human resource (HR) applications such as people analytics[3] and 'gamification'[4]. AI may create opportunities but also new challenges for occupational safety and health (OSH), its management and regulation. Most of the discussion around AI is about the quantity of jobs, but it should also be about job quality, and OSH is a key aspect of this.

AI in automation of tasks and occupational safety and health

Robots embedding AI are becoming mobile, smart and collaborative. Their use removes workers from hazardous situations and the quality of work is improved by handing repetitive tasks to fast, accurate and tireless machines. Cobots can also facilitate access to work for many people (ageing workers or with disabilities) and collaborate with human workers in a shared workspace.

However, cobots' increased mobility and decision-making autonomy, based on self-learning algorithms, could make their actions less predictable for the workers collaborating with them. This may result in an increased risk of accidents through collision or arising from the equipment used by cobots. Over-reliance on technology could also lead to deskilling and safety risks. As cobots are connected to the internet of things, there are cybersecurity issues and associated risks of functional safety. Workers having to keep up with a cobot's pace and level of work may be put under pressure to achieve the same level of productivity. Increased working with robots may also significantly reduce contact with human peers and social support. This may have negative impacts on workers' safety and health, particularly their mental health.

With the increasing use of AI, automated systems are now able to carry out not only physical tasks but also a variety of cognitive tasks, such as driving autonomously or assisting with, for example, legal casework or medical diagnoses. The use of AI-based systems is, therefore, anticipated in many different sectors and settings, from manufacturing and agriculture to the care sector, hospitality, and transport and services, including customer-facing jobs. As the content of these jobs and the tasks to be performed will change, new challenges for OSH may arise.

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[1] Based on EU-OSHA's research on the impact of digitalisation on OSH (see https://osha.europa.eu/en/emerging-risks/developments-ict-and-digitalisation-work), in particular:
EU-OSHA, 2018, *Foresight on new and emerging occupational safety and health risks associated with digitalisation by 2025* (https://osha.europa.eu/en/publications/foresight-new-and-emerging-occupational-safety-and-health-risks-associated/view);
EU-OSHA, 2019, *OSH and the future of work: benefits and risks of artificial intelligence tools in workplaces* (https://osha.europa.eu/en/publications/osh-and-future-work-benefits-and-risks-artificial-intelligence-tools-workplaces/view);
EU-OSHA, 2019, *The future role of big data and machine learning in health and safety inspection efficiency* https://osha.europa.eu/en/publications/future-role-big-data-and-machine-learning-health-and-safety-inspection-efficiency/view);
EU-OSHA, 2020, *Smart personal protective equipment: intelligent protection for the future* (https://osha.europa.eu/en/publications/smart-personal-protective-equipment-intelligent-protection-future/view).

[2] A cobot or co-robot (of collaborative robot) is a robot that has been designed with the aim of having physical (and social) interaction with people in a shared work environment.' Jansen, A. et al., 2018, *Emergent risks to workplace safety; working in the same space as a cobot*, TNO Report R10742.

[3] The use of big data and digital tools to 'measure, report and understand employee performance, aspects of workforce planning, talent management and operational management'. Collins, L. et al., 2017, *People analytics: recalculating the route*, Deloitte Insights.

[4] The use of game mechanics and game thinking to engage workers.

For example, automation of tasks can be associated with more sedentary work and with less variation of tasks, with workers being left with repetitive work. Automation of tasks can result in cognitive underload and boredom, in performance pressure and intensification of work and certain risk factors, such as isolation and lack of interaction with peers, and can have a negative impact on teamwork, all of which are known psychosocial risks.

AI for managing and monitoring workers

AI has also facilitated the emergence of new forms of monitoring and managing workers. Digital, AI-based technologies allow for new, widespread, continuous and lower cost forms of worker monitoring and management based on the collection of large amounts of real-time data on workers. These data may be collected during and outside working hours and in a variety of workplaces as well as outside the workplace, and sometimes beyond what is strictly necessary or legal.

Data can be collected about workers through mobile devices, wearable or embedded monitoring devices (in clothes, PPE, or even on the body). They include keyboard clicks, the content of emails, websites visited, number and content of telephone calls, information from social media, locations through GPS tracking, body movements, vital signs, indicators of stress and fatigue, micro-facial expressions, tone of voice and sentiment analysis.

The data collected are used to inform management and make automated or semi-automated decisions based on algorithms or more advanced forms of AI. This may allow employers to increase control over their workers and the workplace, incorporate rating systems or other metrics into performance evaluation, improve workers' performance and productivity, rationalise the organisation of work and production, reduce the cost of monitoring and surveillance, profile workers, influence their behaviours, discipline them or improve HR management. In that context, novel fields emerge, such as people analytics and gamification.

These novel forms of monitoring and managing workers may give rise to legal, regulatory and ethical questions, as well as concerns for OSH, in particular for workers' mental health. Indeed, they may result in workers losing control over their jobs and to increased micromanagement, performance pressure, competitiveness, individualisation and social isolation. Workers may feel that their privacy is being invaded, also a source of anxiety and stress. They may be unable to take breaks when they need to, which may cause accidents and health issues such as musculoskeletal disorders and cardiovascular diseases.

Unstable work schedules, such as the short-term schedules established automatically by algorithms, have a variety of negative impacts on workers, including increased work–family conflict and work stress and income uncertainty. The use of workers' data to reward or penalise them could lead to job insecurity and stress. As the key operational components of AI-based forms of managing workers often comprise a 'black box', workers and their representatives may lack information on and power over strategies adopted and decisions made.

An opportunity to improve workers' safety and health

New forms of AI-based monitoring of workers may also provide an opportunity to improve OSH surveillance, reduce exposure to various risk factors, including harassment and violence, and provide early warnings of stress, health problems and fatigue. Real-time advice tailored to the individual can influence workers' behaviour and improve safety and health. AI-based monitoring could support evidence-based prevention, advanced workplace risk assessment and more efficient, risk-based, targeted OSH inspections. Information could be used by organisations to identify OSH issues, including psychosocial risks, and where OSH interventions are required at organisational level.

But ethical decisions and effective strategies and systems are needed for handling the large quantity of sensitive personal data that can be generated. Adequate legal provisions giving national labour inspectorates access to anonymised data could, provide an opportunity for evidence-based prevention and policy-making. The need to collect data about workers should be balanced against the rights of workers to privacy and their safety and health. It is important to ensure transparency in collecting and using such data, and workers and their representatives should be empowered through the same access to information.

Since 2016, the European Agency for Safety and Health at Work (EU-OSHA) has been undertaking extensive foresight research on digitalisation and OSH. From 2020, an EU-OSHA 'OSH overview' builds on this foresight work to provide further information for policy, prevention and practice on the challenges and opportunities for OSH as a result of digitalisation. An EU-wide Healthy Workplaces Campaign to be launched in 2023 will also be dedicated to digitalisation and OSH. More practical resources will be published on EU-OSHA's website as part of this campaign.