

Anticipating and managing the impact of change
Ethics in the digital workplace



Ethics in the digital workplace



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Introduction

Background and scope of the report

The use of technologies associated with digitisation and automation processes – such as the internet of things (IoT), advanced robotics and artificial intelligence (AI) – can bring fundamental changes to work organisation and may have profound implications for working conditions and employment relations. Previous research has shown that digital technologies can contribute positively to the work environment by ensuring safer and healthier working conditions and improving the efficiency of work processes (Eurofound, 2020a, 2021a). In the context of the COVID-19 pandemic, cutting-edge digital technologies have also helped to mitigate health risks and increase workplace safety (Eurofound, 2020b). While digital technologies create new opportunities, they also raise ethical concerns due to their ubiquity and pervasiveness; for example, they can enable more intrusive managerial control and monitoring practices (Eurofound, 2020c, 2021b; Ball, 2021).

The ethical implications of the use of digital technologies in the workplace are frequently discussed in relation to data protection and privacy, but there are many other fundamental human rights at stake in an increasingly interconnected and digital work environment. These include the rights to non-discrimination, human dignity and integrity, freedom of association and collective bargaining (FRA, 2020). Although many of these rights are enshrined in legislation, the rapid pace of technological change makes enforcing that legislation more challenging.

Although ethical issues have legal ramifications, the ethical implications of digital technologies are not limited to compliance or legal issues. Depending on how they are implemented in the workplace, digital technologies can have wide-ranging implications for working conditions. They can either augment or compromise human involvement and capacities at work, in terms of work autonomy and personal development. They can contribute to more meaningful job profiles by eliminating menial or repetitive tasks and freeing up time for more stimulating work or reduce humans to passive recipients of instructions given by machines. Far from being pre-determined, these outcomes emanate largely from managerial decisions and practices.

At EU level, the policy debate on ethical concerns arising from digitalisation has become more prominent in recent years and has increasingly focused on AI. In 2018, in response to a request from the European Council

(European Council, 2017), the European Commission put forward a European strategy on AI and published the communication *Coordinated plan on artificial intelligence*, encouraging EU Member States to develop their national AI strategies (European Commission, 2018a). In relation to ethical concerns of AI, the European Commission also set up a high-level expert group on AI (AI HLEG) in the same year. It established a working definition of AI and subsequently produced *Ethics guidelines for trustworthy AI*. These guidelines set out the ethical implications arising from the use of AI and outline seven key requirements – firmly grounded in fundamental rights and democratic values – that AI systems should meet to be determined as trustworthy. These are human agency and oversight; technical robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being; and accountability. Although the guidelines are non-binding, they are a starting point for the development of EU regulation of AI.

In 2021, the European Commission proposed new draft legislation on the supply and use of AI which sets out a regulatory framework that bans some uses of AI considered unacceptable, heavily regulates high-risk uses and lightly regulates AI systems involving limited or minimal risks (European Commission, 2021). High-risk AI would, for example, include systems assisting with recruitment and work management and those using biometric identification. According to the draft rules, the onus is on the providers of high-risk AI systems to fulfil a set of obligations, for example to provide clear and transparent information about how the system works, allowing for human oversight and ensuring that high-quality datasets are used.

European social partners have also actively engaged in the debate on the ethical implications of the use of AI in the workplace and digitalisation of work more generally. European trade union confederations, including UNI Global Union and the European Trade Union Confederation (ETUC), were among the first to voice concerns. In 2016, UNI Global Union issued its *Top 10 principles for ethical artificial intelligence*, which outlines concrete demands to ensure AI systems are fully transparent and stresses the importance of worker participation in the implementation, development and deployment of such systems. More recently, during the COVID-19 pandemic, UNI Global Union raised concerns in relation to the increasing use of AI-enabled webcams and systems for monitoring call centre staff working from home during the pandemic (Hoffman and Burrow, 2020; The Guardian, 2021a). ETUC is equally vocal about digital surveillance, which, when used without workers'

knowledge and consent, ‘breaches EU privacy law and basic democratic EU values and principles’ (ETUC, 2021). The ETUC *Resolution on the European strategies on artificial intelligence and data*, which was adopted in July 2020, calls for ‘a legal and empowering European framework based on human rights, and therefore including labour and trade union rights and ethical rules’ (ETUC, 2020).

In June 2020, the European social partners – ETUC, BusinessEurope, CEEP and SMEunited – signed a framework agreement on digitalisation to deal with the challenges of digital technologies in the workplace. It reiterates the importance of the ‘human in control’ principle and respect for human dignity in the context of digitalisation and use of AI systems in the workplace.

Although many ethical concerns are widely discussed in policy and scholarly debates on digitalisation, particularly in relation to AI, there is no consensus on which concerns warrant more attention in policymaking. Drawing on a range of sources, this report provides policymakers with timely information – grounded in evidence-based research – that may increase understanding of the ethical implications of digital technologies and impact on fundamental rights in terms of work and employment. It offers a snapshot of the most debated ethical concerns and of policy initiatives addressing such challenges. Notwithstanding the importance of investing in new technologies and digital innovation, this report draws attention to the importance of European and national policies that ensure that new digital technologies are implemented in the workplace in an ethical way, respecting human dignity and fundamental rights, and without compromising job quality.

Key concepts and definitions

Ethical implications

For the purpose of this report, the ethical implications arising from the use of digital technologies in the workplace refers to the use of digital technologies having an impact on working conditions and fundamental rights. The latter include, for example, the rights to data protection and privacy, human dignity, non-discrimination, freedom of association and collective bargaining. The ethical implications of digital technologies also include ethical principles not yet enshrined in legislation. In the workplace context, ethical implications inevitably overlap with implications for working conditions. For example, intrusive use of digital technologies for monitoring employees’ productivity may impinge on employees’ data protection rights and privacy, compromise human dignity, reduce autonomy and opportunities for personal development at work, and increase emotional labour (that is, require a greater effort on workers’ part to control and manage their own emotions), with negative consequences for employees’ well-being.

Working conditions

Working conditions refers to the working environment and aspects of an employee’s terms and conditions of employment. This covers such matters as the organisation of work and work activities, training and skills, safety and health, working time and work-life balance. Working conditions such as working time arrangements and occupational safety and health are covered by national and supranational regulations as well as collective bargaining agreements. Eurofound’s definition of working conditions incorporates considerations of broader factors, such as aspects related to the intrinsic quality of work, which affect the well-being of employees. An adapted version of the job quality framework developed by Eurofound was used to guide the review and structure the findings from the desk research presented in Chapter 2. This framework includes the following main elements of job quality: intrinsic quality of work (skills, autonomy and social support), working time and work-life balance (duration, scheduling, flexibility and intensity), safety and health (physical and psychosocial risks) and employment quality (career prospects and earnings) (Eurofound, 2013, 2017).

Vectors of change and associated technologies

This research builds on Eurofound’s conceptual framework on the digital age, in which the term ‘digitalisation’ is used in a broad way to refer to the transformation brought about by the widespread adoption of digital technologies. This framework postulates that the digital revolution will bring about profound changes to work and employment as a result of three vectors of change: automation, digitisation and coordination by platforms (Eurofound, 2018). This report focuses exclusively on digitisation and automation; coordination by platforms is outside the scope of the analysis. In the conceptual framework, automation is defined as ‘the replacement, in full or in part, of labour input by machine input for some types of tasks in production and distribution processes’, whereas digitisation is defined as ‘the use of sensors and rendering devices to translate (parts of) the physical production process into digital information, and vice versa’.

Each vector of change is associated with a set of advanced digital technologies. This report focuses on IoT (including wearables) for digitisation, advanced robotics for automation, and AI (see Table 1). AI cuts across both vectors of change. It can, for example, be embedded in either advanced robots or IoT applications. This report refers to the European Commission’s definition of AI. It should, however, be noted that there are several other definitions of AI and there is currently no agreed upon definition (FRA, 2020).

Table 1: Definitions of selected technologies

IoT and wearables	IoT uses networked sensors attached to outputs, inputs, components, materials or tools used in production to create a cyber-physical system in which the information collected is fed, via the internet, to computers to gather data about production and work processes and to analyse these data with unprecedented granularity. Wearables are devices comprising electronics, software and sensors that are designed to be worn on the body (Billinghurst and Starner, 1999). Examples include smartwatches, head-mounted displays, body cameras and smart clothing.
Advanced robotics	Advanced industrial robotics is the branch of robotics dedicated to the development of robots that, through the use of sensors and high-level and dynamic programming, can perform ‘smarter’ tasks – that is, tasks requiring more flexibility and accuracy than traditional industrial robots.
AI	The European Commission’s high-level expert group on AI (AI HLEG) defines AI as ‘software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions’ (AI HLEG, 2019a, p. 36). The draft EU regulation on AI refers to a range of approaches and techniques that fall under the definition of this technology. These are ‘(a) Machine learning approaches, including supervised, unsupervised and reinforcement learning, using a wide variety of methods including deep learning; (b) Logic- and knowledge-based approaches, including knowledge representation, inductive (logic) programming, knowledge bases, inference and deductive engines, (symbolic) reasoning and expert systems; (c) Statistical approaches, Bayesian estimation, search and optimization methods’ (European Commission, 2021).

Sources: Eurofound, 2018, 2020a; AI HLEG, 2019a; European Commission, 2021

The division of vectors of change into broad categories is an analytical tool to help better discern their implications for work and employment, rather than a perfect description of how technologies are used in the workplace. In practice, technologies interact together, which potentially amplifies their impact in the workplace and complicates deciphering the exact implications of a single technology for work and employment.

Structure of the report and methodological note

This report is divided into three core chapters. Building on the definitions provided in the introduction, the first chapter provides a brief overview of key technology applications that are gaining traction in the workplace and their use during the COVID-19 pandemic. The second chapter reviews a range of academic and policy documents discussing ethical issues and implications for working conditions arising from the deployment of these technologies in the workplace. The third and last chapter maps key ethical concerns raised in policy debates in the EU Member States (and Norway) on digitisation and automation of work processes and on AI-related technologies. The chapter also explores policy initiatives on digitalisation that seek to address ethical issues in the context of work and employment.

Outside the scope of this report are technology applications used exclusively in the context of self-employment, freelancing and some new forms of employment in which the employment status is unclear (as in the case of platform work).

The information and data used for this report are drawn from a mix of sources. These include a literature review conducted as part of an ongoing research project on the ethical implications of digital technologies for work and employment. This was supplemented by information provided in mid-2021 by the Network of Eurofound Correspondents on the basis of a semi-standardised questionnaire, which addressed aspects such as ethical concerns about digital technologies discussed in policy debates, and relevant national policy and legislative initiatives linked to ethics. The replies from each national correspondent were based on desk research and, where appropriate, consultation with national social partners.

1 Key technology applications in the workplace

It can be difficult to distinguish between digitisation and automation applications in the workplace, as they are usually simultaneously implemented and interlinked. The intertwined use of these technologies is, in fact, catalysing innovation in the workplace. For instance, wearables endowed with IoT sensors collect data that can feed AI-based algorithms to create, for instance, productivity predictors. Advanced robots are generally equipped with sensors and actuators that collect, transmit and process vast amounts of data in real time, or are algorithmically controlled and can be reprogrammed to carry out different tasks in production. AI and advanced robots can also be combined into so-called ‘embodied AI’, simulating sociality in human–robot interaction (AI HLEG, 2019b).

Internet of things and wearables

Previous Eurofound research reviewing several applications of digitisation technologies has shown that IoT is primarily introduced to optimise business processes and increase efficiency (Eurofound, 2021a, 2021b). The research suggests, however, that adequate safeguards and protections should be put in place by employers (including regular risk assessments and clear data governance practices), as the technology can be scaled up quickly, enabling intrusive forms of employee monitoring and control that go far beyond the initially intended purposes.

The pervasiveness of some applications is exemplified by a growing number of diverse ways they are used in the workplace. In many cases, IoT devices and wearables are ostensibly offered by employers to increase workers’ safety and promote their well-being. For example, some companies encourage their employees to wear wristbands to track daily exercise, increase healthy habits or simply raise awareness of their physical activity and the importance of a healthy lifestyle (Giddens et al, 2017). These wristbands can also collect data on the hours an employee spends in a sedentary state, their heart rate and their sleep patterns (Priyadharshini, 2019). Employees’ voluntary enrolment in ‘health data monitoring’ is usually secured by offering financial rewards for achieving certain health-related goals, such as an average number of steps per day (Washington Post, 2019a).

A wide range of wearables is currently available on the market and used to monitor workers; examples include wearables that calculate driving speed or analyse how much time employees spend on toilet breaks (Kaupins and Coco, 2017). While the use of wearables in work settings has been a relatively common practice in the United States (US) since the early 2010s (Edwards et al, 2018), it is less widespread in the EU due to stricter data protection legislation. It is, however, difficult to quantify the number of companies making use of these technologies, as the developers of these applications keep the names of their clients confidential.

Microchip implants also fall under the category of wearables. This is another application that is gaining traction in some countries. In 2014, in Sweden, the bio-hacker Hannes Sjöblad organised ‘implant parties’, implanting microchips in volunteers. The chips acted as security interfaces allowing those implanted with them to, for instance, open doors without a key (BBC News, 2014).

In 2017, Three Square Market became the first company in the US to offer all its employees implanted microchips, as part of an experiment. The chip enabled them to make purchases in the office break room, open doors, operate photocopiers and log into their computers; it also stored medical information (TechRepublic, 2017). The experiment had a significant negative impact on the reputation of the company and caused a public outcry in the US as it was perceived as a form of pernicious surveillance and even as a vision of tech-apocalypse (The Guardian, 2019). A year after the experiment, employees with the implants were reported to be still regularly using them at work, and further employees had agreed to have microchip implants (MIT Technology Review, 2018).

Although the use of IoT applications and wearables raises ethical concerns, particularly in relation to employees’ privacy and data protection and their working conditions, they can and are being deployed by responsible employers to the benefit of their employees. Tracking sensor technologies are, for example, used to increase workers’ safety in high-risk work environments, detecting hazardous conditions and triggering automated alert responses (Thibaud et al, 2018; Eurofound, 2021a). Sensor technologies are also deployed to improve workers’ safety in less risky work environments (Eurofound, 2021a).

Advanced robotics

Robots and the automation of tasks have been a reality in manufacturing for decades. Assistive robots and partially autonomous systems have already been implemented in many industrial production plants, with Germany ranking third globally for robot density in industrial production plants (Wisskirchen et al, 2017). The use of advanced robots is, however, expanding to sectors beyond manufacturing. For instance, automated robots are increasingly used in warehousing and business logistics to move parcels and stock products, as well as to carry the inventory to workers who package it for its final destination (Hamann et al, 2018). The rising trend towards purchasing and selling via e-commerce platforms has boosted the uptake of automated systems to facilitate the assembly of a substantial number of orders in a short period (Boysen et al, 2019).

The difference between the previous generation of robots and recent advancements is that machines are increasingly digitised and interconnected systems capable of more sophisticated and complex human-machine interactions (Fletcher and Webb, 2017; Iphofen and Kritikos, 2019). Machines learn which actions to perform under which circumstances, and they can adapt to changes in their environment and autonomously take decisions based on a pre-defined set of instructions. Robots in automotive assembly lines that automatically complete one part of the product assembly may raise fewer ethical concerns than AI-assisted robots, which are powered by algorithms enabling them to self-learn and respond to changing environments, or robots directly interacting with humans, for example ‘cobots’.

Although the term ‘cobot’ was originally coined to refer to a robot interacting with humans on a workstation, the meaning has been generalised to denote ‘an intelligent machine designed and made for the purpose of collaboration with humans in a shared environment, especially in open industrial environments’ (Bi et al, 2021, p. 3). Cobots are increasingly being used by automotive corporations such as BMW Group, Daimler and Volkswagen (Weckenborg et al, 2020). Notably, at the Volkswagen plant in Wolfsburg, the Smart Production Lab is developing state-of-the-art robots with a special focus on cobots (Volkswagen, 2018).

A particular type of cobots are social robots: anthropomorphic robots or humanoids that are ‘able to cooperate with humans as capable partners and communicate with them intuitively in human terms’ (Breazeal et al, 2004). These robots differ from other forms of workplace technology in that humans are more likely to participate in social exchanges with them and even have feelings of attachment to them (Bankins and Formosa, 2019). An example of social robots in the workplace are humanoid robots named Pepper and

Elenoide functioning as human resources (HR) experts at the German headquarters of pharmaceutical company Merck (Stock et al, 2019). Social robots have also been introduced in several other domains, such as healthcare (to assist elderly people), education (as teaching assistants) and tourism (as information providers) (Schmiedel et al, 2021).

As traditional sequential people-machine production processes are replaced with more sophisticated interconnected cyber-physical systems that involve greater integration of humans and automation via various components (for example, robotics, mobile devices, sensors), greater attention should be paid to ethical issues arising from the engineering design of these new industrial systems (Fletcher and Webb, 2017). Advanced robotics should be analysed from an ethical perspective, taking into account their degree of complexity and how they interact with employees (Palmerini et al, 2016).

Artificial intelligence

Current applications of AI are limited to what has been defined as ‘narrow’ or ‘weak’ AI in policy and academic debates. Narrow AI can perform certain specific tasks that humans perform, rather than replicating how humans think (Hengstler et al, 2016; AI HLEG, 2019b). Narrow AI uses machine learning and deep learning tools to pull information from large volumes of data on which to base analytical models to generate predictions or other outcomes. In contrast, ‘general’ or ‘strong’ AI systems can perform most of the activities that humans do, including reasoning and thinking like a human being, and are capable of emotionally driven responses to situations. Currently, workplace applications of general AI are a theoretical possibility rather than existing technologies.

Many AI applications are still at only an experimental or the development stage (FRA, 2020). AI applications currently being implemented in workplace settings can be divided into broad groups: algorithmic work management, people analytics, pre-hiring screening and recruitment AI software, emotional AI and AI-assisted robots. This last term refers to a specific subgroup of advanced robotics with embedded complex algorithms that enable them to perform more sophisticated tasks than robots in the workplace have done in the past (see the section ‘Advanced robotics’ above).

Algorithmic work management

While the use of algorithms for management purposes is not a novel practice, recent technological developments have enabled more sophisticated and accurate techniques known as algorithmic management (Wood, 2021). This term refers to the use of algorithms in the workplace to automate – partially or fully – managerial

functions with the aim of optimising business processes and HR management. According to Mateescu and Nguyen (2019, p. 3), algorithmic management uses ‘a diverse set of technological tools and techniques to remotely manage workforces, relying on data collection and surveillance of workers to enable automated or semi-automated decision-making’. Exemplified by platform work but spreading to more traditional sectors such as business logistics and, to some extent, manufacturing, retail and call centres, algorithmic management techniques using AI tend to be more pervasive and opaque than previous management techniques using algorithms (Gillespie, 2014). In a review of the literature, Kellogg and colleagues (2020) identified new algorithm-based control mechanisms that employers use to elicit desired outcomes from workers. Building on existing labour process theory (Edwards, 1979), the researchers argued that algorithms are used by employers to direct workers by restricting and recommending (in terms of what needs to be done, in what order and what time frame), to evaluate workers by recording and rating (to review and assess performance), and to discipline workers by replacing and rewarding, thus eliciting cooperation and enforcing compliance (Kellogg et al, 2020).

Algorithms used to direct employees

Applications aimed at directing employees to perform specified tasks are exemplified by management practices implemented in Amazon warehouses. Barcodes on items are used to construct inventory knowledge that enables better product management (Delfanti, 2021). Employees scan these barcodes, and the scanner in return assigns tasks to them, communicates orders and monitors their work. In this manner, the scanner works as a mediator between workers and management. The technology dictates the pace of work to increase workers’ productivity, ultimately gaining control over the workforce (Delfanti, 2021). Algorithms are widely used in sectors such as retail and hospitality to prepare workers’ schedules based on a forecast of demand and workers’ availability (Bri  ne, 2020). For instance, retail company Uniqlo uses Percolata, a machine learning-based application, to plan worker schedules. The application uses predictive analytics to forecast sales and hourly traffic to each store so that managers can decide on the number of staff needed and plan worker schedules accordingly. In this respect, the collection of information on an entirely different group (customers) is used to control workers – a practice termed ‘refractive surveillance’ (Levy and Barocas, 2018).

Algorithms used to evaluate employees

There is also anecdotal evidence of a growing number of companies developing algorithm-based AI applications to evaluate employees. For instance, the abovementioned AI application Percolata uses in-store

sensors to calculate the ‘true productivity’ score of a worker, enabling managers to rank workers and assign shifts based on this metric. In addition, software company Veriato and service provider Hubstaff have developed keylogging software that tracks employees’ productivity, monitoring idle versus active time and computer activities through keyboard and mouse use (MIT Technology Review, 2020). Another company, KeenCorp, has reportedly developed software that scores employees’ level of engagement and motivation by analysing their emails in terms of content and word patterns (Bales and Stone, 2020). In call centres, AI software installed in workers’ computers warns staff if they are speaking too fast or if they sound tired or not empathetic enough (The New York Times, 2019). Software company Enable has developed an AI productivity platform, which continuously runs software on workers’ computers that uses an algorithm called Trigger-Task-Time. This software can determine the typical workflow for each worker, identifying how emails or phone calls lead to certain tasks and how long these tasks take to be completed (MIT Technology Review, 2020).

Algorithms used to discipline employees

Algorithmic management can serve as a tool to promote, discipline or dismiss employees. In the US, Amazon has fully switched to the algorithmic management of its freelance drivers under Amazon Flex (Bloomberg, 2021). The work of Flex drivers is supervised by an algorithm that later rates them in one of four categories: ‘Fantastic’, ‘Great’, ‘Fair’ or ‘At Risk’. This last refers to the risk of being dismissed due to poor performance. Hence the algorithm also decides the employees who remain in the company and those who are dismissed. Performance review is solely based on an algorithm, with no human intervention and no way of contesting these decisions or ratings. While Amazon managers admitted that unfair dismissals could therefore occur, they argued that, for the company, the benefits outweigh this lack of fairness, as long as drivers can be easily replaced (Bloomberg, 2021). In Europe, Amazon Flex was introduced in Germany in 2017 and operates under similar conditions to the US. Amazon is also reportedly using AI-equipped cameras in its branded vehicles in the US. These cameras have four lenses and capture the road, the driver and both sides of the vehicle. This application is claimed to increase drivers’ safety on the road but the cameras can be used to monitor workers with direct implications for their privacy rights (CNBC, 2021).

AI-based algorithms are also used to support managers’ decisions on dismissals, based on their predictions about employees’ poor performance, deviant behaviours or lack of engagement with the company (Parent-Rochelleau and Parker, 2021). In this regard, automation may change managers’ daily routines and

reduce their control over the workforce as they are displaced by an ‘algorithmic boss’ that increasingly oversees decision-making (Adams-Prassl, 2020).

People analytics

Other algorithm-based applications for work management use people analytics, which can be defined as ‘the computational techniques that leverage digital data from multiple organisational areas to reflect different facets of members’ behaviour’ (Gal et al, 2020, p. 1). Depending on the level of sophistication, people analytics use AI or non-AI algorithmic technologies to analyse large volumes of data with a view to identifying patterns and making predictions about employee behaviours and, in so doing, support decision-making for workforce management. Common uses of people analytics are to gauge employees’ engagement, predict turnover and tailor incentives for staff retention.

An example of an application of an AI algorithm for HR management is IBM’s ‘predictive attrition program’, which claims to predict with 95% accuracy whether an employee is planning to quit their job (CNBC, 2019a). This information is then used to plan actions for managers to retain employees at risk of leaving. As part of this process, some AI software extracts information from employees’ social media accounts, raising ethical concerns about privacy, even if the information is posted publicly (CNBC, 2019b). Similar data analysis software examining workers’ engagement with the company has been used by Walmart and Credit Suisse Group (Wall Street Journal, 2015; HRD Connect, 2016).

In addition, IBM’s Myca (My Career Advisor) predicts if employees will need to improve their skills to keep up with changes in the labour market and in their roles. This information is then used to enrol employees in specific training courses. Insurance company AXA has implemented an ‘online career assistant’ to help employees seek new job opportunities within the organisation based on their skills and profile (Loi, 2020). Furthermore, companies such as JP Morgan, General Electric, Accenture and Deloitte have introduced AI-based tools – such as those developed by Lattice, TinyPulse and Zugata – for performance reviews (Quartz, 2017). These tools use data collected through direct employee surveys to score their engagement and performance.

There is, however, anecdotal evidence suggesting that HR managers still largely prefer to work with Excel spreadsheets than data analytics tools (Tambe et al, 2019). According to LinkedIn’s report *2020 global talent trends* – which is mainly based on a survey of more than 7,000 ‘talent professionals’ in 35 countries – 55% of respondents reported that their company still needed help to develop basic people analytics and 73% considered that investing in people analytics was a major priority for their company for the next five years (LinkedIn Talent Solutions, 2020).

Pre-hiring screening and recruitment

A growing number of AI-based applications are used to support the hiring process, for example sorting CVs and screening social media sources in order to reduce HR administrative expenses (Hamilton and Sodeman, 2020). For instance, the AI-based recruitment automation software developed by software provider Ideal can screen and rank thousands of job applications based on how well CVs match the open position (Vox, 2019).

Particularly since the beginning of the COVID-19 pandemic, companies have increasingly been using asynchronous video interviews as part of the hiring process, to reduce the pool of applicants to a selected few who will be interviewed in person. Following the video interviews, algorithmic software is used to assess the applicants based on their recorded answers to pre-defined questions and on their facial expressions (The Guardian, 2018; Financial Times, 2021). An example of such software is HireVue – named after the company that developed it – which analyses facial movements during interviews, word choice and speaking voice to rank candidates against other applicants based on an automatically generated score (Washington Post, 2019b). The tool is employed by big companies such as Goldman Sachs, Unilever and Hilton.

Many of these applications raise ethical concerns about potential bias and discrimination. For instance, the Amazon engineering hub in Edinburgh was found to be using AI software to sort job applications that carried out lexical analysis of CVs favouring words more commonly used by male applicants, thus discriminating against women (Reuters, 2018).

Paradoxically, AI hiring applications that are implemented by companies to improve productivity by maximising the efficiency of the process may result in losses, as the standard metrics used in the selection process do not necessarily capture the attributes of a good employee (for example, the necessary skills, work ethic and efficacy). Software that promises an efficient recruitment process can keep a significant part of the labour force hidden, with companies excluding viable candidates from the recruitment process (Fuller et al, 2021).

Emotional AI

A controversial application of AI has been termed ‘emotional AI’, defined as ‘technologies that use affective computing and artificial intelligence techniques to sense, learn about and interact with human emotional life’ (McStay, 2020, p. 1). Several software solutions have been developed for automated recognition of emotions, such as openSMILE for audio extraction and classification, OpenCV to recognise faces, identify objects and classify human actions in videos, and Aria Valuspa, which interacts with humans through virtual characters and can generate search

queries to return the information requested by the humans (Schuller and Schuller, 2018). In the workplace, these technologies are used, for example, to measure employees' attitudes and engagement through computer vision (McStay and Urquhart, 2019).

Other applications of emotional AI in the workplace include software for facial recognition, which is used extensively in the platform economy to verify workers' identity when they log onto their work platform (Watkins, 2020). Facial recognition software has also been embedded in video surveillance cameras, seemingly for safety and security purposes, including preventing theft and embezzlement by employees (Doberstein et al, 2021).

Emotional AI is also incorporated into smart assistants, which have been defined as 'any computer-coded software system or programme that can act in a goal-directed manner' (Danaher, 2018, p. 3). In practice, AI assistants are used to direct employees; they use natural language processing to make recommendations and provide guidance on performing specific tasks (Manseau, 2019). A distinct type of AI assistant is conversational agents – also plainly termed 'chatbots'. Whereas AI assistants were in the past limited to supporting simple tasks through the use of stand-alone commands, recent developments have enabled them to perform more complex tasks. Examples of advanced AI assistants in the workplace include Ava, which is programmed to help data scientists through the process of deciding among the various tasks that could be performed at each stage of their workflow (John et al, 2017), and Iris, which can perform open-ended data science tasks such as lexical analysis and predictive modelling (Fast et al, 2018).

Impact of COVID-19 on the use of technologies

During the pandemic, many companies adopted technological solutions to ensure minimum social distancing in workplaces and, in doing so, reduce the rate of disease propagation. For instance, in the industrial sector, the introduction of automated robots helped to reduce contact and interaction between workers. Similarly, the logistics industry leveraged digital technologies to meet the surge in demand for products sold online during the pandemic by increasing the pace of package assembly and minimising contact between employees to comply with social distancing rules (Shen et al, 2021). Social distancing measures were supported in other sectors by the introduction of social robots. These were used in the medical sector to reduce human interaction in delivering medicines and supplies to patients in hospitals, dispensing hand sanitiser and ensuring the correct use of masks (Aymerich-Franch, 2020; Reuters, 2020). In the hospitality sector – and in particular in fast-food chains

– robots were deployed to perform serving, pick-up and cleaning tasks, thus reducing the risk of infection for both employees and customers (Vision Systems Design, 2020). Facial recognition solutions were also deployed in some workplaces to ensure workers' safety and compliance with COVID-19 preventive measures, for example to check whether masks were being worn and for thermal fever detection.

In the healthcare sector, the use of wearables during the pandemic enabled workers to monitor and treat patients from a safe distance, reducing the risk of infectious disease transmission (Tavakoli et al, 2020). In 2020, many IoT-based devices, including wearables, exhibited a high degree of accuracy in diagnosing patients and monitoring their symptoms. For instance, the company MyHomeDoc introduced a type of remote monitoring system that, via four embedded sensors connected to a user's smartphone, was able to provide information on vital signs instantly and remotely (Channa et al, 2021). Furthermore, several universities partnered with companies to develop wearable devices, such as Fitbit and Garmin, to launch studies aimed at detecting early signs of COVID-19 infection (Roblyer, 2020). Other potential applications have also been explored, such as the use of AI-powered robots for swabbing and physiotherapy treatments and for UV sterilisation of the environment (Tavakoli et al, 2020).

The introduction of digital technologies to many workplaces, ostensibly to guarantee the safety of employees during the pandemic, has raised some ethical concerns in relation to potential breaches of employees' data protection and privacy rights. For example, the French Confederation of Professional and Managerial Staff (CFE-CGC) denounced the use of a health management system called CoPass (CFE-CGC, 2020). Under this system, employees' health and environment was assessed regularly using an online medical questionnaire that generated a QR code assigning each employee a colour (red, orange or green). This indicated their level of vulnerability to the virus and determined whether they should work from home, work on site or take time off. According to the CFE-CGC, this system arguably breached the principle of proportionality enshrined in data protection legislation. The same trade union, in close collaboration with the French Democratic Confederation of Labour (CFDT), succeeded in preventing a Swedish multinational operating in the hygiene and health sector from setting up a system of devices called Proximity Warning, produced by the company Phi Data, requiring each employee to wear a collar that would trigger a buzzer in the event of another person approaching within two metres. CFDT representatives reported that this tool was, according to the management, 'to be used even after COVID for purposes, for example, of security, which suggests that the purpose of the system is not for health purposes' (CFDT, 2021).

During the COVID-19 pandemic, digital technologies played a crucial role in enabling a significant share of workers to continue working. According to a 2020 global survey of more than 1,600 businesses across 13 countries, the introduction of IoT devices had become an even higher priority for 84% of respondents, which had already adopted such technologies as they were deemed to enhance remote working (Vodafone, 2020).

There is, however, evidence that the use of digital technologies has also expanded the potential for remote workers to be controlled and closely monitored. A survey conducted for ExpressVPN in 2021 among 2,000 employers and 2,000 employees working remotely or in a hybrid capacity in US companies (with more than 10 employees) found that 78% of employers reported using employee monitoring software to track workers' performance or online activity (ExpressVPN, 2021). The main surveillance activities included monitoring the websites and apps used and real-time screen monitoring. The survey also found that only 53% of employees knew their employer was actively monitoring their communication and online activities.

After the pandemic, telework is likely to continue to feature prominently as part of hybrid working arrangements. As employers are increasingly more amenable to the idea of remote working, monitoring and surveillance technologies may continue to be used by managers to simulate the control that exists in the workplace, venturing into territory rife with ethical dilemmas and regulatory challenges.

Summary

- While IoT is primarily used to optimise production processes and workflows, the technology is capable of gathering large amounts of data that can be used to monitor the performance of employees. Although wearables endowed with sensor technologies can be used to improve workers' health, safety and well-being, they also enable intrusive monitoring of work (and non-work) activities and the collection of a wide range of personal data.

- Advanced robotics differ from traditional robots in the greater complexity of the tasks that they can perform and their increased level of interaction with workers. These robots can self-learn and work collaboratively with workers. Collaborative robots, also known as cobots, are increasingly used in manufacturing settings and in the service sector. Due to the complex human-machine interactions that these technologies entail, human factors should be considered in the design of advanced robots.
- The main types of AI applications are algorithmic work management, people analytics, AI software for pre-hiring screening and recruitment, emotional AI and AI-assisted robots. Algorithmic work management includes applications to direct, evaluate, discipline and dismiss workers, through devices that set tasks for workers and measure their productivity in doing them. People analytics are tools used, among other things, to gauge employees' engagement and predict staff turnover. AI software is also used to assist in screening CVs and to support decision-making on recruitment. Emotional AI can detect emotions and is, for example, used to support customer services and recruitment. Finally, AI-assisted robots are machines capable of performing more sophisticated and complex tasks than previous generations of robots.
- Digitisation and automation technologies have played an important role during the COVID-19 pandemic in enabling remote working and helping to limit the spread of the virus in workplaces. There are several examples of applications used to comply with social distancing rules, especially in the healthcare sector but also in the hospitality sector and the logistics industry. Some applications are expected to be used more frequently in the future and become standard practice, which could entail a change in purpose. Due to the powerful data collection and processing capabilities of these technologies, it is important to reassess their implications for both job quality and workers' rights, with a view to guaranteeing adequate safeguards and protections for employees.

2 Ethical implications of digitisation and automation in the workplace

Policy and academic research on the impact of digitalisation in the workplace tends to address ethics and the implications of digital technologies for working conditions separately. Ethics and working conditions, however, interact with each other. The use of digital technologies in the workplace heightens ethical concerns where they impact negatively on intrinsic aspects of quality of work (for example, autonomy, learning and skills). Conversely, if the technology is implemented in an ethical way, respecting fundamental rights, the implications for working conditions are more likely to be positive. By taking an approach sensitive to ethics, the technologies can be leveraged to increase workers' safety, human involvement and work capacity, leading to learning opportunities and more meaningful jobs.

Defining ethics in the digital workplace

The ubiquity and pervasiveness of digital technologies and devices have given rise to concerns of an ethical nature. Stahl and colleagues argue that 'ethics is a key component that can determine acceptance of new technologies as well as legislative and other responses to new technologies' (Stahl et al., 2016, p. 1). There is, however, no agreed upon understanding of the ethical implications or ethical use of digital technologies. Several reviews have been conducted by scholars in recent times to pin down the ethical concerns associated with the use of digital technologies. They point to a wide variety of issues, from data privacy to bias in algorithms, from replacing humans with machines to manipulation of data or human responses.

A systematic review of the literature on the ethics of computing found privacy (including aspects related to data protection) to be the dominant ethical concern discussed in the reviewed publications, published between 2003 and 2012 (Stahl et al, 2016). Other topics for ethical reflection widely discussed in the literature were autonomy, agency and trust.

Another review of the literature on ethics and technology found that the ethical principles most frequently discussed were privacy, security, autonomy, justice, human dignity, control of technology and the balance of power (Royakkers et al., 2018).

Robotics

In the area of robotics, the Engineering and Physical Sciences Research Council, which funds research in the United Kingdom, draws attention to ethical issues that resonate with principles discussed in the literature and existing ethical guidelines, for example transparency, responsibility and safety. A pre-condition for the ethical development and use of advanced machines is compliance with existing law, including on privacy, with humans retaining legal responsibility for the operation of machines at all times (Boden et al, 2011). The notion of human responsibility in the ethical design of robots and robotics systems has been taken on in two influential documents for policy, that is the British Standards Institute's 'Robots and robotic devices: Guide to the ethical design and application of robots and robotic systems' and the IEEE's 'Ethically Aligned Design: A Vision for Prioritizing Human Wellbeing with Artificial Intelligence and Autonomous Systems' (Bryson, 2017).

AI

With regard to AI, the ethical principles underpinning regulatory and voluntary initiatives have converged in recent years, focusing on transparency, justice and fairness, non-maleficence, responsibility and privacy (Jobin et al, 2019). Other researchers have found an increasing consensus on 'normative core' ethical principles grouped under the following themes: privacy, accountability, safety and security, transparency and explainability, fairness and non-discrimination, human control of technology, professional responsibility and promotion of human values (Fjeld et al, 2020). A review carried out by Floridi and colleagues points to a good degree of consistency and overlap between sets of ethical principles on AI identified in a comparative analysis of the literature (Floridi et al, 2018).

Algorithms

Drawing on a review of the academic literature on ethical aspects of algorithms, researchers have mapped out two kinds of ethical concerns, of an epistemic and a normative nature (Mittelstadt et al, 2016; Tsamados et al, 2020). While the epistemic concerns (about inconclusive, inscrutable and misguided evidence) relate to the quality and accuracy of the data used to justify conclusions generated by algorithms, the normative concerns (about unfair outcomes and transformative effects) have to do with the ethical

Table 2: Ethical concerns relating to algorithms

Ethical concern	Explanation
Inconclusive evidence	Algorithms produce uncertain knowledge, as they draw on data processing based on inferential statistics and/or machine learning techniques. The evidence collected is insufficient to establish causal connections or justify actions.
Inscrutable evidence	Limitations arise from a lack of knowledge regarding the quality of the data and the way the data are used to generate conclusions (the ‘black box’ issue).
Misguided evidence	Data processing done by algorithms is subject to the same limitations as other types of data processing in the sense that the evidence produced is as reliable and neutral as the data on which it is based. Algorithms also reflect the values of their designers, and the process of their development is far from being neutral.
Unfair outcomes	Algorithmic decisions and actions can pose risks of direct and indirect discrimination.
Transformative effects	Algorithms drive a transformation of the notion of privacy and pose a challenge to the autonomy of data subjects.
Traceability	It is difficult to identify any harm due to algorithmic activity or its precise cause, and hence to apportion responsibility.

Source: Based on Mittelstadt et al, 2016; Tsamados et al, 2020

impact of algorithmically driven decisions. The authors argue that it is difficult to understand an algorithm’s decision-making logic and trace the chain of events leading to an algorithmically based decision. This precludes the possibility of detecting potential harm or assigning responsibility if any harm occurs. These considerations give rise to another ethical concern, referred to as ‘traceability’. According to these reviews, topics such as the traceability of algorithms and their transformative effects (for example, challenging the notion of privacy) have so far received more limited attention than the other ethical concerns in the literature. Table 2 summarises the ethical concerns arising from the use of algorithms.

Mittelstadt (2019) argues that the consensus around high-level ethical principles hides ‘deep political and normative disagreement’ (p.9). The emphasis on common ground in the debate on ethical principles has in fact overshadowed controversies and disagreements. As noted by Rudschies and colleagues (2021), the ‘minimum requirements’ that some scholars have tried to establish may not be sufficient to deal with ethical issues. It is equally problematic that the interpretation and implementation of ethical principles vary. For example, Wong (2019) found 21 definitions of fairness in the literature, and these were often inconsistent. A wide range of definitions also exists in relation to transparency, accountability and interpretability (Bibal and Frénay, 2016; Doshi-Velez and Kim, 2017; Ananny and Crawford, 2018; Guidotti et al, 2018).

It also remains unclear which ethical principles (whether relating to AI or other digital technologies) should be prioritised and how tensions between some principles should be resolved (Jobin et al, 2019; Ponce Del Castillo, 2020). Some scholars argue that experts developing ethics guidelines on AI and advising on ethical AI practices should now embark on a second phase, moving on from a consideration of which principles should be taken into account to look at how

those principles should be implemented (Morley et al, 2020).

Ethical principles at stake

Digitisation and automation technologies are also expected to impact on ethical principles not necessarily enshrined in legislation, and which are commonly addressed under ethical guidelines and codes of conduct. For instance, the use of AI, IoT-based and robotic systems raises ethical concerns about the transparency of their actions and, more generally, their trustworthiness. For example, robotic applications and automated systems need to provide trustworthy information to users, for example enabling effective and safe human-machine interaction, ensuring regulatory compliance and meeting ethical expectations. Trustworthiness is a key requirement in the context of both IoT and AI, as users have a right to understand how their data are used and the logic behind the decision-making based on the collected and processed data. An important related ethical principle, typically discussed in relation to AI, is ‘explainability’ – that is, the ability of human users to understand and trust AI algorithms.

Accountability is also at stake due to the increased interaction between advanced robots and human workers, and the autonomous decision-making capabilities of smart machines. These technologies are not considered moral agents and cannot be held accountable for their actions, but blaming a machine’s programmer or owner might also be regarded as unfair (Leveringhaus, 2018). Some authors, however, argue that autonomous robots can be considered subjects rather than objects, and thus to have responsibility for their actions in legal terms (Leroux and Labruto, 2012). In this respect, Leroux and Labruto (2012) argue for the introduction of ‘electronic personhood’, in the same way that some companies have legal personhood.

A prominent theory by Danaher (2020) introduces the concept of ‘ethical behaviourism’, according to which robots can have moral status if their performance is equivalent to that of other entities that have significant moral status. A 2016 European Parliament report also reflected on the possibility of giving smart autonomous robots an ‘electronic personality’ entailing specific rights and obligations. However, in May 2018, an open letter signed by 156 AI experts from 14 European countries rejected the Parliament’s recommendation (Floridi and Taddeo, 2018). In the letter, the experts argued that companies can be given legal personhood since they are constituted and run by real people, whereas attributing personhood to robots would risk ‘misplacing moral responsibility, causal accountability and legal liability regarding their mistakes and misuses’ (Floridi and Taddeo, 2018, p. 1).

In addition, the use of automated decision-making processes can hide explicit or implicit bias behind an ‘objective’ technological façade (De Stefano and Taes, 2021). Who is responsible for the decisions enabled by an automated decision-making technology is not clearly specified in legislation either. Moreover, algorithms can self-adjust to give rise to new algorithms, making it difficult even for the developer to explain the logic underlying the functioning of the algorithm (Magrani, 2019).

One approach to ensuring accountability and avoiding potential harm resulting from algorithmic management is the application of a ‘human-in-command’ principle, whereby workers are involved in the implementation of such systems, thus retaining autonomy and control, and human managers are accountable for automated algorithmic decisions (De Stefano, 2018).

Digitisation and automation – especially if AI-powered – also raise concerns about the justice and fairness of the actions undertaken by machines. Advanced digital

technologies need to be used within a fairness framework that prevents, monitors and mitigates unwanted bias and discrimination (Jobin et al, 2019). An online scenario-based experiment conducted by Lee (2018) with 321 participants on Amazon Mechanical Turk found that workers perceived decisions taken by algorithms to be less fair and less trustworthy than those taken by human managers. Simultaneously, justice can be regarded in terms of individuals’ equal access to the advantages provided by emerging technologies, while also recognising the potential unequal impact on the workforce. This ethical principle is closely related to the concept of non-maleficence, which advocates the development, deployment and use of technology in a way that avoids bringing any harm to people (Floridi et al, 2018). Table 3 summarises the relevance of the ethical principles discussed above to each of the technologies covered in the report.

Impacts on fundamental human rights

The EU Charter of Fundamental Rights guarantees the protection and promotion of EU citizens’ rights and freedoms. It became legally binding in the EU with the entry into force of the Lisbon Treaty in December 2009. Several rights enshrined in the charter are the same as those set out in the European Convention on Human Rights (ECHR). Relevant provisions safeguarding fundamental rights are also found in the EU treaties and EU secondary law (for example, the General Data Protection Regulation, GDPR). The charter is structured under six titles: dignity, freedoms, equality, solidarity, citizens’ rights and justice.¹ It also includes a broader scope of fundamental rights in the light of technological advances in society, relating to data protection, bioethics and transparent administration.

Table 3: Relevance of ethical principles by technology

Ethical principle	IoT	Advanced robotics	AI
Trustworthiness	X	X	X
Transparency	X	X	X
Explainability			X
Accountability and responsibility	X	X	X
Justice and fairness			X

Source: Created by the authors based on the literature review

¹ Further details of and explanations about the provisions of the EU Charter of Fundamental Rights are available from the online resource of the European Union Agency for Fundamental Rights (FRA) at <https://fra.europa.eu/en/eu-charter>

Recent policy research has drawn attention to the ethical consequences of the use of AI with respect to fundamental rights. For instance, a European Parliament report explored the ethical implications and potential impacts associated with the deployment of AI in societies, including the unequal distribution of the benefits of the technology in society and potential exploitation of workers, new issues related to privacy and data rights, negative repercussions for democracy, and the embeddedness of bias and discrimination in AI-based decisions (European Parliament, 2020).

Research on AI and fundamental rights conducted by the European Union Agency for Fundamental Rights (FRA) confirms that many fundamental rights could be impacted by the use of AI (FRA, 2020). In a work context, these go beyond the most often discussed rights to data protection and privacy and include the rights to human dignity, equality, non-discrimination, freedom of association, collective bargaining, and fair and just working conditions. These rights are often interconnected and several can be at stake simultaneously depending on the individual applications, their purpose and their implementation.

Table 4 summarises the findings from the literature review on the fundamental rights most impacted by each type of technology. It should be considered that combined applications of the technologies amplify these impacts and engage a larger set of rights. For example, IoT or advanced robotics powered by AI may raise issues around discrimination and bias, and therefore impact the right to non-discrimination.

Right to human dignity (Article 1) and right to integrity of the person, including mental integrity (Article 3)

Although digital technologies can be deployed in the workplace to benign effect and contribute positively to the work environment, there are increasing concerns about the impact on human dignity and the psychological effects of the digitisation and automation of work.

With digitised and automated systems taking over core tasks, workers may become dispossessed from the intrinsic value and purpose of performing their jobs. They may feel that they are increasingly becoming appendages to a machine or passive recipients of instructions given by a machine. Whereas robots taking over the most complex tasks may lead to workers feeling that they serve less of a purpose, this need not be the case if employees see themselves as teaming up with robots to achieve better outcomes with their help (Smids et al, 2020). More pessimistically, Berg (2019) points out that new technologies are being leveraged by companies to ‘displace labour’ to more precarious and invisible forms of employment by outsourcing a growing number of tasks to individual online workers through work platforms. These workers experience a much lower degree of employment and income security than other groups of workers in standard or other non-standard employment arrangements, including temporary and part-time work, casual or zero-hours contracts, and bogus self-employment.

The uptake of human tasks by robots can have a dehumanising effect on workers, as it may lead to the commodification of labour (De Stefano, 2018). This is particularly the case for workers interacting with devices that have the power to make decisions about their actions. By determining schedules and tasks, new data-driven forms of work management (which are

Table 4: Fundamental human rights impacted by the use of technologies in the workplace

Fundamental human right	IoT and wearables	Advanced robotics	AI
Right to human dignity (Article 1)	X	X	X
Right to integrity of the person, including mental integrity (Article 3)	X	X	X
Right to liberty and security (Article 6)	X	X	X
Right to respect for private and family life (Article 7)	X		X
Right to protection of personal data (Article 8)	X	X	X
Right to freedom of assembly and association (Article 12) and right to collective bargaining and action (Article 28)	X	X	X
Right to non-discrimination (Article 21)			X
Right to fair and just working conditions (Article 31)	X	X	X
Right to an effective remedy and a fair trial (Article 47)	X		X

Source: Created by the authors based on the literature review

powered by new technologies) can lead to a business model in which workers are treated as commodities. It has also been argued that emotional AI (or emotion detection technologies) negatively impacts human dignity, as the quintessential attribute of dignity is physical, mental and experiential self-determination (McStay, 2020), and such technology seeks to appropriate emotional experience. To put it another way, the human face, as explained by the European Data Protection Supervisor, should not be an object for measurement and categorisation by automated processes (Wiewiórowski, 2019).

Other concerns in relation to human dignity are raised in research on the impact of AI on decision-making in work settings (Bader and Kaiser, 2019). The research suggests that human interaction with AI applications causes a cognitive displacement – as humans replace their own judgement at the time of taking a decision with the result of an automated decision-making process. These findings referred particularly to workers at a call centre which used IBM Interact to take more accurate, efficient and quick decisions. IBM Interact is an AI-based software that analyses customer data to provide users with pre-determined sales options for the customer. The use of this technology also required workers to distance themselves from their own reasoning as ‘they could not track the algorithmic decision logic they had to accept’ (Bader and Kaiser, 2019, p. 662). Nonetheless, the study found that some employees exhibited a higher degree of involvement in the decision-making process, overruling the decision of the technology when they thought it was incorrect; this greater involvement occurred when managers required it or when workers had an affective attachment to their job (wanting to use their unique human competencies).

The extended monitoring and surveillance capabilities of most advanced technologies also pose new risks, well beyond the most debated concerns about data protection and privacy. Evidence from research suggests that new digital technologies deployed for monitoring purposes can impact employees’ personal integrity, as they feel that their honesty at work is being questioned; unnecessary and disproportionate surveillance may be perceived by workers as an affront to human dignity and ethically unacceptable (Ball, 2021).

According to a survey carried out in 2018 by the Swedish Municipal Workers’ Union (Kommunal) among 832 senior safety representatives, 75% of respondents reported that new digital systems used in the workplace to measure work performance, tracking and surveillance had a negative impact on personal integrity in the workplace (Spänt Enbuske, 2019).

With regard to AI, drawing on the literature on algorithmic monitoring, Leicht-Deobald and colleagues (2019) argue that algorithm-based HR decision-making can undermine employees’ personal integrity,² tipping the balance in favour of compliance with externally generated rules and regulation, and turning into a form of social control. This evokes the concept that Zuboff (1988) termed ‘anticipatory conformity’.

Right to liberty and security (Article 6)

New digitisation and automation technologies can be valuable tools to enhance workers’ productivity, but, if used for monitoring purposes, they can impact negatively on workers’ sense of empowerment. Constant monitoring hardwired into the technology can limit the range of actions a worker can undertake, as workers know they are being observed and might fear that freely chosen action could have negative consequences for them (Eurofound, 2020c; Ball, 2021).

Workers’ autonomy and creativity can also be undermined by some robotic applications (including those incorporating AI), as work tasks can potentially become tightly structured (Smids et al, 2020). Furthermore, the information on workers collected by emotional AI applications can impact employees’ liberty and security, as this information can be used to influence or manipulate workers (European Parliament, 2020; McStay, 2020). This includes the increasing risk of cyberattacks in which hackers take control of an AI personal assistant to exploit its relationship with the worker with whom it normally interacts. It has been demonstrated that humans are strongly influenced by the behaviours undertaken by their peers (Cornelissen et al, 2017), and workers can also be influenced by the behaviour of machines. A machine displaying unethical behaviour can influence people’s perception of what is acceptable (Köbis et al, 2021).

The growing interaction between workers and robots along with the increasing complexity of the tasks carried out by robots also create greater uncertainty about the actions and potential flaws of the machine, contributing to emerging risks (Brocal et al, 2019). For instance, in manufacturing settings, human and machines are increasingly sharing tasks in order to complete complex operations more rapidly (Badri et al, 2018). This human-machine interaction could pose a threat to workers’ safety, as robots, including cobots and autonomous vehicles, could collide with people (EU-OSHA, 2018). The safety of human-robot interactions should be guaranteed by regulations that aim to standardise and harmonise processes, interfaces and parameters (Gallin and Meshcheryakov, 2020).

2 Personal integrity can be defined as the human ability to act in concert with one’s own true self and values and can be regarded as ‘a fundamental human value for its own sake’ (Leicht-Deobald et al, 2019).

Such regulations include, for instance, making robots stop working when a human operator approaches them, or limiting the power and force of robots to a safe level. Nevertheless, although robots could incorporate sensors, vision systems, reduced speeds and appropriate materials to avoid any harm to human workers, these factors could also turn into a threat themselves, as robots could be the victims of malware, hacking, and technical and human errors. More precisely, these threats relate to inaccurate sensor information, disrupted communication between the sensors and the robot, blocked communication channels and the manipulation of the embedded software or instructions (Steijn et al, 2016).

Right to respect for private and family life (Article 7) and right to protection of personal data (Article 8)

Surveillance techniques powered by AI-based and IoT applications put at risk the privacy of workers' personal data. During the COVID-19 pandemic, digital technologies played a crucial role in enabling a significant share of workers to continue working. But they also enabled a greater level of monitoring and surveillance of remote workers. In 2020, demand for employee surveillance software recorded huge increases compared with the pre-pandemic period (ZDNet, 2020). As pointed out by Ball (2021), the perception on the worker's part that their privacy is being invaded by such monitoring is heightened when they work from home, as digital surveillance enters the worker's home space.

In recent times, work surveillance has become increasingly possible and more pervasive, extending beyond the physical workplace to home and more generally workers' private and even social lives, as many aspects of workers' behaviour and movements – location, productivity, attitude, conversations – can now be analysed (Edwards et al, 2018).

The capture of personal information may also be indirect and not part of deliberate data collection and processing for the purpose of monitoring employee performance. This does not, however, lessen the ethical concerns. The interconnectedness and ubiquity of digital systems means that they capture a huge amount of data. It is therefore essential when implementing such systems to assess the risks around privacy and data protection and put in place clear data governance practices with strong protections for employees (Eurofound, 2020c, 2021b).

The pervasive use of digital technologies raises important ethical dilemmas, not least in relation to how to reconcile competing interests, namely the employer's need for information and the employee's need for privacy (Eurofound, 2020c). These concerns are particularly acute in relation to the use of technologies

as part of HR management. In this regard, Hamilton and Sodeman (2020) argue that transparency with regard to the type of data collected, and how those data are processed, is key to addressing ethical and legal concerns. Another risk involves hackers manipulating the algorithms or accessing and divulging workers' data, thus breaching their data protection rights.

Privacy concerns have wider ramifications and are also linked to dignity and integrity of the individual:

Privacy has always been regarded as an important if not crucial right. The privacy of employees does more than protect information; privacy is so integral to our identity and autonomy, that it has been argued to be a greater good.

(Martin and Freeman, 2003, p. 357)

Right to freedom of assembly and association (Article 12) and right to collective bargaining and action (Article 28)

The complexity of the algorithms along with the population's lack of data literacy renders algorithmic transparency and accountability difficult to assess (Lepri et al, 2018). This opacity also creates an imbalance of power between those who have access to the data and the individuals from whom the data are retrieved. With regard to the right to collective bargaining and industrial action, this information asymmetry implies an imbalance of power between employers and employees (European Parliament, 2020; Eurofound, 2020c). The large volume of data collected and the lack of transparency around the collection, processing and use of that data result in employees having an informational disadvantage, as they do not know the extent to which the data are used by the employer to assess their performance and how that affects their work (Dagnino and Armaroli, 2019). This arguably hinders their ability to negotiate and bargain in the workplace (Adler-Bell and Miller, 2018). The datafication of work could also make workers reluctant to exercise some of their rights or to sue an employer for violating their rights, as they may fear that this information will form part of their 'online reputation' and affect future job prospects (Todolí-Signes, 2021a).

If job security is perceived to be lower due to an increasing trend to replace workers with machines through automation, employees' bargaining power may be eroded (Corfe, 2018). The introduction of cobots in the workplace also means that individual employees will have less opportunity to interact with their colleagues and to potentially form assemblies and associations. New forms of employment arising from digitisation and automation can also make it difficult for individual workers to associate for collective bargaining. Notably, according to the European Agency for Safety and Health at Work (EU-OSHA), new business models can lead to work becoming more fragmented,

with workers having to work across sectors for several employers, not be based in a specific location, or be pseudo self-employed³ (EU-OSHA, 2018). Consequently, workers will have more difficulty in being represented by trade unions or worker representatives, or simply organising themselves for collective bargaining. However, new types of trade unions and collective associations have emerged in response to this trend.

Right to non-discrimination (Article 21)

Digitisation and automation technologies powered by AI can have ethical implications in terms of their impact on equality and non-discrimination rights. Practices such as scoring or profiling of workers can be regarded as discriminatory. These can lead to the unfair dismissal of employees, as exemplified by the case of Amazon's Flex Group employees: these workers may be dismissed based on an automated rating provided by a machine (Bloomberg, 2021). Automated selection of candidates for job interviews based on predicted productivity can also lead to discrimination (FRA, 2018).

There is a growing body of research on discrimination by algorithms (Kamiran et al, 2013; Sandvig et al, 2014; Žliobaitė and Custers, 2016). FRA research on AI and big data highlights the issue of low-quality data, leading to inaccurate predictions and discrimination or unfair treatment, and FRA points to a range of approaches that can be used to detect discrimination in the use of algorithms and to 'repair' algorithms with a view to avoiding ethical pitfalls and violations of fundamental rights (FRA, 2018, 2019a).

Recent findings suggest that automating the hiring process has caused firms to narrow excessively the pool of applicants, excluding many qualified workers (Fuller et al, 2021). If these qualified applicants do not use the 'correct' wording to describe their skills and experience in their CVs, matching that used in the description of the job offered, the algorithm will exclude them from the recruitment process. Such systems may lead to conformism prevailing over talent and, especially, diversity. Furthermore, algorithms used in HR management, for instance for screening candidates or resource allocation, can incorporate existing human and structural biases, thus discriminating against individuals based on their race, ethnic origin or gender (European Parliament, 2020; Loi, 2020). Many systems to screen candidates are trained using white male faces and voices, disadvantaging applicants who diverge from that norm (Ajunwa, 2021).

Facial recognition technologies for monitoring purposes could also increase existing social inequalities, since facial recognition software is likely to be encoded with racial and gender biases (Scheuerman et al, 2019) and because monitoring is not experienced by all in the same way (Ball, 2021). Dissatisfaction with these monitoring techniques is in fact more common among historically more marginalised groups (Stark et al, 2020). FRA research on facial recognition technology (2019b) points to the difficulty of removing such biases through mathematical or statistical solutions, and argues that an important cause of discrimination is the quantity and quality of data (facial images) used to develop and train algorithms.

On the other hand, algorithmic management could enable companies to introduce more egalitarian hiring and management of employees, as carefully designed and trained machines could be less biased against certain groups of applicants (Deshpande et al, 2021). Biases may be easier to identify and amend in consciously racist or sexist algorithms than in the (un)consciously biased human decision-maker they replace (Thierer et al, 2017). This is certainly in principle a potential advantage of AI, but much more empirical evidence will have to be gathered to corroborate it.

In recent years, several toolkits have been developed for bias detection and mitigation, such as the AI Fairness 360 Open Source Toolkit designed by IBM to examine biases in the output of machine learning models (Bellamy et al, 2019); the software developed by Themis that provides a discrimination score based on the relationships between inputs and outputs (Galhotra et al, 2017); and Amazon's SageMaker Clarify tool, which provides eight measures of pre-training bias (Vetrò et al, 2021). This last tool can be used, for instance, to determine whether the dataset used to train an algorithm has an age bias (as it might do if, for example, most of the data included were on middle-aged individuals). In addition, the software also helps to explain incorrect predictions made by the model and suggest possible measures to correct the errors.

Right to fair and just working conditions (Article 31)

The EU Charter of Fundamental Rights encompasses under Article 31 'the right for every worker to working conditions which respect his or her health, safety, and dignity'. A review of the implications of digitisation and automation for particular areas of working conditions is presented in the following section of this chapter.

3 EU-OSHA (2018) defines pseudo self-employment as a situation in which an employer, to avoid costs such as sick pay or holiday pay, treats as self-employed a contractor who is really an employee.

Right to an effective remedy and a fair trial (Article 47)

An important concern arising from the use of digitised and automated systems in the workplace concerns the invisibility of the control and supervision that they enable; this makes it difficult for employees to contest management decisions based on sensor-collected data or data analytics and to seek redress. Without clear governance and consultation with staff, the use of digital systems – equipped with IoT sensors or AI powered – may lead to intensive data-driven HR management, with limited or no redress mechanisms for employees if unfair or unfavourable employment decisions are taken (Eurofound, 2021b), including an inability to seek compensation for any harm caused.

An important condition enabling a worker to exercise their right to an effective remedy and a fair trial is the availability of information on how a system or algorithm works (FRA, 2019a). Wachter and Mittelstadt argue for individual-level rights granting data subjects ‘the ability to manage how privacy-invasive inferences are drawn, and to seek redress against unreasonable inferences when they are created or used to make important decisions’ (Wachter and Mittelstadt, 2019, p. 12).

Implications for working conditions

The implications of the use of digitisation and automation technologies (including AI) for working conditions are reviewed with reference to the main elements of job quality, based on an adapted framework developed by Eurofound (2013, 2017). This framework includes intrinsic quality of work (skills, autonomy and social support), working time and work–life balance (duration, scheduling, flexibility and intensity), safety and health (workplace-based physical and psychosocial risks) and employment quality (career prospects and earnings).

Intrinsic quality of work

Skills and autonomy

The extent to which technological change impacts on skills is still a matter of academic debate. A long-standing theory of skill-biased technological change (Bell, 1974) predicts a monotonic shift in employment demand towards high-level skills, whereas the demand for employment in low-skilled occupations would decline, as tasks in such occupations are more amenable to being carried out by machines. A refinement of this theory is the routine-biased technological change theory (Autor et al, 2003; Goos and Manning, 2007; Goos et al, 2009; Autor, 2015), which postulates that employment demand has shifted in advanced economies in two main ways – that is, on the basis of skills and the routine task content of jobs. The predicted impact of such changes is to polarise

employment growth, with employment demand greatest in less routine jobs that tend to be situated at the extremes of the wage distribution. Along these lines, Acemoglu and Restrepo (2019) argue that, since the 1980s, advances in robotics have enabled low-skilled labour tasks in manufacturing – such as machining, welding, painting and assembling – to be automated. Eurofound research has, however, pointed to a variety of different patterns of change across EU Member States, with upgrading and polarisation the two principal patterns observed (Eurofound, 2016; Fernández-Macías and Hurley, 2017).

Some authors argue that automation and AI-powered machines redefine existing jobs and occupations in the short or medium term, rather than fully replacing them, as in the case of the advent of ATM machines redefining the bank teller’s job (Carriço, 2018). According to data from the World Economic Forum’s Future of Jobs Survey conducted in 2020 among large global employers, algorithms and machines are more likely to replace humans in performing tasks related to information and data processing and retrieval, administrative tasks and some traditional manual tasks, whereas tasks including managing, advising, communicating, reasoning and decision-making will continue to be performed by humans (WEF, 2020).

A distinction should be made between technologies that automate routine tasks and those that augment human tasks. Automation refers to outsourcing tasks to a machine with little or no further human involvement, while augmentation entails continued close interaction between humans and machines (Raisch and Krakowski, 2021). The latter enables workers to complement machines’ abilities with humans’ unique capabilities. Acemoglu and Restrepo (2019) have termed this ‘the reinstatement effect’ – that is, labour gains a comparative advantage thanks to the adoption of technology in the performance of a broader range of tasks.

Eurofound research on game-changing technologies has also drawn attention to a general tendency of digitisation and automation technologies to reduce the need for some manual tasks and increase demand for intellectual skills (Eurofound, 2020a). Drawing on qualitative methods, Eurofound research has also found that digitisation technologies in the workplace have a profound impact on tasks and skills (Eurofound, 2021a). Among digitisation technologies, the most pervasive is IoT, which contributes to the digitisation of many manual routine tasks in manufacturing settings while, at the same time, prompting a shift towards supervisory, control, coordination, planning and analytical tasks. This redefinition of tasks drives the acquisition of new, advanced digital and analytical skills and results in greater autonomy, particularly for employees in managerial and engineering positions but less so for blue-collar manual workers (Eurofound,

2021a). The research also found that IoT use tends to reinforce existing task-driven work organisation, characterised by limited work autonomy for those working on assembly lines, while increasing work autonomy only for higher skilled workers in managerial and engineering positions.

In the context of caregiving practice, Vallor (2015) warns against the risk of workers' moral deskilling due to automation; this occurs when work entailing moral and ethical decisions is outsourced to robotic carers. The author argues that robotics developers should design care robots in such a way that care values (for example, attentiveness, responsibility, competence and reciprocity) are safeguarded and caregivers' moral and uniquely human capacities are enhanced (Vallor, 2015).⁴ This is what has been referred to as a 'values by design' approach.

There are also growing concerns that digitally enabled work management, as exemplified in platform work, is expanding to more conventional sectors (Wood, 2021), exacerbating already deskilled jobs and leading to new Tayloristic forms of work organisation, which are characterised by a low level of autonomy and increased control over workers.

Investments in upskilling and reskilling of workers and in AI literacy will be needed in all sectors and at all levels to enable the transition to new tasks involving increasing interaction with machines and technologies (Ponce Del Castillo, 2018; Eurofound, 2021a). AI literacy refers to workers developing the capacity to critically engage with AI in various contexts. In the absence of reskilling programmes or opportunities for career change, low-skilled blue- and white-collar workers are at greater risk of losing their jobs.

Social support

Eurofound case study research shows that digitisation technologies increase interdependencies between departments and roles, putting greater emphasis on teamwork and communication (Eurofound, 2021a). However, in the area of automation, the replacement of human workers by robots and the use of cobots may reduce the amount and variety of social interaction among workers (Smids et al, 2020) and give rise to negative psychological side-effects linked to growing social isolation in the workplace.

In the health sector, automation may result in medical professionals losing contact with patients due to care, diagnostic and surgery robots taking over some of their tasks (EU-OSHA, 2018). By the same token, if robots take over repetitive tasks, automation may provide workers with more free time to interact with human co-workers

and perform more rewarding tasks (Chesley, 2014). In the case of teachers, if an AI technology were used for basic grading of students, the teacher could focus on taking on the role of coach, giving individual feedback on the learning process to students.

The introduction of social robots in the workplace may also change workers' social interaction, as they will increasingly find it usual to socialise with a robot. The Creative Robotics Lab at the University of New South Wales in Australia has designed a type of social robot intended to encourage collaboration between employees, and in particular to foster workers' creativity (Phys Org, 2018). On the other hand, a study conducted by Sutherland and colleagues (2019) investigated the perceptions of clients of a social robot receptionist at a medical clinic. Although clients felt comfortable with the emotions that the social robot could express, the study concluded that they did not find it as friendly as a human.

Working time and work-life balance

Working time

New technological developments are expected not only to result in some human tasks being carried out by machines but also to reshape the internal organisation of companies. Increased digitisation and automation can provide both employees and employers with more working time flexibility (Eurofound, 2020a). AI technologies may enable employers to schedule employees' working time in an automated and flexible manner that takes into account multiple criteria such as costs, job-person fit and employee preferences (Strohmeier and Piazza, 2015). However, it has also been found that the use of algorithms to plan workers' schedules may lead to these varying wildly week to week, making it difficult for workers to plan anything more than a week in advance (Guendelsberger, 2019). Workers' schedules are linked to fluctuations in customer traffic – that is, employers aim to have the right number of workers, hour by hour, depending on the number of customers (NBC News, 2014). This implies that workers need to be available 24/7. This is also the case for workers at continuous production sites, who can be called at unsocial hours to check or fix failures in automated processes (Eurofound, 2020a). Furthermore, the emergence of a work culture of always-on availability – facilitated by the ubiquity of digital technologies – has implications for working time and work-life balance, as it contributes to extending the working day beyond standard or contractual working time and eroding the increasingly fine line between work and home life.

⁴ Moral capacity is defined by Thomasma and Weisstub (2004) as the freedom to develop, weigh and judge values and outcomes.

Work intensity

As identified by a study comparing the 2010 and 2015 editions of the European Working Conditions Survey, the EU has seen a growing intensification of work in the aftermath of the global financial crisis; technological change has been a contributing factor in this (Adăscăliței et al, 2021). There is, however, mixed evidence on the impact of digitisation and automation technologies on work intensity. Eurofound case study research on digitisation technologies has found an increase in work intensity, particularly in the early phase of technology adoption, as employees need time to acquaint themselves with the new technology and ways of working (Eurofound, 2021a). This increase in work intensity can, however, be mitigated by the provision of adequate training prior to and during technology roll-out.

Some studies found that the use of machines to carry out ergonomically disadvantageous tasks – that is, tasks having a negative impact on the human body, such as transporting heavy packages – is increasing the intensification of work as workers undertake more challenging activities. For instance, Lager and colleagues (2021) found positive effects of the use of digital technologies in logistics in that repetitive and ergonomically disadvantageous tasks were replaced with more challenging and attractive tasks; however, this substitution of tasks also increased work intensification. In this study, the introduction of a ‘pick-by-voice’ system used in different logistics departments and warehouses was found to be cognitively challenging for employees, as they felt bombarded with information through their headsets.⁵ In general terms, the findings demonstrate that the use of digital technologies replaced physical strain with psychological stress (Lager et al, 2021).

In Germany, an online survey among 398 labour inspectors identified work intensification as the most serious threat to future occupational safety and health in the context of increasing digitalisation (Hauke et al, 2018). Similarly, according to an EU-OSHA foresight study, work intensification is one of the many safety and health risks associated with the use of information and communications technology (ICT)-enabled devices, including IoT, robotics and AI systems (EU-OSHA, 2018). Increased work intensification may also arise from the pervasive nature of workplace monitoring enabled by digital technologies, a lack of understanding of the functioning of complex digital systems on the part of employees or the need to match the pace of work set by machines. In general, workers’ cognitive capabilities can be affected differently in different scenarios.

Algorithmic management has also been found to result in work intensification, as employees need to meet the pace of work set by an algorithm lacking any form of inherent empathy (Todolí-Signes, 2021b). Furthermore, in situations where algorithm-based systems take over evaluation and disciplinary functions (for example, in business logistics and call centres), workers tend to work longer hours at a higher pace, as they fear damaging customer ratings or negative appraisals by their employers (Wood, 2021). This has been found to put additional emotional demands on workers and to increase anxiety levels (Bakewell et al, 2018).

Safety and health

Physical risks

Some advanced robots have an ergonomic design intended to improve workers’ postures and decrease work-related health risks. Eurofound research on digitisation has found that digitisation technologies contribute to a reduction in exposure to more traditional occupational risks, making the work environment safer (Eurofound, 2021a). However, the research noted potential increased exposure to ergonomic risks associated with the more sedentary work and reduced levels of physical activity in a more data-driven work environment (Eurofound, 2021a). In addition, IoT applications have been deployed in the workplace to gather safety-related information on the environment – for example, to detect the presence of noxious gases – and thus prevent harm to the workforce (Thibaud et al, 2018).

Along similar lines, automation of tasks in the workplace can contribute to reducing the risk of physical harm to workers, with robots taking over repetitive or dangerous tasks (EU-OSHA, 2018; Deshpande et al, 2021). For example, robots are used in manufacturing settings to perform routine manual tasks, lessening the risk of musculoskeletal disorders (EU-OSHA, 2019). The types of tasks that robots take over are also referred to as the ‘4Ds’: dull, dirty, dangerous and delicate (Valori et al, 2021).

Industrial exoskeletons are among the technology applications used to reduce musculoskeletal effort and improve workers’ occupational safety and health (Huysamen et al, 2018). Although employees could theoretically work longer thanks to exoskeletons, as they would not get as physically tired, they could as a result become more mentally tired, with no means of counteracting this effect (BBC News, 2018). Continual use of exoskeletons could also result in a loss of strength and flexibility in muscles and joints (EU-OSHA, 2018).

⁵ The system provides workers with a set of headphones and a tablet that displays information such as contract orders, sequences and numbers of pieces and guides the employee, with some including a built-in scanner.

Research has also pointed to divergent outcomes of advanced robotics on human safety. While some applications are introduced into the workplace with the aim of increasing workers' safety and health, several accidents caused by machines have been recorded since humans and robots began to interact at work (Alhamouz et al, 2019). While the first wave of intelligent robots was designed for dangerous and dirty tasks and operated in 'safe' cages, the second wave of robots – such as cobots – is designed to operate in the same environment as humans and in close contact with workers (Winfield et al, 2021). This close collaboration may imply an increased risk of harm to humans interacting with machines, introducing new ethical dilemmas and legal concerns – for example, workers' accountability for robots' actions or liability issues linked to potential accidents stemming from human-robot interactions (De Stefano, 2018).

To avoid any harm being caused by this close collaboration, several safety assurance mechanisms for cobots have been proposed, such as safety-rated monitored stop, hand guiding, speed and separation monitoring, and power and force limiting (Bi et al, 2021). In addition to these safety mechanisms in cobots, other AI-powered technologies should also incorporate safety and health measures after an assessment of the occupational risks that each specific occupation or job entails.

The increased interconnectedness between robots and IoT systems will leave robots exposed to cyberattacks, especially those that were initially designed to work in isolation, such as industrial robots (TrendLabs, 2017). Hence robots are at risk of sabotage by third parties. In this respect, companies should undertake adequate security reviews to guarantee minimum risks to the workforce when interacting with machines. While companies have taken several steps to safeguard workers' safety, for example by integrating safety sensors into machines to avoid risks of collisions or accidents, such sensors require additional communication, which can also be sabotaged. This illustrates the challenges in ensuring workers' safety and security in relation to cyberattacks on cobots (Hollerer et al, 2021).

Psychosocial risks

The use of digitisation, automation and AI-driven technologies gives rise to the emergence of several new psychosocial risks that could have a negative impact on workers' mental health. Increased use of ICT technologies in the workplace is found to be associated with higher levels of strain and stress as workers experience fast-paced jobs with more interruptions and multitasking (Chesley, 2014). There is evidence that digital devices intended to reduce physical strain in the workplace can lead to increased stress due to the

greater cognitive load (Lager et al, 2021). This is in line with previous findings pointing to a general shift from physical demands associated with work in the manufacturing sector to psychosocial risks, more typical of the service sector or white-collar jobs (Eurofound and EU-OSHA, 2014).

In the context of the increasing automation of tasks, human-robot collaboration will impose a new way of working and thinking on shop floor operators and will transform the role of the human through greater interactions with machines. This may create new psychological concerns and anxieties on the part of workers, even if digitised and automated production systems are expected to be inherently safer than traditional industrial robots (Fletcher and Webb, 2017). To ensure the successful implementation of such technology in the workplace, it is essential to assess the potential impacts beforehand, provide training to affected workers and implement change management interventions with a view to dispelling initial mistrust and anxieties linked to collaborative work with robots and promoting a change of mindset (Fletcher and Webb, 2017).

The presence of increasingly interconnected and ubiquitous digital systems in the workplace – continuously collecting and processing vast amounts of data in real time – can itself be a stressor, which increases work intensification, creates anxiety and heightens feelings of job insecurity in situations where performance falls behind targets or expectations, or simply if workers perceive their jobs as highly replaceable (Manokha, 2020; Eurofound, 2021b).

The use of people analytics for workers' appraisal and performance management without clear disclosure of how this process is conducted and how the data are used is likely to increase workers' stress, as they will feel 'spied on' (EU-OSHA, 2019). Constant and excessive employee monitoring is also more likely to increase emotional labour, as workers feel compelled to hide their emotions and even suppress their personality, preferences and feelings (Ball, 2021; Todolí-Signes, 2021b). This has clear ethical implications, as, more generally, 'constant observation can be an assault on the ethical rights of workers' (West and Bowman, 2016, p. 638).

The literature has also coined a new concept, 'surveillant anxiety', which refers to the pressure that individuals are under due to constant monitoring of their actions (Crawford, 2014). An online survey conducted for ExpressVPN in 2021 found that 59% of surveyed employees reported feeling stressed and/or anxious about their employer monitoring their online activities. According to 43% of employees, workplace surveillance is a violation of trust and makes them feel unappreciated and resentful (ExpressVPN, 2021).

According to a European Parliament study, this anxiety is likely to translate into ‘psychosocial risks, including loss of autonomy, decreased self-esteem, decreased confidence, increased paranoia, and decreased levels of creativity and communication’ (Deshpande et al, 2021, p. 21). Similarly, psychological studies have linked employee monitoring with fatigue, anxiety, depression, nervous disorders and even hostility in the workplace, especially when monitoring technologies were used to punish and intimidate workers (West and Bowman, 2016).

A systematic review conducted by Ball (2021) for the European Commission’s Joint Research Centre noted that the use of monitoring and surveillance technologies that are not explicitly aimed at preserving workers’ safety or used to train workers are often regarded as excessive or less acceptable by employees. Workers’ job characteristics (for example, the extent of autonomy in a job) and the configuration of the monitoring were, however, found to play an important role in moderating the outcomes.

Depending on how they are used, digital technologies can also create the conditions for the emergence of antisocial behaviours, including third-party physical violence and workplace bullying or harassment. For example, digitalisation increases customers’ expectation of instant service and creates frustration among customers when automated systems do not work as they should, with workers often being on the receiving end of this frustration. Workers can also be targeted on social media by angry customers and the wider public. For example, there are instances of social workers and medical staff coming under attack on social media from ‘no vaxxers’ (BMA, 2021; DW, 2021). This antisocial behaviour can be equated to cyberbullying, defined as ‘aggressive behaviour, such as threats or bullying, taking place over the internet’ (Eurofound, 2015). Research has found that women are more likely than men to be targeted by online abusers and experience a wider variety of online abusive behaviours (Lenhart et al, 2016).

Employment quality

Career prospects

The use of advanced technologies to improve decision-making in companies has implications for workers’ career prospects. These new tools have the potential to profoundly affect the lives of workers, particularly in relation to education and training (Loi, 2020). For example, AI applications can have

positive effects on career prospects by increasing internal mobility within firms. A study carried out by IBM found that AI could contribute to better career experiences for employees by improving the matching process between skills and jobs, improving the experiences of employees looking for better career opportunities, enlarging the pool of internal candidates, increasing the visibility of opportunities to employees and contributing to a better understanding of skill needs (Zhang et al, 2018). However, these potential benefits to workers are conditional on how managers choose to use these technologies (Lane and Saint-Martin, 2021).

Earnings

The effects of digitisation and automation on earnings are expected to vary across sectors and skill levels. Job opportunities are increasingly dependent on having the right digital skills, while there is still a shortage of individuals possessing these skills. The limited available empirical evidence on the impact of AI on wages does not suggest an overall decline in wage levels due to AI. Rather, the evidence suggests that better educated and higher skilled workers enjoy a small to moderate wage premium because of AI adoption, which could result in a potential increase in income inequality (Lane and Saint-Martin, 2021).

A negative impact on wages can be expected as robots replace workers for some tasks. Since using robots is usually less costly than paying workers’ wages, employees may need to renegotiate their salaries to avoid losing their jobs. An empirical study performed on data for six European countries did not find any significant effect of robotisation on average wages; however, employment rates fell by between 0.16 and 0.20 percentage points with the introduction of one additional robot per thousand workers (Chiacchio et al, 2018).⁶

Another concern is that the vast amounts of data collected about workers’ activities via digital devices could lead to performance-driven pay, which would have an impact on working time and workers’ rights; for example, it could result in workers routinely working overtime, not taking rest breaks, not taking sick leave or not availing themselves of annual leave. Even the most detailed data about employee performance (in line with pre-established performance metrics) are not necessarily a source of objective truth; any decisions (about wages and promotions) solely based on such data may be fraught with ethical pitfalls.

⁶ Employment and wage developments were measured using microdata from the European Community Household Panel and the European Union Statistics on Income and Living Conditions surveys. Data on the number of robots sold were retrieved from the International Federation of Robotics dataset.

Summary

- The differing definitions and concepts of the basic ethical principles related to AI and other digital technologies make the analysis of the ethical implications complex. Many scholars argue there should be a shift away from analysing these ethical principles to instead focusing on how these principles should be practically implemented.
- The use of advanced digital technologies in the workplace can have an impact on several fundamental rights, including the rights to human dignity and integrity, liberty and security, data protection and respect for private life, freedom of assembly, collective bargaining, and access to effective remedy and a fair trial.
- Digitisation and automation technologies also have an impact on ethical principles not necessarily enshrined in legislation but commonly addressed under ethical guidelines and codes of conduct. For example, ethical concerns are raised in relation to the trustworthiness of technologies, the transparency and explainability of the actions of AI systems, the 'human in control' principle and fairness of AI-based decisions, bringing into focus issues around accountability, responsibility and liabilities.
- Digitisation and automation technologies can have both negative and positive impacts on the intrinsic quality of work, working time and work-life balance, safety and health, and employment quality. The nature of the impacts depends partly on the design and implementation of these technologies in the workplace.

3 Policy debates and initiatives on ethics and digital technologies in the EU

Ethical concerns raised in policy debates

EU level

At EU level, the debate on digital technologies – and particularly AI – is increasingly focused on ethical issues, drawing attention to the impact that novel technologies have on social and fundamental rights. Dating back to 2017–2018 in the context of establishing a digital single market, the EU-level debate has increasingly emphasised the need to protect personal data and fundamental rights and to strengthen transparency requirements as a strategy to increase trust in AI. These references to ethical concerns in the European-level policy debate were followed by the publication in 2020 of a *White paper on artificial intelligence* (European Commission, 2020). The white paper responded to concerns raised by several Member States regarding the dangers of regulatory fragmentation within the EU and sought to broaden the consultation of European and national stakeholders on the ethical implications of AI. The key ethical concerns raised in the white paper relate to human dignity, protection of privacy and personal data and non-discrimination.

EU Member States

In policy debates, concerns regarding the ethical implications of AI vary between EU Member States. Broadly, national debates tend to be dominated by issues relating to data protection and privacy, often in relation to digitally enabled employee monitoring and surveillance. The issues of potential discrimination by algorithms, fairness and transparency also feature in national policy debates. However, such issues have entered national debates more recently and are prominently discussed in only a handful of Member States, namely Austria, Belgium, Denmark, France, Germany, the Netherlands, Spain and Sweden.

In terms of the intensity of the debate on the ethical implications of AI, a clear distinction exists between northern and continental countries on the one hand and southern and eastern Europe on the other (Figure 1). In northern and continental countries, the debate on the ethical implications of AI tends to be older and is informed by discussions dating back to the mid-2000s on the implications of Industry 4.0 technologies for work and employment. In these countries, the debate touches on a broader range of issues, with both trade

unions and employers contributing to the discussions, by conducting policy analysis and issuing positions, codes of conduct and guidelines for ethical use of technologies including AI.

In contrast, in southern and eastern Member States, the debate on ethical issues relating to AI is more marginal. More central topics of policy discussion are investment in infrastructure, uptake of AI technologies, the quantitative impact of digital technologies on the labour market, skill needs and investments, as well as the potential economic benefits brought by AI. Particularly in eastern Europe, the emphasis on ethics in relation to AI is not only new but also largely driven by European-level initiatives. Spain is an exception in the cluster of southern European countries. Here, the intensity of debate is comparable with that found in northern and continental Member States, with trade unions focusing on specific ethical issues such as privacy and security concerns, dehumanisation of work, the right to association and collective bargaining, and the potential detrimental impacts of algorithmic management on work. While these concerns have been predominantly voiced in the context of platform work, they have extended to broader debates on the future of work in recent years.

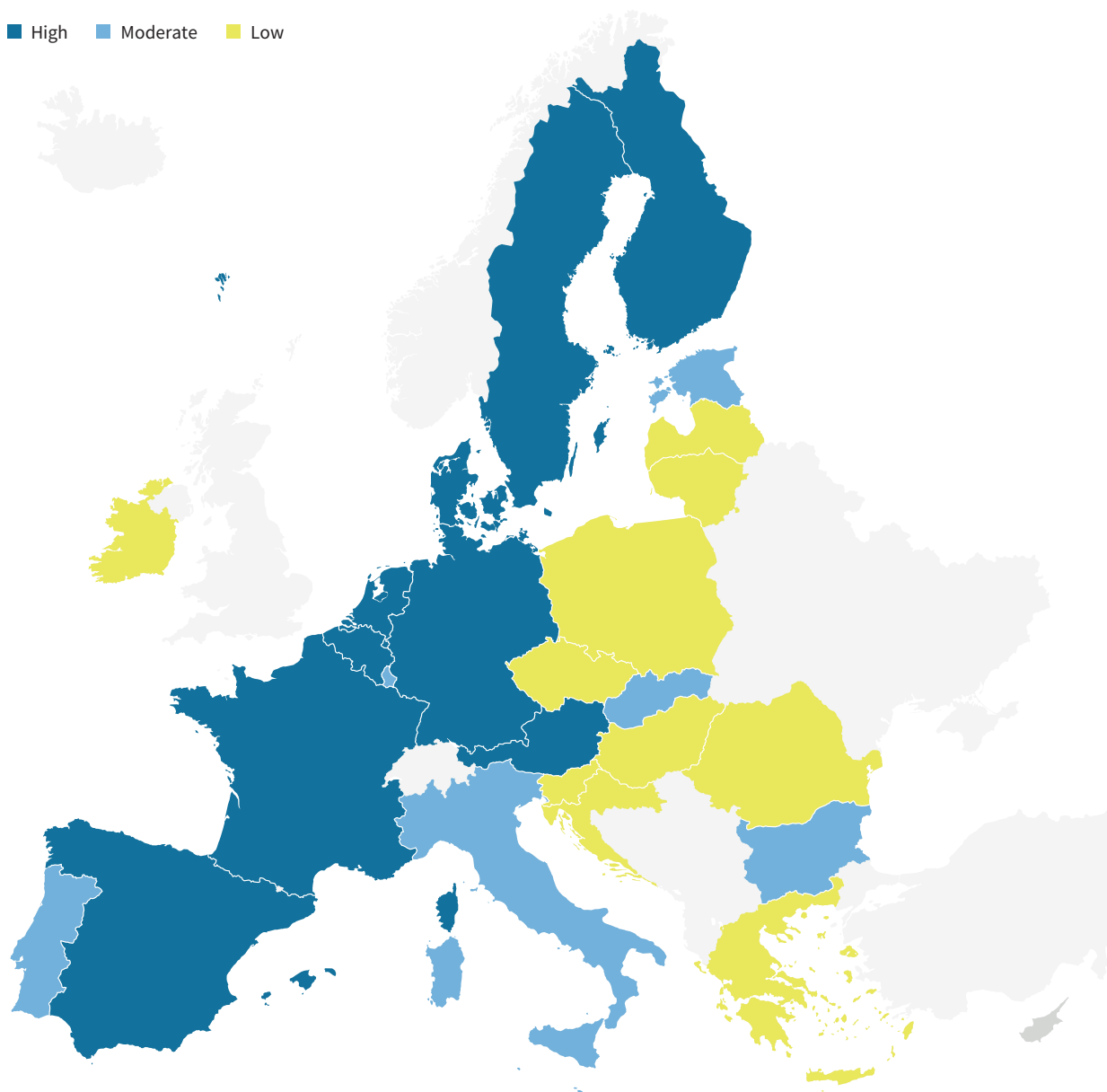
Social partners

One of the core concerns raised by trade unions with respect to AI is its potential negative implications for data protection and privacy and monitoring in the workplace and in society in general. These concerns were heightened by the greater use of surveillance and monitoring technologies in remote working during the pandemic (Eurofound, 2020c). Evidence presented by ETUC, based on inputs from its national affiliates, suggests that the pandemic contributed to an increased uptake in monitoring technologies in European workplaces, a diversification in approaches used to monitor the activities of workers and an expansion in the type of data collected for surveillance and monitoring purposes (Ponce Del Castillo, 2020).

At national level, trade unions have documented the detrimental effects that digital surveillance can have on workers. For example, the Spanish Trade Union Confederation of Workers' Commissions (CC.OO) argues that AI algorithms are becoming pervasive in the world of work, with a growing number of companies incorporating AI technologies into organisational

Figure 1: Intensity of debate on the ethical implications of AI in the EU

■ High ■ Moderate ■ Low



Source: Created by the authors based on information received from the Network of Eurofound Correspondents

processes (Calderón, 2021). In 2021, the CC.OO endorsed the joint declaration on the responsible use of AI in the insurance sector, calling for the use of and respect for high ethical standards in the use of AI (UNI Europa et al, 2021). The union notes that AI technologies are likely to become more pervasive in the future with ‘algorithms and AI being increasingly relevant for determining working conditions’ (El Salto, 2021).

Similar concerns with respect to data protection and privacy, particularly in the context of greater use of digital technologies for monitoring and surveillance, are raised by trade unions in Austria, Croatia, France, Germany and Sweden. The German Trade Union Confederation (DGB) and the United Services Trade Union (ver.di) contend that the deployment of AI in the

workplace brings a host of ethical challenges in terms of increased monitoring and surveillance of employees. Ver.di argues that the personal data of employees need to be protected and that the use of AI technologies should not impact other personal rights (ver.di, 2020). In contrast, employer organisations predominantly approach the impact of AI from the angle of competitiveness and investment in skills, and they highlight the potential regulatory burden stemming from proposed legislation. For example, the Confederation of German Employers’ Associations (BDA) argues that the proposed amendments to the Works Council Constitution Act would increase the regulatory burden for companies. The BDA also argues that collective bargaining at local level should be the

preferred means of addressing the potential impacts of digitalisation, including issues of data security, privacy and transparency.

In Sweden, the Confederation of Swedish Enterprise – alongside trade unions – has however raised concerns about the pervasive surveillance enabled by AI technologies and the implications for data protection and privacy. It contends, though, that not all monitoring applications of AI are negative. If used ethically, it points out, AI applications such as facial recognition can stop non-staff from entering work premises or prevent staff from accessing dangerous areas (addAI, 2021).

Another important ethical concern raised in national public debates about AI is the issue of discrimination and bias stemming from the use of the technology in various organisational processes ranging from recruitment and selection procedures to performance management. These concerns are prominent in debates in Austria, Denmark, Finland, France, Germany, the Netherlands and Spain. In Denmark, the Association of Nordic Engineers (ANE) has raised concerns about the potential bias encoded in AI applications at the design and development stage, calling for:

a strong emphasis not only on minimizing bias in the developed AI systems, but also on ensuring diversity in the workforce as well as considerations of how educational systems may need to be reformed to address the mounting needs and pressing concerns.

(ANE, 2018, p. 17)

In France, the CFDT trade union argues in favour of inclusive and responsible AI as a strategy for minimising potential bias and discrimination. The union also favours a human-in-command approach to correcting potential algorithmic biases (CFDT, 2018). In a similar vein, the Finnish Confederation of Professionals (STTK) argues that the quality of the data used to train algorithms is a potential source of bias, an issue that needs to be addressed through regulation (STTK, 2018). Social partners have also raised concerns with respect to the distributional impacts of automation and AI and the broader societal consequences for fairness, equality and social justice. Concerns regarding the social justice implications of AI have been raised in Bulgaria, France, Greece, Malta and the Netherlands. In the Netherlands, a report published by the Social and Economic Council in 2016 observed that technological unemployment is likely to impact countries in the medium term, with significant effects on income distribution. To respond to these challenges, the report calls for sustained investments in novel technologies and lifelong learning programmes, as well as monitoring of the implications

of such technologies for work and employment by social partners and the government (SER, 2016). In Malta, social partners have voiced concerns about the potential downwards pressure that digitalisation puts on wages, impacting on issues such as fair pay and the effectiveness of collective agreements to secure decent wages (GWU, 2021). In France, the General Confederation of Labour (CGT) emphasises the need to anticipate transformations induced by AI through a framework that promotes social progress and is informed by a broad social and societal dialogue (Molins, 2019). In Bulgaria and Greece, trade unions call for discussions on the broader societal implications of AI, including on issues such as sustainability, social cohesion and inequality. In Bulgaria, the view of the Confederation of Independent Trade Unions of Bulgaria (CITUB) is that ‘digitalisation is a political, hence a social decision’, which needs to be informed by an explicit discussion of its implications for social justice (Sofia University, 2018).

European and national policy initiatives

The European Commission’s strategy on AI for Europe (2018b) – which is part of the wider EU digital strategy – has spurred the adoption of national AI strategies in most EU Member States, with a view to supporting the development of human-centric, secure, inclusive and trustworthy AI. As part of the European Commission’s AI Watch initiative, progress on national AI strategies is regularly monitored and cooperation between EU Member States fostered.⁷

In February 2022, 23 Member States had adopted national AI strategies. At the time of writing (Q1 2022), national AI strategies were still in development in Belgium, Croatia, Greece and Romania. All the published AI strategies recognise the need to pay attention to the ethical challenges raised by AI. Most of the strategies also incorporate or make explicit reference to the ethical guidelines published by the high-level expert group on artificial intelligence (AI HLEG) set up by the European Commission. For example, the Austrian strategy argues that the protection of human rights and human dignity are cornerstones of the European approach to ethics and that ethical and social reflection is an essential part of developing novel technologies. In Cyprus, the national AI strategy notes that small countries depend on supranational regulations to reconcile the potential economic advantages brought by AI with the need to ensure that ethical concerns are addressed.

⁷ Other initiatives mapping and monitoring AI-related policies are the Organisation for Economic Co-operation and Development’s Artificial Intelligence Policy Observatory (OECD.AI; see <https://oecd.ai/en/>) and the Council of Europe’s AI initiatives (see <https://www.coe.int/en/web/artificial-intelligence/national-initiatives>), largely based on FRA’s collection of policy initiatives during 2016–2020.

By comparison, the Lithuanian AI strategy contends that trustworthy AI has two components: a focus on ethical implications and fundamental rights that defines the core principles, values and appropriate regulations to protect them and technical robustness and reliability to ensure that AI does not cause unintentional harm.

Differences between strategies exist with respect to whether concrete actions are proposed to address ethical concerns and the priority assigned to ethical principles in the context of work and employment. While referring to the need to follow ethical principles, AI strategies in Estonia, Finland, Italy and Slovenia do not detail which regulatory instruments will be used to gather information about or regulate the use of AI technologies. In contrast, AI strategies published in other EU Member States specify particular initiatives. One type of initiative is the establishment of ethics committees, councils or expert groups to monitor developments in the field of AI, supervise AI use and develop recommendations on ethical issues raised by the technology. As shown in Table 5, nine Member States have established AI ethics committees and twelve have established technology expert groups, which, within a broader remit to foster the uptake of AI, also analyse the ethical concerns raised by the technology.

In France, the AI strategy recommends the establishment of a national advisory committee on ethics modelled on the National Consulting Ethics Committee (CCNE), created in 1983 for health and life sciences. The advisory committee would be separate from the CCNE and would be tasked with coordinating public debates on the ethical implications of AI, providing expertise on the effects of AI in relation to social and labour market issues, and developing independent opinions on the medium- and long-term implications of the technology.

In Denmark, a Data Ethics Council was established in 2019 with the mission of advising on ethical aspects related to data use in the public and private sectors and

increasing awareness of the ethical implications of AI through debates and public consultations. By February 2022, the council had issued three recommendations with respect to the use of private data in the public space and launched several public consultations on relevant legislative proposals.

In Germany, an Ethics Commission was established by the Federal Ministry of Transport and Digital Infrastructure with the purpose of ruling on driverless cars. The commission published its report on automated and connected driving in June 2017 (Ethics Commission, 2017).

Several EU Member States are also considering setting up, or have already established, AI observatories to monitor ethical developments in the field of AI. This is the case in Austria, Czechia, France, Germany, Hungary, Poland, Portugal and Slovenia. In Austria, the government plans to establish a socioeconomic observatory for AI similar to the Organisation for Economic Co-operation and Development's AI Policy Observatory and the EU's AI Watch. In Germany, a new observatory will be tasked with monitoring the uptake of AI, conducting impact assessments with regard to the implications of AI for the world of work and society as a whole, and developing studies on how socially compatible technologies can be developed. The German AI plan also supports the establishment of AI observatories at supranational level to monitor the implications of AI from a cross-regional or global perspective.

Differences also exist in national strategies with respect to the depth of analysis of the ethical implications of AI for the world of work. In particular, the Austrian, French and German strategies go beyond describing the potential quantitative impacts of AI on employment levels and provide an extensive analysis of the ethical risks that AI technologies pose for workers. For example, the Austrian strategy discusses the implications of AI for work organisation and forms of work, contending that human-centred AI systems in a work context have

Table 5: Policy approaches to ethics in the EU and Norway

Approach	Country
Ethics committees	Cyprus, Denmark, Finland, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia
Expert groups	Austria, Belgium, Czechia, Estonia, Germany, Ireland, Italy, Lithuania, Malta, Norway, Poland, Slovakia, Sweden
AI observatories	Austria, France, Germany, Hungary, Poland, Spain
Codes of conduct/Toolkits/Guidelines	Bulgaria, Cyprus, Estonia, Finland, Germany, Hungary, Lithuania, Netherlands, Norway, Portugal, Slovakia, Spain
Certification schemes	Denmark, Malta, Norway, Spain
Supranational coordination	Cyprus, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Netherlands, Norway, Slovakia, Spain, Sweden

Source: Created by the authors based on information received from the Network of Eurofound Correspondents

strong potential to upgrade work processes, as certain tasks could be carried out using AI-supported automated systems. The strategy also addresses a broader range of issues, such as collective bargaining, social security, quality of life, preventing discrimination and promoting diversity. Furthermore, the French strategy describes the potential complementarities between humans and machines, and it reviews some of the risks associated with the use of AI in the employment context (for example, potential loss of control, discrimination and bias, data protection and deskilling).

In a handful of EU Member States, such as Austria, France and Germany, social partners have tended to be involved in drafting national AI strategies. For example, in Germany, the strategy explicitly mentions the involvement of social partners in the broad consultation that took place prior to its adoption and highlights the important role that social partners will have in making the implementation of AI more inclusive and fairer for workers. In Norway, peak-level social partners are regularly involved in the development of strategies on AI and are also members of the Digitalisation Committee set up by the government. While not directly mentioning the involvement of social partners in the development of national AI strategies, other EU Member States, for example Czechia, Malta, the Netherlands, Slovenia and Spain, refer to broad stakeholder consultations.

A growing number of policy initiatives complement national AI strategies in several EU Member States – particularly in Nordic and continental countries – acknowledging ethical concerns particularly in relation to the use of AI. For example, in Belgium, two regional initiatives – AI4Belgium and Action Plan AI – seek to provide information and policy support on regulating AI. AI4Belgium is a grassroots initiative that includes public and private sector stakeholders; it calls ‘for a robust and up-to-date legal framework, ethical principles and more transparency’ (AI4Belgium, undated). By comparison, Action Plan AI is an initiative supported by the Flemish Region that aims, among other things, to establish a knowledge centre on data and society (Departement Economie Wetenschap & Innovatie, 2019). In the Nordic-Baltic region, ministers responsible for digital development from Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway and Sweden have signed a declaration on increasing partnerships in the field of AI, which includes a focus on developing ethical and transparent guidelines, standards, principles and values to guide the use of AI (Nordic Council of Ministers, 2018). Furthermore, in Finland, the government-funded AuroraAI project promotes the implementation of AI in public services and a human-centric and ethically sustainable approach to the use of the technology.

Regulatory approaches and links to ethics

Privacy and data protection legislation

National legislative developments of relevance for the debate on ethics in relation to new technologies are mainly in the realm of data protection and privacy, largely as part of the implementation of the General Data Protection Regulation (Regulation (EU) 2016/679), known as the GDPR. The GDPR, which entered into force in May 2018, sets out the seven data protection principles on which national data protection legislation is built. These are lawfulness, fairness and transparency; purpose limitation; data minimisation; accuracy; storage limitation; integrity and confidentiality; and accountability (GDPR, Article 5). The GDPR, however, leaves to individual Member States questions of personal data processing in the employment relationship, opening up the possibility of introducing ‘more specific rules to ensure the protection of the rights and freedoms in respect of the processing of employees’ personal data in the employment context’ (GDPR, Article 88(1)).

The GDPR also introduces the right not to be subject to a decision taken without human intervention and based solely on automated processing that significantly affects an individual (GDPR, Article 22). Automated individual decision-making is, however, permitted under certain circumstances, for example if authorised by a Member State, if necessary for entering into a contract or if based on the data subject’s explicit consent. The notion of informed consent has often been criticised as not representing an appropriate legal basis – particularly in the employment context, owing to the imbalance of power between employer and employees. The notion of informed consent is also unsuitable in the context of the use of AI-driven systems, considering that algorithms are inherently non-transparent and, in most cases, not intelligible to the data subject (Aloisi and Gramano, 2019).

In some countries, such as the Netherlands, the employee’s consent is not considered a valid legal ground for processing personal data (Eurofound, 2020c). In Germany, the Federal Data Protection Act contains specific rules for the handling of employee data, with a special clause on the definition of consent. Section 26 states that the validity of the consent should be assessed based on the level of dependence of the person employed in the employment relationship as well as the circumstances under which the consent was granted.

The GDPR also opens up the possibility for Member States to allow the processing of biometric data – otherwise considered a special category of personal data – for example, on the basis of the consent of the data subject. In several Member States, the use of

biometric devices in the workplace is either forbidden outright or permissible only for access control and security purposes, and subject to restrictions (Eurofound, 2020c). This is, for example, the case in Portugal, where the Data Protection Act (Law 58 of 8 August 2019) also explicitly forbids the ‘reversibility’ of such biometric data – that is, the data obtained must be anonymised to avoid the original fingerprint or face scan being traced back to an individual. The use of biometric devices as part of ‘corporate wellness’ programmes – in which employees willingly take part – is, however, an emerging trend and greater clarity is needed on the legal basis for the processing of biometric data in the workplace (Ball, 2021). The GDPR also establishes that in cases of automated decision-making, including profiling, the data controller (that is, the employer in the employment relationship) is required to provide ‘meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject’ (GDPR, Articles 13 and 14). These articles lay the foundation for a ‘right to explanation’ on which national legislation can build. As argued by Todolí-Signes (2019), these protections may, however, be insufficient, as ubiquitous digital technologies give rise to unjustified interference in workers’ fundamental rights and freedoms and open the door to potentially discriminatory decisions.

Some EU Member States have gone further in regulating data processing in the employment context. For example, French data protection legislation (implementing the GDPR) is supplemented by a national law on data protection (*La loi informatique et libertés*) amended in 2018, and the doctrines of the French Data Protection Authority (CNIL). On 21 November 2019, the CNIL adopted a reference framework on the processing of personal data for the purposes of personnel management, which prohibits decision-making by machine alone.

The French Human Rights Defender has pointed to the need for stronger protections in the face of the growing use of algorithms:

The lack of transparency of the systems implemented and the correlation of data made possible by algorithms, often in a totally invisible way, make the protections offered by the law uncertain or even ineffective ... This subject has long remained a blind spot in the public debate. It should no longer be a blind spot ... Biases can thus be integrated at all stages of the development and deployment of systems ... only a precise and regular control of the results of the learning algorithm will make it possible to ensure that the algorithm does not become discriminatory with successive encodings.

(Défenseur des droits, 2020)

The French Human Rights Defender also notes that the designers of algorithms, as well as the organisations purchasing and using algorithm-based systems, do not show the necessary vigilance to prevent human bias being perpetuated and reinforced in algorithm-based decisions.

The Italian data protection legislation is also complemented by provisions set out in the Workers’ Statute, which prohibits the use of technology for continuous and indiscriminate monitoring of workers. The use of remote monitoring devices in the workplace requires a prior trade union agreement or administrative authorisation and is permissible only for specific purposes: organisational and production requirements, work safety and protection of company assets. Recent Italian case law on the lawfulness of algorithmic work management also provides guidance on the applicability of important principles enshrined in the GDPR and, in some instances, hints at the relevance of a risk-based approach as envisaged by the draft EU regulation on AI (Clifford Chance, 2021).

Similarly, in several other Member States, labour law complements national data protection legislation with specific provisions regulating data processing in relation to workplace surveillance through technical means. For example, in Sweden, complementing the Data Protection Act, the Work Environment Act has specific provisions on workplace surveillance – also applicable to the digital work environment – and further supplemented by a regulation on screen-based work that does not permit monitoring of employees’ computer-based activities without employees being informed and aware of being monitored.

In Germany, the federal government is examining the need for refined or extended data protection rights for employees, particularly in the context of AI and other digital technologies. The rationale behind the adoption of a new Workers’ Data Protection Act is ‘to raise the level of legal certainty within companies and safeguard employees’ personal rights and their right to control their own data’ (Federal Government, 2018, p. 28). However, at the time of writing, no proposal for a draft law or other legislative initiative has been put forward.

Beyond data protection legislation

There are growing concerns among policymakers in the EU and beyond that AI technologies can be leveraged to weaken democracy and promote digital dystopia. The Council of Europe has set up an ad hoc committee on artificial intelligence (known as CAHAI) to explore the feasibility of a legal framework for the development, design and application of AI that respects human rights, the rule of law and democracy (Council of Europe, undated). Another important global initiative is the United Nations Educational, Scientific and Cultural Organization’s recommendation on the ethics of AI, which outlines broad ethical implications of the use of

AI systems in society and provides guidance to signatory countries on responsible use of the technology. A pitfall of this instrument is that it has no legal status and no enforceability on companies actively using AI (Unesco, undated).

In the EU, the European Commission has laid out plans to regulate AI use (European Commission, 2021) based on the level of risk posed by the type of AI technology in question. According to the draft rules, AI systems used, for example, for work management and recruitment are classified as high risk and therefore need to comply with certain mandatory requirements and an ex ante conformity assessment before being accepted on the EU market. If it comes into force, this regulation will enforce what until now were mere recommendations with no legal binding power.

However, a number of criticisms have been raised with regard to the proposed regulation. From a worker perspective, it is problematic that the legislation governs exclusively the relationship between providers of AI technologies and those deploying them, leaving out those directly affected by the deployment of AI systems. The draft regulation has also been criticised for not addressing the key issue of liability – that is, who is responsible for the consequences of actions undertaken by pre-programmed intelligent systems – and not providing redress mechanisms for those harmed by AI systems (Ponce Del Castillo, 2020, 2021). Furthermore, according to De Stefano and Taes (2021 p. 11), ‘the assessment of conformity of these systems will take the form of self-assessment by the provider’. This means that there is no requirement for an external conformity assessment by a notified body.⁸ This allows companies the freedom to use such systems at their own discretion and entails power asymmetries that disadvantage the individuals affected by the use of AI systems.

At national level, legislative initiatives on AI and other digital technologies applicable to the employment context have been slow to emerge, with only a few instances being reported. One such initiative is the enactment of a new regulatory framework by the Maltese government in 2018 to support the development and use of innovative technologies: the Malta Digital Innovation Authority Act and the Innovative Technology Arrangement and Services Act (ITAS Act). The Malta Digital Innovation Authority Act establishes a public authority to promote ethical and legitimate design and exploitation of innovative technologies and provides a certification system, whereas the ITAS Act regulates innovative technology

arrangements and services and sets out the methods by which the authority can certify them. Although the legislative framework originally focused on distributed ledger technology, the scope has been widened to cover other advanced technologies, including AI.

A novel approach to regulating the use of digital technologies (including AI) is exemplified by the Charter of Digital Rights released by the Spanish government in July 2021 (Presidencia del Gobierno, 2021a). The charter guarantees the dignity and fundamental rights of workers in digital environments. The rights enforced include, for example, the right to disconnect, the right to data protection and privacy in the use of digital devices for a range of purposes including monitoring and surveillance, and the right to be informed about the use of such devices. Furthermore, the use of algorithms in the workplace is subject to a data protection impact assessment intended to identify any risks related to ethical principles and rights. The charter is not per se a regulation but rather a reference framework serving as a guide for future legislative projects and policies (Presidencia del Gobierno, 2021b).

The growing role of AI in work management has prompted national trade unions – as in Austria and Germany – to advocate for extending existing co-determination rights to AI use in the workplace. An important step in this direction is the German Works Council Modernisation Act, which provides for the involvement of works councils in decisions regarding the use of AI. According to the DGB, the successful implementation and uptake of AI in the workplace will depend on a broad participation process that involves employees and their representatives (DGB, 2019). In its initial assessment on the Commission proposal for a regulation on AI, the DGB also calls for ‘a right, for unions in particular, to take legal action in the first step for disclosure of the functionalities of the algorithms in AI systems used in companies and the source code behind these algorithms’ (DGB, 2021).

Similarly, the Austrian Chamber of Labour (AK) calls for the strengthening of co-determination rights with respect to the use of AI through a bottom-up approach that gives works council members sufficient time, financial resources and access to expertise to analyse the potential effects of new technologies.

In other Member States – such as Denmark, Finland, the Netherlands and Sweden – and in Norway, bargaining or consultation on the introduction of new technologies is promoted by legislation. For example, in Sweden, the Employment (Co-Determination in the Workplace) Act requires employers bound by collective agreements to

⁸ In the proposal for a regulation, a notified body is defined as ‘a conformity assessment body designated in accordance with this Regulation and other relevant Union harmonisation legislation’.

negotiate with union representatives regarding any significant changes to business activities or the work and employment situation.

There are also instances of collective agreements – at national and sectoral levels – under which the involvement of employee representatives is a pre-condition for the introduction of new technologies in the workplace (without, however, specifying the type of technology). A case in point is Belgium, which has a long-standing national collective bargaining agreement (No. 39 of 13 December 1983) concerning information and consultation on the social consequences of the introduction of new technologies. In the Italian national agreement in the telecommunications sector (12 November 2020), information disclosure on the use of new technologies in the workplace and the involvement of trade unions are also basic requirements. Article 57 of this agreement deals with the protection of workers' rights (including the rights to privacy and non-discrimination) in relation to the use of new digital technologies and systems.

In Norway, the central 'basic agreement' between the Confederation of Norwegian Enterprise (NHO) and the Norwegian Confederation of Trade Unions (LO) contains a supplementary agreement on technological development and computer-based systems. This stipulates that the design and implementation of the technology must be subject to social dialogue with employee representatives and the impact of the technology is to be assessed not only in technical and economic terms but also with regard to social considerations including organisational change, employment, social interaction, gender equality, and so on.

More sporadic are instances of company-level agreements addressing explicitly the impact of digitisation and automation technologies on working conditions and, more so, on workers' fundamental rights. Initiatives on ethics at company level generally take the form of codes of ethics rather than collective agreements and are by nature aspirational.

Social partner initiatives

The adoption of the European social partners' autonomous framework agreement on digitalisation in 2020 has set in motion discussions and exchanges among national social partners on the challenges and risks of digitalisation and the actions that need to be taken. In several Member States, the process for the implementation of the framework agreement at national level has begun, but progress may have been slowed down by the COVID-19 pandemic, which has resulted in shifting priorities on the agendas of national social partners. At the time of the screening of national sources (Q3 2021), the framework agreement was being implemented in the Netherlands, with the first

implementation report released in April 2021 (Stichting van de Arbeid, 2021). As part of the implementation process, Dutch social partners have agreed with the government on various schemes to promote sustainable employability and lifelong skills development within companies and across sectors. In France, peak-level social partners have set a 'social agenda', under which discussions and exchanges on AI are expected to take place in 2022, but with no indication on whether this will lead to an agreement or an action plan.

In a handful of EU Member States where ethical issues are particularly prominent in policy debates on digitalisation and AI, national trade unions have been campaigning for responsible use of technologies and have issued ethical guidelines and checklists. For example, German services union ver.di published *Ethical guidelines for the development and use of artificial intelligence (AI)*, which are intended to provide guidance and practical advice to those who develop, introduce and use AI applications in the workplace (ver.di, 2020). Some of the principles set out in these guidelines cover, for example, non-discriminatory, safe and meaningful use of AI; human oversight; and clear responsibilities. The DGB has also published a guiding framework for the introduction of AI in the workplace, which revolves around the principle of 'good work by design' and proposes a forward-looking approach, arguing that 'a prerequisite for good design [of autonomous software systems] is a broad participation process, which should begin with the definition of the objectives for the AI and its application and should include an impact assessment' (DGB, 2020, p. 2).

The principle of developing AI applications through dialogue among all actors involved is highlighted in other guidelines issued by trade unions in other Member States, for example the General Labour Federation of Belgium (FGTB/ABVV, 2019). Published as part of a campaign for socially responsible digitisation, the FGTB/ABVV guidelines call for greater involvement of works councils and union representatives in the early stages of technology adoption.

Trade unions in France and Italy have also published guidelines and supporting documentation on ethical use of technologies in the workplace. For instance, in 2018, the CFE-CGC developed a HR Ethics and Digital Charter, which outlines a set of definitions, principles and good practices with a view to promoting responsible use of personal data in algorithm-driven HR practices. The charter is intended 'to bring this fundamental right [the right to data protection] to the heart of social dialogue in companies, by placing it on the agenda of a works council' (CFE-CGC, 2018). Going beyond the issue of data protection, the guide issued in 2020 by the French General Union of Engineers, Managers and Technicians (UGICT-CGT) draws attention to the need to ensure the transparency of algorithms,

provide ethics training to engineers and promote social dialogue around AI applications for a fair and inclusive adoption process at enterprise level (CFDT, 2018).

There are comparatively fewer initiatives promoted by employer organisations that address specifically ethical issues arising from the increasing digitalisation of work; the existing initiatives typically focus on challenges in the area of new skills and are aimed at raising awareness among employers about the importance of investing in continuous training and skills development. For example, in Spain, the CEOE has developed a catalogue of digital training plans for vulnerable groups at risk of digital exclusion (CEOE, 2021), and the Belgian employer organisation Agoria released in 2020 a white paper highlighting the need to invest in continuous training while leveraging digital technologies for meaningful work.

In some EU Member States, sectoral employer organisations have, however, developed codes of conduct or ethical guidelines for their members. For example, Dutch trade organisation NLdigital, representing ICT and telecoms companies, has established a group called ThinkTank Ethics to develop an ethical code of conduct on AI. Drawing on the European Commission's guidelines for ethical AI (AI HLEG, 2019a) this code of conduct focuses on a number of requirements for trustworthy AI, namely privacy and data governance, transparency, diversity, non-discrimination and fairness, and technical robustness and safety (NLdigital, 2019).

In Finland, several employer organisations and trade unions⁹ have taken a common stance on digitalisation, issuing in 2019 a joint statement on principles for successful digitalisation (including AI), highlighting the importance of investing in skills, implementing coherent and fair rules, and ensuring cooperation between all parties. The underlying message is that, if implemented correctly, digitalisation is an opportunity for both employers and employees, as it can increase labour productivity and employee well-being.

There are also instances of national social partners working together through EU-funded projects to support renewed forms of social dialogue in the context of the increasing digitalisation of work. One example is the SéCoIA Deal ('Serving confidence in AI through dialogue') project with the participation of the CFE-CGC, the French Union of Local Businesses (U2P), the Italian Confederation of Managers and Other Professionals (CIDA), and the Swedish Confederation of Executives

and Managerial Staff (Ledarna). Another such initiative is the WorkTransitionCEE project,¹⁰ bringing together social partners from eastern European Member States, notably Romania (the employer confederation Concordia and the National Trade Union Bloc (BNS)), Hungary (the Confederation of Hungarian Employers and Industrialists (MGYOSZ) and the Metalworkers' Union (VASAS)) and Slovakia (the National Union of Employers (RUZ) and the Independent Christian Trade Unions of Slovakia (NKOS)).

A similar project at national level is Arbeit 2020, initiated in Germany by three industry trade unions – the metalworkers' union IG Metall, IG BCE, representing workers in the mining, chemicals and energy sectors, and the food, beverages and catering union NGG (Haipeter, 2019). The project sought to raise works councils' awareness about the impact of digitalisation in the workplace, improve their capacity to respond to changes and ultimately lead to the negotiation of 'agreements for the future' (*Zukunftsvereinbarungen*) with management to address jointly any issues identified.

Similarly, the Italian General Confederation of Labour (CGIL) launched in 2020 the Lavoro 4.0 project, aimed at developing a framework to address the consequences of the introduction of AI through collective bargaining and training initiatives, targeting both union representatives and workers.

Summary

- The policy debate on the ethical implications of the use of digital technologies varies between EU Member States. Ethical issues are typically raised in relation to AI and most prominently debated in northern and continental Member States. Different ethical concerns and priorities feature in national debates on the implications of AI. This diversity partly reflects the lack of a common understanding of the ethical implications of AI among policy stakeholders, as well as the different priorities that social partners and governments set for the policy agenda.
- In recent years, several policy initiatives have been proposed or implemented across EU Member States to address the ethical implications of AI. Many of these initiatives are soft policy instruments that seek to coordinate legislative actions, monitor the uptake of AI and establish voluntary codes of conduct.

⁹ The Confederation of Finnish Industries (EK), the Central Organisation of Finnish Trade Unions (SAK), the Finnish Confederation of Professionals (STTK) and the Confederation of Unions for Professional and Managerial Staff in Finland (Akava), as well as the central and local government sector employer organisations and the commission for church employers.

¹⁰ The full title of the project is 'Renewed social dialogue for the new world of work – job transitions and digitization in central and eastern European countries'.

- National AI strategies address the ethical implications of AI for work and employment to varying degrees. Only a few national strategies provide details on how these implications will be addressed through policymaking.
- National legislative initiatives addressing ethical issues (other than data protection) in the context of digitisation and automation (including AI) have been slow to emerge. This is likely to change if the EU draft regulation on AI is adopted. There is, however, also greater scope to build further on the GDPR and introduce more specific rules applicable to the employment relationship. National and sectoral collective agreements deal more generally with securing the involvement of employee representatives in technological change in the workplace to ensure that technology adoption does not compromise working conditions.
- In some EU Member States, trade unions have been particularly vocal about the threats to workers' rights posed by digital technologies in the workplace and have been campaigning for greater involvement of employee representatives in technological change. Fewer initiatives have been taken by employer organisations to address the ethical implications of the digitalisation of work. There are instances of national social partners joining forces and sharing a vision of a participatory approach to the design and implementation of technologies in the workplace.

4 Conclusions

The use of sensor technologies such as IoT, advanced robots and AI is a reality in a growing number of workplaces and impacts many areas of working conditions. New ethical concerns arise as applications become increasingly complex, reliant on the real-time collection and processing of vast amounts of data, and capable of autonomous decision-making. These ethical concerns relate to the quality of work, fundamental human rights and ethical principles.

The evidence on the implications of digitisation and automation technologies for working conditions is mixed, and the extent to which these technologies raise ethical dilemmas depends largely on how they are designed and implemented in the workplace, as well as on the existence or otherwise of regulation to deal with the most acute ethical issues.

Digitisation and automation technologies are generally found to increase workers' physical safety and eliminate manual routine tasks, possibly enabling workers to focus on more rewarding tasks. However, a pre-condition for this to happen is the provision of adequate training, upskilling and reskilling to workers whose tasks are at greater risk due to technological change. While technologies can contribute positively to job quality by taking over more mundane tasks, one risk is that human intervention is relegated to a secondary role – with workers confined to supervisory tasks or exception handling – which may induce a sense of alienation or loss of control over the work.

Research has also shown that technologies can either diminish or increase social interactions, depending on the specific applications. Automation technologies can have a negative effect on the social environment in situations where workers are required to interact routinely with machines instead of other human co-workers. The capacity of workers to forge a positive social identity and relationships in the workplace may also be compromised as machines equipped with sensors and endowed with AI capabilities replace human agency.

Applications of these technologies can also impact workers' mental health due to the constant and pervasive monitoring that they enable, along with the increased work intensity that this may entail. At the same time, constant monitoring to increase employees' productivity may result in infringement of employees' rights to liberty and security, along with the right to privacy and protection of personal data. The acquisition of detailed information on workers – including on their private lives – accentuates the existing asymmetry of power in the employment relationship, weakening

employees' bargaining and negotiating power, and potentially limiting workers' freedom of expression. AI systems could infringe on the right to non-discrimination because the data or the underlying model used to build the algorithm are biased, and these same biases are perpetuated in the automated decision-making. Digitisation and automation technologies raise further ethical concerns about liability and accountability for actions undertaken by machines with decision-taking capabilities.

These considerations show the extent to which working conditions and the ethical implications of the use of digital technologies are intertwined. It is therefore important that policies addressing ethical issues arising from digitalisation consider key aspects of quality of work and are not compartmentalised or confined to legal and compliance issues.

Over the past few years, rapid technological developments, particularly in AI, have brought with them increasing uncertainty about the consequences of the technologies for work and employment. This uncertainty is heightened by the fact that legislation tends to be a step behind technological change ('law lag'), which reduces the efficacy of existing provisions in cushioning the negative or unintended effects of the use of technologies. There are, however, important legislative developments unfolding at EU level. In April 2021, the European Commission published its draft regulation on AI, which sets out a regulatory structure that bans some uses of AI considered to involve unacceptable risks, imposes conformity requirements on high-risk uses (for example, compulsory human oversight and proof of safety) and lightly regulates less risky AI systems. The use of AI for recruitment and worker management currently falls under the category of high-risk use of AI, and will therefore be regulated but not banned outright. From a worker perspective, the current proposal may not be optimal, as it governs the relationship between those who develop the AI technologies (the technology provider) and those who deploy them (for example, the employer), leaving the worker out of the equation, and with limited mechanisms for redress if any harm is caused to workers due to any misuse of the technology.

Ethics are increasingly invoked in policy debates at EU level as a way to foster a common EU identity that has fundamental democratic values at its core. The wording 'human-centric AI approach' – so frequently used in EU policy documents on AI – evokes the idea of a European identity firmly grounded in foundational human values, distancing the EU markedly from other

global leaders – such as China and the US – that have taken very different approaches to the use of digital technologies in their societies.

References to ethics can be found in several EU policy documents, from the EU strategy on AI and the *Ethics guidelines for trustworthy AI* developed by the European Commission's high-level expert group on AI to the GDPR and the initiatives of the European Data Protection Supervisor (EDPS, undated). It is nonetheless important to maintain momentum in policy development and implementation, build further on the current regulatory framework and secure stronger protections for employees against potential misuse or unintended negative effects of advanced technologies, which can be detrimental to workers' fundamental rights. It may be argued, for example, that the principles enshrined in the GDPR may not be sufficient to protect workers' rights in an increasingly interconnected and digital work environment. Academic and policy experts have also repeatedly highlighted the issue of the power imbalance between employers and employees, which calls into question whether workers can freely consent to data gathering and processing.

In recent years, there has also been a proliferation of guidelines on ethical use of technologies, particularly AI, but it remains unclear which ethical principles should be prioritised or how they should be implemented and enforced. It is now time to move the discussion on ethical principles from theory to practical implementation.

Furthermore, ethical issues should be tackled not exclusively through policies specifically oriented towards governing AI-based technologies but also through other relevant policies, for example on education and training. Computer scientists, software engineers and other technical experts may lack knowledge of how to incorporate ethical principles into the design of technology applications or awareness of the ethical consequences of their work. This could be addressed by embedding ethics in standard courses on computing and ultimately in professional practice.

Finally, in order to ensure the appropriate development of an ethical approach to digitalisation of work, the involvement of social partners is crucial to safeguard the interests of all stakeholders at all levels, from the design and implementation of national strategies to the introduction and use of the technologies in the workplace.

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Digitisation and automation technologies, including artificial intelligence (AI), can affect working conditions in a variety of ways and their use in the workplace raises a host of new ethical concerns. Recently, the policy debate surrounding these concerns has become more prominent and has increasingly focused on AI. This report maps relevant European and national policy and regulatory initiatives. It explores the positions and views of social partners in the policy debate on the implications of technological change for work and employment. It also reviews a growing body of research on the topic showing that ethical implications go well beyond legal and compliance questions, extending to issues relating to quality of work. The report aims to provide a good understanding of the ethical implications of digitisation and automation, which is grounded in evidence-based research.

The European Foundation for the Improvement of Living and Working Conditions (Eurofound) is a tripartite European Union Agency established in 1975. Its role is to provide knowledge in the area of social, employment and work-related policies according to Regulation (EU) 2019/127.

