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Artificial intelligence at the workplace and the impacts on work organisation, working conditions and ethics

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Artificial intelligence at the workplace and the impacts on work organisation, working conditions and ethics

June 2023

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This paper draws from the deliverables from contracts 21-3030-04 and 21-3030-02 prepared for the European Foundation for the Improvement of Living and Working Conditions (henceforth Eurofound) in the frame of a research study on human and ethical implications of automation and digitisation at the workplace for work organisation and working conditions. The overview report of this study 'Ethical workplace digitalisation: From theory to practice' is expected to be published in early Autumn 2023 on [Eurofound web site](#).



Abstract

The Digital Compass sets the goal to increase the digitalisation of businesses and take-up of artificial intelligence (AI). The use of AI-based technologies, such as algorithmic management, AI-based robots and wearables using algorithms for data processing, is increasing across countries and sectors. Based on a literature review and the insight from exploratory case studies at company level, this paper presents the main applications of AI-based technologies at the workplace and their impacts for work organisation, working conditions and ethics. Evidence shows a range of both positive and negative impacts of the use of AI on work organisation and working conditions as well as several ethical concerns. To address some of these concerns, a set of ethical guidelines and recommendations from EU, international and national public authorities and social partners have emerged in recent years. The paper presents and compares the different initiatives, highlighting the current gaps to ensure the protection of workers and working conditions while contributing towards the digitalisation goals of the Digital Compass.

Keywords

Artificial intelligence, workplace, impacts, work organisation, working conditions, ethics, legislative framework

1. Introduction

The four goals of the Digital Compass¹ set out by the European Commission for the Digital Decade are 1. a digitally skilled population and highly skilled digital professionals; 2. secure and sustainable digital infrastructures; 3. digital transformation of businesses; 4. digitalisation of public services. The digitalisation of businesses and public services is dependent on the digitalisation of infrastructure and services and of the availability of a digitally skilled population. In its 'Digital Compass' communication, the Commission sets the target of 75% of European enterprises having taken up cloud computing services, big data, and Artificial Intelligence (AI) by 2030 and calls for international digital partnerships that, among others, set standards in multilateral fora such as on the ethical use of AI.

AI systems have been defined by the EU High Level Expert Group on 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. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors, and actuators, as well as the integration of all other techniques into cyber-physical systems) (AI HLEG, 2019a).

The applications of AI at the workplace are varied and increasing, ranging from algorithmic work management, people analytics, pre-hiring screening and recruitment AI software, emotional AI, and AI-assisted robots (Eurofound, 2022). In addition, some AI applications use 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 (Eurofound, 2022; Urzì Brancati et al., 2022). AI solutions can make businesses more efficient by improving work organisation, resource management and productivity. At individual level, AI applications can take over repetitive and tasks that are dull or prone to errors, relieving workers' time to focus on more value-added tasks or improving their safety (Deshpande et al., 2021; Eurofound 2022). On the other hand, the introduction of AI at the workplace can impact several elements of working conditions (e.g., health and safety, working time and work intensity, skills, etc.) and have ethical implications related to privacy, autonomy, human dignity, non-discrimination, equity, and accountability (Wood, 2021; European Agency for Safety and Health at Work, 2022; Eurofound, 2022). Recent years have seen a proliferation of guidelines for ethical use of AI, with different principles and proposals for application (Fukuda-Parr et al, 2021).

In this context, the objective of this paper is aligned with the objectives of the research carried out on behalf of Eurofound from which this paper partly draws. The objective is to analyse the impacts of AI at the workplace in terms of changes to work organisation, working conditions and any ethical implications. This paper also reviews the existing EU legislative framework on the use of AI at the workplace with other relevant initiatives at national and international level, including existing ethical guidelines, and identifies key gaps that need to be addressed to ensure the development and deployment of trustworthy AI in the world of work contributing to achieving the goals of digitalisation of businesses from the Digital Compass.

Building on the research conducted for Eurofound, this paper addresses the following research questions:

¹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 2030 Digital Compass: the European way for the Digital Decade, COM/2021/118 final/2, 9. 3. 2021

- What are the main applications of AI at the workplace?
- What are the impacts of AI on work organisation, working conditions and ethics?
- What are the existing rules and guidelines on the use of AI and ethical AI, and what are the remaining gaps?

To inform this paper, we used insight from the literature review (Eurofound, 2022), screening of policy initiatives and consultation with key stakeholders and experts conducted for Eurofound as part of their research study. A complementary literature review was conducted through academic databases (i.e., Scopus, ISI Web of sciences, EBSCO) with supplementary searches on Google Scholar, ResearchGate, Elsevier and SSRN, and snowballing from the bibliographies of relevant sources identified. The literature review prioritised peer-reviewed literature, to form the basis of the analysis presented in the paper. In addition, key reports and publications from EU and international authorities and agencies (e.g., International Labour Organisation, Eurofound, Joint Research Centre, EU-OSHA) and key social partners (e.g. ETUC, BusinessEurope) were reviewed. The evidence collected through this literature review was synthesised using the principles of rapid evidence assessment.

In addition, the paper draws insight from case studies of establishments having adopted AI that analysed the related impacts on work organisations, working conditions and ethics, conducted in the context of two recently completed but not yet published studies *Human and ethical implications of automation and digitisation at the workplace on work organisation and working conditions* for Eurofound², and *Case Studies on Algorithmic Management in Logistics and Healthcare Sector* for the Joint Research Centre (JRC)³.

2. Main applications of AI at the workplace

Advanced technologies based on AI systems are transforming the workplace. Whereas these technologies are being deployed in nearly all sectors, the spread and take up of AI-based technologies varies across countries and sectors (EU-OSHA, 2018; Eurofound, 2020). Additionally, AI-based technologies take different forms such as algorithmic management applications, wearables using algorithms to process the data collected, or AI-assisted robots and advanced collaborative robots (i.e., cobots). This section provides an overview on the level of deployment and types of technologies with a focus on the European Union.

2.1 Use of AI-based technologies in the EU

The European Commission's Advanced Technology Industry (ATI) data dashboard⁴, using several sources (direct surveys with companies, Eurostat data and further EU surveys) provides a composite score for each EU Member State on advanced technology generation, uptake or investment, among others. The EU countries with the highest composite scores for advanced technology uptake are Finland (with a score of 65 out of 100), Denmark (57) and the Netherlands (53); while Cyprus (3), Bulgaria (7) and Romania (9) have the lowest levels of technology adoption.

The data provided by Eurostat, in particular Eurostat's survey on ICT usage in enterprises, draws an overview on the different rates of AI-technology adoption across Member States and sectors. According to this data, the level of adoption varies across countries depending on the type of technology. Altogether, Internet of Things (IoT) devices have been more widely adopted across the EU than industrial and service robots and AI systems, although significant differences exist in the level of

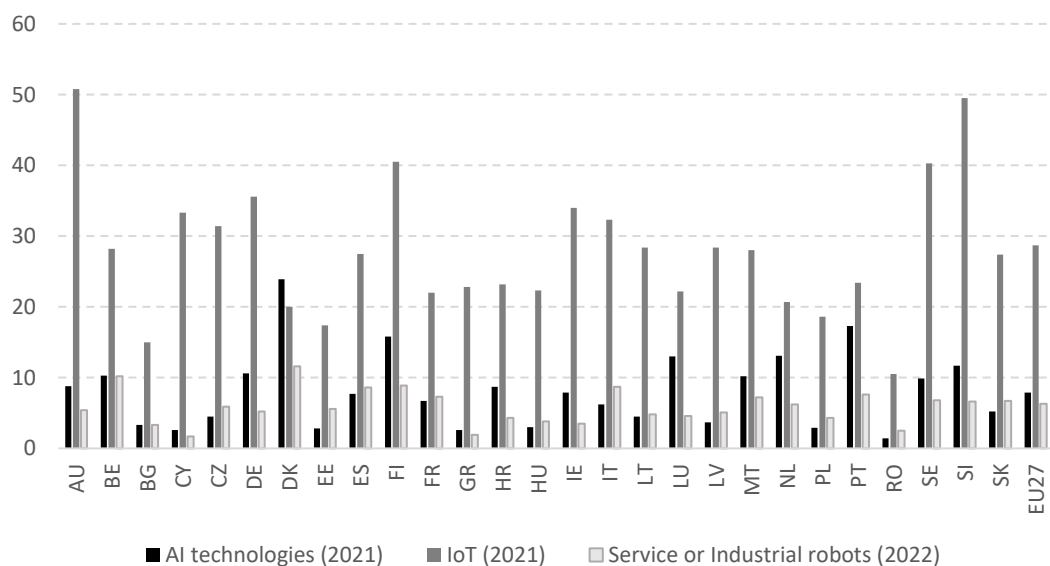
² Eurofound (forthcoming). Ethical workplace digitalisation: From theory to practice. Deliverable from contract 21-3030-04. Soon available at: <https://www.eurofound.europa.eu/publications/report/2023/ethical-workplace-digitalisation-from-theory-to-practice-0>

³ JRC (forthcoming). Case Studies on Algorithmic Management in Logistics and Healthcare Sector. Deliverable from contract 942679-2022-ES.

⁴ Available at: <https://ati.ec.europa.eu/data-dashboard/overview> (Last accessed 5th May 2023).

adoption. Figure 1 exhibits the rates of adoption of AI, IoT and robotic technologies. According to Eurostat data for 2021, at least one AI system is used by 8% of enterprises in the EU on average. AI systems are widely used by enterprises in Denmark (24%), followed by Portugal (17%) and Finland (16%). The lowest percentages of AI systems used in enterprises are found in Romania (1%), Bulgaria, Cyprus, Estonia, and Poland (all with 3%). Additionally, on average 28% of enterprises in the EU use IoT devices, with Austria (51%), Slovenia (49%), and Finland (40%) exhibiting the highest percentages of IoT use in enterprises, while Romania (11%), Bulgaria (15%) and Estonia (17%) show general low levels of IoT adoption. With regard to the use of industrial and service robots, on average 7% of enterprises in the EU use industrial or service robots, with Denmark (13%) and Finland (10%) leading the adoption of robots in enterprises. On the other hand, Ireland (2%), Cyprus (3%), and Latvia (3%) have the lowest percentages of enterprises that claim to have introduced robots in the workplace.

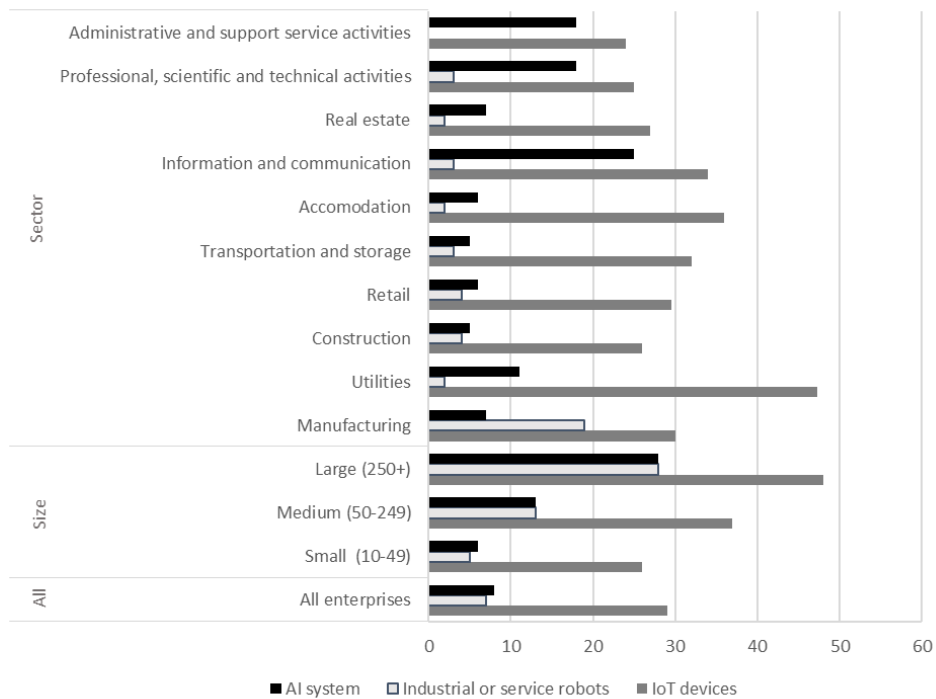
Figure 1. Advanced technology use by enterprises (with at least 10 employees) by EU Member State, 2021 (%)



Source: Authors' own elaboration based on Eurostat survey on ICT usage in enterprises (2021)

At company level, according to Eurostat data, IoT devices are the most adopted technology across sectors. As seen in Figure 2, this is particularly the case for the utilities, accommodation, and information and communication sectors, where respectively 47%, 36% and 34% of enterprises had incorporated IoT devices. In the case of AI systems, most sectors presented low levels of uptake, while three sectors presented high levels of uptake, namely the information and communication (25%), administrative and support service activities (18%), and professional, scientific, and technical activities (18%) sectors. The adoption of service robots was still low (below 5%) across all sectors, with the utilities sector having the highest uptake with a 4% rate of adoption. Large companies presented a considerably higher level of advanced technology adoption than medium and small companies.

Figure 2. Advanced technology adoption in companies by sector and size in 2020 in EU27.



Source: Authors' own elaboration based on ICT usage in enterprises survey (isoc_e), Eurostat, 2021 and 2020.

With regards to the adoption of AI-based robots, and in particular collaborative robots (i.e., robots), the International Federation of Robotics (IFR, 2020) estimated that from 2018 to 2019 there was a 11% increase in the rate of collaborative robots over installed industrial robot units. Moreover, according to the third European Survey of Enterprises and New Emerging Risks (ESENER), around 3.5% of more than 45,000 interviewed enterprises have implemented direct human-robot interaction (HRI) (Wischniweski, Heinold, & Rosen, 2021). The EU Member States for which enterprises reported the highest percentage of HRI applications were found in Slovakia (8.7%), Denmark (6.9%) and the Czech Republic (6.7%).

In terms of investment in AI technologies, the International Data Corporation (IDC) (2020) estimated that Europe's total spending on AI would reach EUR 10.64 billion in 2021. According to IDC's Worldwide AI Spending Guide (2020), out of the total spending in 2020 on AI in Europe, 24% was spent in the financial services industry, followed by the manufacturing (22%) and the retail and wholesale sectors (14%).

2.2 Overview of AI applications in the workplace

AI applications in the workplace can take various forms although these can be divided into three main groups: algorithmic management applications, emotional AI, and AI-assisted robots. It is important to note that the use of these technologies is intertwined, with some applications falling into more than one of the mentioned groups.

Algorithmic management refers to the use of algorithms in the workplace to automate – partially or fully – managerial functions to optimise business processes and human resource management. Algorithmic management relies on the use of data collection and surveillance techniques to enable automated decision-making in real time (Mateescu & Nguyen, 2019), while these techniques tend to

be more pervasive and opaque than previous management techniques using algorithms (Gillepsie, 2014). In a review of the literature, Kellogg and co-authors (2020) identified that algorithmic management is used by employers with three main purposes: to direct workers by restricting and recommending (in terms of what needs to be done, in what order and what timeframe), evaluate workers by recording and rating (to review and assess performance), and discipline workers by replacing and rewarding (to elicit cooperation and enforce compliance).

The use of algorithmic management first gained visibility in the context of the platform economy – as the rating system to evaluate workers' performance based on consumer feedback turned to be an important source of data for early models of algorithmic management (Adams-Prassl, 2022). The online nature of platforms also enables them to exchange and gather considerable amounts of data in an easy and cheap manner (McDonnell et al., 2021). The use of data therefore expanded for platforms to monitor and guide the delivery of tasks through algorithms to ensure high-quality services (Wiener, Cram, & Benlian, 2021). The use of algorithmic management practices has since then been rapidly expanding to other industries and professions such as retail, manufacturing, marketing, consultancy, call centres, lawyers, or the police (Wood, 2021). For instance, in warehouses, workers use scanners with embedded AI systems that assign tasks, communicate orders, and monitor workers performance (Delfanti, 2021).

Algorithms have also been used to set workers' schedules (Bri ne, 2020) or for the screening of job applications (Hunkenschroer & Luetge, 2022). AI-applications can also facilitate managers decision-making through the prediction of employees' performance, deviant behaviours, or low engagement with the company (Parent-Rochelleau & Parker, 2021). In this regard, there is a variety of applications measuring workers' productivity through, among others, their keyboard and mouse use (Heaven, 2020), the analysis of workers' emails content and work patterns (Bales & Stone, 2020) or by tracking and analysing data collected via social media use and communications tools used in the workplace (e.g., Slack, Microsoft Teams) (De Stefano & Wouters, 2022). AI-based applications are also used to take non-managerial decisions, such as to help doctors and nurses diagnose patients and recommend treatments based on that diagnostic. In particular, AI technologies have been found to have a high rate of success in reading radiology scans to detect cancers (Reardon, 2019), or to assist in the triage of patients in emergency rooms (Soltan et al., 2022).

Emotional AI is defined as technologies that 'use affective computing and artificial intelligence techniques to sense, learn about and interact with human emotional life' (McStay, 2020). Emotional AI often consists of wearables and other technologies used to extract data about a person's emotional state based, among others, on their facial expression, body language, voice tone or heart rate variability (Mantello et al., 2023). In the workplace, these technologies have been used to passively measure employees' attitudes and engagement using computer vision (McStay & Urquhart, 2019).

A review and analysis of patents of emotion recognition applications in the workplace worldwide from 1998 to 2020 showed that most often these technologies refer to the monitoring of customers and company representatives on customer service; monitoring of employees' reactions to company policies and events; the detection of security threats (i.e., workers intending to commit fraud or unauthorised users); the detection of availability and preferences of workers for meetings or task assignments; and the detection of workers' feelings in order to change them (Boyd & Andalibi, 2023). Some specific examples on emotional AI applications include, for instance, the use of AI software in workers' computers in call centres to warn them if they are speaking too fast, if they sound sleepy or not empathic enough (Roose, 2019). AI identifying emotions has also been used at the recruitment

stage, such as the automated assessment of video job interviews through face analysis and voice indications (Ajunwa, 2021). Whereas there is an increasing commercial availability of emotional AI in the workplace, it is an emerging technology surrounded by critiques on its accuracy, scientific validity, ethics, societal implications, and legality (Roemmich, Schaub, & Andalibi, 2023). Moreover, there is scientific disagreement about whether AI can, in fact, detect emotions (Crawford, 2021).

Advanced robotics make use of AI-systems to self-learn and respond to changing environments. Machines therefore learn which actions they should perform under which circumstances, adapting to changes in the environment and autonomously taking decisions based on a predefined set of instructions (Iphofen & Kritikos, 2019). As robots became intelligent and were able to adapt and respond to changing environments, the physical barriers that were placed between human workers and robots could be removed (Valori et al., 2021). This translated in the development of collaborative robots, or cobots. The term of cobot was initially coined for a robot interacting with humans, while the definition was later generalised as ‘an intelligent machine designed and made for the purpose of the collaboration with humans in a shared environment, especially, in open industrial environments’ (Bi et al., 2021). The International Organization for Standardization (ISO) (2016) defined cobots as intended to ‘combine the repetitive performance of robots with the individual skills and ability of people’. For instance, in warehouses, robots complement the work of human workers by performing time-consuming and repetitive tasks such as transporting finished orders to a depot (Pasparakis, de Vries, & de Koster, 2023). In the healthcare sector, collaborative robots are used to assist in surgeries, and in particular to assist in surgical procedures requiring detailed precision such as laparoscopic surgeries (Mayor, Coppola, & Challacombe, 2022).

A particular type of AI-based robotics refers to Autonomous Mobile Robots (AMRs) which have been widely used in intralogistics operations such as warehouses and manufacturing (Fragapane et al., 2021). AMRs autonomously orient themselves with the use of advanced sensors and a virtual space map in order to conduct tasks related to storage, transport and production in smart factories (Hercik et al., 2022). Another emerging field of development of AI-based robotics refers to Socially Assistive Robots (SARs), broadly defined as robots that provide assistance through social interaction (Feil-Seifer & Matarić, 2005). Other authors define this type of robots within the umbrella term of social robots, which refers to anthropomorphic robots that are ‘able to cooperate with humans as capable partners and communicate with them intuitively in human terms’ (Breazeal et al., 2005). Hence, this type of robots embeds some of the characteristics of emotional AI. These robots differ from other forms of workplace technology as humans are likely to form social exchanges and have feelings of attachment to them (Bankins & Formosa, 2019). SARs have been introduced in several domains such as healthcare (i.e., to assist and accompany elderly people and children), education (i.e., as teaching assistants) and tourism (i.e., as information providers) (Schmiedel et al., 2021). The development of SARs has been in particular expanding in the healthcare sector amid concerns of future labour shortages in the sector coupled with demographic trends of an ageing population.

3. The impacts of AI on work organisation, working conditions and ethics

AI-based technologies are changing how organisations manage work, their workers and employment relationships, while the use of these technologies can also have ethical implications. This section provides an overview on how the deployment of AI in the workplace can have implications in three main dimensions: work organisation, working conditions, and ethics. The insights presented are based on a literature review on the topic as well as the findings from exploratory case studies conducted

between 2021 and 2023 in specific workplaces in four European countries (i.e., Denmark, France, Italy, and Spain) in the context of the earlier mentioned studies for Eurofound and the JRC (forthcoming).

3.1 Work organisation

As AI-based technologies can be used for a multitude of tasks, AI will lead to new and different work organisations and management models based on an in-depth reflection on the place that AI is given in each workplace (Ponce Del Castillo, 2018). In the case of algorithmic management applications, as mentioned in the previous section, algorithms have a direct impact on work processes as they help organisations' members in directing, evaluating, and disciplining workers (Kellogg, Valentine, & Christin, 2020). Hence, the whole spectrum of the employment relationship from hiring, managing, determining salary levels, to terminating an employment relationship can now be automated (Adams-Prassl, 2020). In this regard, as put forward by Jarrahi and co-authors (2021), AI applications should not be regarded as autonomous from work organisations but as a tool reflecting and redefining existing relationships between managers and workers. In other words, workers and managers are not passive recipients of algorithmic results but assist in the development and alignment of the system to their needs and interests (Jarrahi et al., 2021). This means that AI models will produce and reproduce work practices and will have to be adapted to emerging and changing relations in work practices (Jarrahi et al., 2023).

The development of algorithmic management has also resulted in some cases in the emergence of new work organisations without pre-existing relationships among the management and the workforce such as those embedded under the platform economy. These companies attract potential employees by offering more work autonomy, flexibility, and independence (Ivanova et al., 2018). Workers in the platform economy can choose their work location, thus being able to work from multiple locations, while they can also decide in which tasks they want to engage. However, in some platforms such as Uber or Amazon Mechanical Turk, workers have a lower ability to choose tasks or clients to serve (Dunn, Munoz, & Jarrahi, 2023). At the same time, this autonomy and independence is relative as platforms tend to exert indirect control over their workforce through the use of algorithms (Rosenblat & Stark, 2016). For instance, food delivery platforms recommend routes and although 'riders' have the right to choose a different route, their choice remains monitored (Veen, Barratt, & Goods, 2020; Todolí-Signes, 2021).

Technology dictating work processes and the pace of work is exemplified by warehouses using AI-based scanners. As employees scan barcodes, the scanners assign tasks to them and supervise their work, acting in this manner as mediators between workers and management (Delfanti, 2021). In general terms, the future of warehouses is claimed to be reflected in patents owned by Amazon (Delfanti & Frey, 2021). In this respect, Amazon has also patented the design for a wristband which can track where warehouse workers are placing their hands and which is able to vibrate against the wearer's skin to point their hand in the right direction (Solon, 2018). Therefore, AI-based technologies have also been used to nudge workers' behaviours. Another example beyond warehouses and logistics refers to the use of algorithms analysing data to generate personalised emails targeted to employees to suggest behavioural changes with the aim of increasing organisational effectiveness, prevent burnout or to build an engaging culture in the workplace (Gal, Jensen, & Stein, 2020).

The deployment of AI technologies has also been argued to help workers free up from routine and dull tasks so they can engage in more valuable work. A distinction can be made on this matter between technologies that take up tasks with little or no human involvement; and those for which humans' unique capabilities can complement machines' abilities to perform more complex tasks (Raisch & Krakowski, 2021). The first one enables, for instance, doctors or teachers to spend more time with

patients and students instead of performing data clerk activities (Smids et al., 2020). The second one, refers to the reinstatement effect by which technology adoption allows for a broader range of tasks (Acemoglu & Restrepo, 2019). For instance, the introduction of AI-based robotics has in some cases resulted in human workers having more responsibility for the machine operation as they need to anticipate robots' actions or be more involved in decision-making (Moniz & Krings, 2016).

The case studies conducted by the authors as part of a study for the JRC give further insights on the impact on work organisation. The preliminary results of a case study conducted in a logistics warehouse in Italy showed that new job profiles emerged with the introduction of the advanced technology. In particular, a specific role was created to supervise and interact with the robots for which workers undertaking the role needed to undergo a specific training. In another warehouse in Italy, the technology did not imply the need to integrate or adapt the number of personnel nor did it result in any additional activity to be carried out. In the case of two healthcare facilities in France, preliminary results show that the automation of triage activities in emergency rooms enabled workers to focus on their medical role and disregard some administrative duties while in an Italian healthcare facility, the adoption of advanced technologies led to the creation of new figures inside the establishments (i.e., technology specialists, data managers) (JRC, forthcoming). Similarly, case studies conducted for Eurofound showed that the deployment of AI solutions in a French technology manufacturer as well as a Danish unemployment fund were also found to affect task content and distribution as workers spent less time on repetitive administrative tasks and focused on more rewarding tasks better aligned with employees' education and qualifications (Eurofound, forthcoming).

The introduction of AI-based robotics has also resulted in an increased flexibility in the workplace as human workers can decide how much of their manual work they can hand over to the automation technology (Gajšek, Stradovnik, & Hace, 2020). However, other authors have regarded this as a new challenge since managers need to determine the appropriate assignment of tasks between robots and humans (Liu et al., 2022). Additionally, AI applications imply a higher level of new human-machine interactions which can imply collaboration, cooperation, or co-existence (EU-OSHA, 2022). Work processes and task design might therefore need to be remodelled in order to accommodate new technology devices and their needs.

It is widely admitted that to obtain all the benefits from the introduction of AI technologies in the workplace, the design of the technology deployment is crucial. In the case of algorithmic management applications, Gal and co-authors (2020) argued that to overcome the ethical challenges of these applications, organisations should reframe these technologies as fallible and thus introduce new organisational roles and practices related to human oversight in algorithmic decision-making or increased transparency. In the case of collaborative robots, a systematic review of the literature showed that trust was the key factor to guarantee the success of the introduction of cobots (Kopp, Baumgartner, & Kinkel, 2021). Trust toward the robot, in turn, relates to the reliability and predictability of the robotic agent's performance (Paliga, 2023). Hence, to overcome preliminary fears on robots taking over jobs or dehumanising the workplace; workers who are going to work with the machine should be part of the design of the technology deployment.

The case studies conducted by the authors as part of studies for Eurofound and the JRC also provided evidence on the importance of including workers and workers' representatives for an optimal implementation of the technologies. For instance, the introduction of an AI-based technology in a Danish unemployment fund was initially regarded with fear as the tool was expected to diminish the value of the work conducted by staff at the fund. However, as workers became involved in the design

and development of the application, they learned how the technology was going to take over repetitive and time-consuming tasks so they could spend more time on more rewarding tasks such as tailored advice, support and coaching to job seekers (Eurofound, forthcoming). Similarly, a French manufacturing company follows a standardised procedure for the introduction of AI technologies affecting workers. In this company, AI technologies are, in fact, only introduced after the suggestion from employees themselves and after assessment by a 4.0 Project Committee, which also monitors and assesses the technology on a regular basis after its deployment (Eurofound, forthcoming). This arguably helped workers making use of the technology to accept and trust the introduced AI technologies.

Power structures within organisations are also expected to change due to the lack of transparency associated with AI-based technologies. Workers will increasingly be managed by algorithms for which they lack data literacy to understand their functioning and assess the logic behind the decisions they take (Leicht-Deobald et al., 2019). This is argued to result in information asymmetries between employers which make use of algorithms to drive their managerial decisions and workers the data is retrieved from to inform these decisions (European Parliament, 2020). Workers will also have an informational disadvantage as they do not know the extent to which the data is used by the employer to assess their performance and how it impacts on their work (Dagnino & Armaroli, 2019). This arguably hinders their bargaining and exit power in the labour market (Adler-Bell & Miller, 2018).

3.2 Working conditions

AI technologies have impacted workers' ergonomics although with mixed evidence on their effects. On the one hand, digital technologies are associated with more sedentary work and less physical activities (Eurofound, 2021). On the other hand, advanced robotics are now starting to be designed with the aim of improving workers' postures and decreasing related ergonomic risks. For instance, the use of assistive surgical robots has been found to alleviate surgeons' physical workload and to reduce the risk of musculoskeletal disorders (Hotton et al., 2023). In assembly lines, the introduction of collaborative robots was evidenced to improve physical ergonomics in repetitive process (Gervasi et al., 2023). Similar conclusions were derived from the case studies conducted in warehouses in Italy and France as part of the preliminary results of the study for the JRC, as employees claimed they had a lower physical workload as they did not need to walk long distances or circulate on trolleys in the aisles as in traditional establishments (JRC, forthcoming). Hence, collaborative robots have the potential to improve workers physical state if their design takes into account workers' needs and limits (Lorenzini et al., 2023).

The automation of tasks via AI in the workplace has also reduced the risk of harm to workers as machines take over repetitive or dangerous tasks. For instance, AI-based robots have replaced workers in performing dangerous tasks such as dealing with toxic elements or assisting emergency rescue services (Eurofound, 2020). However, advanced robotics also entailed a closer human-robot interaction that pose safety risks to workers. To guarantee the protection of human workers interacting with robots, international standards to promote a safer human-robot interaction have been developed in recent years to avoid any type of damages derived from this interaction (De Simone et al., 2022).

Despite gains in efficiency, the deployment of AI technologies has exacerbated the overall recent trend on the intensification of work. It is widely admitted that advances in digital technologies are increasing the amount of work to be done, with new jobs being created to fill the digital capacity available (Willcocks, 2020). As a matter of fact, according to an EU-OSHA foresight study (2018), work intensification was identified as one of the main emerging occupational safety and health risks related

with the deployment of advanced technologies - including but not limited to AI-based systems. In the case of AI-based technologies, work intensifies as employees need to follow the work pace established by an algorithm or a machine, thus raising performance standards. For instance, the use of advanced technologies in warehouses has been found to increase performance standards regarding the pace of items' manipulation (Parent-Rochelleau & Parker, 2021). In this regard, workers are requested to increase the volume of tasks to be completed based on the apparent productivity gains that the introduction of the technology generated.

In the case of platform workers, employees' performance is monitored via the speed at which they complete the tasks they are assigned. This puts additional pressure on workers to increase their pace of work to meet the standards of the AI-application as this same application often assists on the decisions concerning their employment status in the company. Additionally, platform workers have also been found to work longer hours at a higher pace as they fear receiving bad customer ratings (Wood, 2021), while delivery workers have skipped legally mandated breaks or safety rules in order to meet their targets (Deshpande et al., 2021). Higher performance standards coupled with rising work intensity have increased overall job dissatisfaction levels, with many employees turning out to quit their jobs (Pasparakis, de Vries, & de Koster, 2023).

AI technologies have also been associated with psychological risks – as the findings from the literature review conducted for Eurofound showed (Eurofound, 2022). For instance, the intensification of work has led to additional pressure due to higher work standards and the pace of work, and in some cases resulted in increased anxiety levels among employees (Bakewell et al., 2018). The use of AI-technologies to monitor workers' performance has also been negatively associated with workers' mental health as they relate to higher levels of stress and risk of burnout (Manokha, 2020). In this regard, there is a growing body of literature associating AI-based monitoring with, among others, loss of autonomy, decreased self-esteem and confidence, or falls in the levels of creativity and communication within the workplace (Deshpande et al., 2021). Monitoring technologies have in some cases even made workers feel forced to hide their emotions or suppress their personality, preferences, and feelings (Todolí-Signes, 2021).

The use of AI-technologies will also impact workers' cognitive skills. It has been argued that AI will replace workers in performing routine and dull tasks so workers can focus on more demanding, creative and rewarding tasks. Other researchers have pointed out that the use of AI decision-making applications provokes a cognitive displacement of humans from decisions – as humans replace their own judgement at the time of taking decisions for an automated decision process (Bader & Kaiser, 2019). Additionally, sometimes the introduction of AI applications has also resulted as cognitively challenging. For instance, in an automotive supplier warehouse, the introduction of an AI-based system for the pick-up of products was challenging for employees as they felt bombarded with information through their headsets (Lager et al., 2021). A scoping review also found that the introduction of advanced robots in manufacturing sites translated in an increase in the mental workload as workers had to supervise the work situation, implying an allocation and reallocation of attentional resources (De Simone et al., 2022).

Another growing concern with relation to the deployment of AI-based technologies in the workplace refers to workers social isolation as they interact less with colleagues. However, , the introduction of AI technologies has been found in several instances to enable workers to engage in more social tasks. For instance, case studies conducted in healthcare facilities in France and Italy showed that the adoption of AI-based technologies helped healthcare workers to have more free time to engage with patients (JRC, forthcoming).

In general terms, workers will increasingly have to interact with machines while the positive consequences on the introduction of machines will depend on how this technology is introduced in workplaces. In some cases, workers will even perceive machines as co-workers. For workers following algorithmic instructions, algorithms are in fact perceived to take the role of bosses or supervisors (Möhlmann et al., 2021; Baird & Maruping, 2021). However, workers may find their relationship with algorithms difficult and confusing as they do not know whether they should follow the instructions given or if these can be overridden (Tarafdar, Page, & Marabelli, 2022). Additionally, even if workers consider that the work instructions given by the algorithm are incorrect or inconsistent, they may not look for further clarifications or override the instructions because the speed of execution of a task is prioritised (Marabelli, Newell, & Handunge, 2021). At the same time, as algorithms normally decide on workers' job prospects within the company, they may fear overriding the technology.

On the other hand, in the case of AI robotics, empirical evidence suggests that workers interaction with robots as if they were co-workers depends on their cognitive and affective trust toward the robot – that is trust on the robot's performance and fulfilment of human expectations (Paliga, 2023). For instance, in a long-term healthcare facility, the overall satisfaction on a screening robot leveraging the workload of the staff was so welcomed that some of the staff even stopped to wave goodbye to the robot before leaving work (Getson & Nejat, 2022).

It is also important to mention the working conditions of workers whose job is to train and verify the algorithms behind the AI applications. Most companies outsource processes related to this data training to crowdsourcing platforms. The so-called micro-workers are normally underpaid for their job, usually lacking social protection while they are often subject to systems of control and surveillance (Miceli & Posada, 2022). Additionally, the work of micro-workers is also hidden as it normally is not done in public spaces but in private homes; it is performed outside the reach of many labour legislations; and much of the labour done by micro-workers is thought to be already automated (Altenreid, 2020). Interviews conducted with micro-workers in France hinted to the fact that performing tasks related to AI training and verification could be destabilising for workers (Casilli et al., 2019). Micro-workers normally do not know the objectives of the tasks they are performing, which brings them to question themselves on the ethical implications of their work. In other cases, they are distressed by the fact that they are involuntarily accessing the personal data of other people, or by being exposed to violent content.

3.3 Ethics

AI-based technologies have several ethical implications as they can act as agents that take moral decisions although not considered as moral agents. AI technologies can thus not be held accountable for their actions, while blaming their programmer or their operator might be regarded as unfair (Leveringhaus, 2018). The lack of transparency or the complexity of the algorithms that drive the decisions taken by these technologies render the accountability problem more bothersome. This opacity relates to the ability of machine-learning approaches to generate outcomes which do not allow for untangling or accessing its detailed information (Heinrichs, 2022). It is therefore difficult to assess whether a problematic decision was merely a one-off 'bug' or evidence of a systematic failure (Mittelstadt et al., 2016).

In general terms, decision-making in companies is increasingly relying on the use of algorithms and the analysis of huge sets of data. Whereas advocates for the use of algorithm-based decision-making claim that the technology helps managers take unbiased and objective decisions; there exists no peer-reviewed evidence on how algorithms overcome these biases (Raghavan et al., 2020). Automated

decision-making processes have in fact been found to exhibit biases which are exacerbated by a lack of transparency on the models they use (Gaudio, 2022). As algorithms are trained with historical data, they tend to repeat structural biases. AI applications have therefore been found to discriminate certain workers based on race or gender. For instance, there is evidence that applications to screen through job candidatures discriminate those which differ from the profiles the system was trained with (Ajunwa, 2021). This had led for screening applications to automatically reject female candidates in positions historically male dominated such as engineering.

Furthermore, AI lacks the capacity for moral imagination, that is to be aware of contextual moral dilemmas to create new solutions (Leicht-Deobald et al., 2019). AI technologies are neither able to generate emotions over the decisions taken, nor are they able to empathize with others. In this respect, while algorithms take decisions based on human's task actions, they are ignorant on human's cognitive reactions to these decisions as they are not recorded by the system (Tarafdar, Page, & Marabelli, 2022). Hence, according to Wang (2021) if decisions are only taken based on data, AI may generate analytical and emotionally detached decisions, creating an ethical minefield. As workers are the subjects of these automated decisions, they may feel that the decisions affecting their working conditions and job prospects are unfair and unfounded.

Empirical evidence points to the fact that workers perceive decisions taken by AI technologies as less fair than those taken by humans. For instance, an online scenario-based experiment conducted by Lee (2018) found that platform workers perceived decisions taken by algorithms to be less fair and trustworthy than those taken by human managers. Further evidence suggests that individuals find AI decisions as more unfair since algorithms do not consider qualitative information or context (Starke et al., 2022). Similarly, Bankins and co-authors (2022) evaluated, through a survey, the impact of AI decision-making applications on workers' experiences in six human resource management functions. Their results show that workers generally preferred decisions taken by a human although their preferences changed when the AI made a positive decision compared to a negative human decision.

Hence, the use of AI technologies raises concerns on justice and fairness on the actions undertaken by the machines. As a response, several propositions to increase AI's interpretability have been put forward in recent years, encompassed under the term 'Explainable Artificial Intelligence' (Minh et al., 2022). However, the responsibility on the decisions taken by an automated decision-making technology is still not clearly specified in legislation. There therefore exists the so-called 'responsibility gap' in the use of AI technologies. In this respect, some authors have pointed out that the use of advanced technologies should be performed under a fairness legal framework that prevents, monitors, and mitigates unwanted biases and discrimination (Jobin et al., 2019).

To address the responsibility gap, there are three general alternatives according to Gunkel (2020). The first one regards human operators as being always responsible for the tools and instruments they use including AI-based technologies. The second is termed as hybrid responsibility by which the moral agency is shared between humans and machines. It is difficult to discern who is responsible for the actions taken by AI technologies, in the same manner that it is difficult to assess the responsibility for an engineering structure failing. The third alternative refers to extending responsibility to non-human entities, such as AI technologies, as it has been previously done with animals.

Another particular ethical concern relates to the use of AI-based technologies for monitoring and surveillance purposes. The use of these technologies poses several ethical risks as they can constitute a deep privacy violation. Moreover, data could be collected by AI which is unnecessary or forbidden by EU and national privacy policies without users even noticing it (Brendel et al., 2021). The trend towards a higher percentage of remote working coupled with the increased use of monitoring tools

has blurred the boundaries between private and professional life. Therefore, in this context, AI-based technologies can have a larger impact on freedom, privacy, as well as autonomy and moral reasoning (Aloisi & Gramano, 2019).

The use of emotional AI can also be harmful as workers interacting with this type of technologies may be vulnerable to manipulation and adapt their behaviour without cognizance (Roemmich, Schaub, & Andalibi, 2023). Likewise, workers could also be influenced by the behaviour of machines. For instance, a machine displaying unethical behaviour could influence people's perception on what is morally acceptable (Köbis et al., 2021). However, it has not been clearly established whether machine and human behaviour have the same impact on people. Empirical evidence also shows that emotional AI, if unregulated, could exacerbate labour relation tensions while increasing stress and anxiety levels among disadvantaged ethnicities, gender, and income classes (Mantello et al., 2023).

As mentioned in previous sections, the design for the deployment of AI-based technologies in the workplace is crucial to overcome the ethical challenges that the technology poses. In this regard, there is evidence of organisations trying to involve workers who are going to interact with the AI technology in the design of the technology's deployment. Additionally, to avoid accountability problems, the use of the technology should also be embedded within a framework for safety and trustworthy use. Recent years have seen a surge of political, commercial, and academic proposals for ethical guidelines for trustworthy AI. However, these guidelines tend to be voluntary creating a gap between the developed ethical guidelines and the deployment of trustworthy AI (Mökander & Floridi, 2021). In the next section we provide a comprehensive overview on existing ethical guidelines to regulate AI.

4. Applicable rules and ethical guidelines to regulate AI

The various impacts of AI on the world of work and beyond have recently been put in the spotlight with the open letter of 29 March signed by various CEOs of Silicon Valley, scientists, and tech experts, calling for a pause of at least six months in the training of AI systems (Future of life, 2023). The letter argues that AI systems with human-competitive intelligence can pose profound risks to society and humanity and that the pause to the race of AI labs should be used to jointly develop and implement a set of shared safety protocols for advanced AI design and development to ensure that AI systems are accurate, safe, interpretable, transparent, robust, aligned, trustworthy, and loyal. The letter also calls for the development of robust AI governance systems, with regulatory authorities dedicated to AI, oversight of AI systems, a robust auditing and certification ecosystem, liability for AI-caused harm and public funding for technical AI safety research.

In recent years, several initiatives have emerged at EU, international and national level to guide and regulate the development and use of safe and ethical AI systems. In the following subsections we include an overview of these actions based partly on the research conducted for Eurofound (project on *Human and ethical implications of automation and digitisation on work organisation and working conditions*).

4.1 EU actions

The European Union has been at the forefront of the debate and actions on ethical AI with the recent development of several guidelines and pieces of legislation.

In April 2019, the High-Level Expert Group on AI (AI HLEG), set up by the European Commission in 2018, presented their final Ethics Guidelines for Trustworthy Artificial Intelligence (AI HLEG, 2019b). According to these guidelines, trustworthy AI should be lawful, ethical, and robust. The guidelines state that trustworthy AI systems should respect fundamental rights by adhering to the ethical

principles of respect for human autonomy, prevention of harm, fairness, and explicability. To offer guidance on the implementation of trustworthy AI systems, the AI HLEG put forward seven requirements (i.e., human agency and oversight; technical robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being; accountability) with an accompanying assessment list. Stakeholders were invited to test this assessment list through a piloting process, following which the AI HLEG presented the final Assessment List for Trustworthy AI (ALTAI) in July 2020 (AI HLEG, 2020).

In February 2020, the European Commission reaffirmed its commitment to respecting European values and human rights in AI development and application in its White Paper on AI (European Commission, 2020a). In the same year, the European Parliament adopted a resolution on a Framework of ethical aspects of artificial intelligence, robotics and related technologies⁵, calling for ‘an effective, comprehensive and future-proof regulatory framework’ for the safeguard of fundamental human rights and ethical values, and considering employment as a high-risk sector.

In April 2021, the Commission presented its proposal for a regulation laying down harmonised rules on AI (AI Act), which aims to ensure that AI systems used in the European Union are safe and respect fundamental rights. The proposed Regulation differentiates between different uses of AI following a risk-based approach:

- 1) AI systems that create an unacceptable risk and should be prohibited. These include manipulative or exploitative AI applications contravening EU fundamental rights and values, social scoring by public authorities and real time remote biometric identification systems in publicly accessible spaces.
- 2) AI systems that create a high-risk for health and safety or fundamental rights due to its purpose and function. In the field of employment, AI systems used for recruitment and decision making on promotion and termination of work-related contractual relationships, for task allocation and for monitoring and evaluating performance and behaviour of workers are considered high risk. Such AI systems should be permitted on the EU market subject to specific mandatory requirements and an ex-ante conformity assessment. The mandatory requirements are based on the AI HLEG Guidelines and piloted assessment list and include a risk management system, data and data governance, technical documentation, record keeping, transparency and provision of information to users, human oversight, accuracy robustness and cybersecurity.
- 3) AI systems that create a limited risk, namely those that interact with humans, are used to detect emotions or determine association with (social) categories based on biometric data, or generate or manipulate content (‘deep fakes’), which should be subject to transparency obligations.
- 4) All other AI systems with low or minimal risks that can be developed and used in the EU without additional legal obligations than existing legislation.

The negotiation on the AI Act has dragged in the last two years, delayed in recent months by controversies over the dangers of generative AI capable of creating text or images. The Member States only adopted a common position on the AI Act on 6 December 2022 (Council of the EU, 2022). Stakeholders and scholars still point a number of shortcomings in the proposed AI Act.

The proposed AI Regulation does not contain provisions that would allow Member States to lay down more specific domestic provisions for the employment context (Adams-Prassl, 2022). While employers

⁵ European Parliament resolution of 20 October 2020 with recommendations to the Commission on a framework of ethical aspects of artificial intelligence, robotics and related technologies, P9_TA(2020)0275

consider that the proposed definition of 'AI systems' is too broad and may endanger innovation (BusinessEurope, 2021), trade unions are of the view that the proposed AI Act fails to address the workplace dimension, in particular regarding the active participation of trade unions and workers' representatives. Trade unions propose obligations for employers to ensure that workers are aware of the role and impact of AI on their work and can react when possible harms appear (UNI Europa, 2021). Similarly, the European Economic and Social Committee recommends including a complaints and redress mechanism for organisations and citizens that have suffered harm from any AI system, practice or use that falls within the scope of the AI Act (European Economic and Social Committee, 2021a). Trade unions also regret that the scope of high-risk applications does not include relevant workplace applications other than algorithmic management (UNI Europa, 2021; ETUC, 2021). They point in particular to high-risk applications that infringe privacy (e.g., employers being able to access workers' data), allow surveillance outside of the workplace and working hours and cause discriminating AI decisions due to limited data (UNI Europa, 2021).

Legal experts propose to reconsider the 'high-risk criterion' proposal as it does not cover the impact on health and safety, to introduce the right to disconnect to limit the invasion of workers' private lives by AI tools and to extend the scope of the legislative initiative on platform work (Moore, 2020). Experts point out that the proposal for the AI Regulation is horizontal and does not take into account the specificities and risks of AI in specific sectors (De Stefano & Wouters, 2022). Furthermore, the Commission proposal lacks mechanisms to address the dynamic nature of AI technologies, characterised by continuous learning, which would require reassessment of the AI system (Lekadir et al., 2022). In addition, the Commission proposal establishes diverging public and private obligations for similar practices, namely for social scoring and real-time remote biometric identification systems for law enforcement, although public services may be using private AI tools and the risk levels associated with AI use by public or private actors do not differ in the power asymmetry they create towards individuals (Georgieva et al., 2022).

The Commission proposal mentions that harmonised standards and supporting guidance and compliance tools will assist providers and users in complying with the requirements laid down by the proposal and minimise their costs. This means that conformance with technical standards and common specifications should give providers of high-risk AI a level of confidence that they are compliant with the mandatory requirements of the proposed AI Regulation and cut compliance costs for businesses. The use of harmonised standards, prepared by the European Standards Organisations, as technical specifications meeting the requirements of European Directives, has been a common practice since 1985 (Oxford Commission on AI and Good governance, 2021). However, commentators believe that internal conformity assessment procedures for high-risk systems are insufficient (De Stefano & Wouters, 2022) and trade unions call for the conformity assessment of AI systems used for employment to be at least conducted by authorised third parties (ETUC, 2021).

The interaction between the proposed AI Regulation and the GDPR requires special attention, as recommended by the European Data Protection Board, especially when looking at the existing rules and safeguards for the use of AI in the workplace. Firstly, the purpose limitation principle of the GDPR that implies that personal data should only be collected for specified, explicit and legitimate purposes, can appear at odds with big data and AI-related practices (De Stefano & Wouters, 2022).

Then, in line with the GDPR, data processing is only lawful if a legal ground exists. Consent is a usually easily applicable legal ground, however not in the employment context since consent cannot be freely given when prejudices may arise if the employee does not consent (Article 29 Data Protection Working Party, 2017). Similarly, it is unlikely that jobseekers can freely consent to AI-driven recruitment tools, thus consent is not a conceivable legal ground for AI-enabled recruitment tools. Another legal ground

can be if the processing is necessary for the performance of the contract, however it is questionable whether intrusive AI-driven surveillance can be justified as necessary. The legitimate interest of the employer can be another legal ground for data processing, but that requires employers to engage in a test of the balance of interests including a fundamental rights assessment, assessing whether the processing is necessary, fair, proportionate, and transparent. This legal ground would not hold if the assessment results in disproportionate disadvantages imposed on the data subjects (workers or jobseekers). Thus, the need for a legal ground imposed by GDPR provides limitation to the use of intrusive AI-enabled monitoring applications at work and of AI-enabled recruitment tools (De Stefano & Wouters, 2022).

The GDPR provides a right to information to the data subject regarding the processing of personal data, including spelling out the effect of the data processing on the subject. In case of automated decision-making, which could be driven by AI, the data subject should also receive meaningful information about the logic involved. Employers thus owe workers insight on the data processing and data protection authorities (DPAs) should enforce these rules if an employer refuses to comply (De Stefano & Wouters, 2022). However the European Parliament has pointed that the GDPR is not fully used and enforced, as DPAs are understaffed and underfinanced and Member States have not made recourse to Article 80(2) that could entitle trade unions to lodge complaints and go to court without being mandated by data subjects (workers)⁶. In addition, the European Economic and Social Committee regrets that Member States have not made use of Article 88 which allows them to establish more specific rules (through legislation or collective agreements) to guarantee the protection of rights and freedoms with regard to the processing of employees' personal data within the framework of employment relationships (European Economic and Social Committee, 2018). The lack of any similar provision in the AI Act that could allow Member States to take additional measures to guarantee trustworthy AI in the workplace, is not consistent with the GDPR's approach.

Article 22 of GDPR provides data subjects with a right not to be subject to automated processing alone if this processing produces legal effects concerning them or significantly affects them, and offers them a right to human intervention, to express their views and contest the automated decision. Article 22 has already been invoked in cases regarding digital labour platforms, such as Uber and Ola, however one difficulty was to prove that the platform's decision-making is fully automated, as platforms often argued that a human is in the loop before the decision is made. Therefore Article 22 does not seem to be an insurmountable barrier to the use of algorithmic management (De Stefano & Wouters, 2022).

The EU Charter of Fundamental Rights enshrines in Article 21 the prohibition of any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation. Non-discrimination at work is covered under several Directives (Council Directive 2000/78/EC, Directive 2000/43/EC, Directive 2006/54/EC and Directive 2010/41/EU). However, enforcing non-discrimination law for AI-based systems can be difficult as the main enforcement pathway is through individuals filing a claim in court, and discrimination of automated systems can be difficult to prove for individual workers or jobseekers as 'compared to traditional forms of discrimination, automated discrimination is more abstract and unintuitive, subtle, and intangible' (Wachter et al., 2021).

In 2021 the European Parliament and the Council made a Proposal for a Directive on improving working conditions in platform work, which would oblige digital labour platforms to inform workers

⁶ European Parliament resolution of 25 March 2021 on the Commission evaluation report on the implementation of the General Data Protection Regulation two years after its application, P9_TA(2021)0111.

and their representatives thoroughly about how the algorithmic systems operate (Article 6), and to consult workers' representatives on decisions likely to lead to the introduction of or substantial changes in the use of automated monitoring and decision-making systems (Article 9). The proposed Directive forbids the processing of personal data not strictly necessary for the performance of the contract such as data related to emotions, psychological state, health, and private conversations (Article 6). Digital labour platforms must also evaluate the OSH risks, including psychosocial ones, of their algorithmic systems (Article 7), and offer a mechanism to overturn automated decisions (Article 8). These provisions go beyond the proposed provisions of the AI Act and call for more alignment of the AI Act on the right to information, assessment of OSH risks and limitation of data processing. At the same time, the proposed Directive on platform seems to take algorithmic management for a given while the AI Act includes it as a high-risk application of AI (De Stefano & Wouters, 2022).

To complement the AI Act, the European Commission has also proposed the AI Liability Directive, which lays down the rules for access to redress in instances of harm caused by AI systems. Liabilities in relation to AI use are indeed a key concern for enterprises that consider adopting AI technologies as according to an EU-wide enterprise survey, 33% of the surveyed enterprises indicated 'liability for potential damages' as a major barrier to AI use (European Commission, 2020b).

In its 2022 Resolution on AI in a digital age⁷, the European Parliament welcomes the proposals on the AI act and the AI liability act and states that establishing the world's first regulatory framework on AI could give the EU leverage and a first-mover advantage in setting international standards for trustworthy and human-centric AI. However, the European Parliament notes that this requires EU harmonisation through future-proof regulations and EU-wide coordination and implementation of AI-related legislation, as well as regulatory coordination and convergence with like-minded international partners.

4.2 International initiatives

The latest EU initiatives on regulating AI complement and inspire other initiatives at international level.

In May 2019, the OECD adopted a Recommendation on Artificial Intelligence to promote the use of AI that is innovative and trustworthy and that respects human rights and democratic values (OECD, 2019). The OECD Recommendation of the Council on Artificial Intelligence promotes the following principles for responsible stewardship of trustworthy AI:

- Inclusive growth, sustainable development and well-being.
- Human-centred values and fairness.
- Transparency and explainability (AI Actors should make stakeholders aware of their interactions with AI systems, including in the workplace, enable those affected by an AI system to understand the outcome and enable those adversely affected by an AI system to challenge its outcome).
- Robustness, security and safety.
- Accountability.

The OECD also recommends governments to prepare for labour market transformation by building human capacity with the necessary skills, to ensure a fair transition for workers whose job is impacted by AI, and to work closely with stakeholders to promote the responsible use of AI at work, to enhance

⁷ European Parliament resolution of 3 May 2022 on artificial intelligence in a digital age (2020/2266(INI))

the safety of workers and the quality of jobs. The OECD Recommendation was approved by 42 countries including 36 OECD members and six non-members.

In 2019, the Council of Europe published guidance to Member States on the main principles that should be followed to prevent or mitigate the negative impacts of AI systems on human rights (Council of Europe, 2019). The Recommendation stresses the special risks stemming from AI to the rights to non-discrimination and equality, data protection and privacy, as well as freedom of expression, freedom of assembly and the right to work. In addition, it highlights seven key areas that require particular focus: the need to conduct human rights impact assessments before an AI system is acquired, developed and/or deployed; the observance of human rights standards in the private sector; information and transparency; meaningful public consultations; the promotion of AI literacy; independent oversight; and effective remedies.

In 2020, the Council of Europe adopted a Recommendation on the human rights impacts of algorithmic systems, which calls on States to ensure that algorithmic design, development and ongoing deployment processes incorporate safety, privacy, data protection and security safeguards by design (Council of Europe, 2020). The Council of Europe also recommends regular review of the human rights impacts throughout the lifecycle of algorithmic systems, and to ensure effective remedies for all claims of violations of Convention rights due to the use of algorithmic systems.

The Council of Europe also created an Ad Hoc Committee on AI (CAHAI), later replaced by an AI Co-ordination Group, which is currently working on a framework for the development, design and application of artificial intelligence, based on human rights and democratic standards.

In 2021, the UNESCO published a 'Recommendation on the Ethics of Artificial Intelligence', adopted by all 193 UNESCO Member States (UNESCO, 2022). The UNESCO Recommendation provides 10 core principles for a human right centred approach to AI:

1. Proportionality and do not harm (no use of AI for social scoring or mass surveillance)
2. Safety and security
3. Right to privacy and data protection
4. Multi-stakeholder and adaptive governance and collaboration
5. Responsibility and accountability
6. Transparency and explainability
7. Human oversight and determination
8. Sustainability
9. Awareness and literacy
10. Fairness and non-discrimination

The UNESCO recommendation indicates 11 key areas for policy actions, including economy and labour. The UNESCO is working with governments, the private sector, academic institutions and CSOs to translate the recommendation into policies and actions, with the support of a Global Observatory on the Ethics of AI and a Global Forum on Ethics of AI where governments and stakeholders meet annually to exchange knowledge and practices.

The UNESCO Recommendation is the first global framework aiming to guide states in the use of AI from an ethical perspective. Such a comprehensive and widely endorsed framework should address the current proliferation of ethical principles and voluntary codes of conduct covering only a limited range of human rights. However, the compliance to the Recommendation is voluntary. In addition, businesses are not addressed by the recommendation, which can be seen as a limitation to apply the principles to the world of work. It should also be noted that among the leader countries in AI, the

United States have not adopted the Recommendation since former President Trump pulled his country out of UNESCO, while China has expressed support for the guidelines but there are doubts about its genuine commitment since one of the recommendations (No 26) bans social scoring, a system currently implemented in China. This situation illustrates the gap between international commitments and national practices and raises questions about the effectiveness of international initiatives under UN auspices (Zamfir, 2022).

4.3 National policies

In a 2023 report, the Council of Europe assesses that Member States have acted on some of the areas identified in the Council of Europe 2019 Recommendation, but that the overall approach has not been consistent. The report highlights a lack of human-right centred regulation of AI systems on many fronts and the lack of oversight and enforcement of human rights norms and safeguard on AI systems. Much remains to be done to adopt legal frameworks that address, prevent and remedy human rights abuses by AI actors in the private sector, as Member States still tend to rely almost exclusively on data protection framework for these issues (Council of Europe, 2023). However, a Eurofound report found that all the published national AI strategies recognise the need to pay attention to the ethical challenges raised by AI, most of them referring to the ethical guidelines published by the high-level expert group on artificial intelligence (AI HLEG) set up by the European Commission (Eurofound, 2022).

The proposed AI Act envisions to create or entrust existing national supervisory authorities with the application and implementation of the law. Some states have already taken steps in establishing supervisory authorities for AI, such as Spain whose Agency for the Supervision of Artificial Intelligence (AESIA) is expected to become functional in late 2023. There has been a tendency for DPAs to be considered appropriate for AI-related oversight mechanisms, but the Council of Europe highlights that they should be provided with adequate resources and interdisciplinary expertise to deal with human rights aspects of AI systems (Council of Europe, 2023). Several EU Member States have also established ethics committees, expert groups or AI observatories to assess and monitor ethical developments in the field of AI (Eurofound, 2022).

Some cases have been brought before judicial and non-judicial bodies relating to the human rights impacts of AI systems, however they demonstrated that the legislation in place is inadequate to effectively remedy such harms, with long processes and the withholding of information by AI actors, preventing effective assessment of the claims and effective remedies (Council of Europe, 2023).

One recent example of relevant provision in national labour legislation to deal with the challenges of AI in the work context is the newly introduced Article 64.4 in the Spanish Workers Statute (*Estatuto de los Trabajadores*) providing that workers' representatives must be 'informed by the company of the parameters, rules and instructions on which the algorithms or artificial intelligence systems are based that affect decision-making and that may affect working conditions, access and maintenance of employment, including profiling of workers and applicants'. This provision applies to all companies using algorithmic management and complements the Rider's Law' that requires companies using algorithmic management to disclose relevant information to their workers, including how algorithms and AI impact on working conditions, hiring decisions and layoffs, as well as the drawing up of workers' profiles.

4.4 Social partners actions

General duties of employers to inform employees and ensure their health and safety at work are in place at EU level, although they have been implemented in different ways across Member States.

EU Directive 2002/14/EC⁸ establishes a general framework for informing and consulting employees in undertakings that employ at least 20 or 50 employees about any measure that forms a threat to employment and any decision that leads to ‘substantial changes’ in work organisation. If it concerns ‘substantial changes’ the consultations are meant to be conducted to reach an agreement (Article 4). The effective information and consultation of employees’ representative with regard to the introduction of AI depend on the implementation of the Directive by Member States and courts, and the interpretation of when does AI lead to substantial changes to work organisation.

Moreover, Framework Directive 89/391/EEC imposes a duty upon employers 'to ensure the safety and health of workers in every aspect related to the work. This includes taking measures to preserve workers' safety and health, and adjusting the measures as necessary (Article 6). Since employers are responsible for OSH aspects, they are also responsible for preventing mental health risks that may arise with the introduction of algorithmic management or other AI applications (De Stefano & Wouters, 2022).

The implementation of this general framework has resulted in countries with a strong tradition for social dialogue granting worker representatives the right to be informed and consulted about significant changes to work organisation and working conditions, sometimes with explicit reference to technological innovations. In some Member States, social partners have negotiated provisions in horizontal or sectorial collective agreements to regulate the use of digital technologies in the workplace. Most of them relate to new skill needs, data protection particularly in the context of monitoring through digital means, and the right to disconnection. For example, the Spanish banking employers’ association (Asociación Española de Banca, AEB) reached an agreement in March 2021 with trade unions to recognise a set of ‘digital rights’, including the right to disconnect, the right to digital privacy, the right to digital education and the right to not being subject to fully automated algorithmic decisions, and being discriminated against based on such decisions (Federacion Fuerza Independencia Empleo, 2021).

In June 2020, the European social partners (Business Europe, SME United, ETUC, CEEP) agreed on a Framework agreement on digitalisation laying out the commitments of social partners to optimise the benefits and deal with the challenges of digitalisation in the world of work (Business Europe, SME United, ETUC, CEEP, 2020). The Framework agreement covers digital skills, modalities of connecting and disconnecting, AI, surveillance and the respect of human dignity. Regarding AI at the workplace, the Framework agreement states that it should respect privacy and dignity of the worker and should ensure human control, safety with the undertaking of risk assessment, fairness to avoid bias and discrimination, transparency and explainability. For human resource procedures such as recruitment, evaluation, promotion and dismissal, performance analysis, the agreement states that transparency needs to be safeguarded through the provision of information. Moreover, affected workers should be able to request human intervention or contest the decision.

The Framework agreement is an autonomous initiative of the European social partners and commits them to promote and implement it through tools and measures at national, sectorial and/or enterprise level. The process for implementing this Framework agreement at national level has been initiated in several Member States, but progress has been slow, partly due to the COVID-19 pandemic (Eurofound, 2022).

⁸ Directive 2002/14/EC of the European Parliament and of the Council of 11 March 2002 establishing a general framework for informing and consulting employees in the European Community

In a few Member States, national trade unions have been campaigning for responsible development and use of technologies at the workplace and published ethical guidelines (e.g. Ethical guidelines for the development and use of AI by the German services union ver.di, FGTB/ABVV guidelines calling for greater involvement of works councils and union representatives in the early stages of technology adoption in Belgium, HR Ethics and Digital Charter by the CFE-CGC in France). There are comparatively fewer initiatives launched by employer organisations, mainly revolving around skills needs and the importance of training and skill development (Eurofound, 2022).

In its guide to artificial intelligence, the European Economic and Social Committee also advocates individual companies to follow the path of existing ethical guidelines and ensure ethical introduction and use of AI at the workplace. The guide states that AI needs to be discussed in executive boards if it is part of the companies’ strategies and with employee representatives and calls for the setup of ethics committees within companies to measure and set limits to the machines. For example, in France, the insurance company CNP Assurances set up an Ethics Committee for AI and appointed an AI Ethics Officer. This committee reports to the Secretariat-General and the Financial Division and trade unions have to be involved (European Economic and Social Committee, 2021). Some international technology companies such as Google, Microsoft, IBM, SAP and Intel have also issued their own ethical principles for the use of AI but remain very general on how to implement them in practice (Vakkuri et al., 2019). Organisations that design and deploy AI systems can also resort to ethics-based auditing which helps identify and communicate the normative values embedded into a system. Different approaches to ethics-based auditing of AI already exist, including functionality audits that focus on the rationale behind a decision, code audits that review the source code, and impact audits that investigate the effects of an algorithm's outputs (Mökander & Floridi, 2021).

To sum up, recent years have seen a proliferation of ethical guidelines and recommendations from EU, international and national organisations as well as social partners. As summarised in the table below, there is relative convergence in the principles contained in the various guidelines, with particular focus on safety and transparency, followed by fairness, explainability, data protection and human control. However, to make these different guidelines and principles effective, awareness raising of the principles is needed among AI developers and users, as well as effective risk assessment and certification procedure before new AI systems are rolled out, constant oversight and monitoring of such systems while being used, and mechanisms for ensuring liability in case of harm and effective remedies for those affected. Technological progress is often faster than regulation, but it appears that now is the time that legislators are establishing the rules and principles as foundation for further AI research and use.

Table 1. Main principles for AI in ethical guidelines and recommendations

	Safe	Transparent	Fair/ non-discriminatory	Explainable	Data protection	Human control	Accountable/ Responsible	Respect human rights	Robust	Trustworthy	Harmless	Sustainable	Lawful	Ethical	Proportional	Accurate	
Open letter calling for a pause in the training of AI systems	x	x							x	x							x
EU HLEG Ethics Guidelines for Trustworthy Artificial Intelligence	x	x	x	x	x	x	x	x	x		x		x	x			

	Safe	Transparent	Fair/ non-discriminatory	Explainable	Data protection	Human control	Accountable/ Responsible	Respect human rights	Robust	Trustworthy	Harmless	Sustainable	Lawful	Ethical	Proportional	Accurate
EU AI Act	x							x								
OECD Recommendation on Artificial Intelligence	x	x	x	x		x	x	x	x	x		x				
Council of Europe Recommendation on the human rights impacts of algorithmic systems	x				x											
UNESCO Recommendation on the Ethics of Artificial Intelligence	x	x	x	x	x	x	x				x	x			x	
European social partners Framework agreement on digitalisation	x	x	x	x	x	x										

Source: Authors' elaboration

5. Conclusions

In its Digital Compass, the European Commission sets out the digitalisation of businesses as one of the key objectives, with a target of 75% of European enterprises having adopted by 2030 one of the advanced technologies (i.e., cloud computing services, big data, and AI). Advanced technologies based on AI systems are already being increasingly deployed in the workplace, at varying pace across countries and sectors. AI-based technologies are used in various applications including algorithmic management, wearables using algorithms to process the data collected and AI-based robots.

The use of AI-based technologies at the workplace affects the work organisation, working conditions and ethics. Algorithmic management directly affects work organisation and decision making as it helps organisations to direct, evaluate and discipline workers. The development of algorithmic management has also resulted in the emergence of new work organisations without pre-existing relationships between the management and the workforce such as those under the platform economy.

The deployment of AI technologies helps workers free up time from routine and dull tasks so they can engage in more complex, valuable and creative tasks. It also relieves workers from physical or dangerous tasks. This leads to a new organisation and allocation of work between the workers and the technology. The use of AI-based applications implies new human-machine interactions, including collaboration, cooperation or co-existence. In the case of AI-based robotics, closer human machine interactions also require the need for safety assurance mechanisms.

AI-based technologies lead to gains in efficiency and productivity, which also translates in an intensification of work as workers need to follow the pace of the technology. This intensification coupled with AI-driven monitoring of the work done exacerbates the pressure and leads to increased psychosocial risks for workers, with evidence of higher anxiety and stress and negative impacts on mental health linked to the loss of autonomy and decreased self-confidence.

The use of AI also implies several ethical implications. The complexity and opacity of algorithms raise the question of accountability and liability in case of harm. In addition, as algorithms are trained with

historical data, they tend to repeat structural biases, with evidence of AI-based decision-making processes being discriminatory or unfair. Another ethical concern relates to the use of AI-based technologies for monitoring and surveillance purposes as it can constitute a privacy violation. The use of emotional AI may also influence workers' behaviour and make them vulnerable to manipulation.

The various impacts on work organisation, working conditions and ethics identified imply the need for careful design and deployment of AI-based technologies, based on ethical guidelines and safety procedures, in consultation and negotiation with employees and their representatives to foster understanding and acceptance of the technologies. Several initiatives have emerged in recent years at EU, international and national level to regulate and guide the development and use of safe and ethical AI systems.

At EU level, the High-Level Expert Group on AI published its Ethics Guidelines for Trustworthy Artificial Intelligence with an assessment list to make the guidelines operational. The European Commission released the proposed AI Act to regulate the deployment of AI systems in the EU according to their level of risk. However, the proposed AI act fails to address the workplace dimension and does not allow Member States to lay down more specific provisions for the employment context. The GDPR lays out rules for the processing of data and provides limitation to the use of intrusive AI-enabled monitoring applications at work and of AI-enabled recruitment tools. The right conferred by the GDPR to contest fully automated-decisions has already been invoked in court, but proved difficult to apply as platforms generally argued that there was still a human in the loop. The legislative arsenal on non-discrimination at work has also been invoked in some cases involving AI systems, but was also complex to apply as the claimant cannot access information to prove the discrimination of automated systems, and platforms tended to withhold this information.

To complement the AI act, the European Commission proposed the AI Liability Directive, which lays down the rules for access to redress in instances of harm caused by AI systems. Finally, the proposed Directive on platform work goes one step further than the AI act in the employment field, as it forbids the processing of non-work-related data (e.g. related to emotions, psychological state, health), introduces the obligation for digital labour platforms to inform workers about the functioning of the algorithmic and any decision bringing substantial changes, and to evaluate the OSH risks of algorithmic systems.

At international level, the OECD, the UNESCO and the Council of Europe have issued separate recommendations on the use of AI, which converge on some of the principles, but whose implementation and results remain to be seen. At national level, the AI strategies of the EU Member States often refer to the ethical use of AI, but much remains to be done to adopt legal frameworks that address, prevent and remedy ethical challenges of AI in the work context.

On the social partner front, employee representatives have a general right to be informed about decisions that leads to 'substantial changes' in work organisation but whether AI leads to such substantial changes is left for interpretation in national frameworks. The European social partners have issued a Framework agreement on digitalisation that includes principles for the use of AI at the workplace. This Framework agreement still needs to be implemented nationally. In some Member States, specific provisions have already emerged in national, sectorial or company collective agreements, often relating to the skill transition, data protection and the right to disconnection.

Overall, the challenges surrounding the use of AI-based technologies at the workplace have gained visibility in recent years as evidenced in the literature and actions from public authorities, social partners, and some businesses. New regulatory frameworks are emerging based on ethical guidelines for the safe, fair, and ethical use of AI, whose effectiveness still needs to be seen and will depend on increased awareness raising and AI literacy of AI developers and users, social dialogue and public oversight.

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