Study exploring the context, challenges, opportunities, and trends in algorithmic management

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Executive summary

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Introduction

This exploratory study analyses the social, economic and legal contexts of and trends in algorithmic management (AM) focusing predominantly on its effects on workers and employers. It provides a preliminary quantitative overview of AM usage, an exploration of challenges and opportunities, a comprehensive analysis of the applicable legal and policy framework, and a discussion of the possible future trends.

1. Algorithmic management and the world of work

Algorithmic management can be described as a diverse set of technological tools and techniques for managing the workforce, relying on the collection of data and monitoring of workers, to enable automated or semi-automated decision-making. AM tools and systems are predominantly used for the following managerial activities: (i) recruitment; (ii) work/task scheduling; (iii) nudging/directing (e.g. algorithms that suggest to workers how to complete tasks); (iv) worker monitoring/surveillance; (v) worker evaluation; (vi) talent management/training; (vii) rewarding workers; and (viii) worker dismissal.

It should be noted that, to date, no sources robustly and fully capture the prevalence of AM in the EU. Furthermore, there is wide variation in the results provided by different sources. Such limitations have been taken into account in this study. Lastly, gathering insights from businesses/employers proved to be challenging during the study. Please see Annex 1 for details on the methodologies that were used.

Taking this into account, the study suggests the following preliminary insights on the prevalence of AM in the EU (see section 1.2):

- There are indications that, in 2023, up to a quarter of companies in the EU-27 have been using AM tools.
- Among the various management functions considered (see section 1.1.2) most companies use algorithms to monitor or evaluate workers.
- Large, privately owned companies in the EU-27 use AM more frequently than other types of companies.
- There is no robust or consistent evidence regarding what types of workers (classified by (i) age group, (ii) gender, (iii) occupation, and (iv) level of education) are most subject to AM in the EU-27.

2. Opportunities and challenges

Based on the methodology outlined in section 2.1, AM can bring several **opportunities and challenges** to workers and employers, including:

- **Working conditions.** AM tools can simplify and reduce the workload of managers, help them allocate tasks more effectively through data analysis and automation. This can lead to cost-cutting, increased productivity, and efficiency. AM tools can

prevent some risks for Occupational Safety and Health (OSH) by, for example, alerting workers about dangers and hazards, identifying ergonomic risks, or assessing workers' general well-being. These preventive measures can improve workplace well-being, including identifying and addressing psychosocial risks. At the same time, these tools can lead to deskilling and/or job displacement which cause stress and job insecurity, significant OSH risks. Additionally, AM can reduce workers' autonomy, increase work intensity, and undermine social interactions within the workplace, negatively impacting relationships between managers and workers and contributing further to psychosocial risks.

- **Data protection and privacy.** AM tools can create opportunities for workers and employers to enhance data protection and privacy, for example through the use of 'data trusts' – an instrument that allows individuals or organisations to pool their data for a specific purpose while safeguarding privacy and ensuring its ethical use. However, some AM tools can lead to the invasion of workers' privacy and the erosion of transparency in decision-making, particularly if they are used without providing sufficient information and/or explanations to workers.

- **Fairness and discrimination.** When using high-quality data, AM tools can help eliminate biases and subjectivity in management decision-making. They can also help with the identification of areas for improvement, and of workers who are ready for a new position or promotion. At the same time, some AM tools might introduce or reinforce biases. Examples include automated recruitment tools, which can perpetuate patterns of discrimination by preferring candidates from a specific age group, sex, social orientation or background, etc. Furthermore, the lack of transparency involved in AM decision-making can lead to the unfair treatment of workers and the potential for discrimination.

- **Workers' collective rights.** AM tools can empower workers, strengthen collective bargaining, for example by keeping up-to-date information on wages and company actions, and facilitate real-time communication between workers. AM tools can also negatively affect workers' rights by, for example, allowing to potentially identify workers' trade union membership, organising efforts, or collective bargaining discussions through the analysis of large datasets.

3. EU Legal and policy framework [1]

- There is no legislation tailored specifically to the use of AM, except for the agreed Directive on improving working conditions in platform work (PWD) that establishes a new set of rights for people subject to AM on digital labour platforms. Several laws in the EU *acquis* could potentially be applied to various aspects and operational phases of AM. However, given the general nature of such legislation and the fact that in several instances it was designed when AM did not yet exist, further interpretation of existing legislation would be needed and some issues are not yet covered.

- **The overarching EU legal framework,** including the Working Time Directive (WTD), the Transparent and Predictable Working Conditions Directive (TPWCD) and the Work-Life Balance Directive (WLBD) **is in principle equipped to tackle the underlying aspects of various issues AM poses related to working conditions** (e.g. aspects of transparency and predictability, communication, and health and safety). This framework applies to workers engaged in **both** conventional work environments and algorithm-driven work settings. However, whether it does so adequately remains an open question.

- Some limitations stem from the **mismatch between the design of certain legal instruments and the real-world application of AM systems**. For example, the EU equality framework is in principle suitable to address discrimination stemming from AM systems. However, the constitutive features of algorithmic discrimination are barely compatible with the 'traditional' notions of discriminatory practices, thus reducing the effectiveness of the existing rules and redress mechanisms.

- Another structural limitation of the EU *acquis* in the field of labour law is that it leaves **self-employed persons unprotected**, owing to the legal bases of the relevant legal instruments. Other challenges that may be relevant to AM systems in the area of working time legislation include the binary distinction between working time and rest time, and the lack of indication as to how to compensate workers for 'productive' and 'unproductive' working time. These concerns are **not unique** to the case of AM but represent broader challenges which could be reinforced through AM.

- **Some categories of AI systems**, including those used at work to perform managerial functions, **are classified as 'high risk' under the Artificial Intelligence Act (AI Act)** and must comply with a detailed set of requirements (see chapter 3 for an extensive discussion.) If adequately implemented, this set of provisions under the AI Act holds great potential to make providers contribute to the fair application of AM at work.

- **The risk-based approach adopted in EU instruments**, such as in the Framework Directive on Safety and Health at Work (OSH), the AI Act and the PWD,**can address some AM-related risks to OSH**, such as the routinisation and standardisation of work, diminished worker decision-making autonomy and some of the heightened health and safety hazards, provided that assessment and mitigation processes are carried out throughout all phases of AM.

[1] Between the submission of the Final Report and the publication of this study, Directive (EU) 2024/2831 of the European Parliament and of the Council of 23 October 2024 on improving working conditions in platform work and Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence were formally adopted. These developments do not substantially change the analysis presented here.

- **The General Data Protection Regulation (GDPR) addresses the intricate challenges posed by AM systems**, encompassing issues relating to the processing of personal data as well as transparency and safeguards in cases of fully automated decision-making. The GDPR also provides flexibility tailored to different contexts, especially when it comes to the protection of employees' personal data, and can be used as a starting point towards establishing workers' data trusts (independent intermediaries, holding and managing data on behalf of the individuals or organisations involved – see section 2.2.2) empowering workers with greater control over their personal data in the face of AM challenges.

- **However, not all AM functionalities are tackled comprehensively by existing EU regulation.** One case in point is a decision based on semi-automated processing, which raises similar issues to solely automated practices, and yet is not fully captured by the GDPR. Other limitations pertain to the primarily 'individualised' character of the GDPR, which is based on the category of the 'data subject', making it somewhat inadequate for effectively dealing with the complexities inherent in AM in work contexts.

- **The large corpus of EU anti-discrimination instruments is highly relevant and apt to promote the creation of bias-free workplaces**, including when decisions are made using AM tools. **However, AM might introduce new challenges to tackling discrimination.** First, discrimination through AM tools is often almost undetectable, which negatively affects workers' awareness of potentially discriminatory behaviours of employers or co-workers. Second, AM tools may classify individuals and groups on the basis of information and factors that do not enjoy clear and direct protection in equality law. Relatedly, algorithmic discrimination can be dynamic and multidimensional, and can be based on insights that are not accessible based on ordinary human observations. Third, AM tools often lack transparency – an aspect that experts consistently consider one of the primary obstacles to pursuing legal action and enforcement measures. Actively informing and consulting with worker representatives fosters transparency, making the algorithm-based systems more understandable and trustworthy. In addition, workers' representatives are best placed to codetermine and co-design internal rules of AM due to their knowledge of operational practices and internal bottlenecks. Hence, the **rights to information and consultation, social dialogue, collective bargaining and other participatory methods play a pivotal role in the realm of AM.**

- **The EU framework on information and consultation faces challenges in its enforcement**, which is highly dependent on the national industrial relations systems. The novel nature of AM further complicates this issue, widening interpretive gaps concerning certain fundamental elements of the legislation, such as the concept of 'substantial changes in work organisation or contractual relations' (see section 3.5).

4. Future trends

Based on the methodology outlined in Chapter 4 and Annex 1, in the **short to medium term**, the promise of AM cutting costs and improving efficiency and productivity will be the key drivers of wider AM adoption. However, the cost of such technologies can be a barrier for some, as AM might require large-scale initial investments in terms of finance, time, and learning.

In the **medium to long term**, new regulations can affect AM adoption. On the one hand, such regulations could partially reduce AM adoption, for example restricting AM usage for certain types of management functions (e.g. for dismissing workers). On the other hand, clear regulations defining how AM can be used, and for what purposes, could boost the adoption of AM by alleviating uncertainty and creating trust among users of AI-powered AM tools.

In the **long term**, technological megatrends serve as the primary drivers of more widespread AM adoption. These include growing hyperconnectivity, as well as rapid research and development in AI and machine learning, which allows AM to continuously improve. Also relevant is possible human enticement via technology, whereby many workers are starting to rely on a symbiotic relationship with certain technologies (see chapter 4).

Regarding the future usage of AM several scenarios are in principle possible:

- **Baseline scenario:** this scenario assumes that the prevalence of AM will grow in the short term, but will be slowed down by relatively high costs, skills requirements, a desire for human-centric management, and potential new regulations. According to the analysis, this scenario is highly likely, which means that AM might grow on average at a pace of 3-4 % annually throughout the next 10 years, with a possible slowdown after five years.

- **Growth scenario:** the growth scenario assumes a significantly faster pace of growth in the prevalence of AM, driven by four factors: cost-saving pressures, the potential for increased efficiency and productivity, the rapid growth of new digital technologies and business models, and non-restrictive regulation. This scenario is also highly likely, which means the usage of AM could grow at a rate of around 4-6 % annually throughout the next 10 years, with some slowdown after five years.

- **Slowdown scenario:** under the slowdown scenario, the costs of implementing AM will remain too substantial for many organisations, especially smaller ones. We did not find evidence of the likelihood of this scenario, or other scenarios apart from the two discussed above.

Conclusions

Based on the key findings presented briefly above, the main conclusions of the report are as follows:

- Analysis and policy debate regarding AM should focus on the management functions that can be automated by such tools rather than on a general definition of AM. This fosters an easier analysis, and allows the identification of those policies that already indirectly cover AM.

- Based on evidence from a combination of various sources, up to one-quarter of enterprises in the EU are arguably using AM tools, and this usage could grow by between 3% and 6% annually over the upcoming 10 years. However, these results should be taken with caution (see next point).

- It is difficult to estimate the prevalence or make predictions about the future of AM, as no single database robustly covers all relevant data, while some datasets that cover only certain management functions often provide conflicting data. In addition,

based on the surveys conducted with workers and employers, we saw that businesses/employers are often unwilling or unable to share their experiences with AM tools. Hence, additional research is needed in this area to validate these results and expand on the existing evidence.

- AM tools can improve workers' speed, efficiency and productivity, in turn reducing costs and increasing profits for organisations. But it can also reduce workers' autonomy, result in deskilling, and increase psychosocial risks due to the exercise of algorithmic control and monitoring.

- AM tools can foster fairness and reduce discrimination if such tools have been built using non-biased data. However, it can also exacerbate issues concerning workers' data protection and, if biased data are used, it can give rise to discriminatory actions. Hence, AM tools' potential for bias is heavily dependent on how such tools have been designed, developed and/or deployed.

- The large array of different data collected through AM tools can empower workers' collective rights, as workers' representatives can use these data to identify critical issues. However, given the complexity involved in understanding such models and data – as well as the possibility that AM can be used to identify who is likely to unionise in a company – such tools also present significant challenges to collective bargaining.

- Given the ever-evolving nature of AM and the rapidly transforming world of work, information and consultation as well as collective bargaining provide a flexible arrangement to mitigate the negative effects of AM tools. Proper training and up-skilling for both workers and managers is essential to reap the benefits of AM.

- Currently, the applicable EU legal framework does not refer specifically to AM, with the only exception of the Directive on improving working conditions in platform work. Even so, the comprehensive nature of the EU *acquis* to a large extent safeguards workers from many of the challenges AM tools can bring to the workplace, including those relating to OSH, working conditions, data protection and equality. However, the effective application and enforcement of the law in contexts where AM tools are widely used remains a challenge.

- The General Data Protection Regulation (GDPR) provides a solid foundation governing the processing of workers' personal data. The GDPR is an effective framework regulating certain functions of AM, such as digital monitoring and automated decision-making. It offers solutions to address the intricate challenges posed by such systems, encompassing issues relating to lawful processing and transparency, and providing safeguards in cases of solely automated decision-making. However, existing data protection rules do not cover all AM functions comprehensively, although general principles and requirements as well as data subjects' rights apply whenever personal data is processed.

- Algorithmic discrimination differs significantly from traditional discriminatory behaviours for which the existing rules are primarily tailored. For instance, AM tools can lead to unconventional and abstract classifications that are not easily covered by, considered as, or associated with existing protected grounds. Moreover, given the complexity and lack of transparency involved in AM tools, workers may not even be aware that they are subject to discriminatory actions. Without access to evidence and data, proving algorithmic discrimination can be very challenging.

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