European Commission

SCIENCE FOR POLICY BRIEF

Labour. Education and Technology

The rise of digital monitoring and algorithmic management of work: empirical insights

HIGHLIGHTS

- → Digital platforms and algorithms are increasingly used to coordinate work processes in traditional work settings.
- → This phenomenon, to which we refer as "platformisation of work", potentially alters work organisation and working conditions but there is still little evidence on it.
- → A new JRC survey offers original representative data for Germany and Spain on the use of digital devices at work; digital monitoring and the algorithmic management of work.
- → The use of digital platforms and algorithms is higher in high-technology industries, knowledge-intensive services, and public administration. Clerks and operators are the most 'platformised' occupations.
- → 'Platformisation' is associated with work organisation arrangements such as detailed procedures, problem-solving and complex activities, but not with time flexibility or autonomy.
- → In terms of working conditions, platformisation seems to be associated with greater monotony and stress at work.

THE RISE OF PLATFORMISATION

Like most other aspects of social life, economic activities and workplaces are becoming increasingly digitalised and interconnected. The pervasiveness of digitalisation and connectedness in work, accelerated by the recent COVID pandemic (Adascalitei et al 2022), tends to expand the use of platforms and algorithms, since they are the most efficient mechanisms for coordinating digital interactions of any kind.

Digital Labour Platforms are technological infrastructures in which algorithms are used to match clients who need a service with workers who are able to provide that service, and to coordinate the provision of those services. Platform workers use a variety of digital tools to carry out their work; these tools are generally able to collect data (and perform functions of surveillance), which are then processed and fed to algorithms that carry out automated actions, such as assigning shifts and tasks, providing instructions, evaluating performance and disciplining behaviour. These automated actions can be referred to as 'algorithmic management'.

In general, digital labour platforms used for coordinating work processes tend to incorporate functions of digital monitoring and algorithmic management (Fernández-Macías 2017). These functions create hierarchical power structures that make platforms similar to traditional employers, with the providers of labour services being in a *de facto* subordinate position vis-a- vis the algorithms. In the last few years, digital labour platforms have become a more consolidated and regulated phenomenon, increasingly similar to conventional work settings.

Simultaneously, in conventional work settings there is an increasing use of platforms and algorithms for the coordination of work processes. This is especially the case in

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large firms and in sectors such as logistics (both in warehouse and delivery work) and to a lesser degree retail, manufacturing, marketing, consultancy, banking, hotels and call centres (Wood, 2021). This implies a certain convergence in the use of platforms and algorithms for the coordination of work both in conventional organisations and digital labour platforms.

This phenomenon, to which we refer as *the platformisation of work*, deserves increasing attention from policy makers as it can potentially lead to negative implications in terms of work organisation or working conditions. The new empirical evidence provided by the JRC can help inform future policy action on the matter.

SOME BASIC DEFINITIONS

Platformisation of work is the increasing use of digital platforms for coordinating work processes in all kinds of economic organisations. Digital platforms are technological infrastructures that allow multiple parties to interact with one another.

Digital labour platforms (DLPs) are digital platforms where buyers and sellers of labour services can transact, and which facilitate and coordinate those transactions with their algorithms (Pesole et al, 2018; Urzì Brancati et al, 2020);

Platform workers are workers who provide paid labour services via DLPs. They can provide services online or on-location; can last a few minutes or several months (project based) and require low, medium or high skills.

Digital monitoring is "any collection and processing of information (using digital tools), whether personally identifiable or not, for the purposes of influencing and managing those whose data have been garnered" (Lyon 2001 cited in Ball, 2021:10).

Algorithmic management is the use of computer-programmed procedures (i.e. algorithms), which may be powered by artificial intelligence or not, to coordinate labour input in an organisation (Baiocco, et al. 2022).

POLICY CONTEXT

The main EU-level legal references with respect to the platformisation of work are: the General Data Protection Regulation (GDPR), the 2021 European Commission proposal for a "Directive on improving working conditions in platform work" (COM(2021) 762), and the 2021 proposal for an Artificial Intelligence (AI) Act.

The GDPR requires that personal data processing in the workplace be necessary and proportionate and prohibits fully automated dismissal or punishment without human intervention. The Commission proposal for a directive on platform work underlines the importance of assessing the impact of algorithms and platforms on employment status; and the need to mitigate the potentially negative consequences of algorithmic management.

The proposal for an AI Act lays the foundation for regulating artificial intelligence and provides criteria for risk management and data governance, but does not address the impact on working conditions or provide collective rights. AI providers must self-certify compliance, and it is unclear who is responsible in case of controversies involving third-party AI systems.

MEASURING PLATFORMISATION

The **JRC Algorithmic Management and Platform Work survey (AMPWork)** collects original representative data for Germany and Spain, gathering information on three essential elements to understand the platformisation of work: first, the material base, meaning the digital devices used at work; second, the digital monitoring and surveillance of work; and third the algorithmic management of work. These elements are measured in three different contexts which provide complementary perspectives on the phenomenon of platformisation of work (see box 1).

Box 1: Survey Methodology

The JRC Algorithmic Management and Platform Work survey (AMPWork) was conducted in Spain and Germany between September 2021 and March 2022. The survey was designed and coordinated by the European Commission's Joint Research Centre, in collaboration with the Directorate General for Employment, Social Affairs and Inclusion. The fieldwork was carried out by IPSOS.

The AMPWork survey is representative of the working age population (16-64) living in private households in Spain and Germany, whose usual place of residence is the territory of the country and who are able to speak the national language.

The AMPWork sample followed a multi-stage, stratified and clustered design with a random walk procedure for the selection of the respondents at the last stage. Only one individual per household was selected for interviewing, and all interviews were conducted face-to-face in the respondent's own household. The survey covers 3,000 cases in Germany and 4,000 in Spain.

The questionnaire is structured in three main sections: the first section tries to measure the platformisation of regular work. The second section is specifically focused on workers in Digital Labour Platforms (DLPs). The third section of AMPWork measures the unpaid provision of digital content for sharing platforms.

Use of digital tools

To understand the extent to which a 'platformisation' of regular work is taking place, we need to first take a look at the use of digital tools in the workplace. To this end, the AMPWork survey asked those respondents in paid employment whether they used any of the following digital devices in their current work: 1) personal computers or laptops; 2) tablets, smartphones or other mobile computer devices that connect to the internet; 3) wearable devices such as proximity cards, fitness trackers, smartwatches, dataglasses, or other embedded sensors; and 4) other digital devices not covered by the other three main categories (such as digital cameras, drones, digital laboratory equipment).

Perhaps surprisingly, given the common assumption that digitalisation has reached all forms of work**, more than one third of respondents in both countries reported not using digital devices at work**, a rate which is slightly higher in Germany (38%) than in Spain (35%). Among those workers who report using at least one of the four types of digital devices, **the most commonly used device is a personal computer (PC) or laptop** (55% and 56%, in Germany and Spain respectively). **In most cases, the use of a PC or laptop is combined with other devices**, with the combination of PC/laptop and mobile devices being the one most frequently mentioned (31% and 27% of all respondents in the respective countries). Indeed, although mobile devices are quite frequently used in combination with computers, they are rarely used on their own (5% and 7%).

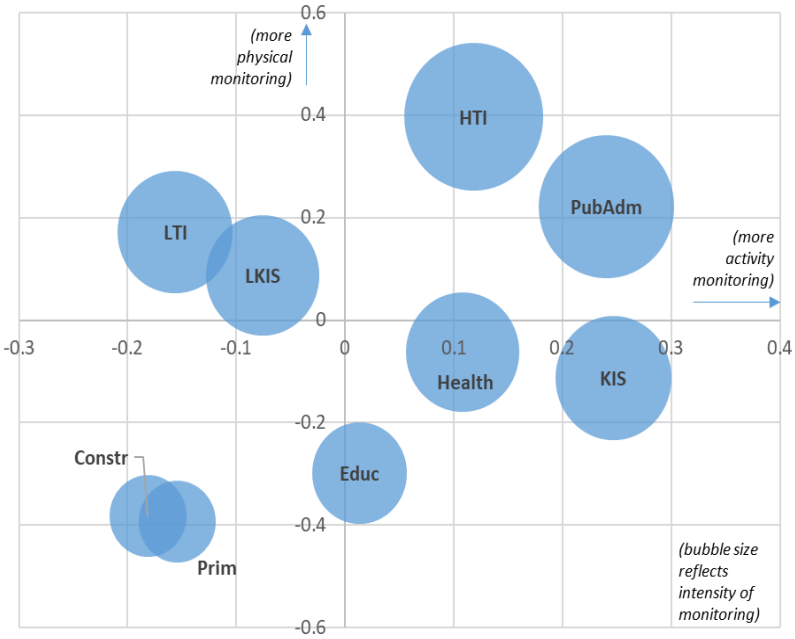
Digital monitoring

Based on a review of the literature and on expert advice, the AMPWork questionnaire elicited information on employers' use of digital devices for purposes of monitoring and surveillance. In particular, respondents were asked whether the organisation where they work uses any digital tools for any of the following purposes: monitoring work times, computer use, voice calls or emails, internet use, use of CCTV or webcams, tracking entry/exit/movements, monitoring physical location, and monitoring vehicle locations.

AMPWork estimates show that **the most common type of digital monitoring is the tracking of working times**, which is reported by around half of all workers in both Germany (50%) and Spain (46%). The second most frequent form of digital monitoring is the use of swipe cards for tracking entry/exit/movements in the workplace (14% and 39% in Germany and Spain, respectively), followed by use of devices to monitor vehicle locations (9% and 8%) and CCTVs or webcams (9% and 20%). Given the correlation across types of monitoring, we built two indicators for *activity monitoring* (which is a linear combination of the variables related to the monitoring of computer use, voice calls or emails, or internet) and '*physical monitoring* (a linear combination of variables linked to the monitoring of physical presence in the workplace: tracking of entry/exit, CCTVs, monitoring work times or physical location).

By occupation, **high levels of physical monitoring are found for operators, while it is relatively low for all of the other occupational groups**. **Activity monitoring is highest for clerks and professionals, and lowest for those in elementary, service, trades and agricultural occupations**. By sector, the highest levels of monitoring and surveillance are found in high technology industry (HTI) and Public Administration, for both activity and physical monitoring.

Figure 1 – Digital Monitoring by Sector



Source: Fernández-Macías et al, 2023; note: intensity of monitoring is a simple indicator summing up all the 8 monitoring variables.

Algorithmic management

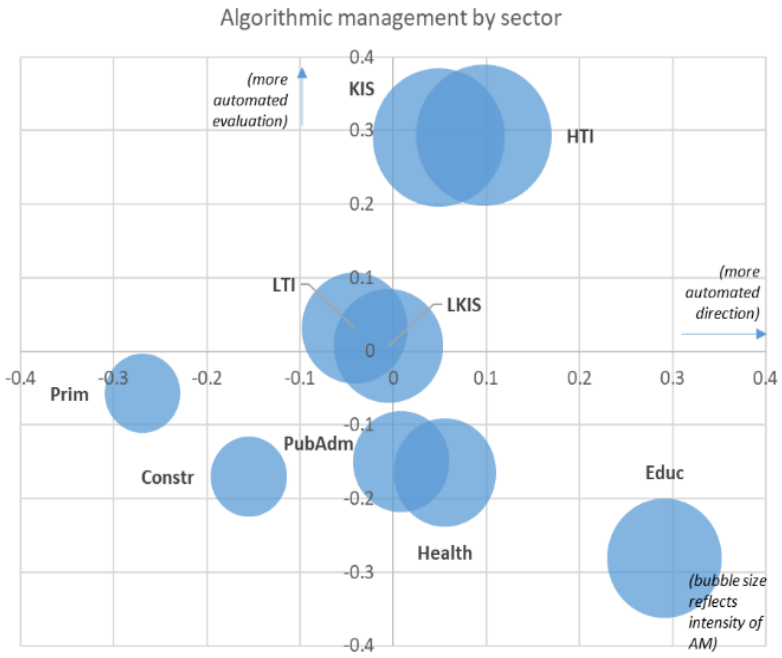
All AMPWork respondents in paid work were also asked a series of questions about algorithmic management and automated performance benchmarking systems. In particular, respondents were asked whether the digital tools they used at work were used to automatically allocate or and communicate their roster/shift/working time, the activities to carry out, the speed or rate of work and instructions regarding how work should be carried out. Additionally, they were asked whether their performance was ranked on a leader board; whether they were awarded points, badges, prizes or stars, or similar, for meeting targets or different levels of performance;

whether their performance ratings were used as a way to decide which tasks, work or shifts they were given. Finally, they were asked whether they could lose their job, get suspended or have their shifts cancelled if they didn't maintain a minimum rating, score or metric.

Estimates show that the automated allocation of work is the most widespread form of algorithmic management, whereby more than 10% of German workers and almost 20% of Spanish workers are automatically allocated their shifts or working time via a digital device. Moreover, 7% and 16%, respectively, are allocated work activities via digital devices; 3% and 7% have the speed of their work determined by a digital device; and 4% of German workers and 11% of Spanish workers follow automated instructions or directions at work.

By occupation, the highest levels of automated direction are found among industrial plant and machine operators and assemblers, as could be expected. By sector, we see **surprisingly high levels of algorithmic direction in education**. This might be linked to the increasing use of digital tools for education at all levels, which has been greatly accelerated by the Covid-19 pandemic. Automated direction is also relatively high in **high technology industries (HTI), health and knowledge intensive services (KIS)**; while it is lowest in the primary sector and in construction.

Figure 2 – Algorithmic Management by Sector



Source: Fernández-Macías et al, 2023; note: intensity of monitoring is a simple indicator summing up all the 8 monitoring variables.

What is a 'platformised' worker?

To assess the extent to which platformisation is taking place, we created four categories based on the combined use of digital tools and the presence of algorithmic management, digital monitoring, or both.

The first category (***no use of digital tools and no platformisation***) includes all those workers that use no digital tools at work and are not subject to either algorithmic management, nor digital monitoring, comprising 38% of German workers and 35% of Spanish workers.

The second category (***use of digital tools but no platformisation***) includes those workers that use digital tools, but which are not under digital monitoring or algorithmic management systems. Just over half (51%) of German workers and just over two-fifths (41%) of Spanish workers fall into this second category.

The third category (***soft platformisation***) includes those workers that use digital tools and are under mild forms of digital monitoring and algorithmic management. We estimate that 10% of German workers and 18% of Spanish workers can be classified into this third category.

The fourth category (***strong platformisation***) includes those workers that use digital tools, and are under strong forms of both digital monitoring and algorithmic management, meaning that they are simultaneously *under all* the four main types of digital monitoring and algorithmic management. Just 1% of German workers and 6% of Spanish workers belong to this category.

In terms of occupation, both soft and strong platformisation are found mainly among operators and clerks. By sector, high technology industries (HTI) have the highest levels of both strong and soft platformisation, followed by knowledge intensive services (KIS). Interestingly, education comes third in the category of strong platformisation (although it is important to note that in general, the levels of strong platformisation are low).

In terms of work organisation, platformisation is associated with detailed procedures, problem solving and complex activities, but not with time flexibility or autonomy. In terms of working conditions outcomes, platformisation seems to be associated with less communication and greater monotony. In addition, the 'strong platformisation' category is mildly associated with stress at work.

Finally, with respect to location of work, 'platformisation' is stronger for those mainly working outside of their employers' premises, namely in a vehicle, at home, or in public spaces.

Figure 3 – Platformisation by work organisation and working conditions outcome

	Time flexibility	Detailed procedures	Problem solving	Complex activities	Autonomy index
No digital	-0.15	-0.22	-0.23	-0.34	-0.19
Digital tools, no AM	0.13	0.06	0.12	0.19	0.13
Dig soft DM & AM	-0.03	0.27	0.14	0.13	0.08
Dig strong AM & DM	0.00	0.34	0.23	0.50	-0.06

	Can take break	Can communicate with superiors	Can communicate with peers	Stress at work	Job is monotonous
No digital	-0.06	-0.09	0.10	-0.08	0.15
Digital tools, no AM	0.03	0.14	0.00	0.06	-0.20
Dig soft DM & AM	0.08	-0.15	-0.19	-0.01	0.13
Dig strong AM & DM	-0.07	-0.23	-0.17	0.12	0.51

(Main place of work)	Employer	Client	Vehicle	Home	Public space
No digital	-0.18	0.17	-0.03	-0.33	-0.04
Digital tools, no AM	0.15	-0.09	-0.09	0.18	-0.01
Dig soft DM & AM	0.04	-0.12	0.18	0.18	0.11
Dig strong AM & DM	-0.21	-0.06	0.59	0.33	0.10

Source: Fernández-Macías et al, 2023. Note : AM stands for algorithmic management, DM for digital monitoring, soft and strong are to be understood in the sense of the four categories outlined in this brief.

WHAT WAY FORWARD?

This policy brief discussed the rise of platformisation and its implications for the world of work. AMPWork shows that the material basis for platformisation is already well established, at least in the two countries analysed. The majority of workers (around two thirds) are already using digital devices in their daily work activities; these devices are likely to incorporate platform-type software for the coordination of their input.

Respondents using digital devices at work are in most cases also subject to some degree of digital monitoring, according to their responses in the AMPWork survey. In particular, the survey reveals that the combined use of computers, mobile and wearable devices is strongly associated with the monitoring of work activities. Algorithmic management is much less common than digital monitoring, although not marginal. Around one in five workers in Germany, and one in three in Spain, is subject to one or more automated systems of management, of which we identified two main types: algorithmic direction (where the algorithms provide instructions to workers) and algorithmic evaluation (where the algorithms assess the performance of workers).

Based on an analysis of new and original data, this policy brief identifies specific working conditions associated with platformisation, such as heightened stress and monotony, but also more complex tasks and problem-solving.

Since 'platformisation' of work is still a recent phenomenon there is little evidence about its prevalence and its implications. These initial findings confirm the importance of this field as a focus of attention for further research, which could extend the evidence to other EU countries and deepen on a better understanding of its implications. In recent years there have been numerous attempts, both at EU and national level, to clarify the employment status of platform workers and address some of the implications of algorithmic management, at least for what concerns automated actions and data privacy. Our findings suggest that this phenomenon increasingly deserves the attention of policy makers, going beyond digital labour platforms to dig deeper into the implications of the 'platformisation' of regular work, with a focus on the sectors or occupations potentially more vulnerable.

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Please cite the policy brief as: Urzí Brancati, M.C, Gonzalez Vazquez, I.,,Fernández-Macías, E. (2023), The Rise of Platformisation: Empirical Insights, JRC Science for Policy Brief on Labour, Education and Technology.