

INCODING case studies reports

**Non-inclusive industrial relations system and algorithmic
management in the labour process**

Two case studies of high vs. low employee participation working practices

Partner: Társadalomtudományi Kutatóközpont
HUN-REN Centre for Social Sciences

Authors: **ÉVA FARKAS**

CSABA MAKÓ

JÓZSEF PAP

MIKLÓS ILLÉSSY



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PREFACE

The INCODING project is a two-year project supported by the European Commission, Directorate-General for Employment, Social Affairs, and Inclusion, receiving funding under the call for proposals SOCPL-2021IND-REL aimed at improving expertise in the field of industrial relations.

The INCODING is a joint project of 5 partner organizations from five countries. The aim of the project is to analyse the role of collective bargaining and other forms of employee involvement at workplace level in (co) governing the black box of Algorithmic Management (AM) with a view to identify the main challenges for workers and their representatives, and explore its contribution to Inclusive AM understood as the turn to more transparency in the design and implementation of Artificial Intelligence (AI) based systems at company level and guaranteeing human oversight of automated processes. Moreover, the project also aims to learn from best practices, develop collective bargaining strategies and provide recommendations for trade unions, workers' representatives and employers negotiate the conditions under which AM and AI systems are used.

The first phase of the project consists of gathering existing information on the role of collective bargaining in governing Artificial Intelligence and Algorithmic management systems. The output of this activity is the publication of four national (DK, ES, GE and HU)¹ stock taking reports summarising the state of the art in each country, paying attention to the sectors where company case studies have been selected, and one stock taking report summarising the state of the art in relation to legal and social dialogue development at EU level.

The second phase of the project consists of empirical qualitative research of two companies (in two sectors) where artificial intelligence and algorithmic management is used by the company. At supranational level, fieldwork consists in the analysis of positions, views, and discourses of relevant actors in relation to artificial intelligence. The output of this activity is the publication of a set of national reports and an EU-level report presenting the findings of the two company cases studies and the analysis at EU level.

1. INTRODUCTION

Motto:

“The workplaces in which workers or worker representatives are consulted regarding new technologies are the same workplaces where the most positive impacts on workers’ productivity and working conditions are reported.” (OECD, 2023: 13)

Before presenting the two company case studies carried out in the INCODING project, we would like to briefly present the context in which the themes of artificial intelligence (AI) and algorithmic

¹ INCODING Stock taking reports available at: <https://incoding-project.eu/country-stock-taking-reports/>

management (AM) are embedded. To this end, we summarise the views of key stakeholders (academics, policy makers, employers’ associations, and trade unions) on these issues in general.

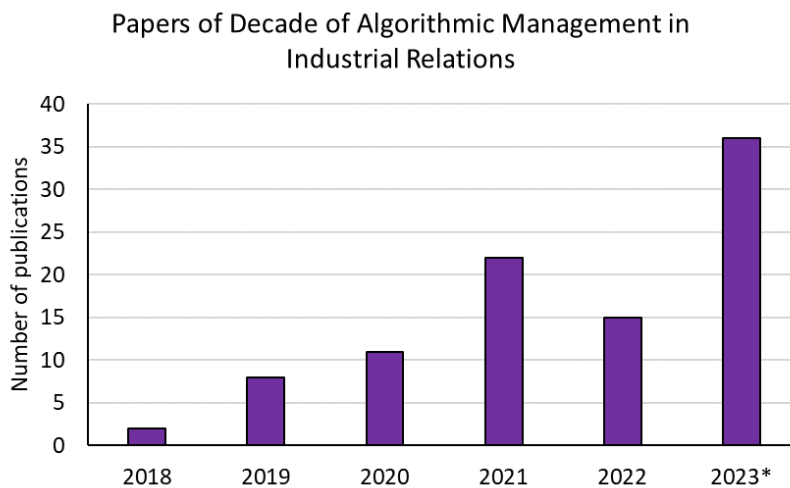
Views of technological changes: the dominance of the AI “optimists”

Each new wave of technological progress triggers debates about its impact on employment and working conditions (job quality). The current discussions regarding AI/AM and their effect on work and employment are reminiscent of those that took place in the early 1900s (Gmyre et al., 2023). The so-called 'automation anxiety' has a long history in social science. Leontief (1952) had a particularly pessimistic view, suggesting that work would become less important in the future as machines replace workers, who may not be employed by emerging industries. In contrast, the OECD's latest survey results support the optimistic scenario of technological change. According to the survey, around 80% of AI users believe that AI, if used correctly, could lead to higher productivity and better job quality (OECD, 2023:12). Unfortunately, there are no systematic surveys on AI in Central and Eastern European countries. However, the Stanford "Artificial Intelligence Index Report 2023" indicates that the Hungarian public opinion (49%) is relatively positive about the impacts of AI, and falls somewhere between the more optimistic Spanish (53%) and the less favourable German (37%) public opinions (Pap et al., 2023).

Relative shortage of publications with the term of “Algorithmic Management” in the Industrial Relations Discipline

In the academic publications of the IRS discipline, there are very few studies on "AM" and even fewer on "transparency of AM" in comparison to the number of studies that focus on "AI" (see in details in Figures 1 and 2).

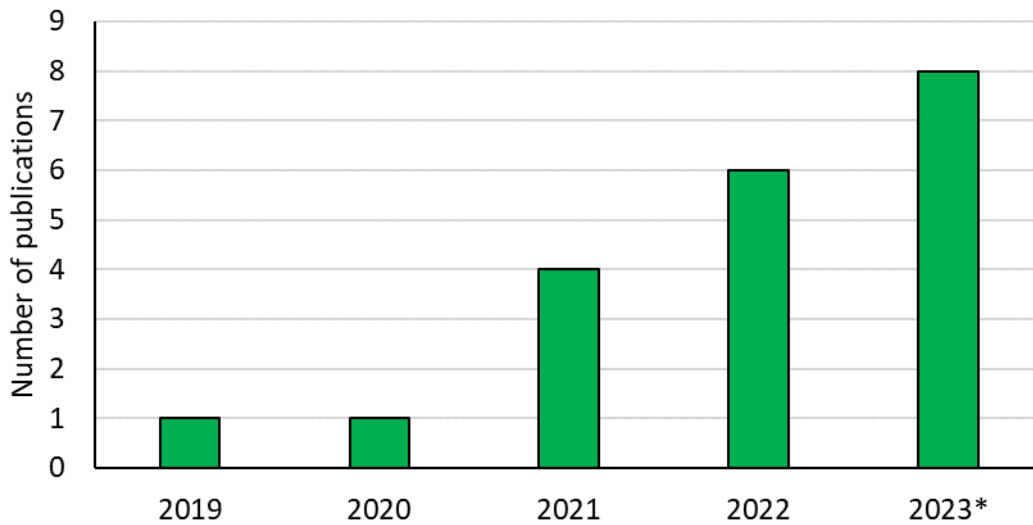
Figure 1



The data shows that AM is an emerging topic in the field of industrial relations and the number of publications grows year by year almost exponentially. Attention to AM increased in 2023 in particular, with more studies published on the subject by September 2023 than in the previous two years combined. Algorithmic transparency is an even younger theme and still is almost non-existent: in the past five years only 20 studies have been published within the Industrial Relations System (IRS) discipline.

Figure 2

Paper of Decade of Algorithmic Transparency in Industrial Relations



Source: Figures based on Scopus indexed journal database, prepared by the science-metric expert Péter Sasvári, Ludovika University of Public Service, Budapest, October 2023.

*The data refer to the period between January and September 2023

The government’s approach in a nutshell: focusing on human capital development and lack of social dialogue with the IRS actors

The 'Hungarian Artificial Intelligence Strategy 2020-2030' document fails to identify the role of social actors in the development of AI. However, it identifies two significant social requirements related to the spread of AI: the need to develop human capabilities through education and competence development, and the need to prepare the population for the technological changes brought about by AI. This includes the need to demystify AI/AM, explain its advantages and limitations, and how it affects our daily lives and work. The document aimed to improve the social awareness of one million Hungarian citizens by the end of 2021 and provide basic AI courses to 100,000 of them as part of its efforts to prepare the Hungarian population for the use of AI, but no empirical data is available to assess the fulfilment of this goal.

Employers’ associations: early phase of exploration

It appears that the Hungarian employers' associations have not shown much interest in the topic of AI/AM diffusion. Business Hungary, the largest employers' association in the country, confirmed that even their European-level organisation, "Business Europe," has only recently begun to explore AI/AM-related issues. This lack of interest could be due to the absence of a critical mass of firms using AI technology in Hungary. Comparing Hungary's use of AI technology to other INCODING countries, Denmark is in the lead, followed by Germany and Spain, while Hungary is categorized as one of the "trailing edge" countries, ranking only higher than Greece and Romania.

Trade Unions and digitalization: European instead of national initiative in the awareness building

Over the past thirty years, the Hungarian labour relations system has experienced a decline in the role and influence of social dialogue at the national and sectoral level. Trade unions have a weak presence within the companies, but this can be compensated by extending sector-level collective bargaining agreements. However, this compensation effect is weakest in Hungary, as per the INCODING project consortium countries (Borbély et al., 2021). The lack of financial, organizational, and human resources makes it extremely difficult to acquire the necessary knowledge to influence the transformation of AI/AM in the workplace. The European Union is attempting to lead change in this area, with the Hungarian metalworkers trade union (VASAS) participating in an EU-supported project with Romania and Slovakia to study the general impact of digitalization on work. However, the special role of trade unions in the AI/AM transformation was not mapped out, despite their active involvement in the project (Bogo & Vakhil, 2022). The issue of a lack of AI-related expertise among social partners is not unique to Hungary, as the latest OECD report on AI and the labour market highlights: “While AI technologies have the potential to assist social partners to pursue their goals and strategies, the lack of AI-related expertise among social partners is a major challenge” (OECD, 2023:3).

Comparison of the company case studies: Low Involvement vs. High Involvement Working Practices

The Hungarian research team conducted case studies on two companies in different sectors. The first company, Dataexpert Services, operates in the Information and Communication Technologies (ICT) sector as a "knowledge-intensive business service sector" that employs highly skilled and well-paid workers. The second company, Contract Logistics Firm, operates in the logistics sector, employing low-skilled and low-paid workers. The design and development of the automation and artificial intelligence practices in the labour process at Dataexpert Services are characterized by a "High-Involvement-Working Practice" (HIWP), while the implementation of automation and AI in the labour process at Contract Logistics Firm represents the "Low-Involvement-Working-Practice" (LIWP). In the second case, the central headquarters of the global logistics firm designed the AI/AM practices, and local managers were only involved in the implementation process, as well as the short-term formal and On-The-Job Training (OJT). The local managers were only informed after the technological changes were made. Table 1 summarizes key features of the design/implementation output of the AM/automation in the labour process in the firms surveyed.

Table 1: AM Design and Practices: Knowledge Intensive Business Service vs. Logistics Labour Process

Characteristics of the labour process		1 st Case Study <i>Low Involvement Working Practices: Contract Logistics Firm</i>	2 nd Case Study: <i>High Involvement Working Practices: Dataexpert Services</i>
Input: data? Which data are collected?	How are these data collected?	GDPR/Hungarian Data Protection Regulation adopted by the Hungarian Contract Logistics Firm (e.g.: individual performance monitor does not contain the names of employees)	The Project Planning System (PPS) system based on information about the various clients, the employees' input, performance and the KPI

	Lack of regulation: linking wages to tracked outputs of the employees is not prohibited in Hungary	indicators. The user ‘dashboard’ was developed: the main objective was that all the information should be visible in one place so it is clear to the employees.
Processing: How is the algorithm designed?	The AM system was designed and developed by the global logistics firm level. The Hungarian contract logistics firm participated only in the implementation process. Both workers and managers at the Hungarian contract logistics firm were not involved in the design of the new technology (automation) based labour process.	In the PPS the quality of the data heavily dependent on the workers’ input and involvement. The algorithm of PPS was designed/ implemented and further developed by the participation of employees (HIWP).
Output: How are decisions made and implemented?	Employees have “phony participation” in the SmartReM system implementation, i.e. information sharing in spite the company presence of the trade union	The employees are not only responsible for maintaining the data but also involved in the design of the tool to support their day-to-day activities. Plus, they have the autonomy to directly negotiate with the clients on the conditions for delivering their projects.

Note: The analytical dimensions adopted from, Molino, at. al. 2023:4

2. CASE 1: PARTICIPATORY AM DEVELOPMENT IN THE KNOWLEDGE INTENSIVE BUSINESS SECTOR (THE CASE OF PROJECT PLANNING SYSTEM IN THE DATAEXPERT SERVICES)

DataExpert² is a Hungarian private company owned by two entrepreneurs who established the organization in 2007. Initially, the scope of the business was providing online survey programming, data cleaning, and data processing services for market research agencies that have outsourced these stages of a market research project. The organization has been exponentially growing in the first ten years, and by 2023 they achieved a headcount of 65 after a peak of 80 full-time employees immediately before the pandemic. Revenue has been gradually increasing in the 16 years of DataExpert Ltd.'s history, with the client base becoming increasingly diversified; in the first eight years, one large customer provided business stability, but by 2023 its two departments supported more than 200 customers. They position themselves as “the largest independent market research operations support provider in Europe” since being independent was regarded as an essential

² The full version of the case study can be found in Farkas et al., 2023.

characteristic since companies with similar portfolios are often exclusively linked to (or even owned by) big market research agencies. DataExpert (DE) supports a broad customer base and does not specifically belong to any other groups or networks. That also means that its business development is driven by the management.

2.1. INTRODUCTION: BASIC CHARACTERISTICS OF THE SECTOR AND THE COMPANY

2.1.1 SECTORAL CONTEXT AND RELEVANCE

Before 1990, union membership was compulsory in Hungary, resulting in 98% union density³. This was abolished during the political and economic regime change, and the strength and the unionization rate have been steadily declining ever since. For example, in 2001, according to the Labour Force Survey conducted by the Central Statistical Office, nearly 20% of workers were union members, but by 2020 the percentage had fallen to 7.4%. The proportion of workers covered by collective agreements in 2015 was 20.6%. According to the OECD, the collective bargaining coverage rate was 22% in Hungary in 2019 (Countouris et al., 2023:91). More specifically, 16.9% of employees in the ICT sector were covered by a collective agreement (compared to 25% in 2004). The role of collective agreements is illustrated by the fact that in 2015 only 28.1% of employees in the ICT sector said that collective agreements had an impact on wages, compared to a national average of 56.8%. In principle, it is possible to extend collective agreements to the entire sector, but this has not been done in the ICT sector. The proportion of workers covered by single-employer collective agreements in this sector was above 20% in 2015 but had fallen below 14% by 2018. The proportion of workers covered by multi-employer collective agreements is negligible and on a downward trend: 0.74% in 2015 and 0.26% in 2018.

2.1.2 COMPANY CHARACTERISTICS (SIZE, RELEVANCE WITHIN THE SECTOR, ETC.)

DataExpert Services (DE) offers high value-added and knowledge-intensive business services in the information and communication sector. Their market research operational portfolio consists of the following activities: survey programming and hosting, custom IT development, data processing, data analytics, data visualization, graphic design, and market research technology transition support. In order to provide these services in high quality, DE relies on a substantial IT infrastructure, including hosting platforms and computing capabilities for online data collection, as well as an array of niche software, data framework and visualization tools for requested data processing activities. DE's project-based business model sets the requirements on the use, impact, and regulation of AM at the company, which means that the conditions of the collaboration – including the price, deadlines, and deliverables – are negotiated with the clients, project by project. In most cases, there is no contractual guarantee for an expected amount of revenue within a certain period, although more intense cooperation is incentivized by a rebate scheme. DE offers two service options: (1) project-based, varying in duration, and (2) support with dedicated team members managed by the customer, reducing scalability as they are exclusively available for that customer. The company currently employs more than 60 (highly trained and highly paid) employees, and there are no formal institutions, channels of collective bargaining, trade unions, works councils or collective agreement options at the company.

³ The source of all data in this paragraph is Berki, 2023.

2.2. THE USE / EXTENSION OF AI AND AM IN THE COMPANY

The main driver for the introduction of AM was the rapid growth of the company, both in terms of the customer base, the business portfolio, and the competence-base. After the first few years of the company's lifecycle, when they reached 8-10 employees, the management decided to develop a tool called Project Planning System (PPS) in order to be able to monitor the delivery and the financial results of each project. As they had the necessary competences in this field, the AM tool was developed internally. The gradually growing business portfolio and customer base have not required significant organizational segmentation or the establishment of different divisions. Even if the supported customer base or the applied technology could be diversified, the day-to-day workflow and task structures are very similar company-wide. This means that regardless of the department or project, the same tool (PPS) is used in almost the same way. Only minor differences could be identified in the day-to-day work tasks from an administration perspective.

Considering the five characteristics that have been conceptualized by Mateescu & Nguyen (2019:3), the PPS does represent an AM solution since:

- the data feed is regular: employees book all their hours spent on projects every day;
- the system monitors, tracks, and implicitly controls the workers through the technology by making productivity, efficiency, and profitability transparent for every employee. As such, it contributes to implicit and explicit performance management: the colleagues can delegate tasks for the least occupied ones or the most productive ones; furthermore, the people managers/team leaders can initiate improvement programs based on the observed performance indicators;
- it facilitates decision-making in HRM as well as business development via real-time information about the financial results and employees' occupations;
- performance against productivity targets are automatically evaluated; and
- it indirectly motivates the workers through full transparency.

The PPS currently supports various areas, such as project management, accounting, finance, billing, strategic management, and many different functions within HR management, as it is highly embedded into the day-to-day core and support activities. The main objective was that all the information should be visible in one place so it is clear to the employees:

- how many booked hours they have in the given month (on client projects);
- how much overtime they have done in the past month;
- how many of their projects have imminent deadlines;
- how many of their projects require business intervention if the price and estimated hour ratio is no longer meet, i.e., inefficiency is identified; and
- holiday statistics

The booking of the spent hours, as well as the holiday administration, has always been one of the first and most straightforward activities in the system, but with a new dashboard interface introduced in 2021, the re-negotiation with the clients and the cost update has also gained emphasis. As a result, employees of the DE became more aware and involved in the management of

their projects with re-negotiation no longer exclusively a task or privilege of management. The PPS provides employees with productivity feedback, such as using color codes to warn the user if the projects are overrunning in terms of time or budget. This type of assistance increases efficiency both for the management and the employees with the easy-to-understand interface of the system. It also helps to make the performance assessment more objective and provides input to prepare for regular conversations.

Figure 3: Standard production flow at DataExpert



Source: Authors

The production flow includes each step of the service delivery and consists of seven major activities. While these are listed in linear order an individual or group may be working on more than one project in parallel, meaning that linearity is only applied within that particular delivery lifecycle.

2.3. THE IMPACT OF PPS

In terms of impacts, the PPS contributes to the analysis of the everyday operation of the firm, but may facilitate long-term, strategic decision-making as well. As the Operations Director put it: *"I can see what kind of requests have come from where. From this, I can make analyses of what happens in that market if something happens there at a higher level. Then I can draw a conclusion from this that there will be a conference in that market in three months, then we should go there, since it makes sense to go out there, because we can probably come home with business."*

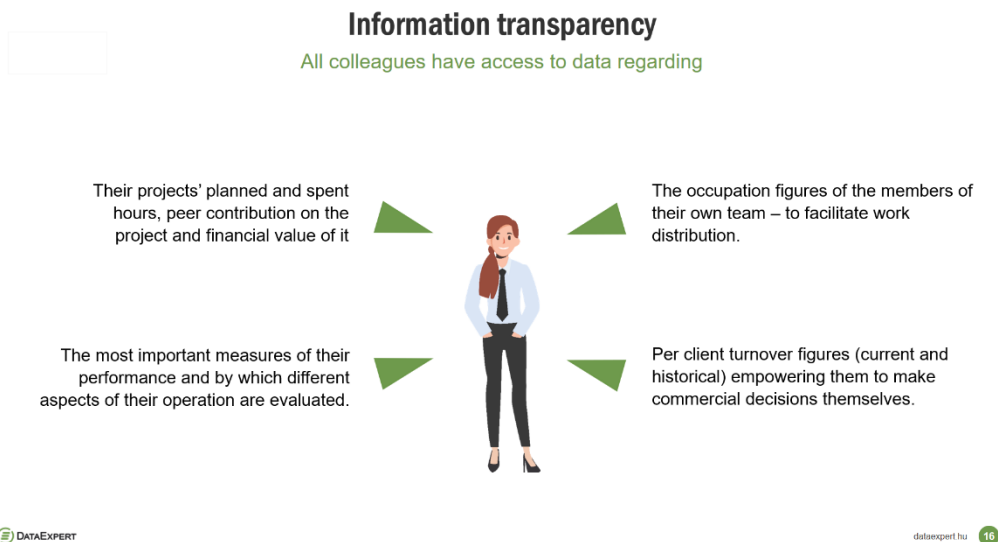
Another important objective of the system is people management. The performance metrics are considered as input for compensation, benefits, and promotion. Based on the information framed by the business context, the productivity and profitability of each employee can show their financial contribution. In addition to compensation and benefit calculations, data are available for HR's analysis of each employee's performance. At the same time, management is aware that HRM-related personnel decisions, be it promotion, dismissal or salary setting, should not be made solely based on the analytics measured by the PPS: *"...we know that the best employee is not the one whose productivity is the best. There were also quite extreme cases of this. There have been times when someone comes in and does a basically not-so-great job, but immediately, his numbers are enormous. If a group-level result is good, then we guess that if there were three juniors and two seniors, it was obviously the seniors who caused this group's production to be so good and not the guy who just came from university."* – Operations Director.

The introduction of the PPS has had equally important but more indirect effects as well, especially in terms of employee participation and engagement, organisational culture, and communication. The expectations on the performance, as well as on the results, are widely communicated across the company: there are monthly company meetings about the teams' and accounts' progress. The strong emphasis on personal and team contribution to the overall target makes the employee feel involved and encouraged to act with ownership on a day-to-day basis, as well as to focus on the company's interest during the negotiations with the clients: *"Everyone within the team is empowered to decide about the deadlines they give to the client. But we discuss things anyway, so we would*

never leave someone look at a price alone and walk away, and we also discuss the deadline." – Analyst.

It is noteworthy that these monthly reviews are based solely on the PPS system. These presentations are designed to showcase both outstanding and underperforming results, with the aim of increasing awareness of the company's financial progress and identifying areas for improvement. The monthly reviews serve not simply as top-down communication from management about business performance but also inform the daily informal conversations among workers. The transparency of these metrics, and the fact that they are available to everyone, is regarded as highly motivating. If recognition and compensation continue to reinforce the value of the business-driven mindset, it is likely that these conversations will remain an essential part of workplace discussions. As one analyst pointed out, *"I'm driven by numbers and income, so when I complete a project, I always go back and review how much income I've generated. This information is readily available on the main page where the annual income is displayed. Moreover, everyone can see where the company stands compared to the department-level plans. I would suggest that they also display where we stand at the company level, as that would be even more motivational."*

Figure 3: Aspects of information transparency



Source: Karasszon, D. – Szabó, Cs. (2022)

“Now, it's more in the company culture that we regularly talk about how much the income will be and tell them that you may not be interested, but we need to discuss it. By now, everyone is driven as they experience more success in asking for more from the client. The colleagues represent the business better and can agree on better and better pricing.” - Founder, CEO

This transparent system also reinforces the idea that employees' actions and attitudes have an impact on the company's financial outcomes. Transparency is an essential aspect of the company's image and is a fundamental building block of their organizational culture. Although the management team has always been data-driven, the recent cultural shift has resulted in a higher level of transparency.

The CEO stated that the company regularly discusses revenue streams, even with employees who may not be directly involved. This approach has motivated employees to ask for more from clients, leading to more successful and profitable outcomes. As a result, employees can represent the business better, and the company can agree on better pricing strategies.

A clear negative consequence of this gamified, transparent and constant performance monitoring is the potential intensification of work. However, PPS can be used to promote work-life balance as well: *“... it is not certain that it is good if the % in the PPS is 100%, then it means that you worked a lot of overtime. (It’s not good) for the company, because then the employee will be exhausted, nor for the employee, because then he will have no private life, so this has to be balanced.”* – Operations Director.

2.4. REGULATION AND GOVERNANCE OF AI AND AM

Since the company lacks a works council or trade union, informal regulation and ad hoc governance of AI and AM prevailed when PPS was introduced and throughout the process, which has been going on for more than a decade. It is clear that the introduction of the PPS was a result of a top-down managerial decision. It is also evident from the interviews that this process was accompanied by many conflicts, about which we have little information. Even in the absence of formal institutionalized support, however, the employees were not left without bargaining power because of their growing involvement in the continuous development of the system.

The continuous development of the PPS can be seen as a development process of self-regulation and governance with the involvement of the employees. First, the proper operation of the system is heavily dependent on the data input of the employees, therefore they precisely know which kind of data are collected. Second, (almost) all data tracked by the PPS are constantly available for all employees. Third, as mentioned previously, the PPS is constantly evolving to meet new needs, and employees are involved in this development process and can make suggestions on its design and functions. Finally, the core lesson of the DataExpert company case study is that employee participation in the technological changes took place even in the absence of the employees’ representative institutions (i.e. trade union, works council). The key precondition of the employees’ involvement is a work organization that supports teamwork, problem-solving and empowering workers through decentralized managerial decisions (e.g. enrichment of the data-production tasks with autonomy in negotiations with the customers.) The importance of the workers’ participation in “directing” technological changes is supported by recent literature on the relationship between digital technologies and job quality (Berg et al. 2022).

3. CASE 2: IMPLEMENTATION AND PRACTICE OF AM IN THE LOGISTIC LABOUR PROCESS (THE CASE OF THE CONTRACT LOGISTICS FIRM)

The Contract Logistics Firm (CLF)⁴ company is a global logistics and courier company that operates in more than 220 countries worldwide. Headquartered in Germany, it is one of the world's largest logistics companies, providing a comprehensive range of services in the field. The company

⁴ For a full version of the case study, see Pap et al., 2023. The real name of the company is withheld for the sake of anonymity.

investigated in this case study is a local branch of this global logistics firm. The sub-unit was established in Hungary in 1997, by 2022 it had over 700 employees in the country. There are operations ranging from small to large, and numerous clients who are served by the Hungarian branch. In our case study, we focused on two individual sites. The first one is a fully dedicated warehouse for only one client, is one of the world's largest tire manufacturing companies. The other warehouse is serving three different clients. The contract logistics unit is managing a call center with up to 50 people in addition to the warehouses and physical operation. The aim of the company is to provide complex logistics services, within and across its business units (Pap et al., 2023).

3.1. INTRODUCTION: BASIC CHARACTERISTICS OF THE SECTOR AND THE COMPANY

3.1.1 SECTORAL CONTEXT AND RELEVANCE

Logistics is a sector in Hungary where trade unions are relatively strong. The ratio of employees covered by collective agreement is 36.7%. This is the third highest rate after electricity (45%) and education (38.9%), while the national average is 20.6%. There is a visible weakening trend in this indicator, though, as the same ratio was 46.9% in 2004 and 42.7% in 2009. In contrast to the ICT sector, collective bargaining in the logistics sector plays an important role in shaping working conditions, illustrated by the fact that 62.7% of employees said that collective agreements had an impact on wages, which is above the national average of 56.8%. (In the previous case, the same ratio in the ICT was only 28.1%).

Concerning the firm investigated, the local branch went through several acquisitions and mergers in the last 30 years. Originally the organization was the logistics unit of one of the largest Fast Moving Consumer Goods (FMCG) Corporation in the world. Their unit's main business was the logistics processes related to vegetable (sunflower) oil. At this time the unit had a collective agreement, and they were part of the Trade Union of Agricultural, Forestry, Food Industry, Water and Hospitality Workers (MÉDOSZ).

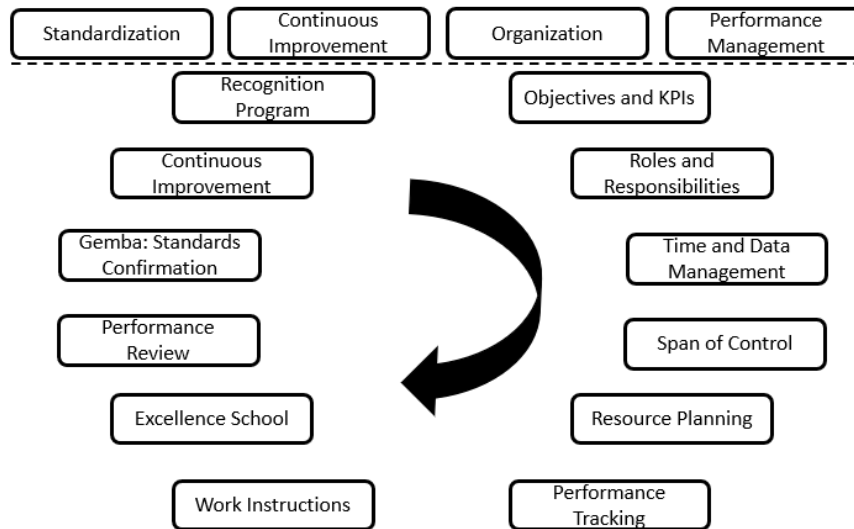
The new owners at each acquisition respected the collective agreement, and the local organization of the union at the company kept engaging the workers to take part in the trade union movement and representation, which explains the reason why MÉDOSZ now represents the workers of one of the largest logistics companies that serves high-tech, fashion, FMCG clients, and has very limited exposure to agriculture or food. Trade union influence at the sector level is relatively strong. For example, the collective agreement coverage rate is higher (36.7%) than the national average (20.6%). However, the local trade union did not reach the minimum membership rate of 10% required for its legitimacy.

3.1.2 SECTOR CHARACTERISTICS: TRENDS AND TECHNOLOGIES IN CONTRACT LOGISTICS

The cycle times of the warehousing activities (e.g. storage, picking, packing, loading, labeling, etc.) are controlled by the workers, unlike in the case of manufacturing where there are production lines, conveyors, and machinery that can have specific tact or cycle times which determine the pace of execution by the workers. Therefore many contract logistics companies introduced systems that can track workers in the warehouses, and that are able to measure performance in real-time, in order to maximize the workers' productivity. This requires two things: 1) a portable device that can be carried by the workers to track them, in this instance the Radio Frequency scanner, and 2) standardization of warehousing tasks and a corresponding database of cycle times that is used to measure productivity.

In the following, we present a summary of the two most important AM technologies used at the company: Operation Management System (OMS) and SmartReM. The OMS addresses 12 areas of the operation using lean operational principles (see Figure 4). The system aims to meet client expectations while the organization continuously learns and improves by empowering and motivating people.

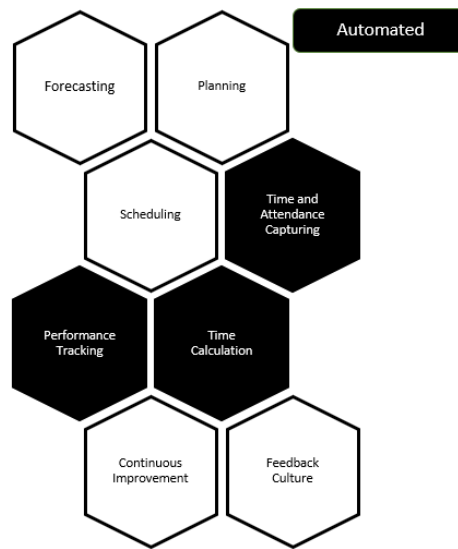
Figure 4: The OMS architecture



Source: Own design, based on the interviews

OMS has been partially automatized and is linked with a module that enables algorithmic management called SmartReM (Smart Resource Management). The SmartReM module in turn is connected to eight other modules at the end-to-end labour management process. The task allocation itself is not automated, but the performance tracking and reporting are. The module provides an automated data feed to the company's payroll system, tracking workers' time and attendance information as well as input for the workers' performance-based bonus payments. The output of the performance tracking is used for evaluation and as a guide to give regular and formal feedback to the workers every month. The primary aim of SmartReM is to monitor the workers' performance in real-time and to provide insights to their leaders, which requires the standardization of procedures and expected outcomes. In addition to monitoring employees, the system can be used for the whole service value chain as presented in Figure 5 (automated fields are marked in black color).

Figure 5: The SmartReM system’s key features



Source: Own design, based on the interviews

3.2. THE USE / EXTENSION OF AI AND AM IN THE COMPANY

While artificial intelligence (AI) as such is not used in the OMS, algorithmic management (AM) techniques are applicable in the SmartReM system, which is in effect inside the OMS. Out of the eight key features of SmartReM (Forecasting, Planning, Scheduling, Time and Attendance Capturing, Performance Tracking, Time Calculation, Continuous Improvement, and Feedback Culture), three are using AM. The three processes are Time and Attendance Capturing, Performance Tracking, and Time Calculation. (See in detail Figure 5)

Time and Attendance Capturing automatically records employees' working time, including breaks and overtime, which is used for payroll calculations and salary determination. It also tracks activities not previously recorded, like cleaning or packaging.

Time Calculation is used to plan the number of employees required for upcoming shifts, considering fluctuations in demand. It relies on input from process engineering and real-life data from workers.

Performance Tracking is a fully automated process where workers use RF scanners to record their activities, and their performance is measured against target times. Deviations are addressed in real-time or during monthly feedback sessions.

Radio Frequency (RF) Scanners are handheld devices used for tasks like picking, packing, and shipping in warehouses.

Operators are not well informed of the details of the system they are using. In particular, newly hired workers without prior warehouse experience lack clear knowledge and understanding of how their data is processed and by whom: *“I’m not sure about the usage of the system by the managers, and not sure how I could be involved”* (Operator2).

The data collected in the system are first used by the immediate supervisor of the worker, and then it is used on an aggregate basis on the shift and site level. In addition, relevant data are sent to the

payroll administrator to be able to compute the workers' wages, based on the time and attendance, and performance figures. However, workers lack an understanding of who has access to their data:

"I don't really know who has access to my data. I believe my line manager has access to it on an individual level." (Operator1)

"I think the supervisors, the shift leaders, the payroll, and HR can access my data, but I'm not really sure". (Operator3)

The employee representative, in this instance the trade union secretary, has no knowledge about the system. It is necessary to note that in their role as a Facility Specialist at the company they are not part of the core operation of the sites, and therefore do not interface with the system at the worksite.

3.3. THE IMPACT OF OMS AND SMARTREM

Regarding workload management, there is a real-time data feed regarding team and individual workers in order to balance the workload, identify inefficiencies, and be able to intervene to minimize productivity loss. The partial automation of the system creates a potentially transparent organization. However, the employees belonging to the different levels of the organizational hierarchy do not interpret the SmartReM system accordingly.

Examples of employee participation in the AM implementation process:

"We are not involved in the system design and parameter settings, nor the workers' representatives (union)." (Operator1)

"I'm not sure how the managers are using the system or its results. I don't know if they make any decisions based on that. I'm just aware of how I am using the system. I'm pulling a computer with me to see my real-time performance and the percentages. I feel that it's motivating to see my performance on a monitor during my shift." (Operator3)

It is crucial to highlight the knowledge differences between the people surveyed. The person who is in charge of system deployment is not only aware of the characteristics of OMS and SmartReM, but also has more than a half-decade of working experience with these systems. The Site Managers are involved in the roll-out of the program, and while they have to approve the deployment project, they have limited influence on the system itself. The site manager stressed transparency as a crucial precondition of the successful implementation: *"If this is well-managed it's good for both employee and manager. It is important to have a transparent process, especially as bonuses are linked to this. It is a long process, we have to be very careful to implement it, ...(since there)is a continuous maintenance and development of the system. If the system is not perfect or not transparent, it is counterproductive. Employees can be really nervous if the system does not work properly."* (SiteManager2)

The Supervisor interviewed was less optimistic about how happy the employees were about the AM: *"I would not say that the workers were happy when we launched it, but it impacted positively the performance. I think that new things are never welcomed. People were not convinced that the system would work properly. Workers were more skeptical of the technological aspect than monitoring and surveillance. Workers were working before in a system that was paying them a performance-based salary, so they thought that their income might be impacted."* (Supervisor)

The workers have different experiences with the system, one of them who recently joined the company, but had been working in the United Kingdom before in modern warehouses, sees the system of SmartReM as an essential one: *“I think technology as such is important. Managers use it to supervise our work. I cannot imagine that we’d work without this system. Otherwise, we’d make mistakes, it also means much less paperwork, and basically, I believe it supports our work.”* (Operator2)

About the potential full automation, the site manager was skeptical: *“There are automated warehouses, but I think in the long-term the result of automation will be that the same productivity will require fewer workers, but not warehouses without workers. The biggest cost element is wages, so it is a competitive advantage to have this technology deployed. I don’t think that a human manager can be replaced by automated systems, I think the human touch and personal contact between supervisor and employee are critical. It is also vital for developing workers to the next level of the organization, e.g. to Supervisors.”*(Site Manager1)

The senior worker – having two decades of experience at the firm – was a bit more specific: *“I believe that the system is very useful for managers, but I experienced some issues when we implemented it about a year ago. I experienced that it complicated our daily tasks. Besides, it helps me to work without mistakes, the system does not allow incorrect picking, and it stops me immediately...Yes, slight changes in the way we work, and also in the way we receive feedback. The working process mainly remained, in my view this technology as such does not impact my work.”* (Operator1)

3.4. REGULATION AND GOVERNANCE OF OMS AND SMARTREM

In Hungary the law allows companies to pay the salary based on individual performance, and the local branch of the company is using this possibility to motivate workers. This is in contrast to other countries in Europe, such as France, Netherlands or Germany, where it is not allowed to pay based on performance measurement goals. The Hungarian subsidiary where OMS and SmartReM are deployed can adjust some parameters, or highlight issues, but the whole deployment process is controlled by the centralized so-called “Standardization” team. In logistics generally and especially in contract logistics, the local branches have to follow the global strategy, and the decisions are taken by regional or global heads of the organization. However, local managers have a strong Profit and Loss (P&L) responsibility. The Hungarian branch has a final decision on the implementation of such systems, and the local technical team can maintain certain parameters of the system. However, developing key features, solving system bugs, and laying out the foundation of the process were controlled by the global standardization team.

As we move down the organization hierarchy, the level of control related to the system architecture rapidly shrinks. The lower-level leaders, such as shift or team leaders cannot influence key parameters or features, but they are involved in the deployment process. The workers receive training, and if they have any problems after the system is live, they may put it forward to their immediate leaders.

Although there is a trade union in the organization, it is less visible, especially for the newly hired employees. The two newly recruited workers we interviewed had limited or no information about the existence of the union. While the third colleague, who has been working at the company for a longer period of time, was well aware of the union’s presence and is a member of the union related to the AM, he did not experience any consultations with the trade union: *“We have a workers union. We communicate with them frequently face to face. They have been involved not only in employment-*

related things but also in work-related things, e.g. the actual processes in the warehouse. I did not encounter any issues while communicating with the union. However, the system-related issues/things are communicated directly to the WH Management and the System Deployment teams.” (Operator1)

Employees with long working experiences had a generally positive view of the union, while many younger workers appeared to lack an appreciation for the value of trade unions. The long-serving trade union secretary observed young employees were passive and disinterested in collective interest representation: *“Young colleagues of Generation Z and Y are not interested in being part of the union, they rather quit in case there are any problems instead of addressing issues through trade union.”*

4. COMPARATIVE ANALYSIS

One of the important factors that determine the manner and impact of the introduction of AM is to examine the characteristics of the company and its market. DataExpert is a relatively young company, especially compared to the Contract Logistics Firm (CLF). In the history of the company, the development of PPS was accompanied by a change in the structure of the market. Previously, they were dependent on one larger customer, which made their operation vulnerable, but with the diversification of the range of customers and, in parallel, the service portfolio, it became essential for managers to have real-time information on the current utilization of resources and profitability. This was the primary driver for the introduction of PPS. CLF, on the other hand, is a global company with numerous customers in more than 200 countries, so standardization was the primary driving force behind the introduction of AM.

Another group of factors determining the way and effects of the implementation of AM can be linked to the working context or the characteristics of the labour process, such as task characteristics, employee autonomy, decentralization of decision making or employee involvement. Of course, these characteristics of the work process are partly related to changes in the market environment of the companies investigate. In the case of DataExpert, for example, we saw how, with the expansion of the customer base and the service portfolio, it became essential not only to follow company processes in real-time, but also to decentralize decisions and increase employee autonomy. The degree of awareness of the work tasks also increased, as did the added value of the services provided by the company in general. What's more, since the company's management focused not simply on increasing income, but on increasing profitability, it became essential to spread commitment and an entrepreneurial attitude among employees, which was accompanied by an increase in the level of employee involvement. On the other hand, in the case of CLF, we saw that the higher quality of service required to meet customer needs led to a decrease in the level of employee autonomy. Previously, the cycle time of work processes was mostly controlled by the employees, even if the knowledge intensity of the tasks they carried was not necessarily high. As a result of standardization, though, this control was significantly reduced, with the automatic recording of employee outputs. While in the case of DataExpert, the goal was indeed to measure company-level performance, in the case of CLF the focus was on measuring individual employee performance.

One of the most important features of the introduction of AM is transparency. In the case of DataExpert, the current workload and partly the performance of the employees were made

transparent to the entire organization. This process involved many conflicts, but since the employees were an indispensable part of the data provision, it provided them with a relatively strong bargaining power. Thus, they had the opportunity to participate in AM's development processes, and in general, their autonomy and involvement increased. At CLF, the opposite processes prevailed: transparency was unidirectional, that is, the management could monitor the performance of the employees, but they were in general not fully aware of exactly what data was being collected about them. In this case, the conflicts were softened by the benefits provided by the new system: there was less paperwork, the AM practically eliminated the possibility of error, with wages not changing significantly in practice.

Table 2: Factors influencing the implementation and the impacts of AM

Factors		Contract Logistics Firm	DataExpert
Company characteristics	Age of the company	More than 50 years	Approx. 15 years
	Number of employees	Several hundred	65
	Market structure	Highly diversified customer base	Moderately diversified (approx.. 200 customers)
	Trade union / Works council	Trade union	None
Working context / Labour process	Autonomy	Low	High
	Knowledge intensity	Low	High
	Decision making	Centralised	Dcentralised
	Involvement	Low	High
Transparency		Low	High
Level of conflicts / resistance		Low	Low

5. CONCLUSION AND DISCUSSION

Before drawing the most important lessons learned from the two company case studies, it is worth calling the attention to the fact that in Hungary, compared to the European average, trade unions are much weaker, and institutional forms of social dialogue have almost completely eroded over the last decade. Thus, the experience of these cases can help us to understand the risks and opportunities of the spread of AM in a working and employment context where the traditional structures of institutionalised employee protection are unable to regulate it. It is also important to emphasise that the legal framework in Hungary is also underdeveloped in relation to AI and AM. In this research report, we therefore have attempted to show what other factors shape the introduction and impact of AM practices in the labour process. The mainstream institutional actor-centered theoretical frameworks of the IRS literature may be less suitable for describing and understanding such a new phenomenon as the diffusion of AI and AM in some of the Eastern and Central European countries, where it may have different effects and may require different public policy responses.

One of the most important conclusions drawn from the two company case studies is that even in the absence of formal interest representation institutions, the direction of AM development is not determined solely by technological capabilities, but rather there are organizational structures and other factors that fundamentally influence the way in which AM is implemented, and its impact on the working conditions of employees. Moreover, the latter often prevails even more strongly than the former: in the case of CLF, for example, although there existed a trade union, the introduction of AM affected the employees significantly less favorably than in the case of DataExpert, where neither a trade union nor a works council functioned. Of course, all of this does not mean that it is not important to strengthen the formal structures that provide institutional guarantees against misuse of AI/AM, either by strengthening social dialogue or by changing legal regulations.

The other lesson is recognizing the importance of social learning and the time it takes in such organisational structures. In the case of DataExpert, this is already well illustrated by the continuous development of the PPS, since it is an algorithmic management tool that is constantly changing, partly based on the feedback of the (observed) employees. In the case of CLF, the design-related decisions around AM are centralized, the system is much less transparent, and the experience thus far has not revealed any problems that are inherent in the operation of the system. It takes time to determine whether the technical possibility of data protection risks will necessarily lead to the abuse of personal data and, if so, how the social partners will react to it. In any case, the experiences of the case study indicate that abuses and the resulting conflicts are not in the interest of either employers or employees.

Based on the experiences of the case studies, it is clear that transparency is not only a defining feature, but also an important driver of the introduction of AM, although for different audiences. In the case of DataExpert, for example, each employee can see the workload of their colleagues, enabling a decentralized resource allocation and sharing of tasks, while the company's management has real-time information about the return. Customers, on the other hand, know nothing about internal company processes. In the case of CLF, the need for transparency basically comes from customers who want to know at which stage of the process the delivery of their expected shipment is currently. In order for the company to be able to provide this higher-added service, it was necessary to standardize the service processes, and then, introduce AM devices. Even in this case, the customers do not directly monitor the performance of the employees, only the product. Both cases apply AM tools and strategies for greater transparency and efficiency but toward different needs.

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ANNEX I: Demography of the Persons Interviewed for DataExpert company case study

ID	Role	Age	Years spent at the company	Experience in the industry	Education
Labour Lawyer	AM legal expert, Budapest	45	10	15	University/Legal studies
Chief Executive Officer	Founder and Owner, Debrecen	40<	16	20+	University/Sociology
Consultant	Tool developer, Debrecen	50<	10	30	University/Social Sciences
Department Lead	Operations Director, Debrecen	>30	5	5	University/IT Engineering
Analyst	Account representative / Senior Data Processing Specialist, Debrecen	38	7	7	University/Engineering management
AI-Ethic expert/data expert	Head of Global Azure Cloud Team AI Ethics Budapest	40>	2	20	University/IT/Business Administration
Works Council	President – Deutsche Telecom IT Solutions Co. Ltd. Budapest	40	10	15	Technical High School

ANNEX II: Demography of the Persons Interviewed for the logistics company case study

ID	Role	Age	Years spent at the company	Experience in the industry	Education
System Deplorer	Standardization Lead	43	19	21	University
SiteManager1 (GS)	Site Manager	44	20	20	Secondary
Site Manager2 (KGY)	Site Manager	48	4	8	University
Trade Union secretary	Facility Specialist	56	31	36	College
Supervisor	Supervisor	43	12	12	Secondary
Operator1	Operator	64	20	20	Vocational
Operator2	Operator	41	0.25	4	Vocational
Operator3	Operator	19	0.5	0.5	Secondary