



## **SEAD**

### **Sustainable Employment in the Age of Digitalisation: challenges, obstacles and opportunities**

*CONTRAT N° B2/191/P3/SEAD*

#### **D2.4 - Report**

Unpacking the organisational level.  
Comparative analysis of 22 case studies

Pollet, I. ,<sup>1</sup> Dessers, E. <sup>1</sup>, Smits, I. <sup>1</sup>

February 2024

<sup>1</sup> HIVA-KU Leuven



## Table of content

<b>Introduction</b> .....	5
Research questions .....	5
Methodology .....	6
<b>Cross-sectional analysis</b> .....	7
Characterisation of the cases .....	7
Introducing digital technology .....	9
Social dialogue .....	10
Division of labour .....	11
Human Resources Management .....	12
Impact on line management .....	14
Impact on task structure and quality of work .....	15
The mediating role of the division of labour .....	17
<b>Actor approach</b> .....	20
The actors involved .....	20
Rapid and integrated digitalisation .....	21
Intrinsic digitalisation .....	21
Incremental digitalisation .....	22
The role of actors in selecting and using digital technology .....	23
<b>Quality of work and digitalisation: enabling elements</b> .....	25

### ***Acknowledgment***

*The authors of this report thank Marine Franssen, Laura Beuker, Chiara Focacci, Giseline Rondeaux, and François Pichault for their assistance in the data collection.*



## Introduction

This report is based on the processing and analysis of 22 business cases in the framework of the Belspo project Sustainable Employment in the Age of Digitalisation (SEAD). The description of these 22 cases, based on a total of 119 interviews, is consultable in document D2.3.

In this introduction, we briefly review SEAD's research questions of Work Package 2 'Unpacking the organisational level', and explain the approach taken for analysis and reporting.

## Research questions

The main question is how and to what extent the **division of labour** and the **employment relationship** in an organisation plays a role in how adopting **digital technology** changes the **quality of work**, both for employees in general and for line managers in particular. Division of labour refers to task division and coordination, as well as to the place of technology within it. Employment relationship includes human resources management (HRM) and social dialogue. This leads to the following iteration of research questions:

- How and to what extent has **digital technology** been **introduced into** the work processes? For which business functions? Has this introduction been completed at the time of the survey? Has it led to disruptions in production and work processes, and have these disruptions since been successfully tackled?
- Were **employees involved** in this introduction(s) of digital technology, and the choices that were needed for this process? Was this through social dialogue or through direct communication with staff - and in the latter case through consultation or only by informing (beforehand, or afterwards)? Was there resistance to this introduction?
- Was the **task division** originally high (i.e. grouping of tasks and task performers by function), intermediate (overlap between functions) or low (grouping of task performers by destination/client, whereby the task performer or the team to which they belong observe multiple functions)? Has the introduction and use of digital technology affected the task division (increased or decreased, or grouped differently)?
- To what extent was coordination originally highly or less centralised? Has the introduction of digital technology (further) strengthened or rather weakened this degree of **centralisation**? Is digital technology management done at the departmental level (decentralised), at the central level, or externally?
- What role did **HR Management** play during and after the introduction of digital technology? In view of the changes in required qualifications, did new staff (with a different profile) have to be recruited? Did existing forces need to be retrained? Did task performers need to be disciplined? Were evaluations now done in a different (digitally driven) way? By way of facilitation, were compensation offered in terms of working conditions?
- What is the role of **line management** during and after the introduction of digital technology? Has anything changed regarding task content and hierarchical position?
- What has changed since the introduction of digital technology in terms of the **quality of work** of employees in general, and of line managers in particular? Were tasks more or less standardised as a result? Have the opportunities for regulation (and the conditions for this, including autonomy, variation, support) increased or decreased? Have task requirements (volume, pace, complexity, responsibility) increased or decreased? What effect do we see in terms of work-life balance? How do these elements translate into overall feelings of stress versus subjective well-being? Are any negative trends compensated through better working conditions or job security?

- Is the extent to which **digitisation affects the quality of work also determined by the division of labour and the measures taken within the employment relationship?** These are the underlying hypotheses that shape this study, which we seek to answer through both cross-sectional and actor-based analysis.

## Methodology

The analysis aimed at answering the research questions is based on the reported findings of the 22 case studies. This is done in three steps.

Initially, a **cross-sectional analysis** takes place. For this purpose, the contents of the case reports were deconstructed into parameters based on the different research questions and subquestions. A general overview of the resulting codes can be found in Annex 1, and allows us to discover general trends in how, for the different companies, digital technology influenced the quality of work, and to what extent we see similarities and differences between the companies in doing so. On the basis of the codings, we also examine whether this influence was mediated by previous choices in terms of work organisation, in particular the degree of division of labour or functional concentration.

Secondly, the cases are considered against the **strategies adopted by the actors** in adopting and implementing digital technology. This mainly involves the actions of management, but possible higher decision-making levels and employee reactions are also included in the consideration. While respecting the individuality of each case, we try to distinguish types in terms of how decisions are made around digitalisation and how the consequences of these decisions are handled. Based on a narrative actor analysis, we also examine to what extent we can speak of a mediating role by management, the HRM department and social consultation.

Thirdly, a **synthetic thinking exercise** follows in which insights (or, if you like, hypotheses to be verified by further research) are derived from both these approaches about how, in a contingent environment, the move to digital technology as the engine and steering wheel of the production process redefines the role of human labour in a way that has implications both for workers' everyday experiences and for other sub-fields in society, including labour market and education.

## Cross-sectional analysis

A comprehensive case study protocol and carefully crafted interview questionnaires were used to gather the data. However, it is important to acknowledge that the reporting of cases varied due to the diverse nature of the companies surveyed and the specificities of the conducted interviews. Consequently, for some cases, information on specific aspects or parameters was not provided, either because more attention was paid to other aspects during the interviews, or the information being unknown or deemed irrelevant by the interviewee. As a result, there are some informational gaps, leading to discrepancies where the aggregate of findings for certain aspects does not match the total case count of 22.

### Characterisation of the cases

All cases represent Belgian companies or Belgian branches of multinational companies. A total of 21 companies were involved. From one public sector company, two departments were included as separate cases, so that we arrive at 22 cases in total (see Table 1 and Annex 1).

Broken down by sector, we count 10 cases from the manufacturing sector (construction & industry), 7 from the tertiary sector and 5 from the public sector.

Broken down by size, we count 13 large companies (> 250 employees), 1 medium-sized company (between 50 and 250 employees), and 8 small companies (between 10 and 50 employees).

A closer look:

- 10 cases from the manufacturing sector (7 large and 3 small)
  - 4 building or construction
  - 2 wood and PVC assembly
  - 2 mechanical engineering (parts)
  - 1 metal processing
  - 1 technology production
- 7 cases from the tertiary sector (4 large and 3 small)
  - 2 financial sector
  - 2 distribution or retail
  - 2 online platform companies
  - 1 forwarding company
- 5 cases from the public sector (2 large, 1 medium, and 2 small)
  - 3 job placement or selection
  - 2 nursery

4 companies from the manufacturing sector and 2 from the tertiary sector are part of a multinational whose decision-making centre is not in Belgium.

In 15 cases, the working language was Dutch, in 7 French, reflecting the region where the establishment is located. Although it is theoretically possible that differences in organisational culture and labour relations exist between Flanders and French-speaking Belgium, no specific information was gathered on this aspect, which is not included in the analysis.

The selection aimed to achieve a certain diversity in terms of the characteristics mentioned, but in all cases it concerns companies that have largely or fully implemented their digitalisation process, and that were willing to share their experience with it with the research community. Based on insights from theory and previous research, we examine the possible role of division of labour and

employment relationship, and therefore aim to acquire insights that have a broader application than just the studied cases. However, it should be clear that, given the relatively limited number of cases and the way in which the selection was distributed across the sectors, this sample cannot in itself be considered a statistically representative sample for the Belgian business community.

*Table 1 Summary table of cases with key characteristics*

Case (ref)	Size (employees)	Sector	Industry (MNO = multinational organisation)
1	10 - 50	Tertiary	Online platform
2	> 250	Manufacturing	Wood & decoration (customisation)
3	> 250	Manufacturing	Construction (MNO)
4	10 - 50	Manufacturing	Parts
5	> 250	Tertiary	Expedition (MNO)
6	10 - 50	Manufacturing	Wood & PVC assembly
7	> 250	Tertiary	Financial sector
8	10 - 50	Tertiary	Distribution
9	10 - 50	Public	Nursery
10	> 250	Manufacturing	Construction (MNO)
11-1	> 250	Public	Employment services
11-2	> 250	Public	Employment services
12	10 - 50	Public	Nursery
13	50 - 250	Public	Selection centre
14	10 - 50	Tertiary	Online platform
15	> 250	Tertiary	Distribution (MNO)
16	> 250	Tertiary	Financial sector
17	> 250	Manufacturing	Construction
18	> 250	Manufacturing	Technology (MNO)
19	10 - 50	Manufacturing	Metal processing
20	> 250	Manufacturing	Components (MNO)
21	> 250	Manufacturing	Construction

(N.B. cases 1-14 Dutch-language ; cases 15-21 French-language)



## Introducing digital technology

On the one hand, we looked at which digital technology is used for which business functions, and on the other hand, we examined how the introduction of this technology has gone.

**Business functions** that are digitised (i.e. for which digital technology provides the basis of activity):

- The production process itself: in 14 cases (8 from the manufacturing sector and 6 from the tertiary sector; 10 large and 4 small companies). These are mechanical operations or data handling, in other words, the activity which constitutes the added value offered by the company.
- Tracking of executed actions or value-added information flows: across all 22 cases.
- Support functions (administration / HRM / finance): in 19 cases (strikingly: cases where this does not apply are all small companies)
- Internal communication (intranet / sharepoint / customer platform): in 12 cases. In the remaining cases, internal communication takes place via e-mail, telephone or meetings.

Only 7 cases (1; 11-2; 13; 14; 19; 20; 21) explicitly involved an **integrated system** whereby from a single digital tool, software or application, the various digitally completed functions are controlled and connected. (This would mean, for example, that data tracking from production automatically also feeds accounting, invoicing, inventory data, payroll, performance and customer correspondence).

The **introduction** of digital technology has by no means been smooth everywhere.

- In about half of the companies, this **process** had been completed and the digitised business functions are operational. In the other half, this process is **still ongoing**, which means that either certain tools or software still need to be introduced (or the existing ones replaced due to insufficient performance), or that the organisation and employees have not yet (fully) adapted their task execution to digital technology. A criterion for the selection of cases was to avoid organisations where digitalisation is still in a start-up or pilot phase. That in half of the selected cases the digitalisation process has not yet been completed indicates the challenge and time commitment associated with such implementation.
- In 13 cases, there were **disruptions** experienced during introduction, in the sense that work and production processes suffered from it. This does not mean that production stopped, but rather that it was sometimes delayed or hampered. The disruptions are of various kinds:
  - In a number of cases (5; 8; 10; 11-1; 11-2; 13), the IT application assumed that knowledge (of product features, customer files, the IT operation itself or the language (English) of the interface) is readily available among the employees, which is not automatically the case.
  - Certain cases report an over-reliance on the installer or on an online connection for updates, replacements or simple system availability (4, 9, 18).
  - In some cases, customers are not ready for digital data exchange, requiring manual backup each time (9; 12; 13).
  - In other cases, it is so essential that all employees and departments feed or use the system that delays at one link lead to overall delays (2; 3; 7), which has led to more gradualness and verification of the internal support base being built into further introductions.

The other cases did not mention eventual disruptions, which does not mean they did not happen. In 4 of the 13 cases that did report disruptions, the introduction is now considered complete.

- **Staff resistance** to the introduction of digital technology is reported in 10 cases. In addition to being reluctant to adapt task content and required qualifications, there are also fears of becoming too dependent on the installed software and online connection in general (4; 9). The procedures to be in order with GDPR regulations (e.g. customer records) are felt by small companies as a heavy additional burden. Furthermore, some small businesses complain that they are now 'duplicating work' because digital data is also kept analogue for fear of crashes or hackers, or because customers do not want to use online communication tools (6; 9; 12).
- All companies surveyed indicate that they now have an **IT function**, sometimes as a dedicated department in the organisational chart, sometimes (in the case of small companies) coinciding with a single employee. In 15 of the 22 cases, this function is centralised and serves all departments. In 3 cases, the function is rather decentralised, particularly - and not coincidentally - in platform companies (1; 14) and the technology company (18). In 4 cases (5; 9; 11-1; 11-2), the IT function is managed externally, i.e. by a service outside the company.

## Social dialogue

The term **social dialogue**, in this context comprises both the classic social negotiation (employer-union) through the appropriate bodies (works council, health and safety committee), and any informal channels through which the employer consults internally with the workers on certain decisions. This informal consultation can vary as to the degree of decision-making power granted to employees, theoretically ranging from co-determination to consultation (advice from the employee group) to information (coming either prior to the decision or only after the decision has been taken).

**To what extent do trade unions** play a role when a company decides to introduce digital technology? Overall, we can say that in the cases studied, this role appeared so far to be very limited.

- In 13 of the 22 cases, we hardly see any involvement: in 8 cases (including 6 small companies), there was no union representation. In 5 other cases, the union either did not get involved or was not informed.
- In four other cases, the union was notified but did not respond.
- Remain the 5 cases where the union did play a role in the introduction. In 3 cases, the union protested against how this was implemented or the side effects: In case 17, the protest concerned the late communication, in case 18 the risk of hyperconnectivity due to working from home. In case 15, it was obtained that smartphones should not be used for geolocation. In two cases (10; 16), the union was involved in counselling employees who were experiencing difficulties with their changed job content. In case 16, the union was actually given a say in this.

Employees' **direct participation** in decision-making around the introduction of digital technology was mostly limited to being informed about it, in 7 cases before the introduction, and in 4 cases after the introduction. Only in 3 cases can we speak of some degree of consultation (1; 9; 12). In case 1 this happened within the teams, in case 9 it concerned the supplier of the software, while in case 12 it was on the principle of digitalisation itself (of the back-and-forth booklet in a nursery).

We also see that direct participation is often used in the cases where social negotiations are not taking place. Only in three cases (3; 13; 19) on the introduction of digital technology, there is neither the possibility of social negotiations nor even minimal information provision.

## Division of labour

To estimate how digitalisation relates to the division of labour, we consider the degree of task division of labour and the degree of centralised coordination.

**Task division** refers to the way tasks are distributed among workers. A high level of task division goes hand in hand with an operation-oriented structure, where a department consists of workers who all perform similar tasks. A low level of task division means that a department, and possibly workers within it, take on an array of different tasks. This often involves sequential operations, and sometimes involves the entire process from source (or raw material) to delivery, as is the case in an artisan mode of production, or in a flow-oriented team structure, where a team serves a particular group of customers. An operation-oriented structure gives the employer more control and disciplining options. However, a team structure can offer efficiency gains (e.g. by needing fewer buffers, or by being able to respond more quickly to changing market demand), and usually leads to higher employee motivation and better utilisation of qualifications. Between these two ideal types, all kinds of variants or combinations are possible. Assessing a firm's structure of task division requires a basic understanding of all operations and tasks to be performed, as well as the origin and destination of the inputs and outputs. Task division can be viewed at the firm level, i.e. between departments, or within departments and lower divisions, between sets of tasks (or employees). In principle, the task division between firms (e.g. outsourcing) can also be included in the analysis. In this study, we limit ourselves to the levels that has the greatest impact on the job content of employees, i.e. the task division between departments and within the department or work unit. According to this method, we arrive at the following division (prior to the digitalisation process):

- 8 cases with high, process-oriented task division (2; 3; 4; 5; 8; 10; 17; 18); with 6 of them from the manufacturing sector;
- 3 cases with a rather low task division (9; 13; 14), a customer-oriented team structure, in small or medium-sized organisations from the tertiary or public sector;
- The remaining 11 cases are in between. These often involve a number of employees combining multiple tasks or interacting with multiple departments for the sake of the process flow.

Regarding the **impact of the digitalisation process on the task division**, we see:

- in 11 cases an increase in the task division, strikingly especially in small companies, and furthermore spread over both companies with prior higher and lower/intermediate division of labour. There is a shift from execution to planning/preparation that reduces the executive tasks per department to very uniform procedures, and therefore a devaluation of craftsmanship and (customer) domain knowledge. For example, in case 16 (bank), customer contact was removed from the task package. In case 11-2 (job placement), digitalisation adds an operation (and therefore a department): in addition to intake and personal file handling, there is now online interaction.
- in 7 cases (1; 2; 7; 11-1; 15; 18; 20), we notice a reduction in the task division, which in 5 out of 7 cases involved breaking open the 'silos', i.e. making the departments more compatible with each other, so that the strict separation of qualification-related tasks was no longer tenable;
- In 4 cases (12; 13; 17; 21), we see no significant change in terms of division of labour.

**Coordination** is characterised as highly centralised in three cases (5; 10; 17). These cases involve a multinational freight forwarding company and two large construction companies (including a multinational), where, possibly because of the distance (in terms of location), centralised

coordination is considered necessary. In the other cases too, coordination is rather centralised, sometimes in consultation with lower levels, but nowhere decentralised.

What is now the impact of digitalisation on this aspect?

- Digitalisation has (further) centralised coordination in 9 cases (3; 4; 5; 8; 9; 10; 11-2; 19; 20). There are cases (such as case 5, international freight forwarding company) where digitalisation has prompted central management to tighten the discipline: in the executive sections, the department head has to tolerate next to him (in fact, above him) a data manager who reports directly to headquarters.
- Only in one case (case 2) did coordination become more decentralised.
- In 3 cases (11-1; 15; 18), we see two seemingly intersecting trends: the department manager himself has become less of an executor and more of a coach, but at the same time, data delivery gives headquarters more control over the entire production process.
- In 9 other cases, it is not possible to tell whether coordination has become more or less centralised.

## Human Resources Management

When an intervention in the production process (such as digitalisation) changes the required labour input and the required qualifications, HRM is usually looked at to take the necessary measures to deal with this. Basically, HRM has two present options: solve this externally or/and internally, in particular by either recruiting new workers (i.e. recruitment management) or retraining existing workers until they possess the required level of knowledge and skills (i.e. competence management). In addition, digitalisation may complicate existing monitoring of deployment and performance, requiring HRM to look for other forms of disciplining. We can say in advance that among the 22 cases, there is not one where HRM could stand by and watch from the sidelines during digitalisation: everywhere there was either recruitment or competence management, or the two together.

On **recruitment management**, we note:

- In 20 of the 22 cases, recruitment was required as a result of adopting digital technology. In 13 of these, it was explicitly mentioned that this was substitution, with less digital-minded (often also older) employees being phased out and gradually replaced by new recruits. 11 companies are already struggling with high turnover anyway.
- Only in a construction company (3) and a day nursery (12) there was no mention of recruitment. In another construction company (17), substitution mainly concerned administrative staff.
- Some companies (case 8, distribution, is an example of this) work with a flexible shell of seasonal and temporary workers. In this case, digitalisation facilitates their hiring, as one is less dependent on product and domain knowledge to perform the tasks.

On **competence management**:

- In 15 of the 22 cases, it is indicated that employees undergo training to cope with the new digitised forms of work.
- However, only 8 of these 15 cases (1; 3; 5; 6; 9; 10; 11-2; 21) do mention an explicit training offer from the company to the employees. In the remaining 7 cases, it is left to the employees to seek training aimed at the now digitised task performance. When the necessary justification is provided, the employer then assumes the costs.

- In 5 cases (4; 5; 6; 8; 19), the effect of digitalisation on the required qualifications rather takes the form of *de-skilling*, i.e. no longer needing certain job skills as a result of digitalisation. The trend of *de-skilling* is seen as more significant among the workers experiencing the effect of digitalisation than the *re-skilling* of new (digital) skills.

**On disciplinary measures:**

- In 15 cases, disciplinary measures are reported, often in the form of the establishment of (measurable) targets, which replace the former visual supervision by a line manager. In three of these cases, a bonus is attached to achieving targets (7; 14; 20).
- In 10 cases, performance evaluation happens data-based and no longer by managerial assessment. In 7 of these 10, production targets have also become the rule. This data-based evaluation does not happen in the cases where a bonus system is mentioned (so it seems that companies often choose between the carrot and the stick as a motivational tool).
- 7 cases explicitly state that they do not wish to use data-based evaluations. It can be inferred from the context that people do not want to feel bound by objective figures only in assessing performance.
- In 12 cases (including 5 in the manufacturing sector and 7 in the tertiary/public sector), it is claimed that digitalisation has led to allowing employees more flexibility, both in working hours and in the workplace chosen (working from home).

## Impact on line management

The line manager used to perform a crucial function by representing the employer on the shop floor. This was often someone who supervised and managed a group of task performers, organising and distributing work orders among the group, while also performing some of those tasks him/herself. The position represented a promotion opportunity for employees whose limited level of education would prevent them from advancing further in the company. Line managers are key in translating policies into practice and are crucial for technology implementation success and employee well-being. Literature suggests a shift in line managers' roles from operational control to coaching and people management, with HR tasks devolving faster than decision-making, financial, and knowledge powers. What do the cases tell us about this impact?

- In 11 of the cases, the **(managerial) role** of stock management, distribution of work orders and supervision has been **reduced**. This is because digitalisation enables a direct data flow between management and employees. The associated loss of power and status often does not happen explicitly but makes itself felt indirectly, for example because the line manager notices him/herself to be strongly digitally monitored (case 5), or because the line manager no longer has an information advantage (case 16), or because a 'star role' is designated within the team, an IT-minded employee who gets more control over the digital processes (case 1). In 9 other cases, the line manager keeps his/her role as supervisor. In the 2 remaining cases, there is no mention of whether or not the line manager's leadership or supervision are reduced.
- In 20 cases, the line manager is given additional **staff functions** anyway. These often involve financial tasks (quotations, price calculation, invoices), quality control, human resources management, organisation of flexible schedules, etc. We see this trend in all surveyed manufacturing companies. In the tertiary sector, the additional tasks can be very sector-specific. In case 14 (online platform), it is about trouble-shooting, solving the issues that do not immediately require an IT super-specialist. In case 9 (nursery), the manager has to take on a bigger part in terms of parent contact.
- In 19 cases, the line manager is assigned the role of **coaching** employees on IT use. This coaching takes many forms: devoting attention to the digitally impaired, increasing employees' digital self-reliance, lifting and fixing certain problems to a more aggregate level and, above all, adding human, informal interaction to the often tightly formalised digital communication process. The line manager needs 'soft skills' to do this.
- As a result, according to line managers' own perceptions of the **workload**, it has only decreased in 5 cases and increased in 14. The decrease is because in some companies, new or additional tasks are not tightly imposed, while the impact of work distribution and supervision has been reduced. The increase in workload is not so much attributed to increased work volume but rather to increased responsibility for a group of employees over whom one cannot directly supervise. In addition, the line manager is the one who has to deal with the consequences of system failures or implementation errors of insufficiently qualified staff.

## Impact on task structure and quality of work

With regard to task structure, the main focus was on the degree of **standardisation**, i.e. the extent to which the actions required to perform the task are made uniform across all task performers. In general, thorough standardisation of tasks is an extension of far-driven division of labour.

- As for our cases, in the production / executive departments, we see that digitalisation increases standardisation in 14 out of 22 cases. This means that there will be less variation in the task composition and method of task execution. Specialised or experienced task performers are thus aligned with other (often less skilled or less experienced) task performers in terms of required qualification. This tends to lead to a higher interchangeability of workers and an erosion of autonomy, professional pride and job satisfaction.
- In 4 of the remaining cases (1; 11-1; 14; 20), a reverse trend may be emerging, with tasks taking on a less fixed pattern in terms of composition and execution. These cases are situated in sectors where creative use of the possibilities of digital applications is part of the work assignment (online platform; study service; machine parts).

Under the heading of **quality of work**, various job characteristics were surveyed, both job control characteristics (autonomy, variation, support) and job demand characteristics (workload, physical strain, complexity). In addition, the subjective evaluation from employees' point of view was considered (techno-stress, work-life balance, subjective well-being). Changes in terms of working conditions (pay, job security) were also probed.

Four methodological notes here: (a) it concerns an *estimation* as made by the respondents, mainly from a management perspective (although in a number of cases a short interview with production / executive employees also took place during the company visit); (b) it is not an assessment at a given moment but an *evolution* (improvement or deterioration) as a result of digitalisation; (c) it is an estimation that would apply to the *average employee* in the company (knowing that digitalisation may affect different people or employee categories differently); (d) due to the absence of information on several quality of work items for a third of the cases, and the partial missing data for the remainder, it has been challenging to establish a consistent trend in work quality following digitalisation.

- **Autonomy:** the term autonomy, in this context, refers to the degree of freedom of choice employees have to perform their tasks in their own manner. In 9 cases (including 6 in manufacturing companies) autonomy had decreased, in 7 cases it had increased (including 2 in manufacturing companies), and in 1 case (public sector) it had decreased for some employees, while increased for others.
- **Variation:** the concept of variation covers to what extent an employee can perform several separate tasks, or always has to do the same thing. In 11 cases there is increased variation, in 4 cases reduced variation. In two cases, the increased variation takes the form of task rotation, sometimes used as a 'just principle of task allocation' in the knowledge that some tasks are more attractive than others (case 21, construction sector). Case 15 (distribution) talks about task enlargement, but immediately indicates that within those tasks there is also more repetitive work. Other cases talk about task enrichment, but on closer inspection, it is about handling difficult files (case 11-2, job placement) or proactively addressing emerging digital problems (case 1, online platform).
- **Support:** in 8 cases, people estimate that support possibilities (by colleagues or manager) have increased, partly due to collective connectivity (e.g. case 20, a Japanese multinational).

In 5 cases, people feel that support opportunities have decreased, due to dependence on other (sometimes external) services, the time-consuming nature of seeking help, overly formalised communication.

- **Work pressure:** generally, work pressure is about the tasks that one has to get completed within a time frame. The 14 cases where, since digitalisation, measurable targets are now being used give the impression that workload would increase. Yet we only see an increased workload in 9 cases, in 6 cases rather less workload, and in 2 cases (case 9, day-care centre and case 18, manufacturing) a mixed picture. Among the 9 cases with increased workload, we count 4 from the category of small (or medium-sized) companies.
- **Physical strain:** 7 cases indicated that physical strain has been reduced since digitalisation. These are 2 construction companies, 4 industrial companies and 1 freight forwarding company.
- **Complexity:** in 9 cases, people estimate that the complexity of the work has increased, in 5 cases rather decreased. This distribution is not attributable to sector or company size. People do not necessarily regard increased or decreased complexity as good or bad. Less complexity, in some cases (e.g. case 5, forwarding; case 6, wood & PVC frame production), implies that one's skills are challenged less, threatening to be lost. More complexity can mean that one can acquire new skills (case 15, distribution), but also that one is more exposed to unpredictable stimuli (cases 1 and 14, online platform) or is given more responsibilities (case 2).
- **Techno-stress:** increased stress resulting from having to work with (new) digital technology is mentioned 10 times, in 8 of the cases in large companies. This is attributed to the more formalised nature of communication, to the feeling of being constantly monitored online, to dependence on software and on a (centralised, sometimes external) IT service, and to the employees' feeling of being insufficiently qualified for this themselves.
- **Work-life balance:** in 6 cases, the work-life balance is found to have evolved for the better, mainly due to the possibility of working from home. In 3 cases (cases 3 and 21, both construction companies; and case 15, retail), one sees rather a negative evolution as a result of the increased connectivity requirement.
- **Subjective well-being:** this is a kind of final balance from the employees' point of view, even though it is methodologically questionable because it was not necessarily surveyed directly from them - and if it were, we know (from other research) that job satisfaction is often difficult to separate from life satisfaction in general. Taking this caveat into account, we nevertheless find that this (estimated) subjective well-being decreased in 10 cases, increased in only 2 case (cases 12 and 19), and showed a mixed pattern in 4 cases, i.e. increased for some employees, decreased for others. The most prominent motives heard in the case of decreased wellbeing were: bore-out (cases 4, 17, 18), de-skilling and task fragmentation (mentioned 5 times, including cases 4 and 6), unpredictable stimuli (including case 18), dependence on software and IT service (see also above 'techno-stress'), and – most prominently - formalisation of contacts (mentioned 7 times, cases 1, 5, 13, 15, 16, 18, 20). Case 11-1 identifies avoidance behaviour and also notes that digital systems are too often tailored to intensive users (including programmers) rather than occasional users.
- **Working conditions:** 6 cases report improved working conditions including 4 cases of bonuses for meeting targets. In 3 cases, they report improved job security (case 3; 4; 7), often guarantees offered to avoid losing employees in the current tight labour market. In 3 cases, tasks were provisionally adapted (case 2; 3; 7) to employees whose competences were not ready for digitalisation.



## The mediating role of the division of labour

Given the background hypothesis of this study, we also examined whether the influence of digitalisation on the content and quality of work is **mediated by** the degree of division of labour and the extent to which division of labour is influenced by digitalisation. We examine this mediating role successively for the influence on the standardisation of (executive) tasks, on the line manager’s task package, and on the quality of executive workers’ work.

### Mediating role of division of labour in the extent to which digitalisation affects standardisation of executive tasks

The material from the cases allows us to indicate the division of labour both as it was before digitalization (static) and as it has evolved through/after digitalization (dynamic). We combine both these conditions to examine where standardisation of tasks occurs most frequently.

*Table 2 Division of labour and the effect on standardization of tasks*

Condition		Impact on standardisation of tasks	
Division of labour before digitalisation	Division of labour after digitalisation	Increased	Remained the same or decreased
High (8)	Increased (5)	5	
	Stayed the same (1)	1	
	Descended (2)	1	1
Middle (11)	Increased (4)	4	
	Stayed the same (2)	1	1
	Descended (5)	2	3
Low (3)	Increased (2)	1	1
	Stayed the same (1)		1
	Descended (0)		

This table clearly indicates that increased division of labour also leads to increased standardisation of tasks. In addition, we see that at each division of labour point of departure (high, medium or low), this division of labour can increase or decrease.

### Mediating role of division of labour in the extent to which digitalisation affects the line manager’s task package

We combine the static and dynamic finding related to the division of labour to examine how, under these different conditions, digitalisation affected the line manager’s work.

Table 3 Division of labour and the effect on line manager's task package

Condition		Impact on line manager duties				
Division of labour for digitalisation	Division of labour after digitalisation	Reduced supervision	Additional supportive functions	More coaching	Workload increases	Workload drops
		High (8)	Increased (5)	4	5	5
Stayed the same (1)			1	1		
Decreased (2)	2		2	2	1	1
Middle (11)	Increased (4)	3	4	3	2	2
	Stayed the same (2)		2	1	2	
	Decreased (5)	2	4	4	3	
Low (3)	Increased (2)		2	1	1	1
	Stayed the same (1)			1	1	
	Decreased (0)					

It cannot be deduced from these figures whether the degree of division of labour and the trend in this after digitalisation determines the changed tasks of the line manager. In the different division of labour scenarios, we see that the managerial aspect can be eroded, and staff functions and coaching tasks are added, which more often than not increases the workload.

#### Mediating role of division of labour in the extent to which digitalisation affects quality of work

For the sake of available data, we have to limit the items indicating quality of work to two facilitating characteristics (autonomy and variation) and two challenging characteristics (work pressure and complexity). Moreover, quite a few cases lack data for these variables as well, so in order to maintain the overview, we prefer to present the mediating role of the division of labour before and after digitalisation in two separate tables.

Table 4 Division of labour before digitalisation and the effect on quality of work

Condition		Impact of digitalisation on quality of work							
Division of labour before digitalisation		autonomy		variation		work pressure		complexity	
		High (8)	Rises	2	Rises	2	Rises	3	Rises
Drops	4		Drops	3	Drops	3	Drops	4	
Middle (11)	Rises	4	Rises	6	Rises	4	Rises	5	
	Drops	5	Drops	1	Drops	3	Drops	2	
Low (3)	Rises	1	Rises	3	Rises	2	Rises	1	
	Drops	0	Drops	0	Drops	0	Drops	0	

This table indicates that in contexts where there was initially a high division of labor, digitalization appears to lead to work becoming less facilitated and less challenging, essentially rendering it more passive. This observation aligns with the perception among stakeholders regarding de-skilling and a diminished reliance on skills. With a middle or lower division of labour, we rather see the opposite: the work becomes more facilitated, more adjustable, but the requirements are also higher. Digitalisation in that case leads to more 'active jobs' (in the classification according to Karasek). The increased variety (or task broadening/task enrichment) is particularly striking in this context.

But as touched upon earlier, the division of labour itself is also subject to digitalisation. What mediating effect this may or may not have we see below:

Table 5 Division of labour after digitalisation and the effect on quality of work

Condition		Impact of digitalisation on quality of work							
		autonomy		variation		work pressure		complexity	
Division of labour after digitalisation	Increased (11)	Rises	3	Rises	6	Rises	7	Rises	4
		Drops	5	Drops	3	Drops	4	Drops	5
	Equal (4)	Rises	1	Rises	2	Rises	1	Rises	
		Drops	1	Drops		Drops	1	Drops	
	Decreased (7)	Rises	3	Rises	3	Rises	2	Rises	5
		Drops	2	Drops	1	Drops		Drops	1

In this (as far as division of labour is concerned dynamic) table, we get a more diffuse picture: for both increased and decreased division of labour as a result of digitalisation, we see that both accumulated job control and job demand features increased more often than decreased. Only autonomy and complexity seem to decrease as often as they increase with increased division of labour.

This observation seems to underscore the prevailing notion that **digitalisation tends to lead to more active jobs**. However, the presence of a high or increasing division of labor acts as a deterrent, potentially leading to reduced job content richness. Both tables also give the impression that the division of labour may not be a decisive mediating variable to explain why job quality is improving in some aspects in some firms and not in others. In this respect, a purely quantitative analysis based on this limited number of cases falls short of scientific evidence anyway and therefore has hypothesis-forming rather than hypothesis-testing value. The significant variability in the cases studied might obscure potential explanatory connections. The influence of labor division might vary depending on factors such as the nature of the production process (ranging from standardized and predictable to customized and rapidly evolving) and the technology employed (from simple and straightforward to complex and multifunctional). Future research could focus on 'most similar' case studies, examining cases that are closely aligned in terms of product or service type, organization size, technology used, etc., but differ mainly in their approach to division of labor. In the following section of this report, we adopt an actor approach to specifically examine groups of cases that share similarities in their digitalization management strategies.

## Actor approach

### The actors involved

Whereas the cross-sectional analysis looked at the data in terms of factors, the approach in this chapter is more concerned with **actors and their drivers** or motives. When the case reports are re-read with an eye on the question 'who wants what when introducing and adopting digital technology in the production process?', this reading exercise mainly focuses on the role of management. The bottom line in just about all cases is that digital technology is introduced to make production more efficient, with qualitatively and quantitatively better results. However, management must bear in mind that staff will have to be willing and able to deal with this technology. Depending on company size, organisation (task division and coordination), cooperation culture (industrial relations) and the impact of the new technology on the work itself, it should ideally be possible to estimate whether the staff (or some of them) will go along with these changes or resist them, whether they will be able to master the new (digital) skills, whether they can cope with the fact that their previous skills (sometimes the reason why they chose that job) are no longer needed. However, this would imply that in addition to surveying the main stakeholders (mainly managers), a sufficiently large and representative group of employees had also been surveyed.

Broadly speaking, the cases show three patterns in **management's** actions that we can distinguish - strongly schematising - from each other as follows:

- A rapid and rather integral introduction of digital technology, often imposed from higher decision-making centres (multinational group), where management is obliged to push through the necessary interventions in organisation and job content to this end, irrespective of the staff's attitude towards it.
- A rather dialogue-driven adoption of digital technology, where the shop floor indicates which tools are put to use in which way. This 'dialogue' emerges thanks to a deconcentrated work organisation (often with a team structure), a pre-existing pro-digital culture, or a rather participative consultation culture.
- An intermediate form, where digital technology is introduced incrementally and management (including HRM) has to try out adaptation measures in terms of organisation, job design, training, disciplining.

Faced with these moves at the employer or management level, **employees** can take different positions. They can be involved in selection, design, fine-tuning and/or implementation of new technology. They can go along with the change in their job content and embedding and adopt a cooperative attitude, e.g. undergo training or acquire the necessary qualifications. They can also call it a day and look for other work. Or, they may stay within the company, resist the changes and refuse to perform the work in the new, digitally driven way. Within the same company, different staff may react in different ways. In a number of cases, older employees in particular (*non-digital natives*) show resistance to using new digital tools.

Furthermore, we have seen in the cases that other sections (apart from the production / executive sections) in the companies are also affected by the impact of newly introduced digital technology on the organisation and work processes. The **IT department** is usually given a more central role and often becomes the right arm of general management. With **line managers**, on the other hand, the range of tasks is often redefined in a way that can undermine the line manager's formal and informal position of power.

As the cases mainly present the perspective of management, in this actor approach we will focus on the three patterns of management action outlined above.

### Rapid and integrated digitalisation

From the cases studied, we can characterise digitalisation at five companies as a process that was implemented rapidly, integrally and **top-down**. These are three manufacturing **multinationals** (cases 10; 18; 20), a tertiary sector multinational (case 5), and a large Belgian manufacturing company (case 2). These cases involved an order from above (HQ or owners) instructing management to make the necessary settlements to make digitalisation as flawless as possible. Typically, a digital application for production or tracking (e.g. ERP Enterprise Resource Planning; MES Management Execution System; ATS Applicant Tracking System) became the central focus to which the other applications were aligned. Case 20 explicitly presents itself as a digital factory with quick-response manufacturing and traceability as key quality features.

In two cases, functional concentration (i.e. the level of task division) was increased, in three others it was reduced. That reduction in task division reflects the strategy (enabled by digitalisation) to better align production flow across departments, making departments less like silos and blurring the boundaries between them. This could lead to tasks becoming broader, although there is no mention of this in the cases under review. Rather, we see **IT departments being strengthened** and IT teams or IT managers entering production departments to align both processes and human resources with digitalisation. In a number of cases (including cases 2, 5 and 10), this also undermines the position of the line manager, who has to compensate his/her reduced supervisory function with more supportive functions (from which, however, less status can be derived).

For staff, the consequences were quite profound. In four out of five cases, **disruptions** in the production and labour processes were noted, often because certain employees were thrown into the bath unprepared, tending to slow down the whole process as a supposedly weaker link. In order to bring the required qualifications up to the level of the new task package, it was decided to **recruit new staff**, rather than retrain existing staff. This led to a gradual substitution or replacement of non-digital into digital-minded staff, and this in companies where staff turnover was already high. At the same time, we see an **erosion of former professional skills**. This leads to a growing differentiation between groups of employees: on the one hand, those who are comfortable with the digitised work patterns and do not grumble about the more monotonous tasks; on the other hand, those who suffer from a perceived increased workload, a lower tolerance for mistakes or unmet targets, and fewer opportunities for informal communication. Although we see differences across companies, the basic trend still seems to indicate decreased quality of work and persistently high turnover.

In three cases, trade unions played a role in the process of introducing digital technology. In two of these three, it was about protecting workers in their job security and working conditions (time and location). In the other case, the union saw to it that workers who were not ready for the digitalisation of their jobs could continue working in their old ways for longer while mastering the required digital skills.

### Intrinsic digitalisation

Cases 1 and 14 are online platform companies, which match supply and demand for a particular service. Cases 11-1 (study service of job placement) and 13 (selection office) belong to the wider sector of knowledge companies that work mainly with data. These four companies are characterised by substantial **internal support** for the digitalisation process. Nevertheless, this support is stronger in the two online companies (where the service offered is purely digital in nature) than in the other two, where the digital data flow is a tool to offer the appropriate service to the customer.

The four companies show a rather **low or reduced task division**, partly due to the need not to buffer data or customer files per operation but to have them flow quickly. The digital tools were also designed partly with this in mind. It also helps in this respect that they are smaller companies or work units, with a short hierarchical distance. Digitalisation has not led to a further standardisation of tasks, but rather to greater task variation, albeit that in the two online companies the employees may suffer from too many stimuli, and that in the other two companies employees experience unhealthy levels of techno-stress or excessive connectivity pressure.

When digital technology was introduced, neither the union nor the line manager (if there was one) played a significant role. In view of the skills required, the four companies' main focus is on recruitment, with cases 11-1 and 13 also clearly involving **substitution**: strengthening the pool of digital natives/enthusiasts in place of employees less comfortable in a digital context.

This shows that in companies whose added value lies in the digital dataflow, whether or not to thrive in a **pro-digital work culture** becomes the distinguishing criterion for employee wellbeing, and that even among those who comply there are certain limits to what one can cope with in terms of digital stimuli. The rather streamlined production structure provides flexibility for employees in this respect, while the strategy of recruitment as an allocation mode for desired qualifications can also be detrimental to employees' sense of belonging. In this sense, this 'intrinsic digitalisation' may hold good prospects but does not automatically qualify as an exemplary approach.

### Incremental digitalisation

The remaining 13 cases are not characterised by a purely top-down push for digitalisation, nor by a pro-digital organisational culture. When asked about the main motive for adopting digital technology, **cost savings** and efficiency are the most frequently heard answers. Under pressure from industry competition, there is no choice but to deploy digital tools for machine operation, data flow, costing, communication or customer contact. Typically, this is done step-by-step or **incrementally**: depending on the industry in which one is operating, one starts with the tool for the business function with the highest efficiency gains. Other business functions then follow gradually.

Digitalisation was therefore perceived in these companies as a trend that could not be avoided, and this is often reflected in an already high or increasing division of labour (10 out of 13 cases) and a stronger **standardisation** of executive tasks (11 out of 13 cases). In 6 cases, one encountered resistance in the form of implicit or explicit resistance, especially among older employees, to bringing the digital tools into their work routine (cases 7; 9; 11-2; 12; 17; 21).

This category of incremental digitalization covers a wide range of companies by sector, size and ownership (private/public), which means that the context can also vary widely in terms of working practices and industrial relations. One common point is that all these companies often had to search feverishly for **adaptation measures aimed at reconciling** the willingness of staff to join the digitalisation story with productivity requirements. In seven of the 13 cases, this amounted to tighter discipline, with digital monitoring supplementing or taking over from physical supervision. In 11 of the 13 cases, they additionally turned to (often replacement) recruitment. Training policy was less of an issue (only in 4 cases) and where it did take place it was in the form of informal learning and task rotation (cases 19 and 21). In one smaller company (case 6), digitalisation even prompted the creation of an HRM function. The two companies from the financial sector (cases 7 and 16) use bonuses to get their staff to go along with the digitalisation wave. Case 15 (multinational in the distribution sector) targets 'collective connectivity' (mutual aid) as a way to get everyone sufficiently digitally qualified. The two day-care centres (cases 9 and 12), struggling to master digital technology

and relying on the installer to do so, continue to maintain analogue registration (the "notebook") in addition to digital, which only adds to the workload of the staff.

### The role of actors in selecting and using digital technology

Sometimes digitalisation is presented as a neutral process that just makes work easier and benefits everyone. The practice outlined in the previous sections on the introduction of new technologies in concrete companies, and what it entailed, shows the limits to this view. We see three types of approach: a rather top-down approach, a rather bottom-up approach, and a rather incremental approach, with in each case still considerable differences within those types, especially where the consequences of that approach are concerned. Therefore, it cannot simply be assumed that one approach is better than another. **Management** has a number of options or degrees of freedom and therefore plays a mediating role in the way digitalisation is experienced at the workplace. Admittedly, this is limited to some extent by factors that are not or only partly under management's control:

- The distance between management and the strategic decision-making centre (greater in multinationals, smaller in companies where everyone knows each other);
- Customer expectations regarding form, delivery method, speed of availability of the service/product to be delivered;
- The expectations of other external stakeholders (suppliers, government) on registration and communication;
- The knowledge, skills, willingness to learn and preferences of different staff categories (by function, qualification, age...);
- The availability or scarcity of desirable qualifications in the labour market;
- The availability, quality, compatibility of digital tools (including the options offered by the installer in terms of maintenance, assistance, replacement...);
- Internal tradition with regard to job security (including termination options, type of contracts);
- The constitution (historical design) of the company regarding division of labour and autonomy of departments and workstations;
- Past experiences in adopting new technologies.

As a rule, the management that knows best how to assess or influence these factors will also be able to optimally align the impact of digitalisation on production and work processes with business objectives. However, depending on the context in which the company operates, the scenario will present itself differently for each company. It does seem important that management uses such a self-created scenario, always with the option to deviate from it in function of advancing insight or changing circumstances.

The **other actors** play an admittedly smaller role, even if it is not without significance for certain (categories of) employees. The **HRM policy** often reflects the prevailing corporate culture in which the necessary digital skills are either brought in through recruitment on the external market or assumed to be generated by employees. The tools used are more often in the sphere of tightened discipline (measurable targets, tighter monitoring) than in the sphere of pedagogically designed competence management (with attention to different paces, learning comfort, room for experimentation). Sometimes, line management is given this role, requiring it to play both *good cop* and *bad cop* at the same time, both coach and responsible. In some cases, the **trade unions** insist on maintaining a policy of tolerance for older workers, whereby digital skills are acquired more slowly or only partially. Yet the digitalisation story does not seem to be within the comfort zone of the unions yet (which still is more focused on job security and working conditions). Viewed more broadly, the

whole area of job content quality (autonomy, variety, job demands) seems to remain outside the unions' field of vision - noting, of course, that unions were present and involved only in some of the cases studied.

All in all, we can say that the drivers that collectively make up the employment relation remain underused as mediators. Knowing that - with the applications of artificial intelligence only at an early stage - the digitalisation process is far from over, it poses a challenge for companies to fully involve all stakeholders in this domain in terms of ensuring sustainable, quality jobs.



## Quality of work and digitalisation: enabling elements

What promotes the quality and sustainability of work against the background of digitalisation as an intervention and as a process? After all, digitalisation does not constitute a one-off intervention by management, but is an **ever-accelerating social process**. Those who have made the transition from manual or written to digital skills may realise that new transitions will follow - *und kein Ende*.

Adaptation, change, innovation, they are becoming skills in themselves. Are our workers ready for that? Are our companies ready for that? What do the cases studied teach us?

One of the intentions of the case studies was to retain an optimal combination of elements in terms of division of labour and employment relationship in processes of digitalisation. No single case provides an overall picture in which we can identify all conducive elements together, but each case offers at least one or a few **conductive elements** through which the process, if not successful at least proved manageable for both the company and (most) employees. Some examples:

In case 1 (online platform), we see a tendentially decreasing division of labour, a decentralised IT service, recruitment that has no replacement content. Work is improving in terms of task variety, but the workload is also increasing and employees are in danger of becoming over-stimulated. Moreover, very little space is left for informal communication.

In case 7 (bank), digitalisation made departments less siloed and the work offers more learning opportunities, but not all staff could keep up with this. The bank had to look in the external market for more suitable replacements, who were encouraged by bonuses.

Case 8 (retail) shows how digitalization can be introduced incrementally when the management and the employees approached it as a team (with the IT installer as the antagonist or 'common enemy'). Mistakes and slow adaptation were tolerated during the process. At the end of the day, however, jobs came out 'empoverished' and the gravity shifted from the execution department to the planning/preparation department.

In case 21 (manufacturing), digitalisation also 'broke down silos', and training and job rotation were used to equip staff with the necessary digital skills. On the other hand, the jobs deteriorated in terms of autonomy, support opportunities, workload, technostress and work-life ratio.

In general, the cases confirm the preconceived conducive elements for the way digitalisation plays out on the shop floor: a limited division of labour, decentralised management, consciously developed competence management, consultation with unions or directly with staff, the use of the line manager as a coach, and the incorporation of sufficient autonomy, task variation and informal communication opportunities. Negative elements are top-down imposed digitalisation, lack of change management, and a situation of differentiation between employees, with some seeing their job content improve from their perspective and others at risk of facing either bore-out or technostress (and eventually replacement). Case 11-1 demonstrates the risk of tailoring IT applications and procedures too much to the high-intensity users, leading to stress and nervousness among the less digitally skilled others. This was partly due to the strong centralization of the IT-department in a large organization with very different user groups. All in all, the joint cases show that neither the more conducive elements nor the negative elements occur all together in isolation, i.e. there always seems to be a **quid-pro-quo** at stake.

This has to do with **interests** that are often perceived as not aligned and sometimes as opposed: work as an arena, with qualitative, satisfying task content as a scarce resource. From this view, what is good for some workers would play to the disadvantage of others. Where IT workers gain ground,

line managers would lose out. When senior management seeks efficiency gains, it would be at the expense of employees, their autonomy, their skills. One can argue that this is just a perception, but if acted upon or anticipated, the perception takes on the character of tangible reality. This lurking antagonism (sometimes fuelled by a dynamic of mutual distrust) can be tempered by making visible the choices the different actors have, and empowering them in this respect. This is where both knowledge workers and the social partners have a role to play.

**Companies** and the managers representing them operate in a competitive market where turnover, results and survival as a company are a constant challenge. Facing this on a daily basis sometimes leads to a short-term approach, including when it comes to the deployment of human capital. A more sustainable approach would aim to give existing employees the chance to adapt by focusing on competence management, by avoiding de-skilling, by refraining from using digital tools as a panopticon, or by allowing and even building in informal communication and support possibilities. In this way, you get loyal, motivated employees and do not have to constantly turn to recruitment with the associated costs (selection, familiarisation time, fine-tuning, 'learning fees'...).

But **workers** also have multiple options. It would be wrong to assume that, when it comes to changes in terms of work organisation and task allocation, workers can only behave as passive or defensive actors, either undergoing the changes or resisting them. Workers may also take advantage of digitalisation to broaden their range of qualifications and see it as a momentum in their career development. Furthermore, especially in times of labour market tightness, they can also negotiate individually or collectively about their job content and the autonomy to help shape it themselves.

Finally, it remains a given that the provision of qualifications, skills and attitudes that accommodate a digitised mode of production is a task that does not only belong to the business sector but also to **other societal sub-sectors**:

- Obviously, for both the school system and the various branches of adult education, it will continue to be important to link up as closely as possible with rapidly evolving digital know-how.
- Trade unions, be they national umbrella organisations, sectoral trade unions or enterprise based groups (militants), can be promoters and supporters of digitalisation operations for workers, without detracting from their monitoring function in the face of inappropriate or poorly announced innovations.
- R & D actors at corporate, sectoral and academic level can look for ways to deploy knowledge on workplace innovation, in order to reorganize work supported by new, artificial intelligence based technologies for problem-solving and support, especially for the jobs and teams where tasks and procedures have been changed.

By joining forces from different sides in a narrative that does not assume winners and losers, the Belgian economy can remain at the forefront of finding the right balance between productivity, innovativeness and concern for workers' wellbeing.

## Annex 1: case studies data

CASE	2	3	10	17	21	18	20	4	6	19	5	7	16	15	8	1	14	11a	11b	13	9	12
Sector	man	man	man	man	man	man	man	man	man	man	tert	tert	tert	tert	tert	tert	tert	publ	publ	publ	publ	publ
Industry	wood	const	const	const	const	tech	mach	mach	wood	met	forw	fin	fin	distr	distr	platf	platf	work	work	work	nur	nur
Size	L	L	L	L	L	L	L	S	S	S	L	L	L	L	S	S	S	L	L	M	S	S
Origin	B	MNE	MNE	B	B	MNE	MNE	B	B	B	MNE	B	B	MNE	B	B	B	B	B	B	B	B
NT process	X	X	X	X		X	X	X		X	X	X	X	X		X	X					
NT tracking	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NT support	X	X	X	X	X	X	X		X		X	X	X	X		X	X	X	X	X	X	X
NT comm.	o	o	o	X		X	X		X			X	X	X		X	X		X	X	X	
NT Integr	o	o	o		X		X			X					o	X	X	o	X	X	o	o
NT intro	+	++	+	++	++	+	++	++	+	+	+	++	++	+	+	++	++	+	+	++	+	+
NT disrupt	x	x	x			x		x	o		x	x	o		x			x	x	x	x	x
NT resist	o		x	x	x	x	x	x	o	x		x	o		o		o	o		x	x	x
IT position	C	c	c	c	c	D	c	c	c	c	E	c	c	c	c	D	D	E	E	c	E	C
TD orig	H	H	H	H	M	H	M	H	M	M	H	M	M	M	H	M	L	M	M	L	L	M
TD after	down	up	up	=	=	down	down	up	up	up	up	down	up	down	up	down	up	down	up	=	up	=
Org by NT	flow				flow	flow	flow	plan				flow			plan							
Centralis	M	M	H	H	M	M	M	M	M	M	H	M	M	M	M	M	M	M	M	M	M	M
Cent after	down	up	up	=	=	+/-	up	up	=	up	up	=	=	+/-	up	=	=	+/-	up	=	up	=
Standardis.	o	x	x	o	x	x	o	x	x	x	x	x	x	x	x	o	o	o	x	o	x	o
HR recruit	x		x		x	x	x	x	x	x	x	x	x	x	x	x	(x)	x	x	x	x	x
HR substit	x		x	x	x	x	x			x	x	x	x					x	x	x		
Turnover			H			H	H	H			H	H		H	H			H	H		H	
HR training	i	x	x	o	x	i	i		x	i	x	i	i	i	o	x	o	o	x		x	i
HR discipl	o	x	x	x		x	(x)	x	o	x	x	(x)	x	x	x		(x)		x	X		
eval data	o	x	x	x		x	o	x	o		o		x	x	o	x	o		x	x		o
HR flex					x	x	x	x		x			x	x	x	x	x	x	x			
Soc dial		o	x	x!	(x)	x!	o	o	o	o	(x)	(x)	x	x!	o	o	o	o	(x)	o	o	o
Emp info	x	o	o	o	o	x	x	x	x	x	o	o	o	o	(x)	x	(x)	(x)	o	o	(x)	x
Emp cons	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	x	o	o	o	o	x	x
Line bypass	X	X	X	o	o	X	o	(X)	(X)	o	X	o	X	X	o	X	o	o	o	o	X	o
L support	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X
L coach	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	o		X	X	X	X	
L workload	down	up	up		up	up	up	down	down	up	up		down		up	up	down	up	up	up	up	up
E autonom	up		down		down	down	up	down	down	down	down		up	down	up	up		up+d	down	up	up	
E variation		up			rot	down		down		down	down	up	up	up	rot	up	up		up	up		
E support	up				down	up+d	up	up		down	down		up	up	up	down	up			down	down	up
E workload		up	up	down	down	up+d	up	down	up	down	down				up	up	up		up	up	up+d	down
E phys str				down	down	down	down	down		down	down											
E IT stress		up	up		up	up			up				up	up				up	up		up	
CASE	2	3	10	17	21	18	20	4	6	19	5	7	16	15	8	1	14	11a	11b	13	9	12

E complex	up	up	up			down	up	down	Down	down	down	up	up	up	down	up	up						
E deskill								x	x	x	x				x								
E Work-life		down			down	up	up	up		up		up	up	down				up					
E Job satis	+/-		+/-	down		down	down	down	down	up	down	+/-	+/-	Down	+/-		+/-	down	down	down	down	up	
E Bore out				x		x		x															
E Formal						x	x				x		x	x		x					x		
E Differ								x				x			x			x					
Work cond				=	up		bonus	up		=	=	bonus	bonus	up			bonus						
Perspect		up						up		=	=	up								=			
Task adj	x	x										x											

This table was used for the purpose of aggregate determinations in cross-sectional analysis. The codes assigned are based on the researcher's interpretation of the case reports.

## Codebook

### In general:

X = occurring

o = not occurring

void = case report does not provide information on it

### Specifically per parameter:

CASE	(reference to case report number)	eval data	Performance evaluation is data-based (digital tracking)
Sector	Production (manufacturing) / tertiary / public	HR flex	More flexibility (working hours/location) allowed after/due to digitalisation
Industry	(abbreviation)	Soc dial	Trade unions at NT introduction: (x) informed / x involved / x! opposition
Size	L = >250 employees / M = 50-250 employees / S = < 50 employees	Emp info	x = Employees informed on introduction NT / (x) = ... afterwards
Origin	MNE = multinational corporation	Emp cons	x = employees have some say in form/manner of NT introduction
NT process	Digitalisation of production process itself	Line bypass	Direct supervision line manager replaced by digital follow-up
NT tracking	Digitalisation tracking & monitoring	L support	Line manager gains supportive functions (HR, financial follow-up)
NT support	Digitalisation support (HRM, financial department)	L coach	Line manager pioneering role/coach on digitalisation
NT comm.	Digitalisation of communication	L workload	Workload for line manager increased/decreased (up/down)
NT Integr	Systems are integrated (interconnected)	E autonom	More/less employee autonomy (up/down) / up+d = aspectual
NT intro	Phase of introduction: ++ = introduced / + = in progress	E variation	More/less employee task variation (up/down) / rot = task rotation
NT disrupt	Disruptions in manufacturing happened while introducing digitalisation	E support	More/less employee support (up/down)
NT resist	Employee resistance during digitalisation implementation	E workload	More/less employee workload (up/down) / up+d = aspectual
IT position	Position IT service: c = central / D = decentralised / E = external	E phys str	More/less physical strain on employees (up/down)
TD orig	task division originally H = high / M = intermediate / L = low	E IT stress	More/less techno-stress among employees (up/down)
TD after	Effect of digitalisation on task division up = increased / down = decreased	E complex	More/less complexity/responsibility for employees (up/down)
Org by NT	Impact digitalisation on org: flow = de-silo department / plan = shift to preparing activities	E deskill	Erosion of required professional skills
Centralis	Degree of centralisation hierarchy: H = centralised / M = in between	E Work-life	Work-life balance gets better/worse (up/down)
Cent after	Effect digitalisation on centralisation: up / down / = (same) / +/- (both up and down)	E Job satis	Subjective well-being (job satisfaction) gets better/worse (up/down)
Standardis.	Tasks more standardised after digitalisation	E Bore out	Not enough stimuli or challenges when performing tasks
HR recruit	Adjustment of qualifications after digitalisation through recruitment	E Formal	Opportunities for informal communication between employees fall away
HR substit	Replacement of non-digitally qualified workforce	E Differ	For some workers it evolves positively, for others negatively
Turnover	staff turnover: H = high L = low	Work cond	Employment conditions better (up), same (=), performance bonus (bonus)
HR training	Adapting qualifications after digitalisation through retraining: x = organized / i = informal	Perspect	Job security/development prospects better (up), same (=)
HR discipl	Greater control and discipline of staff after digitalisation	Task adj	Tasks adjusted if employee finds digitalisation problematic