PART IV
Conclusions and implications: job autonomy torn back and forth

18. Job autonomy as descriptor of change

This thesis reveals that service workers have a deep desire for job autonomy. The extent to which they are granted this autonomy is another question, the answer to which depends on the corporate strategy for realizing the potential of labor power and specific work content in the branches. ADM systems show different levels of intervention in the work processes of service workers (assisting, augmenting, automating) and may be utilized to fulfill different corporate strategies, mostly in a specific relationship between control and optimization. Employees themselves want to retain control over their work as much as possible. Using ADM systems does not fundamentally contradict this aspiration.

Has the deployment of ADM fundamentally changed work in the service sector? Is it the disruptive change that is predicted and expected for the world of work? With respect to the scope of this thesis, i.e., the extent to which using ADM systems influences the job autonomy of service employees, the answer must be no, not for the branches and tasks under consideration. This is because the systems are embedded in the existing structures of companies and work organizations, and, in many areas, learning ADM systems only intervene selectively in work processes.

The initial objective of this thesis was to gain insight into the effects of ADM on service activities. The answer to the core research question, namely, what influence ADM systems have on job autonomy for service sector employees, is, in short, a predominantly positive one. The extended question about the conditions and effects of this changed job autonomy directly involves the organizational embedding of the ADM system. A technical system does not serve the purpose of control, monitoring, support, or relief if it is not intended and embedded to do so.

The following concluding chapters reflect on the key findings of this thesis and attempt to transfer the empirical results to the service sector. First, a retrospective review is provided of specific expressions of job autonomy in the service sector, which shows a clear divide in terms of low and high autonomy values but also selective alignments (Chap. 18.1). The different levels of intervention of ADM systems in work processes are then summarized (Chap. 18.2) to highlight the special features regarding the interplay of learning ADM and job autonomy (Chap. 18.3). This distinction is intended to take account of the technical and organizational complexity of embedding ADM systems in work processes. Chap. 19 refers to these findings and supplements the consideration of specific corporate utilization strategies behind the use of ADM systems. Finally, this thesis concludes with a brief outlook and areas for action (Chap. 20).

18.1. Less and highly autonomous services: distinct yet converging

The structured quantification of all autonomy dimensions (Part II) lays the foundation for validating the basic theoretical assumptions of this work, which assume a fundamental division into less autonomous services (LAS) and highly autonomous services (HAS). The impression of a quite different job autonomy ratio between the two groups is initially confirmed in the context of the empirical analyses: LAS such as retail, logistics, accommodation and food services, or healthcare and social services show below-average job autonomy values. In contrast, HAS typically have higher average values than the service sector as a whole. The separation of the two groups is therefore empirically justified.

However, there are notable exceptions and peculiarities to this relationship. It is worth emphasizing that Criteria Autonomy not only shows mixed results for the service sector but that the differences between individual service branches are not as pronounced as might be expected. This suggests that the ability to set one's own work goals or to influence their evaluation across branch boundaries is considerably influenced by the respective control and optimization practices. Most service employees work under high pressure to perform, sometimes to their limits. The few exceptions in this sense are, for example, public administration and real estate, but also, surprisingly, wholesale and retail trade. Although other dimensions of autonomy show significant cuts, at least the pressure on employees to perform does not appear to be as pronounced as in other service branches.

What holds equally interesting implications is that Interactional Autonomy, as the component of job autonomy that has so far received little attention in other studies, is extremely homogeneous for the entire service sector. Service employees in Germany therefore not only support each other in a similar way but also have a comparable relationship of responsibility and dependency to others in their own work. Again, it is the interaction work that unites service work in its entirety. Apparently, service employees have established similar coping mechanisms with this interaction work, which allows them to work with a relatively high degree of freedom compared to other dimensions of autonomy. The view of education as well as healthcare and social services, however, reveals a sobering picture. High workloads and the most demanding interaction work are apparently also reflected in greater dependencies on the success of their work. It is particularly worrying that these two branches fall

so far behind other service branches, as the results point to particularly conflict-ridden and demanding interaction work.

These findings suggest that Interactional Autonomy eludes the development logic of the other job autonomy dimensions, i.e., LAS and HAS. It can be assumed that the other job autonomy dimensions develop along the lines of the control logics described, i.e., their access does not yet include interactional components of work. Employees with a particularly high potential for working with ADM systems, i.e., ADM knowledge, are largely in line with these findings. They are clearly among the top performers and HAS. Remarkably, however, they are even below the averages of the entire service sector for Criteria and Interactional Autonomy. Although no causality can be assumed, there are clear indications of a parallel occurrence of ADM skills and performance pressure, output control, and conflictual interactions.

Accounting for the changes in job autonomy since 2012, i.e., a period in which a considerable surge in digitalization is assumed, it is necessary to speak of solidified polarizations between LAS and HAS – but only regarding certain job autonomy dimensions. The highly autonomous branches are increasingly setting themselves apart from their counterparts, particularly in aspects relating to working hours and scheduling. This ties in with the marketization and flexibilization narratives of this group of employees: self-control and corporate target orientation.

What development gives reasons for reflection, however, are Task and Method Autonomy, i.e., the dimensions of job autonomy, which centrally concern work tasks, work quantity, task composition, and task execution. The boundaries between LAS and HAS are dissolving, as all have lost degrees of autonomy. In the less autonomous segments, the question arises as to where exactly new restrictions are being imposed, while in the highly autonomous areas, this development contradicts the existing logic of labor control and utilization. Overall, this suggests that the actual execution of work is more standardized and predetermined – possibly due to the use of ADM, which also has access to highly qualified occupations. Both trends towards devaluation and a stagnation of innovative work behavior can be formulated as consequences of these developments. However, the possibility that lower degrees of autonomy may even have a positive effect on certain groups cannot be ruled out; after all, excessive demands on self-organization and self-control can also lead to delimitation and the dissolution of boundaries.

In summary, it is important to note that the empirical analyses (especially in Part II) indicate that the service sector is characterized by significant restrictions overall. Statistically speaking, maximum values in job

autonomy could never be assumed, but the overall index values are still well below the possibilities of self-determined or at least co-determinable levels. The corresponding control logics can be easily traced based on the distinction between LAS (direct control, Taylorism, industrialization of services) and HAS (indirect control, self-optimization, internalization of the market). Comparability is established regarding performance requirements and output expectations (Criteria Autonomy) because both are controlled in this respect. Similarly, most branches resemble each other in terms of a balanced degree of Interactional Autonomy, which overall still tends to indicate self-determined interaction with clients.

18.2. Assisting, augmenting, automating … liberating?

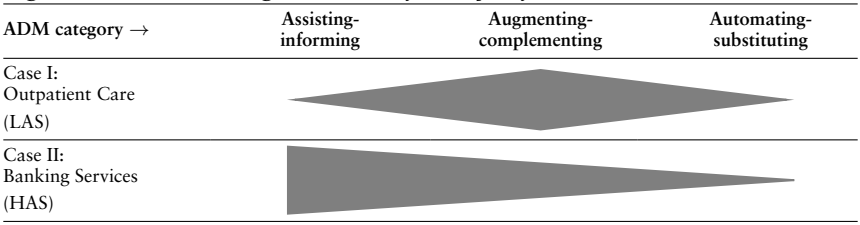
ADM systems come in a wide variety of shapes and functional scopes for companies: purely software-based and with physical components, integrated into existing systems, or part of newly set-up, networked solutions. Digital and rule-based systems are sometimes difficult to separate, and the learning components are not always clearly identifiable as such for users, as this learned output does not necessarily have to be extraordinarily complex. What unites the systems under consideration is that the various components have a broad spectrum of direct or indirect influences on the work of service employees, from assisting and augmenting to automating individual tasks.

In the two company case studies, the interplay between the depth of intervention of ADM systems in work processes and the degree of job autonomy in the branch showed what is possibly transferable to the entire service sector: LAS use ADM systems with a greater depth of intervention in service work than HAS (Figure 17). In most HAS, by contrast, the degree of digitalization is much higher than in the former, so the possibilities for the supplementary use of technology probably need to be carefully weighed up.

What should not be concluded from the above is that LAS are simply easier to automate than HAS. In both company examples, the limits of automation close to the interaction work with clients became apparent, and it is not foreseeable that, even if technically possible in parts, there will be a complete strategic move away from personal interaction work. Finally, there is still a connection between personal work with clients and the quality and individualization of services.

However, what is outlined in terms of taking over and supporting decision-making is that in the case of LAS, there may be more intervention in the decision-making process, meaning that employees must engage

Figure 17: ADM categorization by company case studies



more frequently and more deeply in negotiation processes between the machine and their own decisions. This development can be interpreted as supportive if the employees (as in the example of outpatient care) retain the authority to interpret final decisions about their work themselves.

However, should they lose this sovereignty, for example, through increased monitoring of compliance with ADM outputs, not only are massive reductions in job autonomy to be expected, but also corresponding coping mechanisms that may circumvent the ADM system through appropriation processes. In the case of HAS, by contrast, there appears to be less intervention in the decision-making practices of employees, in line with the underlying logic of self-control and optimization. Of course, there are also examples in which more complex decision-making situations are influenced. In the case of HAS, the problem lies more in the extent to which conflicts arise with the autonomy-depleting marketization mechanisms that arise from the use of ADM.

Abstracting from the case studies, a range of different effects involving the various ADM categories on work have emerged: The special feature of *assisting-informing* ADM lies in its basic information-providing character as an option. These systems are designed to process information and make it available on request. They are therefore reactive and do not actively intervene in work processes. They do not fundamentally change the form and content of work processes; they structure, centralize, and prepare information (e.g., the functions of working time and service recording in outpatient care or recommendations of unknown clients in banking services). This enables greater task variability, i.e., an information-driven expansion of the basis for decision-making, which allows tasks to be carried out more quickly and possibly more precisely. The selection and compilation of one's own task portfolio is supported based on the higher level of information. In this way, a greater density of information helps to accomplish work tasks and reduces the workload to a certain extent, especially if search processes are minimized.

Regarding the possible influence on the time and location components of job autonomy, new degrees of freedom can be created through more efficient work execution. With a high quality of information and its provision in sufficient quantity, both faster and less disruption-prone work are feasible. The informative character of these systems can influence Working Time and Locational Autonomy, in which the locally bound nature of information is partially resolved. However, the core of interaction work remains tied to specific locations, particularly in the case of LAS.

In terms of Interactional Autonomy, it has been proven that the individual employee can act more independently of team structures or other third parties due to the better quality of information provided by the ADM system. In cases of doubt, information no longer must be requested from other parties but can be obtained according to need and situation. This allows for concentration on the cooperative elements of work that are necessary for productive interaction.

The deployment of *augmenting-complementing* ADM systems can have ambivalent consequences for various dimensions of employees' job autonomy. Regarding Task Autonomy, it is evident that some routine tasks that require little autonomous decision-making are taken over by these systems, freeing up space for other, possibly more complex tasks. Whether this feature of the system is advantageous for the autonomy of employees depends very much on whether they really want to be relieved of these tasks or not, or to what extent they can retain the final decision-making authority for themselves. It is likely that some employees perceive the relief from certain simple decision-making tasks as a relief and, in a certain sense, as a strengthening of their job autonomy, while others feel deprived of their task variability and methodical freedom. The effect of changing Task Autonomy therefore depends on the extent to which the use of the system is tied to constraints or is available as an optional support tool. The use of augmenting-complementing ADM systems is a question of power and its negotiation between employees and the technical systems and thus employers – and the associated heterogeneous interests of both sides.

In augmenting-complementing ADM systems, the danger of new boundaries being drawn between workers and machines seems to be the most tangible. If ADM systems are to act in a complementary manner when performing a work task, this can quickly lead to real or perceived unwanted interference in workers' task spectrum. At what points in the work process should the technical system decide, suggest, or stay out completely? This form of demarcation, in turn, has the greatest influence on the autonomy of tasks and methods. If the system provides an alter-

native solution depending on the situation, the paths and approaches to the work objective are not predetermined but are decided based on a negotiation and coordination process between technical and non-technical elements, i.e., between workers and machines. Employees retain the right to "the last word" but must continue to bear sole responsibility for the decisions made and thus the work result (Criteria Autonomy), even though there are interventions in the individual's own work process.

The considerations on the influences of augmenting-complementing ADM systems on the above-mentioned dimensions of job autonomy illustrate how much their positive or negative relationship can depend on the design and embedding in the work context, the application goals of the technologies, and the individual demands of the employees. Even if one assumes that the aim of the deployment (on the part of the employer) is to support employees in their decisions and to disregard the possible monitoring functions of the systems, a field of tension arises between undesirable interference in one's own work and desired reinforcement of one's own actions.

The *automating-substituting* elements of ADM contribute to strengthening job autonomy, as the two company case studies made clear. The decisive factor is which tasks are performed. If they are planning, administrative, or routine tasks, employees experience a new sense of freedom resulting from their omission. If they were tasks that interfered with work with clients, the outcome of this assessment might be different. The same applies to technical faults and incorrect output, which can quickly turn positive autonomy moments for service employees into negative ones. In both cases observed, the automating character of the respective ADM is perceived positively, as it creates scope for work that requires more complex, creative, and social thinking. This freedom can be expressed in terms of time and the cognitive focus being placed on more demanding tasks.

Regarding the adoption of decisions and the decision-making process, the use of such automated ADM does not lead to a perceived reduction in task variability or the ability to select precise work steps. Although decisions and recommendations in predefined situations are made entirely without workers' intervention, it can be assumed that job autonomy increases if, as in the present cases, the final situational authority over their transfer to the core tasks in the service is retained.

Technical hurdles and possible erroneous outputs from the highly automated functions of the ADM systems are particularly problematic. If these are known and occur regularly, employees are in a constant state of activation, as the time, location, and content of the fault cannot be predicted. Positive elements of job autonomy that are triggered by au-

tomation are thus nullified. One could even go as far as to speak of employees being overburdened if the need to react to disruptions and identify them in the first place is a permanent necessity.

What remains regarding the effect of automating-substituting ADM in services is the fundamentally beneficial and positive perception by employees, who certainly feel relieved and liberated – if the automating functions of the systems are limited to clearly defined tasks in the planning and administrative areas beyond interaction work. Overall, the effect of using ADM systems on the job autonomy of service employees is less dependent on the intervention depth of the systems in work processes. The assisting and automating elements of the systems are clearly permeated by experiences of liberating job autonomy. The use of augmenting ADM is more conflictual because a constant negotiation process between the tasks of the ADM system and workers must be conducted at the level of job autonomy.

18.3. The distinctive features of learning ADM

Both digital systems and rule-based ADM, as well as learning ADM, are capable of generating positive job autonomy experiences for employees. In the empirical examples, these positive influences on job autonomy outnumber the few negative impacts by far (Table 13), and the latter depend largely on the underlying corporate utilization strategy of the respective systems. The effects described are based on the experiences of employees in the two case study companies but also allow for further conclusions to be drawn.

What is fundamentally evident is that digital and rule-based systems have almost exclusively positive effects on the job autonomy of service employees due to their high degree of maturity and increasing accuracy. These effects become tangible if they do not interfere with the execution of the interaction work and the controlling mechanisms that are undoubtedly inherent in them are absent. In contrast, learning ADM succeeds in bringing about improvements in areas of work to which rule-based systems previously had less access. This refers in particular to the expansion of options for action, in some cases, individualization, and thus also improvements in the quality of services and the creation of new temporal freedoms. However, it is becoming increasingly apparent that learning ADM, at least in its current applied status, can lead to more contradictions at work.

Table 13: Effects of rule-based and learning ADM on job autonomy dimensions

Autonomy Dimensions	Digitality/rule-based ADM	Learning ADM
Task Autonomy	+ Information access and standardization + Transparency and holism of information + Support with selection of tasks	+ Less workload: planning-rational actions + Supplementation of task variability + Holism of services – Intransparency: missing information – Higher workload: compensatory actions
Method Autonomy	+ Execution of interaction work unaffected + Deviation from system instructions + Support in choice of methods and tools	+ Execution of interaction work unaffected + Options for action expanded – Threat to experiential knowledge – Confidence/following of system outputs
Criteria Autonomy	+ Support of work targets (quantity) + Higher sense of security – Transparency of tasks in real time	+ Support of work targets (quantity + quality) – Intransparency: questionable output – Missing indicators for evaluating performance
Scheduling Autonomy	+ Time gains + Predictability + Task prioritization/sequence unaffected	+ Time gains – Influence on task prioritization/sequence – Parallelism of tasks/intensification
Working Time Autonomy	+ Flexibility and time gains	(– Flexibility demands)
Locational Autonomy	+ Information access + Location-independence	(– Flexibility demands)
Interactional Autonomy	+ Higher quality of information + Facilitated teamwork + Administrative tasks away from client	+ Individualization and quality of service – Emotional demands – Intransparency: information asymmetries

Compared to rule-based systems, learning ADM succeeds in having a positive effect on Task Autonomy, in particular by offering a broader range of tasks, either because these systems directly recommend options or because automated tasks create new scope for other duties, thus increasing the overall holistic nature of work tasks. Less work is required due to the takeover of rational planning activities. While choices for work actions have increased in the examples mentioned, the execution, in particular the interaction work typical of service work, remains unaffected (Method Autonomy), as is also the case with rule-based systems. In the perception of the employees, the achievement of work objectives is increased not only in terms of quantity but also in terms of quality (Criteria Autonomy) – especially to the extent that information and action sequences are revealed that would either be very difficult or not available at all to employees without the output capability of the systems. This

support for achieving work targets is closely linked to the time gains made possible by using the systems (Scheduling Autonomy).

Up to now, digital and rule-based technical systems have been responsible for influencing Working Time and Locational Autonomy. Regarding learning systems, no significant impact has been identified, particularly in jobs with a high proportion of interactions. At most, changes in the flexibility requirements for employees can be expected in the future, for example, if the time and location preferences of clients are incorporated to a greater extent into system calculations.

New conflicts and contradictions in dealing with learning ADM arise in three main areas: the possible lack of traceability and transparency of system outputs, the associated intervention in interaction activities, and the automated takeover of management tasks. Both case studies unite to create even greater transparency regarding individual tasks and their execution. However, this is due to the purely digital nature rather than the learning elements of ADM. These, by contrast, tend to create intransparency for both management and employees. The intransparency of system outputs, or rather, the lack of traceability of how the results were generated, what data was included, and how the results are to be evaluated by employees, may have a negative impact on job autonomy in many ways. In particular, the lack of information at work can undermine the holistic nature of work tasks and often require time-consuming rework and follow-up research. The lack of information may imply a certain devaluation of employees' work in the sense of non-participation.

Employees try to understand why the ADM system has made a certain decision through their own research and thus nullify possible efficiency gains. Especially in combination with interaction work, a lack of information offers a high potential for conflict because employees may lose their status as experts and naturally want to minimize uncertainties when working with people to maintain service quality. The intransparency of learning ADM can therefore have a central impact on the achievement of work objectives if, in case of doubt, they do not take situational compensatory measures. How can one's own work results be assessed in the absence of transparency, anyway? Nothing less than the complete elimination of Criteria Autonomy is feasible.

An interesting contrast arises regarding Interactional Autonomy. The individualization of service activities based on the analysis of learning ADM has a positive effect on the relationship between service employees and service recipients. Learning ADM directly or indirectly improves the coordination, efficiency, and security of certain work processes, which is reflected in higher service quality overall. However, the emotional demands placed on employees are not unaffected when a lack of trans-

parency in system output and information asymmetries come up against highly situational interaction settings. If using these ADM systems also promotes these information asymmetries between colleagues, any qualitative, quantitative, or time-related benefits associated with using the system could be nullified.

The potential influence of learning ADM on interaction work has already been indicated, but it potentially goes far beyond this. What needs to be questioned is the extent to which ADM systems pose a threat to subjectivizing work actions and experiential knowledge. After all, learning ADM systems implies a fundamental change because they generate experiential knowledge themselves and apply it in a context-specific manner. This trading of experiential knowledge with the system does not necessarily have to affect job autonomy negatively if it is made available to service employees in a complementary way and the assessment of its quality remains with the workers.

However, the actual implementation of automation has often shown in practice that workers' skills are underestimated and machine capabilities are overestimated, so the replacement of experience-based interaction work must be addressed critically. The danger of transferring experience-based work to ADM systems lies not only in the devaluation of service employees and a massive loss of meaning and motivation, but also in a loss of quality for service recipients. Incidentally, there are also technical mechanisms that can create transparency in supposed black box systems. However, these are not yet legal obligations. Since these technical possibilities are not being exploited, a certain corporate interest must also be assumed behind the lack of transparency.

Overestimating the capabilities of ADM systems can be reflected in their planning and management skills. There is no doubt that learning systems in particular are better suited to processing and combining huge amounts of data than workers, but these systems also have an essential element that can have a significantly intensifying effect on the work of employees, namely the time component. This refers not only to the integration of real-time data in ADM calculations but also to the fundamental linking of system outputs to specific time periods (e.g., time-limited client preferences or traffic patterns). Learning ADM can thus influence the prioritization and planning of work tasks, may cause their parallelization, and generally has a work-compressing character.

Finally, this principle of intensification addresses the frequently mentioned issue of performance optimization. In the case of learning ADM, there are fewer signs of a shift towards direct control mechanisms but a solidification of indirect control mechanisms, which also potentially decouples middle management from decision-making processes or even

eliminates them altogether. In both case studies, these tendencies have certainly become visible, with central tasks or target achievement mechanisms being shifted to the respective ADM systems. Even if the human component has not been eliminated, mainly because the ADM results have not yet been competitive with the experience-based actions of workers and their supervisors, the replacement of management positions is a target corridor for deploying learning ADM. The result would be a further distancing of employees from company management, which may open more freedom at the working level of employees but may also result in the voice of individual employees in the company becoming increasingly quieter. If there is also a decoupling of team structures, the isolation practices of individual employees will manifest. These areas of conflict must be actively counteracted if the positive potential of learning ADM, which undoubtedly exists, is to be fully realized.

19. Corporate strategies becoming tangible

Insights into the corporate strategy behind the utilization of a certain ADM system cannot be gained from the outside, but only by examining the functioning and organization of a company in depth. This means that the corporate strategies were not clear when the case studies in outpatient care and banking services were selected. In retrospect, however, this categorization provides excellent explanations for the observations in both cases and beyond.

As an example of LAS, the organizational conditions in outpatient care are fundamentally predestined to be embedded in the logic of digital Taylorism: clearly separable and time-defined tasks fundamentally enable ADM systems to act as the pacesetter of work. The quantifiability of individual tasks in real time and the link to location-based data open huge control potential, which is also used in this way in other care companies. Comparisons with highly automated and algorithmically planned services such as logistics are obvious, at least regarding those organizational aspects of the work apart from direct interaction with clients. In this case study, however, these developments are only visible as potentials, and behind them lies a corporate strategy that does not focus on control. This perception shows that the use of ADM systems for process rationalization and optimization is even supported by employees and must not necessarily be imposed by management.

Of course, in this case, one can speak of an example of good practice in which certain particularities are present, such as the IT background of the managing director, who is the main driver of the company's affinity for technology, or the predominantly negative previous experience of the employees in other settings and companies, which leads to a common desire to do things differently. The size of the company also plays a role; although organizational and technical requirements are not proportional, they are disproportionately greater in large companies. Informal practices for coping with work can, however, be assumed regardless of the size of the company.

What remains is that both purely digital systems and learning ADM systems can be used in LAS as a tool for process optimization for the benefit of employees. This is not about full automation, but rather the optimization of tasks that lie outside the immediate core of care work. The example of care work shows that branches with a relatively low level of digitalization already benefit from fairly simple digital systems, especially if they standardize processes, centralize information, and create location independence in order to offer employees a certain degree of flexibility.

The selectively used learning elements of ADM also bring relief and are welcomed by both middle management and employees. One condition, however, is that the employees remain in control of the interpretation and evaluation of the system output. The overall conclusion is that, particularly in branches that are still less digitized, process digitization and rule-based ADM are not inferior in importance to learning ADM systems for the time being.

As an example of HAS, banking services form a clear contrast to their counterparts and are in line with other branches in this group in that there is hardly any need to discuss basic digital process optimization, such as in the care sector. Processes are already largely digital. In the case of HAS, there is a debate about the extent to which process rationalization and optimization can even be a primary corporate strategy when using ADM systems. Perhaps, from a corporate perspective, new methods must be found to access the labor power of employees. In the example of banking services, this consideration is confirmed as far as the control potential behind the analyzed ADM system can play a formative role for bank advisors in the future.

The ML-based ADM example can be understood as a targeted attempt to intervene in the interaction activities of employees by specifically suggesting clients and content. So far, it has been an area that has remained largely untouched by technology. Of course, technology has also found its way into client contact and service areas. However, when it comes to areas that focus intensively on individual advice, research, recommendations, or knowledge transfer, the strengths of workers have manifested. The case study continues to rely on these strengths, and there is no prospect of fully automating client management and contact. However, this specific example shows the attempt of a traditional universal bank to further standardize processes around and with clients, similar to pure digital banks. This also implies the devaluation of the experience and knowledge of employees, whose significance threatens to erode even further in the future. Ultimately, this attempt to remove the utilization of experiential knowledge is based on management's devaluation interests.

As has already been described in sufficient detail, the financial sector is experiencing an industrialization of service activities – a narrative that until now has tended to be associated with Tayloristic approaches to services or manufacturing industries. Marketization efforts still exist, of course, and a shift towards direct control mechanisms cannot yet be spoken of in this example. Nevertheless, the question arises as to whether a recombination of known control mechanisms can be identified for HAS in the future, which, by means of learning ADM, will provide new access possibilities to experience-led work. It must be assumed that there is

a fine line between influencing these meaningful and motivating parts of work for the purpose of control and the continued granting of job autonomy to maintain self-control and self-optimization mechanisms.

Overall, the impact of using an ADM system on job autonomy depends less on the specific technical features of the system and more on its organizational embedding. ADM can always be exploited for control mechanisms, and its learning elements even tap into the profoundly important experiential knowledge of service employees – but only if using technology and ADM take priority over the decisions of the employees. If the focus remains on decision support, the positive effects on job autonomy take center stage. If ADM results in a direct and irrevocable compulsion to act, job autonomy suffers. Both can be organizationally desirable for the company.

If using ADM in LAS, as in the case study, tends to focus on objectifying actions that can be easily formalized, a positive contribution to job autonomy is possible. This development should not be underestimated for LAS, as there is potential for job autonomy in all dimensions. Since the subjective elements at work are less affected, there are cases that break with the narrative of digital Taylorism and the utilization of technology as a control instrument. Perhaps this applies in particular to highly person-oriented tasks, which have always been in conflict with the characteristics of restricted working environments due to the need to incorporate subjective elements into the work.

As far as the deployment of ADM in HAS is concerned, the focus may not be on the automating character of the systems but initially on their assistive-complementary character. This may actually be about supporting employees – but to what end? If it is the exploitation of subjectifying action, then the focus is rather on intensification, i.e., an overall worsening of the work situation. In this case study, the potential for relief through the support and transfer of tasks in the planning/administrative area must be distinguished from opportunities to intervene in the subjective part of work, which can ultimately lead to a loss of experiential knowledge and motivation. ADM systems in HAS are embedded in existing marketization and exploitation logics to the extent that their supportive properties contribute to desired self-control and self-optimization mechanisms in objectifying work activities. However, they contradict this narrative in their attack on experience-led work, which raises the question as to the conditions of highly autonomous services anew.

Based on the empirical work of this thesis, the possibility of a consolidation of the various forms of job autonomy in the service sector emerges (and not without surprise). There are constellations in which

branches with highly oppressive, intensive conditions characterized by little job autonomy can gain degrees of freedom and thus also relief through using ADM and a corresponding corporate strategy that is based less on control. In contrast, there are also highly autonomous services based on self-control and self-optimization, which may lose degrees of freedom resulting from the expansion of control and interference in the employees' authority to interpret interaction work, which means that the intensity and stress levels in these activities will not decrease in the foreseeable future.

20. Outlook and reflections

This thesis primarily provides a structured analysis of the influence of novel ADM systems on the job autonomy of employees in the service sector. It lays the foundation for further work on the subject of negotiating job autonomy in the workplace, the success of positive autonomy experiences with the use of technology, and identifying organizational conditions and boundaries that are necessary to maintain or create appealing working conditions.

Part I of this thesis lays the theoretical and conceptual foundations for dealing systematically with the interplay between job autonomy and ADM systems. Particular emphasis was placed on presenting a comprehensive but also transferable concept of job autonomy that attempts to do justice to the modern conditions of work and will hopefully also be useful in further studies.

At the beginning of this work, the focus was quickly placed on service workers and less on the entire sector, i.e., those employees who have to work particularly close to other people. This proved to be very fruitful, as the interaction work performed by them in particular harbors potential for conflict regarding ADM systems. The theoretical and conceptual considerations in particular revealed gaps of knowledge regarding the interplay of interaction work and the use of learning ADM, which point to the need for further theory development that goes far beyond this thesis. It is not yet foreseeable what influence the learning elements of new types of ADM will have on experience-led and situational work behavior, as practiced so intensively by service employees. However, it is clear that intensive interaction work will continue to be an area of conflict between employees and employers in the future. From the company's perspective, it is one of the large remaining levels of uncertainty in which employees, even if restrictions become clear, try to maintain their sovereignty. There should be no shortage of exciting case studies in which this field of research can be observed in the future.

Part II of this thesis has revealed a clear divide within the service sector in terms of job autonomy, which speaks volumes about existing inequalities. Nevertheless, a number of similarities within the service sector have become apparent, which legitimize transferability between individual branches. Further research needs and opportunities are abundant in the context of quantifying job autonomy. It is desirable to repeat the analyses carried out with more up-to-date and in-depth data, particularly regarding technology use, and to isolate the connecting lines and dependencies between individual dimensions of job autonomy. The latter point

in particular, namely the dependencies between different autonomy dimensions, can provide enormous added value in terms of understanding patterns of stress and motivation.

Part III ultimately aimed to reflect the utilization of ADM systems in practice in as much detail as possible. Certainly, some nuances in the deployment of technology are specific to the respective company constellations. Nevertheless, patterns of impact on job autonomy from ADM systems can be clearly identified. These findings are of immense value in understanding the organization of companies as a whole. A holistic approach is an essential factor in gaining this knowledge. Far too often, the use of certain technologies, but also other interventions in work processes, is viewed in isolation and hardly embedded in the practical everyday lives of employees.

Of course, these two case studies are not sufficient to capture the complexity and diversity of even just one service branch. There is a need for far more concrete examples and cross-sector comparative studies that are brought to the public's attention and that show how the still-intangible concept of AI is being applied. This would also contribute to a more realistic assessment of the potentials and dangers for society and, in particular, reduce (or at least make assessable) fears that individual technologies and, thus, individual private companies have too great an influence on work and life. The aim of research in these areas must include not only providing this educational work but also communicating it to the public in an understandable manner. Moreover, the application of AI, its development, physical utilization, required resources, and ultimately its social impact must be viewed globally, beyond the Eurocentric perspective.

From the perspective of Germany (and Europe), the most important research and development drivers, companies, market capitalizations, and manufacturers are concentrated in the USA or China (e.g., Bryson & Malikova, 2021, pp. 4–6). This can lead to ever-new areas of conflict, e.g., regarding European data protection principles or German labor law. In this respect, AI is considered a subject of regulation for political actors.

There is no question that legislative action is needed (e.g., GI, 2018, p. 8), and this is well known to decision-makers and lawmakers. In its current form, the GDPR is too incomplete to provide comprehensive protection for employees. In the future, hopes must be pinned on the introduction of employee data protection and the AI Act to create a binding legal basis for companies. However, we should not tire of pointing out existing laws and rights, such as the right to co-determination in companies when introducing new technologies or risk assessment in the workplace.

It is well known that the difficulty lies both in enforcing existing laws and rights and in formulating new legal measures that also cover novel AI systems and their dynamic development. However, the creation of legal certainty ultimately benefits not only employees and their representatives, but also companies. Agreeing on a common basis for action must be the goal for the future, as the quality of employment conditions and the weight of employees' voices also depend on it. Hopefully, substantial regulations will be drawn up as part of the upcoming legislative changes, and these will not be undermined by excessive political influence from individual interest groups before they come into force.

In conclusion, I can only formulate a plea for needs-based approaches to the interplay between technology and work. There is far too little discussion in society about which goals are to be achieved with technology, how these can be achieved, and whether these objectives have any social benefit at all. In view of dwindling human and natural resources, the question of the sensible and socially necessary deployment of technology must come to the fore. The need for discussing the rational and socially beneficial usage of technologies is all too often subject to the supposed potential for additional capital utilization. In any case, and in view of workers' desire for job autonomy, excessive technology-based control of work performance and output, whether direct or indirect, appears to be an outdated corporate objective.

Appendix | Introduction | Part I

Table 14: Service branches according to WZ 2008

Branch	Code
Wholesale and retail trade; repair of motor vehicles and motorcycles	Section G
Wholesale and retail trade and repair of motor vehicles and motorcycles	Division 45
Wholesale trade, except of motor vehicles and motorcycles	Division 46
Retail trade, except of motor vehicles and motorcycles	Division 47
Transportation and storage	Section H
Land transport and transport via pipelines	Division 49
Water transport	Division 50
Air transport	Division 51
Warehousing and support activities for transportation	Division 52
Postal and courier activities	Division 53
Accommodation and food service activities	Section I
Accommodation	Division 55
Food and beverage service activities	Division 56
Information and communication	Section J
Publishing activities	Division 58
Motion picture, video and television prog. prod., sound rec. and music pub. activities	Division 59
Programming and broadcasting activities	Division 60
Telecommunications	Division 61
Computer programming, consultancy and related activities	Division 62
Information service activities	Division 63
Financial and insurance activities	Section K
Financial service activities, except insurance and pension funding	Division 64
Insurance, reinsurance and pension funding, except compulsory social security	Division 65
Activities auxiliary to financial services and insurance activities	Division 66
Real estate activities	Section L
Real estate activities	Division 68
Professional, scientific and technical activities	Section M
Legal and accounting activities	Division 69
Activities of head offices; management consultancy activities	Division 70
Architectural and engineering activities; technical testing and analysis	Division 71
Scientific research and development	Division 72
Advertising and market research	Division 73
Other professional, scientific and technical activities	Division 74
Veterinary activities	Division 75

Administrative and support service activities	Section N
Rental and leasing activities	Division 77
Employment activities	Division 78
Travel agency, tour operator and other reservation service and related activities	Division 79
Security and investigation activities	Division 80
Services to buildings and landscape activities	Division 81
Office administrative, office support and other business support activities	Division 82
Public administration and defence; compulsory social security	Section O
Public administration and defence; compulsory social security	Division 84
Education	Section P
Education	Division 85
Human health and social work activities	Section Q
Human health activities	Division 86
Residential care activities	Division 87
Social work activities without accommodation	Division 88
Arts, entertainment and recreation	Section R
Creative, arts and entertainment activities	Division 90
Libraries, archives, museums and other cultural activities	Division 91
Gambling and betting activities	Division 92
Sports activities and amusement and recreation activities	Division 93
Other service activities	Section S
Activities of membership organisations	Division 94
Repair of computers and personal and household goods	Division 95
Other personal service activities	Division 96

Source: Destatis (2008a) in German. English translation in Destatis (2008b).

Table 15: Employment by branch, employment status, sex, working time, 2022

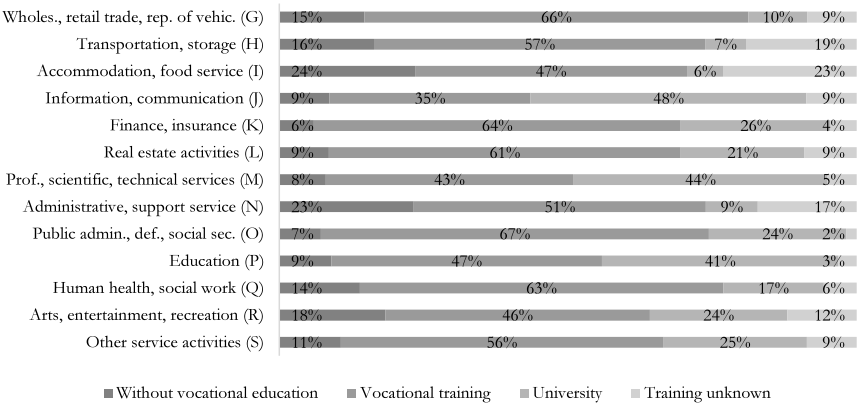
	Regularly employed		Marginally employed	
	Total	**Share**	**Total**	**Share**
Total economy	34.705.174	100 %	7.609.194	100 %
Service sector	24.997.813	72 %	6.314.924	83 %
Men	11.144.829	45 %	2.692.799	43 %
Women	13.852.984	55 %	3.622.125	57 %
Full-time	15.822.971	63 %	–	–
Part-time	9.174.842	37 %	–	–
Wholes., retail trade, rep. of vehic. (G)	4.645.666	19 %	1.271.759	20 %
Transportation, storage (H)	1.946.424	8 %	453.225	7 %
Accommodation, food service (I)	1.039.410	4 %	977.109	15 %
Information, communication (J)	1.323.226	5 %	134.256	2 %
Finance, insurance (K)	970.204	4 %	75.884	1 %
Real estate activities (L)	305.731	1 %	263.228	4 %
Prof., scientific, technical services (M)	2.510.603	10 %	432.913	7 %
Administrative, support service (N)	2.317.900	9 %	951.875	15 %
Public admin., def., social sec. (O)	2.030.677	8 %	119.093	2 %
Education (P)	1.436.345	6 %	251.920	4 %
Human health, social work (Q)	5.315.319	21 %	813.925	13 %
Arts, entertainment, recreation (R)	302.295	1 %	243.392	4 %
Other service activities (S)	854.013	3 %	326.345	5 %

Notes: Reporting date Dec 31, 2022.
Source: Statistics of the Federal Employment Agency in BA (2023b).

Figure 18: Employment shares by branch, sex, working time, 2022

Notes: Regularly employed. Reporting date Dec 31, 2022.
Source: Statistics of the Federal Employment Agency in BA (2023b). Own calculations.

Figure 19: Employment shares by branch, qualification, 2022



Notes: Regularly employed. Reporting date Dec 31, 2022.
Source: Statistics of the Federal Employment Agency in BA (2023b). Own calculations.

Table 16: Employment growth by branch, working time, qualification, 2018–2022

	Total	Full-time	Part-time	W/o voc. qualif.	Vocational training	University
Total economy	4 %	2 %	10 %	7 %	1 %	20 %
Service sector	6 %	4 %	10 %	11 %	3 %	22 %
Wholes., retail trade, rep. of vehic. (G)	2 %	1 %	6 %	12 %	0 %	25 %
Transportation, storage (H)	6 %	5 %	10 %	19 %	4 %	34 %
Accommodation, food service (I)	–2 %	–1 %	–4 %	6 %	–6 %	24 %
Information, communication (J)	20 %	19 %	23 %	21 %	9 %	35 %
Finance, insurance (K)	0 %	–1 %	3 %	3 %	–5 %	20 %
Real estate activities (L)	13 %	11 %	17 %	24 %	10 %	29 %
Prof., scientific, technical services (M)	11 %	8 %	18 %	12 %	5 %	21 %
Administrative, support service (N)	0 %	–1 %	1 %	9 %	–4 %	18 %
Public admin., def., social sec. (O)	11 %	9 %	15 %	3 %	8 %	26 %
Education (P)	9 %	4 %	14 %	11 %	9 %	11 %
Human health, social work (Q)	8 %	4 %	13 %	10 %	6 %	21 %
Arts, entertainment, recreation (R)	3 %	1 %	7 %	8 %	0 %	19 %
Other service activities (S)	1 %	–3 %	7 %	1 %	–2 %	17 %

Notes: Reporting dates Dec 31, 2018 and Dec 31, 2022.

Source: Statistics of the Federal Employment Agency in BA (2023b) and BA (2019). Own calculations.

Table 17: Influence of digitalization on selected job characteristics by branch, 2022

	Decision-making scope			Workload			Parallel processes			Monitoring and control		
	Increase	No change	Decrease	Increase	No change	Decrease	Increase	No change	Decrease	Increase	No change	Decrease
Wholes., retail trade; rep. of vehic.	26 %	64 %	10 %	48 %	46 %	6 %	48 %	47 %	4 %	33 %	60 %	7 %
Transportation, storage	17 %	71 %	13 %	39 %	49 %	12 %	46 %	52 %	1 %	42 %	50 %	8 %
Information, communication	28 %	65 %	7 %	41 %	56 %	3 %	52 %	46 %	2 %	24 %	70 %	6 %
Finance, insurance	17 %	69 %	14 %	55 %	44 %	1 %	50 %	50 %	0 %	34 %	63 %	3 %
Prof., scientific, technical services	25 %	65 %	10 %	54 %	38 %	8 %	46 %	47 %	7 %	32 %	64 %	4 %
Public admin., def., social sec.	18 %	74 %	8 %	48 %	46 %	5 %	41 %	56 %	3 %	38 %	58 %	4 %
Education	25 %	66 %	8 %	54 %	43 %	3 %	45 %	54 %	1 %	27 %	67 %	6 %
Health	17 %	71 %	12 %	54 %	38 %	8 %	46 %	48 %	6 %	42 %	54 %	5 %
Social Service	12 %	79 %	9 %	46 %	49 %	4 %	43 %	53 %	4 %	41 %	50 %	9 %

Source: DGB-Index (2022b). Table 18, 20, 22, 28.

Appendix | Part II

Table 18: Decomposition of job autonomy dimensions with recoding in 2018

Autonomy Dimension	No.	Variable	Question	Answers	Effect	Recoding
Task Autonomy	1	F411_03	How often does it happen in your work that one and the same work process is repeated down to the last detail?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	2	F411_05	How often does it happen in your work that you improve on existing procedures or try something new?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	3	F700_03	How often does it happen that you have influence over the amount of work assigned to you?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_08	How often does it happen that you are not informed in time about important decisions, changes, or plans for the future?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	5	F503	Do you perform your tasks mainly according to instructions or mainly independently?	predominantly following instructions (1); predominantly independent (2); both equally frequent (3); not stated (9)	–	0; 2; 1; missing
Method Autonomy	1	F327_03	How often does it happen in your work that you have to identify and close your own knowledge gaps?	frequently (1); sometimes (2); never (3); not stated (9)	+	2; 1; 0; missing
	2	F411_02	In your work, how often do you find yourself being told how to perform the work down to the last detail?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F411_04	How often in your work do you find yourself faced with new tasks that you first have to think about and familiarize yourself with?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing

Criteria Autonomy	1	F411_07	How common is it in your work that you are prescribed an exact number of pieces, a certain minimum output, or the time to complete a certain job?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	2	F411_12	How often does your work require you to push yourself to the limit?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F411_01	How often does your job involve working under intense deadline or performance pressure?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
Scheduling Autonomy	1	F411_06	How often do you experience disruptions or interruptions in your work, e.g., due to colleagues, bad material, machine malfunctions, or telephone calls?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	2	F411_09	How often does your work require you to keep track of different types of work or processes at the same time?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F700_02	How often does it happen that you can plan and schedule your own work?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_06	How often does it happen that you can decide for yourself when to take a break?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0 (=4 or 8); missing
Working Time Autonomy	1	F208*	How often do you manage to take your family and private interests into account when planning your working hours?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	2	F209	Are your working hours normally between 7 a.m. and 7 p.m.?	yes (1); no (2); not stated (9)	+	1; 0; missing
	3	F216_04*	Have you arranged the following in your job? (on-call duty, work on demand etc.) – not of the above	not stated (0); stated (1)	+	0; 1
	4	F220*	Do you usually work on Saturdays, at least once a month?	yes (1); no (2); not stated (9)	–	0; 1; missing
	5	F223*	Do you usually work on Sundays, at least once a month?	yes (1); no (2); not stated (9)	–	0; 1; missing

Locational Autonomy	1	F228*	Do you work for your company – even if only occasionally – from home?	yes (1); no (2); not stated (9)	+	1; 0; missing
	2	F229* &	How often does this occur?	always (1); frequently (2); sometimes (3); rarely (4); not stated (9)	+	5 (F229=1); 4 (F229=2); 3 (F229=3); 2 (F229=4); 1 (F232=1 or F232=2); 0 (F232=3); missing (F229=9 or F232=9)
		F232*	If your company gave you the option of working at home at times, would you accept this offer?	yes (1); no (2); not possible in my work (3); not stated (9)		
Interactional Autonomy	1	F327_04	How often does your job require you to take responsibility for others?	frequently (1); sometimes (2); never (3); not stated (9)	–	0; 1; 2; missing
	2	F327_05	How often does your work involve convincing others and negotiating compromises?	frequently (1); sometimes (2); never (3); not stated (9)	–	0; 1; 2; missing
	3	F700_12	How often do you get help and support for your work from colleagues when you need it?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_13	And how often do you get help and support for your work from your direct supervisor when you need it?	frequently (1); sometimes (2); rarely (3); never (4); does not apply (8); not stated (9)	+	3; 2; 1; 0; missing (=8 or 9)

Notes: Own translation, collection, and item assignment.
Source: BIBB/BAuA-ETB 2018.

Table 19: Decomposition of job autonomy dimensions with recoding in 2012

Autonomy Dimension	No.	Variable	Question	Answers	Effect	Recoding
Task Autonomy	1	F411_03	How often does it happen in your work that one and the same work process is repeated down to the last detail?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	2	F411_05	How often does it happen in your work that you improve on existing procedures or try something new?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	3	F700_03	How often does it happen that you have influence over the amount of work assigned to you?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_08	How often does it happen that you are not informed in time about important decisions, changes, or plans for the future?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	5	F503	Do you perform your tasks mainly according to instructions or mainly independently?	predominantly following instructions (1); predominantly independent (2); both equally frequent (3); not stated (9)	–	0; 2; 1; missing
Method Autonomy	1	F327_03	How often does it happen in your work that you have to identify and close your own knowledge gaps?	frequently (1); sometimes (2); never (3); not stated (9)	+	2; 1; 0; missing
	2	F411_02	In your work, how often do you find yourself being told how to perform the work down to the last detail?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F411_04	How often in your work do you find yourself faced with new tasks that you first have to think about and familiarize yourself with?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
Criteria Autonomy	1	F411_07	How common is it in your work that you are prescribed an exact number of pieces, a certain minimum output, or the time to complete a certain job?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing

	2	F411_12	How often does your work require you to push yourself to the limit?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F411_01	How often does your job involve working under intense deadline or performance pressure?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
Scheduling Autonomy	1	F411_06	How often do you experience disruptions or interruptions in your work, e.g., due to colleagues, bad material, machine malfunctions, or telephone calls?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	2	F411_09	How often does your work require you to keep track of different types of work or processes at the same time?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	–	0; 1; 2; 3; missing
	3	F700_02	How often does it happen that you can plan and schedule your own work?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_06	How often does it happen that you can decide for yourself when to take a break?	Frequently (1); sometimes (2); rarely (3); never (4); have no breaks (8); not stated (9)	+	3; 2; 1; 0 (=4 or 8); missing
Working Time Autonomy	1	F208*	How often do you manage to take your family and private interests into account when planning your working hours?	frequently (1); sometimes (2); never (3); not stated (9)	+	2; 1; 0; missing
	2	F209	Are your working hours normally between 7 a.m. and 7 p.m.?	yes (1); no (2); not stated (9)	+	1; 0; missing
	3	F216*	Do you work demand or have on-call duty?	yes (1); no (2); not stated (9)	–	0; 1
	4	F218* &	Do you work – even if only occasionally – on Saturdays?	yes (1); no (2); not stated (9)	–	1 (F220=96 or F220=97 or F218=2); 0 (F220=1 or F220=2 or F220=3 or F220=4 or F220=5); missing (F218=9 or F220=99)

		F220*	On how many Saturdays do you work on average per month?	1; 2; 3; 4; 5; less than once a month (96); changes, can't say (97); not stated (99)		
	5	F221* &	Do you work – even if only occasionally – on Sundays?	yes (1); no (2); not stated (9)	–	1 (F223=96 or F223=97 or F221=2); 0 (F223=1 or F223=2 or F223=3 or F223=4 or F223=5); missing (F221=9 or F223=99)
		F223*	On how many Sundays do you work on average per month?	1; 2; 3; 4; 5; less than once a month (96); changes, can't say (97); not stated (99)		
Interactional Autonomy	1	F327_04	How often does your job require you to take responsibility for others?	frequently (1); sometimes (2); never (3); not stated (9)	–	0; 1; 2; missing
	2	F327_05	How often does your work involve convincing others and negotiating compromises?	frequently (1); sometimes (2); never (3); not stated (9)	–	0; 1; 2; missing
	3	F700_12	How often do you get help and support for your work from colleagues when you need it?	frequently (1); sometimes (2); rarely (3); never (4); not stated (9)	+	3; 2; 1; 0; missing
	4	F700_13	And how often do you get help and support for your work from your direct supervisor when you need it?	frequently (1); sometimes (2); rarely (3); never (4); does not apply (8); not stated (9)	+	3; 2; 1; 0; missing (=8 or 9)

Notes: Own translation, collection, and item assignment.
Source: BIBB/BAuA-ETB 2018.

Table 20: Observations and shares by branch, 2018 and 2012

Branch	Observations 2018	Share 2018	Observations 2012	Share 2012
Service sector	11.738	100 %	10.896	100 %
Wholes., retail trade, rep. of vehic. (G)	1.242	11 %	1.484	14 %
Transportation, storage (H)	785	7 %	686	6 %
Accommodation, food service (I)	323	3 %	317	3 %
Information, communication (J)	746	6 %	627	6 %
Finance, insurance (K)	647	6 %	724	7 %
Real estate activities (L)	113	1 %	104	1 %
Prof., scientific, technical services (M)	800	7 %	586	5 %
Administrative, support service (N)	444	4 %	432	4 %
Public admin., def., social sec. (O)	1.714	15 %	1.642	15 %
Education (P)	1.809	15 %	1.395	13 %
Human health, social work (Q)	2.583	22 %	2.328	21 %
Arts, entertainment, recreation (R)	181	2 %	159	1 %
Other service activities (S)	351	3 %	412	4 %

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 21: Source variables, observations, shares of secondary variables, 2018 and 2012

Variable/Specification	Source variable		Share 2018	Share 2012
Task type	see Table 22	N=	11.738	10.896
Management			30 %	31 %
Information-related			38 %	38 %
Object-related			16 %	18 %
Person-related			28 %	26 %
Educational attainment	max1202/Max1202	N=	11.716	10.893
W/o voc. qualification			5 %	7 %
Vocational training			48 %	57 %
Upgrading training			6 %	6 %
University			41 %	30 %
Sex	S1	N=	11.738	10.896
Female			61 %	64 %
Male			39 %	36 %
Company size	F515	N=	11.456	10.544
Micro company			12 %	14 %
Small company			28 %	29 %
Medium company			29 %	27 %
Large company			32 %	30 %
Working hours per week	az	N=	11.738	10.896
10 to 20			12 %	14 %
21 to 30			17 %	15 %
31 to 40			39 %	39 %
More than 40			32 %	32 %
Length of employment	F510	N=	11.693	10.859
More than 10 years			54 %	58 %
Up to 10 years			19 %	16 %
Up to 5 years			17 %	17 %
Up to 2 years			10 %	9 %

ADM Knowledge	see Table 23	N=	1.811	1.421
Basic			79 %	77 %
Advanced			21 %	23 %
Knowledge intensity	TI_KI	N=	11.738	10.657
KIS			74 %	86 %
LKIS			26 %	14 %
Changes in work environment	see Table 24	N=	11.239	10.449
Low			68 %	65 %
Middle			16 %	17 %
High			16 %	18 %
Frequency of making difficult decisions	F327_02	N=	11.734	10.891
Never			12 %	12 %
Sometimes			43 %	45 %
Frequently			46 %	43 %

Notes: The generated variables are based on the listed source variables. The specifications of the variables age group, company size, and working hours are created by the author. Task type, ADM knowledge, and changes in work environment are generated variables. Differences in the number of observations are due to missing values in the responses.

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 22: Decomposition of variable task type

Task type	Variable	Question	Inclusion criterion	Operator (Inclusion)	Exclusion criterion	Operator (Exclusion)
Management	F301	Do you have employees for whom you are <the> direct supervisor?	F301=1			
	Please tell me how often these activities occur in your work, whether frequently (1), sometimes (2), or never (3):					
Information-related	F304	Measure, test, control quality	F304=1	OR	F301=1	OR
	F310	Organizing, planning, and preparing work processes.	F310=1	OR	F312=1	OR
	F311	Develop, research, construct	F311=1	OR	F315=1	OR
	F313	Collecting information, researching, documenting	F313=1	OR	F316=1	OR
	F314	Advise and inform	F314=1	OR		
	F318	Working with computers	F318=1	OR		
	F319	Use of the Internet or edit e-mails	F319=1	OR		
Object-related	F303	Manufacture, production of goods and commodities	F303=1	OR	F301=1	OR
	F305	Monitoring, control of machines, equipment, technical process	F305=1	OR	F312=1	OR
	F306	Repair, Recondition	F306=1	OR	F315=1	OR
	F308	Transport, storage, shipping	F308=1	OR	F316=1	OR
	F320	Cleaning, waste removal, recycling	F320=1	OR		
Person-related	F312	Train, teach, instruct, educate	F312=1	OR	F301=1	
	F315	Hosting, accommodating, preparing meals	F315=1	OR		
	F316	Care, nurture, heal	F316=1	OR		

Notes: Own translation. The classification of a respondent to a certain task type is based on the assigned variables listed. This means that the assignment is made as soon as one (reference to operator OR) of these variables has been answered with "frequently" (=1) or yes (=1) and the inclusion criterion has thus been met. The assignment is excluded as soon as an exclusion criterion is fulfilled.

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 23: Decomposition of variable ADM knowledge

ADM knowledge	Variable	Question	Inclusion criterion	Operator (Inclusion)
Basic	Please tell me how often these activities occur in your work, whether frequently (1), sometimes (2), or never (3):			
	F313	Collecting information, researching, documenting	F313=1	AND
	F318	Working with computers	F318=1	AND
	For each area, please say whether you need this knowledge in your current job as <…> and, if so, whether basic (2) or advanced (3).			
	F403_04	Knowledge in the field of mathematics, specialized arithmetic, statistics	F403_04=3	AND
	F403_06	Knowledge of PC application programs	F403_06=3	AND
Advanced	Please tell me how often these activities occur in your work, whether frequently (1), sometimes (2), or never (3):			
	F313	Collecting information, researching, documenting	F313=1	AND
	F318	Working with computers	F318=1	AND
	For each area, please say whether you need this knowledge in your current job as <…> and, if so, whether basic (2) or advanced (3).			
	F403_04	Knowledge in the field of mathematics, specialized arithmetic, statistics	F403_04=3	AND
	F403_06	Knowledge of PC application programs	F403_06=3	AND
	F324	Do you use computers exclusively as a user (1) or does your usage go beyond simple application (2)?	F324=2	AND

Notes: Own translation. The classification of a respondent to a certain ADM knowledge type is based on the assigned variables listed. This means that the assignment is made if all (reference to operator AND) of these variables have been answered with the inclusion criterion listed above. The only difference between Basic and Advanced is the additional inclusion of the variable F324 in the latter.

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 24: Decomposition of variable changes in work environment

Variable	Question
	Now please tell me if the following changes have been made in your <immediate work environment> in the last two years.
F1001_01	New manufacturing or process technologies
F1001_02	New computer programs
F1001_03	New machinery or equipment
F1001_04	New or considerably modified products or materials
F1001_05	New or considerably changed services
F1001_06	Has there been any considerable restructuring or reorganization that affected your immediate work environment?

Notes: Own translation. The variable changes in work environments are based on six selected variables, which assign an index value of 0 to 100 to the observations depending on their characteristics. The assigned variables are all answered with yes, no, do not know, or not stated. The latter two are omitted from the analysis. Consequently, the index value 100 (or 0) is assigned if all questions are answered with yes (or no). The specification of the variable describes three levels: low (index value 0–33), middle (34–66), and high (67–100).
Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 25: Detailed summary statistics of Autonomy Index, 2018

	Autonomy Index					Task Autonomy					Method Autonomy					Criteria Autonomy					Scheduling Autonomy					Working Time Autonomy					Locational Autonomy					Interactional Autonomy				
	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max
Service Sector	12	42	50	57	80	6	39	50	61	87	3	33	47	64	87	12	34	47	67	94	13	40	48	60	86	4	36	59	73	73	19	19	28	74	94	9	45	53	65	84
Branch																																							
(G)	17	41	47	53	78	6	37	46	58	87	3	31	40	53	87	12	36	54	75	94	13	38	48	59	86	5	45	50	59	73	19	19	19	28	94	9	45	57	70	84
(H)	12	37	44	51	78	6	32	43	53	84	3	25	34	52	87	12	30	47	67	94	13	40	49	62	86	4	31	46	59	73	19	19	19	28	94	9	45	57	67	84
(I)	21	37	43	49	63	8	35	47	56	87	3	25	34	53	87	12	28	47	67	94	13	35	48	59	86	4	23	32	46	73	19	19	19	28	94	9	41	57	70	84
(J)	23	52	59	64	79	8	45	57	66	87	13	45	59	79	87	12	34	47	66	94	14	48	59	66	85	5	58	63	73	73	19	28	74	91	94	9	45	57	70	84
(K)	25	47	54	60	80	11	40	51	61	87	11	33	47	59	87	12	30	47	62	94	13	48	49	65	86	9	59	73	73	73	19	28	28	85	94	9	45	57	70	84
(L)	38	47	55	61	78	11	40	51	61	87	14	40	53	68	87	12	39	56	75	94	23	48	49	60	85	9	58	63	73	73	19	28	28	85	94	11	45	57	67	84
(M)	19	51	56	62	78	8	45	55	65	87	3	45	59	68	87	12	30	47	66	94	14	48	50	60	86	4	59	73	73	73	19	28	74	85	94	9	45	57	70	84
(N)	20	42	47	54	72	6	36	46	55	87	3	25	34	53	87	12	38	57	77	94	13	48	52	66	86	4	36	58	63	73	19	19	19	28	94	9	45	57	67	84
(O)	22	44	51	56	80	6	38	48	58	87	3	34	47	64	87	12	36	49	67	94	13	48	48	60	86	4	58	73	73	73	19	19	28	28	94	9	45	57	66	84
(P)	23	50	56	61	80	6	50	59	69	87	5	45	59	68	87	12	34	49	67	94	13	40	48	59	86	5	46	63	73	73	19	28	91	91	94	9	35	45	59	84
(Q)	13	37	44	51	79	6	39	48	59	87	3	33	45	59	87	12	28	43	62	94	13	33	48	59	86	4	23	46	63	73	19	19	19	28	94	9	35	45	59	84
(R)	26	41	47	55	75	11	38	47	64	82	3	33	47	67	87	12	38	56	75	94	13	42	49	62	86	4	23	32	58	73	19	19	28	85	94	9	45	57	67	84
(S)	26	45	53	59	79	6	40	53	65	87	3	34	47	64	87	12	38	52	68	94	13	48	56	60	85	5	46	59	73	73	19	19	28	74	94	9	45	57	67	84
Task type																																							
Management	13	42	49	56	80	6	43	53	64	87	3	34	52	67	87	12	28	43	62	94	13	41	48	59	86	4	32	50	73	73	19	19	28	85	94	9	35	45	59	84
Information-related	12	45	52	59	80	6	37	47	59	87	3	33	45	59	87	12	38	54	74	94	13	48	50	65	86	4	46	63	73	73	19	19	28	74	94	9	46	60	70	84
Object-related	12	41	48	55	79	6	34	45	54	87	3	25	40	53	87	12	36	54	74	94	13	41	50	66	86	4	45	58	73	73	19	19	19	28	94	9	46	60	70	84
Person-related	18	40	47	55	80	8	40	51	63	87	3	34	47	64	87	12	28	45	64	94	13	33	48	59	86	4	32	50	73	73	19	19	28	85	94	9	39	45	59	84
Educational attainment																																							
W/o voc. qualif.	22	38	46	53	77	6	35	46	54	84	3	25	34	53	87	12	34	54	75	94	13	38	49	65	86	4	32	46	59	73	19	19	19	28	94	9	45	59	70	84
Vocational training	12	40	47	54	78	6	36	47	58	87	3	33	45	59	87	12	34	49	67	94	13	40	48	60	86	4	32	58	73	73	19	19	19	28	94	9	45	57	67	84
Upgrading training	19	43	49	56	79	8	39	51	61	87	3	33	47	60	87	12	28	47	62	94	13	42	48	60	86	4	45	59	73	73	19	19	28	74	94	9	39	47	59	84
University	18	48	55	61	80	6	47	58	67	87	3	45	59	73	87	12	34	47	64	94	13	48	48	60	86	4	46	63	73	73	19	28	74	91	94	9	39	46	59	84

Sex																																						
Female	13	42	49	56	80	6	39	50	59	87	3	33	45	59	87	12	34	47	67	94	13	40	48	59	86	4	44	59	73	73	19	19	28	74	94	9	45	54	67	84
Male	12	42	50	58	80	6	39	51	63	87	3	33	47	67	87	12	34	49	67	94	13	43	49	60	86	4	32	58	73	73	19	19	28	85	94	9	43	51	64	84
Company size																																								
Micro company	17	44	51	58	79	6	40	52	64	87	3	33	45	59	87	12	39	57	75	94	13	44	51	66	86	4	44	59	73	73	19	19	28	74	94	9	45	59	70	84
Small company	13	42	49	56	79	6	39	50	60	87	3	33	45	62	87	12	34	49	67	94	13	40	48	59	86	4	44	59	73	73	19	19	28	74	94	9	45	53	65	84
Medium company	21	41	49	56	77	6	38	49	60	87	3	33	47	64	87	12	28	47	66	94	13	40	48	59	86	4	32	58	73	73	19	19	28	85	94	9	41	48	60	84
Large company	12	42	50	58	80	6	39	50	61	87	3	34	52	67	87	12	28	45	62	94	13	41	48	59	86	4	36	59	73	73	19	19	28	74	94	9	42	53	64	84
Working hours per week																																								
10 to 20	19	43	50	58	79	6	37	48	60	87	3	31	40	53	87	12	43	62	83	94	13	41	51	66	86	4	46	59	73	73	19	19	28	28	94	9	45	60	74	84
21 to 30	17	42	49	56	77	6	38	48	59	87	3	33	45	59	87	12	34	53	68	94	13	38	48	60	86	4	45	59	73	73	19	19	28	74	94	9	45	57	70	84
31 to 40	18	42	49	57	80	6	39	50	60	87	3	33	47	64	87	12	34	49	67	94	13	41	48	60	86	4	45	59	73	73	19	19	28	74	94	9	45	54	65	84
More than 40	12	41	49	57	80	6	40	51	63	87	3	34	52	67	87	12	28	42	60	94	13	41	48	59	86	4	32	50	63	73	19	19	28	85	94	9	35	45	59	84
Length of employment																																								
More than 10 years	12	42	49	57	80	6	39	50	60	87	3	33	45	59	87	12	30	47	64	94	13	40	48	59	86	4	36	59	73	73	19	19	28	74	94	9	42	51	64	84
Up to 10 years	17	42	50	57	78	6	39	50	62	87	3	33	47	64	87	12	34	49	67	94	13	40	48	60	86	4	36	58	73	73	19	19	28	74	94	9	44	48	64	84
Up to 5 years	13	42	50	57	80	6	39	51	62	87	3	33	47	67	87	12	34	49	67	94	13	41	48	60	86	4	32	59	73	73	19	19	28	74	94	9	45	54	65	84
Up to 2 years	21	41	49	57	77	6	37	48	60	87	3	33	47	64	87	12	36	56	74	94	13	40	48	65	86	4	32	58	73	73	19	19	28	74	94	9	45	57	70	84
ADM knowledge																																								
Basic	25	48	55	62	79	11	47	58	67	87	5	45	59	79	87	12	28	47	62	94	13	48	48	59	86	4	50	63	73	73	19	28	74	91	94	9	39	46	60	84
Advanced	26	54	60	66	79	16	54	64	72	87	14	53	67	79	87	12	28	47	64	94	13	48	59	66	86	5	50	63	73	73	19	74	85	91	94	9	35	46	64	84
Knowledge intensity																																								
KIS	13	43	51	58	80	6	41	52	63	87	3	34	52	67	87	12	30	47	64	94	13	40	48	59	86	4	36	59	73	73	19	19	28	85	94	9	41	48	64	84
LKIS	12	40	47	53	79	6	35	46	58	87	3	25	40	53	87	12	34	52	68	94	13	41	48	60	86	4	32	50	59	73	19	19	19	28	94	9	45	57	70	84
Changes in the last 2 years																																								
Low	13	43	50	57	80	6	39	50	61	87	3	33	45	64	87	12	36	53	68	94	13	41	48	60	86	4	44	59	73	73	19	19	28	85	94	9	45	57	67	84
Middle	12	42	49	57	79	6	40	50	62	87	3	34	52	67	87	12	28	43	62	94	13	40	48	59	86	4	32	59	73	73	19	19	28	85	94	9	41	48	60	84
High	19	40	47	55	77	6	39	50	61	87	3	34	47	67	87	12	21	38	56	94	13	40	48	59	86	4	32	50	63	73	19	19	28	85	94	9	36	45	59	84

Frequency of making difficult decisions																																								
Never	18	41	49	57	80	6	43	53	64	87	3	45	59	68	87	12	28	41	60	94	13	40	48	59	86	4	32	58	73	73	19	19	28	85	94	9	35	45	57	84
Sometimes	12	43	50	57	79	6	38	50	59	87	3	33	45	59	87	12	36	53	67	94	13	41	49	60	86	4	45	59	73	73	19	19	28	85	94	9	45	57	70	84
Frequently	17	42	49	56	80	6	33	42	53	87	3	23	33	45	87	12	43	64	83	94	13	41	52	66	86	4	45	59	73	73	19	19	28	28	94	9	57	67	78	84

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Table 26: Detailed summary statistics of Autonomy Index (w/o Loc), 2018 and 2012

	Autonomy Index (w/o Loc)					Task Autonomy					Method Autonomy					Criteria Autonomy					Scheduling Autonomy					Working Time Autonomy					Interactional Autonomy				
	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max	Min	p25	p50	p75	Max
2018	11	44	51	58	84	6	39	50	61	87	3	33	47	64	87	12	34	47	67	94	13	40	48	60	86	4	36	59	73	73	9	45	53	65	84
2012	17	45	51	58	82	7	40	51	61	87	4	37	49	63	90	12	30	47	67	94	12	40	48	59	86	4	35	60	74	74	8	44	53	65	84

Source: BIBB/BAuA-ETB 2018 and 2012. Own calculations.

Appendix | Part III

Figure 20: Translated interview guideline for context interviews

Guideline for context interviews

Central question of the interview:

The overarching question of this interview is to what extent workers' job autonomy is affected by the use of technical systems of algorithmic decision-making and execution.

What does "job autonomy" mean?

The term "job autonomy" describes all the scope for action and decision-making that workers have in carrying out their work. Exemplary questions are: Can you decide for yourself how a task is to be performed? Can you decide for yourself how quickly these tasks are completed?

Why is it important to deal with job autonomy?

Descriptions of the scope for action and decision-making at work can help to assess what consequences the use of technical systems has for workers. The focus is on the subjective perception of workers' job autonomy. Different forms of job autonomy can provide information about how stressful and intensive work is perceived to be or which motivating and meaningful moments may be released at work.

What are "context interviews"?

The context interviews with executives, IT managers, and work councils serve the purpose of assessing the organizational and technical embedding of algorithmic systems in companies. They form the basic prerequisite for the downstream employee interviews and are intended to map the employee-, employer-, and IT-related perspectives on the technical system to obtain as holistic a picture as possible of how it is perceived in the company. The interviews thus also serve to contextualize the content of the employee interviews.

Block I: Functions of the technical system in the company

- Please describe the functions and places of use of the system in your company.
- What technical support did you use before the introduction of the system, and/or can you describe the non-technical work setting?
- From your point of view, with what objectives was the system introduced in the company?
- What are the advantages (disadvantages) of using the system for the company from your perspective?

Block II: Efforts caused by the system

- What efforts were involved in the implementation and maintenance of the system for your company?
- What technical and organizational hurdles (simplifications) does the system entail?
- With which other technical systems is the algorithmic system networked in your company?
- What data is necessary for the system to function?
- How and by whom is the collected data used?
- How do you assess the functioning of the system?

Block III: Work organization

- Can you describe how the system influences the distribution and planning of work tasks?
- To what extent does the system influence information, communication flows, and cooperation in the company?
- In what way does the system influence the organization of working time and place?
- Does the system set specific work and performance targets? What are they, and who sets them in advance?

Block IV: Influence on employees

- In your view, to what extent has the work of employees changed as a result of using the system?
- Which aspects of employees' work do you consider to be more self-determined (limited) as a result of using the system?
- To what extent do you consider the system to be a relief (burden) for employees?
- What other organizational, social, or economic aspects have an influence on the company apart from the use of technology/digitalization?

Personal information (optional)

- In which year were you born?
- What educational/vocational training have you completed?
- What is your position in the company? / What is your relationship to the company?

– How many hours a week do you work on average?
– How long have you been working in this profession and for this company?

Figure 21: Translated interview guideline for employee interviews

Guideline for employee interviews

Central question of the interview:

The overarching question of this interview is to what extent workers' job autonomy is affected by the use of technical systems of algorithmic decision-making and execution.

What does "job autonomy" mean?

The term "job autonomy" describes all the scope for action and decision-making that workers have in carrying out their work. Exemplary questions are: Can you decide for yourself how a task is to be performed? Can you decide for yourself how quickly these tasks are completed?

Why is it important to deal with job autonomy?

Descriptions of the scope for action and decision-making at work can help to assess what consequences the use of technical systems has for workers. The focus is on the subjective perception of workers' job autonomy. Different forms of job autonomy can provide information about how stressful and intensive work is perceived to be or which motivating and meaningful moments may be released at work.

Block I: Subjective perception of the technical system in everyday work

First of all, it is important for me to learn more about your everyday working routine and how you deal with the system.

– Can you describe your "typical" working day? Situations in which you deal with the system are important here.
– Please explain in a "before and after" view how your work has changed overall since the introduction of the system?
– How do you evaluate the functioning of the system in your everyday work?
– In your opinion, what goals are being pursued with the use of the system?

Block II: Influence on autonomy dimensions

I would now like to know more about how your work has changed in detail through the use of the system. This concerns particular areas in which you

yourself determine the planning and execution of your work and situations in which the system influences your work. The following questions, therefore, always refer to situations in which the system influences your work. We start by looking at what tasks you carry out and how you carry them out.

[Task Autonomy]:

- Can you describe the ways in which the use of the system influences exactly what tasks you perform?
- Does the system influence whether you have all the information you need to do your job?
- To what extent does the use of the system change the amount of work you do?

[Method Autonomy]:

- Can you describe the extent to which you can determine the way (i.e., procedure, method) in which your tasks are performed?
- In which situations does the system give you advice or recommendations on how to do your work?
- Also, can you describe situations where you deviate from the guidance you are given?
- Do you learn anything new when using the system?

Now it is a question of how your work results are evaluated and to what extent you can set and pursue your work goals yourself. It is particularly important what influence the system has on your work goals and assessment of work results.

[Criteria Autonomy]:

- What criteria do you use to evaluate whether you have done your own work well?
- In what way does the system influence these "criteria"?
- To what extent does the system give you certain work or performance goals?
- Are there also situations in which you rely on the system? What are they?

The next questions refer to time- and place-related components of your work, for example, to what extent you determine when, how fast, or where you work. Again, this is about whether the system influences your freedom of choice.

[Scheduling Autonomy]:

- In which situations does the system influence the order or priority in which you complete tasks?
- To what extent can you determine for yourself how quickly you work?
- Can you decide for yourself when to take breaks?
- In what ways does the system influence how you deal with unpredictable situations or interruptions at work?

[Working Time Autonomy]:

- To what extent does the system influence when you start and finish work, and how many hours do you work in total?
- Has there been any change in the need to cover for colleagues and in general in the way you can plan your working hours? Can you describe the aspects in more detail?

[Locational Autonomy]:

- Please describe how the system influences where you do your work. This can include work commutes, time spent at the company site, work travel, or client/client premises.
- Has the use of the system changed anything in the relationship between time spent at work, on the road, or at home?

Now the question is to what extent the cooperation with or relationships with other people in your work environment have changed. These people can be your colleagues and supervisors in the company or the service recipients.

[Interactional Autonomy]:

- Can you describe what aspects of your cooperation with your colleagues or supervisors have changed since you started using the system?
- Can you describe situations where the system influences who you work with, either within the organization or in relation to your clients?
- From your perspective, does your relationship with your clients change as a result of using the systems? In what way?

Block III: Overall assessment

The last questions are about your overall impression of working with the system.

- Do you perceive your work with the system as more self-determined (more restricted) overall?

– Which aspects of your work do you perceive as generally facilitated (more burdened)?
– Apart from the use of technology, which other organizational, economic, or private aspects have an impact on your work and sense of autonomy, i.e., your freedom of action and decision-making?

Personal information (optional)

Finally, I would like to ask you for some personal information. This information will, of course, be treated confidentially.

– In which year were you born?
– What schooling/vocational training have you completed?
– What is your position in the company?
– How many hours a week do you work on average?
– How long have you been working in this profession and for this company?

Figure 22: Translated interview guideline for expert interviews

Brainstorming template for expert interviews
"Algorithmic Decision-Making in Service Work.
An Analysis of Changing Job Autonomy"
= How does the autonomy of employees change as a result of AI use?

Why expert interviews?

Situate selected empirical study results in your field of expertise: From your perspective, what should be considered when using AI in the workplace?

Bottom line:

– Does it contribute to increasing social inequalities? To what extent?
– Can the use of tech contribute to reducing the workload of employees?

RESULTS

Case I | Outpatient care: "We all know how it shouldn't be."

The company example uses a hardware and software solution that moves administration, billing tasks, and work planning into the digital space. Tour planning is algorithm-driven. On tour, care documentation is recorded by means of voice input, handovers, and performance and time recording on

networked tablets, via which there is also access to the tour plan and care-relevant information on the clients.

- +/- Accurate recording of working hours/services
- + Requirements of interaction work alleviated
- + Flexibilization of place/time
- + Time savings/reduction of admin. Efforts
- + Standardization/information access

Case II | Banking: "AI just needs to be taught intelligence."

The company example uses a software solution that largely automates client selection and approaches for advisory activities. This recommendation system suggests clients to bank advisors who would be most likely to purchase a certain product. The probability calculation is based, in particular, on the clients' transaction data and is intended to replace campaign-based approaches with more needs-oriented approaches.

- +/– Increasing the chances of success/pressure
- + Preservation of adaptable interaction work
- – Higher flexibility demands on advisors
- – Increase in the amount of work
- – Devaluation of experiential knowledge

Conditions for autonomy-promoting tech use:

- The objective of tech-use as a critical path (realization of economic efficiency, control, rationalization, or support?).
- Technical prerequisite: quality of results and functionality are decisive
- Use of technology/reliance on functionality only in combination with experiential knowledge
- (Non-)exploitation of performance-related employee data as an instrument of control
- Interaction work as the core of service work can still be individually shaped

Table 27: Specification of interviews conducted

No.	Interview type	Interviewee/field of expertise	Day	Recording
#1	Context	Executive, company I	14.10.22	1:31:14
#2	Context	Care manager, company I	14.10.22	1:39:00
#3	Context	Technology provider, company I *[online]*	21.10.22	0:55:21
#4	Employee	Care manager, company I *[online]*	28.10.22	0:50:17
#5	Employee	Care professional, company I	09.11.22	1:18:45
#6	Employee	Care assistant, company I	09.11.22	0:37:11
#7	Employee	Care professional, company I	10.11.22	0:57:31
#8	Employee	Care professional, company I	10.11.22	1:01:32
#9	Context	Employee representative, company II	20.04.23	1:42:31
#10	Context	Middle management, company II	20.04.23	1:05:21
#11	Context	Middle management, sales, company II	25.05.23	1:20:32
#12	Employee	Branch manager, bank advisor, company II	23.06.23	1:07:16
#13	Context	Technology expert, sales, company II	23.06.23	1:08:22
#14	Employee	Bank advisor, company II	11.07.23	1:13:32
#15	Employee	Bank advisor, company II *[online]*	18.07.23	0:47:30
#16	Employee	Bank advisor, company II *[online]*	24.07.23	0:53:35
#17	Expert	Public policy, regulation *[online]*	22.06.23	0:48:09
#18	Expert	Occupational safety, standardization *[online]*	26.06.23	0:55:39
#19	Expert	Research funding, care technologies *[online]*	27.06.23	0:54:44
#20	Expert	Labor law, employee participation *[online]*	10.07.23	0:54:33
			∅	1:05:08
			∑	21:42:35

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