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# SHIFTING STRUCTURES - A SYSTEMATIC LITERATURE REVIEW ON PEOPLE ANALYTICS AND THE FUTURE OF WORK

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# SHIFTING STRUCTURES – A SYSTEMATIC LITERATURE REVIEW ON PEOPLE ANALYTICS AND THE FUTURE OF WORK

*Research Paper*

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## Abstract

*The sudden decentralisation of work caused by the COVID-19 pandemic challenges institutionalised work practices, which some companies seek to counter by using people analytics. Narratives around people analytics often portray it as an enabler of remote workers' (self-)organisation. Simultaneously, especially when deployed for performance management, people analytics is considered an enabler of workplace surveillance. Further, algorithmic biases in the systems can perpetuate social injustice and discrimination of marginalised groups, impacting established hierarchies and social structures in the workplace. Our study 1) provides an overview of the status of emerging themes around people analytics, remote working, and leadership, and 2) assesses the impact people analytics has on shifting structures in organisations. We guide our analysis by deploying and extending the Structural Model of Technology. Our results suggest that people analytics poses vastly different challenges for employees and leaders, and that it can potentially contradict current trends towards flat hierarchies.*

*Keywords: Literature Review, People Analytics, Structural Model of Technology, Algorithmic Leadership.*

## 1 Introduction

In the last three years, the way we organise work has undergone changes. In early 2020, the COVID-19 pandemic forced companies to introduce or expand their work-from-home policy to safeguard against the disease's rapid spread. As numerous employees realise the benefits of this mode of working, such as reduced commuting hours and increased time sovereignty and flexibility (Mann and Holdsworth, 2003; Taskin and Devos, 2005; Bloom, Liang, Roberts and Ying, 2015), many have decided to at least partially continue working from home beyond the pandemic. Apple, on the other hand, introduced plans for compulsory attendance at the offices for three days per week, which eventually led to public protests amongst the staff, leading them to start a petition to prevent the mandatory return to the office (Makortoff, 2022). Even during the early stages and times of high uncertainty of the COVID-19 pandemic, numerous employers and employees argued strongly in favour of the return to the traditional office and against remote working (Laumer and Maier, 2021). A recent study found that the majority of employees (around 70%) struggled with having to work remotely, and even more (around 80%) described it as an actual challenge (Fedorowicz, AbuJarour, Ajjan and Owens, 2022). The debate about whether or not to work from home is a highly emotive as well as politically charged one. Remote work, in the context of this paper, includes all forms of work that are performed outside the company office. This includes work from home but is not limited to home-based work (Allen, Golden and Shockley, 2015). Remote work that is not home-based might be performed from anywhere in the world, including

cafés, co-working spaces or holiday homes (Wang, Schlagwein, Cecez-Kecmanovic and Cahalane, 2020). It is characterised by two key features: Physical distance and the resulting usage of information and communication technologies (Taskin and Devos, 2005). Previous research frequently describes remote work as a highly ambivalent topic, providing both opportunities and risks (Siha and Monroe, 2006; Whittle and Mueller, 2009; Prester, Cahalane and Schlagwein, 2020). Besides its flexibility, remote work is often associated with increased levels of digital workplace surveillance and control by supervisors (Fleming and Spicer, 2004; Sewell and Taskin, 2015).

Against the backdrop of these ongoing changes, people analytics (PA) is rapidly gaining popularity, promising to provide ‘quick fixes’ to challenges of self-organisation and supervision and to enable the decentralisation of work (Frost and Duan, 2020; Hafermalz, 2021). PA is an umbrella term summarising data-driven approaches for algorithmic workforce management to increase the efficiency of human resources (HR) activities based on the usage of descriptive, predictive, or prescriptive analytics for optimising performance, decision-making, and employee experience (Gal, Jensen and Stein, 2017; Tursunbayeva, Di Lauro and Pagliari, 2018; Giermindl et al., 2021). It facilitates the management of physically dispersed teams while also supporting the self-organisation of employees, for instance, by offering personalised recommendations (Frost and Duan, 2020; Kudyba, 2020). Beyond these applications, PA is often pictured to support various HR tasks within companies. Prevalent use cases include automated CV scanning to identify ‘ideal’ candidates, fluctuation prediction, or performance management (Jarrahi et al., 2021). To this end, PA systems leverage sophisticated statistical models utilising methods from machine learning (ML) or artificial intelligence (AI) to perform tasks traditionally carried out by human leaders (Newell and Marabelli, 2015). However, by constantly collecting and analysing employee-generated data, some PA tools serve as sheer surveillance software. Employees’ behavioural data, including, for instance, the number of emails sent, time spent attending (virtual) meetings, or chat messages exchanged with colleagues, is conjoint with historical data sets collected by the company or external data to improve decision-making and job performance (Gal, Jensen and Stein, 2020). The use of software to track remote workers has grown by about 20% since early 2020. In 2021, approximately 72 to 101 million of the 193 million employees in the EU-27 were subject to some form of algorithmic management (European Commission, 2021).

Neither PA nor remote work are entirely novel phenomena. Nevertheless, the scope and scale at which they both have been deployed since the beginning of 2020 certainly are. Recently, scholars have provided insights into aspects such as the concept of PA or the challenges caused by ethics and privacy risks in PA literature reviews (Marler and Boudreau, 2017; Tursunbayeva et al., 2018; Tursunbayeva, Pagliari, Di Lauro and Antonelli, 2022; Chalutz Ben-Gal, 2019; Fernandez and Gallardo-Gallardo, 2020; Köchling and Wehner, 2020; Giermindl et al., 2021; Margherita, 2022). However, none of these reviews provides insights into the intertwinement of the key trends of the (post-) pandemic workplace: Leadership, PA and remote work. Existing reviews do not focus on the hierarchical structures in companies that are strongly affected by PA. Yet, as power relations at work are changing due to the deployment of PA, so are traditional structures within organisations. Moreover, we argue that existing reviews do not adequately account for the different challenges employees and leaders face when dealing with PA. Though, as our literature review indicates, those differences are vast. Last, most of the literature reviews, whilst providing valuable insights on their respective focus, do not seek to contribute to extending theory. As researchers from various disciplines currently focus on understanding and explaining PA and the broad realm of algorithmic management, theories and methods to support this quest are urgently needed.

We further argue that the various changes in both institutionalised work structures and how people (self) organise work that have occurred since the outbreak of the pandemic postulate the beginning of a new paradigm of work. To better grasp the emerging challenges caused by the sudden dissolution of established structures within organisations, new perspectives on leadership are needed. As we see various new streams of research and themes evolving around PA, we argue it is necessary to take a step back and reflect on those emerging themes in light of this new paradigm of work. PA holds unprecedented potential for the surveillance of workers whilst, at the same time, promising the

enablement of a more flexible workplace and, thus, a potentially more sustainable lifestyle as well as fostering a more inclusive workplace. Therefore, understanding the impact of PA is an important first step for shaping the tools in a way that enables employees to benefit from their application. Consequently, with this paper, we seek to analyse and review the progress of PA research in the context of the future of work and recent changes in hierarchical workplace structures. Our research endeavour is guided by the research question: *How is the increasing deployment of PA systems disrupting traditional structures and hierarchies at the workplace?*

We approach this research question by conducting a structured literature review following the well-established guidelines by Webster and Watson (2002). Falling back on the theoretical lens of Orlikowski's (1992) Structural Model of Technology (SMT), we classify the identified literature. The SMT is a theoretical model designed for investigating and understanding the complex interplay between technology and human actors in organisations. Building on the SMT allows a thorough investigation of the limits and opportunities of human actors within the organisations. As our results show, PA challenges traditional structures in organisations: the use of PA reinforces power imbalances in hierarchical structures between employees and leaders. Furthermore, our review shows that the risks arising from the use of PA are significantly more pronounced for employees, who are, unlike leaders, often the objects of analyses performed by the systems. To account for these shifting structures, we propose an extension of the SMT, making a distinction between leaders and employees, which we nomologically deduce from the findings of our literature review. The contribution of our paper is twofold. First, by reviewing the literature published since the outbreak of the COVID-19 pandemic, we offer insights into the pronounced transformational pressure many working environments currently face. Thereby, our literature review acts as a timely contribution to the current academic discourse on remote working, leadership, and the future of work. Second, we extend the established SMT by an algorithm-centric perspective, highlighting the nuances of the technology-mediated interaction between employees and leaders.

## **2 Structural Model of Technology**

The SMT is designed to investigate the constraints and opportunities of human decisions, development, and application of technologies, as well as the structuring of organisations. It focuses on the social and political context in which technology is applied rather than on its technical features. It also highlights the importance of considering the diverse perspectives and interests, and therefore diverse forms of agency, of different stakeholders in the development and use of technology (Orlikowski, 1992). The SMT thus constitutes a natural fit for guiding our understanding of how PA as a technology impacts traditional structures and hierarchies at the workplace. Orlikowski's (1992) SMT, which draws on Giddens's (1984) theory of structuration, provides a theoretical lens to understand the duality of technology. Both the SMT and the theory of structuration are frequently used in IS research (Rose and Hackney, 2003; Chu and Smithson, 2007; Jones and Karsten, 2008). Meijerink and Bondarouk (2021), for instance, deployed the duality of technology to highlight the recursivity of algorithmic management and thus to provide a view on the desired benefits of algorithmic management, which co-exist alongside the negative outcomes. Orlikowski continued to build on structuration theory and developed the practice lens model in 2000. The newer model emphasises the role of everyday practices in shaping technology and how technology, in turn, shapes practices, which is a highly valuable approach (Orlikowski, 2000; Jarrahi, 2010). Nevertheless, the original SMT emphasises the role of agency in the use and development of technology, which is the more suitable lens for our research endeavour.

The theory of structuration builds on the notion that human actions are enabled and constrained by structures, though these structures also originate from previous human actions. According to Giddens, structures constitute a generic concept manifested in the structural properties of a social system. Those structural properties represent the rules and resources used by human agents in day-to-day life. They both mediate human actions. Simultaneously, the structural properties are reaffirmed by human actors using them. As humans perform actions in an organisation, they also perform interactions. Patterns of interaction lead to the establishment of standardised practices in organisations, for instance, how

business travels are accounted for, how to call in for a sick day, or how employees are evaluated. As these structures become institutionalised over time, they form the institutional properties (Giddens, 1984).

Building on those parameters, the SMT is inherently based on the assumption that technology is both established by human agents and, at the same time, establishes institutional properties. As depicted in Figure 1, the SMT comprises three main dimensions: *human agents* (i.e., technology designers, users, and decision-makers), *technology* (i.e., material artefacts mediating task execution in the workplace), and *institutional properties* (e.g., structural arrangements, business strategies, ideology, culture, control mechanisms as well as environmental pressure) (Orlikowski, 1992). These dimensions influence each other constantly and reciprocally (represented by the arrows in Figure 1). Human action influences technology (arrow a), as technology is always the result of human action, such as building, designing, trying, or modifying it. In turn, technology influences human agents (arrow b), as technology usage is facilitated and constrained by various parameters. At the same time, human agents are also influenced by the institutional properties (arrow c), as the interaction with and deployment of technology are set within the norms and boundaries of the institution. The institutional properties, however, are influenced by the technology (arrow d), as the limitations and possibilities of technology transform the structures of the institutional properties.

Employees and managers experience PA in very different ways. While one party voluntarily interacts with the system, the other party becomes subject to the system’s analyses. Thus, as our subsequential analysis demonstrates, PA presents entirely different challenges to the various actors in a company depending on the context. Orlikowski’s well-established model serves as a strong template for examining the different experiences of human agents facing the different sides of PA.

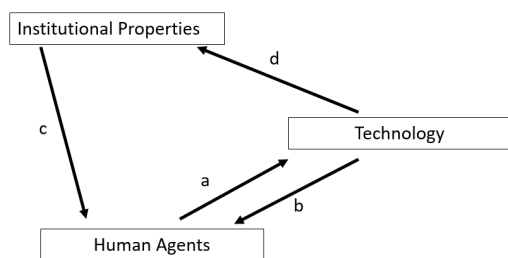


Figure 1. *Structurational Model of Technology by Orlikowski (1992).*

### 3 Literature Review

We align our review process with Webster and Watson’s (2002) proposed method for literature search, selection, and analysis (Figure 2). The method is particularly suited to our project, firstly in terms of rigour: in comparison to e.g., a hermeneutic literature analysis, the methodology can ensure that all relevant literature in the defined search area is identified (Boell and Cecez-Kecmanovic, 2010, 2015). Secondly, the search process becomes more transparent and reproducible by creating a search protocol and specifying keywords. Thirdly, Webster and Watson (2002) provide a thorough manual on the process of compiling a concept matrix to adequately structure the relevant literature and thus provide a framework for the following review.

After an initial stage of broad reading (Pignatelli et al., 2005; vom Brocke et al., 2009), we identified a set of eight keywords for the structured database search, matching the wording used in leading articles on PA (e.g., Marler and Boudreau 2017, Tursunbayeva and colleagues 2019; 2022; 2020, Giermindl and colleagues 2021). To ensure that relevant literature appeared in our search results, we have also placed common synonyms (e.g., People Analytics *and* HR Analytics, Remote Work *and* Work from Home) in our keywords. Considering the highly interdisciplinary nature of the literature on PA, with research stemming from fields such as human resources management, organisational sciences, Information

Systems (IS), or computer sciences, we queried several databases. Our focus, however, is literature stemming from IS. Thus, we started our search with the AIS eLibrary and, subsequently, queried the online databases of Taylor & Francis, Wiley online library, IEEE Xplore Digital Library, Emerald insight, ACM Digital Library, Springer publishing, Sage, and ScienceDirect. This set of databases was chosen for two reasons: first, it contains highly relevant literature, and second, it provides the search result reproducibility opportunity described by Webster and Watson (2002), as the databases are freely searchable by all researchers worldwide without the need for a (costly) institutional log-in. We narrowed our search focus and only included research published between January 2020 and October 2022. The initial search led to a vast number of papers (n=2,212), as especially the keywords referring to remote working yielded a very high outcome of literature that was only indirectly connected to our research endeavour. Further, a large number of the papers referred to the management of platform workers or other forms of algorithmic management that was not related to computer-based work/ office work. Subsequently, we excluded those papers that did not thematically align with our research topic. Additionally, we excluded research that solely focused on technical issues or programming. The titles and abstracts of the remaining papers (n=344) were re-examined and we could further exclude literature based on the criteria mentioned above, leading to a selection of papers for broad reading (n=138). Of those, only a small number (n=19) fulfilled the main criteria for our review: they focused on 1. the application of PA in the context of computer-based/ office work, and 2. the social impact of applying PA, and 3. had a final version that was handed-in after the outbreak of the COVID-19 pandemic. With this set of papers, we conducted backwards and forwards search which then led to the final set of papers for our review (n=38). The reviewed articles have been published in the past three years 2020 (9), 2021 (21), and 2022 (8). Out of all articles, more than a third (15) directly refer to the COVID-19 pandemic. Half of those (7) frame the pandemic as a driver for the increasing deployment of PA. While the amount of literature mentioning risks of PA is increasing, less than half (14) of the articles describe the potential risks in-depth. The domains of the reviewed articles are diverse, with the majority stemming from Management and Organisation (17) and Information Systems (10), and few texts stemming from Computer Sciences (5), Ethics (3), Psychology (2), and Law (1).

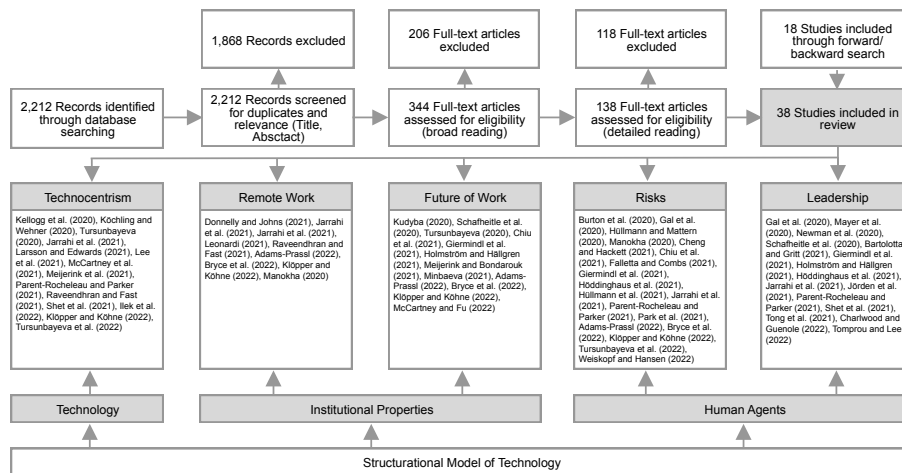


Figure 2. Literature Search and Conceptualisation Process.

Our literature review follows a concept-centric approach. We independently identified a set of concepts for our subsequent classification process of the literature. Next, we synthesised all concepts to develop a non-overlapping and coherent final set. During the classification process of the relevant articles, we continuously revised the set of concepts in discussions. The final concepts are *technocentrism*, *remote work*, *future of work*, *risks*, and *leadership*. Last, we hierarchically categorised and matched all concepts with the SMT dimensions. To do so, we assigned each concept to the dimension whose definition best reflected the concepts thematic character (i.e., technology, institutional properties, human agents). The resulting structure of concepts is:

1. **Technology**, referring to a positivistic or technocentric view of PA with little or no emphasis on potential risks (14 studies),
2. **Institutional Properties**, referring to structural shifts in the way people conduct work due to the COVID-19 pandemic and/ or digitalisation, for instance, the enabling character PA holds for decentralised working (16 studies),
3. **Human Agents**
  1. *Risks*, referring to ethical, social, or legal harm constituted by the use of PA for either companies or employees (18 studies),
  2. *Leadership*, referring to the challenges PA usage constitutes for managers and leaders and/ or the way PA transforms traditional leadership (15 studies).

Our categorization is not disjunctive. Consequently, publications are associated with more than one concept.

Next, we summarise the literature's findings embedded into the structure of the SMT and the resulting concepts. We start with the concept of technology as the most dominant theme. This includes literature that focuses on the benefits of PA and provides an optimistic outlook on its deployment. Following this, we elaborate on findings within the institutional properties concept, ascribing the challenges and implications PA holds for the decentralisation of work and pointing toward PA's enabling character for remote working. Further, this includes what we describe as *future of work*, investigating PA's transformational properties. Last, we focus on risk-related research within the human agents concept. This growing research stream focuses on creating awareness of PA's potential ethical, social, and legal risks. We bisect this category to account for the vast differences in the risks PA provides for leaders and employees. This includes the challenges PA holds for leadership and how it is transforming traditional approaches to people management.

### **Technology**

The potential benefits PA might hold in substituting or complementing traditional forms of leadership constitute a distinct topic within this stream of literature (Jarrahi et al., 2021). PA may be deployed throughout the entire employee life cycle and provide actionable insights into the performance of organisations, teams, and individuals (Tursunbayeva et al., 2022). PA allows to process the vast amount of data generated by employees, for instance, by using tools for digital collaboration (Meijerink, Boons, Keegan and Marler, 2021). This transforms what is perceived as otherwise underutilised data into vital points of insight for companies. Several studies emphasise the potential that the deployment of PA might hold for employees. As the feedback provided by PA systems is usually comprehensive and presented in a simplified form, it may help employees to gain a better understanding of their tasks and what is expected of them. Transparent and understandable algorithmic feedback also has the potential to increase worker productivity (Parent-Rocheleau and Parker, 2021). Using objective metrics to measure productivity and outcome of work across all employees could also improve conditions for women and other members of marginalised groups (Klöpper and Köhne, 2022). PA promises to develop individual personalized training programmes for employees, supporting both organisations and employees in obtaining new skills, fostering cultural and behavioural change, and supporting collaboration (Tursunbayeva, 2020). Further, workers' councils could gain helpful insights into the well-being of employees, such as information on overtime hours (Lee et al., 2021). However, these represent the minority – the majority of the technocentric literature focuses on the benefits for enterprises, especially on the potential economic value of PA. This has been a key theme in literature stemming from various disciplines such as IS, economics, or organisation strategy (Kellogg, Valentine and Christin, 2020). The deployment of analytics in the HR department is considered a future value driver for enterprises (Larsson and Edwards, 2021; McCartney, Murphy and McCarthy, 2021). Informed decisions in strategic management and a reduction of the HR headcount could lead to increased financial performance over time (Shet, Poddar, Wamba Samuel and Dwivedi, 2021; Charlwood and Guenole, 2022; Ilek, Maier and Weinert, 2022). In this notion, enterprises seek to minimise risks and increase productivity by deploying PA (Köchling and Wehner, 2020; Ilek et al., 2022).

Despite some notable ethical contributions, current PA research is dominated by optimistic and technocentric perspectives (Tursunbayeva et al., 2022). Though, it becomes clear that organisations are aware of moral and ethical issues: one dominant driver for the adoption of PA tools is, that organisations increasingly seek to eliminate human biases (Köchling and Wehner, 2020). Employees, however, often unaware of potential risks, are increasingly willing to accept the automated tracking of their behaviour if they are able to obtain personalised feedback or other benefits from it (Raveendhran and Fast, 2021).

### **Institutional Properties**

While deploying algorithms for management purposes has previously been an issue predominantly in the context of gig work, the COVID-19 pandemic and the subsequent reorganisation of the workforce also led to increased use in traditional organisations (Adams-Prassl, 2022). With increasing numbers of employees working from home, several organisations started looking for tools that would allow the monitoring of dispersed teams (Jarrahi et al., 2021). Here, PA appeared to be a ‘quick fix’ to meet the new management demands. As teams increasingly rely on digital collaboration tools, they generate high amounts of data, creating detailed logs of their behaviour, ready to be analysed by PA (Leonardi, 2021). The unprecedented extent of the data collection introduced during the COVID-19 pandemic has the potential to change employees’ behaviours and actions both working from home or in the company office (Bryce, McBride and Cunden, 2022). Some tools even collect and analyse log-in times, screenshots, and keystrokes to provide insights into employee ‘productivity’ (Jarrahi et al., 2021). In this regard, companies continuously explore new ways to track the behaviour of their employees, with many of them already tracking non-traditional metrics such as emails, biometrics, contact data, or social media activity (Raveendhran and Fast, 2021). In this context, existing literature also highlights the immanent potential of PA to function as surveillance software. In the context of surveillance, PA tools affect the disciplinary power of employers but also serve a self-disciplining function (Manokha, 2020). Meanwhile, the need to self-organise is high, particularly for employees working from home. Vendors of PA specifically address these needs, holding the prospect of offering individualised feedback to boost performance (Klöpffer and Köhne, 2022). Thus, both employees and employers are looking for ways to adjust to the new situation. The decentralisation of work can also be understood as *decontextualisation* and *recontextualisation*. As work is relocated in different geographical and technological contexts, human relations within companies also change (Donnelly and Johns, 2021). What started as decentralisation of work by companies to avoid facility costs, employees now turn into an opportunity for establishing better balance of life and work responsibilities.

Another distinct stream within the identified literature is the impact of digitalisation and automation on the future of work. Scholarly attention has focused on this topic for decades now, while the discourse on PA has only gained traction in recent years (Adams-Prassl, 2022). Meanwhile, PA has been named one of the top technologies that will change how people conduct work (Tursunbayeva, 2020). While PA’s deployment continues, debates on regulation and standards for its ethical and sustainable use are sparked among legislators, scientists, and practitioners (Klöpffer and Köhne, 2022). Although the challenges for HR professionals are well known, those trends towards data-driven employee management have only seen little progress in the previous decade but have now been accelerated tremendously by the COVID-19 pandemic (Minbaeva, 2021; Bryce et al., 2022). In the few discussions on PA in the context of the future of work, employees usually consider both immediate outcomes for their individual work and comparably distant implications for the world of work in general, such as the impact on working conditions (Chiu, Zhu and Corbett, 2021). Our society and the way we conduct work are changing at an unprecedented speed (Holmström and Hällgren, 2021). Consequently, the trend toward algorithmic management will likely persist, and scholars should prioritise analyses of how algorithms transform autonomy and management (Giermindl et al., 2021; Holmström and Hällgren, 2021; Klöpffer and Köhne, 2022). Although the promises of how much PA will change work are fairly strong, there is little evidence in the existing literature of how these promises have been or are being fulfilled (McCartney and Fu, 2022). Questions of autonomy and control have long been at the core of remote work and PA research. At the same time, datafication can vastly influence our understanding of traditional control configurations (Schafheitle, Weibel and Rickert, 2020). PA has been shown to both



restrain and enable the autonomy of workers, thus emphasising the duality of its nature (Meijerink and Bondarouk, 2021).

### **Human Agents**

*Risks*—following the calls of previous literature, researchers are increasingly investigating the ethical, social and legal challenges that entail the usage of PA tools (Falletta and Combs, 2021; Hüllmann, Krebber and Troglauer, 2021; Jarrahi et al., 2021; Adams-Prassl, 2022; Bryce et al., 2022; Weiskopf and Hansen, 2022), expanding the body of critical literature on PA (Gal et al., 2020; Giermindl et al., 2021; Klöpffer and Köhne, 2022; Tursunbayeva et al., 2022). Some scholars suggest that, for employees, PA might create more negative outcomes than benefits (Parent-Rocheleau and Parker, 2021). The most pronounced topic in this stream of literature is the discourse on algorithmic bias and discrimination. The underlying algorithms of the systems can reinforce and perpetuate biases, discrimination and social injustice (Hüllmann and Mattern, 2020; Cheng and Hackett, 2021; Giermindl et al., 2021; Klöpffer and Köhne, 2022; Weiskopf and Hansen, 2022). This may include identifying and labelling medical conditions, including disabilities, thereby sometimes violating existing legislation (Tursunbayeva et al., 2022). Data protection and privacy issues render PA a highly sensitive topic (Hüllmann et al., 2021). While previous debates on PA focus mainly on such privacy risks, it is increasingly becoming evident that surveillance has more wide-ranging effects on employees. The restriction of employee privacy and autonomy can negatively affect mental health. Digital surveillance and increasing levels of work intensity can foster stress, burnout and other health problems (Tursunbayeva et al., 2022). Moreover, constant monitoring of employees may cause employees to feel pressured into working more, thereby also causing health problems (Manokha, 2020). Beyond health-related issues, the high levels of surveillance through PA systems may also strengthen conflicts between groups in organisations, such as people with different religious beliefs or between smokers and non-smokers, as every break (e.g., smoking or praying) can be monitored – even if they are working from home (Park, Ahn, Hosanagar and Lee, 2021). Finally, constant surveillance can create employee conformity, preventing whistleblowing or unionising (Adams-Prassl, 2022). This could lead to vicious cycles, as unions are essential to protect employees from potential harm caused by algorithmic management. German legislation, for instance, recently strengthened the rights of workers’ councils to co-determine algorithmic systems (Klöpffer and Köhne, 2022). Another theme emerging within the reviewed literature is ‘algorithmic aversion.’ It describes resistance to deploying algorithmic systems or following its recommendations (Jarrahi et al., 2021). In the context of PA, research on algorithmic aversion focuses on understanding how PA should be designed in order to gain users’ trust and acceptance. This can entail either the education of employees on existing ‘myths’ about algorithms and, thereby, improve the acceptance of helpful support or the disguise of potentially harmful tools as trustworthy (Burton, Stein and Jensen, 2020; Höddinghaus, Sondern and Hertel, 2021). Thereby, knowledge on algorithmic aversion and how to prevent it can thus be used in the interest of employees or against them. Employees who work with systems they do (or can) not fully understand might lose their confidence, fear a potential loss of status within their professional group, and consider leaving the company (Chiu et al., 2021).

*Leadership*—the reviewed literature elaborates on the principles of leadership and the perception of human and algorithmic leaders. Leadership is defined as “*any process or practice that a leader undertakes to direct, motivate, or encourage his/her employees to achieve organisational objectives*” (Schafheitle et al., 2020, p. 3). The place in the hierarchy defines who has the right to *make* decisions and who is obliged to *follow* those decisions (Schafheitle et al., 2020). Algorithms increasingly perform managerial tasks that traditionally involved human decision-making and were executed by middle or upper management (Gal et al., 2020; Mayer, Strich and Fiedler, 2020; Parent-Rocheleau and Parker, 2021). Actions performed by algorithmic and human managers trigger different responses from workers (Tomprou and Lee, 2022). PA, as a mediator, both challenges and redefines the dynamics, relationships, and communication between managers and workers (Jarrahi et al., 2021). It is perceived to reduce employees’ autonomy and to foster a strong information asymmetry between managers and workers (Bartolotta and Gritt, 2021; Parent-Rocheleau and Parker, 2021). A distinct stream of literature elaborates on the risks for leaders and managers. As algorithmic management transforms contexts of

work by replacing expertise (Holmström and Hällgren, 2021), managers' positions are affected by those transformations (Jörden, Sage and Trusson, 2021). Deploying PA could erode the trust of employees in supervisors due to three reasons. First, algorithmic management can make employees question the need for human managers. Second, a lack of transparency of processes and goals of data collection can cause mistrust in the algorithmic system and the organisation (Tomprou and Lee, 2022). Third, a lack of data literacy among HR staff can lead to PA systems that are not adjusted to the needs of the employees: HR managers might work with biased or incorrect data due to a lack of experience handling such data (Shet et al., 2021). The same holds for supervisors. There is a high risk that they are overly confident towards trusting such systems (Giermindl et al., 2021), potentially leading to incorrect or subpar decision-making, further enhancing the potential loss of employee trust. Managers' trust in automated decision-making systems could ultimately lead to an erosion of tactical thinking, as they no longer have to make critical decisions by themselves (Giermindl et al., 2021; Jarrahi et al., 2021). Another distinct theme in this stream of literature is the acceptance of algorithmic leadership. This often overlaps with research on algorithmic aversion, outlined above. Currently, the literature provides mixed evidence on employees' trust in algorithmic systems. Tomprou and Lee (2022) exercised multiple studies and found that people would prefer human agents to read their application letters and evaluate their performance, as algorithms were perceived as "less fair." However, for scheduling or task assignment, algorithmic agents were trusted equally or more than human decision-makers. Compared to human managers, algorithms provide feedback with greater breadth and depth, leading to increased job performance. Though, if the source of the feedback is disclosed as algorithmic to employees, the performance is only average, and they perceive the feedback as less trustworthy (Tong, Jia, Luo and Fang, 2021). However, Höddinghaus and colleagues (2021) found that employees perceived automated decision-making as more transparent than decisions made by human leaders. Algorithmic evaluations can also be perceived as reductionist, leaving out crucial non-quantifiable information – and thus less fair despite removing human bias (Newman, Fast and Harmon, 2020).

## **4 Discussion**

### **4.1 Technocentrism prevents employee-centric perspective**

The SMT works on the notion that technology, human agents, and institutional properties influence each other reciprocally. However, while literature within the concept *technology* provides valuable insights, it does not sufficiently address either the positive or negative impact it has on employees. It also neglects the impact employees have on the system by constantly providing PA with their personal data. Further, technology mediates human action and thus social (inter-) action between employees. As human agency is needed in technology use and to give meaning to it, Orlikowski (1992) concludes that human agents have the choice of whether or not they use a specific technology. Nevertheless, she rightfully adds that in the workplace, human agents might not be able to choose freely whether to deploy a particular tool. This holds true, especially for PA, where employees might not even be aware of being subjected to the tool.

In reviewing the literature within this concept, one point stood out in particular: the ever-increasing importance of data as the basis for financial growth. The notion that companies make losses if they leave data underutilised is particularly interesting. Companies are increasingly gaining economic power as they are mining people's data, while there is yet no indication in the PA literature on how employees can possibly regain their data sovereignty or use their own data as a financial asset.

### **4.2 Institutional properties are both restricting and enabling**

The impact of institutional properties on workers vastly differs for PA compared to other earlier workplace technologies (e.g., email clients, fax machines). As PA accesses and processes, among other things, personal data, it is far more invasive than other workplace technologies. Currently, the framework conditions for remote work are being renegotiated in many organisations. At the beginning of the COVID-19 pandemic, it was not common in many countries, especially in Europe, to work from

home. Remote working has now become the new normal for many occupational groups, especially knowledge workers. In theory, deploying PA in remote work scenarios could amplify workers' flexibility and autonomy. By utilising the systems, employers could continuously monitor whether employees are performing their contracted responsibilities. Therefore, provided that the work does not require physical presence and fixed working hours, employees could well be working from home – or from anywhere in the world – and at preferred times of the day. This flexibility would be beneficial for many people, including those who have to care for children or other family members.

Another aspect of institutional properties is how companies deal with overtime hours. The inherent monitoring potential of PA renders the applications practical solutions to record employees' working hours accurately. In the US market, the use of productivity trackers is currently on the rise (Kantor and Sundaram, 2022). These tools not only record whether employees work overtime hours but also whether work is being done at all – especially in the context of remote work. The use of such systems requires the existence of reliable and universal measures for productivity. In the context of knowledge work, for example, such metrics are rather difficult, if not impossible, to develop. In 2022, the European Court of Justice decided that all companies must record working time (Ulber, 2022). The rationale for this decision was, among other things, to prevent unlawful or unpaid overtime. In the long term, it remains to be seen whether this decision will lead to an increase in the use of PA in Europe. This correlates with another finding: employees cannot escape the gaze of their employers, even in their own homes. The omnipresence of surveillance we see in public places is now arriving in employees' homes, another characteristic of the future of work. This is a matter that needs strict regulations.

Discussions about remote work are frequently linked to the issue of sustainability. It is considered to have the potential to contribute to greater sustainability, build communities by, for example, offering more flexible working hours for a better work-life balance and promote inclusion because people can work within their familiar environment. Yet, while PA can to some extent enable remote work, it can also negatively influence the aforementioned aspects. Our review of the literature reveals that the ostensible flexibility provided by remote work is often overshadowed by surveillance scenarios in the context of PA. Furthermore, the ability to work around the clock and the ability to track this through PA tools may raise employers' expectations, ultimately contributing to a lower quality of life for employees. As studies show, surveillance can stop workers from joining unions or cause the elimination of social interactions in the workplace. This is antithetical to community building.

### **4.3 Human Agents as a multidimensional construct**

Within the Human Agents concept, we reviewed literature discussing the potential risks for leaders and employees. Our findings reveal an apparent discrepancy in the distribution of those risks. The risks for employees are fundamentally different from those for leaders, and there seem to be significantly more risks for employees. For instance, studies describe risks for organisations stemming from the failure of PA projects. As Ilek and colleagues (2022) point out, the implementation of PA currently has a high failure rate. Yet, only seven per cent of the projects fail due to technical reasons: the majority of projects fail due to poor communication of the projects to employees, unclear goal-setting, and unpredicted challenges during implementation. Therefore, we propose that those risks should not be addressed as risks of PA as a technology but rather constitute challenges that might arise during PA introduction. Another potential risk for leaders is attributed to being overly trustful in the recommendations made by PA. This could potentially lead to subpar decision-making and result in the leaders' loss of skills. Critically assessing this risk indicates that this should also be described as a risk for employees, as they will be burdened with negative consequences of poor decision-making as well. The root cause of this risk lies within the responsibilities of the organisation and its leaders. The same holds true for risks associated with algorithmic leadership. Currently, this newly emerging theme provides mixed results with regard to risks and challenges. Leadership approaches that involve algorithms will likely change how employees perceive leadership and whom they perceive as a leader (Höddinghaus et al., 2021). Due

to unreasonable or unfair behaviour from human leaders, some employees may express more trust in algorithmic leadership. Yet, this is directly related to the behaviour and the reasoning of the leaders. Again, whilst this is frequently highlighted as a potential risk for leaders, the consequences for employees – and ultimately for organisations – emerging from poor leadership appear much more severe. In addition, unlike leaders and organisations, employees can exert little influence on the risks posed to them by PA. This further increases the imbalance of power between leaders and employees. By preventing unionising, creating a vast information asymmetry and potentially micromanaging every minute of employees' workdays, unprecedented mechanisms of control have emerged.

This resonates well with other currently emerging streams of research on leadership styles. Among these are, in particular, concepts that are often summarised as positive or moral leadership, such as authentic (Novicevic, Harvey, Ronald and Brown-Radford, 2006), ethical (Mihelic, Lipicnik, Tekavcic and others, 2010), servant (Sendjaya and Sarros, 2002), spiritual (Fry and Matherly, 2006) and the more established concept of transformational leadership (Carless, Wearing and Mann, 2000), as well as emerging theories around paradoxical leadership (Zhang, Waldman, Han and Li, 2015). Whilst research on employees' perceptions of algorithmic leadership is an emerging topic, the impact of PA systems on the relationship between employees and leaders and, thus, the impact on leadership styles is missing. A recent report found that companies currently need to redesign themselves for speed, with flatter hierarchies as the key takeaway (De Smet et al., 2020). However, our literature suggests that PA contradicts such trends towards flat hierarchies, as power imbalances between employees and leaders can potentially grow. Human agency is not only exercised by people directly associated with an organisation but also by the programmers or designers of such systems. Processes such as data set labelling ultimately have an enormous impact on the workers whose personal data are evaluated against training data sets that have been pre-selected and labelled in a certain way. However, only the critical contributions in the literature provide evidence that the PA as a technology is influenced, that is, biased from the outset. This is made salient by the application of Orlikowski's (1992) SMT: Human agency plays an essential role in both the development and use of PA. Unless it is clearly stated that human agency is responsible for biases and resulting discrimination or invasion of privacy, it is all too easy to shift responsibility to the underlying algorithms of PA. Algorithms, however, have no agenda of their own; they carry out what human agents have predetermined in the form of training data and assign labels. Outsourcing responsibility to algorithms, therefore, provides a practical loophole.

#### **4.4 Extended Structural Model of Technology**

Based on our literature review, we argue that – to better suit the nature of emerging technologies such as PA – the SMT needs to be extended for those contexts. As our findings indicate, the challenges, risks and implications with regard to the deployment of PA differ significantly between employees and leaders. Additionally, as employees and leaders are subjected to different functions and properties of the systems, it is essential to address those accordingly. This differentiation is necessary for gaining an in-depth understanding of potential risks posed by the systems. Figure 3 depicts the adapted SMT. In our extension of the model, we not only distinguish between employees and leaders as human agents (b1 and b2), but we also describe the relationships between them in a more nuanced way ( $\beta_1$ ). While in the original model, only the effect of technology on human agents and vice versa is described, we bisected this (b1 and b2) to better account for the vastly different implications PA has on leaders and employees. Finally, the technology (i.e., PA) mediates the interaction and communication between the human agents: employees and leaders ( $\beta_1$ ). Earlier technologies such as, for instance, email, also impact and mediate between employees and leaders, though on a very different scale. Whilst emails are sent between two (or more) people, the interaction with PA is often one-sided and sometimes anonymous. For example, leaders might see a dashboard depicting the current risk of unwanted fluctuation, where employees are represented as aggregated numbers to respect their data privacy. Employees themselves are subjected to this interaction, whilst leaders choose to interact with the system. This represents a fundamental difference. Employees are constantly visible, even in formerly “safe spaces” such as their own homes, and information about their activities is meticulously recorded. In the US, the first complaints about this situation have already been raised, as, in some organisations, the meticulous

recording of digital activities is equated with productivity. Time recorded by PA as unproductive or absent is not paid in these particular, though increasingly common, cases (Kantor and Sundaram, 2022).

We propose that it is particularly relevant in the context of PA to highlight the mediation of human action between leaders and employees ( $\beta_1$ ). Here, we find that employees largely lack the means to prevent the collection, analysis, and transmission of their data. Leaders are provided with insights that they often cannot directly relate to individuals because the data is usually transmitted in aggregated form. This ensures compliance with data protection regulations. In individual scenarios, however, it is well possible for leaders to obtain insights about individual employees. For instance, the aggregated data may be limited to a small team, in which the leader can infer to whom the displayed data probably relates. The mediation of the interaction between leaders and employees, therefore, results in a strongly one-sided communication in favour of the leaders. The use of the systems might also result in leaders perceiving the employees as mere numbers and statistical figures and less as human beings, which is not in the sense of humanistic management. The resulting power imbalance contributes to a further shift in traditional structures in an institution.

In addition, the manner in which technology “facilitates and constrains human action” (Orlikowski, 1992, p. 17) is more nuanced in the case of PA compared to earlier, not algorithm-driven technologies (b1 & b2). For employees and leaders, PA presents itself as a very different approach with different functionalities. Employees are subjected to the tracking of their data, while leaders receive charts and graphs on the employee-generated data. Employees may even feel the need to behave in a certain way so that their behaviour is captured in a fashion that seems *as productive as possible*. Leaders, on the other hand, are potentially influenced in their decision-making. For instance, it could be the case that, before implementing PA, the leader made decisions after a process of discussing with employees within the team or department. After PA implementation, those discussions might stop, and decisions might be made based on PA data. Scholars argue that leaders might actually lose some of their managerial competencies if they are overly confident in the recommendations of PA systems and thus stop to base their decisions on practical experience (Giermindl et al., 2021).

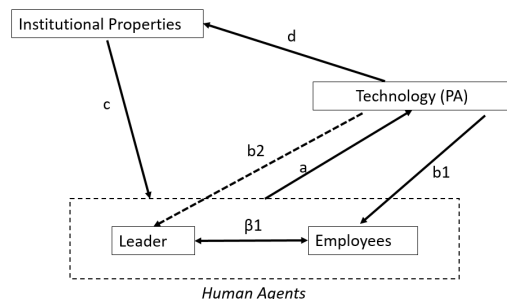


Figure 3. Adapted Structural Model of Technology.

## 5 Implications and Future Research

*Theoretical Implications*—our extension of the SMT provides the first step towards a theoretical model for studying the impact PA has on different groups within an organisation, particularly leaders and employees. Emphasising these differences can contribute to a more sustainable and employee-centric view of PA in practice. Researchers, vendors, and leaders alike must take the perspective of and the impact on employees into account. Our results indicate that the deployment of PA has the potential to dehumanise employees, whilst especially the vendors of PA portray the systems in a very different, much brighter light, arguing the systems will put the employee in the centre. Most notably, our study suggests that the risks of PA are not evenly distributed: employees are burdened with most of the risks associated with PA systems. We argue that this imbalance needs to be addressed more clearly.

*Practical Implications*—our study provides relevant insights for a range of stakeholders. Organisations that intend to implement PA must consider the needs of their employees and the potential impact of PA on power imbalances from the beginning. The impact of PA on hierarchies must be considered early on. Offering management training with a focus on leadership, remote work, and PA could be an important building block. PA manufacturers or vendors do carry responsibility for the design and impact of their systems. For instance, they could provide training material themselves. The implications of PA for employees necessitate immediate action. This entails that employees and their representatives are able to identify risks and intervene if necessary, requiring both training and sufficient transparency of PA systems themselves. The use of PA imposes conditions on employees that, when examined closely, render the ostensible flexibility of remote work and modern companies with flat hierarchies absurd. Thus, work relationships need to be discussed and renegotiated in the context of PA use. A specific number of working hours during which no monitoring may be performed, for example, could be contractually specified.

*Limitations and Future Research*—our extension of the SMT has yet to be empirically evaluated, which is undoubtedly a limitation of our work. At the same time, the current phase of restructuring the workplace, which we capture with our literature review, is an ongoing process, and real-life handling of PA may differ substantially from what we have found in our review. The reviewed literature primarily focuses on the U.S. labour market. As a result, the study includes PA practices that are not necessarily common or, in some cases, even legally compliant in other countries (e.g., within the EU). Our research clearly demonstrates that there are striking gaps in our current understanding of PA. We suggest that future research puts more emphasis on the people in ‘people’ analytics and the potential privacy intrusions. This entails not just data privacy but also the psychological implications of constant monitoring in physical spaces that have previously been considered private. Building on our model, we hope that future research can better study and capture the reciprocal relationship between technology and people in the context of emerging technologies such as PA. To that end, our model could be used in a field study to demonstrate the interaction between technology, people, and the company, in accordance with Orlikowski’s (1992) original contribution. Further, research on PA and leadership is of interest to the currently emerging research streams on different leadership styles.

To conclude, employees can rarely decide freely whether or not to be subjected to PA due to their economic dependence on their employer. Yet, existing guardrails often fall short of protecting employees from risks, especially as many of those risks are only indirectly related to data privacy. The current rise of the meticulous tracking of workplace activities is, in most cases, not in the interest of employees but in those of employers. Regardless of the goal of the PA implementation, however, the surveillance potential is imminent to PA systems and threatens to invade employee privacy. At its core, the debate often seems to be not about feasibility or existing technical solutions but primarily about power: PA can reinforce power imbalances between employees and employers. Minute-by-minute evaluation of workers’ activities at their desks goes far beyond the control known from Fordist and Taylorist scenarios. Clearly, much work still needs to be done. PA can and should be shaped by those most affected by its implementation. Although the adapted SMT proposed in this paper needs further testing, it provides an initial step for researching the social impact of PA in organisations.

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