

The Remote Work Equation

The Remote Work Equation

People, Processes, Performance and Policies.
Balancing Governance, Technology, Regulation
and Work Culture in the European Workscape

Edited by

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Introduction to *The Remote Work Equation*

In recent years, remote working has progressively moved from being a marginal organizational solution to becoming a structural component of contemporary work arrangements. What initially emerged as a contingent response to extraordinary circumstances has evolved into a stable and increasingly widespread mode of organizing work, affecting not only individual firms but also broader economic and social systems. This transformation has raised fundamental questions regarding how work is designed, governed, and evaluated, challenging consolidated assumptions about the relationship between space, time, and organizational control.

The growing relevance of remote and hybrid work is not limited to the internal dynamics of organizations. It extends to labour markets, public policies, and territorial development, influencing patterns of employment, access to opportunities, and the distribution of resources across different groups of workers and regions.

For firms, remote working represents both an opportunity and a source of complexity: it enables flexibility, access to a wider talent pool, and potential gains in efficiency, but at the same time it requires rethinking coordination mechanisms, managerial practices, and performance evaluation systems.

For workers, it introduces new forms of autonomy and work–life integration, while also generating risks related to isolation, blurred boundaries between professional and personal life, and unequal access to adequate working conditions.

In this context, remote working cannot be adequately understood through a single disciplinary lens or by focusing on isolated aspects. Rather, it must be approached as a multifaceted and systemic phenomenon, in which technological, organizational, legal, environmental, and behavioural dimensions are deeply intertwined.

This book is grounded in this perspective and aims to provide a comprehensive and integrated overview of the most relevant aspects associated with remote working, offering a structured framework to interpret its implications for organizations, workers, and policy-makers.

The main objective of the book is therefore to bring together different but complementary perspectives, each addressing a specific dimension of remote work, while maintaining a coherent and interconnected analytical framework. The chapters are not conceived as independent contributions, but as parts of a broader narrative that highlights the interdependencies among the various elements shaping remote working practices. Each chapter explicitly connects its focus with the issues discussed in the others, contributing to the construction of a unified and systemic understanding of the phenomenon.

This integrated approach represents one of the main strengths of the book. Remote working is often analysed through fragmented lenses – legal, technological, organizational, or psychological – leading to partial interpretations that risk overlooking the interactions among these dimensions. In contrast, the contributions collected in this book are designed to show how these aspects co-evolve and mutually influence each other. For instance, regulatory frameworks shape the boundaries within which organizations can design remote work arrangements; technological infrastructures enable or constrain organizational choices; environmental and psycho-social conditions affect both individual well-being and performance outcomes; and managerial control systems must adapt to these evolving conditions in order to remain effective.

Within this overarching perspective, the book is structured around a sequence of chapters that progressively develop the analysis of remote working from its institutional foundations to its managerial and operational implications, and finally to its broader policy consequences.

Chapter 1 situates remote working within the broader context of labour law and public policy, emphasizing the complexity of the regulatory environment and the multiplicity of sources that govern this form of work. It highlights how remote working interacts with issues such as employment protection, flexibility, and social inequalities, drawing attention to the potential for both inclusion and exclusion that characterizes this phenomenon. In particular, the chapter underscores the role of public policies in shaping equitable access to remote work opportunities and in addressing emerging disparities among workers and territories.

Chapter 2 builds on this institutional perspective by focusing on the evolution of digital labour markets and the increasing role of platform-based models of work. It examines the implications of algorithmic management and digital intermediation for the regulation of working conditions, with particular attention to the challenges posed by hyper-connectivity and the need to ensure adequate protection of workers' well-being. By exploring the concept of the right to disconnect and the regulatory mechanisms associated with it, the chapter provides important insights into the tensions between technological possibilities and the protection of fundamental rights in digitally mediated work environments.

Chapter 3 shifts the focus to the technological and infrastructural foundations of remote working, presenting a structured overview of the tools and systems that enable work to be performed across distributed environments. Rather than treating technology as a neutral background, the chapter frames it as a central component of the remote work ecosystem, highlighting how choices related to digital infrastructure, connectivity, data security, and collaboration platforms influence both organizational processes and individual work experiences. In doing so, it emphasizes the need for coherent integration between technological solutions, organizational practices, and governance mechanisms.

Chapter 4 introduces a process-oriented perspective, examining how organizations can analyse and manage work activities in flexible and remote settings. By focusing on process mining techniques and goal-oriented management approaches, it shows how organizations can move beyond traditional forms of supervision based on direct observation, and instead rely on data-driven insights to understand how work is actually performed. This perspective highlights the importance of aligning organizational objectives with the execution of activities, while also recognizing the challenges associated with data availability, interpretation, and implementation.

Chapters 5 and 6 explore the environmental and psycho-environmental dimensions of remote working, addressing both the physical characteristics of the work environment and the psychological experiences of workers. The analysis of the home office as a work setting highlights the role of spatial configuration, indoor environmental quality, and technological infrastructure in shaping comfort, health, and productivity. At the same time, the examination of psycho-environmental variables sheds light on the complex interplay between autonomy, isolation, stress, and well-being, emphasizing that remote work outcomes are not uniform but depend on a combination of individual, organizational, and contextual factors. Together, these chapters underline the importance of designing work environments – both physical and digital – that support sustainable and effective work practices.

Chapters 7 and 8 focus on managerial control and performance evaluation in remote and hybrid work contexts. They address one of the most critical challenges faced by organizations: how to assess and manage performance when traditional mechanisms based on physical presence and direct supervision are no longer applicable. By adopting an activity-based perspective, these contributions propose a shift in the unit of analysis from jobs or roles to the activities through which work is actually carried out. This approach allows for a more granular and multidimensional understanding of performance, taking into account not only efficiency and outcomes, but also the conditions under which activities are performed. In particular, the analysis highlights the importance of integrating objective performance indicators with information

on employees' preferences, perceptions, and experiences, recognizing that these factors play a crucial role in shaping how work is executed and, ultimately, in determining organizational results.

Chapter 9 brings together the insights developed throughout the book and translates them into a coherent set of policy considerations. It emphasizes that the challenges associated with remote working cannot be addressed through isolated or sector-specific interventions, but require coordinated and integrated policy responses. By identifying key principles and areas of intervention, the chapter outlines possible directions for supporting the sustainable development of remote work, balancing efficiency, equity, and resilience.

Across all the chapters, a common thread emerges: remote working is not simply a different location where work takes place, but a transformation that affects the fundamental mechanisms through which work is organized, coordinated, and evaluated. This transformation requires organizations, workers, and policy-makers to reconsider established practices and to develop new frameworks capable of capturing the complexity of distributed work arrangements.

In particular, the book highlights how the shift towards remote and hybrid work challenges traditional assumptions about control, visibility, and performance. In environments characterized by spatial dispersion and digital mediation, the direct observation of work activities becomes less relevant, and organizations must rely on alternative forms of coordination and evaluation. This shift entails moving from a logic centred on presence and supervision to one based on objectives, processes, and outcomes, while ensuring that such mechanisms remain aligned with workers' well-being and organizational sustainability. At the same time, the analysis underscores that remote working does not produce uniform effects across individuals and contexts. Differences in job characteristics, access to technology, quality of the work environment, and individual preferences all contribute to shaping heterogeneous experiences and outcomes. As a result, standardized approaches to remote work design and management may prove insufficient, and greater attention must be paid to contextual factors and interdependencies.

The systemic perspective adopted in this book allows these complexities to be addressed in a coherent way. By bringing together contributions that span legal, technological, organizational, environmental, and managerial dimensions, the book provides a comprehensive framework for understanding remote working as an integrated phenomenon. The connections established among the chapters are intended to guide the reader through this complexity, showing how each dimension contributes to the overall functioning of remote work systems.

Ultimately, the aim of this book is not only to describe the current state of remote working, but also to offer analytical tools and conceptual frameworks that can support its effective governance. By highlighting both opportunities

and challenges, and by emphasizing the interdependencies among the different dimensions involved, the book seeks to contribute to a more informed and balanced debate on the future of work. In this sense, remote working emerges as a key domain in which broader transformations of contemporary economies and societies become visible. Its evolution will depend on the ability of organizations and institutions to design solutions that are not only efficient, but also equitable and sustainable. The integrated perspective developed in this book is intended to support this effort, offering a structured and coherent interpretation of a phenomenon that is likely to remain central in the years to come.

SUGGESTED FURTHER READING

- Barrero, J. M., Bloom, N., & Davis, S. J. (2023). The evolution of work from home. *Journal of Economic Perspectives*, 37(4), 23–49. <https://doi.org/10.1257/jep.37.4.23>
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1. Remote working and inequalities: Public policies and regulatory framework

**Giovanna Iacovone, Carla Spinelli and Aurora
A. Vimercati**

1. REMOTE WORKING, ORGANISATIONAL CHOICES AND INEQUALITIES: THE QUESTIONS AT STAKE

The relationship between organisational choices and the flexibility granted to employers in defining how work is to be carried out in terms of the workplace and working hours has always been a complex and controversial issue, and still is a subject of debate, particularly among labour law scholars. This issue assumes an even greater degree of intricacy within the paradigm of remote working that, in traditional terms, means working outside the employer's premises on a continuous basis.

As is well known, this phenomenon has existed for years, although it is somewhat circumscribed to specific types of workers (Felstead 2022, p. 16). However, in recent decades, the advent of the internet and digitalisation have facilitated the use of remote working, mainly in terms of home-based teleworking. Besides, the trends towards the digitalisation of work and increasing flexibility in work arrangements have been greatly accelerated by the crisis caused by the SARS-CoV-2 virus, when the implementation of physical distancing measures to combat the spread of the virus led to many workers working from home all or most of the time (Ker et al. 2021; Eurofound 2022a; 2022b; 2023a; 2023b).

This allowed a large number of companies and workers to experience remote working for the first time, highlighting both the positive and negative aspects connected to it. It is now clear that remote working and more flexible work organisation arrangements are becoming an increasingly important feature for employers and employees in Europe (European Agency for Safety and Health at Work 2023, p. 4), suggesting that it has evolved from an emergency

contingency measure into a structural opportunity to reshape work organisation and social structures across Europe.

Despite the growing importance of flexible working arrangements, many issues remain unresolved, especially when considering the shift to a new paradigm of work organisation and the working conditions that this entails (Eurofound 2022b, p. 59). From a general perspective, it is important to note that there is no standard definition of remote working (López López 2026; see Section 3 below), although there is a basic consensus on its multifaceted function. The broad concept of remote working is indeed generally conceived as a way of working that meets the needs of companies and their employees, and contributes to sustainable growth objectives, if not the well-being within a community or society, in line with sustainable growth objectives (see Section 5). Although there are potential advantages for workers, companies and society alike, realising this potential relies on a multitude of factors.

For the purposes of this chapter, attention will be focused on those factors which, according to some, could jeopardise the scope and effectiveness of existing labour law systems:

the blurring of boundaries between private and professional life, the resulting extension of working hours and intensification of the pace of work, the disproportionate impact of these phenomena on gender, and the expansion of occupational health and safety risks beyond traditional workplaces. (Countouris et al. 2023, p. 12)

This is particularly worrying when one considers how technology allows managerial prerogatives to extend beyond the boundaries of the employment contract, making it easier to resort to false self-employment while maintaining tight control over pseudo independent contractors (Countouris et al. 2023). In addition, further concerns arise from the increasing use of platform-mediated forms of work, including outsourcing processes (cf. Chapter 2 in this book). Ultimately, it is argued that the phenomenon under consideration may exacerbate social and economic inequalities among workers so to foster an unfair distribution of wealth, rights and opportunities (Turrin 2024, p. 372). Among the most entrenched disparities, it is worthwhile to draw attention to the divide between those who are able to work remotely and those who are not, the disparity between more and less developed regions across the European Union (Corazza 2022; Eurofound 2024) or even the discrepancy in treatment between standard and non-standard workers (Perulli 2026). Overall, it seems reasonable to believe that a more worker-centred regulation of remote working is desirable, and that this will require, over time, a reconfiguration of important elements of employment protection and social security legislation at a supranational level (Countouris et al. 2023, p. 12). However, the path towards achieving this is not without further challenges, starting with the need to question

entrenched workplace culture (see Chapters 4, 6 and 8 in this book), given that “some of the tensions surrounding the use of remote work are, to a large extent, a reflection of a certain managerial culture profoundly rooted in a pre-modern understanding of managerial control, understood as direct or bureaucratic control, over the labour force” (Countouris et al. 2023, p. 12). This, in turn, leads to a need to redefine corporate culture, which raises fundamental questions about the role and function of trade union representation (Countouris and De Stefano 2023, p. 147; Perulli 2026). In fact, to create an equitable remote working environment, it is important to encourage and maintain fair and equal dialogue and bargaining (Aloisi and De Stefano 2020). However, remote working – and the digital economy more generally – weakens solidarity between workers and their trade unions, who find it more difficult to organise and communicate with remote workers (Ranaraja 2022; see also Section 2.3 below). The question that arises is therefore crucial, especially when considering that “ensuring effective access to collective rights, institutions and processes in the digital workplace constitutes a democratic (and market-democratising) re-embedding safety valve” (Vergis 2026, p. 66).

Ultimately, this sheds further light on the debate surrounding the need to reconsider the concept of work itself (Stone and Arthurs 2013; Davidov 2016; Albin 2024) in the face of systemic societal challenges such as the fear of technological replacement, climate change, demographic shifts and rising inequalities. The aim is to enhance the transformative potential of work when constitutional principles and fundamental rights are at stake.¹ To this end, it is worth considering how the Sustainable Development Goals adopted in the UN 2030 Agenda may be relevant to remote working, given that this framework also takes into account the environmental and social pillars embedded within it (Novitz 2026).

¹ A vivid example of the difficulty of this challenge is provided by Article 2 and Article 3, paragraph 2, of the Italian Constitution, with regard to the duty of the Republic to remove those obstacles of an economic or social nature which constrain the freedom and equality of citizens, thereby impeding the full development of the human person and the effective participation of all workers in the political, economic and social organisation. This can be achieved through policies that promote equal opportunity, provide adequate social services, ensure full participation in civic life and protect human dignity as an individual and within the social groups in which one’s personality is expressed. However, it will maybe prove to be more difficult to deal with such objectives in face of the ongoing deep transformation concerning work and especially now that the link between work and place has been severed. Without a workplace, it becomes more difficult to imagine work as a “social formation” in which the worker develops his personality.

2. LABOUR LEGISLATION AND PUBLIC POLICIES

2.1 The EU Framework

According to the European social partners' Framework Agreement of 2002 (European Telework Agreement), telework is defined as "a form of organising and/or performing work, using information technology, in the context of an employment contract/relationship, where work, which could also be performed on the employers' premises, is carried out off those premises on a regular basis". A critical point in this definition concerns the expression "on a regular basis", referring to the work performance carried out outside the company's premises. It seems to leave out, beyond the intention of the social partners to adopt a broad notion of remote work,² those types of remote work in which this regularity could be lacking, as in the case of occasional, mobile or alternating telework.

In the Report on the Implementation of the European Telework Agreement,³ as a result of the analysis of the national regulations considered, the European Commission suggested a modification of the definition of telework adopted by the social partners, consistent with what had been its original proposal in this regard, that is, to provide for a quantitative threshold for qualifying remote work.⁴

There is no doubt that the expression "on a regular basis" could have more than one meaning. On the one hand, it can be considered as inherent to the

² Cf. ETUC, *Framework Agreement on Telework – Interpretation Guide*; www.etuc.org.

³ EU Commission (2008), *Report on the Implementation of the European Social Partners' Framework Agreement on Telework*, SEC (2008) 2178, Bruxelles.

⁴ "The Commission therefore proposed the following definition of telework: 'Telework is a method of organising and/or performing work which accounts for at least a considerable proportion of working time and which is done by a natural person in the framework of an employment relationship, in the following cumulative conditions:

- the work is done at a distance (away from the firm's premises or away from the place where the work is expected),
- the work is performed using information technology and technology for data transmission, in particular the internet'.

Definitions based on these factors could cover the three types of telework identified: teleworking from home, mobile teleworking (via portable communication systems) and work in telework centres (outstations, neighbourhood offices, telecottages). They could also cover both permanent and alternating telework, i.e. arrangements whereby the worker spends part of his/her working time at the employer's premises and the rest elsewhere" (paragraph 3.1).

temporal continuity of telework, which cannot be occasionally performed to be qualified as such. On the other hand, it could entail that work shall be performed permanently outside the workplace.

Adopting a narrower interpretation of the definition of telework would mean that ICT-mobile work, which is a form of remote work with a high rate of mobility as it is not bound to a specific place to perform work, and remote work, conceived as a system of organisational flexibility that combines work remotely and results orientation, so as to operate a balance between business goals and individual needs, could not be covered by the European Telework Agreement concerning teleworkers' working conditions. In this perspective, to address the challenges of these new kinds of working arrangements a strong EU legislation on working conditions can be applied anyway, such as the European Framework Directive on Safety and Health at Work,⁵ the Working Time Directive,⁶ the Work–Life Balance Directive⁷ and the Transparent and Predictable Working Conditions Directive,⁸ provided that the possibility to adjust the employment conditions to the particular characteristics of this form of work is duly considered.

In the same vein, the European social partners' Framework Agreement on Digitalisation of 2020, adopted within the framework of the European Social Dialogue, also covers, in a broad sense, many remote work-related issues (Senatori 2020). More precisely, the crucial questions afforded in the Agreement concern digital skills, modalities of connecting and disconnecting, as well as intrusive monitoring through remote surveillance. All these topics will be analysed in detail in the next section, since they constitute the major weaknesses of working conditions, related to home-based telework, ICT-based mobile work and smart/agile work, that the pandemic experience have brought to light.

On 28 June 2022, the European social partners signed a work programme from 2022 to 2024, that included the negotiation of a legally binding agreement on “Telework and the right to disconnect”. The social partners had agreed to review and update the Telework Agreement of 2002 (Huybrechts 2022) to be put forward for adoption as a legally binding agreement implemented via a Directive. However, the negotiation process was very hard and definitely failed

⁵ Directive 89/392/EEC.

⁶ Directive 2003/88/EC which is relevant insofar as it limits weekly working hours and regulates minimum daily rest periods.

⁷ Directive 2019/1158/EU, which extends the existing right to request flexible working arrangements (including remote work arrangements and flexible work schedules) to all working parents and carers.

⁸ Directive 2019/1152/EU, which contains provisions related to place of work and work patterns.

in November 2023. Following their inconclusive negotiations, the European social partners asked for the issue to be addressed by the Commission. As a consequence, the EU Commission launched a two-stage consultation of European social partners to gather their views on the possible direction of EU action on ensuring fair telework and the right to disconnect. Adopting a legislative initiative at EU level in order to set a common regulatory ground would be very useful in order to improve the protection of workers in all forms of telework.

A successful negotiated solution has already been adopted on teleworking abroad, following the initiative of the Administrative Commission for the Coordination of Social Security Systems, to deal with the high number of employees working from home for some days a week but having an employer and office situated in another Member State (Pochet 2021). From 1 July 2023, a new multilateral Framework Agreement on the application of Article 16 of Coordination Regulation EC 883/2004 in cases of habitual cross-border telework entered into force, which is essential to ensure the free movement of persons within the European Union. The agreement has been signed by 22 States so far.⁹ The personal scope of the Framework Agreement is limited to habitual cross-border teleworkers who are in an employment relationship and fall under the application of Article 13(1)(a) of the Coordination Regulation EC 883/2004.¹⁰ It allows that the legislation of the State of the employer is applicable, upon request.¹¹ In other words, the Framework Agreement does not introduce new “automated” rules, since a request by the employer or employee is necessary, but foresees a simplified procedure and offers legal certainty in advance for social security issues (Aceto 2023).

2.2 Some Comparative Insights

It is mainly on the basis of the definition and regulation of remote work foreseen by the European Telework Agreement 2002 that national legal frameworks of EU Member States were enacted before the pandemic, while in some countries only more recently and because of that. The rapid rise in the adoption of remote working during the Covid-19 pandemic has shown the weaknesses of the existing legal framework across EU Member States. Some of them had

⁹ The list of the signatory States of the Framework Agreement, as well as the date from which the Framework Agreement applies in each of the States concerned is available at <https://socialsecurity.belgium.be/en/internationally-active/cross-border-telework-eu-eea-and-switzerland>.

¹⁰ Article 2(2) of the Framework Agreement 2023.

¹¹ Article 3 of the Framework Agreement 2023.

too restrictive rules, which did not meet the specific needs related to affording the pandemic.¹²

A derogatory approach towards the existing regulations was adopted by national governments in their emergency legislation, in order to make it easier to implement a high level of home-based telework to face the pandemic through social distancing. As a consequence of the forced wide pandemic experiment of remote work, a debate has spread in these countries about the necessity to adapt or integrate the existing regulations to address the challenges and opportunities of remote working, particularly in a post-pandemic scenario. In Portugal, for example, the legal regime on remote work has changed under many aspects with the enactment of Law No. 83/2021, which foresees amendments and additions to the Labour Code (Amado and Coelho Moreira 2022).

In other countries, where there were no regulations on remote work at all, a debate arose on the opportunity and/or necessity to introduce an ad hoc legislation. One notable example is Spain, which adopted the Royal Decree-Law No. 28 in September 2020, introducing a comprehensive legislation covering remote working (Fernández Collados 2021).

The Scandinavian countries have confirmed the regulation of remote work among the competences of collective bargaining, according to their voluntary industrial relations tradition. In Finland, for example, remote working levels were already relatively high compared to the EU average pre-pandemic due to several factors, such as the larger proportion of workers in knowledge- and ICT-intensive service sectors, the institutional setting, the level of digitalisation and the prevailing culture of trust. At this current time, the definition of remote work is not foreseen by the Finnish legislation but is rooted within workplace practices and collective agreements.

Indeed, in most EU countries collective agreements are the main instruments in large companies currently shaping the use of remote work, ICT-mobile work and smart/agile work, complementing or not statutory legislation. This is the case in Germany (Krause 2023; Santagata De Castro 2022), for example, where, according to the traditional industrial relations system, it is left to the social partners to regulate these aspects of work organisation.

In Italy, the European Telework Agreement has been implemented by the National Cross-sectoral Agreement of 2004, signed by the leading trade unions and employers' organisations of the private sector. Indeed, specific clauses on remote work are present in industry-wide collective agreements of prominent branches, such as trade, banking, telecommunications, clothing and cleaning, embracing roughly 70% of employees in the private sector. Even the concept

¹² *Italian Labour Law e-Journal*, 13(1S) (2020): Special Issue: Covid-19 and Labour Law. A Global Review.

of smart/agile work was originally elaborated by a number of pioneering company agreements, which inspired the later enactment of Law No. 81 of 2017 on “agile work”. Notwithstanding the legislative choice to support individual autonomy, leaving it to the parties of the employment contract to determine a wide range of working conditions through the so-called “agile work pact”, the social partners did not give up their negotiating prerogatives, neither before nor during the pandemic (Senatori and Spinelli 2021).

Emerging from the analysis developed above, we can see that there are a plurality of sources of law, at EU and national level, that have to be taken into account when looking for regulatory solutions for critical issues related to remote work, ICT mobile work and smart work. Therefore, much is left open to interpretation, which explains the heterogeneity of the approaches and the uncertainty of the results in terms of the employment protections which can be granted to those flexible workers.

2.3 The Regulatory Criss-crossing

The Framework Agreement on Telework of 2002 (Article 11) provides for the information and consultation rights of workers’ representatives on the introduction of telework “in accordance with European and national legislations, collective agreements and practices”. In most EU countries collective agreements are the main instrument currently shaping the use of remote work and hybrid work in large companies, either complementing or replacing statutory legislation.

According to a 2022 Eurofound study with regard to the regulatory framework of remote work (Eurofound 2022b), EU Member States can be categorised into two main groups, distinguished by the prevailing role of statutory legislation or collective bargaining respectively. However, within the first group of countries, several clusters had been identified, which were distinguished on the basis of the degree to which collective bargaining has developed and plays a regulatory role anyway. This scenario is explained as a consequence of the different industrial relations models practised in the countries, as well as other aspects related to national institutional settings and the political context.¹³ The report compares the consequences for the coverage of

¹³ The differences in telework regulations across EU Member States have recently been analysed from various analytical perspectives, with the aim of gaining a more comprehensive understanding of the diversity of telework across Europe. As well as the procedural and substantive rules that regulate telework, two other analytical dimensions were observed: workplace remote work practices and environmental aspects that are potentially related to the possibility of teleworking and the demand for it (Sanz de Miguel et al. 2026).

provisions and the protection of workers of national regulations, as a consequence of the different combination between statutory law and collective bargaining in each cluster (Ratti and García-Muñoz 2024). Interestingly, another Eurofound study of 2022 observes how in most countries, where national-level regulation on remote work provides a generic framework, collective agreements and social dialogue are effective ways to protect workers at company level. Instead, where no social dialogue exists, it can be difficult to implement national-level regulation at company level and effectively protect employees (Eurofound 2022a, p. 64). This provides clear evidence that social dialogue is relevant to enhance workers' rights at every stage of implementing remote or hybrid working arrangements.

The effective implementation of trade unions and workers' representatives' rights in the workplace is of paramount importance in strengthening social dialogue at company level. However, enforcing these rights in increasingly virtual workplaces is challenging. The fragmentation of companies and the greater mobility of workers present countless challenges to representation systems. Overcoming the "materiality" of workplaces due to digitalisation requires us to rethink the ways in which the rights of trade unions and workers' representatives are exercised. In response to these issues, there is a growing demand for trade unions to undergo a digital transformation, in terms of using digital means to both enhance communication and exercise their rights at the workplace. This is not merely a tool to amplify workers' voices, it is also a strategy that enables trade unions and workers' representatives to continue to fulfil their fundamental role of organising and representing workers.

3. DEMATERIALISED WORK AND SPATIAL-TEMPORAL FLEXIBILITY: A LABOUR LAW PERSPECTIVE

The displacement of the spatial component of work can be considered both from a theoretical perspective as a potential paradigm shift for the world of work and, more pragmatically, as a challenge for the implementation of specific regulatory regimes. The proliferation of remote and hybrid work models poses essential challenges to labour regulation systems and trade unions (Countouris et al. 2023, p. 12).

In the face of the unfolding Covid-19 crisis, a really important form of labour market adjustment has been the mass shift to working from home, which has not only prevented further job losses, but has also supported public health efforts by reducing social contacts (Soares et al. 2021). However, such a sudden and huge shift to remote work has been implemented almost everywhere but without appropriate organisational arrangements and within the emergency legislation framework (Eurofound 2020; 2021).

Nevertheless, as a consequence of its widespread use, remote working has become more appealing within business re-organisations.¹⁴ Moreover, the mass uptake of remote work during the Covid-19 pandemic reduced some of the stigma that had previously been associated with this type of working arrangement. Working outside the employer's premises is presented as a potential win–win work organisation pattern, which can match the employers' interest in improving flexibility and productivity and the workers' interest in work–life balance (Senatori and Spinelli 2021).

As a consequence, longer-term growing demands for remote work have been developing in the post-pandemic scenario (Aksoy et al. 2022). In this perspective, remote work could give a new impetus to the much-needed human-centred agenda for the future of work,¹⁵ provided that regulators, companies, workers and their unions become aware of the pitfalls of contractual distancing.

In particular, remote working is not a one-size-fits-all solution but it requires that many factors are aligned in terms of a supportive culture, appropriate systems and trust-based work environment (Spinelli 2024). More precisely, the most relevant aspects concern: (1) time and work organisation; (2) health and safety; (3) digitalisation; (4) communication; (5) training; (6) performance management; (7) work–life balance; and (8) gender dimension.



1. *Time and work organisation.* According to several surveys, employees working from home tend to work longer hours than when they are working on the employer's premises. This tends to happen partly because the time to commute to the workplace is replaced by work itself, partly due to changes in work routines and to the blurring of the boundaries between paid work and personal life (Eurofound and the International Labour Office 2017; Messenger 2019). Remote and hybrid work offers workers a higher degree of autonomy in organising time and space of their work performance, which is an asset. Autonomy, however, can also lead to an intensification of work when combined with heavy workloads and work cultures dominated by competition, self-management or mechanisms to enforce performance. Working time regulations establishing daily and weekly limits have to be respected to face the negative consequences of working time flexibility in remote work.
2. *Health and safety.* Performing remote work can affect both physical and psychosocial health. The main hazards for the health of teleworkers are the unavailability of ergonomic work equipment and a dedicated working

¹⁴ For a case study on Italy, see Bratti et al. (2024).

¹⁵ ILO (2019), Global Commission on the Future of Work, *Work for a Brighter Future*, Geneva.

area, the risk of overwork and psychosocial implications of working from home. According to most national laws and collective agreements regarding health and safety, the employer is responsible for the protection of the occupational health and safety of workers, and this typically applies to remote working as well. The employers' responsibilities include identifying and managing the occupational risks of remote workers. It is of paramount importance to involve health and safety representatives in this process, with the obligation of consultation, information and training.

3. *Digitalisation* is defined as a socio-technical, constantly evolving process that takes place on the individual, organisational, societal and global levels and across all sectors. Since the beginning of the pandemic, the pace of the digitalisation process has quickened as well as the adoption of digital technologies by enterprises. Those two factors encouraged workers to carry on working remotely. Mass teleworking, coupled with digitalisation, offers many opportunities but carries several risks as well. Companies therefore need to weigh the risks against the possibilities before they invest and roll out a new piece of technology to their workforce. For this reason, several tools were – and are still being – developed to track and monitor the activity of employees working from remote locations, increasing possible side effects on their dignity and privacy.
4. *Communication*. It should be highlighted that the lack of face-to-face interaction with colleagues represents another main concern for remote workers. As a matter of fact, research evidence shows that teams that work remotely face more significant communication challenges than face-to-face teams. These challenges multiply over time: the more team members spend time working apart, the more the degrees of separation between them and the sense of professional isolation increase. This definitely results in the erosion of teamwork: workers tend to share less information with their colleagues and in some cases have difficulty interpreting and understanding the information they receive. Full-time remote working causes a real risk of social and professional isolation which could potentially play out on a massive scale. For this reason, organisations should introduce and increase informal opportunities for workers to connect or adopt hybrid forms of remote work.
5. *Training*. In order to safeguard employees' well-being and maintain agreed work performance standards, it is necessary for both workers and managers to reassess working habits and learn new skills. Adequate training is therefore required to keep workers motivated, adopt different working modalities and maintain good team collaboration.
6. *Performance management*. To be effective, remote working needs to maintain a high standard of team performance. The best method to manage remote workers is through a process called Management by Results,

whereby both manager and employee agree on a common productivity measurement mechanism. For this to be effective, it is necessary to identify objectives, tasks, milestones and monitor and discuss progress, allowing personnel to have the flexibility and autonomy to organise their work (cf. Chapters 7 and 8).

7. *Work–life balance.* Blurring boundaries and the difficulties to maintain work–life balance are among the biggest problems that arose during the pandemic. Work–life conflict is one of the most significant challenges that remote workers and especially home-based teleworkers experienced during the pandemic. Indeed, the Covid-19 crisis shattered the notion that paid work and personal life are two entirely separate domains, as well as dispelled the ideal myth that workers can and should always be available to perform their work-related functions (cf. Chapter 2).
8. *Gender dimension.* The world of work, including remote work, is gendered. Existing social and economic gender inequalities and challenges for women were aggravated by the pandemic, meaning that it is time that companies and other organisations become more gender-responsive in their actions. Women working on the frontline in healthcare or working from home while also dealing with childcare and household chores need to be safeguarded. In this regard, organisations should improve HR policies regarding flexible working in a gender-oriented perspective.

4. GENDER EQUALITY AND CARE ISSUES

4.1 Flexible Remote Working Arrangements and Caring Purposes

As already noted, there has been a worldwide boom in remote working during the Covid-19 pandemic and, since then, it “has not vanished entirely”, although it has shifted towards some sort of “‘hybrid’ model, mostly combining a couple of days per week working from home with a few days in the office”, with significant direct and indirect gendered effects (Silvera 2025, p. 48).

Remote working, and the large-scale use that has been made of it in its broad sense (López López 2026), has indeed proved challenging from a gender perspective, bringing back to the surface – in an even more amplified form – long-standing issues concerning the social division of labour. This is particularly the case given that more women than men have taken advantage of remote working, thus reviving gender segregation and the discrimination associated with it (Arabadjieva and Franklin 2023, p. 61).

It is commonly held that working from home offers the opportunity to achieve a better work–life balance thanks to the flexibility it allows in terms of space and time, including the possibility of combining work with domestic

and care tasks, taking advantage of the time saved by not having to commute to and from work (Arabadjieva and Franklin 2023, p. 66; Eurofound 2022b).

This *de facto* relevance of remote working from a gender perspective is apparently acknowledged by the law. This is the case of the already mentioned Italian Article 18, paragraph 1 of Law No. 81/2017, explaining that the rationale of agile work is “to increase competitiveness and facilitate the reconciliation of work and private life”. This does not mean that there exists a right to flexible working; not even in the case governed by paragraph 3 bis – introduced by the 2019 Budget Law (Law No. 145/2018) and subsequently amended by Legislative Decree No. 105/2022, concerning the implementation of Directive 1158/2019 on work–life balance for parents and carers (see the next sub-paragraph). In fact, this provision added a final paragraph referring to workers who have care responsibilities in various capacities, which indeed merely recognises a priority in the allocation of flexible working arrangements in favour of workers who find themselves in such circumstances and who request them (Vallauri 2024, p. 256).

Generally speaking, flexible arrangements at work are largely permitted or even promoted in many EU legal systems; both in the interests of the organisation and, conversely, of the worker in reconciling work and personal, family and social needs, as is the case with part-time work (Silvera 2025, p. 49). Nevertheless, the law does not usually specify the actual ability of workers to effectively balance work with other needs, so that the flexibility offered by these mechanisms appears misleading, at least from the workers’ point of view.

This seems to imply that the advantages for the company (in terms of increased productivity and competitiveness, reduced absenteeism, savings on workplace set-up) would be certain benefits resulting from flexible organisation: as if workers who negotiate with their employers for remote working conditions that suit their work–life balance needs were finally able to do so on an equal footing, thanks in part to the greater bargaining power that comes from being able to guarantee better results for the other party.

However, the assumed dual function of remote working may turn out to be a mechanism used by one party to the detriment of the other, even more so because the contracting parties are free to agree – that is, in the Italian legal context – on a use of remote working that satisfies even one of the two purposes. How, then, can we not doubt the real suitability of this tool to promote harmonisation and redistribution between productive work and care work and, hypothetically, to intervene in the strong power imbalances between genders?

From a gender equality perspective, the increasing use of remote working – particularly remote working from home – by female workers could reinforce existing gender stereotypes that associate women with the domestic sphere and gender roles related to care responsibilities (EIGE 2021). Most importantly,

this may lead women to take on more unpaid care work, given their willingness to perform such tasks alongside unpaid domestic labour within the household. Gender roles are perpetuated by this (Fredman and Fudge 2016; Beltrán 2026). However, this can cause conflicts between professional and private life, potentially resulting in interruptions to work. Such interruptions could in turn result in a decline in performance, affecting career prospects and ultimately contributing to mental and physical health risks.

The crucial point to address here is the very idea of conciliation together with the many risks commonly associated with the misuse of the conciliation mechanism and its tools: the risk of an increase in the amount of unpaid work performed by women; the risk of increasing work intensity and of a blurring of the boundaries between paid work and private life, as well as the risk of reducing women's visibility in the work community and hindering women's career progression; and the risk of increasing online violence and harassment against women (Arabadjieva and Franklin 2023, p. 66).

In the context of labour law, this entails placing the person at the centre of the discussion and considering the power dynamics that primarily revolve around time management but also affect broader issues, invoking a plurality of rights, starting from the right to work and encompassing the constitutional principle of equality in all its forms.

This is why remote working must be placed in a broader context and discussed not only in terms of conflicting interests, but also as an opportunity to enhance socio-economic and cultural alliances while fostering better coordination between policies and regulations (Beltrán 2026). More generally, such a comprehensive approach offers a deeper understanding of unequal power relations offering insights into feminist debates while questioning fixed categories and their patriarchal roots (Butler 2022).

To this end, mechanisms and instruments that regulate flexible working arrangements must be carefully examined in order to understand their real impact on social roles, while taking into consideration the influence of the organisational and cultural structure of companies and therefore the need for change.

Being aware of the many side effects that the misuse of flexible work arrangements may entail in a gendered perspective may be especially helpful when considering traditional welfare institutions such as pensions, unemployment benefits, family transfers and tax systems, as well as the aforementioned arrangements of flexible work. Hence, the need to move away from their presumed neutrality and challenge the assumptions about the division of labour between men and women that are often taken for granted (Saraceno 2018, p. 117).

From an even broader perspective, exploring the boundary between paid work and personal life offers a valuable opportunity to reconsider a fundamental



concept in feminist literature that is still greatly underestimated in current legal and political debate (Fotaki 2023; Fredman 2024). This concept is care, the relevance of which has been highlighted and reinforced by the pandemic, stressing the importance of rethinking it in connection with vulnerability and recognition issues (Butler 2015; Bancou 2024), and questioning the way in which they are experienced and organised in contemporary working life.

As suggested by a well-established doctrine, care “should be regarded as a constitutional value, performing a similar role to existing constitutional commitments to core values such as freedom, equality, and dignity” (Fredman 2024, p. 754), taking meaningful steps to promote social justice and democratic resilience. Care is indeed “a necessary and important social activity” (Fredman 2024, p. 757), provided that “a better care system is economically sound, as a means both to generate employment and to create a healthier, better-educated, and more productive population” (Fredman 2024, p. 757).

4.2 Remote Work Arrangements in the Light of EU Non-discrimination Law

Far from being a refined piece of rhetoric or a kind of wishful thinking, social justice and democratic resilience seem to be the very issue at stake when dealing with practices of flexible work arrangements, especially in the light of reconciling family and work in a gendered perspective within remote working.

In line with the above observations, it seems reasonable to argue that remote working should be considered as a multifaceted tool that has different implications and can serve different purposes. Reference has already been made to the importance of public policies in making its use beneficial for both employers and employees as well as consistent with social justice objectives (see also later in the chapter). However, this does not mean that the regulatory dimension is of little importance.

This is all the more important in view of the prolonged period of instability and insecurity that seems to be looming on the horizon. In fact, there are widespread concerns about the scope for (effective) freedom and self-determination of the individual within relational models in which the totem of individual choice risks obscuring the real dynamics of power. All this also evokes – and raises once again – the question of autonomy and self-determination at the heart of original feminist demands. Anti-discrimination legislation can be helpful in understanding how to approach organisational choices when faced, for example, with a request to benefit from working arrangements that facilitate work–life balance.

In this regard, it is worth mentioning EU Directive 2019/1158, which adopts a concept of work–life balance expressed in terms of “work–family balance”, aimed at achieving gender equality through “the participation of women in

the labour market and the equal sharing of care responsibilities between men and women” (recital 6). This is a kind of selective work–life balance (as it focuses on care needs) and a targeted one (as it is intended to have an impact on employment and demographic dynamics influenced by gender inequality). Despite the selective focus on objectives, the scope of work–life balance measures is broad. In terms of beneficiaries, this broad scope is reflected in particular in the virtually very inclusive category of “caregivers”. As regards work–life balance tools, this results in a significant range of measures: beyond the issue of “leave” (which has in any case been expanded in terms of types), with which work–life balance in Europe has long been almost synonymous, “flexible working arrangements” are considered (Article 3.f) as an autonomous tool, and not only (as in the previous Directive 2010/18) as an ancillary/complementary solution to leave and available upon return.

Most importantly, according to recital 34 of the 2019 Directive:

[I]n order to encourage workers who are parents and carers to remain in the work force, such workers should be able to adapt their working schedules to their personal needs and preferences. To that end and with a focus on workers’ needs, they have the right to request flexible working arrangements for the purpose of adjusting their working patterns, including, where possible, through the use of remote working arrangements, flexible working schedules, or a reduction in working hours, for the purposes of providing care.

Accordingly, Article 9 of the same Directive requires Member States to take “the necessary measures to ensure that workers with children up to a specified age, which shall be at least eight years, and carers, have the right to request flexible working arrangements for caring purposes”.

Although the Directive does not go so far as to require Member States to frame the measure in the form of a potestative right for the worker, but rather merely prescribes an obligation for employers to take into account requests made for flexible working arrangements, it is also true that it requires the employer to “consider and respond to requests for flexible working arrangements (...) within a reasonable period of time, taking into account the needs of both the employer and the worker”. Above all, according to the same provision, employers “shall provide reasons for any refusal of such a request or for any postponement of such arrangements” (Article 9, paragraph 2). In other words, the employer, in justifying the refusal or postponement, may not omit to explain the assessment made of the opposing needs, arguing the reasons that made their own, of an organisational nature, prevail over those of the applicant, related to work–life balance. This motivation can be subject to review by the judge who will be able to assess the legitimate exercise of the power of refusal or referral in terms of the reasonableness of the decision taken.

In this regard, the comparative analysis offers heterogeneous insights, mostly depending on the regulatory criss-crossing (see Section 2.3), particularly when considering the binding force of collective agreements. In any case, either the law or collective agreements often provide grounds for acknowledging the right to remote working in situations involving parental or care responsibilities. For example, the Portuguese law No. 83/2021 expressly provides for a right to remote working for parents, establishing specific rules that vary according to the age of their children and other circumstances. In other countries, such as France, the law requires employers to provide a specific reason for refusing a request from a parent or carer in special circumstances (Article L1222-9 of the Labour Code).

5. CHALLENGES AND OPPORTUNITIES FOR PUBLIC POLICIES

5.1 Remote Work and Territorial Development

In the light of the above observations, there are good reasons to understand remote work as an instrument for pursuing social objectives. The large-scale adoption of remote working brought about by the pandemic has given rise to some sort of structural opportunity to reshape work organisation and societal models across Europe (Xiang 2022).

While legal debate has focused primarily on redefining the employment relationship, managerial prerogatives and workers' rights, a broader socio-legal perspective reveals substantial positive externalities that extend beyond individual labour contracts to affect entire communities. Smart working, understood as a flexible, digitally enabled form of working, can promote territorial cohesion, gender equality and, more broadly, the advancement of a sustainable development model that is socially, environmentally and economically aligned with EU priorities (Miciukiewicz et al. 2012).

One of the most significant impacts of smart working is its potential to address the long-standing territorial disparities that characterise the national – and, more broadly, European – landscape. These disparities are not confined to the traditional north–south divide but also extend to the systemic gap between large metropolitan areas and rural or inner territories (Eurofound 2024). Such economic, social and cultural inequalities pose a challenge to substantive equality, as geographical location can effectively prevent individuals from reaching their full potential and participating in economic, political and social life.

Remote working offers a practical solution to the depopulation of small municipalities and rural areas, which is often linked to the weakening of local economies. By decoupling the place of residence from the employer's physical

location, smart working enables citizens to choose where to live based on personal preferences and the quality of life in a given area, rather than mere proximity to productive activities. This shift could generate reverse demographic dynamics, facilitating new settlement patterns and supporting the revitalisation of areas affected by long-term demographic decline.

The experience of the pandemic clearly demonstrated the potential connection between smart working and the reconfiguration of demographic trends at a national level. This bottom-up revitalisation could stimulate renewed local development, private investment and the restoration of essential services that were previously discontinued due to declining populations.

However, a precondition for these processes is overcoming the “digital divide” – disparities in access to fast, reliable broadband – which remains a key structural obstacle to inclusion. Accordingly, EU funding instruments such as Next Generation EU (NGEU) and the Recovery and Resilience Facility (RRF) prioritise digital transition in pursuit of the objective of “social and territorial cohesion”, recognising the digital infrastructure as essential for equitable territorial development.

Specifically, the NGEU programme was established as a long-term development strategy to move beyond the immediate pandemic emergency, aiming to lay the foundations for a future-oriented Europe (Yanini 2022). Its general objective is to promote economic, social and territorial cohesion by enhancing resilience, supporting the green and digital transitions, and mitigating the social and economic impacts of the crisis. Financed through the unprecedented issuance of common European debt on financial markets, NGEU operates primarily through the RRF, which funds national plans designed to overcome pre-existing structural weaknesses (Clarizia 2021).

This instrument represents a paradigm shift in public policy, as it focuses on performance and the achievement of specific targets (milestones and targets) rather than merely the regularity of expenditure, thus driving structural reforms and fostering sustainable growth.



Moreover, digitalisation is not merely conceived as a technological domain, but as a cross-cutting enabler of sustainable urban transformation that enhances quality of life, resource efficiency and territorial competitiveness (see Section 3). In line with the European Commission’s definition, smart cities use digital tools to improve citizens’ well-being, enhance mobility, reduce pollution, optimise resource management and provide safer and more inclusive public spaces. In this context, remote working supports peripheral communities and helps to prevent “brain drain”, enabling individuals to work for companies based in industrial hubs or overseas while living in urban or rural areas.

In Italy, for example, after centuries in which demographic development was based on productive capacity, small towns and peripheral areas that had experienced progressive decline due to mass emigration caused by the lack

of industrial development in many areas of the country are now returning to the fore. Through this change of course, however, the attractiveness of places would no longer be dictated by the availability of economic activities, but rather by the personal choices of workers.

5.2 Remote Working and Inequalities

Remote working may also generate substantial social sustainability benefits, particularly with regard to work–life balance. Having greater autonomy over working hours can have a positive impact on personal and family life, making it easier to balance professional duties with personal responsibilities (see Section 4.2). This issue is particularly relevant in the context of gender equality. Despite progress in female participation in various professions, women remain significantly underrepresented in senior positions and continue to face structural barriers. A key challenge in achieving substantive gender equality is dismantling biases related to maternity and presumed limitations in terms of availability, flexibility and commitment.

Remote work, combined with digitalisation, is a strategic tool that can counter these dynamics. By reducing the emphasis on physical presence and offering increased temporal and spatial flexibility, remote working can help to remove outdated stereotypes and support women in managing care responsibilities without facing disproportionate career penalties, in line with EU gender equality strategies. As is well known, remote working can bring significant economic benefits to both employers and employees. Businesses benefit from reduced fixed costs, including those associated with traditional office spaces, while workers save time and money on commuting.

At a macroeconomic level, decentralising qualified labour can stimulate urban regeneration and promote economic growth in previously marginalised areas, thus reinforcing the objectives of the EU Cohesion Policy. This aligns with the “place-based approach” promoted by the EU, which aims to reduce persistent inequality in specific places through integrated, tailored public goods and services designed with local participation (Zimmerman and Atkinson 2021).

From an environmental perspective, reduced daily commuting leads to lower greenhouse gas emissions, less traffic congestion and better air quality – all of which are outcomes that align directly with the EU’s objectives under the European Green Deal, particularly with regard to sustainable mobility and environmental protection.

The full realisation of remote working requires a robust and coherent support framework, beyond its potential. Effective governance depends on public policies that address digital infrastructure gaps and ensure the availability of essential services throughout the territory. Collective bargaining and

regulatory frameworks will also play a vital role in shaping an agile working model that balances flexibility with the protection of workers' physical and mental well-being (see Section 2.3). This includes their right to clearly separate working and personal time, an issue that is gaining recognition at the EU level through initiatives on the right to disconnect (see Chapter 2) and the prevention of work-related psychosocial risks (see Chapter 6).

About the risks, one cannot ignore the danger of phenomena such as time porosity, that is, the continuous interference between work time and personal time, which can lead to stress, burnout and alienation. The constitutional concept of work, in fact, prevents it from being reduced to a mere means of income, but sees it as "an indispensable factor in moral growth and personal fulfilment", which is also nourished by interaction and relationships with others. This is why collective bargaining is playing a crucial role in defining advanced organisational models, such as "F.O.R. Working" (Flexibility, Objectives, Results) or "Work FOR Future", which go beyond the logic of time control to embrace management by objectives: in other words, models that value the trust and responsibility of the worker, increasing their autonomy and promoting their well-being, also understood as a clear separation between the professional and private spheres (the so-called right to disconnect, which contrasts with the logic of the so-called "always-on culture", which corresponds to the tendency of workers who perform their work remotely to feel obliged to guarantee constant availability and consequent compliance with orders, even when these arrive outside working hours).

Therefore, a complex regulatory environment integrating legislation, collective agreements and individual arrangements is needed to overcome cultural and organisational obstacles, particularly the limited diffusion of a results-oriented work culture, and the misconception that remote working is merely remote work or a welfare instrument.

In the current climate of uncertainty, a one-size-fits-all, top-down approach would be ineffective. It is essential to establish a virtuous and lasting relationship between remote work and territorial development, and this requires the broad mobilisation of all relevant stakeholders – enterprises, social partners and local authorities.

The separation of the physical workplace and the place of work performance induced by the pandemic has marked a structural turning point. From this perspective, the European Union emerges as an indispensable partner, providing support not only through regulatory initiatives such as the right to disconnect and occupational health, but also through financial instruments that promote innovative models of social and economic organisation, empowering local and national initiatives aimed at revitalising peripheral communities and fostering territorial cohesion.

ATTRIBUTIONS

All the authors have prepared and written the initial draft, though the single sections have to be attributed as follows: Sections 1 and 4 to Aurora Vimercati; Sections 2 and 3 to Carla Spinelli; and Section 5 to Giovanna Iacovone.

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2. A blueprint to better protect remote workers' right to disconnect: Some thoughts on the EU Platform Work Directive

Alessandro Rosanò

1. INTRODUCTION

Over the last 15 years at least, the rise of collaborative economy has brought about significant changes to the economic landscape in general (Anczuk-Gorywoda, 2016; Busch, Schulte Nölke, Wiewiórowska-Domagalska, & Zoll, 2016; Dyal-Chand, 2015; Finck, 2017), to the labour market in particular, and, consequently, to the rules that apply to the labour market (Davidson, Finck, & Infranca, 2019; De Stefano, 2016; Finkin, 2016), including those developed by the European Union (EU).

In order to clarify the key points of the previous sentence, it is worth starting with the European Commission's definition of collaborative economy. According to the Commission, collaborative economy refers to business models in which activities are facilitated by platforms that create an open market for the temporary use of goods or services usually provided by private individuals (European Commission, 2016b). It brings together three categories of individuals: service providers; users; and intermediaries. Service providers share goods, resources, time, and/or skills. They are private individuals and may carry out their activities on an occasional basis or in a more professional capacity. Users benefit from the services. Intermediaries connect service providers and users and facilitate transactions between them through an online platform. Therefore, platforms provide an information society service, normally for remuneration, at a distance, by electronic means, and at the request of a user and, by facilitating relationships between service providers and users, they generate new job and income opportunities, allowing individuals to work flexibly (European Commission, 2016b).

Furthermore, the European Commission has identified some key characteristics of platforms, which: can create new markets; compete with traditional ones; operate in the context of multilateral markets, but with varying degrees of control over direct interactions between groups of users; benefit from network effects, with the result that the value of the service increases as the number of users increases; are based on information and communication technologies; and play a pivotal role in creating digital value, facilitating new entrepreneurial ventures and generating new strategic dependencies (European Commission, 2016a; Van Cleynenbreugel, 2017).

In 2021, the European Commission reported that over 28 million people in the EU were working through digital labour platforms and that this figure would reach 43 million by 2025 (European Commission, 2021b). Therefore, it can certainly be argued that online platforms (search engines, social media, e-commerce platforms, app stores, price comparison sites, etc.) have become increasingly central to European social and economic life (European Commission, 2015) and that platform work is a new form of employment that emerged over the last years (Aloisi, 2022).

Precisely for this reason, in 2020 the European Commission pointed out that the sustainable growth of the digital platform economy requires improving the working conditions of workers, taking into account priority issues relating to professional status, working conditions, access to social protection for platform workers, access to collective representation and bargaining, as well as the cross-border aspects of this type of work (European Commission, 2020).

Unsurprisingly, in recent years there has been growing interest among legislators, courts, and scholars in work carried out via digital platforms, primarily due to the difficulty of adequately defining the nature of the working relationship between service providers and platforms. On the one hand, platform workers are free to decide whether and when to work by connecting to the platform application; on the other hand, workers are subject to the contractual and organisational conditions established by the platform itself and accept that all aspects of their work are guided by the platform (Donini, 2019; Perulli, 2021). Therefore, the distinction between employed and self-employed work becomes less clear in this case and can lead to abuse by platforms.

Furthermore, attention should be paid to the importance of algorithmic management systems in the relationship between workers and platforms (Adams-Prassl, 2022; Aloisi & De Stefano, 2022). As has been said, 'technology is increasingly taking over functions customarily executed by employers. In "datafied" workplaces, orders are issued via collaborative platforms [and] data are constantly and granularly collected' and algorithmic management systems are now a universal and intrinsic feature of the platform-based business model (Aloisi & Potocka-Sionek, 2022, p. 30).

It is precisely this feature that makes it possible to draw a parallel with remote working, meaning work carried out at a distance by an employee connected to the company headquarters via information technology (Iacovone, Spinelli, & Vimercati, Chapter 1 in this book; for a focus on the more technical aspects of remote working, see Chiesa, Ciano, Figini, & Tedeschi, Chapter 3 in this book). The problems that arise in the relationship between workers and platforms in relation to algorithmic management may be similar, if not identical, to those encountered in the relationship between remote workers and employers, particularly with regard to the problems posed by the hyper-connectivity of workers and, therefore, the need to protect the workers' well-being (Kühitz & Tizi, Chapter 6 in this book) and maintain a clear demarcation between working hours and rest periods.

For this reason, this chapter focuses on Directive (EU) 2024/2831 on improving working conditions in platform work (the so-called Platform Work Directive, or PWD), as it can provide useful insights for addressing the issue of protecting workers' right to disconnect at the European level.

2. AN OVERVIEW OF THE PLATFORM WORK DIRECTIVE

In the political agenda defined for her first term, the then candidate for President of the European Commission, Ursula von der Leyen, stated that the transformation processes underway in the digital sector had already led to significant changes in the labour market and that, for this reason, it was necessary to examine how the working conditions of platform workers could be improved (von der Leyen, 2019). It appears that discussions began within the European Commission and other EU institutions towards the end of 2019 on how to improve the working conditions of platform workers, with particular emphasis on collective bargaining and access to social protection (Espinoza, 2019). Discussions with stakeholders were held starting in early 2021, highlighting that digitalisation had created new opportunities in terms of income, job creation, and entrepreneurship, and facilitated flexible working arrangements, but that some types of platform work were associated with precarious working conditions, resulting in a lack of transparency and predictability in contractual arrangements, health and safety issues, and inadequate access to social protection (European Commission, 2021a). In particular, it was necessary to address issues relating to employment status, working conditions, access to social protection, access to collective representation and bargaining, cross-border dimension of platform work, algorithmic management, and training and professional opportunities for people working through platforms (Aloisi & Potocka-Sionek, 2022).

Aware of these issues, in September 2021 the European Parliament adopted a resolution noting that the legal framework of both the EU and the Member States in this area was unsatisfactory, mainly due to problems relating to the exact classification of platform workers, with the result that there was a regulatory gap regarding new working methods, which had a direct impact on workers' rights and the functioning of online platforms (European Parliament, 2021c). For this reason, the European Parliament welcomed the initiatives already launched by the European Commission.

In December 2021, the European Commission presented a proposal for a directive on improving working conditions in platform work. In particular, it aimed to ensure that people working through digital platforms could be attributed the correct employment status in light of their actual relationship with the digital labour platform, to ensure fairness, transparency, and accountability in algorithmic management in the context of work through digital platforms, and to increase transparency, traceability, and awareness of developments in work through digital platforms (European Commission, 2021b; for a comment, De Stefano, 2022).

The path to its approval was extremely bumpy (Verhuyck, 2024). On the one hand, the European Parliament pushed for legislation that would further strengthen protections for people working through platforms, while on the other hand, the Council of the EU wanted a less stringent directive, with the result that the trilogues between the Commission, Parliament, and Council proved extremely difficult (Bourgery-Gonse, 2023, 2024). Therefore, the proposal was subject to several radical amendments, especially with regard to the presumption of the existence of an employment relationship (Adams-Prassl, Aloisi, Countouris, De Stefano, & Rainone, 2025).

The compromise reached between the European Parliament and the Council in early 2024 came as a surprise (Ratti, 2022) and led to the adoption of the PWD, which must be transposed by the EU Member States by 2 December 2026 (Directive (EU) 2024/2831, Article 29).

Pursuant to the provisions of the PWD, a digital labour platform is defined as a natural or legal person who provides a service, at least in part, remotely via electronic means, and at the request of the recipient, which involves the organisation of work performed by individuals for remuneration and the use of automated monitoring systems or automated decision-making systems (Directive (EU) 2024/2831, Article 2(1)(a)). Platform work is defined as work organised through a digital labour platform and performed in the EU by an individual on the basis of a contractual relationship between the digital labour platform or an intermediary and the individual (Directive (EU) 2024/2831, Article 2(1)(b)). Persons performing platform work means an individual performing platform work, irrespective of the nature of the contractual relationship or the designation of that relationship by the parties involved (Directive

(EU) 2024/2831, Article 2(1)(c)), whereas a platform worker is any person who performs work through digital platforms and who has, or is deemed to have, an employment contract or employment relationship as defined by law, collective agreements, or practice in Member States, having regard to the case law of the Court of Justice (Directive (EU) 2024/2831, Article 2(1)(d)).

The decision to adopt this act is based on the awareness of the difficulties involved in identifying the exact legal classification of the relationship between workers and platforms and the need to regulate automated monitoring systems and automated decision-making systems based on algorithms, which are used by platforms to organise and manage work through digital platforms (Directive (EU) 2024/2831, Recitals 7 and 8). Therefore, rules have been introduced to facilitate the correct identification of the employment status of persons performing work through digital platforms and to promote transparency, fairness, human oversight, safety, and accountability in the algorithmic management of work through digital platforms, defining minimum rights that apply to all persons performing work through digital platforms (Directive (EU) 2024/2831, Article 1).

Therefore, Member States must establish adequate and effective procedures to verify and ensure that the employment situation is determined on the basis of facts relating to the actual performance of the work (Directive (EU) 2024/2831, Article 4). It is presumed that the contractual relationship between a digital labour platform and a person performing work through that platform constitutes an employment relationship if there are facts indicating direction and control, but this presumption may be rebutted by the platform (Directive (EU) 2024/2831, Article 5(1); in more general terms, on this aspect, see Stewart & McCrystal, 2019).

As regards algorithmic management, it is envisaged that digital labour platforms, through automated monitoring or automated decision-making systems, will not be able to process certain personal data, such as data relating to the emotional or psychological state of the person performing work through digital platforms, private conversations, and personal data to infer racial or ethnic origin, migrant status, political opinions, religious or philosophical beliefs, disability, health status, including chronic diseases or HIV status, trade union membership, sex life or sexual orientation of a person (Directive (EU) 2024/2831, Article 7). Given that the processing of personal data by a digital labour platform using automated monitoring systems or automated decision-making systems is a type of processing that may present a high risk to the rights and freedoms of natural persons within the meaning of Article 35(1) of Regulation 2016/679 (the General Data Protection Regulation), platforms must carry out a data protection impact assessment (Directive (EU) 2024/2831, Article 8). Digital labour platforms must inform workers about the use of automated monitoring systems or automated decision-making systems,

in particular regarding whether such systems are in use or are being introduced, the categories of data and actions monitored, supervised, or evaluated by such systems, including evaluation by the recipient of the service, the purpose of the monitoring and how the system is to carry it out, and the categories of decisions that are taken or supported by such systems (Directive (EU) 2024/2831, Article 9).

Furthermore, digital labour platforms must regularly assess the impact of individual decisions made or supported by automated monitoring systems and automated decision-making systems on persons performing work through digital platforms and ensure that there are sufficient human resources to effectively supervise and evaluate the impact of individual decisions made or supported by automated monitoring systems or automated decision-making systems (Directive (EU) 2024/2831, Article 10). Persons performing work through digital platforms have the right to obtain, without undue delay, a reasoned explanation, orally or in writing, in a transparent and intelligible manner, from the digital labour platform for any decision taken or supported by an automated decision-making system, and have the right to ask the digital labour platform to review the decisions taken and to obtain a response to that request (Directive (EU) 2024/2831, Article 11; on this topic, Aloisi & Potocka-Sionek, 2022; Rosin & Parviainen, 2025; Veale, Silberman, & Binns, 2023).

In addition, digital labour platforms must assess the risks of automated monitoring systems or automated decision-making systems to their safety and health, in particular with regard to possible risks of work-related accidents and possible psychosocial and ergonomic risks, assess whether the safeguards of such systems are adequate for the risks identified, taking into account the specific characteristics of the working environment, and introduce appropriate preventive and protective measures (Directive (EU) 2024/2831, Article 12(1)). Platforms shall not use automated monitoring systems or automated decision-making systems in any way that unduly pressures digital platform workers or otherwise jeopardises their physical and mental health and safety (Directive (EU) 2024/2831, Article 12(3)).

Persons performing platform work must have their right redress protected in the event of violations of their rights under the PWD (Directive (EU) 2024/2831, Article 18) and national courts or competent authorities may order the digital labour platform to produce any relevant evidence within its control (Directive (EU) 2024/2831, Article 21). Member States shall take the necessary measures to protect persons performing work through digital platforms from any unfavourable treatment by the digital labour platform and from any adverse consequences resulting from a complaint lodged with the digital labour platform or from proceedings brought to ensure compliance with the rights provided for in the PWD (Directive (EU) 2024/2831, Article 22) and to prohibit the dismissal or termination of the contract of persons performing platform work (Directive

(EU) 2024/2831, Article 23). Furthermore, Member States must introduce effective, dissuasive penalties proportionate to the nature, gravity, and duration of the infringement committed by the undertaking and to the number of workers affected in cases of infringements of the internal rules transposing the PWD (Directive (EU) 2024/2831, Article 24).

Finally, it is provided that the PWD cannot constitute a valid reason for reducing the general level of protection already afforded to digital platform workers in Member States and does not affect the prerogative of Member States to apply or introduce laws, regulations or administrative provisions that are more favourable to digital platform workers or to promote or allow the application of collective agreements that are more favourable to digital platform workers (Directive (EU) 2024/2831, Article 26).

3. THE PLATFORM WORK DIRECTIVE AS A BLUEPRINT TO BETTER PROTECT REMOTE WORKERS' RIGHT TO DISCONNECT

The digital transition is having a profound impact on the organisation of work, so much so that some claim that platforms, through the use of artificial intelligence and algorithms, will become the main operational tools of businesses (Abriani & Schneider, 2021). This calls for new mechanisms to protect workers' rights or for existing ones to be adapted in order to address new scenarios and related issues. As discussed above, one such issue concerns the correct classification of the relationship between workers and digital platforms, while another relates to the algorithmic management of work performance. In light of this, it can be argued that, while promising flexibility and autonomy, platform work has been shown to promote precariousness and insecurity, as it combines the challenges of casual work with those of algorithmic management (Fredman, Du Toit, Bertolini, Valente, & Graham, 2025).

Thus, the importance of the PWD stems from its ambition and ability to operate on two levels, namely by involving two regulatory areas, the social and the digital (Aloisi, Potocka-Sionek, & Ratti, 2025) and for this reason it can offer a model not only for regulating platform work, but also for broader regulation of issues relating to work in the context of the digital transition, thus potentially influencing future developments in EU labour law (Countouris & Adams-Prassl, 2024; Mangold, 2024).

One of these concerns the excessive connection of workers through digital tools. This is one of the many issues relating to algorithmic management, given that the latter encompasses a wide range of tools and techniques for remote workforce management and, therefore, also for monitoring workers (Article 29 Working Party).

Echoing the European Parliament's statement in 2022 regarding the spread of artificial intelligence, there is a problem concerning the increased use of surveillance in the workplace, which often occurs without workers' knowledge, let alone their consent, with detrimental consequences for privacy, data protection and, more generally, workers' human dignity, as well as for their mental health (European Parliament, 2022).

This raises the issue of the right to disconnect, described as the 21st-century right to privacy (Ray, 2002a, 2002b), which should be understood as a remedy that allows workers to remain selectively online, counteracting the hyper-connectivity imposed outside working hours through company tools, given the negative effects this could have on the physical and mental health of employees. The right to disconnect is, therefore, the right of workers to be unavailable, which should prevent employers from contacting them at certain times of the day and week, thus counteracting non-stop work and workaholism (Fenoglio, 2018; Zucaro, 2019).

For the purposes of remote working and the proper protection of remote workers, that represents a key issue, which is confirmed by the fact that over the last few years, several European countries have adopted regulations on the matter. However, the differences between the various legislations are evident, given that sometimes the concept of the right to disconnect is defined (for example, in Greece), while, in most cases, legislators have merely identified the methods for protecting this right. In some cases, the rules apply only to remote workers (in Greece and Italy), while in others, they apply to all workers (in France). Furthermore, it should be noted that some legislations emphasise the role of collective bargaining in order to make the right to disconnect effective (in France and Spain), while others leave the matter to be regulated by individual contracts (in Italy) (Rosanò, 2024).

For this reason, the European Parliament passed a resolution on 21 January 2021 calling for the adoption of a directive to harmonise the rules in this area (European Parliament, 2021a).

In particular, the European Parliament has defined the right to disconnect as a fundamental right that is an integral part of new working patterns in the new digital era and an important tool of social policy at EU level to ensure the protection of the rights of all workers, and in order to urge the European Commission to take action, it has drawn up a proposal for a directive. The proposal states that the right to disconnect allows workers not to perform work tasks or communicate with their employer outside working hours using digital tools, to disconnect from work tools and not to respond to requests from their employer outside working hours, and that it should apply to both public and private sector workers (European Parliament, 2021b, Recitals 1–11, Articles 1–2). According to the European Parliament's proposal, Member States must take the necessary measures to enable workers to exercise this right and establish

an objective, measurable, and accessible system for measuring the duration of daily working time (European Parliament, 2021b, Article 3). Other minimum safeguards concern the practical arrangements for disconnecting from digital tools, health and safety assessments, the criteria for granting employers an exemption from the obligation to implement workers' right to disconnect, the criteria for determining how to calculate compensation for work performed outside working hours, and awareness-raising measures (European Parliament, 2021b, Article 4). No unfavourable treatment (including dismissal) is permitted against workers who exercise or attempt to exercise their right to disconnect, nor is any unfavourable treatment or consequences permitted as a result of a complaint made to the employer or proceedings brought to ensure compliance with the right to disconnect (European Parliament, 2021b, Article 5). A right of redress must be recognised in cases where the right to disconnect is deemed to have been infringed (European Parliament, 2021b, Article 6), and effective, proportionate, and dissuasive penalties must be applied in cases of infringement (European Parliament, 2021b, Article 8).

It should be noted that the European Commission has not yet drawn up a proposal for a directive and that it seemed to prefer that the social partners conclude an agreement on teleworking and the right to disconnect (European Commission, 2023). However, the negotiations proved inconclusive. Therefore, the European Commission launched a consultation with a view to taking further action in the future (European Commission, 2024), which has recently entered its second phase (European Commission, 2025). According to the Commission, a right to disconnect could be introduced through a legislative initiative, which could apply either only to employees performing telework, or only to employees in teleworkable jobs or to all employees in the public and the private sector (European Commission, 2025). The relevant instrument could set broad principles, which should be implemented by the Member States or social partners, or could set minimum requirements on the implementation of the right to disconnect and possible derogations for specific occupations or sectors (European Commission, 2025).

Pending the development of specific legislation, the PWD could serve as a testing ground and template for the right to disconnect, with a view to effectively protecting this right within the EU legal system and developing a better legal framework for remote working.

From this point of view, it is worth noting that several of the provisions contained in the European Parliament's proposal for a directive on the right to disconnect correspond to provisions in the PWD. Therefore, it could be argued that the latter, when interpreted teleologically, could offer specific protection for the right to disconnect for digital platform workers.

To this end, Article 4 of the proposal for a directive on the right to disconnect may be taken into consideration, according to which Member States

must ensure that detailed arrangements are put in place to enable workers to exercise their right to disconnect, guaranteeing, among other things, health and safety assessments, including psychosocial risk assessments, in relation to this right. Article 12 of the PWD stipulates that digital labour platforms must assess, *inter alia*, the risks of automated monitoring systems or automated decision-making systems for the safety and health of workers, in particular with regard to possible risks of work-related accidents and possible psychosocial and ergonomic risks. In particular, paragraph 3 of the same article stipulates that platforms may not use automated monitoring systems or automated decision-making systems in any way that unduly pressures digital platform workers or otherwise jeopardises their physical and mental health and safety. It is clear that hyper-connectivity can constitute a situation in which workers are unduly pressured, with detrimental consequences for their mental health.

Under Article 7 of the proposal for a directive on the right to disconnect, which deals with employers' information obligations, employers must provide clear, sufficient, and accurate information to each worker on (among other things) the practical arrangements for disconnecting from digital tools for work purposes, including any monitoring systems, and the system for measuring working time. Article 9 of the PWD requires digital labour platforms to inform workers about the use of automated monitoring systems or automated decision-making systems, including the categories of data and actions monitored, supervised or evaluated by such systems. This seems to imply that platforms must define exactly when monitoring systems are active and when they are not, respecting workers' rest periods accordingly.

Pursuant to Article 5(1) of the proposal for a directive on the right to disconnect, workers must be protected against discrimination, less favourable treatment, dismissal, and other measures taken by the employer on the grounds that the worker has exercised or attempted to exercise the right to disconnect or as a result of a complaint lodged with the employer or proceedings brought to ensure compliance with the right to disconnect. Article 22 of the PWD requires Member States to take the necessary measures to protect persons performing work through digital platforms from any unfavourable treatment or consequences resulting from a complaint lodged with the digital work platform or from proceedings brought to ensure compliance with the rights provided for in the PWD. Furthermore, Article 23 of the PWD stipulates that Member States must take the necessary measures to protect persons performing work through digital platforms from any unfavourable treatment or consequences resulting from a complaint lodged with the digital work platform or from proceedings brought to ensure compliance with the rights provided for in the PWD.

Article 6 of the proposal for a directive on the right to disconnect stipulates that workers must have a right of appeal in the event that their rights

are violated. The same is provided for in Article 18 of the PWD in relation to platform workers.

It is understood that the analogical reasoning used here has its limitations due to the fact that the PWD is a tool that aims to regulate multiple aspects of a complex issue relating to the labour field, while the right to disconnect, however important, is a specific aspect. However, in light of the reconstruction above, it can be argued that there is scope for proposing a teleologically oriented interpretation of the PWD in order to include the right to disconnect among the protections recognised by it.

4. CONCLUSION

As highlighted by the Committee on Employment and Social Affairs of the European Parliament, ‘the increasing use of digital technologies in the workplace, including tools that enable constant connectivity as well as real-time monitoring and surveillance, pose numerous risks to the mental health of workers by blurring the boundaries between professional and private life’, which can lead to ‘excessive work-related stress, burnout, a deterioration of work–life balance and increasing sentiment of social isolation’ (Committee on Employment and Social Affairs, 2025). More specifically, algorithmic management may raise performance pressure, which can cause serious health and safety risks (Committee on Employment and Social Affairs, 2025).

The PWD identifies the use of algorithmic workforce management systems as a given (Aloisi, Joppe, & Abraha, 2025). In fact, the use of automated monitoring systems and automated decision-making systems is one of the determining criteria for identifying a digital labour platform, thus constituting a prerequisite for defining the scope of application of the PWD itself.

Given that algorithmic management is now an integral part of the world of business and work (De Stefano, 2020), for this reason, it can be considered that the PWD can serve as a regulatory benchmark for issues raised by algorithmic management of work, including the effective protection of the right to disconnect. In this regard, it must be considered that the Committee on Employment and Social Affairs of the European Parliament has called on the EU Member States and the employers for the recognition and effective implementation of the right to disconnect and requested the European Commission to submit a proposal for a directive on algorithmic management in the workplace (Committee on Employment and Social Affairs, 2025).

Thus, the PWD might offer fundamental insights for future developments in EU labour law. Clearly, as far as the topic tackled in this chapter is concerned and given that the deadline for transposing the PWD is still pending, much will depend on the transposition rules adopted by the EU Member States and how those rules will be interpreted by national courts. However, there seems

to be interpretative room to include the right to disconnect in the scope of the PWD, while waiting for pieces of EU legislation focused on said right and algorithmic management.

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3. Remote working toolbox: Technologies and infrastructure for companies and workers

**Mario Chiesa, Tiziana Ciano, Valeria Figni
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1. REMOTE WORK SETUP: FROM OFFICE TO HOME

Remote working is a continuum, not a simple “office versus home” dichotomy, that requires coherence between where work takes place (the physical context), how collaboration occurs (synchronous/asynchronous modes and tools), and how data and well-being are protected (Choudhury, Foroughi & Larson, 2021). Following the COVID-19 shock, organizations rapidly adopted digital collaboration platforms and codified hybrid routines; evidence suggests that many of these adoptions have persisted beyond the emergency phase, reshaping the everyday “digital workplace” (Sahut & Lissillour, 2023). Recent empirical snapshots already indicated a large and durable shift towards working from home, with substantial shares of the workforce expressing their intent to continue remote or hybrid arrangements post-pandemic (Bloom, 2020). Large-scale evidence shows that remote and hybrid work reshape collaboration patterns, working hours, and social networks; productivity outcomes depend on the nature of tasks, organizational processes, and management choices. In some contexts, geographical flexibility (Work From Anywhere) has led to measurable improvements in output (e.g., +4.4% at the United States Patent and Trademark Office), indicating that the benefits of remote work emerge when coordination and security are carefully designed (Yang et al., 2022).

However, while the benefits of flexibility and autonomy are widely acknowledged, the technological complexity underlying remote work remains a challenge for many institutions. Ensuring seamless connectivity, data security, and ergonomic comfort requires careful selection and integration of hardware, software, and network resources. For companies, this means investing in resilient cloud infrastructures, secure virtual private networks (VPNs), and

compliant data-handling practices; for workers, it involves building functional and comfortable workstations that sustain focus, collaboration, and well-being. The remote workplace, in this sense, is not a singular location but a digitally orchestrated ecosystem.

Therefore, contemporary remote work takes shape as a hybrid ecosystem, in which physical and digital spaces intertwine to sustain productivity, well-being, and security. It is no longer a matter of choosing between the office and the home, but of designing conditions and tools that allow each environment to express its full potential. The quality of the work experience increasingly depends on the synergistic orchestration of three dimensions: environment; technology; and organizational culture. From an institutional perspective, a further dimension becomes crucial: governance and coordination. Institutions are called upon to redefine mechanisms for planning, monitoring, and evaluating work, ensuring alignment between individual activities and organizational objectives. In hybrid and remote settings, the achievement of business goals relies less on direct supervision and more on outcome-oriented coordination, shared performance indicators, and transparent communication processes. This shift requires organizations to develop new forms of trust-based monitoring, supported by digital tools, clear accountability frameworks, and adaptive leadership practices. To understand how these factors interact in practice, it is useful to distinguish the operational and psychological specificities of working in office environments and from home, analysing how each contributes to the effectiveness and sustainability of remote work.

The aim of this chapter is to provide an overview of the tools and infrastructures that make such ecosystems possible. Moving from the physical setup to digital platforms, from connectivity to automation, it outlines a structured “toolbox” that organizations and workers can adapt to their specific contexts. The chapter is designed to offer a structured, accessible, and actionable starter pack for professionals, HR departments, and IT managers who are tasked with designing or refining remote work strategies. Its main goal is to translate the complexity of technological options, often fragmented and evolving, into a clear and modular framework, addressing not only what tools exist, but also why, how, and when to use them.

In particular, this chapter positions the technological and infrastructural “toolbox” for remote working within the broader analytical framework developed throughout the book. While Chapter 1 situates remote work within evolving regulatory and inequality dynamics and Chapter 2 highlights the implications of digitalization and algorithmic management for workers’ rights (most notably the right to disconnect), this contribution focuses on the material and technological conditions that make those regulatory principles operational in everyday work practices. At the same time, the tools and infrastructures discussed here provide the enabling layer for the organizational and managerial

transformations explored in Chapters 4, 7, and 8, where process mining, activity-based performance measurement, and employee-centred performance governance rely on reliable digital traces, secure connectivity, and interoperable platforms. Moreover, the chapter connects directly with Chapters 5 and 6 by showing how technological choices intersect with the physical and psycho-environmental dimensions of remote work, shaping well-being, boundary management, and work sustainability. In this sense, the remote working toolbox should not be read as a neutral technical catalogue, but as a practical interface that reinforces the book's overarching argument that remote work is a systemic transformation requiring coordinated legal, organizational, technological, and human-centred responses.

1.1 Remote Working in Office Environments

In office environments, in-person work continues to serve as a strategic hub for coordination, social interaction, and organizational learning. Even within an increasingly digital ecosystem, physical proximity retains a distinctive value: it facilitates informal exchanges, collaborative problem-solving, and the building of trust among colleagues – elements that are difficult to replicate in fully virtual settings. From this perspective, the office is no longer the only place where productive work occurs, but rather an intentional space, designed to host activities that benefit from co-presence and synchronous interaction.

In fact, on-site work remains valuable for immediate coordination, rapid access to shared resources, and the social cues that build trust and team cohesion. Beyond task execution, brief informal exchanges (“office chitchat”) act as rituals that can lift the mood and strengthen relational ties, while requiring guardrails to avoid distraction (Methot *et al.*, 2021). In hybrid settings, the office is most effective when purpose-designed for activities that benefit from co-presence, for example, workshops, cross-functional problem-solving, onboarding, and mentoring, while routine or focus-intensive tasks shift to quieter environments or home offices. Environmental psychology research shows that open-plan noise impairs memory and motivation and increases fatigue, underscoring the need for acoustic treatment, zoning, and restorative micro-breaks in shared spaces (Jahncke *et al.*, 2011). Recent evidence comparing home and office conditions suggests a trade-off: self-reported work performance tends to be higher in the office, whereas comfort and well-being score higher at home; *design levers* (i.e., controllable features of the work environment that organizations or individuals can intentionally adjust) such as temperature, noise control, furniture, and aesthetics are strong predictors of perceived performance and comfort in both settings (Srivastava *et al.*, 2024). As remote work platforms have matured, teams increasingly weave office time into cloud-based workflows, document co-authoring, shared boards, and persistent chat,

reducing context switching between physical and digital spaces and making hybrid presence more seamless (Sahut & Lissillour, 2023).

1.2 Remote Working from Home: Constraints and Enablers

If the office represents the place of co-presence and immediate coordination, the home instead becomes the centre of autonomy and personalization. In remote work, the domestic environment transforms into a flexible professional space, shaped by individual needs yet highly dependent on technological infrastructure and the quality of digital connections. This dimension, seemingly more free, introduces new complexities – from the management of work–life boundaries to the need for intentional practices of social connection that replace the spontaneous rituals of the office and help maintain a sense of belonging within the group.

Therefore, Working From Home (WFH) allows workers to personalize their environment, exercise time autonomy, and eliminate commuting, factors that can improve satisfaction and work–life balance. However, technology-enabled interaction at a distance requires deliberate practices to counter isolation and sustain a sense of social presence (Bloom, 2020). Empirical studies during COVID-19 show that teams adopted a patchwork of tools and rituals to maintain cohesion and informal bonding in all-remote settings (Bloom, 2020; Yang et al., 2022). At the organizational level, flexibility is not equally accessible or beneficial across roles and occupational levels; without explicit inclusion policies, work–life flexibility can inadvertently widen inequalities (Methot et al., 2021). Connectivity gaps remain a structural barrier in certain geographies: even prior to the pandemic, roughly a quarter of rural Americans reported inadequate access to high-speed Internet, a limitation that directly impedes video conferencing, cloud access, and security updates (Anderson, 2018). In practice, sustained effectiveness at home hinges on adequate bandwidth/latency, ergonomics, clear collaboration norms, and seamless integration with the organization's remote work platform stack (Sahut & Lissillour, 2023). These insights underscore the need for structured support: clear norms, shared rituals, and equitable resourcing; so that home-based work remains both productive and humane.

Therefore, the office and the home are not opposites, but complementary environments within the same work ecosystem. The former offers co-presence, social cues, and onboarding, while the latter enables autonomy, personalization, and savings in commuting time. In this sense, as further discussed in Chapters 5 and 6, both hardware (furniture, spatial layout, environmental controls) and software (digital platforms, interfaces, and collaboration tools) must be conceived as active enablers of psycho-environmental well-being, supporting the principles of restorative design and Indoor Environmental

Quality (IEQ) that are critical to sustaining cognitive performance, emotional balance, and long-term health in hybrid work settings. In both cases, effectiveness depends on explicit rules of collaboration, adequate equipment, and protections for data and well-being – pillars that are explored in the following sections.

1.3 Data Protection and Privacy Regulations

Data protection is a cornerstone of remote working. In the EU, the General Data Protection Regulation (GDPR) sets core principles, such as lawfulness, data minimization, integrity, and confidentiality, along with impact assessments where appropriate and strong accountability duties (GDPR, 2016). Whether in office or at home, data protection is a non-negotiable foundation of remote work. Practical safeguards include secure remote access (e.g., VPN plus multi-factor authentication), encryption in transit and at rest, and role-based access control, complemented by transparent policies for device usage, logging, and retention. The rapid, post-lockdown consolidation of remote work platforms further raises the stakes for privacy-by-design configurations and continuous governance, ensuring efficiencies from platform adoption do not come at the expense of regulatory compliance or user trust (Sahut & Lissillour, 2023; Bloom, 2020).

Supervisory and expert bodies translate these legal requirements into operational guidance. The European Data Protection Board (EDPB) publishes guidelines and best practices on telework tools and HR/health data, helping controllers implement GDPR-aligned controls in day-to-day remote settings. The European Data Protection Supervisor (EDPS) provides institution-specific guidance on working conditions and privacy safeguards for EU bodies (EDPS, n.d.). On the technical-organizational side, security baselines such as NIST SP 800-46r2 recommend concrete controls for telework, remote access, and BYOD; including end-to-end encryption, MFA, log/audit management, network segmentation, endpoint hardening, and clear device/data-use policies (NIST, 2016). In practice, effective compliance in hybrid and remote contexts requires aligning these governance frameworks with enforceable configurations across identity, access, and endpoint management, codified as privacy-by-design defaults and reviewed regularly under a documented risk-management process.

Cybersecurity and the protection of personal data therefore constitute the infrastructural foundation of remote work. However, for these rules to translate into concrete practices, both workers and organizations must have access to the appropriate tools to implement them. The following section addresses this operational dimension by presenting a review of devices, accessories, and

technologies that enable secure, ergonomic, and productive work – whether from home or in a hybrid mode.

Beyond data protection, remote and platform-mediated work is subject to substantive legal limits on monitoring and algorithmic management under the EU Platform Work Directive (PWD), as analysed in Chapter 2. The PWD constrains the use of intrusive or continuous surveillance tools, strengthens transparency and human oversight over automated decision-making, and reinforces workers’ autonomy, including the right to disconnect from digital work systems outside the agreed working time. Consequently, any technical or organizational “toolbox” for remote or hybrid work must comply with this regulatory blueprint, ensuring that monitoring functionalities are strictly necessary, proportionate, and time-bound, exclude covert surveillance, and are designed to prevent spillovers into workers’ private life. In this sense, privacy-by-design must be complemented by *autonomy-by-design*, embedding legal limits on monitoring directly into platform configurations, defaults, and governance processes.

2. STARTER PACK FOR THE REMOTE WORKER

To bridge the gap between theory and practice, the following sections outline the foundational hardware, smart technologies, and network requirements that form the backbone of an effective remote work environment. This “starter pack” distills the essential components required for successful remote work into practical recommendations. It emphasizes the importance of tailoring device choices, digital platforms, and security measures to the specific needs of both individuals and organizations. By assembling a well-curated toolkit, remote professionals can maintain productivity, comfort, and compliance regardless of location.

Indeed, as organizations consolidate on remote work platforms, the selection of interoperable, secure, and ergonomic equipment becomes a strategic lever for sustained adoption (Sahut & Lissillour, 2023). Post-lockdown adoption of collaboration platforms has been persistent rather than transient, which means the workstation+peripherals layer determines the quality of everyday experience (Sahut & Lissillour, 2023). At the same time, not all workers enjoy the same infrastructure at home; connectivity constraints in some geographies can impair access to video, cloud, and updates (Anderson, 2018).

2.1 Essential Devices and Ergonomic Accessories

Core recommended equipment includes a capable laptop (modern CPU/RAM, SSD), ergonomic keyboard and mouse, a laptop stand to raise the screen, quality headsets/microphones for clear audio, and at least one external monitor to

expand workspace. These choices directly affect comfort, clarity, and throughput in day-to-day tasks. In line with the discussion in Chapters 5 and 6, such equipment choices are not merely technical upgrades but foundational elements of restorative design and IEQ, directly influencing psycho-environmental well-being.

Laptop. A modern laptop with sufficient CPU/RAM, SSD storage, reliable Wi-Fi, Bluetooth, and ports for docking/monitors is the foundation for office and home work alike. This is the kind of device on which encrypted clients (VPN, MFA apps) and productivity suites can run smoothly, minimizing friction across locations (Sahut & Lissillour, 2023).

Webcam. A 1080p webcam with good low-light performance improves meeting quality and reduces cognitive load associated with poor image fidelity, especially in hybrid rooms where framing matters. “Smart webcam” is an additional core example in the technology kit.

Headset + portable speakerphone. Noise-cancelling headsets and portable speakerphones (e.g., Jabra, Poly Sync, etc.) are critical for clear audio in *ad hoc* spaces; they mitigate background noise and echo, improving intelligibility and reducing fatigue. Consistent, high-quality audio is a proven multiplier for remote meetings and helps offset environmental noise, which otherwise degrades performance and increases fatigue in shared spaces (Jahncke et al., 2011).

External monitor(s) and basic ergonomics. One or two external displays increase visual workspace and reduce neck strain; a laptop stand, external keyboard and mouse, and proper chair/lighting complete an ergonomic setup. These accessories directly influence comfort and throughput during long stretches of remote work (Kossek & Lautsch, 2018).

2.2 Smart Technologies

Smart peripherals further improve hybrid meetings: interactive whiteboards (e.g., Surface Hub) integrate video, digital inking, and shared boards; directional/360° webcams (e.g., OWL Labs) improve framing/pickup. Beyond conventional tools, immersive technologies open new avenues: VR/MR platforms can increase presence, co-presence, and engagement in remote collaboration, while also imposing design constraints (e.g., comfort, latency, motion fatigue). Reviews synthesize these affordances and trade-offs for enterprise collaboration (Bleakley et al., 2022; Miller et al., 2021).

However, even the best hardware configuration is ineffective without a stable and secure digital infrastructure. After defining the material and digital resources that enable comfortable and productive remote work, it is essential to focus on the element that represents its true lifeblood: connectivity. Ultimately, the effectiveness of collaborative platforms and digital tools depends on the

availability of a stable and secure network infrastructure, with performance demands differing according to use case.

3. CONNECTIVITY AND NETWORK SECURITY

Connectivity represents the invisible foundation of digital work. Every form of communication, videoconferencing, cloud synchronization, or remote access depends on the quality of the network that connects people, data, and infrastructure. In this section, we examine how different connection technologies (fibre, FWA, mobile, satellite) and local configurations influence performance, reliability, and security, with particular attention to the specific requirements of remote work.

Internet connectivity is a fundamental prerequisite for modern digital activities, particularly in professional and remote working contexts. The efficiency, stability, and continuity of Internet access depend on both the technology adopted and the configuration of the local network. Moreover, it may depend on the location. Selecting an appropriate connection technology and tariff plan, alongside an optimally configured home network, are thus essential for ensuring seamless and productive online operations.

Assessing the real-world performance of an Internet connection is commonly achieved through a so-called *speed test*, which typically measures:

- Latency (ping): Time taken for a data packet to travel to a remote server and back, measured in milliseconds (ms). Values below 30 ms indicate optimal responsiveness.
- Download Speed: Rate at which data is received from the Internet, expressed in Mbps (Megabits per second).
- Upload Speed: Rate at which data is sent to the Internet, also in Mbps. A connection is termed *symmetric* when upload and download speeds are comparable.

Speed tests are critical for evaluating service quality, particularly in professional and remote working environments.

Several technologies are available for Internet access, each characterized by distinct performance parameters, coverage, and infrastructural requirements. In the following, we review the most prominent ones.

3.1 Connection Types

ADSL (Asymmetric Digital Subscriber Line) and VDSL (Very-high-bit-rate Digital Subscriber Line) utilize the existing copper telephone network to

transmit data. ADSL is an asymmetric technology offering higher download than upload speeds, typically up to 20 Mbps and 1 Mbps, respectively. VDSL represents an evolution of ADSL, achieving up to 100 Mbps in download and 20 Mbps in upload under standard conditions, and up to 300 Mbps when using vectoring techniques. However, both technologies experience significant performance degradation with increasing distance from the distribution node.

Advantages:

- Extensive territorial coverage;
- Compatibility with existing telephone infrastructure.

Limitations:

- Limited maximum speed;
- Performance degradation proportional to the distance from the exchange.

Optical fibre technology represents the current state-of-the-art in fixed Internet access, using light pulses transmitted through glass or plastic fibres. It guarantees extremely high data transfer rates, minimal latency, and exceptional reliability. Fibre connections can be classified as follows:

- Fibre-to-the-Node (FTTN): Fibre reaches a local node; the final segment uses copper.
- Fibre-to-the-Cabinet (FTTC): Fibre reaches the street cabinet near the user.
- Fibre-to-the-Home (FTTH): Fibre extends directly to the user's premises.

FTTH provides the best performance, with potential data rates up to 10 Gbps and typical consumer services offering 100 Mbps to 1 Gbps. Optical fibre systems are resistant to electromagnetic interference and signal attenuation due to distance, making them suitable for high-bandwidth applications such as video streaming, gaming, and cloud computing.

Advantages:

- High throughput and low latency;
- Excellent stability and reliability.

Limitations:

- Limited coverage in rural/mountain areas;
- Potentially high installation costs.

Fixed Wireless Access (FWA) delivers Internet connectivity via radio links between a base station and a receiving antenna installed at the user's premises. The antenna connects to a local modem-router, distributing the signal within the home or office environment. FWA offers speeds up to 100 Mbps, with newer deployments exceeding 1 Gbps under optimal conditions. Performance depends on distance, line-of-sight, and environmental factors.

Advantages:

- Rapid deployment without cable infrastructure;
- Viable alternative in semi-urban and rural areas.

Limitations:

- Coverage limited by radio range and topography;
- High sensitivity to weather conditions.

Satellite Internet provides connectivity through communication satellites, enabling coverage even in remote or underserved regions. Traditional satellite systems are characterized by high latency due to the distance to geostationary satellites and susceptibility to weather conditions. Recent advancements, such as the deployment of low Earth orbit (LEO) constellations (e.g., Starlink), have substantially reduced latency (below 30 ms) and increased data rates (up to 50–250 Mbps).

Advantages:

- Global coverage;
- Independence from terrestrial infrastructure.

Limitations:

- Higher latency;
- Weather sensitivity and higher costs.

Finally, mobile Internet connectivity is provided via cellular networks employing technologies such as 3G, 4G/LTE, and 5G.

- 3G: Offers up to 2 Mbps; suitable for basic browsing.
- 4G/LTE: Provides up to 150 Mbps (and higher in ideal conditions); supports HD streaming and gaming.

- **5G:** Enables ultra-high-speed connections exceeding 10 Gbps with extremely low latency, facilitating real-time applications such as augmented reality and IoT.

Advantages:

- High mobility and geographic availability;
- Good performance, especially with 4G and 5G.

Limitations:

- Variable speed and latency depending on coverage and congestion;
- Requires compatible devices.

Tariff plans can generally be classified as flat-rate, offering unlimited data for a fixed cost, or pay-as-you-go, where costs depend on usage. The optimal choice depends on user requirements and expected data consumption. Within the home, Internet access is typically managed via a router, connected either through wired (Ethernet) or wireless (Wi-Fi) interfaces. Wired connections provide superior stability and speed, whereas Wi-Fi allows greater mobility.

Additionally, actual Internet performance often deviates from the theoretical maximum advertised by Internet Service Providers (ISPs), influenced by several variables:

- *Infrastructure Quality:* Cable condition, distance from the exchange, and interference.
- *Network Congestion:* Shared bandwidth among multiple users during peak hours.
- *Device Performance:* Router quality, network interface efficiency, and configuration.
- *Signal Attenuation:* Particularly relevant for Wi-Fi, affected by distance and physical barriers; Wi-Fi extenders can mitigate coverage issues.
- *Weather Conditions:* Particularly impactful for FWA and satellite systems, where rain, snow, or fog can attenuate radio and satellite signals.

A comprehensive evaluation of these factors is essential for optimizing Internet performance through appropriate technology selection and home network configuration.

3.2 Performance Requirements for Remote Work

Understanding the technical characteristics of different access technologies is the first step; however, the true reference point for designing home and corporate networks lies in identifying the actual performance requirements necessary to work remotely in an efficient manner.

The increasing prevalence of remote work has placed heightened emphasis on the quality, reliability, and performance of home Internet connections. Effective remote working requires network conditions that support not only high-speed data transfer but also *stability*, *low latency*, and *minimal packet loss*. These parameters are directly correlated with productivity, communication efficiency, and user experience.

The required download and upload bandwidth depends on the type and intensity of online activities, but we can sketch a general overview in Table 3.1.

While optical fibre and 5G connections easily meet these requirements, ADSL and FWA systems may experience limitations, especially during concurrent device use.

Low latency (<30 ms) and jitter (<20 ms variation) are essential for synchronous communication, such as video calls or remote desktop sessions. High or unstable latency can result in audio–video desynchronization, delays, or data retransmission, significantly degrading user experience. For this reason, optical fibre and wired Ethernet connections are preferable for remote work environments.

Network availability and uptime are equally critical. Professional-grade performance requires at least 99% service availability, corresponding to a maximum downtime of approximately seven hours per month. Frequent

Table 3.1 Recommended internet bandwidth for common remote work activities, based on download and upload speed requirements

Activity Type	Recommended Download Speed	Recommended Upload Speed
Basic office tasks (email, browsing, cloud docs)	5–10 Mbps	1–3 Mbps
HD video conferencing (Zoom, Teams, Meet)	10–25 Mbps	3–5 Mbps
4K streaming or large file transfers	25–100 Mbps	10–20 Mbps
Real-time collaboration or remote desktop applications	≥ 50 Mbps	≥ 10 Mbps

Source: Authors.

interruptions can disrupt workflows, hinder file synchronization, and compromise online meetings. Redundant connections (e.g., a mobile hotspot backup) can help mitigate risks of service outages.

3.3 VPNs and Secure Remote Access

A high-performing connection, however, is not sufficient unless it is also secure. The growing flow of sensitive data, access to corporate resources from home networks, and the extensive use of cloud platforms require advanced protection and authentication mechanisms such as VPNs, which serve as key tools for securing remote connections and ensuring controlled access to corporate infrastructures.

A VPN creates an encrypted tunnel between the user's device and the corporate infrastructure, enabling secure access to internal resources and masking the public IP address – an essential safeguard when using public or unprotected Wi-Fi networks (NIST, 2016). Beyond protecting the confidentiality of data in transit, a VPN ensures the integrity and authenticity of communications, mitigating the risks of interception and “man-in-the-middle” attacks (Anderson, 2010).

The effectiveness of a VPN depends on three main factors:

1. *Connection and encryption protocols* (e.g., OpenVPN, IKEv2/IPsec, or WireGuard), which balance security and performance;
2. *Client configuration*, including authentication through digital certificates, automatic activation, and kill switch functionality; and
3. *Gateway architecture and location*, which influence latency and service availability.

Advanced organizations adopt multi-gateway infrastructures distributed geographically, integrating VPNs into Zero Trust Network Access (ZTNA) architectures, where user identity and device posture are continuously verified (Kindervag & Balaouras, 2010; Gartner, 2023). From this perspective, the VPN is no longer only a secure channel, but a strategic component of digital resilience, integrated with monitoring systems, identity and access management (IAM), and adaptive access policies (NIST, 2020).

For high-sensitivity sectors – such as healthcare, finance, and public administration – the use of VPNs should be combined with continuous monitoring, segmentation policies, and audit logs, in accordance with GDPR requirements and ENISA's network security guidelines (ENISA, 2015).

3.4 Encryption, Authentication, and Risk Mitigation

A VPN represents a fundamental measure, but on its own it cannot guarantee complete security. To significantly reduce cybersecurity risks and ensure operational continuity, it is necessary to integrate encryption, multi-factor authentication, and privilege management principles within a broader security framework.

Accordingly, the security of remote connections relies on end-to-end encryption and robust authentication mechanisms. When evaluating VPN services, best practices recommend prioritizing (NIST, 2016; ISO/IEC, 2015b):

- No-log policies, which prohibit the recording of traffic data and metadata;
- Updated protocols (OpenVPN, IKEv2/IPsec, WireGuard) based on advanced algorithms such as AES-256-GCM or ChaCha20-Poly1305;
- Servers located in jurisdictions with adequate privacy protections (e.g., the European Economic Area).

It is important to note that encryption may reduce performance; however, the impact can be minimized through optimized clients, nearby gateways, and controlled split-tunnelling strategies (Yang et al., 2022).

Comprehensive protection requires integrating the VPN with:

- Multi-factor authentication (MFA), recognized as a core security measure (Microsoft Security Intelligence, 2025);
- Least Privilege Access, to reduce internal exposure risks (Saltzer & Schroeder, 1975);
- Real-time monitoring and logging, supported by SIEM (Security Information and Event Management) tools (Gartner, 2017);
- Regular updates of certificates and protocols, to avoid known vulnerabilities (ENISA, 2025).

Risk mitigation should also focus on raising workers' security awareness through continuous training, practical incident-response exercises, and regular simulations, enabling employees to recognize and avoid risky practices such as sharing sensitive data via email or storing copies on unsecured or inappropriate cloud-based services (SANS Institute, 2022).

At a strategic level, emerging architectures such as Zero Trust and SASE (Secure Access Service Edge) unify VPN, firewall, CASB (Cloud Access Security Broker), and behavioural analytics functions into a single cloud-native model, providing dynamic protection, scalability, and reduced operational costs (Gartner, 2017; Cisco, 2024).



Finally, the “privacy by design” principles established by the GDPR (Art. 25) and reiterated in the European Data Protection Board guidelines require that any remote access solution ensure data minimization, operational transparency, and documented accountability of the data controller.

The effectiveness of remote work therefore depends on solid connectivity, secure channels, and integrated encryption and authentication practices. However, networks represent only the first layer of the digital infrastructure: built upon them is the cloud, which provides resources, applications, and platforms on a global scale. The following section explores this dimension, analysing service models (IaaS, PaaS, SaaS), “Cloud-First” strategies, and the security and compliance challenges of the hybrid digital environment.

4. CLOUD AND DIGITAL INFRASTRUCTURE

Cloud computing today constitutes the backbone of the digital economy, providing ubiquitous access, elastic scalability, and continuous updates that are difficult to replicate in local (on-premise) infrastructures (Mell & Grance, 2011; NIST SP 800-145). The adoption of cloud technologies enables organizations to reduce infrastructure costs, enhance operational resilience, and foster innovation, making it an essential pillar of digital transformation (OECD, 2025). However, migration to the cloud requires structured governance that integrates technical, legal, and organizational dimensions: security, data protection, and regulatory compliance must be embedded from the system’s design phase – following the principles of “security and privacy by design” (ENISA, 2015).

4.1 What is Cloud Computing (IaaS, PaaS, SaaS)

Cloud computing is defined by NIST as a model that enables on-demand access to a shared pool of configurable computing resources – servers, storage, applications, and services – delivered and managed over the Internet (Mell & Grance, 2011).

Its main service categories include:

- *IaaS (Infrastructure as a Service)*: provides virtualized infrastructure resources (compute, network, storage) on demand;
- *PaaS (Platform as a Service)*: offers managed development and runtime environments that simplify application deployment;
- *SaaS (Software as a Service)*: allows end users to access complete applications via the web, without local management.

The main benefits include:

- Automated updates and patches (ensuring operational continuity and security);
- Ubiquitous accessibility from different devices and locations;
- Dynamic flexibility and scalability;
- Reduced operational risk through redundancy;
- Cost optimization via pay-per-use and elastic scaling models (Armbrust et al., 2010; Gartner, 2023).

Alongside these advantages, the literature also highlights challenges related to vendor lock-in, data sovereignty, and contract transparency (Marinos & Briscoe, 2009; ENISA, 2015), which require appropriate cloud governance strategies.

Defining the cloud's service categories – IaaS, PaaS, and SaaS – therefore means understanding the different ways in which organizations can externalize or share their technological infrastructure.

However, choosing a service model is only the first step: the real challenge lies in integrating the cloud into a comprehensive strategy capable of balancing innovation, security, and economic sustainability.

4.2 Cloud-First Principle in Corporate and Public Strategy

Since 2019, the Italian Public Administration has adopted the Cloud-First principle, which mandates the prioritization of cloud solutions – particularly AgID-certified SaaS services – in next-generation ICT procurements (AgID, 2019; Department for Digital Transformation, 2023). This strategy is implemented through the National Strategic Hub (Polo Strategico Nazionale, PSN) and the Cloud Enablement programs of the Three-Year Plan for ICT in Public Administration, which support secure migrations, risk assessments, and data classification based on criticality and sensitivity. In the private sector, similar approaches drive IT modernization and corporate resilience, with the adoption of hybrid models, DevSecOps practices, and multi-cloud governance frameworks (Gartner, 2017; Microsoft Security Intelligence, 2025). The Cloud-First logic represents an evolution from the “cloud-only” model, as it recognizes the need to integrate legacy technologies and mission-critical applications within gradual and sustainable migration paths (OECD, 2025).



4.3 Choosing Public, Private, or Hybrid Cloud

The “Cloud-First” paradigm drives organizations and public administrations to prioritize cloud solutions as a lever for modernization and efficiency. However, the application of this principle is not uniform: security requirements, data

sovereignty, and interoperability demand targeted architectural choices. Within this framework lies the ongoing debate between public, private, and hybrid cloud models, each offering distinct advantages and constraints in terms of governance, performance, and compliance.

Organizations today increasingly combine different cloud models to balance security, costs, and operational flexibility.

- *Public Cloud*: services provided by external vendors (e.g., AWS, Azure, Google Cloud), ideal for variable workloads and horizontal scalability.
- *Private Cloud*: dedicated and controlled infrastructure, often used by entities with high confidentiality or compliance requirements (e.g., banks, healthcare institutions).
- *Hybrid or Multi-Cloud*: dynamic integration of public and private environments, enabling optimal workload distribution and mitigating vendor lock-in risks (Marinos & Briscoe, 2009).

Recent decision-making frameworks (e.g., ISO/IEC 2015a; NIST SP 500-292) recommend mapping workloads to the different cloud architectures according to:

- Performance and latency requirements;
- Compliance and data localization constraints;
- Process criticality and business priorities; and
- Direct and indirect management costs.

Data-centric and policy-driven orchestration approaches allow transparent workload distribution, ensuring compliance and resilience even within complex environments (ENISA, 2015).

4.4 Compliance and Data Security in the Cloud

The decision on which cloud model to adopt cannot overlook risk management and data protection.

In a distributed or multi-tenant ecosystem, security becomes a shared responsibility between providers and organizations.

Accordingly, cloud security follows a shared responsibility model, where the provider ensures the infrastructure's security, while the user is responsible for configuration, data management, and access control (AWS, 2023).

Key security measures include:

- *Encryption* of data in transit (TLS 1.3) and at rest (AES-256 or equivalent);

- *Centralized identity and access management (IAM)*, with least-privilege policies and MFA authentication;
- *Continuous monitoring and logging*, supported by SIEM systems (Security Information and Event Management);
- *Data residency and sovereignty controls* to ensure compliance with the GDPR and EDPB guidelines (2020–2023).

Operational compliance can be further strengthened through international certifications (ISO/IEC, 2015a; ISO/IEC, 2025; CSA, 2022) and third-party audits (ISO/IEC, 2025; CSA, 2022). In the European context, ENISA (2025) recommends risk-based cloud security approaches, with particular attention to multi-tenancy, logical segregation, data portability, and exit strategies. Finally, the GDPR (Reg. EU 2016/679) and the new EU Data Act (Reg. EU 2023/2854) impose obligations of transparency, interoperability, and accountability, making cloud data governance a strategic component of long-term digital sustainability. Cloud computing underpins ubiquitous access, elasticity, and continuous functional updates – capabilities that are difficult to replicate in traditional on-premise infrastructures.

In summary, the cloud is not merely a technical infrastructure, but an enabling platform for collaboration, distributed intelligence, and process automation. It allows teams to work synchronously and asynchronously, share resources, and maintain operational continuity from any location. The next section explores this practical dimension – which brings the advantages of the cloud into everyday work, transforming connectivity and digital infrastructure into truly integrated work experiences.

5. COLLABORATION AND PRODUCTIVITY TOOLS

Collaboration and productivity tools enable distributed teams to coordinate work, communicate efficiently, and maintain shared context. After the pandemic shock, adoption of remote work platforms has remained high and is now a structural feature of the digital workplace (Sahut & Lissillour, 2023). At the same time, large-scale studies show that fully remote work can reconfigure collaboration networks (fewer cross-team ties, more asynchronous traffic), which has implications for innovation and knowledge flow (Yang et al., 2022).

5.1 Videoconferencing Platforms

The first dimension of collaboration is synchronous presence. Videoconferencing platforms translate, in real time, network constraints, security policies, and shared calendars into a unified meeting experience.

Therefore, the choice of tool is not merely functional – it directly affects the ergonomics, inclusivity, and cognitive load of meetings.

Key capabilities include high-quality audio/video, screen sharing, recording, in-meeting chat, and deep calendar/document integrations. Teams adds AI-assisted features (e.g., transcription, live translation) that streamline coordination. At scale, all-remote collaboration can become more siloed and rely more on asynchronous communication, with fewer cross-team interactions (Anderson, 2018). Effective leaders counter this by deliberately engineering cross-functional touchpoints in the meeting and messaging cadence.

What matters in selection

Across platforms, prioritize:

- Reliability and A/V quality under variable home networks;
- Security and compliance (E2EE where available, admin controls, data residency);
- Meeting ergonomics (breakout rooms, live transcription/translation, Q&A, hand raise, background noise suppression);
- Integrations with calendars, cloud storage, and project/workflow tools.

What the evidence says

- *Network effects and media mix.* Firm-wide remote work increased reliance on asynchronous channels and reduced cross-group collaboration time, even when meetings remained frequent (Yang et al., 2022). This means video must be paired with clear norms for when to meet versus write.
- *Meeting load patterns.* During lockdowns, the number of meetings and attendees/meeting rose, while meeting length fell (DeFilippis et al., 2020). Translation: more coordination touchpoints, but briefer, raising the value of crisp facilitation and follow-ups.
- *“Zoom fatigue”.* Theory and measurement attribute video fatigue to non-verbal overload (close-up faces, continuous gaze, self-view) and validate a multi-dimensional ZEF scale (Bailenson, 2021; Fauville et al., 2021, 2023). Practical mitigations: optional video, hide self-view, shorter meetings, camera-off intervals.
- *Audio quality is a multiplier.* Deep-learning noise suppression and echo cancellation significantly improve intelligibility and reduce cognitive load in imperfect environments (Reddy et al., 2021). Budget for certified headsets/speakerphones and enable platform-side DSP.

Employee takeaways. Default to audio-first quality (headset), use self-view off, and schedule 5-minute buffers between calls.

Employer takeaways. Standardize room “archetypes” (huddle/small/medium) with pre-tested A/V bundles and publish a meeting charter (purpose, pre-reads, time-boxing, recap).

5.2 Messaging and Chat Tools for Teams

However, not everything requires a meeting. To avoid “meeting overload” and accommodate different time zones, an asynchronous framework is needed – one that preserves memory and decisions. This is where messaging channels integrated with documents and calendars come into play. In other words, we move from presence to right-time collaboration.

Therefore, enterprise messaging platforms (Slack, Teams, Google Chat) support channels for topics/projects, file sharing, and powerful search, often integrated with project tools and cloud storage. WFH studies report that technology-enabled social interaction (via chat/video) requires conscious effort to sustain presence and avoid “always-on” fatigue (Nesher Shoshan & Wehrt, 2022). Embedding lightweight rituals (greetings, check-ins) can help maintain morale and social glue.

From synchronous to “right-time”. Channel-based chat (Teams/Slack/Chat) supports asynchronous collaboration and discoverable decisions. But without norms, “always-on” messaging and email can erode boundaries (Mazmanian et al., 2013) and increase email overload and stress (Martin, Fuhrer & Poussing, 2025).

What the evidence says

- *Network fragmentation.* All-remote settings produced more siloed networks and fewer cross-group interactions; leaders must engineer cross-team touchpoints intentionally (Yang et al., 2022).
- *Boundary management.* Classic work on the autonomy paradox shows mobile/email connectivity can simultaneously increase flexibility and entrench 24/7 availability unless organizations set clear norms (Mazmanian et al., 2013).

Operating rules that work

- Use channels (not DMs) for decisions; summarize with owner + due date in-thread.
- Set SLA of response by channel (e.g., chat = 24h, email = 48h) and define quiet hours.
- Link channels to project boards and docs to keep artefacts discoverable.

Employee takeaways. *Mute non-essential channels; batch notifications; negotiate anchor hours.*

Employer takeaways. *Publish naming conventions, retention/search policies, and after-hours expectations; train on async writing.*

5.3 Project Management Software

Chats and files create movement, but without a work structure, they risk dispersing focus and responsibility. Project management platforms connect conversations and artefacts to tasks, deadlines, and dependencies, transforming communication into measurable execution. Therefore, project platforms provide task tracking, Kanban/Gantt views, resource coordination, and cross-tool integrations, creating a fluid ecosystem for complex work. Their structure counteracts the network fragmentation observed in fully remote contexts by making ownership, timelines, and dependencies explicit. Boards, timelines, and backlogs visualize work, clarify ownership, and reduce coordination latency, especially when integrated with chat and files.

Beyond traditional project management features, process mining techniques (as discussed in Chapter 4) can further enhance coordination by revealing actual work flows, deviations, and bottlenecks based on event data. Similarly, the activity-based methodology described in Chapter 7 provides a complementary framework for structuring work around activities rather than tools.

What the evidence says

- *Kanban benefits and limits.* Systematic reviews in software engineering report perceived gains in flow visibility, WIP control, and team communication, with success contingent on explicit policies and organizational maturity (Ahmad, Markkula & Oivo, 2013; Ahmad et al., 2018). Tools amplify sound processes; they don't replace them.
- *Remote meeting practices for development teams.* A 2024 SLR synthesizes benefits, problems, tooling, and good practices for remote software team meetings – underscoring facilitation, agenda clarity, and artefact capture as key to effectiveness (de Andrade et al., 2024).

Employee takeaways. *Keep boards single-source-of-truth; define Definition of Done; limit WIP.*

Employer takeaways. *Provide templates, integrations (chat↔PM↔repo), and outcome metrics (lead time, throughput, quality) rather than counting tasks.*

5.4 Personal Productivity Tools

Even the most robust project system is ineffective if individuals cannot manage their time and preserve their attention. That's why personal productivity tools (such as time-boxing and distraction blockers) serve as the link that aligns individual rhythm with the team's cadence, reducing friction and stress.

In fact, focus/time-management apps (e.g., Pomodoro timers, distraction blockers) help individuals maintain momentum and boundaries. Other examples are: RescueTime, Harvest, Time Doctor, Focus@Will as representative options to reduce distractions, increase accountability, and support healthier rhythms. Organizationally, flexibility usually does not benefit all roles equally, making equitable policies and adequate equipment provision is therefore essential to reducing disparities.

Tools that support time-boxing and breaks can protect deep work. Classic HCI work shows interruptions increase speed but at the cost of stress, frustration, and time pressure (Mark, Gudith & Klocke, 2008). Recent studies suggest structured breaks (Pomodoro/Flowtime) can improve subjective experience and task completion in study contexts, with mixed effects depending on task type (Smits, Wenzel & de Bruin, 2025).

Employee takeaways. *Reserve no-meeting blocks; use timers for repetitive or draining tasks; avoid Pomodoro for long creative flow when momentum is high.*

Employer takeaways. *Normalize focus hours, reduce status meetings, and track maker time (not just attendance).*

5.5 Visual and Integrated Workspaces

Visual and integrated workspaces empower remote teams to brainstorm, design, plan, and execute projects in a shared digital environment. These platforms blend visual collaboration with task and document management, enabling seamless teamwork both in synchronous and asynchronous modes, depending on the task needs. Adoption has surged as organizations seek to replicate the creative and organizational benefits of physical workspaces in the digital realm, especially for design, planning, and cross-functional projects.

What the evidence says

- Online collaborative whiteboards (e.g., Miro, Conceptboard) enhance creativity and problem-solving by allowing teams to visualize ideas and workflows, increasing transparency, and reducing the risk of miscommunication and lost context (Simsek Caglar, Vainio & Roto, 2024).
- Integrated suites (e.g., GitLab, Google Colab) combine also project management, document ownership, and workflow integration to avoid confusion and information overload, improving workflow efficiency and reducing context switching, which is critical for remote teams (Choudhury et al., 2020).

Employee takeaways. *Employees can rethink how they connect and contribute by using visual and integrated workspaces to make ideas and workflows more transparent, encourage active participation, and build a shared context that improves team alignment and creativity*

Employer takeaways. *Standardize the use of visual and integrated platforms across teams in hybrid workspaces to ensure consistency and ease of onboarding, and train teams on best practices for document organization and sharing, and workflow integration, to maximize productivity and support continuous improvement in remote collaboration.*

5.6 Integration and Workflow Automation

When activities, messages, and meetings are mapped and structured, the next step is to reduce manual steps: integrations and automations turn notes and decisions into tasks, update boards, and notify stakeholders, strengthening end-to-end traceability from meeting to outcome.

A recurring theme is interoperability: many project and messaging tools integrate natively, enabling centralized workstreams and fewer handoffs. Documented benefits from collaboration platforms include reduced email and meetings, improved productivity, and lower costs.

From meetings to outcomes

- *Automatic action items and summaries.* Research shows transformer-based pipelines can detect action items and generate meeting summaries; the field is advancing but still contends with domain adaptation and evaluation challenges (Rennard et al., 2023). Use with consent, then push action items into boards/tickets.
- *Governance matters.* Treat AI features as assistive; document privacy, retention, and human-in-the-loop review paths.

Employee takeaways. *Publish recaps with owners/dates; link them to the PM system the same day.*

Employer takeaways. *Standardize integrations (calendar↔video↔notes↔PM) and low-code automations (e.g., create tasks from recap tags) with clear data-handling policies.*

After exploring the collaboration and productivity tools that make up the everyday “toolbox” of digital work, the next step concerns what is already redefining these tools from within: automation and artificial intelligence. These emerging technologies not only simplify repetitive operations but also add cognitive and predictive capabilities to the remote work ecosystem, opening up new scenarios of efficiency – along with new challenges of governance and responsibility.

6. EMERGING TECHNOLOGIES: AUTOMATION AND AI

Automation and AI mark the transition from static tools to dynamic support systems capable of learning, adapting, and interacting. In distributed work environments, these technologies act as virtual assistants that anticipate needs, synthesize content, and coordinate workflows, enhancing productivity and accessibility. However, their impact is not neutral: while they augment human capabilities, they also raise ethical questions concerning reliability, transparency, and the centrality of the human person.

Therefore, intelligent and immersive technologies can augment distributed teamwork, if deployed with clear ethical and human-centred guardrails. Automation and AI are shifting remote and hybrid work from “tools you open” to assistants that work alongside you: drafting, summarizing, translating, routing tasks, and surfacing insights. Robust evidence now shows that generative-AI assistance can raise knowledge-work productivity on realistic tasks, with especially large gains for less-experienced workers; the challenge is to capture these benefits safely and equitably through sound governance and thoughtful work design.

6.1 Virtual Assistants and Generative AI

The first level of transformation concerns intelligent assistance in everyday activities.

The integration of generative AI into writing, translation, and videoconferencing tools makes the cognitive and linguistic support potential within remote workflows tangible, but it also demands new skills and critical awareness.

AI features such as speech-to-text, real-time translation, and smart suggestions elevate communication and reduce routine workload. These capabilities can also capture action items and support post-meeting synthesis, freeing time for higher-value tasks.

In remote/hybrid workflows, AI assistants can draft and edit emails or reports, summarize meetings, generate action items, translate in real time, and answer context-aware questions about shared documents and threads. Major platforms have embedded these capabilities into collaboration suites and meeting tools, reflecting a sustained, post-lockdown consolidation of remote work platforms.

What the evidence says

- *Field evidence (large-scale)*: Introducing a generative-AI assistant to >5,000 customer-support agents raised issues resolved per hour by ~14–15%, with the biggest gains for novices ($\approx +34\%$); experienced workers saw smaller effects – suggesting AI can compress performance gaps and accelerate skill acquisition (Brynjolfsson, Li & Raymond, 2025).
- *Experimental evidence (RCT)*: In controlled writing tasks for mid-career professionals, access to ChatGPT reduced time and improved quality, again with larger gains for lower-skilled participants, indicating a potential “levelling-up” effect (Noy & Zhang, 2023).
- *Meeting intelligence*: Research syntheses show rapid progress in abstractive meeting summarization, but also open challenges (domain adaptation, evaluation, grounding) – so human review remains essential for high-stakes use (Rennard et al., 2023).
- *Accessibility and inclusion*: Live transcription and on-the-fly translation improve participation for multilingual or hearing-impaired colleagues – now available in mainstream tools (with governance caveats).
- *Caveats*. Speech-to-text and LLMs can hallucinate or misinterpret content; external evaluations of Whisper-based pipelines and other ASR systems document non-trivial error and hallucination rates, underscoring the need for uncertainty flags and human checks (Koenecke et al., 2024).

Design tips for employees. Use AI to draft first versions and meeting recaps; apply critical review and add sources; keep sensitive data in approved workspaces.

Design tips for employers. Start with opt-in pilots in writing, research, and meeting-recap scenarios; require human-in-the-loop review and prompt hygiene; track outcomes (quality, time saved, error rates) rather than raw usage.

6.2 Workflow Automation

The same technologies that generate texts or summaries are also being applied to the transformation of organizational processes. Workflow automation enables the connection of applications and cloud services, reducing human intervention in repetitive tasks and freeing up time for analysis and decision-making activities.

Therefore, low-code platforms move beyond individual apps to trigger-action pipelines: when a form is submitted, create a ticket, notify a channel, file a document, and add an owner and due date. At scale, this resembles lightweight RPA across cloud services.

What the evidence says

- A recent literature review synthesizes the benefits and barriers of *Robotic Process Automation*: best candidates are high-volume, rules-based, low-exception processes; success hinges on process selection, change management, and governance (e.g., versioning, monitoring, fallback).
- *Industry case*: A fully remote company reports resolving ~27.5% of IT tickets automatically and “millions of tasks” monthly via AI+Zapier, claiming large time/cost savings, useful as a feasibility signal, albeit vendor-reported and context-specific.

Design tips for employees. Automate hand-offs (meeting recap → tasks), reminders, and status updates; favour small, reliable automations over brittle, sprawling flows.

Design tips for employers. Build a catalogue of approved automations with data-handling notes; require change control and error budgets; align flows with identity and access policies.

6.3 Predictive Analytics and Smart Dashboards for Remote Management

While automation accelerates processes, its real strategic leverage emerges when the data generated by workflows are analysed predictively and interpreted through a structured performance lens. In this perspective, the Activity Multidimensional Performance (AMP) model proposed in Chapter 7 provides a coherent framework to integrate operational, temporal, qualitative, and contextual dimensions of work performance. Smart dashboards can act as the visualization layer of the AMP model, translating multidimensional activity data into interpretable views that support decision-making without reducing performance to single, reductive indicators. Combined with process mining techniques, these dashboards make it possible to visualize bottlenecks, forecast workloads, and improve planning across activities rather than individuals.

In the context of remote work, event logs generated by meetings, ticketing systems, code repositories, and collaboration tools feed the AMP dimensions with fine-grained, task-level evidence. Process mining techniques transform these logs into maps of how work actually flows, revealing bottlenecks, rework, and compliance drifts that remain invisible in formal organizational charts. This enables managers and teams to apply the AMP model as an evidence-based tool for continuous improvement (van der Aalst, 2016).

At the same time, governance of AMP-based dashboards is critical. Microsoft's Work Trend Index highlights the tension between leaders' desire for visibility and employees' need for autonomy; if unmanaged, "productivity paranoia" can erode trust. To align AMP measurement with ethical use, organizations should privilege aggregate, activity-level metrics (e.g., lead time, throughput, SLA attainment) over individual surveillance dashboards, and clearly communicate what data are collected and for what purpose (Microsoft, 2025).

Finally, regulatory guidance reinforces this approach. In the EU and UK, authorities emphasize that workplace monitoring must be lawful, transparent, necessary, and proportionate; intrusive practices in remote settings (such as covert tracking or keystroke logging) risk breaching data-protection law and undermining trust. Designing AMP-driven dashboards according to

privacy-by-design principles, with explicit worker communication and safeguards, ensures that multidimensional performance measurement supports both organizational effectiveness and workers' rights (ICO, 2023; EDPB, 2020–2023).



6.4 Risks and Ethical Considerations in the Use of AI in Remote Environments

The widespread use of AI and automation in remote work contexts cannot disregard an ethical and regulatory assessment, particularly where such technologies underpin forms of algorithmic management (as introduced in Chapter 2), in which work allocation, monitoring, evaluation, and coordination are increasingly mediated by data-driven systems. Analytical and decision-support systems must therefore operate in compliance with fundamental rights, proportionality, and transparency, as required by the new European AI Act (EU Regulation 2024/1689).

In fact, ethical deployment requires transparency, informed consent, purpose limitation, and contestability, especially when automated tools are used for performance monitoring, productivity scoring, or behavioural analytics. In these settings, algorithmic management systems may reproduce or amplify bias – through skewed training data, proxy variables, or opaque optimization criteria – leading to discriminatory outcomes, undue pressure, or misaligned assessments of worker performance. Such risks are heightened in remote and immersive collaboration environments, where monitoring may rely on indirect signals (e.g., interaction frequency, movement, gaze, or biometric proxies) rather than contextualized human judgement. Reviews of immersive collaboration highlight strong presence and co-presence benefits alongside constraints such as device comfort, motion sickness, tracking accuracy, and fatigue; when integrated into algorithmic management regimes, these technical limitations risk being misinterpreted as indicators of individual underperformance. To mitigate these effects, organizations should pair experimental rollouts with short pilot loops, opt-in mechanisms, clear off-ramps, and, critically, meaningful human oversight capable of reviewing, contextualizing, and overriding automated outputs.

From a security and governance standpoint, AI- and VR-enabled data flows must be aligned with robust privacy, cybersecurity, and VPN safeguards, as well as internal accountability mechanisms that clearly allocate responsibility for algorithmically assisted decisions. The EU AI Act (Regulation (EU) 2024/1689) establishes a risk-based framework for AI, including transparency obligations, restrictions on certain practices, and heightened requirements for high-risk applications, such as systems used in employment and worker management whose implementation will progressively unfold across

2025–2026. Complementary guidance frameworks, including the NIST AI Risk Management Framework 1.0 and the OECD AI Principles, provide operational lenses for identifying bias, ensuring human-in-the-loop or human-on-the-loop controls, and maintaining trustworthiness across the AI lifecycle. Used together, these instruments can steer procurement, development, and deployment towards accountable forms of algorithmic management.

The adoption of automation and artificial intelligence thus marks a turning point in the paradigm of digital work: from purely technical environments to cognitive ecosystems in which people and algorithms cooperate in real time. However, the promise of productivity and innovation associated with algorithmic management can only be realized through forward-looking governance that balances efficiency with equity, safeguards worker autonomy, and places human judgement at the centre of automated performance assessment and organizational decision-making.

7. CONCLUSIONS

Remote work has evolved from an emergency response to a foundational element of modern organizational design. What began as a pragmatic fix has matured into a sustainable model of flexibility, inclusivity, and technological empowerment. Yet, the success of this transition depends not merely on the availability of digital tools, but on the strategic integration of technological infrastructure, culture, and governance that allows technology to serve human work rather than the other way around.

Throughout this chapter, we have shown that effective remote working builds upon a “toolbox” made of four interdependent pillars: technological readiness; security and compliance; collaboration and communication; and emerging intelligence. First, robust digital infrastructure – reliable connectivity, secure VPN access, and scalable cloud services – forms the backbone of operational resilience. Without it, even the most innovative practices fall short. Second, security and data protection are non-negotiable prerequisites: privacy-by-design configurations, encryption, VPNs and multi-factor authentication safeguard both organizational assets and individual trust. Third, collaboration and productivity tools – from videoconferencing and messaging platforms to project management systems – enable coordination across space and time, provided that they are accompanied by clear norms, equitable access, and attention to well-being. Finally, emerging technologies, such as automation and generative AI, are redefining knowledge work itself, amplifying capabilities while raising ethical and governance challenges that must be addressed with transparency and accountability.

If integrated coherently, these components can transform remote work into a strategic advantage rather than a logistical compromise. A well-designed

digital workplace supports not only productivity and cost efficiency but also autonomy, inclusivity, and sustainability – dimensions increasingly central to both talent retention and organizational legitimacy. Conversely, neglecting interoperability, digital ergonomics, or governance risks fragmenting work-flows and undermining trust, ultimately reducing the benefits of flexibility.

The next frontier lies in orchestrating hybrid ecosystems that blend presence and distance, human judgement and automation, security and openness. This requires a cultural shift as much as a technical one: investing in digital literacy, codifying shared rituals, and fostering a leadership style that values output over presence.

In conclusion, from a technological and infrastructural point of view, remote work should be understood not as a temporary arrangement or a set of isolated tools, but as a systemic transformation of how value is created, shared, and sustained in the digital age. The remote working toolbox presented in this chapter provides a foundation for this transformation.

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4. Process mining meets flexible working: Supporting a change of perspective

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1. INTRODUCTION

With the introduction of flexible working, many organizations have changed their approach, shifting from a prescriptive management of their processes to a goal-oriented one: employees are assigned goals, and they are given control over how to carry out their work. Therefore, rigid procedures are not imposed, but monitoring tools are used to understand how work is carried out. This is particularly interesting in those cases where work is carried out remotely and interaction occurs with the support of software systems: a challenging setting for traditional supervision.

The first advantage of this approach is that the organization can “learn” from the employee, who is an expert in performing the job, the best way to execute it. The organization can, then, decide to integrate this knowledge into its processes. The second advantage is that a process analysis carried out in this way allows for the identification of weaknesses, on which the organization can decide whether and how to intervene.

Process mining offers a set of solutions to monitor real processes. Among the solutions and techniques it provides, two are particularly interesting: (1) the extraction of process models from execution logs; and (2) conformance analysis techniques to determine deviations of real executions from a theoretical model.

Thus, process mining can potentially be extremely useful for organizations, especially in the context of flexible working. Its application, however, presents some challenges for organizations. These include:

C1. Its application requires real data, preferably representative of the various ways in which activities are carried out and of good quality. Often, such data must be integrated with the knowledge that is provided by domain or process experts, who can explain behaviors that may appear anomalous.

C2. The cost of tools or professional consulting services can be too high for a small or medium-sized company.

C3. Conducting an effective analysis can be complicated for non-experts, especially when the analysis is exploratory (less so when there are specific hypotheses to confirm or refute).

This chapter introduces process mining applications in a flexible working scenario and briefly mentions their use in a real-world case.

2. PROCESS MINING AS A SUPPORT FOR FLEXIBLE WORKING

2.1 Challenges of Flexible Working for Organizations



According to Weske (2019), “a company can reach its business goals in an efficient and effective manner only if people and other enterprise resources play well together.” Until a few years ago, this sentence was mainly implemented by a company by providing adequate technological support, that is, a software infrastructure that supported the company in its daily business operations.

With the explosion in the adoption of *flexible working*, companies have to face an additional challenge, which is finding the appropriate way of orchestrating their employees. In particular, with flexible working, we refer to different modalities of working (including remote or hybrid working) where employees might work from places other than the office and usually out of management’s sight. Indeed, when flexible working was not that common, the management had direct supervision of the activities because everybody was in the office and their behavior could be monitored easily. In case more efficient ways to carry out some activity emerged or in case a problem occurred, information could spread directly to all the interested parties. With flexible working, this ease in communications is reduced (see Chapter 1). One possibility for companies would be to adopt technologies able to monitor workers’ activities when not working in the office. However, as was well tackled in Chapter 1, this has significant drawbacks for workers. Also, as described in Chapter 2, the European Union has established obligations that platforms have to comply with, such as transparency and limits in data processing and monitoring.

One possibility for companies to manage the work is to implement a shift of perspective by moving from a logic of control of the activities to a logic where

business goals (objectives, performances, and so on) are monitored. Business goals can then be associated with activities or with entire processes. In this chapter, we address the latter, and refer the interested reader to Chapter 7 for a discussion on monitoring of business goals associated with activities.

This chapter explains how process mining techniques can effectively help to re-establish the connection and, thus, the governance in the presence of flexible work, mainly addressing methodological aspects of process mining applications. These techniques rely on the analysis of real data from process execution, thus allowing companies to determine whether key performance indicators (KPIs) have been met, to identify deviations of the way in which employees perform their tasks with respect to expectations, and to investigate the reasons for such deviations. Often, indeed, deviations are symptoms of a malfunction in the expected process and open up new possibilities for process improvement.

Of course, there are some requisites that ought to be met in order to adopt process mining for analyzing the processes. Earlier, we identified three main challenges and re-iterate them here:

- C1. Its application requires *real* data about activity execution, which is possibly both representative and of good quality. Often, such data must be integrated with some domain knowledge, and it may be necessary to involve process experts who can explain behaviors that may appear anomalous.
- C2. The cost of tools or professional consulting services can be too high for a small or medium-sized company.
- C3. Conducting an effective analysis can be complicated for non-experts, especially when the analysis is exploratory (less so when there are specific hypotheses to confirm or refute).

How to address these challenges and support small and medium-sized enterprises is discussed in the rest of the chapter.

2.2 Introduction to Process Mining

The term *business process* (or simply *process*) is used to identify a set of activities that are performed by a group of individuals in coordination in an organizational and technical environment, and that aim at achieving a business goal (Adamo et al., 2025, Weske, 2019). It is reasonable to assume that a company (or organization) has several business goals. To achieve each business goal, some workers need to coordinate their actions. This is usually done in a standardized fashion. A business process represents the activities that are expected

to be performed to achieve the goal and the execution constraints between them.

Broadening the perspective, it is important to observe that a company may be seen as a single actor that interacts with other companies by playing roles in some business processes of other organizations. For instance, a company may represent the process in place to order items from a supplier. This requires an interaction with the supplying company and requires the supplying company to have a process in place as well, so as to be able to answer the request of its client.

When business processes are explicitly represented, it is possible to leverage *business process management* concepts, methods, and techniques (Dumas et al., 2018) whose aim is to support business process design, administration, configuration, enactment, and analysis. In some companies, processes are well formalized and documented, and business processes are also used as documentation, for auditing, for training new employees, and such like. In these cases, which are more common in large enterprises, workers are required to strictly adhere to them. In many cases, however, especially with micro, small, and medium enterprises, processes exist just in the form of best practices or as habits, and are part of the company lore. This situation represents, in the first place, a risk for the company, whose knowledge about how to carry out the company's activities is retained by workers: an experienced employee leaving the company may produce a loss of competencies. Additionally, the way in which activities should be done cannot be easily shared, and the analysis of performances is difficult, if not impossible.

Process mining (van der Aalst, 2016) has been introduced with the double purpose of (i) supporting the discovery of business processes from real data concerning the way in which people do things and (ii) comparing the real execution, extracted from the real data, with an expected execution. A comparison may be done in terms of performances, resource usage, executions (when the expected process is available), and such like.

For its characteristics of analyzing the real execution of processes, process mining is particularly suitable for a goal-oriented work organization, where companies aim at assessing whether their business goals are met; aim at learning from workers' best practices in performing their job; and do not have direct control over process executions. These characteristics are typical of a flexible working setting, as highlighted in Chapter 7. Think, for instance, of an employee who has to handle a request for assistance by a client. He may decide to classify it as urgent even when it is not, just because it is so simple to solve that it will take just a few minutes, improving the company's average time for request handling. This is an example of how a company may learn from employees and where employees' work is driven by goals.

3. APPLYING PROCESS MINING: WHERE TO START

Process mining relies on the availability of real data that records how a process has actually been executed by the involved parties. The execution of a process is seen as a sequence of actions called *events*. The data, therefore, consist of sequences of events, which are stored by an information system in repositories called *event logs*.

An event log stores many executions of the same process. Each execution is called a *trace*. Each trace records which activities were performed and in what sequence. These three pieces of information (trace, activity, and sequence) are the minimum requirements for identifying and analyzing a process.

In addition to these, an event log may contain additional information, such as who performed the activities, the duration of each activity, the cost, the time elapsed between the end of one activity and the beginning of the next, and so on. When available, such information allows for more in-depth analyses. Medium and large-sized companies are often able to collect the data directly from enterprise resource planning or information systems supporting their business.

Essentially, an event log contains information on how the process has been executed, but this information is difficult to interpret. For example, imagine an Excel file storing millions of process executions, similar to each other but only partially identical in terms of activity sequences, each with its own timing.

Process mining tools enable three main types of operations:

Process Discovery. Allows the extraction of process models from real event logs that capture actual executions of activities. A process model can be seen as a map that meaningfully and legibly summarizes the information that is distributed across the various traces that are stored in an event log. It may become a business process, but usually this happens after a polishing/validation phase.

Conformance Checking. When there exists an ideal business process that is expected to be implemented within the company, and when this is explicitly expressed as a process model, it becomes possible to compare real executions with the expected ones (by comparing the traces in the event log with the process model). Conformance checking techniques allow both the graphical visualization of where a trace or an event log deviates from the model and the calculation of how representative a model is of the set of traces contained in the event log. Note that deviations should not necessarily be interpreted as negative. Often, they capture adaptations that may correspond to more efficient procedures or that are dictated by limited resource availability. They are, thus, indicative of the need for further analysis.

Process Enhancement. These tools make it possible to identify strengths and weaknesses in the actual process executions, in order to make improvements, prevent undesirable executions, and adopt more efficient solutions.

The principles of process mining are particularly well suited to flexible working environments. The idea is to assign employees specific objectives while leaving them in control of how to carry out their work, avoiding the imposition of rigid procedures but using analytical tools to maintain oversight of what is being done. As we have seen, the company can “learn” from the workers the best way to perform the tasks in which they are experts, incorporating that knowledge into its processes. The second advantage is that process analysis allows the identification of weaknesses, on which they can intervene.

In order for process mining techniques to be applied, however, challenges C1–C3 ought to be faced. Briefly, the company needs some way to collect actual traces of activities, it needs a proper budget, and it needs the right expertise.

Regarding C1, this challenge is particularly burdensome for companies where software tools are used only to a limited extent—or not at all. In such cases, the execution of activities should be recorded manually, possibly with the support of technological solutions. This step requires investment both in tools and in staff training. For instance, some sectors may adopt electronic tracking systems that generate and record event data. An example where this already happens is parcel delivery. For processes that already rely on software tools, on the other hand, the tracking of activity execution is often possible by activating automatic recording.

Concerning challenges C2 and C3, the next section provides guidelines that may support small and medium enterprises in preliminary process mining analysis.

3.1 Roadmap for Process Mining Application

The first step when applying process mining for process analysis is to clearly identify the scope of the analysis: which information to extract from raw data? This is a complex task for many reasons. One reason is that often it is not clear a priori which information the data contain; moreover, often it is not clear a priori which kind of analysis the company is interested in. Once these aspects have been clarified, an exploratory process can be put in place, where data analysis is guided by the identified objectives.

The steps can be summarized as follows: (1) Define analysis objective; (2) Identify process of interest; (3) Formulate questions of interest; (4) Data selection and preparation; (5) Tools selection; (6) Result interpretation; and (7) Evaluation and refinement. The steps from 4 to 7 can be repeated as many times as needed.

All the steps are described in the following with the support of a running example. To this aim, we consider the fictional IT company named “Next Process Company.”¹

Step 1—define the objective of the analysis (business goal)

The first step consists of specifying the exact business goal of interest. However, an organization is often characterized by having several, intertwined processes, each with its specific business goal. In order to carry out the analysis, one has to identify the *area of interest* (e.g., human resources, customer management, production, etc.) and all the processes that are involved (e.g., hiring and advertising). Analysis requires the availability of data concerning the processes involved in the area of interest. So, part of this step consists of understanding what kind of data is available, what such data represent (i.e., the processes it concerns), and whether the data can be enriched with additional information that helps the analysis. This may happen, for instance, when the process is distributed over several systems, different roles are involved, and so on, and the analysis requires locating the activities and associating them with the responsible roles. Usually, several sources of information need to be integrated in order to capture the whole process.

Depending on the available data, the company may decide to refine or modify the objective of the analysis.

Example: *The Next Process Company is a company specializing in customized software production. The company's activities span over several areas, such as hiring, customer satisfaction, billing, new customer acquisition, advertising, and such like.*

Let us assume that the company is interested in evaluating the processes related to customer request management, starting from the order and continuing through all the steps that lead to the request's closure and the subsequent transition to payment. This area of interest involves a set of processes like customer identification, request classification, assessment of the impact on the software, and development.

Step 2—identify one process of interest to analyze

As highlighted in step 1, the processes involved in the analysis may be more than one, intertwined, and connected to one another. However, in order to perform the analysis effectively, the strategy is to identify one process at a time, as if they were independent, and let the connections emerge along the way. So,

¹ The examples are inspired by a real case study. The name of the company has been anonymized.

in principle, the initially independent processes will become subprocesses of a larger one.

To guide this kind of analysis, it is convenient to begin by initially sketching the whole process but keeping its size and complexity limited (for instance, by using a small number of activities, only a few actors, and few interactions with other processes). This allows breaking down the analysis problem. The process complexity can be increased afterwards, in later analysis steps, by detailing the subprocesses, and by composing the puzzle. The choice of the process to investigate and the level of detail that will be reached necessarily depend on the available data.

Example (management of customer requests): *Let us consider the customer request management process of the Next Process Company, and suppose that this addresses different types of requests, namely: (1) changes to an existing feature; (2) extension with new functionalities; and (3) problem resolution. The idea will be to break down the complexity of the process as a whole by considering in a separate way these three types of requests and by analyzing their management one at a time. The actual analysis will be possible only if Next Process stores data that records how these three types of requests are handled. If not, this analysis would clearly not be possible.*

Step 3—formulate the company’s foci of interest and prioritize them

Once the process in the area of interest has been identified, the next step is to specify what information the analysts should look for in the available data. The reason is that event logs, indeed, are collections of *raw* data. In order to extract information, they need to be elaborated, potentially filtered, aggregated, and visualized. In order to perform this task, the “top-down” approach is widely adopted. Briefly, the analysts elicit a *list of questions* (around ten) that reflect the company’s main purposes, and then use them to focus the data analysis steps. Questions should be answered in order of importance. An important part of the analysis (see next step) will be to verify whether the available data allows answering. The analysis can then progress iteratively, refining the initial questions and repeating the process. This approach allows proceeding quickly. However, it is recommended to limit the level of depth in which questions are answered in the first place. Indeed, the advantage of defining a list of questions before starting the analysis and trying to answer them all allows one to mitigate the risk of starting to dig too much into one specific aspect, losing an overall view of the interests of the company.

Example (questions for the customer request management): The questions of interest identified by the company are:

- *How long does it take to manage a request? (worst, best, and average case)*
- *Which activities take the most time to complete?*
- *Are there process instances that are stuck at any activity?*
- *Are there workers who are assigned simultaneously to more than one strategic or demanding activity?*
- *Are there instances that execute the same activities repeatedly?*
- *Are there complaints from the customer about the way requests are handled?*
- *How is a request handled by the personnel? How often is the person in charge of managing the request changed?*

Now, suppose that by answering the first question, the company discovers that in some cases, an activity expected to be simple takes a long time to be completed. Before starting to investigate in detail why, it is important to annotate the problem and progress in answering the other questions: (1) the other questions may be important as well (or more important) for the company; and (2) answers to other questions may help clarify the identified problem. For instance, a worker shared between two activities may be the reason why it takes a long time to complete one of the two.

Step 4—data selection and preparation

The next phase consists of determining exactly what data is available and assessing whether it is possible to answer the identified questions by using such data. This can be done by looking at the raw data and understanding what each piece of information represents. This step may require interactions between many professionals: domain experts; workers who actually execute the activities; and potentially also experts of the information system that is adopted by the company.

In this phase, it is important to correctly interpret each piece of information, like the meaning of each attribute, the range of values it can take, under which circumstances, and so on. Often in this phase, it is possible to identify some codes or workarounds that the workers invented to signal specific states or to overcome limitations of the present organization. They appear reflected in the data as attributes having strange, unexpected values. The “notes” field, for instance, may be used to store process information that otherwise might be lost.

During this phase, one should also identify missing data and evaluate whether it can be obtained, for example, by requesting it from another department or by integrating many data sources. Particularly challenging, indeed,

are those pieces of information that are expected to be filled in by hand. If the personal information of a client is inserted by hand, it could be subject to mistakes, which may result in inconsistencies with other data. Suppose a company is both a client and a vendor, depending on the information systems, inconsistencies may be introduced.

Example: *Next Process wants to understand which workers are most involved based on their role. It is essential to have information on who (even anonymously) performed which activity on which request. However, if the analysis is intended to consider the seniority level of each resource, it is necessary to verify whether this information is available and, if needed, evaluate the possibility of integrating it, either through the Human Resources department or by consulting employment records.*

Next Process foresees three types of requests: (i) the implementation of a new functionality; (ii) the request for changes to an existing functionality; and (iii) the request for support. Now, suppose that the company wants to assess which role is more used for each request type. The company has to first consider the data that is available for each request type. Suppose that, from this analysis, the company discovers that in the last year, the majority of the requests are of the type “implementation of a new functionality.” Since this does not reflect the expectations of the company, this might be an aspect to be investigated further with the workers or with the domain expert (see step 6).

Step 5—tools selection

In the previous step, the adequacy of the data was roughly checked. To perform the analysis and better understand the information that is captured by the raw data, software supporting tools are very helpful. The commercial and non-commercial landscape is very wide, with tools offering functionalities at a range of prices. Sometimes, in order to solve a problem, a combination of a few different tools is necessary.

The choice of the most suitable tool depends on factors such as:

- The mastery of IT skills in the company and the familiarity with formal processes.
- The format of the input data (e.g., xes, cvs, etc.).
- Communication needs that determine the format of the output—for example, whether it should be graphical and at what level of detail.

Some commonly known current data analysis tools, although not specific to process mining, include MS Excel and R (<https://www.r-project.org/>). If the

data is stored in a database and the company has resources with IT competencies, SQL queries can also be used effectively to answer targeted questions.

Proper process mining and process analysis tools are Apromore (<https://apromore.com/>) and Disco (<https://fluxicon.com/disco/>). These do not require big learning efforts to be used and provide graphical outputs that are easy to interpret.

A tool that is still mainly graphical but requires deeper technical knowledge is ProM (<https://promtools.org/>).

Finally, an example of a very powerful tool that does require programming skills is the Python library PM4PY (<https://processintelligence.solutions/pm4py>).

In summary, Disco and Apromore are “ready to use” and more intuitive for companies. ProM and PM4PY are more flexible and potentially provide more data analysis techniques, but require extra technical (such as programming) skills.

Step 6—interpret the results with the support of domain experts

The analysis performed at the previous step, with the support of IT-based tools, should be guided by the questions of interest identified at step 5. The analysis should start by interpreting the results and formulating: (i) answers to the identified questions and, where possible, (ii) draw hypotheses on the reasons.

For instance, possible hypotheses could be made on why a certain process instance is blocked, why the same activities are repeated multiple times within the same instance, and so on. However, these hypotheses must be validated with the help of the workers who actually perform those activities in practice. This is the stage where employee involvement is most crucial.

It is worth noting that the question-driven analysis suggested by these guidelines allows for targeted feedback from employees. This can potentially ease the analysis because: (1) employees can be asked specific questions, from which much richer information can be extracted, compared to the starting point of a standard top-down analysis; and (2) the questions should be framed in a way that makes employees feel like valuable contributors to the process improvement, rather than persons who are being blamed for their imprecise or wrong actions.

Example: *Going back to the example introduced at step 4, the company discovered some anomalies with the request type. In particular, most of the requests of the last year are of the type: “implementation of a new functionality.”*

By investigating further, the company may discover that workers’ tendency is to select this type of request for all the requests because it allows them to postpone the assignment of a programmer responsible for the request. This simplifies the job of the workers, since it is difficult to identify an adequate programmer in request for change or in a request for support at the early stages. The selection of “new functionalities” thus simplifies the work of the employee. This way of proceeding signals an inadequacy of the information system that the company may want to address in order to better handle the requests.

In these situations, it is necessary to identify when and where the behavior occurs, formulate hypotheses, and verify with the employee whether this is, indeed, the case and what limitations are imposed by the process.

This activity could lead, for example, to modifying certain parts of the information system that supports request management, for instance, by enabling more streamlined procedures for handling minor changes.

Step 7—evaluation, refinement, and iteration

Based on the obtained results and the analyses, the analyst may find it useful to repeat the steps and formulate additional questions to investigate anomalies or explore certain aspects of the process in greater depth. The completion of the first analysis cycle may lead to the identification of certain critical issues that require further investigation. In such cases, it is possible to iterate the application of the steps that we have outlined and discussed so far, starting with the formulation of new questions of interest that are more complex or focused on aspects that were not the main focus of previous iterations.

Example: In the previous case, the analysis could be extended by combining request types and durations: does the time needed to handle a request depend on its type?

Alternatively, one could consider employee experience and the level of difficulty in handling requests: are employees with greater seniority in the company able to solve more complex cases more quickly?

4. USING MONITORING DATA TO SIMULATE AND PREDICT

The formalization of a process model brings several advantages concerning performance evaluation and prediction. We introduce two techniques that can be adopted to this aim. The first technique is known as *simulation*: it allows the definition of alternative scenarios and the evaluation of bottlenecks. It is particularly useful for “what-if” analysis. One can, for instance, simulate the impact on costs and execution time of hiring a new person for a certain position. The second technique has emerged more recently and consists of *predicting the KPIs of interest based on past executions*. One can, for instance, consider an ongoing execution and estimate the time to completion, the final costs, and such like. This technique uses AI-based technologies, which basically are able to predict those parameters based on similarities with past executions.

4.1 Simulation Techniques and Possible Applications

Simulation can be seen as a deterministic technique to make predictions on a process execution or to perform a diagnosis on an existing process. Several tools are available off the shelf to perform simulations (such as SAP Signavio,² Apromore,³ Pm4Py,⁴ or ProM⁵). In order to apply simulation, one has to provide as input both a process model and some additional information on the activities appearing in it. Therefore, one can specify costs, average duration, the needed resources to perform a task, the resources actually available (e.g., how many workers are assigned a certain role), and their working time. When this information describes the real conditions in which a process is executed, then the purpose of the simulation is an evaluation of the process with respect to KPIs like overall costs of the process execution, maximum, average, and minimum duration, bottlenecks, and cycle time.

² <https://www.signavio.com/>

³ <https://apromore.com/>

⁴ <https://processintelligence.solutions/pm4py>

⁵ <https://promtools.org/to-providecompany/>



Simulation can also be based on a “possible scenario” rather than actual data concerning the company. For instance, a company may wonder how the process performances change if a new worker is hired or if some activities are performed differently. This type of *what-if* analysis can be used to make predictions. In the case of distributed processes or in a setting where the process can be executed remotely by some of the resources, the simulation can be a very powerful tool. Indeed, it allows an organization to identify alternative scenarios of execution and evaluate their performance before investing resources to actually implement them. In case, for instance, an employee suggests a change of the process localized to a few activities, what can seem an improvement for the process can be evaluated by the organization considering a broader view, and evaluating the impact on other processes as well. For instance, if the suggestion involves moving a human resource for half of his/her working time to a certain activity, the organization can evaluate (i) whether this is really going to improve the activity performances, and (ii) whether this is going to introduce new weaknesses in the process, such as bottlenecks. The idea is that before restructuring the process, one has to make sure the reasons for a problem are identified correctly. It could be that the reasons for a bottleneck are not directly related to the activity where the bottleneck occurs (it might be that the preceding activities do not support the activity correctly, causing the instances to take a long time to be processed).

4.2 AI Techniques to Predict KPIs in Process Execution

Prediction techniques are not necessarily an alternative to process simulation. Rather, they can complement the types of analysis that can be performed. Prediction techniques in process mining are quite recent (Di Francescomarino and Ghidini, 2022). Currently, few tools are able to provide prediction functionalities. Very interestingly, Nirdizati (Rizzi et al., 2025) is a tool conceived to support users in selecting the most appropriate prediction technique for the specific process and data.

Prediction in processes aims to provide information on the evolution of an ongoing execution of a process, based on completed executions collected as event logs by an information system. Different dimensions can be predicted (Ceravolo et al., 2024): (i) *next activity*, that is, given the current ongoing process execution, what is more likely to be its evolution? Between two alternative activities, which one is more likely to be performed?; (ii) *outcomes*, that is, the results of a process execution. For instance, in a process handling customer complaints, is a specific complaint under investigation likely to be accepted or refused?; (iii) *performance-related aspects*, such as time, costs, and so on. For instance, how long is this complaint analysis going to take?

These techniques are very promising, especially in a flexible working environment. The possibility of predicting evolutions and performance related to a specific process instance allows one to better plan and organize the work. For instance, knowing in advance that certain cases will require complex discussions and interactions allows the management to schedule them when the involved persons can meet and discuss in person, while cases that are expected to be easier can be tackled by employees during their days of remote work.

5. CONCLUSION

In this chapter, we describe how process mining can support a change of perspective for companies, moving from a prescriptive and rigid way of managing the work to a logic of business objective monitoring. In particular, we propose the use of process mining techniques to understand process executions in reality and determine goal achievements and possible improvements. The approach that we propose is complementary to the one proposed in Chapter 7, where an activity perspective and its performances (cost, time, quality, stakeholder satisfaction) are proposed.

The approach proposed in this chapter, complemented by the one proposed in Chapter 7, represents a more effective way for companies to perform the work in the presence of flexible working. It is also a possible solution to answer to workers' needs (Chapter 1), like the right to disconnect, and EU directives on transparency, workers monitoring, and their privacy (Chapter 2).

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5. The home office: Strategies for environmental well-being

Alberto L. Ghiberti, Clara Peretti, Anna Pellegrino and Enrico Fabrizio

1. A HOME FOR WORK

The widespread adoption of remote work, accelerated by the COVID-19 pandemic, has profoundly reshaped the relationship between living and working spaces. What initially emerged as an emergency response to social restrictions has evolved into a structural change in professional organization, promoting greater flexibility and autonomy in managing tasks and daily routines (Barrero et al., 2023).

However, the home office is not a new invention; rather, it revives an enduring tradition of coexistence between domestic and professional spheres. Throughout history, numerous examples, such as the artist studios and professional dwellings of the nineteenth and early twentieth centuries, demonstrate that integrating work and living functions within a single environment is far from unprecedented. The concept of the “workhome,” introduced by Charles and Ray Eames in 1949 to describe their California residence, captured this hybrid condition: a space designed to foster both creativity and daily life.

In recent decades, scholars such as Frances Hollis have examined this condition with renewed scientific attention. Hollis’ pioneering research (2008; 2021) revealed the difficulties of performing professional tasks in spaces not originally designed for them, such as kitchens or bedrooms, and the effects on comfort, concentration, and psychological well-being. Her work emphasized the importance of spatial and functional distinction between living and working areas, even if achieved through adaptable or temporary partitions. The allocation of a dedicated workspace, whether permanent or flexible, therefore becomes an important factor in maintaining both efficiency and mental balance.



While six square meters may be considered a minimal threshold for screen-based activities, the optimal size and configuration of a home office depend

strongly on the nature of the work performed and the individual's spatial and ergonomic needs. Remote work should not be equated solely with computer-based tasks: it may involve creative, manual, or relational activities requiring different environmental conditions.

Ultimately, the home office represents not merely a place of production but an interface between personal and professional identity. Its design, whether intentional or improvised, shapes the psychological experience of work, influencing motivation, satisfaction, and overall well-being.

The most recent literature, that is, that published in the last five years (Barrero et al., 2023; Hollis, 2021; Manu et al., 2024; Mura et al., 2023; Marikyan et al., 2021; Boegheim et al., 2022; Adisa et al., 2021; Emami and Sadeghlou, 2021; Lefosse et al., 2023; Manu and Rysanek, 2025; Vilhelmson et al., 2026; Herrera-Ballesteros et al., 2025; Zenkteler et al., 2023), converges on a fairly consistent picture: during work from home, people report, on average, high levels of satisfaction with environmental conditions—often higher than in offices—but this perception coexists with recurring, objective issues. Instrumental measurements and more structured analyses reveal problematic peaks, especially in indoor air quality (IAQ), with CO₂, total volatile organic compounds (TVOC), and particulate matter (PM) exceeding recommended thresholds in several studies; moreover, acoustic shortcomings and inadequate workstation ergonomics are reported across the board (Manu et al., 2024).

In terms of results, robust and replicable associations emerge between specific indoor environmental quality (IEQ) factors and health. Noise and acoustic satisfaction are the most consistent predictors: low noise satisfaction is associated with fatigue, headaches, anxiety, depression, stress, and concentration difficulties; Humidity relates to eye, nose–throat, and skin symptoms. In parallel, adequate lighting supports concentration and engagement. Temperature shows less systematic links with productivity and well-being, varying by activity, climate, and housing type; however, together with noise, it is implicated in attentional problems. Overall, all IEQ dimensions show small-to-moderate correlations with productivity and well-being, with effects more consistent for productivity (Mura et al., 2023; Marikyan et al., 2021).

A second line of results concerns the home's physical and technological characteristics. Multi-country studies indicate that “facilities” (separate space, ergonomic furnishings, greenery) are the strongest driver of productivity. Overall satisfaction, however, appears to be shaped both directly by comfort and well-being-related factors (e.g., adequate facilities, information and communication technology (ICT) infrastructure, and perceived health and safety) and indirectly via productivity. ICT infrastructure (hardware and connectivity) improves both productivity and satisfaction, while perceived health and safety (protection, mental/physical health) provide an additional contribution. The psychological dimension of attachment to the home workplace is also central:

a comfortable environment satisfies needs for autonomy and competence and, through attachment, supports engagement; “relatedness” remains the most problematic part, likely due to social isolation (Manu et al., 2024; Boegheim et al., 2022).

Methodological limitations are widespread and constrain generalizability. Many studies are cross-sectional, rely on self-reports that are not always validated, and use non-representative samples (geographic bias, high education/income levels, lockdown periods with unusually low outdoor noise); instrumental monitoring is infrequent and often limited to a few parameters (e.g., CO₂ as the only IAQ proxy without TVOC/PM, or acoustics without psychoacoustic metrics; Manu et al., 2024). These gaps help explain occasional heterogeneity (e.g., for temperature) and underscore the need for longitudinal, multi-season, multi-country studies that integrate objective and subjective measures, include richer acoustic and IAQ metrics, and test specific technological configurations.

Recent scientific literature shows that environments for remote working can offer favorable perceived conditions, but intermittent risks linked to air quality and noise, along with often inadequate ergonomic provision, affect physical and mental symptoms and the capacity to concentrate.

The most effective and tangible levers are:

- creating a dedicated ergonomic workspace;
- ensuring robust connectivity and adequate equipment;
- optimizing daylight and glare control; and
- monitoring/managing IAQ and noise.

At the level of corporate policy and residential design, equity must also be addressed: income and housing context weigh on home environmental quality and, in turn, on indoor comfort and performance (Manu et al., 2024; Mura et al., 2023; Marikyan et al., 2021; Boegheim et al., 2022).

As discussed in Chapter 3 of this book, remote work environments function as part of a broader hybrid ecosystem in which the physical setting, digital infrastructure, and organizational practices are closely intertwined. The “remote working toolbox” outlined there emphasizes devices, connectivity, cloud services, and collaboration platforms as core enablers of productivity and security. Building on that systemic view, this chapter focuses on the home office as a specific physical and psycho-environmental context, examining how IEQ, spatial configuration, and low-cost monitoring solutions can complement technological tools to support health, well-being, and sustained performance in everyday remote work.

2. THE PHYSICAL CONTEXT

The physical and social context in which remote work takes place plays an essential role in shaping how individuals experience comfort, concentration, and overall well-being. The home, traditionally conceived as a private and protective space, has become a multi-functional environment where professional life unfolds alongside domestic routines. This overlap between living and working areas blurs traditional boundaries, requiring constant negotiation between personal and professional dimensions (Adisa et al., 2021).

Rooms such as bedrooms, kitchens, or living areas are often adapted to serve as workstations. However, these spaces may not provide the environmental and ergonomic conditions necessary for sustained concentration and effective performance. Individuals who share their homes with family members or roommates frequently report a decrease in well-being, engagement, and productivity. The domestic setting can nevertheless become a positive resource when properly designed and managed. The home embodies both physical and symbolic meanings, reflecting the personal identity of its occupants and their emotional connection to the space. Creating a functional and pleasant work area means not only optimizing environmental parameters such as light, temperature, air quality, and noise control, but also ensuring psychological needs like privacy, control, safety, and personalization (Mura et al., 2023). These elements help transform an improvised setup into a true remote working environment.

Certain spatial and environmental qualities have been shown to enhance concentration, emotional recovery, and cognitive performance. Natural light, pleasant outdoor views, and the presence of plants or natural materials promote restorative experiences and reduce stress (Marikyan et al., 2021). These features, central to approaches such as biophilic and restorative design, strengthen the affective and cognitive resources necessary for productive and healthy work.

The physical environment of home-based work is far from neutral; it actively shapes comfort, focus, and well-being. A quiet, comfortable, and well-designed workspace can reduce stress, improve focus and satisfaction, and turn the home into a supportive place for professional activity.

At the same time, these spatial and environmental features are closely intertwined with psychological mechanisms. Chapter 6 of this book examines these psycho-environmental dimensions (e.g., perceived security, control over the workspace, privacy, and place attachment) and introduces sensory and restorative design strategies to mitigate stressors such as noise, technostress, and blurred work-home boundaries. The psycho-environmental dimensions can be affected by the physical dimensions that are introduced here and vice versa.

Ergonomics has been frequently identified as a critical factor for physical health in remote working environments, particularly during the large-scale home-based work of the COVID-19 period. Several studies conducted during the pandemic showed a significant association between inadequate chairs, non-adjustable desks, and increased musculoskeletal discomfort among remote workers (in the neck, shoulders, lower back, and upper limbs) (Moretti et al., 2020; Szeto et al., 2022). These findings indicate that many home workstations lack basic ergonomic features, and that musculoskeletal discomfort related to poor ergonomic conditions is not only a physical issue, but is also associated with reduced concentration, perceived fatigue, and lower self-reported productivity (Robertson et al., 2022). These findings underline the importance of addressing ergonomics in discussions of remote work, and providing adequate chairs and desks to prevent both direct physical consequences and indirect effects on cognitive and work outcomes.

3. IEQ AND REMOTE WORK

In recent years, research has increasingly examined how domestic environments influence not only physical comfort but also cognitive and emotional aspects of work. Studies show that the quality of home-based work experiences depends less on objective spatial features and more on how individuals perceive and adapt to their environment (Manu and Rysanek, 2025). This perspective aligns with findings in organizational psychology, which describe work-from-home arrangements as continuous processes of negotiation between professional and personal domains (Vilhelmson et al., 2026), shaped by spatial control, boundary management, and self-regulation (Herrera-Ballesteros et al., 2025).

These insights suggest that indoor environmental quality in home offices should be understood not only as a technical matter, but also as a psychological one, where perception, flexibility, and awareness are as essential as temperature or light.

The physical environment is a key element in how people experience remote work. It interacts with social, organizational, and personal factors, influencing concentration, comfort, and overall well-being (Zenkteler et al., 2023). While traditional offices are designed and regulated to meet specific environmental standards, domestic spaces rarely offer the same level of control. As a result, the quality of the home environment can vary widely and depends largely on how people use and manage their space.

The concept of IEQ describes the combination of conditions that define comfort and health inside buildings (European Committee for Standardization, 2019a). It includes four main dimensions: thermal comfort; air quality; acoustic

comfort; and visual comfort. Together, these factors shape how people feel and perform while working.

- *Thermal comfort* concerns temperature, humidity, and air movement. A well-balanced thermal environment helps maintain focus, while heat or cold can cause fatigue and discomfort (European Committee for Standardization, 2005, 2019b).
- *Indoor air quality* depends on ventilation and the presence of pollutants. Poor air quality reduces concentration and can affect physical health (European Committee for Standardization, 2005, 2019b).
- *Acoustic comfort* relates to the amount and type of noise in the environment. Domestic spaces are often exposed to sounds from traffic, neighbors, or household activities, which can interfere with concentration. Simple improvements such as spatial separation, insulation, or soft furnishings can help create a quieter atmosphere (International Organization for Standardization, 2021).
- *Visual comfort* depends on light quantity and quality. Natural light supports alertness and psychological balance, while artificial lighting should ensure adequate brightness without glare or sharp contrasts (European Committee for Standardization, 2019c).

Indoor environmental quality is shaped by many interacting factors, such as building materials, orientation, insulation, outdoor conditions, and the systems that control heating, cooling, ventilation, and lighting. Spatial layout, occupancy density, and maintenance practices also play an important role in maintaining a healthy indoor setting.

Workplace regulations such as technical standards like ISO 7730 (European Committee for Standardization, 2005), EN 16798-1 (European Committee for Standardization, 2019a), and CEN/TR 16798-2 (European Committee for Standardization, 2019b) define comfort parameters for professional environments. However, these protocols are difficult to apply in domestic spaces. For home offices, the goal should be to approximate these standards as much as possible, using both passive strategies (such as natural ventilation or shading) and active systems (like heating, cooling, or lighting controls).

Even without advanced technologies, small everyday actions can help workers monitor and improve their home environment. Compact sensors can track temperature, humidity, light, and air quality, helping users understand and adjust their conditions. Combining these objective measurements with personal feedback supports small but meaningful changes that enhance comfort, well-being, and productivity.

Ultimately, the home office should not only provide a place to work but also ensure environmental conditions that sustain health and focus. A well-balanced indoor environment allows remote workers to perform effectively and to experience their home as a safe, comfortable, and supportive workspace (Zenkter et al., 2023).

3.1 The Air Quality and the Thermal Environment

Thermal comfort describes the condition in which a person feels at ease with the surrounding temperature and humidity. It depends on both personal and environmental factors that interact to create a sense of balance between the body and the environment. Personal variables such as clothing, level of physical activity, and health status influence individual thermal perception, while environmental parameters including air temperature, surface temperature, humidity, air movement, and pollutant levels define the overall thermal and air conditions of a space.

A comfortable thermal and air environment supports focus, well-being, and productivity. In contrast, excessive heat or cold can cause discomfort and stress, while poor air quality may lead to fatigue and reduced cognitive performance. Maintaining stable temperature, proper ventilation, and adequate humidity helps create an indoor climate that sustains both health and efficiency.

Scientific models have been developed to evaluate thermal comfort objectively. The most widely used is the predicted mean vote (PMV) model proposed by Fanger (European Committee for Standardization, 2005), which estimates the average thermal sensation of a group of people in a given environment. A PMV value close to zero indicates thermal neutrality, meaning that most occupants feel comfortable. However, this model assumes a high degree of mechanical climate control and is therefore less suitable for domestic settings, where temperature and air quality vary naturally throughout the year.

In home offices, heating systems usually maintain indoor temperatures around 20°C during winter, while in summer air-conditioned rooms are typically kept between 25°C and 26°C, with relative humidity between 50% and 60%. In these conditions, both air temperature and the mean radiant temperature of surrounding surfaces contribute to perceived comfort.

Recent research has introduced more flexible approaches that consider the human ability to adapt to environmental variation. The adaptive comfort model (de Dear and Brager, 1998) integrates physiological and psychological responses, recognizing that comfort is not fixed but dynamic. People adjust their behavior by changing clothing, opening windows, or modifying activity levels to achieve comfort even in spaces without full mechanical control.

This adaptive perspective is particularly relevant for remote work environments, where users often have greater control over their surroundings. By

combining natural ventilation, moderate heating or cooling, and conscious air quality management, domestic spaces can provide comfortable and healthy conditions that support long-term well-being and performance.

3.2 The Acoustic Environment

A well-designed acoustic environment is essential for productivity and well-being when working from home. Noise pollution can seriously disrupt concentration, reduce efficiency, and increase stress levels. Managing the acoustic quality of the home workspace is therefore key to maintaining comfort and performance.

It is not only a matter of limiting noise from outside or within the home but also of achieving a balanced perception of sound indoors. An effective home workspace should minimize unwanted external noise. Modern buildings are generally equipped with passive acoustic systems that, when properly designed and maintained, ensure adequate sound insulation. These features protect occupants from outdoor sources such as traffic, neighbors, or mechanical systems. In older buildings, where the structure may not meet current acoustic standards, choosing quieter rooms or upgrading windows and insulation can significantly reduce disturbance. Replacing outdated windows, for example, can both improve energy efficiency and enhance acoustic and thermal comfort.

Noise generated inside the home is often more challenging to control. In these cases, reducing noise at its source or separating functional areas is the most effective strategy. This also includes noise generated by other occupants, for instance when multiple household members work from home and attend online meetings at the same time; in such cases, the same countermeasures, spatial separation and sound-absorbing materials, remain effective. Domestic interiors typically have smaller volumes and are furnished in ways that naturally provide some sound absorption, which helps to prevent excessive reverberation. Soft materials such as curtains, carpets, or acoustic panels absorb sound waves, improving clarity and comfort within the room, although they have little effect on external noise.

In some situations, a low and constant background sound, such as white noise or natural sounds like running water, can help mask irregular noises and support concentration. Good-quality audio equipment, including headphones and speakers, also improves sound perception during online meetings. When working in shared spaces, noise-canceling headphones can be an effective solution for maintaining focus.

To assess the acoustic quality of a home workspace, one of the main indicators is the A-weighted equivalent continuous sound pressure level (LAeq), that is, the time-averaged sound level over a given period, A-weighted to approximate human hearing sensitivity, expressed in dB(A) over a measurement period

of at least four hours. According to ISO 22955 (International Organization for Standardization, 2021), the recommended upper limit for non-collaborative work environments, such as a home office, is 42 dB(A). Maintaining levels below this threshold helps to create a quiet and comfortable setting that supports concentration and mental well-being.

3.3 The Luminous Environment

The luminous environment exerts a profound influence on human well-being and cognitive performance. Light functions as a powerful stimulus that, through interactions with retinal photoreceptors, initiates a complex cascade of physiological, psychological, and behavioral responses. The most apparent role of light is its visual function, enabling perception and interpretation of the surrounding environment. However, through the “non-visual or non-image informing system”—a set of neural mechanisms primarily mediated by intrinsically photosensitive retinal ganglion cells (ipRGC)—light can modulate a wide range of biological processes, including circadian rhythm regulation and hormonal production that are of the foremost importance for health and well-being in the context of remote work. Numerous indices have been developed to characterize the luminous environment and evaluate its appropriateness relative to human needs. Lighting design that carefully considers both the visual and non-visual effects of light can contribute to healthier and more comfortable environments, as also recognized by indoor environmental quality certification protocols.

The quality of indoor lighting—whether natural, artificial, or a combination of the two—is governed by various international standards and certification frameworks that provide detailed guidance on lighting requirements for work environments. A key parameter for evaluating lighting quality is the maintained average illuminance, which represents the minimum acceptable illuminance on the task area of a workstation. This value is influenced by several factors, including:

- characteristics of the visual task: size and contrast of relevant details, required accuracy, task duration;
- environmental characteristics: availability of daylight, surface reflectance; and
- characteristics of the worker: individual visual capabilities.

According to EN 12464-1:2021 (European Committee for Standardization, 2019c), the recommended maintained average illuminance for office-type activities is 500 lx, a value that should ideally also be met in remote working

environments. Illuminance requirements may be modulated based on task specificity: higher levels are advisable for critical tasks with minimal tolerance for error, whereas lower levels may be acceptable for activities requiring limited visual resolution or performed for short durations. Sound lighting design is therefore essential for ensuring well-being and productivity for individuals working remotely.

Beyond absolute illuminance levels, lighting quality is strongly affected by its spatial distribution. Uniform lighting on the task area and an environmental lighting setup free from excessive luminance variation is essential for visual comfort and for maintaining optimal visual performance. In remote working environments, it is important not only to provide sufficient illuminance on the workspace but also to avoid significant fluctuations due to temporal variability of daylight or the use of spot lighting without adequate ambient lighting.

Glare is an undesirable visual condition arising from excessive luminance contrasts or overly intense light sources. It may manifest as discomfort glare, causing visual annoyance and fatigue, or as disability glare, which reduces visual performance by impairing contrast sensitivity and the ability to perceive detail. In domestic environments, discomfort glare may result from unshaded windows subject to high solar irradiance, particularly during winter when the sun's elevation angle is low. Glare may also arise from poorly shielded luminaires in the field of view or from the positioning of a visual display terminal relative to high luminance surfaces (luminaires or windows).

In addition to light quantity, its qualitative characteristics—particularly color rendering and correlated color temperature (CCT)—play an important role. Color rendering measures how faithfully a light source reveals object colors, contributing to a vivid and natural appearance. Natural daylight is considered the benchmark for optimal color rendering. Correlated color temperature describes the “tone” of light (warm, neutral, or cool), and is commonly indicated on commercially available lamps. Natural daylight exhibits substantial temporal variability in CCT.

Growing attention is being devoted to the role of light as a biological stimulus capable of eliciting responses beyond vision. These non-visual effects of light exert significant influence on human health and well-being (Houser et al., 2021; Vetter et al., 2022). Light is known to have:

- circadian effects;
- neuroendocrine effects;
- neurobehavioral effects; and
- therapeutic effects.

Because the specific non-visual responses elicited by a given lighting condition depend on multiple interacting variables—including light intensity and spectrum, timing and duration of exposure, spatial distribution, and prior light history—accurately predicting these effects is complex. A widely recognized strategy is the use of natural light, the most effective synchronizer of the human circadian system thanks to its variability over the day, in terms of both intensity and spectral characteristics. Proper circadian entrainment requires exposure to both bright cold light during the morning and daytime in general, less intense and warmer light during the hours before bedtime, and darkness at night. This alternation is essential not only for human health but also for maintaining attention, energy, concentration, and productivity.

4. INDOOR MONITORING

Portable environmental sensors to monitor IEQ promise to make invisible aspects of indoor life visible. By tracking parameters such as temperature, relative humidity, carbon dioxide, particulate matter, total volatile organic compounds, radon, light and noise, these devices can help occupants understand comfort and air quality in real time. Their appeal lies in immediacy and accessibility: a compact device on a shelf or a phone app can reveal when ventilation is insufficient, or when humidity can cause mold. Used well, they support healthier environments, smarter ventilation, targeted filtration and dehumidification, and even energy savings by aligning conditioning with actual needs.

The advantages start with awareness. Continuous data turns vague perceptions into trends that can be acted upon, such as opening windows when CO₂ increases, turning on light when daylight becomes insufficient, or moderating humidifier settings in winter. Historical logging helps identify recurring patterns tied to occupancy, weather, or activities, guiding low-cost source control rather than blanket solutions. Their characteristics in terms of value for money make them an attractive solution for remote working environments.

Possible disadvantages are equally real. Consumer monitors vary widely in accuracy, stability, and build quality, and are not normally suitable for regulatory compliance or to diagnose complex problems on their own. Ownership carries ongoing maintenance: keeping sensors clean; replacing filters where applicable; calibrating or resetting drifted baselines; updating firmware; and, for battery-powered units, managing charge cycles. Data can be noisy or misleading without context; readings may provoke unnecessary anxiety or false reassurance, especially when a single device is treated as authoritative. Connectivity and cloud dependence can compromise reliability or privacy if services go offline or data sharing is unclear. Costs mount if multiple rooms are monitored or if subscriptions are required for advanced features.

Placement and methodology matter as much as the hardware. A monitor too close to windows, doors, or vents will mainly see local turbulence or sources rather than representative room air. Positioning at breathing height, away from direct sunlight and drafts, yields better insight. Short-term snapshots can mislead; averaging over appropriate time windows and comparing like with like across seasons provides a truer picture. Without an outdoor reference, it can be hard to distinguish indoor sources from infiltration during pollution events.

In practice, the best results come from treating home IEQ monitors as decision aids rather than definitive instruments. For non-expert users, a simple “measure–act–recheck” routine helps: collect a baseline; compare to guideline ranges; apply one change at a time (ventilation for CO₂, source control for TVOC, filtration for PM, shading/repositioning for glare, zoning/absorption for noise); and re-measure to confirm improvement. Persistent issues should be discussed with a qualified professional. Choose devices with transparent specifications, proven sensing principles for the parameters you care most about, and clear data export. Calibrate or verify against known references when possible, disable inappropriate auto-baselining in constantly occupied spaces, and review trends over weeks and seasons before making major changes. If data suggest persistent problems—such as chronically high CO₂ despite ventilation, recurring dampness, or elevated long-term radon—consider consultation with qualified professionals. Used thoughtfully, consumer IEQ monitors can support comfort, health, and efficiency, but their value depends on informed deployment, critical interpretation, and follow-through.

From this perspective, IEQ monitoring in home offices can be read as part of a broader data-driven approach to understanding flexible work. As discussed in Chapter 4 of this book, process mining techniques use digital traces recorded by information systems to reconstruct how work processes unfold over time and to identify bottlenecks, deviations, and recurring patterns. In a complementary way, this chapter relies on time-stamped environmental measurements and self-reports to characterize the physical conditions under which such processes take place. Both perspectives depend on the availability of reliable data and raise similar questions about data quality, representativeness, and ethics, but they operate on different layers of the same phenomenon: one focuses on the flow of activities, the other on the quality of the spaces in which those activities are performed.

Recently, a number of small and portable devices have become available to monitor and measure IEQ. These devices typically measure parameters related to the air quality and thermal comfort, such as air temperature, relative humidity, particulate matter, carbon dioxide, volatile organic compounds, and, less frequently, they also measure sound levels and illuminance.

5. CASE STUDIES

Multi-parameter devices (thermal, lighting, acoustic environments, and indoor air quality) and subjective analyses were applied to some selected case studies of remote working environments. The IEQ parameters monitored and the related meters chosen varied depending on the context of the building. Indoor parameters monitored in the analysis are listed below.

- Temperature (°C). Measurement: -40°C to 85°C . Resolution: 0.1°C
- Relative Humidity (RH) (%). Measurement: 0 to 100% RH. Resolution: 0.1% RH
- CO₂ (ppm): NDIR sensor. Measurement: 0 to 5,000 ppm. Resolution: 1 ppm
- Atmospheric Pressure. Measurement: 300 to 1100 mbar (hPa). Resolution: 0.18 mbar (hPa)
- TVOC: MOS sensor. Measurement: 0 ppb to 1187 ppb. Resolution: 1 ppb
- Radon: ionization chamber detector
- PM: laser scattering sensor. PM2.5 and PM10 measurement concentration 0 to 1000 $\mu\text{g}/\text{m}^3$
- Acoustic (sound pressure). Measurement: 35 to 120 dBspl, frequency range: 50 Hz to 20 kHz. Resolution: 0.1 dBspl
- Illuminance. Measurement: 0 lux to 120,000 lux. Resolution: 0.1 lux
- Electromog. HF measurement: 50 MHz to 3 GHz. Range 0–10 V/m, Measurement directions (axes): 3. Resolution: 0.1 Volt/m.

Case studies (Table 5.1) were selected as representative of the mountainous and semi-mountainous (i.e., in the vicinity of the mountains) conditions.

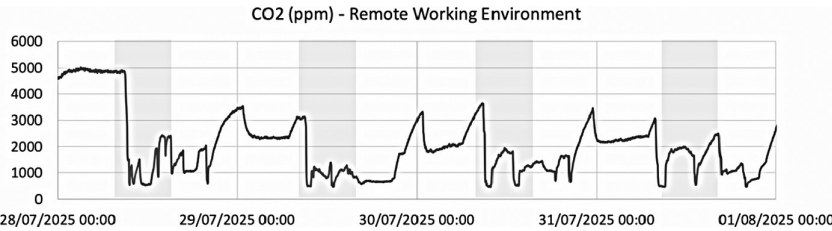
The environmental parameters monitored by integrated devices, such as temperature, relative humidity, CO₂, radon, dust, TVOC, pressure, illuminance (lux), and noise level, were analyzed using the EN 16798-1 standard (European Committee for Standardization, 2019a), which defines four categories of IEQ. The commercial dataloggers used in the analysis had comparable characteristics in terms of measurement accuracy, time interval (varying between 1 and 5 minutes), and price.

In parallel with the monitoring, a subjective questionnaire was also administered with the aim of determining the perception of remote workers regarding their environment. An example of a question from the subjective questionnaire relating to thermal comfort is “Are you satisfied with the temperature in your environment?” Responses ranged from a score of 1 (not at all) to a score of 5 (very satisfied).

Table 5.1 Case studies and characteristics of the indoor environment

Case Study	Height above mean sea level (m)	Building type	Heating emission type	Cooling	Room volume (m ³)
1	1.225	flat	radiator	no	31
2	262	flat	radiator	no	104
3	14	flat	floor heating	yes	27
4	5	flat	radiator	no	120
5	1.201	detached house	radiator	no	48
6	262	flat	air heat pump	yes	89

Source: Authors.



Source: Authors.

Figure 5.1 Example of CO₂ (ppm) monitoring during one week in summer. Working hours are highlighted in gray.

The extensive IEQ parameter measurement campaign highlighted critical issues relating to air quality, thermal comfort, acoustic aspects, and lighting in some environments. By way of example, the graph reported in Figure 5.1 shows the trend of one indoor parameter, namely the concentration of CO₂. This trend is representative of the large variations that the CO₂ levels can have, reaching very high values (over 3000 ppm) when there is no proper ventilation. Even during working hours (gray color), after some ventilation (the steady decrease in concentration), variations can still be quite significant and the level go over the one that can be considered the acceptable one (e.g., 800 ppm, or 450 over the outdoor background concentration).

Table 5.2 summarizes the summer surveys in the case studies described above and provides a concise snapshot of summer indoor conditions over

Table 5.2 *Indoor temperature (°C) in summer, one-week measurement during working hours. Category II of UNI EN 16798-1. Subjective rate (from 1 to 5) derived from the questionnaire*

-	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6
Temperature (°C)	100%	100%	100%	71%	100%	0%
RH (%)	100%	100%	100%	100%	100%	100%
Subjective (thermal comfort)	4	4	5	3	5	4
CO ₂ (ppm)	54%	100%	97%	100%	100%	100%
Subjective (IAQ)	2	5	5	3	5	5

Source: Authors.

one working week, classified per EN 16798-1, where Category II indicates the medium level of expectation. The percentage represents, for each quantity, the occurrence of the hourly measurement that falls within the acceptability limits of Category II. For example, 71% of temperature observations for case study 4 means that for 71% of the time (occupied hours) the air temperature falls within the recommended values of Category II of the adaptive comfort approach. Overall, relative humidity is consistently well controlled across all cases, with all measurements falling within Category II (or even I) and subjective assessments reflecting this with ratings of four or five, suggesting humidity was not a limiting factor for comfort in any space.

Temperature shows a more varied picture. Case studies 1, 2, 3 and 5 remain entirely within Category II (and also I) and receive high subjective scores, indicating strong alignment between measured thermal conditions and occupant perception. Case studies 4 and 6 are the only ones to fall into categories higher than II for the temperature parameter: in case study 6 all measurements fall into Category IV, thus giving a percentage of 0% within Category II, yet the subjective rating is still four. This discrepancy may arise from sensor placement (e.g., near a heat source or sunlit area), differences between air temperature and operative temperature, high air movement from fans improving perceived comfort, or occupant adaptation; it merits a check of measurement location, calibration, and local thermal conditions before drawing firm conclusions.

CO₂ results underline the role of ventilation in perceived air quality. Case studies 2, 4, 5 and 6 maintain Category I throughout and are rated very positively. Case studies 1 and 3 show CO₂ levels above class II, indicating that air exchange is insufficient. In all other cases, the CO₂ indicator describes

low occupancy environments (one person) despite the absence of controlled mechanical ventilation systems in all case studies. In case study 1 the corresponding low subjective rating indicates occupants sensed stuffiness, consistent with insufficient outdoor air rates during occupancy peaks.

Taken together, the data suggest that humidity was adequately managed in all areas, thermal conditions were generally good but with notable challenges in case studies 4 and especially 6, and ventilation was the main driver of dissatisfaction in case study 1. Practical priorities would be to increase and better schedule outdoor air in case study 1, fine-tune temperature control, setpoints and solar shading in case study 4, and verify sensor placement, air movement effects, and controls in case study 6.

6. CONCLUSION

In the literature, the gap between perception and reality is a common thread: the greater sense of control at home can lower the awareness of environmental fluctuations, which is why objective monitoring at home is recommended, in particular for those parameters that cannot be easily determined through senses. One example is daylight availability, which can decrease considerably before we perceive the need to turn on electric lights; another is air quality, which we often fail to notice even when it is poor.

Furthermore, many pollutants are odorless, and monitoring the CO₂ indicator, which represents air exchange, can be an economical and effective strategy. Besides guidelines for controlling the indoor environment, portable and integrated sensors for environmental monitoring are a key technology that enable residential homes to be working environments. Standardized approaches for monitoring and analyzing such data are however far from being well established in the literature for this type of working environment and should be further investigated and contrasted to practical evidence from large surveys in future research.

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6. The bright and dark sides of remote work: Psycho-environmental variables and design strategies to promote remote worker well-being

Silvana Kühtz and Leonardo Tizi

1. REMOTE WORK ENVIRONMENTS: THE HOME OFFICE AND BEYOND

Guaranteeing excellent indoor environmental quality—including optimal thermal, acoustic, and luminous conditions, as analyzed in Chapter 5—is the fundamental requirement for a functional home work environment; however, it is not sufficient on its own. This chapter moves beyond physical parameters to explore the psycho-environmental variables and design strategies capable of addressing the psychological needs and lasting well-being of the remote worker.

The rise of remote work has fundamentally reshaped the importance of physical-environmental and psychological factors in professional life. The corporate office has been replaced by a plurality of different working environments, primarily the home office, but also alternative venues like coworking spaces and third places.

Before exploring the interaction between environment and psychology, it is fundamental to recognize that the success of remote work is first and foremost constrained by the quality of the underlying digital infrastructure. Chapter 3 delineated this technological foundation in detail, analyzing the “Remote Working Toolbox”—including ergonomic devices, secure networks (VPN/MFA), cloud platforms, and collaboration/AI tools—essential elements that enable flexibility but whose mismanagement, particularly concerning governance and monitoring risks, can generate new forms of stress, as further discussed in this chapter.

1.1 A Psychological Perspective on the Home Office

Remote work has repositioned the home office as a central locus of professional activity, transforming the traditional boundary between domestic and occupational spheres. Initially viewed as a temporary necessity, the dedicated workspace within the home has rapidly evolved into a crucial subject of academic inquiry, focusing on its design attributes and their psychological and performance implications (Barrero, Bloom, & Davis, 2023). The structure and furnishing of the home office are no longer considered merely personal choices but are recognized as critical determinants of a remote worker's productivity and well-being. Empirical studies suggest that elements such as adequate lighting, ergonomic furniture, and reduced auditory and visual distractions are directly correlated with improved task focus and lower levels of self-reported fatigue (Hoe et al., 2018). Conversely, environments characterized by poor ergonomics or a high degree of "interruption visibility" into the domestic space often lead to role conflict and diminished work efficacy.

The design of the home office is intrinsically linked to the psychological framing of work. The creation of a physically and psychologically distinct work area is a primary coping strategy against the blurring of work-life boundaries. This demarcation helps remote employees to cognitively switch into a professional mindset, thus facilitating the commencement and conclusion of the work day (Wethal et al., 2022). Consequently, the home office transcends its purely functional role, becoming a socio-spatial artifact that helps individuals manage their temporal rhythms and maintain a professional identity separate from their personal one. Research in environmental psychology highlights that control over one's workspace—a key feature of the home office environment—is a significant moderator of job satisfaction and perceived autonomy. The ability to personalize and configure the workspace acts as a buffer against work-related stress, transforming a potentially isolating setting into a source of empowerment and self-expression.

Organizations that promote working from home should pay particular attention to how domestic environments are structured and be capable of providing the necessary support to create worker-centric workstations. This focus should begin in the early stages of designing a residential environment. The space should not only serve private life but also accommodate work activities, allowing for physical or symbolic boundaries between domestic and working spaces, thereby preserving the delicate work-life balance (Mura, Insalata, & Bonaiuto, 2024).

Proposing a design agenda for the future home office, the study by Margariti et al. (2021) outlines three technological interventions to counteract the negative effects of remote work, focusing on the worker's physical and affective well-being:

- *Flex-seat*: Adaptive seating enriched with sensors and actuators that support postural alternation and seamless transition between tasks and breaks, adapting to posture, temperature, and activity (e.g., focus work vs. meeting).
- *Reflex-light*: An ambient lighting system that uses sensory data (passive or vocal) to reflect, and sometimes predict, the worker's mood, modifying the color, intensity, and rhythm of the light to promote recovery and emotional awareness.
- *Air flow*: Design to make indoor air quality (IAQ) visible, given the correlation between IAQ and mood/well-being, acting as an element of awareness and intervention to improve the domestic microclimate.

The research by Marikyan et al. (2024) confirmed that the transition to a smart home office is driven by several interrelated factors. Perceived productivity is contingent upon service relevance, perceived usefulness, innovativeness, hedonic beliefs, and control over environmental conditions. Meanwhile, perceived well-being is influenced by a broader set of variables, including task–technology fit, perceived ease of use, attitude toward smart homes, and the aforementioned factors. Crucially, the intention to adopt a smart home office in the future is directly predicted by the worker's perceived well-being.

1.2 Other Venues for Remote Work

While the home office dominates the discourse, the concept of remote work environment necessitates an examination of alternative venues, reflecting the inherent flexibility and non-territoriality of remote work models. The diversification of work locations, including third places such as coworking spaces, public libraries, and coffee shops, offers distinct advantages, particularly in addressing the socio-relational deficits commonly associated with prolonged home-based work (Tomaz & Tabrizi, 2024). Coworking spaces, for example, are deliberately designed to foster weak-tie social connections and provide a structured, professional environment that can mitigate feelings of isolation and improve workers' access to shared resources and knowledge exchange (Fast & Jansson, 2024). Their design typically incorporates varied spatial zones—from quiet focus booths to dynamic communal tables—allowing individuals to match the environment to their specific task requirements, a concept known as activity-based working.

However, the efficacy of these non-traditional venues is not uniformly positive and introduces a distinct set of environmental challenges. Working in public spaces, while alleviating social isolation, often presents unpredictable environmental stressors, most notably elevated noise levels, lack of privacy, and fluctuating wi-fi reliability (Oseland & Hodsman, 2018). For tasks requiring deep focus and high cognitive load, the inherent sensory complexity of a

public space can impose an excessive demand on attentional resources, potentially leading to cognitive fatigue. The academic literature, therefore, suggests a hybrid and nuanced approach to venue selection, positing that the optimal remote work environment is not a fixed location but rather a portfolio of accessible spaces—the home office, coworking spaces, and third places—that can be strategically leveraged by the employee based on the task type, the required level of social interaction, and personal restorative needs. This ecological approach underscores the need for workers to develop high levels of spatial self-management competency.

2. THE CONTRADICTIONS OF FLEXIBILITY

The shift to remote work fundamentally influences employees' self-perception and relationship with their workspace, serving as a critical determinant of both physical and mental health outcomes, especially concerning the management of the work–life boundary (Ferrara et al., 2022).

This section explores the duality of flexible work arrangements, examining how the same structural features—namely, increased individual control over work processes and time—can yield both significant psychological benefits and detrimental socio-relational consequences for the remote workforce.

2.1 The Benefits of Autonomy

The fundamental appeal of flexible and smart working models lies in the profound increase in personal autonomy afforded to the employee, which academic literature consistently links to superior outcomes in motivation and job satisfaction. Autonomy, defined in this context as the freedom to determine when, where, and how work tasks are performed, serves as a powerful psychological resource. The concept of remote worker autonomy, central to flexibility benefits, must be viewed critically as it directly challenges traditional managerial systems. Its effective governance, particularly in terms of performance measurement and managerial control and support, is thoroughly discussed in Chapters 7 and 8 of this book. For the remote worker, autonomy translates into the ability to structure the work day around personal energy peaks (chronotype matching) and non-work commitments, thus optimizing the flow of work and personal life.

Evidence suggests that this temporal flexibility directly enhances perceived productivity and reduces self-reported stress. The capacity to engage in task crafting and boundary management—such as scheduling focused work during quiet hours or integrating domestic tasks during short work breaks—is facilitated by the removal of rigid organizational schedules. Furthermore, the reduction in commute time, a direct consequence of remote work, is often

cited as a significant contributor to improved work–life balance and increased discretionary time (Gajendran & Harrison, 2007). This accumulation of temporal resources and psychological control acts as a protective factor against burnout. By having the power to manipulate the work structure, employees are better equipped to manage their cognitive and emotional load, shifting the locus of control from external managerial oversight to internal, self-regulatory processes, which ultimately strengthens organizational commitment and retention.

Some studies show how remote work is associated with lower stress levels, greater engagement, and higher productivity, particularly due to the increased work flexibility and autonomy it offers. However, other research finds no significant effects, or in some cases, even shows detrimental outcomes. Generally, it is acknowledged that effective communication between the remote worker and the organization, coupled with a good work–life balance, are key elements that contribute to higher levels of well-being at work.

The research by Angelici and Profeta (2024) found clear causal evidence that the flexibility (both spatial and temporal) afforded by remote working increases worker productivity. Furthermore, significant improvements were observed in well-being levels and in work–life balance. It was also noted, for instance, that male workers dedicated more time to family and domestic activities.

Even when working from home, the satisfaction of the need for autonomy was confirmed to be the strongest predictor of work engagement (Mura, Insalata, & Bonaiuto, 2024).

Although the shift to remote work is associated with a reduction in both psychological and physical stress responses, the adoption of full-remote models carries the significant risk of exacerbating presenteeism (Shimura et al., 2021).

2.2 The Disadvantages of Isolation

While autonomy offers control, its structural complement in remote work—physical dispersal from the central office—introduces the significant risk of professional and social isolation. Isolation is a multidimensional construct, encompassing both the physical absence of coworkers and the subjective experience of loneliness or detachment from the organizational culture (Fostervold et al., 2024). From a socio-technical perspective, the loss of informal, spontaneous interactions has been shown to severely impair the flow of non-routine information and weaken organizational citizenship behaviors. These chance encounters are critical for maintaining weak ties and a shared mental model of organizational goals.

The psychological impact of isolation is particularly acute. Prolonged detachment can lead to a decrease in affective organizational commitment and

an increased incidence of anxiety and depression among employees who struggle to maintain social connections virtually (Mendonça et al., 2022). This phenomenon is often compounded by the “out of sight, out of mind” bias, where remote workers perceive a reduced visibility to managers, leading to concerns about career progression and fairness in performance evaluations. Moreover, the blurring of boundaries discussed previously can exacerbate isolation, as the worker may fail to develop robust social networks both inside and outside the workplace. The home office, while promoting task focus, may inadvertently create a sensory and relational void. Mitigating this isolation requires intentional strategic intervention, moving beyond mere technological connectivity to foster psychological safety and intentional community building.

Studies focused on the intensive use of technology and the blurred boundaries between work and private life found that remote work can negatively affect workers by excessively intensifying work rhythms and generating stress (Marino & Capone, 2021).

Moreover, while remote work may support the careers of working mothers, it might not benefit young employees who have recently joined a company, as it deprives them of the relational advantages associated with direct contact with colleagues and superiors. These young workers are often subjected to an intensive use of technologies, which can lead to an exacerbation of technostress levels, potentially becoming a health risk factor.

In the research by Palumbo et al. (2023), the effects of smart working on employees’ perceived meaningfulness of their work were investigated. While working remotely allows employees to benefit from greater flexibility, promoting direct control over tasks and self-determination, it can simultaneously compromise interpersonal exchanges with colleagues and superiors, leading to spatial and professional isolation, thus making the work less meaningful.

Furthermore, in some contexts, remote work appears to complicate internal procedures, slowing down the execution of tasks and making processes less agile. This often results in reports of exhausting decision-making processes, the multiplication of approval layers, and meetings perceived as unnecessary (the so-called “meeting overload”). The proliferation of these meetings can cause additional stress, especially when the scheduled times are exceeded.

2.3 Relational Needs of Teleworkers

Addressing the isolation of remote work requires a dedicated focus on the intrinsic relational needs of teleworkers, which extend beyond mere task-related communication to encompass the fundamental human requirement for belonging and support. According to relational-cultural theory, growth and well-being are achieved through mutually empowering relationships (Jordan, 2010). Simply transferring office tasks to a remote setting neglects the

deep-seated need for relational connection. For teleworkers, the maintenance of social embeddedness—the feeling of being connected and valued within a community—is crucial for resilience and mental health.

The research by Mura, Insalata, and Bonaiuto (2024) found that while a higher attachment to the workplace satisfied the psychological needs for autonomy and competence, the need for relatedness was not met. This suggests that a significant consequence of working from home is social isolation from the organization and a lack of face-to-face interaction, both formal and informal, with colleagues (Bentley et al., 2016). Remote workers frequently report higher isolation levels and lower perceived social support compared to in-office counterparts.

While virtual interactions are frequent, they often lack the depth and richness of in-person exchanges, making the fulfillment of the need for relatedness challenging. The absence of physical presence can also impede the development of trust and camaraderie among remote team members (Allen, Golden, & Shockley, 2015).

The existing literature emphasizes that the fulfillment of the need for relatedness in flexible work is not primarily influenced by job characteristics, but by psychosocial variables (Coun et al., 2021), such as:

- perception of organizational support;
- frequency of alternation between remote and office days (hybrid model); and
- leadership style.

Therefore, organizations must actively design supportive structures. This includes establishing effective social support networks and ensuring managers provide clear information on task objectives to offset the loss of direct peer interaction (Charalampous et al., 2019).

The challenge lies in translating the density and richness of in-person relationships into virtual formats. Effective relational support relies heavily on the quality of leader–member exchange, where strong supervisor relationships can substitute for the lack of informal peer support (Bauer & Green, 1996). Virtual interactions must move beyond transactional communication (e.g., status updates) to incorporate expressive and convivial elements, such as dedicated non-task-related online social time or the establishment of formal Communities of Practice (Wenger, 1998). Ultimately, the success of sustained remote models depends on actively designing for the teleworker’s fundamental need for relational capital.

Research on remote work traditionally focused on its effects on attitudes and performance, neglecting how its growing adoption influences the physical office. One study found that while workers desire the office for social ties

and collaboration, this opportunity is often absent due to low attendance. This absence contributes to a contagion effect, where the choice to work remotely spreads because individuals anticipate that their colleagues will also be working offsite (Rockmann & Pratt, 2015). Therefore, future research needs to examine the negative effects of a depopulated onsite office.

A key study focusing on the energy-consuming elements of remote work identified three primary stressors: extended working hours; intensive working; and reduced social support. The research noted that these stressors comprise both internal (individual-controlled) and external (uncontrolled) elements. Crucially, the authors concurrently identified four sub-themes of effective work detachment strategies: cognitive controlling; physical disconnection from work; time-bound routines; and non-work activities (Pensar & Mäkelä, 2023).

Ultimately, as these studies suggest, addressing isolation and relational needs requires more than just environmental adjustments. The role of leadership and trust is pivotal in mitigating these psychosocial issues. A synergy between a well-designed home office and a trust-based management approach is the only way to fully satisfy the remote worker's relational needs and ensure long-term well-being.

3. PSYCHOLOGICAL AND ENVIRONMENTAL VARIABLES

This section delves into the critical interplay between the physical and digital working environment and the psychological state of the remote employee. The attributes of the immediate working space act as powerful moderators of the work experience, directly impacting cognitive function, emotional well-being, and long-term professional sustainability.

3.1 The Role of Environmental Attributes

The physical environment where work takes place is not merely a backdrop, but is characterized by the presence of physical and social stimuli, the perception and evaluation of which constitute the first step in the process of spatial adaptation. In most cases, remote work leads to an overlap between the residential and working environments, breaking down the traditional barriers separating family and professional life by creating workspaces within the home.

However, domestic spaces like bedrooms or kitchens may not be ideal working locations. Individuals working remotely who share space with family members or housemates often experience a decrease in well-being, engagement, and productivity (Adisa, Adekoya, & Okoya, 2021). Remote work offers greater freedom in organizing and managing the workstation space, making

the physical and spatial characteristics of the domestic environment crucial for occupational well-being (or distress).

The home environment can positively influence well-being levels (Emami & Sadeghlou, 2021). The home, defined by its physical aspects, also carries symbolic meanings linked to personal identity, memories, and experiences. This dual identity, both physical and symbolic, becomes highly relevant when the house also serves as a workplace. It is therefore crucial to design the necessary changes to reduce environmental stressors present in the home, such as noise (internal and external), inadequate temperature, poor indoor air quality, domestic crowding, and clutter. An adequate, appropriately sized, separated, quiet, distraction-free, and well-equipped workstation has a positive impact on job performance and well-being, while reducing discomfort levels. Noise and distraction are arguably the most significant home office stressors.

The perception of a private remote workspace, free from problems and disturbances, is directly related to better online interactions and task concentration. Furthermore, perceived environmental comfort (acoustic and visual, furniture quality, spatial usability, etc.) is positively correlated with engagement and satisfaction with remote work, and negatively correlated with work-related stress (Mura, Insalata, & Bonaiuto, 2024).

The physical elements of a workspace, and the resulting perception of comfort, can be considered significant work aspects if they effectively contribute to achieving work objectives and/or promoting personal goals and development. Designing a work environment that satisfies employee needs and preferences (cf. *need-space fit*; Gaudino & Di Stefano, 2023) contributes to occupational well-being and constitutes a competitive advantage for the entire organization (Scrima et al., 2022). A dedicated, well-organized workspace that clearly delineates professional activity from domestic life facilitates effective boundary management and reduces role conflict, thereby transitioning the home space from a locus of distraction to a supportive environment for work.

The research by Mura et al. (2023) aimed to enhance the study of well-being in remote work by developing the perceived remote workplace environment quality indicators (PRWEQIs) scale. This instrument, confirmed through two studies, consists of 15 items grouped into five key indicators: acoustic comfort; visual comfort; quality of the furnishings; safety, and space usability. These factors contribute to a second-order factor labeled general perceived comfort, providing a foundational tool for assessing the physical-spatial qualities of the remote working environment.

3.2 Psychological Needs Related to Space

Even in the minimal space dedicated to remote working, the effectiveness of the workspace is deeply connected to its ability to fulfill fundamental

psychological needs related to the environment, that appear to be rather universal and that traditional offices often satisfy implicitly. In particular, these include:

- *Sense of security*: The perception of being protected from physical and psychological threats or dangers within a given environment (Lynch et al., 2025). This is a primary need that fundamentally influences an individual's capacity to relax, concentrate, and engage in complex activities. When the need for security is threatened (e.g., sudden noises, uncontrolled accessibility), cognitive resources are redirected toward vigilance, thereby reducing performance. In the context of remote work, security is multifaceted, extending beyond the physical to include digital/informational security (data protection, confidentiality of communications) and territorial security (clear boundaries between work and personal spaces that prevent unwanted interruptions).
- *Perceived control*: The belief in one's ability to influence or modify one's environment to meet needs or achieve goals. The capacity to exert such control reduces stress and increases individual resilience. Environmental control encompasses the ability to regulate physical stimuli (such as light, temperature, and noise) and to actively manage the flow of social interactions (e.g., deciding when to be interrupted). Environmental satisfaction is not only tied to achieving thermal or light comfort but increases immediately following a successful control action, even if the environment has not yet reached its optimal state. For this reason, providing occupants with the ability to act upon the environment results in an overall higher level of satisfaction (Hellwig, 2015). Beyond individual variables, perceived environmental control is a primary predictor of occupational well-being and performance improvement. In the home office, this need translates into the worker's capacity to regulate the physical environment and manage temporal and spatial work boundaries. Conversely, the lack of perceived control (such as constant family interruptions) is a primary source of stress and work-life conflict.
- *Privacy*: The selective access (visual, acoustic, informational) to oneself or one's group, implying the active regulation of the boundary between the self and others. This is a dialectical process between the desire for contact and the desire for isolation, the goal of which is to achieve an optimal level of social interaction. In the context of remote work, satisfying this need is crucial for concentration and for maintaining clear professional boundaries. Three forms of privacy are therefore essential: acoustic privacy, which involves having a space where work conversations are inaudible to family members and vice versa; visual privacy, which is the ability to avoid being seen and to minimize visual distractions; and informational privacy, which

aims to ensure that work materials and data are not accidentally accessible to family members, given that professional content “invades” a potentially shared domestic space (Alashwali et al., 2025).

- *Place attachment*: The emotional, cognitive, and behavioral bond that individuals establish with significant places in their lives (Manzo & Devine-Wright, 2019). This profound environmental connection fulfills essential emotional needs and directly influences well-being and quality of life by providing security, a sense of belonging, and comfort, while also reinforcing personal and social identity processes. Workplace attachment is crucial as it is a strong predictor of positive organizational outcomes: it promotes occupational well-being, improves performance, fosters a sense of belonging, and enhances employee loyalty and organizational commitment (Mura, Insalata, & Bonaiuto, 2024). Consequently, designing an environment that achieves a good need–space fit can significantly foster this attachment not only to the specific workspace but also to the entire organization. For the remote worker, the home becomes a critical object of attachment due to its familiarity and high potential for personalization. The remote worker develops the strongest emotional bond with the domestic workspace when its spatial characteristics reinforce their perception of autonomy and competence in managing both work tasks and social relations.
- *Space personalization*: The act of modifying, decorating, or organizing a work environment to reflect the occupant’s identity, values, or functional needs. The ability of an employee to personalize their workspace significantly enhances their sense of psychological ownership and perceived control over the work process. This customization acts as a powerful motivator, directly linking individual comfort and identity to professional output. As a direct manifestation of the need for control, personalization operates on multiple levels: it functions as a territorial marker, signaling possession and establishing clear boundaries; it allows for identity communication through the display of meaningful artifacts; and it facilitates the integration of the professional role within the domestic setting, thereby sustaining a sense of professional identity even in non-traditional scenarios. For remote work, even minor personalization helps to psychologically differentiate the workspace from the domestic environment (Sari & Pekerikli, 2026). This established psychological boundary enhances overall comfort and integration, mitigating feelings of anonymity or alienation and supporting emotional well-being during extended working hours.

Satisfying these specific space-related psychological requirements is essential for transforming an approximate working condition into a truly effective remote workspace. This set of factors is closely linked to the three universal basic psychological drives central to self-determination theory (SDT), the

satisfaction of which is intrinsically connected to human motivation: autonomy; competence; and relatedness (Ryan & Deci, 2000). Drawing from SDT, the workplace must be designed to actively support these fundamental human needs. Employees seek contexts that align with their desires and preferences, striving for an optimal person–environment fit. The design and control over the home environment directly address the desire for autonomy. The home office must also support competence, meaning the feeling of being effective and capable. This is heavily mediated by the functional suitability of the space: the availability of reliable technology; proper ergonomic setup; and adequate storage for work materials. When the physical environment fails to support task execution (e.g., poor internet connection, inappropriate seating), it directly compromises the feeling of competence, leading to frustration and reduced self-efficacy. Finally, while relatedness is often challenged by physical distance, the spatial design can indirectly support it. For instance, maintaining a dedicated “virtual background” or setting a specific area for video calls helps the employee maintain a professional identity and signal their work role, which can reduce ambiguity in virtual social interactions and support a sense of belonging to the professional sphere.

3.3 Environmental Stressors

Despite the benefits of autonomy, the remote environment can present environmental stressors, which are often persistent, that can accelerate psychological strain and contribute to burnout (Bilotta, Vaid, & Evans, 2019).

The term “ambient stressor” refers to chronic, global conditions of the environment – pollution, noise, residential crowding, traffic congestion – which, in a general sense, represent noxious stimulation, and which, as stressors, place demands upon us to adapt or cope. (Campbell, 1983, p. 360)

Environmental stress factors can be grouped into *ambient environmental stressors* (noise, inadequate temperature, air pollution, traffic, inadequate residential quality) and *social-environmental stressors* (lack of privacy, invasion of personal space and territory, crowding). All these conditions can have a significant impact in the context of remote work.

One of the most significant environmental stressors is noise, which can be defined as an unwanted sound, based on a subjective criterion of evaluation (Benfield et al., 2014). In general, noise disturbs the individual by acting on multiple levels: it impairs language processing by masking sounds and conversations, hinders executive functions by making it difficult to perform tasks requiring attention and concentration, increases physiological arousal, and, finally, provokes adverse affective-emotional reactions. Unlike the predictable

background noise of a conventional office, domestic noise is typically intermittent and high amplitude (e.g., family members, delivery calls), which severely impairs directed attention and working memory capacity, leading to increased cognitive load. The resultant strain directly affects sustained task performance, especially for tasks requiring deep concentration.

Traffic constitutes an environmental stress factor characteristic of highly urbanized areas and is often difficult to counteract. Specifically, noise from high levels of congested traffic can cause physiological stress and negative affectivity, reduced task motivation, and more negative interactions with family members at home. Both interior and exterior noise significantly affect acoustic comfort and noise disturbance (Yu, Chai, & Wang, 2024). In this context, acoustic comfort acts as a key indicator of workspace quality—as categorized by the PRWEQIs scale in Section 3.1. However, achieving these standards requires intentional organizational support, such as providing financial subsidies for noise-canceling technology or ergonomic acoustic treatments.

Inadequate temperature and air pollution, especially in indoor environments, are recognized as environmental factors that can contribute to fatigue and discomfort, reducing worker performance and psychological well-being. Exposure to cold negatively impacts performance requiring tactile discrimination and manual dexterity, attention-based cognitive tasks, following a slowing of reaction times, but also reasoning, learning, and memory tasks. However, it appears not to affect simple cognitive tasks and may even have a positive influence on specific ones. Exposure to temperatures above 32°C leads to a general deterioration of physical and cognitive performance, and can also affect mood and interpersonal behavior, with an inhibitory effect on the predisposition to altruistic behavior. IAQ influences health, productivity, and well-being. When IAQ is poor and persistent, this environmental distress can manifest as the Sick Building Syndrome, which describes a set of non-specific symptoms experienced by most people living or working in buildings with poor indoor air quality, with the cessation of discomfort upon leaving the building (Anderson, 2025).

Regarding socio-environmental aspects, the lack of privacy and the invasion of space can be aggravated by the convergence of professional and private life. High spatial density—a condition prevalent for individuals residing in smaller living spaces—directly fosters role conflict by creating an inevitable physical overlap between professional, familial, and personal life, thus leading to intense boundary blurring (Carlson, Grzywacz & Zivnuska, 2009). The mere sight of domestic responsibilities (e.g., unmade beds, laundry) in the background of the workstation acts as a constant, low-level stressor, making cognitive and emotional detachment from work virtually impossible. This continuous activation of multiple roles without clear spatial segregation leads to increased interrole

conflict. Moreover, the reliance on digital tools introduces into remote work environments conditions that directly contribute to technostress.

4. TECHNOSTRESS AND DIGITAL DETOX

The expansion of remote work, accelerated by global imperatives, has rendered technology the critical and indispensable link between the employee and the organization. While this digital infrastructure has allowed for unprecedented operational flexibility, it has simultaneously introduced new and significant sources of psychological strain that directly impact the remote worker's well-being and productivity. Chief among these is the concept of technostress and its correlated mitigation strategies, such as digital detox and digital minimalism.

4.1 Technostress

The term technostress was originally coined by Craig Brod in 1984 (Brod, 1984) to describe the adaptation difficulties experienced by individuals or organizations regarding new technologies. While technology is undeniably useful, its pervasive presence can, however, lead to technostress.

In the contemporary context of remote work, the definition of technostress has evolved, now encompassing a form of psychological stress derived from an individual's inability to cope healthily with the use of information technologies, or from the perception that these technologies are threatening their efficacy and well-being.

It is critical to acknowledge that technostress, in contrast to its negative effects, can also engender positive outcomes (often termed techno-eustress), leading to increased effectiveness and innovation within the workplace. This perspective advocates for broadening the role of information systems: instead of viewing them solely as stress creators, they should be intentionally designed to amplify these positive effects and mitigate the negative ones (Tarafdar, Cooper, & Stich, 2019).

Several factors of technological stress are known to influence gender, age, and work-related stress (La Torre et al., 2024). The academic literature identifies specific dimensions of technostress that are exacerbated within the home office and remote work environments (Jyoti & Ahmad, 2025):

- *Techno-overload*: This stems from the relentless volume and variety of digital communication, inducing cognitive exhaustion and the perception that technology forces individuals to work faster and for longer hours. In the remote work context, the merging of work and personal time and space amplifies this overload, as expectations for immediate response are

no longer confined to traditional office hours. The accumulation of both synchronous (virtual meetings, real-time chat) and asynchronous (emails, shared documents) work creates a pervasive sense of constant urgency (Lelani, Haqq, & Firdaus, 2024).

- *Techno-invasion*: This refers to the extension of technology into private life and the constant expectation of being “always on,” which obliterates temporal and spatial boundaries, forcing workers into perpetual vigilance. The ubiquity of smartphones and laptops renders the distinction between personal and professional life extremely fluid, leading the employee to feel constantly “on-call.” This chronic invasion is strictly correlated with a significant increase in the risk of burnout and anxiety, as the lack of a genuine switch-off impedes the recovery of cognitive and emotional resources and eliminates the crucial psychological resource of detachment (Sonnentag, Cheng, & Parker, 2022).
- *Techno-uncertainty*: The dimension encompasses the anxiety derived from the rapid pace of technological change and the perceived necessity to constantly update one’s digital skills. For some employees, particularly those with lower technological self-efficacy, this can translate into a fear of not being competent or of becoming technologically obsolete.
- *Techno-complexity*: This describes the feeling that the applications, systems, or software being used are too complicated or require an excessive amount of time to be managed correctly, thereby diverting energy and focus from the core business of the work.
- *Techno-insecurity*: This involves the anxiety related to the possibility of security breaches, system malfunctions, data loss, or the monitoring of performance through digital tools, all of which can erode trust and autonomy (Chiu et al., 2023). This concern is exacerbated by sophisticated technologies designed for process governance: Chapter 4 specifically analyzes “process mining” techniques and their application roadmap for organizations, highlighting how these tools, while aiming to improve efficiency through execution logs and simulation, simultaneously intensify the need for ethical guidelines regarding transparency and worker surveillance in flexible working environments.

The tendency toward workaholism is recognized as a potential precursor to technostress. Individuals exhibiting workaholic patterns often leverage technology to blur the boundaries between work and personal time, utilizing digital tools to prolong their engagement in professional tasks far beyond standard working hours (Buono, Farnese, & Spagnoli, 2023). This disposition exacerbates dimensions like techno-overload and techno-invasion.

The consequences of technostress are multidimensional, ranging from psychological and physiological effects to behavioral and performance outcomes.

At the individual level, technostress is correlated with low job satisfaction, increased cynicism, headaches, insomnia, and, in severe cases, increased turnover. At the organizational level, there is a reduction in productivity and work quality due to attention fragmentation and the decrease in the capacity for deep work.

Technostress is shown to contribute to a negative reappraisal of one's professional role. Accordingly, the effective management of technostress is deeply contingent on the individual's perception and interpretation of technological change. To counteract this, organizations are urged to provide tools for managing information overload, such as adequate technical support. Furthermore, achieving a higher degree of task–technology fit is noted as a key structural element leading to lower levels of technostress (Bondanini et al., 2020).

Addressing these environmental stressors requires organizations to move beyond the mere provision of equipment to intentional policy design that fosters spatial and temporal boundary integrity. The fight against technostress in remote work thus becomes a psychosocial risk management imperative.

4.2 Digital Minimalism and Digital Detox

Faced with the growing pressure of constant connectivity, strategic responses have emerged at the individual and organizational levels aimed at re-establishing a healthier and more intentional relationship with technology. Drawing on various theoretical perspectives and empirical findings, the literature highlights practical strategies for fostering healthier digital engagement. These include individual-level insights like screen time management and participation in digital literacy programs, alongside organizational policies such as training programs and broader wellness initiatives (Uslu, 2025).

Digital detox and digital minimalism represent two complementary approaches to this goal. Digital detox is defined as a period during which an individual voluntarily abstains from using digital connectivity devices, such as smartphones, computers, and social media. The primary objective is not the definitive abandonment of technology, but the interruption of dysfunctional habit cycles. This aims to recharge cognitive resources, allowing the brain to exit the continuous vigilance mode typical of constant connectivity, thereby reducing decision fatigue and increasing attention capacity (Schell, 2023). Furthermore, it seeks to improve sleep and physical health by reducing exposure to blue light before sleep and encouraging physical and social activities not mediated by screens, ultimately reasserting autonomy by regaining control over one's time and attention, thus counteracting techno-invasion.

Digital detox is often studied in relation to its recovery benefits and the improvement of subjective well-being. A planned interruption can act as a genuine psychosocial recovery strategy, which is essential for preventing burnout.

However, the efficacy of the detox is limited if it is not accompanied by a deeper, structural change in how technology is integrated into daily work.

Digital minimalism (Newport, 2019) offers a more durable and structural framework compared to temporary detox. It is not about rejecting technology, but about intentionally and purposefully selecting and using it in alignment with one's professional and personal values and goals. It can be defined as a philosophy of technology use in which time spent online is focused on a small number of carefully selected and optimized activities that strongly support an individual's values, while purposefully disregarding all other activities.

In the context of remote work, the application of digital minimalism is manifested through several key practices. The first is a selective technology audit, which involves a critical evaluation of every digital tool used (apps, software, platforms) to determine if its added value exceeds the costs in terms of time, attention, and stress (techno-complexity). The second practice is the definition of rigid boundaries, establishing specific times and zones (physical or virtual) where work technology is switched off or set to non-notification mode. This practice reinforces the separation between work and private life, mitigating techno-invasion. Finally, channel consolidation is crucial: reducing communicative fragmentation by opting for a few prioritized communication channels in order to counteract techno-overload. For instance, this means establishing that urgent communications occur only via phone, and non-urgent ones only via email, while eliminating non-essential group chats.

For both digital detox and digital minimalism to be effective in remote work, it is crucial that they do not remain purely individual initiatives, but are supported by organizational policies. Organizations aiming to mitigate technostress should therefore implement several measures. These include "right to disconnect" policies, which are regulations that protect the employee from the obligation to respond to communications outside established working hours. Furthermore, "digital literacy" training programs are essential to raise awareness of technostress risks and develop technological self-efficacy. Finally, asynchronous communication guidelines should be promoted to encourage tools and a culture that supports asynchronous work and the intentional management of communicative flows, thereby reducing the reliance on continuous video calls. The implementation of these strategies, particularly those concerning the right to disconnect, is intrinsically linked to the foundational legal and regulatory frameworks detailed in Chapter 1 of this book, which analyze the challenges of labor law, public policies, and the mitigation of social inequalities in flexible working arrangements. Hyper-connectivity and the resulting technostress are not merely psycho-environmental challenges but also raise urgent questions of labor law and European regulation. In particular, the analysis of emerging regulatory frameworks, such as the Platform Work Directive,

offers fundamental insights for the protection of the right to disconnect and for algorithmic management, as extensively discussed in Chapter 2 of this book.

The management of technostress and the promotion of a conscious digital usage are, ultimately, essential components for ensuring the long-term psychological sustainability of remote work and for preserving the benefits of autonomy and flexibility offered by digital transformation.

Focusing on the future of remote and hybrid work, Cho et al. (2024) utilized the lens of humanistic geography and co-speculative design practices to explore how remote workers navigate the blurred work–home boundary. Their findings present imagined digital technologies that both reinforce existing boundary work practices (through routines and rituals) and reclaim the notion of home by fostering independence, joy, and healthy relationships. This research informs crucial design implications for creating digital technologies that sustainably enhance workers' lives in the future remote/hybrid landscape.

5. SENSORY DESIGN STRATEGIES

The preceding sections have addressed psychological and environmental variables, as well as the strains derived from technology. Sensory design emerges as a proactive approach to overcome these limitations, focusing on the conscious modulation of sensory stimuli to support remote workers' well-being and productivity. Sensory design, when applied to work environments, is based on the principle that spatial experience is not just visual but is a complex integration of inputs from all sensory channels.

5.1 The Role of Sensory Experiences in Work Environments

In contemporary working cultures, especially within hybrid and digital settings, the sensory dimension of space has been progressively marginalized. The rationalization of the office traditionally privileged visual and cognitive modes of engagement, often suppressing embodied, tactile, and affective dimensions of experience (Pallasmaa, 2005). However, in the post-pandemic context, the reshaping of work has necessitated a renewed focus on the sensory and affective ecology of work. Sensory design thus emerges as a framework that reintroduces the body as a perceptual and epistemological instrument, restoring balance among the senses and the emotional, spatial, and cognitive fabric of the working experience.

Sensory approaches assume that perception is a relational act—not merely the reception of stimuli but an active negotiation between body, environment, and imagination (Ingold, 2000). The workplace is, therefore, not a neutral container but a resonant field that shapes and is shaped by the sensory experiences of its users. The effectiveness of high-cognitive-intensity work, in particular,

depends on the worker's ability to maintain attention and self-regulate emotional arousal, a role crucially supported by the multisensory environment.

Visual design extends beyond aesthetics, encompassing circadian lighting and access to natural light. Exposure to light spectra appropriate for different times of the day (cooler, more intense light in the morning for alertness; warmer light in the evening) is essential for synchronizing the circadian rhythm and supporting sleep quality, a key factor for the recovery of psycho-physiological resources.

As previously discussed, the soundscape is a critical variable in home offices. The presence of unpredictable noise is a major source of distraction and stress. Sensory design utilizes acoustic masking (broadband sounds), the integration of ambient music with low-complexity patterns, and the introduction of nature sounds (such as running water) known for their restorative properties.

The sense of smell is strongly connected to the limbic system, influencing memory and emotions. Studies have suggested a significant role for olfactory stimulation in the alteration of cognition, mood, and social behavior (Sowndhararajan & Kim, 2016). Aromachology (the study of the influence of odors on mood and behavior) suggests using specific essential oils to increase alertness and reduce stress.

By integrating restorative sensory stimuli—natural light, ambient sounds, tactile materials, or biophilic elements—the workspace can counteract technostress, alienation, and cognitive fatigue, functioning as a self-regulating ecosystem that supports both concentration and restoration. Furthermore, this incorporation of sensory design contributes to inclusion and accessibility: by responding to diverse perceptual capacities (auditory, visual, kinesthetic, or olfactory), the space allows for a plurality of access routes to participation, conceiving the workplace as a living, relational organism that evolves with its inhabitants.

5.2 The Amplified World of Sensual Design

Sensual design is a fundamental expansion and deepening of the principles of sensory design, moving from the orchestration of stimuli toward a more comprehensive and embodied understanding of perception, emotion, and meaning-making. Rooted in phenomenology, affect theory, and ecological thought, this approach recognizes that perception is not a neutral or purely physiological act but a lived, affective, and interpretative engagement with the world.

Drawing from Maurice Merleau-Ponty's (1945) notion of the lived body (*corps propre*), it positions the body as the primary interface between self and environment—a site where knowledge, imagination, and empathy converge, but adds on relationships, affect, and pathos.

In this perspective, to design sensually is to act within a relational ontology: the designer resonates with the context. Gernot Böhme's (2017) theory of atmospheres provides a crucial theoretical grounding here: sensual design operates in the liminal zone between subject and object, crafting the "felt space" that arises through affective and sensory interaction. Atmospheres are not properties of things but "spatially extended feelings," and the designer's task is to modulate them ethically and poetically. Light, sound, texture, temperature, rhythm, and even smell participate in the production of what Böhme defines as atmosphere. Design of such atmospheres is therefore crucial for generating well-being, creativity, and collective engagement.

This framework intersects with the ethics of care and sustainability articulated by Ezio Manzini (2015), who describes design as a form of social innovation that nurtures meaningful relationships between people and environments. Sensual design extends this logic of care to the perceptual and emotional realm, foregrounding the quality of experience as a driver of sustainability. Rather than optimizing performance, it seeks to cultivate resonance (Rosa, 2019): a responsive and reciprocal relation between humans and their surroundings. This approach proposes a paradigm shift: from an instrumental design of function and form to a poetic design of relations. It recognizes that to design is to affect and to be affected, to give shape to atmospheres that hold emotional, ethical, and ecological consequences. In a time when disembodiment and digital mediation risk flattening perception, sensual design offers a counter-practice of re-sensitization—a way to inhabit the world attentively, responsively, and poetically (Kühtz, 2024). This is true for workplaces as well.

5.3 Sensory Design Insights and Guidelines

The application of sensory design—and the amplified expression of sensual design—to remote work requires an evidence-based and personalized approach, reflecting the diversity of individual requirements. The main challenge of sensory design is achieving "sensory fit": the optimal alignment between the sensory environment and the individual's needs, preferences, and sensory profile. Since sensory responses are subjective, guidelines must promote self-regulation and environmental control. The remote worker must have the possibility to modulate lighting, sound, and temperature. This can be achieved with ad hoc technological solutions (e.g., noise-canceling headphones, lamps with adjustable color temperature) or through the strategic choice of furniture and fabrics. The introduction of natural and tactilely pleasant materials (e.g., untreated wood, fabrics with rich textures) can enhance the perception of comfort and authenticity, mitigating the coldness of technology.

From a methodological standpoint, sensory-sensual design demands a shift from designing *objects* or *functions* toward designing *experiences*. This

requires an attention to gradients, atmospheres, and micro-perceptions rather than to fixed forms or typologies. Following Böhme's (2017) theory of atmospheres, the designer becomes a curator of affective conditions, a mediator between material and immaterial forces. The guidelines that stem from this understanding are both perceptual and ethical: they suggest designing *with* the senses rather than *for* them, and cultivating awareness of the subtle interplay between body, environment, and imagination. Here are the main points of this approach:

1. *Sensory integration*: Effective sensory design operates across multiple channels—visual, auditory, tactile, olfactory, and proprioceptive—encouraging coherence and complementarity rather than sensory overload. The goal is to create perceptual harmony: light that resonates with sound; texture that supports cognitive focus; and scent that reinforces spatial memory. Research in cognitive psychology (Spence & Gallace, 2011) confirms that multisensory integration enhances attention, emotional regulation, and learning, suggesting that environments rich in balanced sensory cues improve creativity and user satisfaction.
2. *Daily and rhythmic awareness*: Sensory design must consider not only spatial but also daily dynamics. The rhythm of light throughout the day, the pacing of acoustic patterns, and the cyclical modulation of temperature influence mood, alertness, and bodily comfort. Temporal sensitivity transforms design into choreography—a careful tuning between the human body's circadian patterns and the pulse of the environment.
3. *Inclusion and accessibility*: A central insight of this approach lies in its capacity to accommodate diverse sensory profiles. By acknowledging neurodiversity and differing sensory thresholds, designers can craft environments that are perceptually inclusive rather than standardized. This methodology aligns with universal design principles and the ethics of care, where accessibility is not a correction but a constitutive feature of the design process. A sensory-inclusive environment provides multiple modes of engagement—vibration, tactile texture, color contrast, or sound localization—allowing each individual to find resonance through their own perceptual strengths.
4. *Emotional and relational quality*: Atmospheres—whether soothing, stimulating, or contemplative—mediate the relationship between individuals and their environments, shaping collective experiences and social bonds. As studies in affective urbanism and environmental psychology suggest, sensory-rich environments foster empathy, collaboration, and a sense of belonging.
5. *Ecological and ethical awareness*: Sensory design is not only about the human body but also about its entanglement with the environment.

Materials, sounds, and scents carry ecological meanings; they tell stories of extraction, transformation, and care. A sensory ethic requires the designer to think of sustainability not merely as resource efficiency but as *perceptual sustainability*—creating conditions that invite mindfulness, reduce overstimulation, and cultivate balance.

6. *Participatory dimensions*: Engaging users through sensory experiences, and tactile or olfactory mapping exercises of their workplace helps develop perceptual literacy—an expanded capacity to notice, feel, and co-create the space one inhabits.
7. *Affective awareness and emotional intelligence*: Sensual design recognizes emotions as sensory knowledge. Feelings are not subjective noise but essential forms of information that reveal how environments affect us and how we affect them in return. Designers should cultivate *affective literacy*—the ability to perceive and articulate emotional responses to spatial, material, and social stimuli. This approach reframes design as an empathetic dialogue between emotional landscapes rather than a neutral problem-solving activity.

Taken together, these guidelines outline a design ethos that values attentiveness, care, and plural perception. Sensory design does not seek to dominate or manipulate the senses but to awaken them—to make visible, audible, and tangible the relational depth of being in space. In this way, it contributes to a more humane and sustainable design culture, capable of generating not only functional environments but also meaningful, resonant, and emotionally intelligent ones. Designers are therefore invited to think sensually not only in terms of what feels good but of what feels *right*: what fosters empathy; reduces alienation; and respects the interdependence of sensory and social ecosystems. Ethical resonance is thus both a design method and a moral stance, linking aesthetics to sustainability and sensitivity to responsibility.

Sensory design is not an isolated discipline; rather, it integrates synergistically with the concepts of restorative environments and the biophilic design approach.

6. WORKING IN RESTORATIVE ENVIRONMENTS

The challenges of remote work, including isolation, environmental stress, and technostress, make psycho-physiological recovery capacity an essential component for the sustainability of long-term performance. The concept of *restorative environments* offers a fundamental theoretical perspective for the design of remote work environments that do not merely support work but also actively promote stress reduction and the recovery of cognitive resources.

6.1 Restorative Environments

The research trend related to the restorative qualities of environments is united by the hypothesis that certain places, specifically defined as restorative environments, have restorative characteristics; that is, they are capable of replenishing our psycho-physiological and cognitive resources challenged by the daily routine (Staats, 2012). The numerous studies conducted in recent decades, besides demonstrating the existence of the mechanism of environmental restoration, have also more precisely defined the characteristics of the environments capable of regenerating our resources.

Studies on environmental restorativeness still refer today to two influential theories, both proposed in the mid-1980s. These are stress reduction theory (SRT) by Ulrich (1983), and attention restoration theory (ART) by Kaplan and Kaplan (1989).

SRT posits that when faced with specific environmental characteristics favorable for species survival—such as the presence of grass, trees, and water—an initial, unaware, and immediate affective response of pleasure and positive attraction toward that landscape occurs. In an organism under stress, this affective response triggers a cascade of physiological processes that lead from the initial activation of the sympathetic system (typical of stress) to a process of physiological balance and a shift to parasympathetic activation. This results in a change in physiological indices and subsequent relaxation: slowing of heart rate; reduction of stress hormones; and decreased muscle tension. This process also has a positive emotional effect, with a decrease in negative emotions like anxiety and fear, an increase in positive emotions, and the psychological feeling of being relaxed.

ART postulates that directed attention, which is required by most work activities, is a limited resource that needs to be recovered. According to this theory, restorative environments are characterized by four key elements that promote the use of involuntary attention (soft fascination) and allow directed attention to regenerate:

1. 1. *Fascination*: The presence of elements that attract attention without requiring cognitive effort (e.g., the movement of clouds, the sound of water, vegetation with its shapes and colors);
2. 2. *Being away*: The feeling of disconnecting from daily worries and demands, creating a distance, even if only temporary, from the work environment;
3. 3. *Extent*: The feeling that the environment is a coherent “world unto itself” and is sufficiently broad to encourage mental or physical exploration; and

4. **4. Compatibility:** The perception that the environment supports the goals and activities one wishes to undertake at that moment (e.g., relaxation, contemplation, or a break from work).

For example, access to windows with natural views is positively associated with mitigating visual and cognitive fatigue, while simultaneously enhancing concentration, accelerating stress recovery, and increasing productivity. Specifically, research indicates that individuals experience reduced nervousness and anxiety when viewing nature compared with a view to the city or no window view (Korpela, De Bloom, & Kinnunen, 2014).

The restorative process is activated even following brief exposures to an environment with regenerative characteristics. This phenomenon is referred to as micro-restorative experiences, which are particularly important in situations where individuals are exposed to high-stress conditions, or when performing tasks that heavily demand the exercise of voluntary attention and rapid decision-making. Providing these workers with environments in which to spend short, regenerative breaks would be crucial for the management of cognitive resources, though, unfortunately, their strategic value is not always recognized.

In the context of remote work, restorative design aims to infuse these qualities into the home office or alternative workspaces, transforming breaks into opportunities for authentic recovery (Craig et al., 2021). Biophilic design serves as the core strategy of this approach, relying on measurable indicators of restoration to validate its efficacy. Beyond subjective well-being, the impact of such environments can be quantified through physiological markers—such as increased heart rate variability monitored via wearable devices—and improved performance on attentional tasks, effectively linking environmental quality to objective work productivity. However, the successful implementation of these restorative strategies is facilitated by the practical tools explored in Chapter 3 of this book. By integrating the infrastructural solutions and ergonomic standards defined in the “Toolbox,” the home office evolves into a high-performance restorative hub, where technology and nature-driven design work in synergy to support the worker’s health.

6.2 Biophilic Design and Our Need for Nature

Biophilic design is a framework based on the biophilia hypothesis formulated by Kellert and Wilson (1993). Biophilia indicates a positive tendency of human beings to act and collaborate in favor of life, an empirical experience of deep communion with nature. The deep fascination and affiliation humans establish with nature is an evolutionary adaptation, based on innate learning rules that

shape a spectrum of emotions toward living things, ranging from love (biophilia) to fear (biophobia).

However, this empathetic relationship with the natural world is threatened by two global trends: increasing urbanization and the advancement of technology, resulting in a detachment that has generated significant concerns. Richard Louv (2005) coined the expression “nature-deficit disorder” to describe a developmental condition affecting new generations forced to grow up in urbanized contexts that are increasingly estranged from nature.

Designers and architects seek to reconnect human beings with nature by applying biophilic design as the guiding principle for the design of built environments (Tekin et al., 2025). The integration of nature into remote work environments is not merely an aesthetic embellishment but an evidence-based strategy to counteract alienation and environmental stress. The main manifestations of biophilic design include (Kellert & Calabrese, 2015):

- *Direct connection with nature:* The physical presence of plants, water, light, and natural air. Access to a garden or a view of greenery is the most effective intervention.
- *Indirect connection with nature:* The use of natural materials (wood, stone), colors, and textures that recall nature, and forms that imitate natural patterns (e.g., fractal patterns).
- *Nature of the space and place:* The creation of spaces that offer opportunities for exploration, prospect, and refuge, such as a secluded chair near a window for reading (*prospect*) or a defined work corner for concentration (*refuge*).

These suggestions offer a range of options for utilizing biophilic design effectively, provided they are employed in a manner that respects the specificity of each individual design, rather than as a checklist applied indiscriminately.

The reflections of Kellert and Wilson formed the basis for the formulation of the 15 Biophilic Design Patterns developed by Terrapin Bright Green (Browning & Ryan, 2020). These patterns, rooted in environmental psychology and resulting from multidisciplinary practice and research, are organized into three categories: Nature in the Space (7 patterns); Natural Analogues (3 patterns); and Nature of the Space (5 patterns). It has been demonstrated that all patterns are positively related to at least one of the three considered indices of well-being: stress reduction; improved cognitive performance; and increased positive emotions and mood. The most significant results were found in the seven patterns of the Nature in the Space category, which refer to a direct relationship with natural elements, confirming the role of biophilic design in promoting regeneration and well-being.

Applying biophilic design means transforming home spaces or hybrid offices into environments that reduce worker stress, helping to mitigate remote working fatigue and improving concentration and creativity. Research shows that exposure to biophilic elements in work environments reduces cortisol levels, improves cognitive function scores, and increases creativity and the perception of general well-being (e.g., Youn, Kang, & Lee, 2025). This is particularly relevant in the context of technostress, where nature acts as a calming counterweight to constant digital stimulation. Biophilic design can be conceived as part of the broader concept of restorative design.

6.3 Restorative Design for Promoting Well-being and Productivity

Restorative design (Nousiainen, Lindroos, & Heino, 2016) is an approach that goes beyond merely reducing environmental stressors; its primary focus is the regeneration of emotional and cognitive resources subject to exhaustion, through an inclusive, well-being-oriented perspective that addresses psychological needs related to space.

Given the robust empirical evidence supporting environmental restorative-ness theories, the restorative design approach centers its *modus operandi* on biophilic design. This necessitates a two-pronged strategy:

- *stress mitigation*: Eliminating or substantially reducing primary disturbing environmental factors, such as noise, crowding, or inadequate temperatures; and
- *promotion of restoration*: Actively facilitating psycho-physiological and cognitive recovery processes by ensuring contact with nature, adequate sensory engagement, achieving psychological satisfaction (integrating needs like perceived control and privacy), and implementing the design of *affordances* (defining opportunities for desired behavior, e.g., movement).

The integration of these principles, which includes the optimization of physical elements (strategic management of natural materials, circadian-supporting light, color, layout, and room spatial organization) translates attention restoration theory (Kaplan & Kaplan, 1989) and stress reduction theory (Ulrich, 1983) into practical guidelines for remote work. This leads to the creation of a hybrid and dynamic home office that supports both high-concentration tasks and moments of recovery.

For example, the application of these design strategies includes functional zoning to separate the work area from the rest area, creating a mental and physical boundary that offers the benefits of *being away* and *compatibility* with a spatial and visual sensory focus. Another key element is the integration of natural focal points, such as plants or natural landscapes visible from the

desk, and the use of natural materials, which promote *fascination* and *being away*. Light control is also fundamental, involving the use of dynamic lighting systems or lamps with adjustable intensity and temperature to mimic natural light cycles, thereby supporting the circadian rhythm and *fascination*. Finally, to facilitate restorative micro-breaks, a corner can be created with a comfortable armchair (tactile focus) and the possibility of listening to nature sounds (auditory focus) for short, intentional breaks, encouraging the *being away* effect.

The resulting restorative environment supports sustainable productivity, a concept recognizing the necessity of effort and rest cycles. This environment facilitates quicker and more complete psychological detachment during breaks, ensuring cognitive energy is restored more effectively. Specifically, working individually in a vegetated office space yields immediate emotional well-being benefits (Zhang et al., 2025). This capacity for rapid regeneration is the direct antidote to the emotional exhaustion resulting from techno-overload.

In conclusion, the design of a remote work environment should be viewed not merely as a matter of functional ergonomics, but also as a strategic opportunity to implement the principles of restorative design and biophilic design.

7. CONCLUSION

This chapter explored the complex interaction between the work environment, technology, and psychosocial well-being in the context of remote work. Starting with an analysis of physical environments and the intrinsic ambivalences of flexibility, it highlighted the critical role of environmental and psychological variables and the emerging threats derived from constant connectivity. The final sections proposed proactive design strategies to mitigate these risks and optimize the work experience. The analytical framework that emerges is that of a two-sided remote work: while it offers unprecedented autonomy and a potential increase in productivity stemming from spatial and temporal flexibility, it also introduces new forms of tension and disregulation.

The home is not a neutral substitute for the traditional office. The fusion of roles (personal and professional) and the difficulty in creating clear physical and temporal boundaries expose the remote worker to the risks of isolation and emotional exhaustion. Relational needs and spatial autonomy must be balanced.

Technostress, in all its dimensions (overload, invasion, uncertainty), is the direct consequence of the pervasiveness of digital tools. The effective management of remote work is not merely a matter of tools, but of corporate culture that supports the right to disconnect and the adoption of intentional digital minimalism.

The strategies of sensory design and restorative design represent the design response to psychosocial challenges. The conscious application of biophilic design principles and the modulation of sensory stimuli are not merely elements of comfort but essential tools for attention recovery and the physiological reduction of stress. The environment must be designed to facilitate recovery, making remote work psychologically sustainable.

The conclusions of this chapter suggest several critical directions for future research and for management and design practices in the context of hybrid and remote work:

- *Necessity for holistic measurements:* Future research must develop metrics that go beyond simple productivity by integrating objective and subjective measures of psychosocial well-being. Crucially, these must be correlated with the objective physical parameters established in Chapter 5 of this book. The activity multidimensional performance model, detailed in Chapter 8, offers a potential framework for this goal, aligning sustainable productivity with well-being. By bridging technical metrics and biological indicators (e.g., cortisol levels or sleep quality), researchers can move toward a truly holistic assessment of the remote work environment.
- *Role of training on digital literacy and detox:* Organizations must invest in training programs that provide workers with not only technical but also emotional and self-regulatory skills to manage connectivity, transforming digital detox from an extreme action into a practice of daily digital hygiene.
- *Design for resilience:* Design professionals (architects, ergonomists, facility managers) must adopt a more well-being-oriented approach to the design of remote work environments. Guidelines should focus on environmental personalization (sensory fit) and the integration of natural elements, recognizing that control over the environment is a key factor for the remote worker's resilience.

Ultimately, the transition to remote work represents an evolutionary imperative that challenges not only the organizational structure but also our understanding of the relationship between space, body, and mind. The realization of a sustainable remote work model requires a conscious balance between the efficiency of technology and the biological and psychological need for restoration and human connection. Sensory and restorative design strategies are no longer a luxury, but the necessary foundation for a future of work that is not only smart but also salubrious.

However, making remote work salutary is only one part of the sustainability equation. Organizational success also requires a rethinking of governance and control mechanisms: a work model where physical presence loses relevance demands that companies move beyond the reliance on behavioral visibility and

adopt new paradigms for measuring performance based on evidence and the activities performed, as will be illustrated in the following chapter.

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7. Beyond visual control: Measuring the performance of on-site and remote work activities

Antonella Cugini

1. REMOTE WORK AND THE CHALLENGE OF MANAGERIAL CONTROL

The consolidation of hybrid and remote work in the post-pandemic period has altered the informational foundations on which managerial control systems traditionally rest. What initially emerged as an emergency arrangement has become a structural feature of organizational design, combining on-site and off-site work, synchronous and asynchronous coordination, and increasingly heterogeneous contractual forms (Cappelli & Keller, 2013). In this context, the challenge for managers is to reconsider what should be controlled, how, and for what purpose, in a situation of spatial and temporal dispersion. The traditional managerial assumption that visibility is equivalent to control now appears to be increasingly fragile. Organizations may “see more” through digital traces without necessarily developing a better understanding of how value is created (Kelliher & Anderson, 2010; Gibbs et al., 2024). The literature highlights a well-known opacity versus visibility paradox: excessive transparency can inhibit experimentation and induce defensive or strategic behaviour, while insufficient visibility undermines coordination and accountability (Bernstein, 2012). Evidence from studies on open and transparent work environments confirms that increased visibility does not automatically foster collaboration and may even reduce interaction (Bernstein & Turban, 2018). As a consequence, the relevant question is, therefore, not how to maximize visibility, but how to distribute it: which aspects of performance should be visible, to whom, and under what conditions.

In hybrid work this issue is made more complex because direct observation, co-presence, and physical workflow lose importance and, nevertheless, traditional control systems remain anchored to jobs and roles, instead of compelling managers to rely more heavily on processes and outcomes, while balancing

autonomy and alignment (Grant et al., 2013). This challenge is intensified by the fact that hybrid organizations often combine employment relationships, project-based work, and platform-mediated contributions within the same value-creation processes (Cappelli & Keller, 2013). Evidence confirms that remote and hybrid work represent a persistent reconfiguration of work arrangements rather than a temporary deviation (Bloom et al., 2015; Barrero et al., 2021; Felstead & Henseke, 2017).

At the same time, the flexible work literature documents persistent risks of work intensification, whereby increased autonomy is exchanged for heightened responsiveness or effort (Kelliher & Anderson, 2010). Hybrid regimes may thus generate empowerment or subtle control pressures, depending on how managerial expectations, support systems, and performance standards are configured. Reframing control in terms of performance governance rather than surveillance is therefore particularly relevant in hybrid contexts. Governance refers to the capacity to set objectives, define standards, measure contributions, and coordinate interdependencies while sustaining learning and accountability (Pulignano & Doerflinger, 2013). Empirical research indicates that outcomes in remote work depend less on monitoring intensity than on practices such as goal clarity, feedback, resource access, and psychological safety (Grant et al., 2013; Mabaso & Manuel, 2024). Productivity effects are also shown to vary by task type, information frictions, and collaboration technologies, reinforcing the need for a more granular and analytical level of measures (Gibbs et al., 2024; Al Mohamed, 2024; Becchetti et al., 2025).

In fact, as the locus of control shifts, so too must the unit of analysis: Activity – understood as a phase of a process that can be executed by different actors, across locations and technologies – offers a more analytically robust unit (Drury, 2018; Kaplan & Anderson, 2007). Activity-based analysis enables comparison between on-site and remote execution, capturing differences in cost, time, quality, and stakeholder satisfaction that are obscured by job-level reporting (Federici, 2022).

In sum, hybridization exposes a category error in many existing control systems: treating behavioural visibility as a sufficient basis for performance governance. This chapter develops an alternative perspective, arguing for a move beyond visual control toward activity-based performance governance.

1.1 Limitations of Traditional Control Systems in Hybrid Work

Traditional control systems were not designed for hybrid work. Their underlying assumptions about visibility, supervision, and coordination reflect an environment in which effort, behaviour, and outcomes could be inferred through proximity and direct observation. Under hybrid conditions, these assumptions become increasingly fragile. As discussed in Chapter 1 of this book, the

reliance of traditional control systems on physical presence also contributes to differentiated conditions of visibility and evaluation, which may reinforce inequalities across workers in remote and hybrid arrangements.

1.1.1 Behavioural observation as a control surrogate loses traction under dispersion

As discussed in Chapter 2 of this book, attempts to compensate for the loss of direct visibility through intensified digital monitoring raise critical issues in terms of regulatory limits and workers' right to disconnect in technology-mediated work arrangements. The traditional control approach assumes co-location: supervisors pick up cues about effort and quality through everyday proximity; informal exchanges help transmit tacit knowledge; and synchronous routines support coordination. In dispersed work settings, behavioural observation quickly loses its effectiveness as a basis for control and organizations often react by adding digital monitoring tools, but such metrics are not designed to understand how value is actually and can even trigger defensive compliance rather than genuine learning or adaptation (Kelliher & Anderson, 2010). This is the situation where the opacity/visibility paradox becomes evident: too much exposure can inhibit experimentation, while too little makes coordination harder (Bernstein, 2012). The issue mirrors the classic contrast between enabling and coercive forms of bureaucracy: control systems work when they support problem-solving, not when they simply enforce compliance (Adler & Borys, 1996).

1.1.2 Input–behaviour–output control decomposes under hybridity

In co-located environments, managers can triangulate inputs (time/effort), behaviours (observed methods), and outputs (deliverables), whereas in hybrid work inputs are asynchronous and partially unobservable; behaviours are mediated by tools; and outputs are co-produced across distributed teams. This situation could induce two failure modes:

- surveillance drift – the escalation of monitoring intensity without improving informational quality; and
- meeting inflation – the substitution of synchronous time for shared understanding, which can exacerbate cognitive load and reduce deep-work capacity (Grant et al., 2013).

1.1.3 The job/task ontology misrepresents hybrid work

Traditional control systems tend to assume a tidy alignment: tasks fit neatly within jobs, and jobs sit comfortably within hierarchical units. Hybrid work disrupts this assumed order. Tasks become disaggregated, recombined, and

distributed across projects, time zones, and even contractual boundaries. This creates a clear mismatch in the unit of control: on one side, organizations risk over-aggregation, reporting performance at the job level and overlooking the real heterogeneity of the underlying processes and, on the other, they may drift toward over-atomization, tracking micro-behaviours that lack meaningful process context. It is therefore unsurprising that the literature on the “new economy” of work calls for more flexible classification schemes that better reflect contemporary work arrangements and expose the limits of legacy categories in control system design (Cappelli & Keller, 2013).

1.1.4 Trust, autonomy, and intensification interact with control design

Evidence shows that flexible work arrangements often coincide with an intensification of effort, as employees tend to respond to the autonomy they perceive by becoming more available, more responsive, and more self-monitoring (Kelliher & Anderson, 2010). Without carefully designed performance standards and adequate support, hybrid work can quietly normalize a state of constant availability, while offering little guidance about what actually counts as “enough” performance. When this happens, employee well-being deteriorates, and productivity can suffer as well. Knowledge work is particularly sensitive to this dynamic, given the well-documented inverted-U relationship between pressure and performance (Grant et al., 2013). Too little pressure dampens motivation, but too much erodes cognitive capacity and focus. It is very important to consider that intensification is not an inevitable property of hybridity; it is a design effect of control architectures, especially when evaluation systems rely on cues of presence and responsiveness rather than on clear, process-based contributions.

1.1.5 Voice, participation, and legitimacy of metrics become pivotal

Hybrid control regimes depend on the legitimacy of metrics, not just their technical accuracy. When employees perceive measures as misaligned with task realities, they are less likely to accept evaluative outcomes and more likely to game indicators (Pulignano & Doerflinger, 2013). Participation in metric design and calibration – especially at the level where work is actually performed – improves face validity and reduces measurement errors. This is difficult to achieve if control remains centred on roles or job descriptions rather than on activities embedded in processes.

1.1.6 Data abundance does not equal measurement validity

A frequent misconception is that digital traces automatically translate into valid measures. In fact, without a clear model of the activity and its performance dimensions, digital traces are only observational trace variables, not theory-driven indicators. Recent empirical studies on remote work productivity

reveal wide variation across roles, functions, and organizational settings, and this is a reminder that there is no single metric that can capture performance across all contexts. Instead, it strengthens the argument for modelling work at the level of activities, where the nuances of different tasks and processes can be properly understood (Gibbs et al., 2024; Al Mohamed, 2024). Moreover, recent evidence suggests that the effects of remote work on contribution and engagement depend less on physical distance per se than on how informational environments are structured. Studying employees' participation in internal online forums, Liu et al. (2026) show that enforced working from home can amplify free-riding behaviours when contribution is weakly observable, while appropriately designed digital spaces can instead sustain engagement and voluntary contribution.

1.1.7 Legacy accounting and key performance indicator systems struggle to capture hybrid value creation

Traditional cost systems allocate resources to departments and organizational units, obscuring how dispersed activities actually consume time, technology, and coordination effort. As a result, organizations seldom compare on-site and remote work under truly equivalent conditions. This means that decisions about where work should take place, how it should be scheduled, or how teams should be composed are often made without a solid, activity-level understanding of what each mode actually requires. Literature has long argued that activity-based approach corrects these distortions by tracing resource consumption to activities rather than to organizational cost container (Drury, 2018; Kaplan & Anderson, 2007). Extending this logic from cost to performance measurement provides a route to evaluate hybrid work on commensurate terms – time, quality, efficiency, and satisfaction – rather than on presence or availability.

1.1.8 Psychosocial factors mediate the effectiveness of control mechanisms

Job effectiveness, well-being, and work–life balance in remote arrangements are shaped by the interplay of managerial style, technological affordances, and individual capabilities (Grant et al., 2013). Recent studies reiterate that performance management in remote/hybrid settings is effective when organizations combine clarity of goals, supportive feedback, and appropriate autonomy, rather than when they rely on intensified monitoring (Mabaso & Manuel, 2024). In other words, control quality matters more than control quantity.

1.2 Activities as the Basic Unit for Performance Measurement and Governance

Positioning the activity as the basic unit of analysis addresses the ontological and informational limitations of role-anchored control systems in hybrid organizations (Cooper & Kaplan, 1991; Innes et al., 2000). An activity is here defined as a discrete and repeatable phase, within a process, that transforms inputs into intermediate or final outputs and that can be performed by different actors, in different locations, and through different technologies while remaining functionally equivalent within the value stream. This definition deliberately decouples the *who* and *where* of work from the *what* and *how* of value creation, allowing performance to be assessed independently of physical presence.¹ As discussed in Chapter 5 of this book, the diffusion of home-based and hybrid work arrangements fundamentally challenges control models anchored to a single physical workplace, reinforcing the need for performance systems that are independent of co-presence. The shift is not merely semantic: it reorients measurement design, enables commensurable comparisons between on-site and remote execution, and grounds performance governance in process realities rather than in proxies of attendance (Drury, 2018; Kaplan & Anderson, 2007; Federici, 2022).

Activities are conceptually superior to jobs or generic task labels in hybrid settings for three interrelated reasons.

- First, they offer sufficient granularity to capture variation in time, cost, and quality that job-level aggregation systematically obscures, while remaining stable enough to support cumulative observation over time.
- Second, activities are context-neutral: email triage, code review, or customer verification retain their identity regardless of execution mode or contractual arrangement.
- Third, activities are compositional, forming processes whose interdependencies can be traced and diagnosed (Kaplan & Anderson, 2007; Drury, 2018). As discussed in Chapter 4, process mining techniques operationalize this logic by reconstructing and analysing process flows from event data, providing a data-driven basis for diagnosing interdependencies and supporting managerial control.

¹ For a deeper examination of the differences between traditional cost accounting systems and ABC, see the articles by Cugini and Caprioglio (2024) and Cugini and Pilonato (2014, 2013).

Together, these properties mitigate the unit-of-control mismatch that undermines traditional systems under hybridity. Anchoring control at the activity level also reshapes the logic of measurement itself. Rather than treating digital traces as self-interpreting signals, organizations can design indicators explicitly linked to how an activity generates value.

Activity-level indicators also redistribute visibility in ways consistent with Bernstein's (2012) distinction between enabling and intrusive transparency. Activities can be rendered visible through their outputs and effects without exposing individual behaviour to continuous surveillance, offering what Bernstein (2012, p. 190) terms "designed transparency". When employees recognize that indicators reflect the substance of their work rather than superficial visibility, compliance becomes internalized and defensive routines diminish (Grant et al., 2013; Federici, 2022). Visibility thus becomes selective and instrumental, calibrated to coordination and learning needs rather than behavioural control. In this way, activity-based measurement directly addresses the opacity/visibility paradox by specifying what becomes visible, for whom, and for what purpose. Trust plays a pivotal role in this configuration. At the same time, accountability is clarified. Because activities are embedded in processes rather than roles, responsibility can be distributed among contributing, coordinating, and reviewing actors. This reframing replaces linear hierarchical accountability with reciprocal dependencies that mirror how hybrid work unfolds in practice, improving both equity and precision (Kaplan & Anderson, 2007; Drury, 2018).

Comparability represents a further advantage of activity-centric governance. Because activities are functionally specified, organizations can conduct paired comparisons across execution modes, technologies, or temporal configurations. The same "customer identity verification" activity, for instance, can be evaluated consistently across a video-enabled remote process and an in-branch interaction (Drury, 2018; Kaplan & Anderson, 2007; Innes et al., 2000).

At the organizational level, activity-based metrics also enable structured aggregation. Activities roll up into processes, processes into value streams, and value streams into strategic objectives, preserving diagnostic power while supporting alignment (Kaplan & Anderson, 2007; Federici, 2022; Grant et al., 2013; Mabaso & Manuel, 2024). This reconceptualization aligns with research on dynamic capabilities and learning-oriented governance (Bernstein, 2012; Pulignano & Doerflinger, 2013).

Finally, activity-based governance carries strategic implications. By rendering visible the micro-foundations of organizational capability, it allows firms to evaluate how hybrid configurations influence learning, innovation, and long-term value creation. Activity-level visibility thus supports strategic calibration rather than micromanagement (Gibbs et al., 2024; Al Mohamed, 2024).

Consistent with Drury's (2018) warning, effective systems focus on what matters rather than on everything that can be measured, balancing parsimony with relevance and involving employees in metric definition to preserve legitimacy (Pulignano & Doerflinger, 2013).

In this sense, adopting activities as the unit of performance control is not merely a technical refinement but a cultural redefinition of managerial competence. Managers must learn to interpret multidimensional evidence, reason about trade-offs, and facilitate learning conversations. Control becomes a shared language for improvement rather than a mechanism of inspection, reinforcing the shift from surveillance to performance governance.

2. FROM TASK TO ACTIVITY: A PERSPECTIVE FOR PERFORMANCE CONTROL IN HYBRID WORK

The shift from task-based to activity-based perspectives entails a substantive reconfiguration of managerial control in hybrid organizations. It is not simply a question of analytical refinement, but an epistemological one, concerning what is recognized as the fundamental unit of value creation and how such value can be rendered visible and governable. Traditional control systems are typically structured around tasks, conceived as contractual obligations associated with predefined roles within relatively stable hierarchies. In this sense, the task specifies what individuals are expected to do, but it does not necessarily illuminate how their work contributes to process performance or system-wide outcomes. Activities, by contrast, are inherently processual and relational. They capture what actually occurs in the transformation of inputs into outputs, independently of who performs the work or where it is executed. This shift toward activity-based performance control requires adequate analytical and technological support, as discussed in Chapter 3 of this book, which illustrates the operational tools and infrastructures enabling the structured measurement of work activities in remote and hybrid settings.

This conceptual shift becomes particularly salient in hybrid contexts, where the relationship between role, behaviour, and performance is no longer stable but contingent. Tasks are increasingly fragmented across time, space, and technologies; processes traverse digital and physical environments; and performance depends less on formal compliance than on the quality of coordination and contribution within distributed systems. As Bernstein (2012) notes, effective control does not require exhaustive visibility, but rather the structured disclosure of information that is relevant for coordination and learning.

This activity-based approach to performance control is consistent with data-driven perspectives on organizational processes, as discussed in Chapter 4, where process mining techniques are used to reconstruct and analyse process flows as a basis for managerial control.

Moving “beyond visual control” therefore implies a deeper paradigmatic transition: from a behaviour-based logic of control to a process-oriented logic of governance. In the behavioural paradigm, control is exercised by observing how individuals execute assigned tasks and by correcting deviations from expected conduct. In the process-oriented paradigm, control is achieved by designing, monitoring, and learning from the performance of interdependent activities. While the distinction may appear subtle, its implications are substantial. Behavioural control treats compliance as the primary objective; process-based governance treats understanding performance dynamics as the foundation for improvement (Grant, 1996; Okhuysen & Bechky, 2009; Gibbs et al., 2024).

In hybrid organizations, this realignment is no longer optional because physical observation can no longer be relied upon as a consistent or meaningful source of information about effort, contribution, or quality. As a result, control systems grounded in visibility of behaviour risk becoming both ineffective and intrusive. By contrast, activity-based governance makes it possible to focus managerial attention on how work is actually accomplished, enabling coordination and learning without reverting to surveillance-oriented practices (Kelliher & Anderson, 2010; Grant et al., 2013).

As discussed in Chapter 5, the spatial dispersion of work across organizational and home-based environments further weakens control models grounded in physical observation, reinforcing the need for performance systems that are decoupled from a single workplace.

2.1 Rethinking Managerial Control: Why Adopt an Activity-based Approach

An activity-based approach to managerial control rests on three interconnected theoretical pillars: first, the reconceptualization of control as a mechanism for learning and coordination rather than surveillance; second, the integration of cost and performance information at the level of processes; and third, the preservation of trust and autonomy through selective visibility. Taken together, these principles support a form of control that is diagnostic rather than coercive, and developmental rather than disciplinary, allowing organizations to sustain accountability without undermining individual initiative (Bernstein, 2012; Pulignano & Doerflinger, 2013).

1. From surveillance to learning-based control

The first pillar concerns the very function attributed to control. Classical management theories – ranging from Fayol’s principles to early cybernetic models

– conceived control primarily as a feedback mechanism aimed at ensuring conformity between behaviour and plan. In hybrid work behaviour is neither fully observable nor easily standardized. Under these conditions, what becomes critical is not behavioural oversight, but the quality of information that enables actors to understand how their activities contribute to shared outcomes. By focusing on process data and results instead of individual gestures, activity-level metrics provide a more meaningful informational basis for learning and coordination (Grant et al., 2013; Mabaso & Manuel, 2024). In Bernstein's (2012, p. 195) terms, they enable a form of “enabling transparency” that supports reflection without eroding psychological safety.

2. Integrating cost and performance information

The second pillar relates to integration. Traditional accounting systems tend to separate cost measurement from performance evaluation, whereas the activity-based approach overcomes this separation by tracing both resource consumption and performance outcomes back to the same operational unit: the activity. As shown by Kaplan and Anderson (2007), activity-based costing makes it possible to identify resource drivers that reflect how work is actually performed. Extending this logic to performance control allows efficiency, quality, and timeliness to be analysed jointly, within a multidimensional performance model. Control thus shifts from a unidimensional evaluation to an explicit consideration of trade-offs, enabling managers to assess, for example, how reductions in cost affect quality or how time savings influence satisfaction (Drury, 2018; Federici, 2022). Moreover, in hybrid organizations a single process often involves employees operating asynchronously and often belonging to different departments. In this situation, very frequent in service companies, role-based measures tend to obscure these contributions, whereas activity-based metrics make them visible irrespective of organizational boundaries. The result is a form of situated accountability, in which contributions are assessed in relation to the activity rather than to hierarchical position, improving both fairness and interpretability (Pulignano & Doerflinger, 2013).

3. Preserving trust through selective visibility

The third pillar addresses the social dimension of control. The literature on hybrid and remote work repeatedly highlights the fragility of trust under conditions of distance (Grant et al., 2013; Kelliher & Anderson, 2010). Excessive digital monitoring may increase informational availability, but often at the cost of psychological safety because workers may feel mistrusted, engagement may decline, and creative effort may be suppressed. Activity-based control offers

a different solution by clearly distinguishing between visibility of process and visibility of person. What becomes transparent is the performance of the activity, not the private behaviour of the individual. This decoupling enables organizations to preserve autonomy while maintaining accountability (Bernstein, 2012; Federici, 2022). According to recent empirical evidence, that supports this distinction, employees in hybrid environments respond more positively when control mechanisms are perceived as diagnostic – helping to identify inefficiencies or coordination problems – rather than as punitive (Mabaso & Manuel, 2024). When performance information is used as a resource for learning instead of as a tool for surveillance, it tends to foster engagement and perceptions of fairness (Pulignano & Doerflinger, 2013).

2.2 Measuring the Costs of On-site and Remote Activities

Traditional accounting systems, typically organized around departments, roles, and overhead allocations, were not designed to capture how resources are actually consumed by activities carried out across different locations. Hybrid work amplifies these limitations because resource use becomes dispersed, therefore cost models must represent how resources are absorbed by activities, rather than where they are formally positioned within the organizational structure (Kaplan & Anderson, 2007; Drury, 2018). Activity-based costing (ABC), and especially its time-driven variant (TDABC), provides a coherent foundation for this shift. The core intuition articulated by Kaplan and Anderson (2007) is that costs should be traced to activities through time equations reflecting the actual resources required for their execution, instead of relying on arbitrary allocations (Cugini & Pilonato, 2014, 2013). Applied to hybrid work, this logic makes it possible to estimate and compare the cost of performing the same activity on-site or remotely, using time as a common denominator.

2.2.1 The logic of time-driven costing in hybrid environments

In TDABC, activities consume time from one or more resource pools, multiplied by a capacity cost rate. Execution time can differ depending on context, complexity, or communication channel, and such differences are particularly salient in hybrid work. A document approval may take only a few minutes on-site but considerably longer when performed remotely because of asynchronous exchanges or additional verification steps. By contrast, analytically demanding activities may require less time in remote settings, where uninterrupted work is easier to sustain (Bloom et al., 2015; Drury, 2018; Gibbs et al., 2024).

2.2.2 Emerging cost in hybrid work

Hybrid work also introduces categories of cost that remain largely invisible in traditional accounting systems. These include digital coordination costs associated with platforms and communication latency, cognitive switching costs related to interruptions, infrastructure substitution costs transferred to employees, and potential gains from reduced physical space usage (Federici, 2022; Al Mohamed, 2024). An activity-based framework accommodates these elements by linking each cost driver to the activities that generate it, enabling comparisons across execution contexts and revealing whether savings in one area are offset by increases elsewhere.

2.2.3 Comparing on-site and remote activity costs

The main analytical advantage of activity-based costing lies in commensurability. Because activities are defined consistently across execution modes, observed differences in cost or time can be interpreted as genuine efficiency differentials rather than as artefacts of measurement. This allows organizations to distinguish activities that benefit from remote execution from those that still depend on physical co-presence. Empirical evidence suggests that standardized and weakly interdependent activities often display favourable cost profiles when executed remotely. Conversely, activities that rely on intensive knowledge integration or negotiation may generate higher coordination costs when performed remotely, due to delays, misalignment, and reduced informal interaction (Grant et al., 2013; Kelliher & Anderson, 2010; Mabaso & Manuel, 2024). That will make visible where remote work creates value and where it introduces friction. These maps support diagnostic reasoning rather than normative prescription: they inform choices about hybrid design – such as which processes to digitize or when co-location is still desirable – without assuming a single configuration for all activities.

2.2.4 Cost, performance, and the multidimensionality of value

The management accounting literature emphasizes that cost becomes relevant for decision-making only when considered together with other performance dimensions, such as quality, time, and stakeholder satisfaction (Drury, 2018). Cost data capture efficiency, but they do not reveal effectiveness. Reductions may signal improvement when they reflect genuine process optimization, but they may also conceal deterioration when quality or satisfaction is compromised (Kaplan & Anderson, 2007; Federici, 2022; Cugini & Pilonato, 2014; Cugini et al., 2010). In hybrid contexts, such trade-offs include other less tangible aspects, such as cognitive load, learning opportunities, and sense of belonging (Grant et al., 2013; Bernstein, 2012). This insight underpins the Activity Multidimensional Performance (AMP) framework introduced in this chapter.

2.2.5 Measurement as governance, not surveillance

Embedding cost measurement at the activity level also changes the role of measurement itself. Rather than functioning as an instrument of surveillance or budgetary enforcement, activity-level cost data can support distributed governance. When shared transparently, these data provide a common basis for dialogue about improvement, allowing teams to identify resource-intensive activities, diagnose underlying causes, and design corrective actions collaboratively (Pulignano & Doerflinger, 2013; Federici, 2022). Used in this way, cost measurement can reinforce trust rather than undermine it. This balance corresponds to Bernstein's (2012) transparency/privacy equilibrium: enough visibility for coordination, enough opacity to preserve autonomy. In hybrid settings, achieving this balance is a core condition for sustainable control.

2.2.6 Beyond cost: toward integrated performance governance

Ultimately, measuring the cost of on-site and remote activities is not an end in itself but a gateway to integrated performance governance. Once organizations can quantify the economic implications of hybrid execution, they can link cost efficiency to quality, time, and satisfaction through unified dashboards. This progression leads directly to the AMP methodology developed in the next section. In this sense, activity-based costing in hybrid work is less an accounting technique than a coherent philosophy of governance, aligned with the realities of contemporary organizations.

3. THE ACTIVITY MULTIDIMENSIONAL PERFORMANCE (AMP) METHODOLOGY

The consolidation of hybrid work and the parallel shift toward activity-based forms of governance create a need for new approaches to performance measurement. Traditional frameworks struggle to capture how value is generated when activities are performed across different locations, time regimes, and modes of coordination. This perspective also aligns with the analysis provided in Chapter 6 of this book, which highlights how psycho-environmental variables such as perceived autonomy, cognitive load, and well-being interact with performance dynamics in remote and hybrid work settings.

The AMP methodology emerges in response to this gap. It builds on the logic of activity-based costing (Kaplan & Anderson, 2007) and established performance measurement systems (Simons, 1995, 1999; Drury, 2018), extending them into a multidimensional framework able to represent how activities generate value under heterogeneous conditions of execution.

At the core of AMP there is this assumption: performance cannot be adequately represented through a single dimension, because value is produced through the interaction of multiple dimensions that are only partially aligned.

Efficiency, quality, time, and stakeholder satisfaction coexist and none of them can be treated as sufficient on its own. Conventional performance measurement systems tend to assign these dimensions to separate managerial domains, whereas the AMP framework deliberately recomposes this fragmentation by integrating all four dimensions at the level of the activity, making visible trade-offs, synergies, and systemic constraints that single-dimensional metrics tend to obscure (Kaplan & Norton, 1996; Federici, 2022).

From a conceptual standpoint, AMP can be read as an evolution of the Balanced Scorecard logic (Kaplan & Norton, 1996), adapted to the specific challenges of hybrid work and combined with the analytical discipline of activity-based costing. While the Balanced Scorecard connects performance measures to strategic objectives, AMP shifts attention toward activity-level governance, furnishing the informational substrate on which strategic control can be exercised.

3.1 Performance as a Multidimensional Construct

The theoretical foundation of the AMP methodology rests on the recognition that performance is inherently multidimensional because no single indicator can exhaustively represent organizational performance, whose outcomes emerge from interconnected economic, technical, and social aspects (Otley, 1999; Drury, 2018). The need to assess performance through multiple dimensions has long been acknowledged in the management control literature, notably in the development of integrated frameworks such as the Balanced Scorecard (Kaplan & Norton, 1992, 1996; Cugini et al., 2014, 2011). Recent personnel-based evidence on remote work further reinforces this point (Gibbs et al., 2024). In hybrid contexts, multidimensionality becomes even more salient, as physical and digital work, synchronous and asynchronous coordination, coexist and interact in ways that complicate linear cause–effect reasoning.

3.1.1 From unidimensional metrics to systemic performance

Historically, performance control has evolved through successive layers of simplification. Early industrial models privileged efficiency, defined primarily as output per unit of labour. Subsequent developments incorporated quality metrics and, later, broader performance perspectives through instruments such as the Balanced Scorecard. However, most of these frameworks remain anchored at the organizational level instead of at the activities, which are at the origin of corporate value (Kaplan & Norton, 1996; Drury, 2018). AMP addresses this limitation by analysing performance directly at the activity level which cuts across the organizational structure. Consequently, each activity functions as a small performance system in its own right, generating information on efficiency, quality, time, and satisfaction.

3.1.2 Interdependencies among dimensions

The four performance dimensions in AMP are not additive but interdependent and these interdependencies generate what Simons (1995, 1999) describes as tension systems, that is sets of competing objectives that cannot be resolved once and for all. The task of control is therefore not to eliminate tension, but to render it observable and governable and AMP makes such tensions visible, and this cross-dimensional visibility supports ongoing balancing rather than static optimization and enables organizations to adjust performance trade-offs over time (Kaplan & Norton, 1996; Cugini et al., 2014, 2011; Mabaso & Manuel, 2024).

3.2 Proposed Indicators: Efficiency, Quality, Time, Satisfaction

Within the AMP framework, performance is articulated along four core dimensions: efficiency; quality; time; and stakeholder satisfaction. Each dimension corresponds to a distinct evaluative question, but it is their joint consideration that enables meaningful performance assessment in hybrid contexts.

3.2.1 Efficiency

Efficiency expresses the relationship between resources consumed and outputs generated. In AMP, efficiency is not conceived as a static ratio but as a contextual and dynamic property of activities (Kaplan & Anderson, 2007). In hybrid work settings, efficiency must be assessed by comparing equivalent activities performed on-site and remotely. The objective is not to establish the intrinsic superiority of one modality, but to understand the conditions under which efficiency differentials emerge (Gibbs et al., 2024; Federici, 2022). Efficiency thus becomes a situated attribute, shaped by task complexity, interdependence, and technological infrastructure. By anchoring efficiency metrics directly to activity characteristics, AMP supports cost-to-value interpretations in which resource use is evaluated in relation to quality, time, and satisfaction constraints, rather than minimized in isolation.

3.2.2 Quality

Quality refers to the degree to which outputs conform to defined standards and to an activity's ability to avoid rework and downstream defects. Within AMP, quality is examined through both internal indicators (such as error rates, rework frequency, or first-pass yield) and external indicators reflecting stakeholder evaluations. Measuring quality at the activity level allows deviations to be traced to specific execution conditions, enhancing diagnostic precision (Drury, 2018). In hybrid environments, quality issues often arise from coordination gaps and information asymmetries rather than from individual shortcomings. Remote execution may weaken tacit coordination and increase the

likelihood of misinterpretation, while on-site work may suffer from overload or continuous interruption. By linking quality outcomes to execution modes, AMP makes these mechanisms visible and supports targeted process redesign (Grant et al., 2013; Kelliher & Anderson, 2010). It is very important to note that AMP treats quality not only as compliance with specifications but also as a learning signal (Mabaso & Manuel, 2024).

3.2.3 Time

Time is conceptualized in AMP as a multidimensional construct comprising touch time, wait time, and overall cycle time. These components interact differently depending on whether activities are performed on-site or remotely. Remote work often reduces touch time by enabling uninterrupted concentration, while increasing wait time due to asynchronous communication or technological latency. Conversely, on-site execution may shorten feedback loops but suffer from frequent context switching. By disentangling these temporal components, AMP provides a detailed temporal profile of each activity. This allows managers to identify whether delays originate in execution or coordination and to design interventions accordingly. Time metrics also function as a bridge between efficiency and satisfaction: reductions in cycle time may improve service responsiveness but, if achieved through excessive pressure, may undermine employee well-being (Grant et al., 2013; Federici, 2022).

3.2.4 Stakeholder satisfaction

Stakeholder satisfaction extends beyond the customer to include all actors involved in or affected by an activity, such as employees, peers, supervisors, and external partners. In hybrid contexts, satisfaction reflects both outcome quality and process experience. Internal stakeholders assess clarity, support, and coordination, while external stakeholders focus on reliability and responsiveness. AMP integrates satisfaction through feedback mechanisms explicitly linked to activities rather than to aggregated roles or organizational units. Internal surveys may capture the smoothness of handovers between remote and on-site phases, while customer feedback can assess the perceived effectiveness of specific interactions. In this way, satisfaction becomes a diagnostic signal highlighting how hybrid configurations influence relational quality (Federici, 2022; Cugini et al., 2017, 2010).



3.2.5 Integrating the dimensions

Each dimension offers a partial view of activity performance; therefore, the AMP multidimensional structure ensures that hybrid work is assessed in a balanced and context-sensitive manner. Rather than privileging remote or on-site execution a priori, AMP enables organizations to determine which

configurations optimize performance at the activity level, acknowledging that optimal solutions may differ across processes and evolve over time.

3.3 The AMP Dashboard: Visualization and Decision-making Uses

Recent contributions in economics increasingly conceptualize work as a system of interactions rather than as a mere aggregation of individual tasks. From this perspective, firm-level productivity depends on how different forms of interaction are combined – face-to-face, remote synchronous, and remote asynchronous – each associated with distinct coordination costs and relational effects (Becchetti et al., 2025). Hybrid work does not therefore converge toward a single optimal configuration, but instead requires continuous calibration among heterogeneous interaction modes.

The practical implementation of the AMP methodology takes shape through the *AMP Dashboard*, conceived as a visualization and decision-support system that brings together activity-level data across the four performance dimensions. Its role is not limited to reporting metrics. Rather, it translates measurement into structured insight and, ultimately, into a framework for performance governance.

3.3.1 Structure and design principles

The AMP Dashboard is organized according to a hierarchical logic. At the most granular level, individual activities are represented together with their indicators of efficiency, quality, time, and satisfaction. These data are then progressively aggregated by process, by function, or by strategic objective, with the aim of forming a nested structure that mirrors the organization's value-creation architecture. Such a design ensures vertical alignment between operational data and strategic goals, while also enabling horizontal comparability across different hybrid configurations (Kaplan & Norton, 1996; Federici, 2022). Visualization plays a central role in making this multidimensional information interpretable. Rather than relying on static tables, the Dashboard employs interactive visual formats such as radar charts, heat maps, and dynamic scatterplots or other tools that make trade-offs visible. Managers can shift analytical focus by “zooming in” on single activities, for example to understand why improvements in efficiency coincide with declining satisfaction, or by “zooming out” to assess broader patterns at the process level. In this sense, visualization does not merely display data but supports analytical reasoning and collective sensemaking (Simons, 1995, 1999; Bernstein, 2012).

3.3.2 Diagnostic and strategic aims

The AMP Dashboard serves a dual purpose. On the one hand, it supports *diagnostic control*, providing early signals of imbalance, such as rising efficiency

paired with deteriorating quality. On the other hand, it functions as a tool for *strategic learning*, aggregating activity-level evidence to inform decisions on resource allocation, process redesign, or the calibration of hybrid policies. These two purposes operate on different time horizons: diagnostic use enables short feedback loops, allowing timely corrective action before deviations become systemic; by contrast, strategic use supports longer feedback loops through which management can detect recurring patterns (i.e. persistent quality issues in remote execution, or chronically low satisfaction under certain hybrid arrangements) and modify the hybrid work policies.

3.3.3 From data to dialogue

The AMP Dashboard is explicitly designed also to foster dialogue, consistently with the notion of *enabling control* (Adler & Borys, 1996); in fact, managers can use the Dashboard as a shared cognitive reference for discussing performance, identifying causes, and jointly developing improvement initiatives. When employees recognize that metrics reflect the actual complexity of their activities, rather than superficial behavioural proxies, trust in the measurement system increases and this, in turn, facilitates constructive feedback and participation (Pulignano & Doerflinger, 2013; Mabaso & Manuel, 2024). In this way control shifts, at last, from being perceived as an external imposition to becoming part of a collective learning dynamic, strengthening coordination and organizational commitment.

3.3.4 Decision-making and organizational learning

Taken together, these features position the AMP Dashboard as a learning infrastructure and can support *double-loop learning* (Argyris & Schön, 1978), because it enables managers to experiment with alternative combinations of remote and on-site execution and observe how these affect efficiency, quality, time, and satisfaction. This approach is consistent with the view that hybrid work configurations generate enduring trade-offs among productivity gains, coordination costs, and relational dynamics, rather than converging on a single dominant mode of execution (Becchetti et al., 2025).

At this point, it is necessary to clarify how the AMP Dashboard operates in practice: Table 7.1 provides an illustrative example of how multidimensional performance indicators can be used to compare on-site and remote execution of the same activity.

Consider the activity *customer identity verification* within a customer onboarding process; as summarized in Table 7.1, it can be performed either on-site or remotely while remaining functionally equivalent in process terms.

When performance is analysed through the AMP Dashboard, no execution mode emerges as superior. Remote execution displays higher efficiency, as

Table 7.1 *Example of an Activity Multidimensional Performance (AMP) Dashboard for a hybrid activity*

Performance dimensions	AMP indicators	On-site execution	Remote execution	Managerial interpretations
Efficiency	Cost per activity (TDABC-based index)	0.74	0.83	Remote execution benefits from reduced spatial coordination and more focused processing time
Quality	First-pass yield	0.88	0.79	Remote execution shows a higher incidence of rework due to reduced contextual cues
Time	Cycle time index (touch + wait)	1.00	1.21	Asynchronous handovers increase waiting times despite similar touch time
Satisfaction	Stakeholder satisfaction score	0.84	0.77	Convenience of remote execution does not fully compensate for lower perceived interaction quality

Source: Author.

Notes: Indicators are normalized indices used for illustrative purposes. The Table 7.1 shows how the AMP Dashboard enables like-for-like comparison between on-site and remote execution of the same activity across multiple performance dimensions.

captured by a TDABC-based cost-per-activity indicator. This reflects lower spatial coordination requirements and more concentrated processing time.

At the same time, however, these efficiency gains are associated with lower quality outcomes, as shown by a reduced first-pass yield and a higher incidence of rework.

Time-related indicators reveal further tensions: while touch time remains broadly comparable across execution modes, asynchronous coordination in the remote configuration increases overall cycle time. Stakeholder satisfaction scores suggest an additional trade-off, insofar as the greater convenience of remote execution does not fully compensate for the perceived decline in interaction quality.

It is important to highlight that the AMP Dashboard does not point to a single “optimal” configuration between on-site and remote execution. By disentangling efficiency gains from their quality, time, and satisfaction implications, the Dashboard makes visible a set of multidimensional trade-offs that cannot be resolved mechanically. Managerial judgment remains indispensable, but it is exercised on the basis of structured and commensurate evidence, rather than on behavioural visibility or presence-based proxies.

Seen from this perspective, the AMP Dashboard operates as a management and learning device, not as a surveillance tool. It supports informed discussion about process redesign, coordination mechanisms, and execution choices, allowing managers to calibrate hybrid arrangements in line with both performance objectives and stakeholder expectations.

Taken together, this example illustrates how performance visualization in hybrid contexts can move beyond behavioural visibility toward activity-based governance. Rather than collapsing performance into a single index or privileging presence-based signals, the Dashboard preserves the inherently multidimensional nature of value creation and makes tensions explicit. In other words, the AMP Dashboard does not prescribe optimal solutions; it equips managers with evidence that allows them to recalibrate hybrid work arrangements over time, balancing efficiency, effectiveness, and stakeholder concerns.

Ultimately, the AMP Dashboard embodies the central claim of this chapter: in hybrid organizations, effective control derives from information richness. By visualizing the multidimensional performance of activities, it redefines visibility as a resource for learning rather than domination (Bernstein, 2012). Visibility is selectively allocated to what governs performance, not to who performs it.

4. CONCLUSION

The consolidation of hybrid work in the post-pandemic era has altered the foundations of managerial control. As flexibility becomes a structural feature rather than an emergency response, the central challenge is no longer enabling remote work, but governing performance without defaulting to surveillance. This chapter has argued that such governance requires moving beyond visual control, shifting attention from observable behaviours to the activities through which value is actually produced. The transition from task-based to activity-based control entails a deeper epistemic change, one that makes it possible to integrate efficiency, quality, time, and satisfaction within a coherent framework for learning and accountability.

The chapter first highlighted the growing inadequacy of traditional control systems in hybrid contexts, because control architectures grounded in proximity, observation, and hierarchical oversight lose effectiveness when work

unfolds across digital and physical spaces. As noted in the literature, transparency becomes counterproductive when it erodes trust and constrains experimentation (Bernstein, 2012). *Hybrid work calls for structured visibility that does not centre on workers as subjects, but on activities as units of analysis.*

Against this background, the chapter proposed the activity as the foundational unit of performance governance. Unlike tasks or roles, activities capture the “real nature” of work and its contribution to organizational outcomes, independently of location or individual assignment. Anchoring control at the activity level allows organizations to rebuild performance systems that are both analytically rigorous and socially sustainable.

This reconceptualization transforms managerial control in three main ways.

First, it reframes control as a mechanism for learning and coordination rather than surveillance, using visibility to support diagnosis and improvement instead of discipline.

Second, it integrates cost and performance information at the same analytical level, enabling managers to reason about trade-offs between efficiency, quality, time, and satisfaction (Kaplan & Anderson, 2007; Drury, 2018).

Third, it reconciles accountability and trust by decoupling visibility of process from visibility of person.

Building on these principles, the chapter introduced the Activity Multidimensional Performance (AMP) methodology. AMP extends the logic of activity-based costing into a multidimensional framework for performance governance, operationalizing the insight that value creation is inherently multidimensional and cannot be reduced to single indicators. By focusing on activities as micro-foundations of performance, AMP provides granular and interpretable data that reveal the real dynamics of hybrid work, including hidden trade-offs and interdependencies.

Overall, the chapter contributes to the literature by linking the visibility problem of hybrid work to the informational challenges of performance control, extending activity-based reasoning beyond accounting into organizational governance. From a managerial perspective, AMP offers a way to design hybrid systems that are adaptive, evidence-based, and ethically grounded, avoiding simplistic assumptions about where or how work should be performed.

Governing hybrid work ultimately requires rethinking what deserves to be made visible and measurable. By grounding control in activities rather than individuals and by embracing multidimensional performance as a basis for learning, the AMP framework restores managerial control to its enabling role: supporting collective achievement under conditions of organizational complexity.

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8. Individual preferences and corporate performance in remote work: Supporting managerial decision-making

Antonella Cugini

1. FLEXIBILITY, PERFORMANCE, AND INDIVIDUAL PREFERENCES: A MANAGERIAL CHALLENGE

The diffusion of flexible and remote work arrangements, as a temporary solution to ensure business continuity during the COVID-19 pandemic, has profoundly reshaped the way work is organized and assessed within companies. Many organizations now face a rather different problem: not whether flexible work should be allowed, but how it should be governed in the long run. In fact, traditional assumptions concerning where work takes place, how it is coordinated, and how performance can be observed have been progressively weakened. This evolution has very strong implications for management control and performance evaluation systems, because remote work reduces the effectiveness of direct supervision and, at the same time, employees' expectations regarding autonomy, flexibility, and work-life balance have become more explicit and, in some cases, more demanding. The result is often an intensification of the negotiation between organizational requirements and individual preferences, which may make their alignment more difficult and complex. As discussed in Chapter 1 of this book, this negotiation is not neutral, as flexible and remote work arrangements may amplify inequalities in access to resources, visibility, and support, thereby affecting how different groups of employees experience and benefit from flexibility.

As discussed in the previous chapter, these developments call for a rethinking of how performance is analysed and assessed. Performance can no longer be only associated with working time or physical presence: attention must instead shift toward activities as the elementary units through which work is actually carried out and value is generated. Within this perspective, understanding how

activities are performed in flexible work settings and how individual perceptions and preferences shape this process becomes a necessary step for designing a performance measurement system that is truly effective.

1.1 The Employer–Employee Dilemma Between Control and Autonomy

The dilemma between control and autonomy is not new in itself, but it acquires more relevance in flexible work contexts, where physical distance and temporal flexibility tend to alter the traditional conditions of work coordination, supervision, and evaluation. In fact, in traditional management control systems, direct supervision, visibility of effort, and time-based controls played a central role (Merchant & Van der Stede, 2017). In remote and hybrid work these mechanisms lose much of their effectiveness and, in some cases, risk becoming counterproductive.

From the employer's perspective, control mechanisms remain essential to align individual efforts with organizational objectives, to coordinate activities, and to safeguard accountability. At the same time, remote work explicitly promises higher levels of autonomy for employees. Autonomy, typically understood as discretion over when, where, and how work activities are carried out, has long been associated with positive outcomes such as increased motivation, job satisfaction, and perceived work–life balance (Morgeson & Humphrey, 2006; Grant et al., 2013). For this reason, autonomy is often presented as one of the advantages of remote working and a key driver of its acceptance among employees. Yet, this promise of autonomy also raises expectations that organizations are not always prepared to manage or support adequately. As discussed in Chapter 2, unmet expectations regarding autonomy and flexibility may also translate into regulatory and normative tensions, particularly concerning limits to managerial control and employees' right to disconnect in digitally mediated work contexts.

As a consequence, the coexistence of control requirements and autonomy expectations should therefore be understood as a structural condition in flexible work contexts: organizations are required to rely on indirect forms of control, including goal setting, performance indicators, digital coordination tools, and mechanisms of self-regulation. This shift places greater responsibility on employees' perceived self-efficacy and their capacity to organize work activities independently (Tramontano et al., 2021). At the same time, it exposes organizations to risks of under-control, coordination failures, and difficulties in evaluating performance.

Empirical research suggests that autonomy in remote work does not automatically translate into improved outcomes. Several studies document potential adverse effects associated with flexible work, such as work

intensification, blurred boundaries between work and private life, social isolation, and increased exposure to technostress (Ragu-Nathan et al., 2008; Grant et al., 2013; Soman & Mohanan, 2022). These findings indicate that autonomy, when not adequately supported by organizational tools, resources, and competences, may undermine both employee well-being and performance. From the employee's perspective, the tension between control and autonomy is experienced in differentiated ways. Individual preferences, personal circumstances, job characteristics, and levels of digital competence all contribute to shaping how flexible work is perceived and enacted. While some workers benefit significantly from increased discretion and self-organization, others may prefer clearer guidance, more frequent feedback, or closer physical proximity to colleagues and supervisors.

This heterogeneity challenges the assumption that a uniform configuration of control and flexibility can be equally effective for all employees. In this sense, autonomy should be treated as a *contingent resource rather than as an unconditional benefit*.

What emerges, therefore, is that the *dilemma between control and autonomy cannot be addressed through purely normative prescriptions or standardized policies*. Rather, it calls for a more fine-grained analytical understanding of how *employees perceive flexible work* arrangements and how these perceptions *influence the execution* of their activities.

Such understanding is a prerequisite for the design of management control and performance measurement systems capable of aligning organizational requirements with individual needs in flexible, hybrid, or remote work contexts.

1.2 Aligning Corporate Performance and Employee Preferences

The growing diffusion of remote work has intensified the debate on the relationship between organizational performance and employees' individual preferences. In this sense, the alignment between corporate objectives and individual preferences remains a complex challenge to be faced, particularly when flexible work is implemented on a large scale across heterogeneous organizational contexts.

In fact, from an organizational standpoint, performance has traditionally been conceptualized in terms of efficiency, effectiveness, and goal attainment; and management control system as the tool to translate strategic priorities into measurable targets, allocate responsibilities, and monitor results.

In remote work context, however, the link between individual effort and organizational performance becomes less transparent, because the spatial and temporal dispersion of activities complicates coordination and weakens process visibility (Merchant & Van der Stede, 2017; Dos Santos et al., 2022). As

a result, organizations face increasing uncertainty regarding the way to gather individual contributions into a global and coherent company performance.

At the same time, employees' preferences concerning flexible work arrangements have become more explicit and articulated. Empirical research consistently documents substantial heterogeneity in preferences for remote, hybrid, or on-site work, shaped by job characteristics, domestic conditions, commuting distance, digital skills, and individual values (Vij et al., 2023; Klaser et al., 2023). These preferences influence how employees engage with flexibility and affect motivation, satisfaction, and perceived productivity. When this heterogeneity is overlooked, organizations risk adopting standardized solutions that are misaligned with both individual needs and performance objectives.

What emerges, therefore, is a very important aspect to be considered: the relationship between corporate performance and employee preferences should therefore *not be framed as a simple trade-off*, rather, it can be understood as a *dynamic relationship* mediated by how work is actually carried out.

As argued in the previous chapter, performance in flexible work arrangements is more meaningfully analysed at the level of activities, rather than through proxies such as working time or physical presence. Within this activity-based perspective, employees' preferences shape critical dimensions of performance, including concentration, coordination quality, learning processes, and the quality of outputs. These effects are neither uniform nor linear, but depend on the *interaction between individual characteristics, task requirements, and organizational support mechanisms*. Recent empirical contributions lend support to this view: remote work has been shown to enhance performance when accompanied by adequate technological infrastructure, clear coordination mechanisms, and supportive leadership practices (Barbieri et al., 2024; Aguilar-Rodríguez et al., 2023). Conversely, when preferences and work conditions are misaligned, flexible arrangements may generate inefficiencies, stress, and deteriorating performance outcomes. These findings suggest that *employees' preferences should not be treated as peripheral or subjective noise, but as informative signals that condition how work activities are executed*. This interpretation aligns with the analysis provided in Chapter 6 of this book, which emphasizes the role of psycho-environmental variables – such as stress, perceived autonomy, and well-being – in shaping performance dynamics in flexible work contexts.

From an academic perspective, this calls for *conceptual frameworks capable of systematically capturing employees' perceptions and preferences* and relating them to organizational performance concerns.

From a managerial perspective, it implies that performance management systems should incorporate employee-centred information in a structured and interpretable way: employee preferences, in this sense, do not substitute

objective indicators but contribute to explaining why similar activities may perform differently under the same or comparable conditions.

Collecting structured data on employees' experiences of flexible work thus represents a necessary step toward more informed and sustainable organizational decision-making, because such data can help *identify configurations of flexible work that support both improvement in performance activity execution and employee well-being*.



1.3 Aim and Relevance of the Contribution

The aim of this chapter is to contribute to the academic debate on flexible and remote work by introducing a structured and theoretically grounded instrument designed to capture employees' preferences, perceptions, and experiences in remote and hybrid work. In particular, the chapter focuses on the conceptual and methodological rationale underlying the design of the questionnaire and on its potential analytical contribution to both research and organizational practice. For this reason, the value of the proposed instrument lies primarily in its capacity to inform interpretation rather than to generate immediate evaluative judgements.

The chapter is explicitly developed in continuity with the conceptual framework introduced in the previous chapter, which advanced an activity-based perspective for the measurement of performance in flexible work arrangements. As argued therein, assessing performance in the remote work context must focus on activities as the elementary units through which work is actually performed and value is generated. One effect of this awareness is that it raises a complementary and often overlooked question: how can organizations effectively evaluate activity-level performance without understanding the conditions under which those activities are carried out?

This chapter addresses the question by explicitly incorporating the worker's perspective as an essential informational layer for activity-based performance management. Employees' preferences, perceptions, and lived experiences are not treated as subjective secondary considerations, but as contextual factors that shape how activities are organized, executed, and coordinated in flexible work environments. Elements such as access to adequate workspaces and digital tools, the quality of communication and coordination, perceived autonomy, work-life balance, and job satisfaction contribute to defining the conditions under which activities unfold and ultimately influence their performance outcomes. From a methodological point of view, *the proposed questionnaire is conceived as a bridge between individual-level perceptions and organizational-level performance concerns*.

In line with contemporary research on management control and performance measurement, the instrument is not designed to replace objective

indicators, but to complement them by providing structured information on the individual and contextual factors that condition performance (Merchant & Van der Stede, 2017; Dos Santos et al., 2022). The focus is therefore interpretative: employee-centred data are intended to inform the understanding and governance of work activities, rather than stand-alone evaluative measures. This interpretative stance is consistent with earlier studies showing that perceptions of effectiveness, well-being, and balance play a significant role in shaping engagement and activity execution in remote work (Contreras et al., 2020; Grant et al., 2013).

From a theoretical perspective, the chapter also resonates with the job demands–resources model, according to which the outcomes associated with remote work depend less on work location per se than on the balance between demands and available resources (Sardeshmukh et al., 2012).

The relevance of this contribution lies in its *integrative and multidimensional orientation*.

The questionnaire considers interrelated dimensions reflecting key aspects of flexible work arrangements, including demographic and professional characteristics, workspace and digital infrastructure, communication and coordination aspects, perceived performance, work–life balance, and overall satisfaction and preferences.

In doing so, this chapter responds to existing calls in the literature for tools capable of capturing the complexity of remote and hybrid work beyond fragmented or unidimensional measures (Grant et al., 2013; Tramontano et al., 2021; Barbieri et al., 2024). Moreover, importantly, the instrument is conceived not only as a descriptive device, but also as a foundation for analytical interpretation and future empirical developments. Its design allows for the identification of interdependencies among dimensions, the profiling of workers based on recurring patterns of responses, and the potential translation of selected items into performance-related indicators. This aspect is particularly relevant when read in conjunction with the activity-based framework developed in the previous chapter: linking employee perceptions to specific dimensions of activity performance can help explain discrepancies between expected and observed outcomes and support more targeted managerial interventions.

From an academic standpoint, this approach contributes by offering a tool that is explicitly aligned with contemporary developments in performance measurement and management control under flexible work conditions. From an organizational standpoint, it provides decision-makers with a structured framework to systematically incorporate employee-centred information into the governance of remote working arrangements, without compromising analytical rigour or control objectives.

Taken together, the chapter advances the argument that effective performance measurement/management in flexible work contexts requires an

integration of activity-based analytical frameworks and employee-centred data.

2. DESIGNING AN EMPLOYEE-CENTRED TOOL FOR FLEXIBLE WORK

While an activity-based approach offers a solid foundation for rethinking performance measurement in hybrid working contexts, it cannot be deployed in isolation from the conditions under which activities are concretely performed. From this perspective, the employee's viewpoint appears as a necessary complementary layer. As a consequence, employees' perceptions and lived experiences directly shape the way activities are carried out, coordinated, and sustained over time. If these aspects are ignored, management control systems may remain analytically coherent while becoming fragile in practice, as they overlook the contextual factors that influence behaviour, engagement, and effectiveness in distributed work settings.

Building on these considerations, this section introduces an employee-centred tool designed to systematically capture such perspectives. The proposed questionnaire is not conceived as a satisfaction survey, nor as a substitute for objective performance indicators. Rather, it is intended as an interpretative instrument, aimed at making visible the individual and contextual conditions that affect the execution of work activities in remote and hybrid arrangements. In this sense, the questionnaire complements the operational tools discussed in Chapter 3 of this book, by providing employee-centred information that supports the structured analysis and governance of activities in flexible work settings.

The subsections that follow illustrate the purpose, structure, and analytical logic of the questionnaire, clarifying how its design supports the analysis and governance of flexible work arrangements from a managerial perspective.

2.1 Purpose and Overall Structure of the Questionnaire

The purpose of the questionnaire extends beyond descriptive data collection and is explicitly oriented toward supporting interpretation and informed managerial decision-making.

From an academic perspective, the instrument aims to contribute to the literature on flexible work by operationalizing key dimensions that are frequently discussed but often measured in a fragmented manner. Empirical studies on remote working tend to focus on isolated aspects – such as productivity, work–life balance, or job satisfaction – without adequately considering their interrelations or their implications for performance measurement and management control (Grant et al., 2013; Marino & Capone, 2021). The present questionnaire

seeks to address this limitation by adopting a multidimensional structure that reflects the systemic and interdependent nature of flexible work arrangements.

The primary purpose of the questionnaire is to collect structured information on employees' preferences, perceptions, and experiences in remote and hybrid work settings. In continuity with the activity-based approach introduced in the previous chapter, individual responses are conceptualized as contextual variables that shape the conditions under which work activities are carried out and coordinated. Consistent with this purpose, the instrument is addressed specifically to employees who have direct experience with remote work.

The questionnaire is organized into clearly defined sections, each corresponding to a theoretically grounded dimension of flexible work. The questionnaire comprises six main sections.

The first section collects demographic, socio-economic, and professional information, which serves as an essential contextual background for interpreting individual responses.

The second section focuses on workspace characteristics and digital tools, capturing the material and technological conditions that enable or constrain the execution of activities in remote and hybrid settings.

The third section addresses communication and coordination mechanisms, which are particularly salient in contexts characterized by spatial and temporal dispersion of work.

The fourth section investigates perceived individual performance. This dimension acknowledges the relevance of self-assessment in understanding how employees evaluate their effectiveness across different work configurations, without equating such perceptions with objective performance indicators.

The fifth section explores work–life balance, a dimension consistently identified in the literature as central to the sustainability of flexible work arrangements.

Finally, the sixth section examines satisfaction, well-being, and preferences, integrating assessments related to health, career implications, and expectations regarding the future use of remote working.

The overall structure of the questionnaire reflects several methodological choices informed by prior research. First, it relies primarily on closed-ended questions with structured response options in order to ensure comparability across respondents, while still allowing for the identification of meaningful patterns across dimensions (Morgeson & Humphrey, 2006). As discussed in Chapter 4, pattern-based analytical approaches such as process mining rely on the identification of recurrent structures and interdependencies, supporting managerial interpretation without reducing analysis to single aggregated indicators.

Second, the instrument is designed not only for cross-sectional analysis but also for potential longitudinal use, enabling organizations to observe changes in employees' perceptions and experiences over time.

Third, the questionnaire deliberately avoids the construction of a single synthetic index of flexible work effectiveness. Instead, it emphasizes analytically distinct dimensions that can be examined individually or in relation to one another.

Crucially, by mapping individual responses onto dimensions that are relevant for the execution of work activities, the instrument facilitates the interpretation of employee-centred data within a broader performance management framework. This approach responds to recent calls in the literature for tools capable of integrating behavioural, perceptual, and organizational variables in the analysis of flexible work arrangements (Tramontano et al., 2021; Dos Santos et al., 2022).

2.2 Design Principles, Interdependencies, and Analytical Logic

The design of the questionnaire is guided by a set of methodological principles intended to capture the complexity of flexible and remote work without reducing it to a collection of isolated variables. In line with contemporary approaches to work design and management control, the instrument adopts a systemic and relational perspective. Employees' experiences of remote and hybrid work are assumed to emerge from the interaction of multiple factors, rather than from single dimensions considered independently. This assumption underpins the overall analytical logic of the questionnaire and informs its internal structure.

A first guiding principle is *multidimensionality*. Flexible work arrangements simultaneously affect material working conditions, communication practices, coordination mechanisms, perceived performance, work-life balance, and overall satisfaction. Analysing these dimensions separately may obscure their reciprocal influences and lead to partial or misleading interpretations. For this reason, the questionnaire is deliberately structured around analytically distinct yet conceptually interrelated sections. Each dimension can be examined on its own, but its relevance emerges more clearly when considered in relation to the others. This choice reflects established insights in the literature on work design and organizational behaviour, which emphasize that work outcomes are shaped by configurations of task, social, and contextual characteristics rather than by isolated variables (Morgeson & Humphrey, 2006; Grant et al., 2013).

The second design principle is the explicit consideration of *interdependencies* among questionnaire items and dimensions. The instrument is not conceived as a collection of stand-alone questions. Instead, its internal logic supports the analysis of relationships across different areas of experience. For

instance, perceptions of communication quality are analytically linked to perceived performance and satisfaction, while the adequacy of workspaces and digital tools is expected to influence both work–life balance and the effectiveness of activity execution. These interdependencies are not imposed statistically at this stage, but are embedded conceptually in the design of the questionnaire, in line with evidence suggesting that the outcomes of flexible work arrangements depend on combinations of factors rather than on single conditions (Barbieri et al., 2024; Šmite et al., 2023). Importantly, the analytical logic underlying the questionnaire anticipates future empirical developments without presupposing them. Interdependencies are defined theoretically rather than empirically, leaving room for subsequent validation and refinement. This design choice reflects the exploratory and framework-oriented nature of the contribution. By making potential relationships explicit *ex ante*, the questionnaire encourages analytical approaches that go beyond descriptive statistics and support more nuanced interpretations of employees' experiences with flexible work.

A third principle guiding the design of the questionnaire concerns the way employee preferences are captured. Rather than relying on direct self-classification, respondents are not asked to explicitly declare a preference for remote or on-site work. *Preferences* are instead *inferred* from patterns of responses across multiple items. Individual orientations toward different work configurations are therefore treated as emergent profiles rather than as predefined categories. This approach is consistent with research showing that declared preferences may differ from enacted preferences and that attitudes toward flexible work are often contingent on situational factors, such as task requirements, organizational support, and personal circumstances (Vij et al., 2023; Klaser et al., 2023). From an academic standpoint, this profiling logic allows for the exploration of heterogeneity among workers without relying on simplified dichotomies. From an organizational perspective, it enables the identification of groups of employees whose experiences and needs may differ substantially, even within formally similar work arrangements. This, in turn, supports more differentiated and context-sensitive managerial decisions than those implied by standardized flexible work policies.

A further element of the analytical logic of the questionnaire concerns its *relationship with performance measurement*. Consistent with the activity-based perspective developed in the previous chapter, the instrument does not aim to directly measure individual performance as an outcome variable. Instead, selected items capture conditions, perceptions, and experiences that are analytically relevant for understanding how work activities are performed and coordinated under flexible work arrangements. The questionnaire therefore distinguishes between dimensions that primarily provide contextual and interpretative information and dimensions that can inform the construction or

interpretation of performance-related indicators at the activity level. This distinction reflects a deliberate methodological choice. By avoiding a direct translation of subjective perceptions into performance scores, the questionnaire preserves a clear separation between employee-centred data and performance measurement. At the same time, it enables meaningful analytical linkages between individual responses and indicators related to effectiveness, coordination, and sustainability of work activities. Such an approach is consistent with contemporary views in the management control literature, which emphasize that perceptual and behavioural variables should support interpretation and governance rather than replace objective performance metrics (Merchant & Van der Stede, 2017; Dos Santos et al., 2022).

Finally, the *overall analytical orientation of the questionnaire is interpretative* rather than prescriptive. The instrument is designed to support sense-making processes by providing structured information that can be related to organizational objectives, task characteristics, and performance requirements. It does not assume that configurations of flexible work are universally optimal. Instead, it creates the empirical basis for understanding which arrangements are more suitable for specific groups of employees, types of activities, and organizational contexts.

In summary, the design of the questionnaire rests on four core principles: multidimensionality; explicit consideration of interdependencies; implicit profiling of employee orientations; and a clear analytical distinction between perceptions and performance indicators. Taken together, these principles position the instrument as a methodological bridge between individual-level experiences and activity-based approaches to performance measurement, supporting both analytical rigour and managerial relevance in the study of flexible and remote work arrangements.

3. THE MULTIDIMENSIONAL STRUCTURE OF THE QUESTIONNAIRE

The questionnaire presented in this chapter is structured around a multidimensional framework aimed at capturing the complexity of employees' experiences in remote and hybrid work arrangements. This multidimensional articulation reflects well-established insights in the literature on work design, organizational behaviour, and management control, according to which work outcomes in flexible settings are shaped by configurations of personal, contextual, and relational variables rather than by isolated determinants (Morgeson & Humphrey, 2006; Grant et al., 2013). Accordingly, the questionnaire is organized into a set of analytically distinct sections, each focusing on a specific dimension of remote working while remaining conceptually connected to the others. The aim is not to fragment employees' experiences into independent

components, but to preserve their internal coherence while allowing focused analysis.

This structure serves two complementary purposes. First, it enables a systematic and granular description of employees' experiences across different facets of flexible work. Second, it supports the identification of interdependencies among dimensions, thereby facilitating interpretative analyses that are consistent with an activity-based perspective on performance measurement. The subsections that follow describe each section of the questionnaire, outlining its conceptual rationale and positioning it within the relevant academic literature.

The complete version of the questionnaire, including all items and response options, is shown in the Appendix at the end of the chapter.

3.1 Demographic Background, Employment Context, and Remote Working Experience

The first part of the questionnaire is designed to collect background information that is essential for contextualizing employees' responses and for interpreting differences in preferences, perceptions, and experiences of remote working. This section integrates three closely related dimensions: the socio-demographic and professional profile of the respondent; the organizational context in which work is performed; and the individual experience of remote or hybrid work arrangements.

The inclusion of *demographic and socio-economic* variables follows a well-established practice in studies on remote work. Characteristics such as age, gender, educational level, and household composition have been shown to influence both access to hybrid working and its effects on work outcomes. In particular, literature highlights that socio-economic conditions and housing characteristics significantly affect the adequacy of home-based workspaces and, consequently, employees' ability to effectively perform work activities from home (Cuerdo-Vilches et al., 2021). Capturing these variables allows subsequent analyses to control for structural differences that might otherwise confound the interpretation of more subjective dimensions, such as perceived performance, satisfaction, or well-being.

In addition to individual characteristics, the questionnaire collects information on key aspects of the *organizational context*, including firm size, sector, and occupational role. These variables are included because the diffusion, regulation, and day-to-day implementation of remote work practices vary considerably across organizations and industries. Empirical evidence suggests that organizational size, technological maturity, and managerial culture play an important role in shaping how flexible work is adopted and governed (Barbieri et al., 2024; Klaser et al., 2023).

The third component of this section focuses on *employees' direct experience* with remote or hybrid work. Items explore whether remote work is formally adopted within the organization, the extent and frequency, the degree of autonomy in managing working time, and the locations from which work activities are typically performed. This focus is consistent with prior research emphasizing that the intensity, duration, and configuration of remote work are critical determinants of its effects on job effectiveness, work–life balance, and individual well-being (Grant et al., 2013; Tramontano et al., 2021).

These variables provide a foundational layer for the interpretation of the entire questionnaire; in fact, background and experience-related information enable the segmentation of respondents according to personal, organizational, and experiential characteristics. Such segmentation is particularly relevant for understanding heterogeneity in perceptions and outcomes associated with remote working, as it allows observed differences in satisfaction, coordination, or perceived performance to be related to the conditions under which work activities are carried out.

From an analytical standpoint, these variables can be interpreted as moderators in the relationship between remote working arrangements and their individual and organizational outcomes. Differences in experience with remote work, for example, may shape how employees evaluate communication practices or digital tools, while organizational context may influence the degree of support available for flexible work. In this sense, demographic background, employment context, and remote working experience jointly contribute to framing how subsequent dimensions of the questionnaire should be read and interpreted.

3.2 Workspace and Digital Tools

The second section of the questionnaire focuses on the physical and technological conditions under which remote and hybrid work activities are performed. This choice reflects a well-established strand of literature emphasizing that the outcomes of remote work are strongly contingent on the material and infrastructural context in which work activities take place.

From an academic perspective, the relevance of *physical workspace characteristics* has been widely documented in studies on remote and home-based work. The availability of a dedicated workspace, the adequacy of ergonomic conditions, lighting, and noise levels all affect employees' ability to concentrate and to sustain work effort over time. Empirical evidence suggests that disparities in housing conditions and domestic arrangements can translate into unequal working conditions among employees engaged in remote working, with direct implications for both well-being and perceived effectiveness (Cuerdo-Vilches et al., 2021; Felstead & Henseke, 2017).

The questionnaire therefore includes specific items aimed at capturing employees' assessments of their physical work environment when working remotely. These items investigate the degree to which the workspace is perceived as suitable for carrying out work activities, as well as the presence of environmental constraints that may interfere with task execution. Rather than assuming a standardized home-working setting, the instrument acknowledges the diversity of physical contexts in which remote work is performed and treats this diversity as analytically relevant.

It is very important to consider that physical workspace conditions are not conceptualized as neutral background factors; in fact, from an activity-based perspective, they contribute directly to shaping how work activities are carried out, particularly with respect to concentration, cognitive load, and fatigue. Inadequate physical conditions may increase the effort required to manage activities or reduce the quality of their outputs, even when requirements and individual competencies are the same. For this reason, capturing employees' perceptions of their physical workspace provides essential contextual information for interpreting variations in perceived performance and satisfaction in flexible work arrangements. In this sense, workspace variables operate as contextual moderators rather than as direct outcomes, helping to explain why similar work activities may yield different experiences and evaluations across individuals.

Overall, the focus on physical workspace conditions grounds the analysis of remote working in the concrete realities of work execution. By explicitly considering environmental constraints and resources, the questionnaire avoids an overly individualistic interpretation of flexible work outcomes and recognizes that performance and well-being are shaped not only by preferences and organizational policies, but also by the spaces in which work is actually performed. As discussed in Chapter 5, home-based and hybrid work arrangements introduce heterogeneous spatial configurations that shape coordination, concentration, and availability, with direct implications for performance dynamics.

Moreover, the questionnaire explicitly considers the role of *digital tools and technological infrastructure* in shaping employees' experiences of remote work. Access to reliable hardware, software, and internet connectivity constitutes a basic precondition for the execution of work activities in remote settings. At the same time, differences in the quality and configuration of digital tools can generate substantial variation in how work is coordinated, performed, and evaluated.

Prior research has shown that inadequacies in technological infrastructure may hinder communication, slow down work processes, and increase frustration, with negative consequences for both perceived and actual performance (Marino & Capone, 2021; Barbieri et al., 2024). Conversely, well-designed and well-supported digital tools may facilitate coordination, enhance autonomy in

task management, and support continuity in work processes across spatially dispersed contexts. The questionnaire therefore includes a set of items aimed at capturing employees' assessments of the adequacy, usability, and reliability of the digital tools available to them. Moreover, rather than focusing solely on the presence or absence of technology, the questionnaire emphasizes employees' evaluations of whether digital tools effectively support the execution of work activities. This distinction is important, as the mere availability of technological solutions does not guarantee their effective integration into work routines. In fact, from a socio-technical perspective, digital tools are not neutral enablers of remote work because they influence how activities are structured, how information is exchanged, and how performance expectations are communicated. Different technological configurations may privilege certain forms of coordination while constraining others, thereby influencing work practices in ways that are not always fully anticipated by organizational policies. Capturing employees' perceptions of these dynamics provides an insight into how technology conditions the execution of activities beyond formal task definitions.

The questionnaire also takes into account potentially negative effects associated with intensive digital mediation. The literature on technostress highlights that constant connectivity, frequent interruptions, and the coexistence of multiple communication platforms may increase cognitive load and reduce the capacity to engage in complex or concentrated work (Ragu-Nathan et al., 2008; Soman & Mohanan, 2022). For this reason, the instrument does not assume that greater technological intensity necessarily leads to better outcomes; instead, it allows employees to express whether digital tools are perceived as facilitating or hindering the performance of their activities.

From a methodological point of view, grouping digital tools and technological infrastructure within the same section as physical workspace conditions reflects the assumption that material and technological factors jointly influence work performance in remote working arrangements. Poor connectivity, inadequate hardware, or poorly integrated platforms may interact with physical discomfort or environmental distractions, producing cumulative effects on perceived effectiveness and satisfaction. Analysing these dimensions together enables a more comprehensive interpretation of how work environments, both physical and digital, influence employees' experiences.

Consistent with the activity-based perspective adopted throughout the chapter, this section is not intended to measure performance outcomes directly. Rather, it provides contextual information that is essential for interpreting variation in perceived performance, work-life balance, and satisfaction across individuals and organizational settings. Understanding the technological conditions under which activities are carried out is a necessary step for explaining why similar tasks may generate different outcomes in flexible work contexts.

3.3 Communication and Coordination

The third section of the questionnaire focuses on communication and coordination mechanisms in remote and hybrid work arrangements. This dimension is particularly critical in the remote work context, as spatial and temporal dispersion fundamentally alters how work activities are coordinated, how information circulates within organizations, and how interdependencies among tasks are managed. From an activity-based perspective, communication and coordination are not merely contextual variables but integral components of activity performance. Work activities rarely occur in isolation; they are embedded in sequences of tasks and depend on timely and accurate inputs from others.

From a theoretical standpoint, communication and coordination represent core elements of organizational functioning; in particular, traditionally, coordination often relies on informal interactions, shared routines, and immediate feedback. In remote and hybrid configurations, many of these mechanisms are either weakened or replaced by digitally mediated forms of interaction, making coordination more explicit, more formalized, and increasingly dependent on technological infrastructures (Felstead & Henseke, 2017; Šmite et al., 2023; Liu et al., 2026). Ineffective coordination may therefore undermine performance even when individual competence and motivation are high. This is the reason why the employees' perceptions of coordination quality provide valuable information for interpreting variations in perceived performance and satisfaction across different work configurations.

A substantial body of literature shows that the effectiveness of remote working arrangements is strongly influenced by the quality of communication processes. Difficulties in information sharing, ambiguity in task allocation, or delays in feedback may disrupt workflow continuity and increase coordination costs. Conversely, when communication practices are well structured and supported by appropriate digital tools and shared norms, organizations may successfully compensate for physical distance and maintain effective collaboration (Grant et al., 2013; Barbieri et al., 2024). The literature on technostress highlights that an excessive number of communication channels or poorly managed information flows may negatively affect concentration, decision-making, and task execution (Ragu-Nathan et al., 2008; Soman & Mohanan, 2022). For this reason, the questionnaire does not assume that more frequent communication necessarily leads to better coordination, but instead allows employees to assess whether communication practices support or hinder their work activities.

Methodologically, the questionnaire considers communication and coordination as a distinct section: this is a very important aspect because adequate workspace conditions and digital tools, for instance, may have limited impact on performance if coordination mechanisms are weak. Conversely, high-quality communication practices may partially offset environmental or

technological constraints. This perspective is consistent with recent research emphasizing the systemic nature of flexible work arrangements and the importance of interaction effects among dimensions (Šmite et al., 2023; Barbieri et al., 2024).

3.4 Perceived Individual Performance

The fourth section of the questionnaire focuses on perceived individual performance in remote and hybrid work arrangements. This dimension represents a central component of the instrument, as it directly addresses how employees evaluate their own effectiveness, productivity, and capability to carry out work activities under flexible work conditions.

From an academic point of view, the decision to concentrate on perceived performance rather than on objective output measures is theoretically grounded on a growing body of literature emphasizing that self-assessments of performance provide valuable insights into employees' cognitive, emotional, and motivational states, particularly in contexts where direct observation of work activities is limited or absent. In remote and hybrid work arrangements, employees' perceptions of their own performance influence effort allocation, self-regulation, and engagement, thereby shaping actual performance outcomes over time (Grant et al., 2013; Tramontano et al., 2021).

It is very important to notice that perceived performance is not treated in this questionnaire as a proxy for objective individual productivity; instead, it is conceptualized as an interpretative construct that reflects how employees live the execution of their work activities in flexible work contexts. Feelings of being effective, focused, or able to meet work objectives are shaped by a combination of factors, including task characteristics, coordination quality, availability of resources, and work-life balance. For this reason, perceived performance provides information on the conditions under which activities are performed, rather than on their measurable outputs.

This distinction is particularly relevant in light of the activity-based perspective on performance measurement discussed in the previous chapter. When performance is analysed at the level of activities, understanding outcomes requires insight into how those activities are actually carried out in everyday practice. Employees' perceptions offer a privileged viewpoint in this respect, as workers are directly exposed to task demands, coordination requirements, and contextual constraints that are not always visible through formal indicators. Capturing perceived performance therefore complements activity-level performance measures by shedding light on the enablers and obstacles that affect activity execution.

The questionnaire operationalizes perceived individual performance through a set of items addressing self-assessed productivity, ability to

concentrate, effectiveness in task execution, and capacity to meet work objectives in remote working settings. This approach is consistent with previous empirical studies that employ self-reported performance measures in remote work research, particularly when objective performance data are unavailable, heterogeneous, or difficult to compare across job roles (Marino & Capone, 2021; Aguilar-Rodríguez et al., 2023). The literature also suggests that perceived performance is closely related with other dimensions of flexible work: insufficient coordination, for instance, may lead employees to perceive their performance as lower even if output levels remain stable; similarly, inadequate workspaces or elevated levels of technostress may impair concentration and task execution, negatively influencing perceived effectiveness (Ragu-Nathan et al., 2008; Soman & Mohanan, 2022). By treating perceived performance as a distinct analytical dimension, the questionnaire allows these relationships to be explored explicitly rather than implicitly assumed.

Overall, the perceived individual performance section occupies a pivotal position in the analytical architecture of the questionnaire. It functions as an interpretative bridge between employees' experiences of remote working and organizational concerns with performance measurement, supporting a more nuanced understanding of how work activities are performed under flexible arrangements.

3.5 Work–Life Balance

The fifth section of the questionnaire addresses work–life balance, a dimension that has emerged as one of the most central and debated aspects of remote and hybrid work arrangements. Work–life balance refers to individuals' ability to manage boundaries and interactions between work-related activities and private life, and it represents a key determinant of both employee well-being and the long-term sustainability of flexible work practices.

The academic literature highlights that flexible work arrangements may have ambivalent effects on work–life balance. On the one hand, remote working can reduce commuting time, increase temporal autonomy, and facilitate the integration of professional and personal responsibilities. On the other hand, remote work may blur boundaries between work and non-work domains, leading to extended working hours, role overlap, and difficulties in psychological detachment from work (Grant et al., 2013; Felstead & Henseke, 2017). These contrasting effects indicate that work–life balance cannot be assumed as an automatic consequence of flexibility but depends on how flexible work arrangements are designed and experienced. From this perspective, work–life balance is closely connected to the execution of work activities. Difficulties in boundary management may affect concentration, recovery, and cognitive resources, thereby influencing both the quality and sustainability of activity

performance. Conversely, a satisfactory balance between work and private life may support attention, engagement, and resilience in the execution of tasks over time. Moreover, the literature suggests that prolonged work–life imbalance may increase stress, burnout, and turnover intentions, ultimately undermining organizational performance despite short-term productivity gains (Ragu-Nathan et al., 2008; Tramontano et al., 2021). From this standpoint, work–life balance is not merely an employee welfare issue but a variable with direct implications for retention, engagement, and long-term effectiveness.

The questionnaire captures work–life balance through items investigating employees' perceptions of boundary clarity, workload sustainability, autonomy in managing working time, and the compatibility between work demands and personal life. This approach is consistent with empirical research emphasizing the central role of perceived balance and boundary control in shaping attitudes toward remote work and overall work experience (Marino & Capone, 2021; Soman & Mohanan, 2022). The relevance of this dimension extends beyond individual well-being to encompass organizational sustainability. Including work–life balance as a distinct section also allows for the examination of its interaction with other dimensions of the questionnaire. For example, insufficient coordination or excessive digital communication may exacerbate work–life conflicts by extending work-related demands into private time. Similarly, inadequate home workspaces may intensify role interference when professional and personal activities compete for the same physical or temporal resources.

3.6 Satisfaction, Well-being, and Preferences

The final section of the questionnaire focuses on employees' satisfaction, well-being, and preferences in relation to remote and hybrid work arrangements. Within the overall structure of the instrument, this section performs a synthesizing role, as it brings together evaluative dimensions that are shaped by the interaction of workspace conditions, coordination and communication mechanisms, perceived performance, and work–life balance.

From a theoretical point of view, both job satisfaction and well-being are widely recognized as multidimensional constructs, influenced by a combination of task-related characteristics and broader organizational and contextual factors. In remote working contexts, satisfaction does not derive automatically from the availability of flexibility. Rather, it depends on how flexibility is experienced in practice, particularly in relation to workload sustainability, autonomy, social interaction, and perceived career opportunities. Empirical evidence consistently shows that employees often hold ambivalent evaluations of remote working: the same individuals may value autonomy and reduced commuting while simultaneously expressing concerns about isolation, diminished

visibility, or long-term professional development (Grant et al., 2013; Felstead & Henseke, 2017).

Reflecting this complexity, the questionnaire explicitly distinguishes between different components of satisfaction and well-being, rather than collapsing them into a single undifferentiated measure. Particular attention is devoted to *health and psychological well-being*, addressing both physical and mental implications of prolonged remote work. This focus responds to a growing body of research highlighting how intensive digital mediation, constant connectivity, and blurred temporal boundaries may contribute to stress, fatigue, and difficulties in recovery when organizational support mechanisms are insufficient (Ragu-Nathan et al., 2008; Soman & Mohanan, 2022). Including health-related items thus allows the instrument to capture early signals of potential strain that may compromise the long-term sustainability of flexible work arrangements.

Moreover, the questionnaire investigates *satisfaction associated with work content, professional growth, and career prospects*. This dimension is particularly salient in remote working contexts, where employees frequently report concerns related to recognition, feedback, and opportunities for advancement. Prior studies suggest that perceived disadvantages in career development may partially counterbalance the positive effects of flexibility and influence employees' long-term orientations toward remote or hybrid work (Marino & Capone, 2021; Aguilar-Rodríguez et al., 2023). Capturing these perceptions allows the analysis to move beyond short-term evaluations and to consider how remote working is assessed in relation to future expectations. Recent evidence also suggests that hybrid work and flexible working hours can play a positive role in supporting women's career progression, particularly by enabling better reconciliation between work and family responsibilities, which remain unevenly distributed across genders (Rebelo et al., 2026).

A further component of this section addresses *employees' preferences concerning the organization and governance of remote working*. Rather than eliciting abstract or normative opinions, preferences are anchored in respondents' concrete experiences with existing arrangements. This design choice reflects evidence showing that preferences for remote, hybrid, or on-site work are often contingent and situational, shaped by prior experiences, task requirements, and organizational practices rather than by stable individual traits (Vij et al., 2023; Klaser et al., 2023).

From an analytical perspective, data on satisfaction, well-being, and preferences provide an important interpretative key for reading the other dimensions of the questionnaire. These outcomes can be examined in relation to workspace adequacy, communication quality, perceived performance, and work-life balance, allowing researchers and practitioners to reconstruct how different configurations of flexible work are experienced by employees.

Preferences regarding future arrangements, in particular, offer insights into the acceptability and perceived viability of current organizational choices.

Consistent with the activity-based perspective adopted throughout this chapter, satisfaction, well-being, and preferences are conceptualized as indicators of how employees experience the conditions under which work activities are performed. Persistent dissatisfaction, declining well-being, or misalignment between preferences and organizational practices may signal underlying design weaknesses that are likely to affect activity performance over time.

For the sake of transparency and replicability, the complete questionnaire is reported in the Appendix, where all items and response options are presented in full and organized according to the multidimensional structure discussed in this chapter.

4. FROM INDIVIDUAL RESPONSES TO MANAGERIAL DECISION-MAKING

The present section examines how employee-centred data collected through the questionnaire can be translated into meaningful inputs for organizational decision-making, without forgetting that the emphasis is on interpretative logics rather than on prescriptive models. The questionnaire is conceived as a decision-support tool that helps organizations better understand the conditions under which work activities are actually performed, thereby complementing activity-based approaches to performance measurement. Three analytical mechanisms are central to this translation process: the identification of patterns of responses across dimensions; the interpretation of conceptual correlations among questionnaire items; and the selective linkage of employee-centred information to performance-related indicators. Taken together, these mechanisms offer a structured way to connect individual-level perceptions with organizational concerns about the governance of flexible work arrangements, without reducing one to the other.

4.1 Interpreting Results, Worker Profiling, and Correlations

A central methodological feature of the questionnaire concerns the way individual responses are intended to be interpreted. Rather than focusing on isolated variables or single dimensions, the instrument is explicitly designed to support a configurational reading of employees' experiences with remote and hybrid work. This choice reflects a broader theoretical stance, according to which outcomes associated with flexible work arrangements emerge from combinations of individual, organizational, and contextual factors, rather than from linear or additive relationships. Within this perspective, worker profiling functions as an analytical device rather than as a classificatory objective. Profiles are not

defined *ex ante*, nor are they conceived as stable or essential characteristics of workers. They instead emerge *ex post* from recurring patterns of responses across different dimensions of the questionnaire. This approach is consistent with methodological traditions that emphasize heterogeneity, situated experience, and contextual embeddedness in the study of work and organizational behaviour, and it avoids reducing employees' orientations toward flexible work to simplified dichotomies.

The questionnaire operationalizes this profiling logic implicitly. Individual orientations toward remote working, on-site work, or hybrid configurations are inferred from combinations of responses, rather than elicited through direct self-assessment. This methodological choice responds to well-documented concerns in the literature regarding the limits of self-reported preferences, which are often contingent, situational, and sensitive to framing effects. Interpreting orientations as the outcome of lived work experiences, rather than as abstract attitudes, allows for a more grounded and analytically cautious use of employee-centred data.

Closely related to profiling is the treatment of correlations among questionnaire items and dimensions. In this instrument, correlations are understood primarily in conceptual and analytical terms, grounded in theory, rather than as purely statistical associations. The design explicitly recognizes that key aspects of flexible work – such as communication quality, perceived performance, work–life balance, and satisfaction – are intertwined. This emphasis on interdependencies supports a systemic understanding of remote working that is consistent with socio-technical and work design perspectives. For example, perceived difficulties in coordination may co-occur with lower self-assessed performance, while adequate digital tools may partially offset challenges associated with spatial distance or task interdependence. Such relationships are not interpreted as deterministic causal chains, but as configurations of conditions under which work activities are experienced as more or less effective.

From a methodological standpoint, the interpretative use of profiles and correlations contributes to bridging employee-centred data and performance-oriented analyses without conflating the two. Patterns emerging from the questionnaire do not constitute performance measures in themselves. Rather, they provide contextual information that can inform the interpretation of performance at the activity level. This logic is fully coherent with the activity-based perspective introduced in the previous chapter, which emphasizes that variations in performance should be understood in relation to how activities are carried out and under what conditions. In this sense, worker profiles and conceptual correlations operate as intermediate analytical constructs. They allow scholars and practitioners to explore recurring configurations of working conditions, perceptions, and preferences, while keeping the focus on organizational arrangements rather than on individual behaviour.

The emphasis remains on understanding structural and contextual patterns that shape work experiences, not on attributing responsibility or evaluating individual performance.

Overall, the refinement of employee-centred data through configurational interpretation enhances the analytical depth of the questionnaire and supports its use as a research instrument. By foregrounding heterogeneity, interdependencies, and contextualized interpretation, this approach contributes to a more nuanced understanding of remote and hybrid work arrangements and prepares the ground for subsequent discussions on performance indicators and organizational implications.

4.2 Performance Indicators and Organizational Implications

This section addresses how selected dimensions of the questionnaire may inform the construction and interpretation of performance indicators, while preserving a clear analytical distinction between perception and measurement. From a theoretical standpoint, the management control literature has long emphasized that performance indicators do not operate in isolation. Their meaning depends on the interpretative frameworks within which they are embedded and on the conditions under which work activities are actually performed (Merchant & Van der Stede, 2017; Dos Santos et al., 2022). Within the activity-based perspective introduced in the previous chapter, performance indicators are understood here as tools aimed at capturing the effectiveness, efficiency, and sustainability of work activities, rather than as representations of individual effort or behaviour. The questionnaire contributes to this perspective by identifying a set of dimensions that condition how activities are performed, including workspace adequacy, access to digital tools, coordination quality, perceived workload sustainability, and boundary management. These dimensions do not constitute performance indicators in themselves. Rather, they provide contextual information that can help interpret activity-level indicators and better understand variations in observed outcomes.

This approach rests on a key methodological distinction. The questionnaire differentiates between dimensions that primarily serve an interpretative function and dimensions that are more directly related to performance-relevant conditions. Maintaining this distinction is essential to avoid the uncritical transformation of employee perceptions into evaluative metrics, a practice that has been widely criticized in the performance measurement literature for its conceptual weakness and potential managerial misuse. Employee-centred data are therefore treated as enabling information that complements, rather than substitutes for, traditional performance indicators. Within this analytical framework, organizational implications emerge in exploratory rather than prescriptive terms. For example, differences in activity-level performance

across teams or organizational units may be examined alongside variations in perceived coordination quality or workspace adequacy, allowing scholars and practitioners to explore plausible explanations for observed results. Likewise, persistent discrepancies between expected performance levels and employees' perceived ability to perform activities effectively may signal underlying misalignments in work design, technological support, or coordination mechanisms. The questionnaire does not provide ready-made answers to these issues, but it supports structured interpretation.

At this point it is very important to highlight that the use of employee-centred data to inform performance management does *not imply individual-level evaluation or control*. The logic adopted throughout this chapter explicitly avoids attributing performance outcomes to individual preferences or attitudes. Instead, attention remains focused on organizational arrangements and contextual factors that shape how activities are carried out. This stance is consistent with recent calls to design performance measurement systems that are sensitive to work processes, task interdependencies, and execution conditions, particularly in knowledge-intensive and flexible work environments (Tramontano et al., 2021).

From an academic perspective, the questionnaire provides a starting point for future empirical research exploring the relationship between activity-level performance indicators and employee-centred conditions. By clearly distinguishing performance outcomes from the factors that enable or constrain them, the instrument supports more nuanced analyses and reduces the risk of simplistic causal interpretations. This feature is particularly relevant for longitudinal studies, where changes in performance indicators may be examined in relation to evolving work arrangements and employee experiences over time.

4.3 Limitations and Future Developments

At this point in the analysis, after the questionnaire has been described and analysed, it is necessary to acknowledge its limitations and to outline potential directions for future research.

A *first limitation* concerns the reliance on self-reported data. As with most employee-centred instruments, the questionnaire captures perceptions, preferences, and evaluations that may be influenced by individual cognitive biases, temporary conditions, or contextual factors not directly related to work design. Although perceived performance, satisfaction, and work–life balance provide valuable insights into how work activities are experienced, they do not constitute objective measures of performance outcomes. This limitation is deliberately addressed in the design of the instrument, which avoids using perceptual variables as direct performance metrics. Nevertheless, future empirical research will be required to examine the extent to which employee-centred

perceptions are systematically associated with independently measured activity-level performance indicators.

A *second limitation* relates to the exploratory and design-oriented nature of the contribution. The questionnaire is presented as a conceptual and methodological framework rather than as a validated measurement instrument. Issues such as reliability, construct validity, and measurement equivalence across organizational contexts are beyond the scope of the present chapter and remain open areas for further investigation. Subsequent studies could apply established psychometric techniques to assess the internal consistency and factorial structure of the questionnaire, as well as to test the stability of worker profiles and interdependencies across different settings.

In terms of *future developments*, the questionnaire opens several promising avenues for empirical and theoretical research. One such direction concerns longitudinal research designs, which would make it possible to examine how employees' perceptions and preferences evolve over time and how these changes relate to modifications in work arrangements and activity-level performance indicators. This would contribute to a better understanding of the dynamic nature of flexible work and its long-term sustainability. Finally, future research could explore alternative analytical strategies, including configurational and mixed methods approaches, to deepen the interpretation of response patterns and interdependencies among dimensions.

By proposing a structured and theoretically informed questionnaire, the chapter lays the groundwork for future studies aimed at integrating employee perspectives into activity-based performance measurement and the governance of flexible and hybrid work arrangements.

5. CONCLUSION

This chapter has examined the challenge of integrating employee-centred perspectives into the analysis and governance of remote and hybrid work arrangements. Building on the activity-based perspective on performance measurement developed in the previous chapter, the contribution has introduced a structured and theoretically grounded questionnaire aimed at capturing employees' preferences, perceptions, and experiences in flexible work contexts.

The central argument advanced throughout the chapter is that effective performance measurement in remote and hybrid work cannot rely solely on structural arrangements or outcome-based indicators. When work is spatially dispersed, digitally mediated, and characterized by varying degrees of autonomy, the conditions under which activities are performed become a critical object of analysis. The questionnaire does not aim to transform subjective perceptions into performance measures. Instead, employee-centred data are

positioned as enabling information that complements activity-level performance indicators. This distinction is crucial, as it allows the integration of individual experiences into performance analysis while preserving the analytical rigour of performance measurement and management control systems.

The multidimensional structure of the questionnaire captures heterogeneity across individual, organizational, and contextual dimensions. By making these interdependencies explicit at the design stage, the questionnaire supports analytical approaches that move beyond linear cause–effect relationships and instead focus on configurations of conditions under which flexible work arrangements are perceived as more or less effective.

In this sense, the proposed questionnaire functions as a methodological bridge between individual-level experiences and organizational performance concerns. It provides a foundation for future empirical research and offers scholars a structured framework for exploring the relationships between flexible work arrangements, employee perceptions, and activity-level performance. More broadly, the chapter contributes to the ongoing academic debate on remote and hybrid work by highlighting the importance of integrating employee-centred data into contemporary approaches to performance measurement and management control, without reducing such data to mere evaluative metrics.

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APPENDIX – EMPLOYEE QUESTIONNAIRE ON REMOTE WORK

Section 1 – Demographic background, employment context, and smart working experience

1.A Respondent profile

The following questions collect socio-demographic and household information on the respondent. All responses are used exclusively for research and analytical purposes.

A1. Gender

- A. ☐ Female
- B. ☐ Male
- C. ☐ Other

A2. Age

- A. ☐ Under 20
- B. ☐ 21–30
- C. ☐ 31–40
- D. ☐ 41–50
- E. ☐ 51–60
- F. ☐ Over 60

A3. Marital status

- A. ☐ Married
- B. ☐ Civil union
- C. ☐ Separated
- D. ☐ Widowed
- E. ☐ Single
- F. ☐ Other

A4. How many people (including yourself) are part of your household?

- A. ☐ 1 person
- B. ☐ 2 people
- C. ☐ 3 people
- D. ☐ More than 3 people

A5. Who is part of your household (excluding yourself)? (*Multiple answers allowed.*)

- A. ☐ No one, I live alone
- B. ☐ My partner
- C. ☐ My partner and my child/children
- D. ☐ My child/children
- E. ☐ My parents
- F. ☐ Other relatives (e.g. grandparents, uncles/aunts)
- G. ☐ Non-family members (e.g. roommates, friends)

A6. Are there people you personally take care of on a daily basis? (*Multiple answers allowed.*)

- A. ☐ No
- B. ☐ Yes, children
- C. ☐ Yes, self-sufficient persons
- D. ☐ Yes, partially or fully non-self-sufficient persons
- E. ☐ Other (please specify)

A7. Do you own domestic pets?

- A. ☐ No
- B. ☐ Yes, dogs
- C. ☐ Yes, cats
- D. ☐ Yes, other

A8. What is the highest level of education you have completed?

- A. ☐ Compulsory education
- B. ☐ Upper secondary education
- C. ☐ Professional or specialization courses
- D. ☐ Bachelor's or equivalent degree
- E. ☐ Postgraduate Master's degree
- F. ☐ Other (please specify)

A9. At what age did you officially start working?

Number of years: _____

A10. In general, which of the following statements do you agree with?*(Multiple answers allowed.)*

- A. ☐ Technology is difficult to control
- B. ☐ Technology poses increasingly complex challenges
- C. ☐ Technology is an opportunity to improve productivity
- D. ☐ Technology allows for greater work flexibility
- E. ☐ Technology almost always enables improvement

1.B Organizational characteristics

The following questions refer to the characteristics of the organization the respondent currently works for.

B1. Type of organization

- A. ☐ Public sector
- B. ☐ Private sector (for-profit)
- C. ☐ Private non-profit organization
- D. ☐ Other (please specify)
- E. ☐ I do not know

B2. Industry / sector _____**B3. Annual turnover (in million euros)**

- A. ☐ Up to 2
- B. ☐ 3–10
- C. ☐ 11–50
- D. ☐ Over 50

B4. Number of employees

- A. ☐ Up to 10
- B. ☐ 11–50
- C. ☐ 51–250
- D. ☐ Over 250

B5. Is the organization part of a corporate group?

- A. ☐ No
- B. ☐ Yes, with a national parent company
- C. ☐ Yes, with an international parent company

B6. How widespread is smart working in your organization?

- A. ☐ All or almost all organizational units / professional families
- B. ☐ Most organizational units / professional families

- C. ☐ Only some organizational units / professional families
- D. ☐ I do not know

B7. Is the current diffusion of smart working in your organization different from the lockdown period?

- A. ☐ No, smart working was already used before the pandemic
- B. ☐ No, its diffusion is the same as during the lockdown
- C. ☐ Yes, it is more widespread than during the lockdown
- D. ☐ Yes, it is less widespread than during the lockdown
- E. ☐ Yes, smart working is gradually being phased out
- F. ☐ I do not know

1.C Individual smart worker characteristics

The following questions refer to the respondent's professional role, employment conditions, and experience with smart working.

C1. What is your current position in the organization?

- A. ☐ External consultant
- B. ☐ Temporary agency worker
- C. ☐ Executive / senior manager
- D. ☐ Middle manager
- E. ☐ Officer / professional staff
- F. ☐ Clerical / administrative employee
- G. ☐ Other (please specify)

C2. What is your professional family? _____

C3. How long have you been working in this organization?

- A. ☐ Less than 1 year
- B. ☐ 1–5 years
- C. ☐ 6–10 years
- D. ☐ More than 10 years

C4. What type of employment contract do you currently have?

- A. ☐ Permanent contract
- B. ☐ Fixed-term contract
- C. ☐ Apprenticeship
- D. ☐ Occasional or coordinated freelance collaboration
- E. ☐ Self-employed (VAT number)
- F. ☐ Other (please specify)

C5. What is your current working time arrangement?

- A. ☐ Full-time
- B. ☐ Part-time

C6. How do you usually commute to work? (Multiple answers allowed.)

- A. ☐ Car
- B. ☐ Motorcycle
- C. ☐ Public transport
- D. ☐ Bicycle
- E. ☐ On foot
- F. ☐ Car / motorcycle sharing
- G. ☐ Other (please specify)

C7. Approximately how far is your usual workplace from your home?

- A. ☐ Less than 5 km
- B. ☐ 5–20 km
- C. ☐ 21–40 km
- D. ☐ More than 40 km

C8. On average, how much time do you spend commuting to and from work each day?

- A. ☐ About 30 minutes
- B. ☐ About 1 hour
- C. ☐ About 2 hours
- D. ☐ More than 2 hours

C9. Considering your entire working life, when did you start working in smart working arrangements?

- A. ☐ I was already working in smart working arrangements before the pandemic
- B. ☐ I have been regularly working in smart working arrangements since the pandemic
- C. ☐ I have occasionally worked in smart working arrangements since the pandemic
- D. ☐ After the pandemic, I have no longer worked in smart working arrangements

C10. In a typical working week, how much of your working time is spent in smart working?

- A. ☐ Up to 40% (up to 2 days out of 5)
- B. ☐ 41%–80% (approximately 3–4 days out of 5)
- C. ☐ Over 80% (approximately 5 days out of 5)

- D. ☐ I do not know

C11. Are the activities you perform in smart working the same as those you perform on site?

- A. ☐ Yes, the same or broadly similar activities
B. ☐ No, some activities are performed only on site
C. ☐ No, some activities are performed only in smart working
D. ☐ I do not know

Section 2 – Workspace and digital tools

The following questions refer to the physical workspace, digital tools, and technological infrastructure used by the respondent when working in smart working arrangements.

2.1 When you work in smart working arrangements, where do you usually perform your work activities?

- A. ☐ Home
B. ☐ Second home (e.g. seaside or mountain house)
C. ☐ Cafés or similar public places
D. ☐ Hotel
E. ☐ Other (please specify)

2.2 When working in smart working arrangements, do you have a dedicated workstation?

- A. ☐ Yes
B. ☐ Not always
C. ☐ No

2.3 How would you assess the quality of your workstation when working in smart working arrangements?

- A. ☐ Inadequate
B. ☐ Adequate
C. ☐ Good
D. ☐ Excellent

2.4 Which software tools do you use when working in smart working arrangements? (Multiple answers allowed.)

- A. ☐ Instant messaging and communication tools (e-mail, WhatsApp, Hangouts, Skype, Slack, Google Chat, Microsoft Teams, etc.)
B. ☐ E-mail software (Microsoft Outlook, Gmail, etc.)

- C. ☐ Web conferencing platforms (Zoom, Skype, Google Meet, Microsoft Teams, etc.)
- D. ☐ Planning and task management tools (Google Calendar, Asana, Trello, etc.)
- E. ☐ Remote assistance software (TeamViewer, etc.)
- F. ☐ File sharing platforms (Dropbox, Google Drive, OneDrive, etc.)
- G. ☐ Security systems (antivirus software, two-factor authentication, VPN, etc.)
- H. ☐ Productivity monitoring software (e.g. RescueTime, TimeDoctor)
- I. ☐ Virtual reality, augmented reality, or other multimedia technologies
- J. ☐ Other

2.5 What type of internet connection do you use when working in smart working arrangements?

- A. ☐ ADSL connection
- B. ☐ Optical fibre (FTTH or FTTC)
- C. ☐ Fixed wireless access (FWA)
- D. ☐ Satellite
- E. ☐ Mobile SIM / hotspot
- F. ☐ DSL connection
- G. ☐ Other (please specify)
- H. ☐ I do not know

2.6 Who provided the software tools you use for smart working?

- A. ☐ I did not need to acquire new software
- B. ☐ I purchased or rented them at my own expense
- C. ☐ Some software tools were provided by the organization
- D. ☐ All software tools were provided by the organization

2.7 Who provided the hardware tools you use for smart working? (e.g. computer, phone, video conferencing equipment)

- A. ☐ I did not need to acquire new hardware
- B. ☐ The workstation I use is shared with others
- C. ☐ I pay for the use of the workstation
- D. ☐ I purchased or rented the hardware at my own expense
- E. ☐ Some hardware tools were provided by the organization
- F. ☐ All hardware tools were provided by the organization
- G. ☐ The organization pays for the rental of the workstation
- H. ☐ Other (please specify)

2.8 Who provided the internet connection used for smart working?

- A. ☐ I already had an adequate internet connection

- B. ☐ The workstation I use is shared with others
- C. ☐ I pay for the use of the workstation
- D. ☐ The cost of the connection is borne by me
- E. ☐ The connection is provided and/or paid for by the organization
- F. ☐ The organization pays for the rental of the workstation
- G. ☐ Other (please specify)

2.9 What characteristics does the workstation you use for smart working have? (Multiple answers allowed.)

- A. ☐ Adequate lighting
- B. ☐ Ergonomic desk (height, shape, and positioning)
- C. ☐ Ergonomic chair
- D. ☐ Ergonomic positioning of the computer
- E. ☐ The workstation is not fully adequate
- F. ☐ The workstation is totally inadequate
- G. ☐ I do not know

2.10 Have you noticed changes in your expenses since using smart working? (e.g. electricity, gas, car, public transport subscriptions)

- A. ☐ Increase in expenses
- B. ☐ Decrease in expenses
- C. ☐ No change
- D. ☐ I do not know

Section 3 – Communication and coordination

3.1 When you work in smart working arrangements, is internal communication (with colleagues, supervisors, etc.) different compared to on-site work?

- A. ☐ Yes, in smart working it is more efficient and timelier
- B. ☐ Yes, in smart working it is more difficult and less effective
- C. ☐ No, there is no difference
- D. ☐ I do not know

3.2 When you work in smart working arrangements, are collaboration and coordination with colleagues different compared to on-site work?

- A. ☐ Yes, in smart working they are simpler and more effective
- B. ☐ Yes, in smart working they are more difficult and less effective
- C. ☐ No, there is no difference
- D. ☐ I do not know

3.3 When you work in smart working arrangements, is the management of relationships with supervisors different?

- A. ☐ Yes, in smart working it is simpler and more effective
- B. ☐ Yes, in smart working it is more difficult and less effective
- C. ☐ No, there is no difference
- D. ☐ I do not know

3.4 Does smart working influence supervisors' ability to evaluate your performance?

- A. ☐ Yes, evaluation is easier and more timely
- B. ☐ Yes, evaluation is more difficult and less effective
- C. ☐ No, there is no difference
- D. ☐ I do not know

3.5 Does smart working influence people's ability to meet deadlines and achieve objectives?

- A. ☐ Yes, during smart working it is easier to organize oneself and manage time
- B. ☐ Yes, during smart working it is more difficult and complex to meet deadlines and achieve objectives
- C. ☐ No, there is no difference
- D. ☐ I do not know

3.6 Does smart working influence the quality of work and the employee's performance?

- A. ☐ Yes, smart working improves the quality of work
- B. ☐ Yes, smart working worsens the quality of work
- C. ☐ No, there is no difference
- D. ☐ I do not know

Section 4 – Perceived individual performance**4.1 Does your organization use metrics or indicators to assess the performance of your activities?**

- A. ☐ Yes
- B. ☐ No
- C. ☐ I do not know

4.2 Have you noticed differences in your individual performance when working remotely compared to working in the office?

- A. ☐ Yes, when working remotely my performance improves

- B. ☐ Yes, when working remotely my performance declines
- C. ☐ No, there is no difference
- D. ☐ I do not know

4.3 How concentrated do you feel when working remotely?

- A. ☐ I am more focused
- B. ☐ It is more difficult to stay focused
- C. ☐ There is no difference
- D. ☐ I do not know

4.4 In your opinion, are there more distractions when working remotely?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

4.5 Have you noticed differences in your workload when working remotely compared to working in the office?

- A. ☐ Yes, the workload is higher when working remotely
- B. ☐ Yes, the workload is lower when working remotely
- C. ☐ No, there is no difference
- D. ☐ I do not know

4.6 In your opinion, can remote work improve your efficiency and productivity?

- A. ☐ Yes
- B. ☐ No
- C. ☐ I do not know

4.7 In general, do you think that being away from the workplace during remote workdays makes your work more complex?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

4.8 What critical issues have you experienced when working remotely?

(Multiple answers allowed.)

- A. ☐ Technological equipment
- B. ☐ Workstation and work environment
- C. ☐ Tools and instruments
- D. ☐ Access to and consultation of documents

- E. ☐ Coordination with colleagues
- F. ☐ Other (please specify)
- G. ☐ None

4.9 In your opinion, is ‘disconnection’ from work more difficult when working remotely?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

Section 5 – Work–Life balance

5.1 Does remote work make it easier to reconcile work and private life?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.2 Do you think that remote work can offer greater opportunities for professional development?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.3 Since working remotely, have you been able to engage in more physical activity compared to before?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.4 Since working remotely, have you been able to dedicate more time to your family?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.5 Since working remotely, have you been able to spend more time with friends?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.6 Since working remotely, have you been able to dedicate more time to your personal interests or hobbies?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

5.7 Since working remotely, do you have more time for yourself?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

Section 6 – Satisfaction, health, and preferences**6.1 Health****6.1.1 Does remote work influence your work-related stress?**

- A. ☐ Yes, it increases it
- B. ☐ Yes, it reduces it
- C. ☐ No, there is no difference
- D. ☐ I do not know

6.1.2 Does remote work, in general, influence your health?

- A. ☐ Yes, it improves it
- B. ☐ Yes, it worsens it
- C. ☐ No, there is no difference
- D. ☐ I do not know

6.1.3 Has remote work caused or significantly increased any of the following symptoms? (Multiple answers allowed.)

- A. ☐ Anxiety
- B. ☐ Insomnia

- C. ☐ Migraines
- D. ☐ Eye strain and deterioration of eyesight
- E. ☐ Weight gain
- F. ☐ Joint pain (back pain, neck pain, etc.)
- G. ☐ Postural problems
- H. ☐ Reduced physical flexibility
- I. ☐ Other (please specify)
- J. ☐ No significant deterioration

6.1.4 Do you think you have received adequate training on how to organize your workstation when working remotely?

- A. ☐ Yes
- B. ☐ No
- C. ☐ Partly
- D. ☐ I do not know

6.1.5 How do you evaluate the impact of remote work on your health?

(1 = very unsatisfactory; 5 = very satisfactory): _____

6.2 Work and career

6.2.1 In your opinion, does remote work improve employee motivation?

- A. ☐ Yes
- B. ☐ No
- C. ☐ There is no difference
- D. ☐ I do not know

6.2.2 In your opinion, does working remotely penalize professional growth within the organization?

- A. ☐ Yes
- B. ☐ No
- C. ☐ Perhaps
- D. ☐ I do not know

6.2.3 What challenges or difficulties do you face when working remotely?

(Open-ended response)

6.2.4 How do you evaluate the impact of remote work on your job and career?

(1 = very unsatisfactory; 5 = very satisfactory): _____

6.3 Remote work management

6.3.1 Would you prefer to work remotely:

- A. ☐ For the entire working week (full-time or part-time remote work)
- B. ☐ Only on some days of the week (hybrid work)
- C. ☐ Never, I prefer to work on site
- D. ☐ I do not know

6.3.2 In your opinion, should remote workdays be:

- A. ☐ Fixed and predefined
- B. ☐ Flexible and modifiable at the employee's request
- C. ☐ Dependent on periods of the year
- D. ☐ I do not know

6.3.3 Would you like to have greater autonomy in managing your working time when working remotely?

- A. ☐ Yes
- B. ☐ No
- C. ☐ Partly
- D. ☐ I do not know

6.3.4 How do you evaluate the current management of remote work in your organization?

(1 = very unsatisfactory; 5 = very satisfactory): _____

6.4 Overall satisfaction

6.4.1 Overall, how do you evaluate your experience with remote work?

(1 = very unsatisfactory; 5 = very satisfactory): _____

6.5 Opinions on remote work

6.5.1 In your opinion, what are the main reasons for promoting remote work?

(Open-ended response)

6.5.2 In your opinion, what are the main reasons for reducing or eliminating remote work?

(Open-ended response)

6.5.3 What suggestions would you give to an organization to improve remote work?*(Open-ended response)***6.5.4 In your opinion, why do some organizations not promote remote work? (Multiple answers allowed.)**

- A. ☐ They fear losing control over employees working remotely
- B. ☐ They are unable to control performance in remote work
- C. ☐ They cannot monitor how people work remotely
- D. ☐ They find it more difficult to manage work remotely
- E. ☐ Other (please specify)
- F. ☐ I do not know

9. Conclusions: From Evidence to Policy

Christophe Feder

1. INTRODUCTION

The COVID-19 pandemic catalysed a widespread and irreversible transformation of global labour markets, shifting remote work from a niche practice to a structural feature that has largely stabilized as a hybrid arrangement (Barrero et al., 2021). This shift has structurally transformed the global economic and social landscape, prompting institutions and policymakers to adjust accordingly. Although, according to the Global Survey of Working Arrangements (G-SWA), conducted in 34 countries in April–May 2023, employees globally work on average 0.9 days per week remotely (Aksoy et al., 2023), the widespread and embedded adoption of remote work has made it a central topic in national policy agendas for at least four reasons.

First, this aggregate data conceals substantial spatial variation that defines the post-pandemic work system (Aksoy et al., 2023; Dingel & Neiman, 2020). English-speaking countries currently exhibit the highest levels of remote work globally, averaging approximately 1.4 full paid days per week. In Europe, the incidence of remote work is comparatively lower than in North America, averaging 0.8 days per week, with high-incidence countries like Finland and Germany reaching 1.0 day per week. Asian countries report the lowest average at 0.7 days per week, with South Korea recording just 0.4 days per week of remote work. In Latin American countries, the incidence of remote work is slightly higher at 0.9 days per week, in line with the global average.

Second, across countries, remote work has experienced a substantial increase in adoption compared with pre-pandemic levels, requiring appropriate regulation and governance. For example, in the United States, remote work surged dramatically from a pre-pandemic baseline of just 5% of full workdays to roughly 50% during the peak containment period (Barrero et al., 2021; Davis et al., 2024). Modelling suggests that the post-pandemic equilibrium in the United States is roughly four times higher than pre-pandemic levels. Similarly, aggregate data from the EU-LFS confirm that the share of

employees working from home in the EU-27 increased from 11% in 2019 to 22% in 2021 (Demetriades et al., 2023).

Third, employees worldwide express a desire for more remote workdays (averaging 2.0 days per week) than employers currently plan to offer (1.1 days per week), signalling ongoing labour-market negotiations over flexibility and managerial oversight (Aksoy et al., 2023). This discrepancy may lead to socio-economic tensions and potentially inefficient outcomes. Therefore, public intervention can play a constructive role in restoring equilibrium in the labour market, minimizing negative social and economic impacts and ensuring a balanced approach between worker autonomy and organizational control.

Finally, the adoption of remote work is heterogeneous across countries and stratified along both socioeconomic and geographical dimensions. The rapid diffusion of hybrid work practices, driven by technological adoption and organizational learning, disproportionately benefits high-skilled, high-earning workers, thereby increasing income inequality (Davis et al., 2024). Moreover, studies in European countries show that remote work uptake has been strongest in cities and capital regions, where the share of remote workers nearly quadrupled between 2019 and 2021 (Luca et al., 2025). This geographic concentration largely reflects compositional effects, due to the clustering of occupations and industries highly amenable to remote work, such as information and communication, finance, and professional services, in metropolitan centres (Dingel & Neiman, 2020).

Analysing all these trends, it becomes evident that the ability to work remotely is strongly correlated with a nation's technological feasibility. However, as the South Korean example demonstrates, deeply ingrained organizational and cultural factors often constrain the actual implementation of remote work. Consequently, policies aimed at promoting remote work cannot focus solely on technological aspects. They must also address socio-cultural elements within the productive sector, while ensuring respect for entrepreneurial decision-making and individual autonomy.

After a concise synthesis of the evidence presented in earlier chapters on the multifaceted impacts of remote work, this conclusive chapter bridges the previous findings with practical policy recommendations, aiming to maximize the benefits of remote work while mitigating its challenges. The chapter serves both as a scholarly overview for researchers and a practical roadmap for policymakers, regulators, and organizational leaders. Moreover, this final overview not only recapitulates the foundational evidence but also highlights cross-cutting themes, such as equity, efficiency, sustainability, and organizational resilience, that inform the policy framework that follows.

1.1 Recap of previous contributions

The seismic shift in work arrangements precipitated by the COVID-19 pandemic, initially a large-scale, compulsory social experiment, has fundamentally evolved beyond an emergency measure into a structural and permanent feature of the modern labour landscape. This phenomenon has led to a significant expansion of remote work, with projected incidence levels several times higher than before the pandemic, stabilizing primarily into a pervasive hybrid model.

This book has synthesized the multifaceted implications of this transformation across its technological, organizational, legal, and psycho-social dimensions, recognizing the loss of physical, input-based managerial control as a central challenge. The eight preceding chapters have systematically deconstructed this paradigm shift, moving from abstract regulatory principles to the tangible metrics and consequences shaping the hybrid system.

Chapter 1 established the legal contours of this transition, defining remote work's evolution from an exceptional contingency to a structural opportunity that significantly altered the traditional link between work and physical location. This chapter emphasized the complex interplay among national, European, and collective bargaining sources required to regulate this fluid environment, particularly in promoting gender equality and distributing care responsibilities. Crucially, it positioned the governance of remote work as a matter of social justice and public policy, capable of fostering territorial cohesion by addressing the digital divide and mitigating urban brain drain.

Chapter 2 addressed the rapidly increasing influence of technology in managing distributed teams. It analysed the mechanisms of the Platform Work Directive (PWD) as a vital regulatory blueprint for countering the challenges posed by pervasive algorithmic management and the inherent risks of hyper-connectivity. This analysis underscored the paramount necessity of protecting the right to disconnect, viewing mechanisms for transparency and human oversight in automated systems as indispensable safeguards against digital exploitation, whose principles extend beyond the platform economy to all forms of technologically mediated labour.

Chapter 3 provided the essential technical foundation for the hybrid system, characterizing the remote workplace as a heavily digital infrastructure-dependent environment. This contribution detailed the elements of a viable remote working toolbox, which includes resilient cloud infrastructure, high-speed connectivity (Fiber/5G), and stringent security protocols such as VPNs and Multi-Factor Authentication for compliant operations. Furthermore, it discussed the transformative, though ethically complex, roles of emerging technologies such as Artificial Intelligence (AI) and automation in enhancing coordination and reducing routine cognitive load.

Chapter 4 introduced the managerial transformation necessitated by the loss of physical observation, advocating a fundamental shift toward goal-oriented management. This chapter proposed adopting Process Mining techniques (specifically Process Discovery, Conformance Checking, and KPI Prediction) to analyse real process execution derived from digital logs, thereby providing indispensable diagnostic capabilities to maintain organizational efficiency and governance when oversight cannot rely on physical presence.

Chapter 5 anchored the analysis in the physical reality of the home workspace. It defined the crucial importance of Indoor Environmental Quality (IEQ), encompassing thermal comfort, acoustic environment, lighting conditions, and air quality, in sustaining health and concentration. This chapter emphasized that objective monitoring via compact sensor systems is crucial for making otherwise invisible environmental stressors visible, enabling both workers and organizations to manage conditions outside the conventional office setting actively. Evidence indicates that prolonged exposure to suboptimal IEQ conditions, such as high CO levels, inadequate lighting, and persistent background noise, is associated not only with physical discomfort but also with reduced cognitive performance and increased fatigue.

Chapter 6 delved into the psychological cost of flexibility, focusing on the contradictions inherent in remote work arrangements. It analysed the duality of increased autonomy juxtaposed with the profound risks of isolation, unmet relational needs, and the subsequent rise of technostress, manifested as Techno-Overload and Techno-Invasion. Proactive solutions were advanced, advocating the intentional creation of Restorative Environments that draw on Sensory Design and Biophilic principles to support cognitive recovery and long-term psychological sustainability actively.

Chapter 7 articulated the challenge that hybrid environments pose to traditional management control systems, which fail when the job or role, rather than the activity, is maintained as the primary unit of analysis. This work proposed that Activities, defined as discrete, repeatable phases within a process, should serve as the foundational unit for measuring value creation. It introduced the Activity Multidimensional Performance (AMP) methodology, which systematically measures outcomes across Efficiency, Quality, Time, and Stakeholder Satisfaction, thereby enabling objective, commensurable comparisons between on-site and remote execution and promoting a necessary shift from surveillance to diagnostic governance.

Finally, Chapter 8 completed the performance framework by stressing the indispensability of incorporating the employee's perspective. It argued that individual preferences and contextual factors significantly mediate performance outcomes, requiring the systematic integration of employee preference data (captured via structured questionnaires) as interpretive signals for activity-based governance. This focus acknowledged the inevitable heterogeneity

of individual experiences and the persistent tension between organizational needs for control and the individual demand for autonomy.

The unifying thread woven through these contributions is the imperative for equitable, digitally supported, and outcome-based governance to efficiently navigate the dissociation of labour performance from physical location, transforming flexible arrangements from a temporary logistical fix into a permanent, systemic feature of organizational design. Accordingly, all chapters address the inherent paradox of remote work: how to leverage unprecedented individual autonomy and temporal flexibility while actively mitigating the psychosocial risks of hyperconnectivity, technostress, and the erosion of work-life boundaries. Consequently, the collective effort demands a fundamental epistemic transition in managerial control, replacing reliance on physical visibility with diagnostic and objective performance metrics anchored at the activity level.

1.2 How findings suggest specific policy areas

The evidence marshalled throughout this book points to a set of structural gaps and friction points in the rapidly institutionalized remote and hybrid models that demand coherent and wide-ranging policy responses rather than piecemeal adjustments. One recurrent theme concerns the redistribution of costs and benefits that has accompanied the relocation of work from employer-controlled premises to private homes. The proposed analysis of home workspaces demonstrates that many domestic environments systematically fail to meet established thresholds for indoor environmental quality and that the physical and financial burdens of achieving acceptable conditions, ranging from heating and ventilation to ergonomic furniture and monitoring devices, are increasingly borne by workers rather than by organizations. This pattern of cost-shifting, together with documented discrepancies between employer provisions and employee preferences for remote days, highlights a clear fiscal dimension to the governance of remote and hybrid work: taxation, allowances, and employer-funding mechanisms must be recalibrated to recognize the new distribution of operational expenses and to correct the spatially uneven access to remote work opportunities that otherwise risks consolidating new forms of privilege.

A second, closely related policy imperative concerns the twin problems of digital infrastructure and regulatory safeguards for digitally mediated work. The technical foundations of remote working are not merely matters of convenience but of equity and productivity. The book provides concrete performance thresholds and availability benchmarks that translate technical deficiencies into definable policy targets. Where these benchmarks are unmet, the potential for meaningful decentralization, territorial cohesion, and equal participation

in the digital economy is severely constrained. At the same time, the rapid embedding of algorithmic management and automated monitoring into everyday organizational practice presents distinct psychosocial hazards and legal challenges: opacity in decision rules, pervasive connectivity that erodes temporal boundaries, and algorithmic inferences that affect work allocation and evaluation. The PWD and the parallel policy debate about the right to disconnect are treated in the book as exemplary ways of how regulatory instruments can marry technical standards with protective labour norms. Therefore, they point toward a policy agenda that simultaneously expands infrastructure investment and codifies transparency, human oversight, and meaningful limits on intrusive surveillance.

A third cluster of findings situates remote work within broader labour-market dynamics, revealing a pattern of occupational and skill polarization that is being accelerated by automation and digital coordination tools. The activity-based measurement approaches and process-mining techniques show how organizational performance is increasingly analysable and manageable at the granular level of activities and processes, but they also make clear that this analytic sophistication places new demands on workers and managers alike. These dynamics favour those with high levels of digital literacy, domain-specific expertise, and adaptive skill sets while leaving other workers exposed to obsolescence or to roles that cannot be performed remotely. As a result, labour-market and training policies must shift from episodic interventions to sustained, systemic investments in lifelong learning, managerial re-skilling, and transition support that are calibrated to the changing composition of task content and to the differential capacities of local and socioeconomic groups to seize opportunities. The methodological tools described in the book (e.g., KPI frameworks, AMP metrics, and process-mining output) provide measurable diagnostics that can guide the targeting and evaluation of such investments.

Finally, the psychosocial and welfare implications of remote work require urgent modernization of social protection. The evidence on technostress, work-life boundary erosion, and the weakening of occupational health and safety in domestic settings document not only increases in cognitive load and chronic connectivity but also the tendency of flexible arrangements to reproduce or intensify traditional gendered divisions of unpaid care. These effects are not incidental; they are structurally embedded in the ways hybrid regimes organize time, space, and visibility. Consequently, policies that reform welfare must encompass a broader conception of occupational safety that explicitly includes home environments, provide accessible mental-health supports calibrated to the specific features of digitally mediated labour, and integrate gender-sensitive measures to prevent the entrenchment of inequitable care burdens. The evidence provided on psychosocial risk factors and on IEQ deficiencies supports the view that social protection cannot remain tethered to the old

definition of workplace if it is to secure the health, dignity, and participation of all workers in the hybrid economy.

Taken together, these strands imply that effective policy must be systemic and mutually reinforcing: fiscal instruments should underwrite equitable access to the infrastructure and material conditions needed for remote work; regulatory initiatives must protect temporal boundaries, privacy and algorithmic accountability while incentivizing interoperable and resilient technical baselines; labour-market and educational strategies must equip broad swathes of the workforce for activity-oriented, digitally augmented roles; and social protection must be reoriented to address the environmental and psychosocial risks of work performed in private spaces.

1.3 Guiding principles for recommendations

Effective governance of the hybrid work system requires a set of guiding principles that translate the diverse findings presented in this book into a coherent and future-oriented policy framework. As previously demonstrated, the transition to hybrid work has generated a complex interplay of technological, organizational, legal, environmental, and psychosocial dynamics that cannot be addressed through fragmented interventions. Instead, the evidence converges on four foundational principles: equity, effectiveness, sustainability, and resilience. Each principle emerging not as an abstract normative aspiration but as an operational necessity dictated by the structural realities of digitally mediated work.

The first guiding principle, equity, responds to the socio-economic, territorial, and gendered inequalities that hybrid work both reveals and amplifies. The analyses of regulatory frameworks and lived experiences show that access to remote work remains highly stratified along occupational, spatial, and income dimensions, with metropolitan areas, high-skilled professions, and households endowed with adequate digital infrastructure benefiting disproportionately. At the same time, the psychosocial and home-environment findings underline how remote work can reinforce traditional gender roles and expand unpaid care work, reducing opportunities for women unless addressed through targeted, gender-sensitive policies. Ensuring equitable access to high-speed connectivity, supporting workers in meeting the tangible requirements of healthy home workspaces, and distributing the financial burden of remote work more fairly across employers and employees all become essential components of an equity-centred policy agenda. Without such corrective mechanisms, hybrid work risks consolidating a labour market in which flexibility and autonomy function as privileges for some, while becoming constraints for others.

Alongside equity, effectiveness constitutes the second non-negotiable principle. Remote work exposes the inadequacy of presence-based organizational

cultures and compels a shift toward analytic, outcome-oriented forms of governance. The chapters devoted to process mining, activity-based management, and the AMP framework demonstrate that managerial visibility in distributed contexts must rely on diagnostic metrics grounded in process evidence rather than observational intuition. Such systems require organizational investment in digital literacy, data governance, and transparency rules that ensure performance is measured fairly and proportionately. Effectiveness, in this sense, goes beyond productivity: it denotes the organizational capacity to make informed decisions, maintain accountability without intrusive surveillance, and cultivate trust through clear, measurable, and commensurable indicators. Policies that encourage or mandate transparent algorithmic practices, interoperable data standards, and robust feedback mechanisms, therefore, become essential to reinforcing the analytical backbone of hybrid work.

A third principle, sustainability, broadens the perspective by addressing the physical, psychological, and environmental dimensions of remote labour. The findings on technostress, work–life boundary erosion, and the prevalence of suboptimal Indoor Environmental Quality reveal that neither cognitive nor physiological well-being can be taken for granted in hybrid arrangements. Sustainability thus requires a modernized conception of occupational health and safety that extends beyond the office building and explicitly incorporates the home as a legitimate site of work, with corresponding protections and responsibilities. It also entails safeguarding temporal boundaries through enforceable rights such as the right to disconnect, and recognizing the relational and social dimensions of work that must be intentionally preserved in hybrid settings. At the societal level, sustainability further encompasses the potential environmental and territorial benefits of hybrid and remote work (e.g., reduced commuting, lower emissions, and the revitalization of peripheral areas) which can be achieved only through coordinated investments in infrastructure, urban planning, and local service provision. Rather than being a passive outcome of remote work, sustainability is an actively constructed condition requiring regulatory and organizational commitment.

The fourth principle, resilience, provides the integrative dimension that binds the other three together and ensures the long-term viability of hybrid arrangements. Resilience refers to the capacity of organizations, workers, and institutional systems to absorb shocks, adapt to disruptions, and maintain essential functions in the face of uncertainty. The book offers multiple strands of evidence that underscore its importance: the dependence of hybrid work on digital infrastructures that are vulnerable to outages and cyberattacks; the need for governance models that continue to function when direct supervision is impossible; the unpredictability introduced by opaque or automated decision-making systems; the mental-health fragilities associated with isolation and continuous connectivity; and the environmental contingencies of home

workspaces that can undermine performance and well-being. These challenges collectively demonstrate that resilience cannot be treated as a residual property that will emerge organically from technological progress. Instead, it must be embedded in policy through investments in secure and redundant digital networks, mandatory safeguards for algorithmic decision-making, organizational procedures for crisis management, and welfare measures capable of stabilizing the workforce during prolonged periods of volatility. A resilient hybrid system is one in which technological infrastructure, managerial practice, and psychosocial protections reinforce one another rather than leaving workers and organizations exposed to systemic risk.

Taken together, these four principles constitute comprehensive normative architecture for the governance of hybrid work. Equity ensures that access to balanced and voluntary flexible work – from an employment perspective – becomes a universal right rather than a selective benefit; effectiveness enables organizations to operate on the basis of transparent, diagnostic, and evidence-based performance systems; sustainability protects the human and environmental foundations on which hybrid work depends; and resilience guarantees continuity, adaptability, and robustness in the face of technological, social, and economic disruptions. The policy recommendations developed in the following are not conceived as isolated reforms but as expressions of these guiding principles, translating them into concrete instruments, regulatory standards, and organizational practices capable of steering this labour-market transition toward a future that is fair, effective, sustainable, and resilient.

2. POLICY IMPLICATIONS

The findings suggest four clusters of policy responses: restructuring fiscal mechanisms; modernizing regulation and digital infrastructure; reorienting labour market and human capital; and reforming social protection and welfare systems. Combined, these strands imply that effective policies must be systemic and mutually reinforced. These policy instruments should address the complexities of the remote and hybrid work environment through integrated, sustainable, and mutually reinforcing strategies.

Fiscal instruments should secure fair access to remote work infrastructure and material needs. They must also address how costs are redistributed. Regulatory initiatives should protect privacy and time boundaries, ensure algorithmic accountability, and promote resilient technical standards. Labor-market and educational strategies need to prepare the workforce for digitally augmented roles with clear, effective solutions. Social protection must address environmental and mental health risks posed by private workspaces. Health, dignity, and participation for all hybrid workers must be ensured.

2.1 Fiscal policies and incentives

The need to recalibrate fiscal policies and employer-funding mechanisms arises directly from the uneven redistribution of costs and benefits that accompanies the relocation of work from employer-controlled premises to private homes. This pattern of cost-shifting demands policy attention to ensure equity and social justice.

The financial burden of achieving and maintaining acceptable working conditions is increasingly absorbed by workers, encompassing both recurring operational expenses and necessary upfront investments (Manu et al., 2024). Analysis of home workspaces reveals that many domestic environments systematically fail to meet established IEQ thresholds, exposing workers to recurring issues of noise, poor air quality, and inadequate thermal comfort. Workers often bear the cost of adequate equipment, hardware, software, and connectivity, even though their efficiency is fundamentally reliant on high-quality technical inputs (Barrero et al., 2021). Moreover, the failure to provide ergonomically sound equipment contributes directly to musculoskeletal disorders and eye strain among remote workers (Manu et al., 2024). Effective policy must ensure that compensation mechanisms, allowances, and employer-funding strategies are recalibrated to reflect this new distribution of operational expenses, thereby correcting the implicit cost shifting onto employees.

The persistent shift to remote work creates substantial financial benefits for both employees and organizations, but these benefits are unevenly distributed, exacerbating income inequality (Davis et al., 2024). Employees globally place a high value on the option to work remotely, expressing a willingness to accept substantial pay cuts for hybrid work arrangements. In the United States, workers reported willingness to accept, on average, pay cuts of 7% for the option to work from home two or three days per week (Barrero et al., 2021), an estimate comparable to findings derived from experimental data in the call-centre industry, where applicants demonstrated a willingness to accept an 8% wage reduction for the option to work remotely on a full-time basis (Mas & Pallais, 2017). Despite workers accepting pay cuts for flexibility, homework productivity increases by 83% for high-skill workers and 48% for low-skill workers (Davis et al., 2024). Therefore, the projected benefits accrue disproportionately to the highly educated and well-paid, an effect compounded by the fact that high earners have longer commutes and are more likely to have employers that plan for sustained remote work (Dingel et al., 2020). These dynamics raise the ratio of high-skill to low-skill income. Consequently, policies must consider taxation and transfer mechanisms to counteract this increase in disparity and ensure equitable access to remote work opportunities, thereby correcting new forms of privilege.

The fiscal dimension extends to the real estate market, where the shift to remote work is fundamentally reshaping urban economics. The move away from the traditional office environment is expected to lead to a short-term, approximately 8% decline in office rents in the Central Business District (CBD), where supply is fixed (Davis et al., 2024). Conversely, demand for residential space, particularly in the outer suburbs, rises significantly due to the increased need for home office space. Counterfactual simulations suggest the rent increases could translate into a 14% rise in home prices in areas near the CBD and a 25% rise in the outer suburbs. Policymakers must then anticipate and manage the resulting changes in the housing market, potentially through urban planning and local service provision.

2.2 Regulation and digital infrastructure

A second, closely related set of policies addresses the twin problems of digital infrastructure and regulatory safeguards for digitally mediated work. Regulatory initiatives must protect temporal boundaries, privacy, and algorithmic accountability while incentivizing interoperable and resilient technical baselines.

The technical foundations of remote working are not merely matters of convenience but of equity and productivity, as sustained effectiveness hinges on network conditions that support high-speed, low-latency, and stable connectivity. As of today, recommended download speeds for HD video conferencing are 10–25 Mbps, with upload speeds of 3–5 Mbps. Where these performance thresholds are unmet, the potential for meaningful decentralization, territorial cohesion, and equal participation in the digital economy is severely constrained. Connectivity gaps, particularly in rural areas, remain a structural barrier to inclusion (Luca et al., 2025). Policy must expand infrastructure investment to ensure a resilient technical baseline for all workers, leveraging existing instruments such as the European Union's Recovery and Resilience Facility (RRF), which prioritizes the digital transition to pursue social and territorial cohesion.

The rapid embedding of algorithmic management and automated monitoring into everyday organizational practice presents distinct psychosocial hazards and legal challenges, including opacity in decision rules and pervasive connectivity. The use of workplace surveillance poses severe risks to worker privacy, data protection, and mental health. The PWD is considered an exemplary regulatory instrument because its mechanisms, such as safeguards against excessive monitoring and rules governing automated decision-making, mirror the protections needed for remote employees facing similar issues. The PWD mandates promoting transparency, human oversight, safety, and accountability in algorithmic management, requiring platforms to inform workers about

monitoring systems and provide a reasoned explanation for any decision taken or supported by an automated system.

The PWD and the parallel policy debate about right to disconnect exemplify how regulatory instruments can marry technical standards with protective labour norms. The right to disconnect intends to counteract hyper-connectivity imposed outside working hours and prevent non-stop work. The European Parliament's call for a directive on the right to disconnect aims to establish minimum requirements for remote working, explicitly addressing working hours and rest periods. This regulatory path points toward a policy agenda that codifies transparency, human oversight, and meaningful limits on intrusive surveillance. Although infrastructural shortcomings persist, the European Union has taken the lead in developing regulatory safeguards for digitally mediated work, while progressively mobilizing investment tools to address connectivity gaps. This trajectory provides a valuable reference for other jurisdictions.

2.3 Labor market and training

A third cluster of political interventions must situate hybrid work within broader labour-market dynamics. This approach reveals a pattern of occupational and skill polarization, accelerated by automation and digital coordination tools (Luca et al., 2025). Policies should address both the supply and demand sides of labour, and training should be ongoing to keep pace with innovation in these technologies.

As previously described, remote work favours those with high levels of digital literacy, domain-specific expertise, and adaptive skill sets. It primarily benefits workers in professional, technical, and managerial occupations (Dingel & Neiman, 2020; Davis et al., 2024). This dynamic leaves other workers exposed to obsolescence or to roles that cannot be performed remotely. It thereby increases socioeconomic and territorial inequality (Luca et al., 2025). The potential for remote work is stratified, reflecting the uneven distribution of remote work applications across sectors. There is a high concentration in areas like finance and IT (Dingel & Neiman, 2020). Consequently, addressing the digital skills gap is crucial, as online learning is often inaccessible to those who are already digitally excluded (Lodovici et al., 2021).

The adoption of sophisticated analytical tools, such as activity-based measurement and process-mining techniques, places new demands on workers and managers alike. On the demand side, managers require training to shift from physical oversight to diagnostic governance based on multidimensional evidence. As a result, labour-market and training policies must shift from episodic interventions to sustained, systemic investments in lifelong learning, managerial re-skilling, and transition support (Luca et al., 2025). These investments must be calibrated to the changing composition of task content

and the differential capacities of various groups to seize hybrid opportunities. The methodological tools described in the literature, such as the AMP metrics and Process Mining output, provide measurable diagnostics that can guide the targeting and evaluation of such investments.

2.4 Social protection and welfare

The psychosocial and welfare implications of remote and hybrid work require modernizing social protection and occupational health policies, as these challenges are structurally embedded in the reorganization of time, space, and managerial visibility that characterizes these new regimes of work. Scholars consistently point to increased technostress alongside chronic connectivity, emotional exhaustion, and the erosion of work–life boundaries, often driven by extended working hours (Mazmanian et al., 2013; Giménez-Nadal et al., 2024). Public policy must explicitly recognize these risks as systemic rather than exceptional and respond through binding updates to welfare and labour-protection frameworks tailored to digitally mediated work.

Occupational health and safety regulations should be expanded and adapted to reflect the spatial decentralization of work. As professional activity increasingly takes place in domestic settings, existing enforcement mechanisms prove insufficient to address risks related to IEQ, ergonomics, and prolonged exposure to suboptimal working conditions. Evidence shows that inadequate noise control, air quality, and ergonomic arrangements in home offices contribute directly to physical discomfort and psychological strain (Manu et al., 2024). Therefore, policy intervention is required to formally extend health and safety coverage to remote workspaces, such as home offices and co-working environments, by defining minimum enforceable standards and enabling monitoring mechanisms consistent with privacy protections (Vargas Llave et al., 2022).

These findings suggest that extending occupational health and safety frameworks to remote work cannot rely just on generic principles, but should also be based on minimum IEQ requirements and monitoring approaches that combine environmental risk mitigation with privacy protection.

Beyond health and safety, remote work policies must explicitly address their gendered effects. Without corrective measures, remote work risks reinforcing traditional divisions of unpaid care, with women, particularly mothers, reducing time spent in paid employment while absorbing a disproportionate share of household and caregiving responsibilities (Giménez-Nadal et al., 2024). These dynamics undermine professional visibility and long-term career prospects. Therefore, policies promoting flexibility must be coupled with gender-sensitive interventions, including sustained public investment in accessible childcare and care services and alignment with existing gender-equality directives, to prevent flexibility from translating into structural disadvantages.

Finally, effective governance of remote work requires integrating protective labour norms with enforceable organizational practices. Formal recognition of the right to disconnect must be complemented by mechanisms that ensure its effective application at the firm level, limiting hyperconnectivity and intrusive monitoring practices. In parallel, policymakers should incentivize organizations to adopt evidence-based design guidelines to support mental recovery and reduce stress in home-based work environments. Taken together, these policy measures are essential to ensure that the expansion of remote work promotes worker well-being, gender equality, and social inclusion, rather than reproducing or amplifying existing vulnerabilities.

3. CONCLUSIONS AND FUTURE RESEARCH

Remote work is a stable transformation that challenges core assumptions about labour, management, and policy. This book argues that adopting remote work requires solving key paradoxes: scaling flexible technology while protecting the boundaries of personal life, and replacing location-based control with outcome-based, trust-driven oversight. The main policy goal is to ensure equity, effectiveness, sustainability, and resilience.

Achieving this objective requires strategic public investment in robust digital infrastructure to counteract widening socioeconomic and territorial polarization, paired with robust legal and human-centred safeguards. Policies must be both enabling (ensuring interoperable, resilient technical baselines and access to healthy workspaces) and protective (ensuring privacy, algorithmic accountability, enforceable temporal boundaries, and gender-sensitive supports). Crucially, social protections and regulatory frameworks must be designed to evolve in step with technological and organizational innovation, ensuring that governance adapts to change rather than constraining it.

Several important policy themes remain to be explored in greater depth and fall outside the immediate scope of this book. In particular, it will be important to examine how remote work reshapes other public policy domains, including environmental, industrial, and urban and regional planning. Therefore, truly effective policy mix response must be multidimensional. Equally important is the need for policy frameworks that retain sufficient flexibility to respond rapidly to technological change and to new academic evidence as it emerges over time.

Despite rapid knowledge accumulation, important evidence gaps persist and require dedicated academic attention. Future research should prioritize richer, longitudinal data collection and the assembly of continuously updated administrative and big-data sources to support policy evaluation; mixed-methods and comparative designs to identify effects and contextual contingencies; and systematic inquiry into the ethical, organizational, and technical implications

of advanced AI and automation in remote work settings, especially regarding the optimal calibration of human judgment within increasingly autonomous, algorithmically managed workflows.

Finally, translating the complex policy agenda outlined in this book into practice will require rigorous monitoring, multilevel governance arrangements, and a commitment to adaptive learning. Policymakers, social partners, employers, and researchers should jointly define measurable indicators of success, implement pilot schemes to test policy mixes, and scale up effective solutions while preserving the flexibility needed to respond to technological change. If societies, through their institutions, organizations, and labour markets, follow the multidimensional pathway outlined in this book, they will be well positioned to fully harness the benefits of a more flexible organization of work.

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