

Industrial RElations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Deliverable D2.1

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The IRESD4.0 project has received funding from the European Commission under the grant agreement No VS/2021/0052. The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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D2.1 REPORT ON THE STATE-OF-THE-ART REGARDING SMART WORKING AND DIGITAL-SKILLS DEVELOPMENT IN SOCIAL DIALOGUE PRACTICES AND CLASS

Document Information

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Project Acronym	IRESD-ES4.0
Grant Agreement	VS/2021/0052
Deliverable number and title	[D2.1.] [Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs]
Dissemination level	Public
Organization Name	[ADAPT]
Submission date	04/07/2022 [Updated version]

2



Table of Contents

ABBREVIATION	4
LIST OF FIGURES	5
EXECUTIVE SUMMARY	6
INTRODUCTION	10
1.1 Methodology.....	10
1.2 Document Structure	11
THE FOURTH INDUSTRIAL REVOLUTION AND THE GROWING NEED FOR DIGITAL SKILLS. A FOCUS ON DEMOGRAPHIC CHANGES	12
REMOTE WORKING IN EUROPE BEFORE AND AFTER COVID-19	20
1.3 Quantitative data analysis	23
THE IMPACT OF DIGITALIZATION ON EUROPEAN SMES	33
1.4 Fostering the development of digital skills in SMEs	35
1.5 Insights from the metallurgy sector in Italy and Europe	37
1.6 Managing remote work in SMEs.....	39
THE SOCIAL PARTNERS' STRATEGIES TO DEAL WITH THE FUTURE OF WORK	42
1.7 Remote work.....	44
1.8 Digital upskilling.....	48
1.9 A selection of good and less successful initiatives	50
1.10 The point of view of international experts	53
FOCUS: THE REACTION OF ITALIAN COLLECTIVE BARGAINING TO THE PHENOMENON OF DIGITALIZATION	58
1.11 Digital upskilling in the metallurgy sector	58
1.12 Smart working in company-level collective bargaining	60
1.13 Smart working and infection prevention in the Italian metallurgy sector	64
REFERENCES	67



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Abbreviation

ASSISTAL	Associazione Nazionale Costruttori di Impianti e dei Servizi di Efficienza Energetica (ESCo) e Facility Management
CLAs	Collective Labour Agreements
CONFAPI	Confederazione italiana della piccola e media industria
CONFIMI	Confederazione dell'Industria Manifatturiera Italiana e dell'Impresa Privata
EC	European Commission
FEDERMECCANICA	Federazione Sindacale dell'Industria Metalmeccanica Italiana
FIM-CISL	Federazione Italiana Metalmeccanici, Confederazione Italiana Sindacati Lavoratori
FIOM-CGIL	Federazione Impiegati Operai Metallurgici, Confederazione Generale Italiana del Lavoro
GA	Grant Agreement
ICILS	International Computer and Information Literacy Study
IREDES4.0	Industrial Relations and Social Dialogue for an Economy and a Society "4.0"
PPS	Percentage Points
UILM-UIL	Unione Italiana Lavoratori Metalmeccanici, Unione Italiana del Lavoro
WP	Work Package

4

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List of Figures

Figure 1: Enterprises employing ICT specialists (% of enterprises), 2014-2020.....	18
Figure 2: Enterprises that provide ICT-related training to their persons employed, by activity, EU, 2019 (% of enterprises). Source: Eurostat [ISOC_SKE_ITTN2]	19
Figure 3: Prevalence of telework by sector, EU-27, 2018.	24
Figure 4: Proportion of workers who started teleworking as a result of COVID-19 by country, 2020 .	25
Figure 5: Working from home during COVID-19, EU27 (%), 2020	27
Figure 6: Annual change in the share of persons usually working from home, 2020 (percentage points, people in employment aged 20-64 years, by NUTS 2 regions).	28
Figure 7: Gender division regarding smart workers, 2019-2020.....	30
Figure 8: Teleworkability in EU27 by sector, 2020	32
Figure 9: Digital Intensity Index indicators tracking digitization processes (% enterprises), 2019	34
Figure 10: Human capital dimension (Score 0-100), 2021	37
Figure 11: Telework and employment by firm size, knowledge-intensive business services, 2017	39
Figure 12: IRESD4.0 European Stakeholder Board	54
Figure 13: Proportion of ICT specialists in total employment, 2020.....	55



Executive Summary

The present deliverable constitutes the final step of Work Package 2 of the IREDES4.0 project, which was aimed at presenting a state-of-the-art overview regarding the impact and opportunities of digitalization on the world of work, and especially how some of the trends brought about by this phenomenon (i.e., remote work and digital skills development) are addressed by social dialogue and collective bargaining. The Report also contains an in-depth analysis of the Italian case, with a focus on small and medium enterprises of the metallurgy sector (which entails both manufacturing and digital companies). The necessary research for the completion of this deliverable was carried out through mixed methods, i.e., desk research, semi-structured interviews, expert consultation. The following paragraphs provide a brief overview of key findings that emerged for the research carried out.

The changes taking place in the world of work as a result of the IV Industrial Revolution have been long pointed out by international bodies and research centers. Many scholars, especially in the economic field, have stressed that megatrends contributing to these developments include demography, globalization, technology, and the new production process. As for demographic changes, it has been frequently argued that the aging of the population gives rise to direct and indirect effects on the labor market and people's skills. Thus, the first phase of the research, before addressing the issue of skills (and especially digital ones), was aimed at investigating the issue of demographic trends in Europe. The main data regarding this aspect contained in the report is based on the latest Ageing Report (2021) issued by the European Commission.

Eurostat's demographic projections show continued increases in life expectancy both at birth and at the age of 65 for both males and females over the period 2019-2070. In addition, the EU population is projected to decline from 447 million people in 2019 to 424 million in 2070. During this period, Member States' population will age dramatically given the dynamics in fertility, life expectancy, and migration. With specific reference to labor market dynamics, it is worth mentioning that in the EU, the participation rate of those aged 20-64 is projected to increase from 78.2% in 2019 to 80.7% in 2070, driven mainly by higher participation of women and older workers. While the projections indicate an increase in participation rates for all ages, it is particularly visible for those aged 55-64 (+9.6 pps.) and reflects the effect of pension reforms. The size of the EU labor supply is expected to decrease by 16% over the projection horizon, with the largest decline of labor supply for males. Direct effects of demographic changes translate into an overhauling of social security systems, the sustainability of which depends on workers staying longer in employment. Indirect effects refer to the different skills needed by the workforce as a consequence of demographic changes. Since, as demonstrated by the data referred above, the working age of the population is likely to rise, the skills of those who received training a long time ago may not be suitable to keep up with the fast-changing economic context. Other scholars have argued for an inverse relationship existing between demographic changes and the 'automatability' risk. Unlike what was stated by most research, they have posited that the risk of

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Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

automation does not increase with age, nor does it involve only senior workers, those possessing outdated skills, and those who are “less likely to participate in lifelong learning”. Besides demographic changes, technological progress is another relevant aspect, as it impacts the world of work, particularly skills needs.

In this regard, the research highlighted a large gap in the use of digital technology currently present between large enterprises and SMEs, which, according to the Digital Economy and Society Index (DESI), published by the European Commission in 2021 interests both complex technologies and basic digital solutions. Moreover, according to the DESI Index, 4 out of 10 adults and every third person who works in Europe lack basic digital skills. Considering the source just mentioned but doing an in-depth analysis on Italy it is worth highlighting how 41.5% of people in Italy have at least basic digital skills and that 3.6% of employees in Italy are digital experts but 55% of companies that hired or tried to hire digital experts report difficulties in filling these vacancies. In 2020, 19% of EU enterprises employed ICT specialists. Among the EU Member States, Ireland and Belgium presented the highest proportion of enterprises employing ICT specialists, with 30% each. Italy, with 13%, presented the lowest ratio of enterprises employing ICT specialists in 2020. Enterprises are providing more and more training to their personnel to develop or upgrade their ICT skills. Overall, 20% of the EU enterprises provided ICT training for their personnel: Italy is in sixth from the last position concerning this indicator (with a percentage just over 15%). When looking at company size, 68% of large enterprises actively provided the training, while only 18% of SMEs did so.

An analysis of international scientific reports shows how the reasons behind these imbalances are to be identified in the elevated cost of digital technology, the firms’ uncertainties about data security, (Directorate-General for Research and Innovation of the European Commission, *Capitalizing on the benefits of Research & Innovation Projects for Policy: The 4th Industrial Revolution*, 2018) but also in the absence of risk orientation by the management, the low awareness of the benefits of digital technologies or the lack of “self-efficacy” i.e. confidence of the SME owner and staff to use them productively (P. Gubitta, D. Nicolai, *L’innovazione nelle imprese: considerazioni generali e risultati di un’indagine nelle piccole imprese*, Microimpresa, 2013, pp. 79-80, A. Bruzzo, *Per la trasformazione digitale delle Micro-PMI in Italia*, Quaderni di ricerca sull’artigianato, 2020, p. 337). However, the report mostly focuses on a particular factor hindering the use of digital technology in smaller enterprises, that is, the low level of digital literacy among owners, managers, and workers of SMEs, which could have negative effects on their economic performance in the long run (P. Gubitta, D. Nicolai, *op. cit.*, pp. 79-80, A. Bruzzo, *op. cit.*, p. 337). According to academic research on this topic, the causes for the difficulties of SMEs in upgrading their workers’ skills and competencies seem to be found in the lack of customized vocational education or training specifically focused on the needs and characteristics of smaller companies (A. Halvarsson Lundkvist, M. Gustavsson, *Conditions for Employee Learning and Innovation – Interweaving Competence Development Activities Provided by a Workplace Development Programmed with Everyday Work Activities in SMEs*, in *Vocations and Learning*, 2018, p. 46). The digital skills shortcomings in SMEs observed on a European scale seem also to be confirmed by data regarding investments in training in Italian SMEs, which, in addition, appears to be below the EU average (F. Pascucci, V. Temperini, *Trasformazione Digitale e sviluppo delle PMI. Approcci strategici*

7



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

e strumenti operativi, 2017, p. 13). However, digital skills development appears particularly crucial in the manufacturing sector, given the new production processes of Industry 4.0, based on automation, digitalization, and interconnection of machinery: this brought both Italian unions and employers' associations of the metallurgy sector to introduce an individual right to 24 hours of professional training in three years in the main national collective agreements applicable to small and medium enterprises.

About the remote work issue, the research activities primarily concentrated on the terminology regarding this “new way of working”. It was found that the definition of “telework” given by the ILO, i.e. “workers who use information and communications technology (ICT) or landline telephones to carry out the work remotely” (ILO, *Defining and measuring remote work, telework, work at home and home-based work*, 2020, p. 6) was the most appropriate to label the type of work that would be taken into consideration for the project. However, “telework” is nowadays not the most used term to define ICT-based remote work in Italy. Since the issuing of law No. 81/2017, the most recent and common forms of remote work in Italy take indeed the name of “agile work”. Adding to the uncertainty among the meaning of the terms “agile work” and “telework” is the widespread use of the expression “smart working” in the Italian public debate, which, during the COVID-19 pandemic, has been frequently adopted to define remote work carried out exclusively from the employees' homes to prevent infections in the workplace. It needs to be noted, however, that according to many experts the term “smart working” characterizes instead a result-oriented and trust-based management style, which, excluding the perpetual control of the employer on the employees' activities, allows the latter to potentially carry out its tasks from outside the employers' premises and not to be constrained by predefined time slots (M. Corso, *Sfide e prospettive della rivoluzione digitale: lo smart working*, *Diritto delle Relazioni Industriali* No. 4, 2017, p. 980). Smart work does not seem to be a phenomenon destined to involve only Italian companies: according to international scientific reports, the COVID-19 pandemic is to be considered as the spark that will cause a radical shift in the way telework is carried out on a global scale, giving way to the diffusion of flexible smart work practices, while more “rigid” forms of telework will be left behind (ILO, *Teleworking during the COVID-19 pandemic and beyond: A Practical Guide*, 2020, p. 4).

The difficulties in the use of digital technology in SMEs, described in previous sections, also reflect on the diffusion of remote work, both in Italy and in EU countries, which, according to data from the European Commission, appears significantly lower than that in larger companies. This circumstance dates back to the years immediately following the introduction of the European Framework Agreement on Telework of 2002: scientific literature deemed it to be mainly connected to the costs of remote work (P. Neirotti, E. Paolucci, E. Raguseo, *Mapping the antecedents of telework diffusion: firm-level evidence from Italy*, *New Technology, Work and Employment*, 2013, p. 31) the low level of the trust confided in employees working remotely, and the need for better change management (K. Dickson and F. Clear, *Comparative European Perspectives on the Diffusion and Adoption of Telework amongst SMEs*, in M. Sherif, T. Khalil, *Management of Technology: New Directions in Technology Management*, 2007, pp. 273-274). These conclusions were mostly confirmed by the answers given by the interviewees on the matter. When asked about the elements that characterize the implementation

8



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

of remote work in SMEs, some of them, mentioned the limited economic resources of smaller firms, which, together with the general hands-on mentality of small entrepreneurs, used to have complete control over all aspects of their organization, may hinder and/or delay digitalization. However, it needs to be noted how others had radically different views on the matter and argued how the limited costs of the technological equipment necessary for remote work shouldn't make them an obstacle to its implementation to SMEs.

Finally, the research activities consisted of an analysis of 93 Italian company-level collective agreements, which regulate digital skills development and smart working practices in the metallurgy sector. Regarding the first topic, the analysis mainly focused on a new instrument for the up-and reskilling of the Italian workforce, called “New Skills Fund” (Fondo Nuove Competenze), which conditions the access to its resources upon the conclusion of a territorial or company-level collective agreement, whose provisions must define, among other elements, the training path that he/she should follow from that moment on. These agreements showed how companies of the Italian metallurgy sector provide a variety of different training modules, both related to strictly considered digital skills (i.e., cybersecurity and digital documents storage systems) and to the innovation of the companies' production techniques. The collective regulation of remote work in Italian companies of the metallurgy sector was firstly described through the analysis of 36 company-level agreements aimed at structurally implementing smart working as part of the company's organizational model. This effort showed, among other things, how the topic of working space in company-level agreements benefits from a higher degree of flexibility compared to that of working time, and that only a few of them outline result-oriented evaluation methods, crucial for the implementation of smart working. Remote work in the Italian metallurgy sector was also described through the analysis of a sample of 43 anti-COVID-19 company-level collective protocols, given that remote work has been used as a tool to prevent infection in the workplace since the beginning of the pandemic. This showed how anti-COVID agreements do not generally provide a specific description of the rules regarding “emergency” remote work, merely stating its introduction or the extension of a previously existing project.

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Introduction

1.1 Methodology

The findings described in the following sections of this document have been collected through desk research, which, as required by Task 2.1. of the IREDES4.0 project, involved the following sources:

- studies and reports on smart working and digital-skills development, and the impact of these trends on the companies and the labor market changes;
- existing CLAs and other material already published on these topics;¹
- studies and research on the policies impacting skills development and smart working, in particular concerning their inclusion in CLAs;
- analysis of the strategies and approaches to addressing these topics in the social dialogue practices.

However, as per the requirements of Task 2.2., the Report was integrated with data acquired through semi-structured interviews with trade union members and employers' representatives. The interviewees were selected by project partners Fim-CISL Veneto and Confimi Industria Digitale, while ADAPT structured the questionnaire and conducted the interviews.

Given the focus of the IREDES4.0 project, the majority of the selected interviewees (15) operate in Italy. Among them, 7 are entrepreneurs and employers' representatives related to SMEs of the digital and metallurgical sector, while the remaining 8 are union members mostly active in the Veneto region, an area strongly characterized by the presence of SMEs.

Moreover, information regarding the European social partners' perspective on remote work and digital skills development in SMEs of the digital and metallurgical sector has been gathered through a limited number of additional interviewees from different EU countries. The selection of the non-Italian interviewees, also carried out by project partners Fim-CISL Veneto and Confimi Industria Digitale, have been considered to ensure a balanced participation of employees and employers' representatives. All interviews were and have been conducted via videoconference tools, namely Zoom, and recorded.

¹ The data on collective bargaining among Italian workers of the IT sector (pp. 57-65) might not be completely applicable to digital workers of all European countries, considering that their inclusion in the so-called "metallurgical sector" (which also includes metalworkers) – and their consequent relatively high trade union membership and collective bargaining coverage are a peculiarity of the Italian industrial relations system.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

1.2 Document Structure

The document is composed of six paragraphs. The second, third, and fourth paragraphs focus on the results of desk research carried out through the collection and analysis of both national and international scientific literature related to the topics of digital skills development and remote work, and national-level collective bargaining of the Italian metallurgy sector: the fourth paragraph delves in more specific data regarding SMEs of the Italian metallurgy sector. The fifth paragraph describes instead opinions and insights on the topics of the project, gathered through semi-structured interviews with trade unionists and employers' representatives, but also the consultation of a Board of Experts composed of social partners and academics from various European member states, in the context of the First and Second Expert Workshops. The final paragraph is composed of an analysis of company-level collective bargaining centered on the topics of digital skills development and remote work.



The Fourth Industrial Revolution and the growing need for digital skills. A focus on demographic changes

The changes taking place in the world of work because of the IV Industrial Revolution have been long pointed out by international bodies and research centers². Many scholars, especially in the economic field, have stressed that megatrends contributing to these developments include demography, globalization, technology, and the new production process. They play a role not only in the labor market but also in global manufacturing and the social context. As for demographic changes, it has been frequently argued that the aging of the population gives rise to direct and indirect effects on the labor market and people's skills. Before addressing the issue of skills (and especially digital ones), it is appropriate to provide an overview of demographic trends in Europe. The data below is based on the latest Ageing Report (2021) issued by the European Commission³.

Eurostat's demographic projections show continued increases in life expectancy both at birth and at the age of 65 for both males and females over the period 2019-2070. For the EU as a whole, life expectancy at birth would increase by 7.4 years for males and by 6.1 years for females, with the largest increases in the Member States that currently have the lowest life expectancy. In general terms, the EU population is projected to decline from 447 million people in 2019 to 424 million in 2070. During this period, Member States' population will age dramatically given the dynamics in fertility, life expectancy, and migration. The median age would rise by five years over the next decades. The age structure of the population is expected to change significantly. A strong upward shift in the age distribution can be seen in the population pyramids for the EU and the euro area⁴.

As a result of aging, the working-age population is projected to shrink as a share of the total EU population. From 2019 to 2070, the share of the age cohorts above 65 years in the EU population is expected to rise markedly from 20% to 30%, with those aged 80 and over doubling from 6% to 13%. By contrast, the share of the 20-64 age group, namely the working-age population, would fall from 59% to 51% of the total population. The share of those aged 0-19 would also shrink by nearly 2 percentage points, to 19%.

² See, World Employment Confederation, *The Future of Work. White Paper from the employment & recruitment industry*, 2016, available in *Boll. ADAPT*, 2016, No. 31, and World Economic Forum, *The Future of Jobs. Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*, 2016, which can be accessed at *Boll. ADAPT*, 2016, No. 2.

³ European Commission, *The 2021 Ageing Report Economic and Budgetary Projections for the EU Member States (2019-2070)*, Institutional Paper, 2021, No. 148.

⁴ For both genders, the share of the older age cohorts in the population (above 64 for males and above 70 for females) is expected to be higher in 2070 than in 2019. Conversely, the share of males aged 0-64 and females aged 0-69 will decline. Moreover, the largest cohort will shift from 50-54 years in 2019 to 60-64 years in 2070 for both genders. Over the same period, the median age will rise from 43.7 to 48.8 years – specifically, from 42.2 to 47.3 for men and from 45.2 to 50.3 for women.

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

In the EU, the participation rate of those aged 20-64 is projected to increase from 78.2% in 2019 to 80.7% in 2070, driven mainly by the higher participation of women and older workers. While the projections indicate an increase in participation rates for all ages, it is particularly visible for those aged 55-64 (+9.6 percentage points) and reflects the effect of pension reforms. Moreover, there is a general upward shift in female participation, showing the rising attachment of younger generations of women to the labor market. The size of the EU labor supply is expected to decrease by 16% over the projection horizon, with the largest decline of labor supply for males.

Direct effects of demographic changes translate into an overhauling of social security systems, the sustainability of which depends on workers staying longer in employment. Yet this aspect might penalize younger, and potentially higher performing, staff and youth employment, more generally⁵. Indirect effects refer to the different skills needed by the workforce as a consequence of demographic changes. The working age of the population is likely to rise, thus the skills of those who received training a long time ago may not be suitable to keep up with the fast-changing economic context⁶. Other scholars have argued for an inverse relationship existing between demographic changes and the ‘automatability’ risk. Unlike what was stated by most research, they have posited that the risk of automation does not increase with age, nor does it involve only senior workers, those possessing outdated skills, and those who are “less likely to participate in lifelong learning”⁷.

Besides demographic changes, technological progress is another relevant aspect, as it impacts the world of work, particularly skills need. With specific reference to digital skills, the next two paragraphs aim to illustrate their definition⁸ and the state of the art (in terms of their availability) in Europe.

⁵ D. Acemoglu, P. Restrepo, *Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation*, NBER Working Paper, 2017, No. 23077.

⁶ S. Dixon, *Implications of population ageing for the labor market*, in *Labor Market Trends*, 2003, Vol. 111, No. 2, pp. 67-76.

⁷ L. Nedelkoska, G. Quintini, *Automation, skills use and training*, OECD Social, Employment and Migration Working Paper, 2018, No. 202, p. 56. The authors argue that the relationship between higher automation levels and the risk of unemployment for young people lies in the career choice of the latter. Young people, especially when it comes to their first occupation, are engaged in ‘elementary jobs’, e.g. requiring low skills and consisting in tasks which are more likely to be automated. Yet they stress that while the ‘automatability’ risk (e.g. tasks performed by machines and robots) does not increase with age, senior workers feature less fluidity in terms of occupational transitions, as participation in training activities decreases with age, and so does access to upskilling and re-training. This produces so-called ‘skills obsolescence’, which poses challenges related to lifelong occupational training and learning policies (A. De Grip, J. Van Loo, *The Economics of Skills Obsolescence: A Review*, in A. De Grip, J. Van Loo, K. Mayhew (eds.), *The Economics of Skills Obsolescence: Theoretical Innovations and Empirical Applications*, Emerald, 2002).

⁸ Without wishing to be exhaustive and considering that the overview of the definitions of skills and competences is not the subject of in-depth analysis of this report, please refer to the following recent publication for further information. S. Vitello, J. Greatorex, S. Shaw, *What is competence? A shared interpretation of competence to support teaching, learning and assessment*, Cambridge University Press & Assessment, 2021.



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

As for the glossary of key terms⁹ used in the validation of non-formal and informal learning developed by the European Centre for the Development of Vocational Training (Cedefop), “digital competence” refers to the ability to use information and communication digital literacy technology (ICT). Moreover, digital competence is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present, and exchange information, and to communicate and participate in collaborative networks via the internet. In addition, Skills Panorama (whose aim is to improve Europe’s capacity to assess and anticipate skill needs to help make education and training systems more responsive to labor market needs and to match better skill supply and demand across Europe) states that digital competencies also involve “confident and critical use of information society technology (ICT) in the general population and provide the necessary context (i.e. the knowledge, skills, and attitudes) for working, living and learning in the knowledge society and digital competences are defined as the ability to access digital media and ICT, to understand and critically evaluate different aspects of digital media and media contents and to communicate effectively in a variety of ICT influenced contexts”¹⁰. Considering the sectoral focus of the project, it seemed appropriate to integrate this definition with those relating to ICT skills in terms of digital literacy.

Thus, also looking at sources outside the European panorama and consistently with the definitions highlighted by the UNESCO-UNEVOC Glossary¹¹, as for the Royal Society, digital literacy “should be understood to mean the basic skill or ability to use a computer confidently, safely and effectively, including the ability to use office software such as word processors, email and presentation software, the ability to create and edit images, audio, and video, and the ability to use a web browser and internet search engines. These are the skills that teachers of other subjects at secondary school should be able to assume that their pupils have, as an analog of being able to read and write.”¹² While, for the International Telecommunication Union¹³ digital literacy consists of equipping people with ICT concepts, methods, and skills to enable them to use and exploit ICTs. The related concept of information literacy consists of providing people with concepts and training to process data and transform them into information, knowledge, and decisions. It includes methods to search and evaluate information, elements of information culture and its ethical aspects, as well as methodological and ethical aspects for communication in the digital world.

“All Europeans need digital skills to study, work, communicate, access online public services and find trustworthy information¹⁴”. However, from the latest surveys at a European level, it seems that many Europeans do not have adequate digital skills. The Digital Economy and Society Index (DESI) considers

⁹ Cedefop, *Terminology of European education and training policy*, 2014.

¹⁰ Skills Panorama, Glossary (Online repertory - Accessed in December 2021).

¹¹ Unesco International Center for Technical and Vocational Education and Training, TVETpedia Glossary (Online repertory - Accessed in December 2021).

¹² The Royal Society, *Shut down or restart ? The way forward for computing in UK schools*, 2012.

¹³ ITU, *World Telecommunication/ICT Development Report 2010: Monitoring the WSIS Targets*, 2010.

¹⁴ European Commission, *Digital Skills and Jobs*, 2021, Last update June 9, 2021.



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

different datasets¹⁵ for informing the ‘Digital Skills’ indicator under the “Human Capital” domain. According to the 2020 DESI index, 4 out of 10 adults and every third person who works in Europe lack basic digital skills¹⁶, and these not particularly positive performances were also confirmed by the latest survey¹⁷ (the 2021 edition based on 2020 data, released during the writing phase of this report¹⁸). From a diachronic perspective, since 2015, the level of digital skills has continued to grow slowly, reaching 56% of individuals having at least basic digital skills, 31% with above basic digital skills, and 58% of individuals having at least basic software skills. Consistently with the attention paid to the demographic factor in the previous sections, it should be emphasized that the European Commission also notes that the “skills indicators are strongly influenced by socio-demographic aspects. For example, 80% of young adults (aged 16-24), 84% of individuals with high formal education¹⁹, and 87% of students have at least basic digital skills. By contrast, only 33% of those aged 55-74 and 28% of the retired and the inactive possess at least basic digital skills.²⁰” In this regard, and consistently as emerged from discussions with the members of the Stakeholders Board, it should be noted that youth is not a determinant of digital skills and growing up in a “digital world” does not automatically make one digitally competent or literate. The International Computer and Information Literacy Study²¹ demonstrate that young people do not develop sophisticated digital skills just by growing up using digital devices: in 9 out of 14 EU Member States who have participated in ICILS, more than one-third of the pupils achieved scores below the threshold for underachievement in digital competence.

Part of the Digital Economy and Society Index (DESI), the Women in Digital Scoreboard²² assesses Member States' performance in the areas of internet use, internet user skills, specialist skills, and employment-based on 12 indicators considering the gender perspective, a perspective that emerged

¹⁵ See, https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/indicators#digital-skills

¹⁶ This indicator (which is also used by the European Commission in setting 2025 targets) is from the Community Survey on ICT usage in households and by individuals. Digital skills are measured as a composite measure based on a series of yes/no questions, measuring to what extent someone has performed a number of activities, such as seeking information online, sending emails, installing software or using word processing software. An individual is then deemed to have “at least basic digital skills” if there is at least one “basic” but no “no skills” in all four domains. Source: European Commission, *Background note on the Skills Objectives*, July 1, 2020.

¹⁷ The data cited in the next paragraphs refer to the information contained in European Commission, *Digital Economy and Society Index (DESI) 2021 - Human Capital*, 2021.

¹⁸ The DESI 2020 reports referred to EU28 (including the United Kingdom), while DESI 2021 EU averages refer to EU27.

¹⁹ ISCED11 levels from 5 to 8 - formal tertiary (or higher) education.

²⁰ European Commission, *Digital Economy and Society Index (DESI) 2021*, cit., 4.

²¹ <https://www.iea.nl/studies/iea/icils/2018>.

²² European Commission, *Women in Digital Scoreboard 2021*, 2021. Data and country profiles available at: <https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021>. In more detail, the European Commission considers the “Firm Investments” as one of the four domains for the measurement framework of the European innovation scoreboard and this domain includes the following three indicators: R&D expenditure in the business sector; Non-R&D innovation expenditures and Enterprises providing training to develop or upgrade ICT skills of their personnel.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

as of particular interest also for the members of the Board. In this regard, both considering the 2020 and 2021 DESI editions, it emerged that there is also a low representation of women in tech-related professions and studies. Looking at the Italian panorama, although in this case there is no availability of data with a breakdown by economic sector, only 13% of women are STEM graduates compared to 19% of the male component. Furthermore, looking at the figure of ICT specialists (as % of total employment in 2020) only 1.4% are women compared to 5.3% of males. However, these figures are lower than those expressed by the average of European countries also concerning the issue of digital skills: if in Italy, 38% of women possess at least basic digital skills (compared to 45% of men), in Europe this percentage rises to 54% (women) and 58% men. The gap is also considerable regarding those with above-average digital skills: 19% and 25% (respectively women and men) in Italy and 29% and 33% (women and men) in Europe.

Moving on to the issue of business digitization, how digitalized are EU's enterprises? It is well acknowledged that the uptake of digital technologies by businesses has the potential to improve services and products as well as to increase competitiveness. The crisis caused by COVID-19 has also shown that digitalization is a crucial tool to improving the economic resilience of businesses. Considering the latest figures of the DESI index and relevant Eurostat datasets, in 2020, only 1% of EU enterprises with at least 10 persons employed reached a very high level of digital intensity while 14% reached a high level. The majority of the enterprises recorded low (46%) or very low (39%) levels. Compared to 2018, the Digital Intensity Index (DII)²³ has seen a general improvement at the EU level,

²³ European Commission, *Digital Economy and Society Index (DESI) 2021 – Integration of digital technology, 2021*. The DII measures the use of different digital technologies by enterprises and its score (0-12) is determined by how many of the 12 selected digital technologies the enterprises use. The higher the score, the higher the digital intensity of the enterprise, ranging from very low to very high. Digital Intensity Index (DII) is a composite indicator, derived from the survey on ICT usage and e-commerce in enterprises. With each of the 12 included variables having a score of 1 point, the DII distinguishes four levels of digital intensity for each enterprise: count of 0 to 3 points entails a very low level of digital intensity, 4 to 6 – low, 7 to 9 – high and 10 to 12 points – very high DII. The DII composition varies between different survey years, depending on the questions included in the survey, hence the comparability over time may be limited. In 2018 and 2020, the DII composition was similar and comprised the following 12 variables: more than 50% of persons employed having access to the internet for business purposes, employment of ICT specialists; fast broadband (30 Mbps or above); providing more than 20% of persons employed with a portable device allowing mobile internet connections; having a website; a website has sophisticated functionalities (at least one of: description of goods or services, price lists; possibility for visitors to customize or design online goods or services; tracking or status of orders placed; personalized content in the website for regular/ recurrent visitors); use of 3D printing; buying medium-high cloud computing services; sending invoices suitable for automated processing; use of industrial or service robots; having e-commerce sales accounting for at least 1% of total turnover; analysing big data internally from any data source or externally. The DII is used in the Digital Economy and Society Index, the main monitoring tool of the EU's Digital Decade, which sets the targets for the digital transformation of Europe by 2030. Apart from the target of more than 90% of SMEs reaching at least a basic level of digital intensity, the Digital Decade sets goals for high take-up of advanced digital technologies for EU companies, with 75% of enterprises using cloud computing, Artificial Intelligence, Big Data.

16



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

with increases at both very high (+5.0 pps) and high (+0.4 pps) levels. Eurostat data²⁴ show that 9% of the EU's large enterprises had a very high DII and 42% a high level, while only 2% of medium-sized companies registered a very high-intensity level and one-quarter (25%) a high DII. Only 0.4% of small enterprises reached a very high digital intensity, with only 12% scoring a high DII. Almost half of the medium (47%) and small (46%) size enterprises showed a low level of digital intensity. According to one of the targets of the EU's vision for digital transformation, at least 90% of the EU's small and medium-sized enterprises (SMEs) should reach a basic level of digital intensity by 2030. The basic level entails the use of at least four technologies and includes enterprises with low, high, and very high DII. In 2020, three out of five SMEs (60%) in the EU reached at least a basic level of digital intensity, against 89% of large enterprises.

Finally, it is worth mentioning that in 2020, 19 % of EU enterprises employed ICT specialists²⁵. Among the EU Member States, Ireland and Belgium presented the highest proportion of enterprises employing ICT specialists, with 30 % each. Italy, with 13 %, presented the lowest ratio of enterprises employing ICT specialists in 2020. The information and communication sector had the highest proportion, with 72 % of enterprises employing ICT specialists in 2020. Apart from the enterprises in information and communication activities, the highest percentages of enterprises employing ICT specialists were observed in the 'professional, scientific and technical activities sector (30 %), 'electricity, gas, steam, air conditioning, and water supply sector (26 %), 'real estate sector (23 %) and 'manufacturing' (21%). With 8 %, the construction sector presented the lowest ratio of enterprises employing ICT specialists in 2020 in the EU. The percentage of large enterprises employing ICT specialists (76 %) was more than 5 times higher in 2020 than the ratio of small-sized enterprises employing ICT specialists (14 %). In 2020, 8 % of EU enterprises reported that during 2019, they recruited or tried to recruit ICT specialists. The share of enterprises recruiting or trying to recruit ICT specialists was much higher in information and communication activities (53 %) than in the rest of the economy. The ratio was substantially higher among large enterprises – 45 % recruited or tried to recruit ICT specialists in 2019, compared with 6 % for small enterprises. Among the EU Member States, the proportion of enterprises that recruited or tried to recruit ICT specialists in 2019 ranged from 3 % in Romania to 18 % in Belgium. Among the enterprises that recruited or tried to recruit ICT specialists, 55 % reported difficulties in filling vacancies in 2019. In Czechia, more than 3 out of 4 enterprises that recruited ICT specialists in 2019 reported difficulties in filling those vacancies. In Austria and the Netherlands respectively 74 % and 71 % of enterprises that recruited or tried to recruit ICT specialists reported difficulties in filling ICT vacancies. With 24 %, the lowest ratio in 2019 of enterprises with difficulties in recruiting ICT specialists was observed in Spain. In Italy, 55% of enterprises reported hard-to-fill vacancies for ICT specialists in 2020.

²⁴ European Union survey on ICT usage and e-commerce in enterprises.

²⁵ Eurostat defines ICT specialists as "workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job". A workforce with ICT specialists' skills, possessing the potential to maintain and to grow the digital economy, is a key element for a successful digital transformation.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

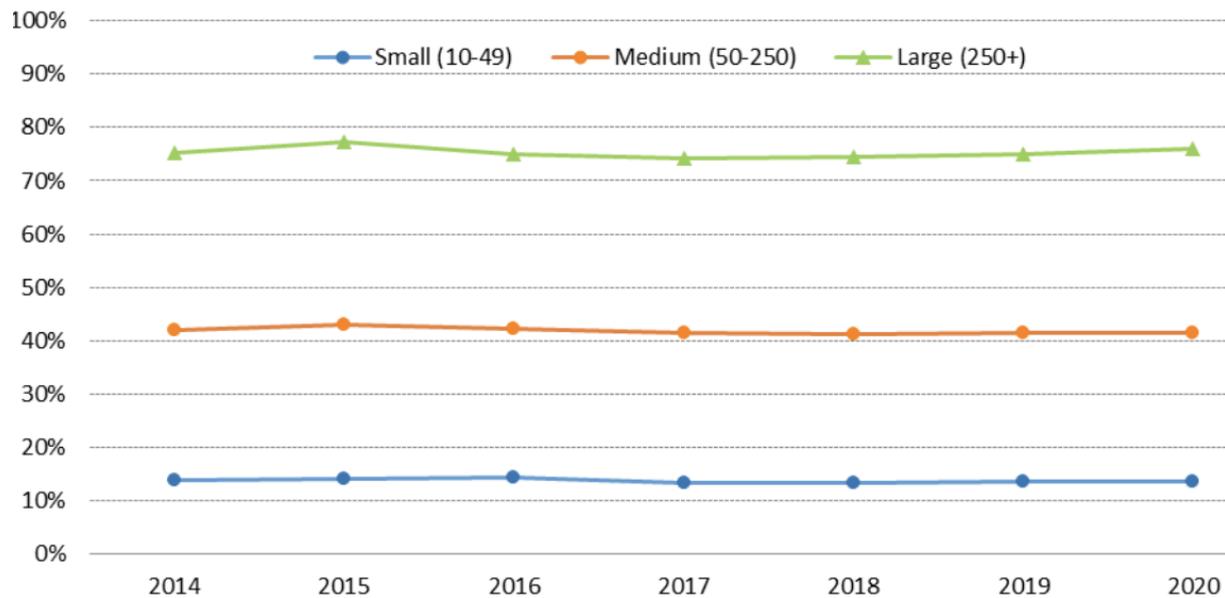


Figure 1: Enterprises employing ICT specialists (% of enterprises), 2014-2020

Source: European Commission, (2021), Digital Economy and Society Index (DESI) 2021 - Integration of digital technology, p. 7

With specific reference to one of the topics before this report, it is appropriate to decline the analysis also on data and performances related to the training issue: not only training is crucial to enhance or equip employees with new ICT skills, but also, considering the issue of the skills for innovation²⁶, as for the European Innovation Scoreboard²⁷ it is possible to state that ICT and STEM skills are particularly important for innovation in an increasingly digital economy. Thus, the share of enterprises providing training in that respect could be accounted as a proxy for the overall skills development of employees. In this regard, ICT training is relevant for all staff, particularly for ICT specialists, but also for other persons employed i.e. non-ICT specialists. About the consolidated data for 2019 (a year that we take into consideration as it is not impacted by the effects of the pandemic emergency)²⁸, 20 % of EU enterprises provided training to all their staff to their ICT-related skills. The ratio reached 68 % among large enterprises, which was more than four times higher than for small enterprises (15 %). In 2019, 10 % of EU enterprises provided training to ICT specialists to enhance their ICT skills. Among large enterprises, the share of enterprises that provided ICT training to ICT specialists reached 56 %, while

²⁶ For a complete picture of the "skills for innovation" issue see L. Casano et al., *Skills, Innovation and the Provision of, and access to Training. Final Report*, 2021. This study was carried out by ADAPT Servizi S.r.l. as a subcontractor within the EU cross-sectoral social partners' (Business Europe, SGI Europe, SMEunited and ETUC), Integrated Projects of the EU social dialogue 2020-2021 (VS/2019/0431).

²⁷ European Commission, *European Innovation Scoreboard 2021*, 2021.

²⁸ For the latest available data (2020), visit the following website: https://ec.europa.eu/eurostat/databrowser/view/isoc_ske_ittn2/default/table?lang=en.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESEDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

only 6 % of small enterprises provided ICT-related training to their ICT specialists. By adopting the sectoral approach, it is possible to state that the proportion of enterprises providing ICT training to their ICT specialists ranged from 3 % of enterprises in construction to 51 % in the sector of information and communication. In 2019, 17 % of EU enterprises also provided ICT training to 'other persons employed'. In all the economic sectors, except for the sector of information and communication, the share of enterprises providing ICT training to non-specialist staff was higher than the ratio of enterprises providing training to ICT specialists²⁹.

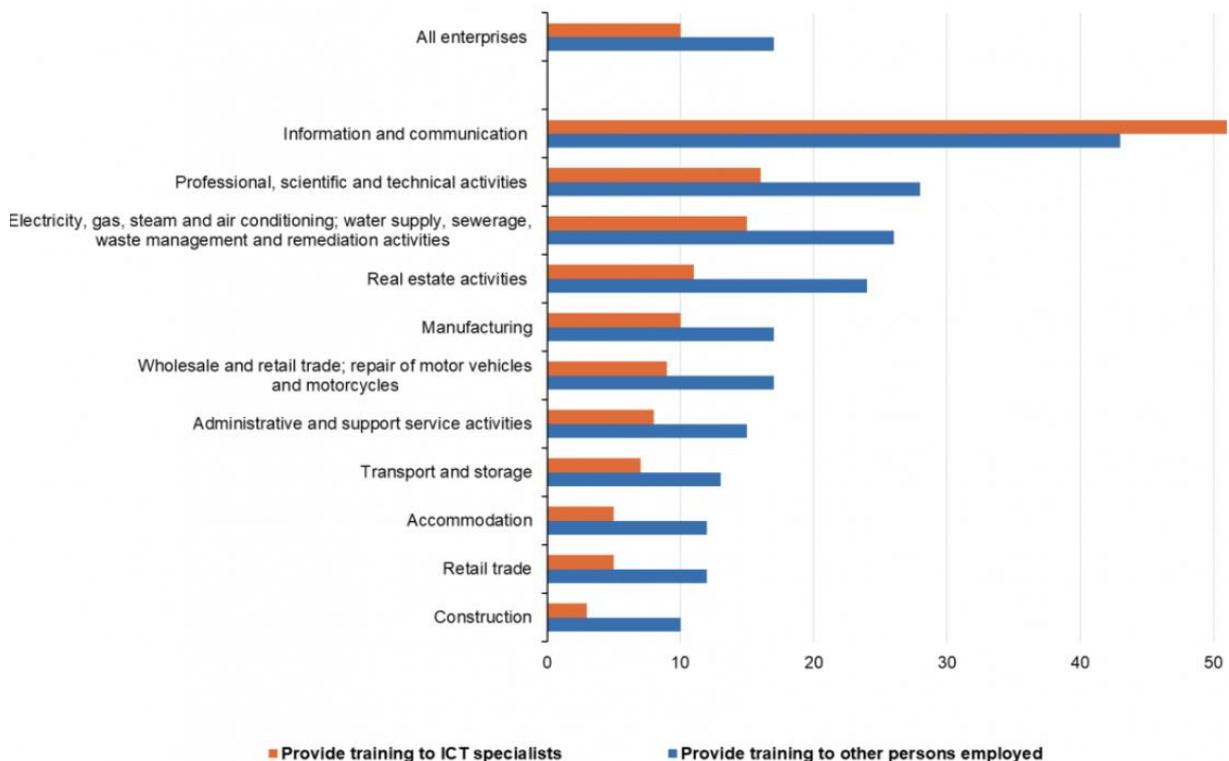


Figure 2: Enterprises that provide ICT-related training to their persons employed, by activity, EU, 2019 (% of enterprises)

Source: Eurostat [ISOC_SKE_ITTN2]

²⁹ For an assessment of the reliability of international reporting and the applicability of statistical surveys to the production context of micro and small enterprises in the countries surveyed by the IRESEDES4.0 project, see paragraph 5.4 below.



Remote working in Europe before and after COVID-19

The massive spread of remote work during the COVID-19 pandemic has captured the attention of the most relevant international and national research centers. Therefore, during the last months, a great number of studies and papers have been published on the topic, focusing on different aspects of this "new way of working", such as the prevention of specific occupational health and safety (OSHA) risks, extended working hours, different working spaces, employees' data protection, etc.

For the scope of this report, however, it appears primarily important to mention the sources aimed at providing an overview of the various terms used to define remote work, to frame the phenomenon as accurately as possible.

In this sense, the technical note from the ILO, *Defining and measuring remote work, telework, work at home and home-based work, 2020* is particularly useful, providing specific definitions of the terms "remote work", "telework", "work at home" and "home-based work".

The definition of "telework" given by the ILO is the one that most efficiently labels the type of work that will be taken into consideration in the context of this report, that is, "a subcategory of the broader concept of remote work" which includes "workers who use information and communications technology (ICT) or landline telephones to carry out the work remotely" (p.6).

As it is pointed out by the renowned joint report by Eurofound, ILO, *Working anytime, anywhere: the effects on the world of work, 2017*, p. 5, most European countries use direct translations of the word "telework" to define work carried out remotely through the use of ICT equipment (for example, *télétravail* in France, *teletrabajo* in Spain).

This circumstance appears to be a direct consequence of the terminology adopted by the European Framework Agreement on telework of 16th July 2002, the first supra-national source for the regulation of the topic, which was transposed shortly after in the nation-wide legislation or collective agreements of the Member states.³⁰

³⁰ It is worth mentioning that on June 28, 2022, ETUC, BusinessEurope, SGI Europe and SME United signed the "Social Dialogue Work Programme" for 2022-2024, in which they agreed to review and update the 2002 Agreement on Telework, considering digitalisation and the COVID-19 crisis. The new agreement will take the form of a legally binding agreement implemented via a Directive. The Programme is available at the following link: https://www.buinesseurope.eu/sites/buseur/files/media/reports_and_studies/2022-06-28_european_social_dialogue_programme_22-24_0.pdf.

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Italy also uses the word “telework” to define ICT-based remote work (see Interconfederal Agreement of 9th June 2004): however, it needs to be underlined that, nowadays, the abovementioned term is not sufficient to describe all the ways through which the country regulates this new way of working.

In 2017 the Italian Parliament issued a law (n. 81/2017) which as of today regulates the so-called “agile work”, i.e., a way to carry out paid employment partly from outside the employers’ premises, possibly through the use of ICT equipment and characterized by great flexibility of the employees’ working hours.

Considering the similarities between agile work and the abovementioned international definition of telework, ever since the publication of law No. 81/2017 Italian labor law experts have participated in an ongoing debate aimed at establishing the defining elements of those two different kinds of remote work: the interest for the identification of such criteria stems from the fact that the classification of a working relationship as “agile work” or “telework” has indeed relevant consequences, especially in terms of OSHA requirements and ICT equipment. In the context of the described discussion, it is interesting to underline the positions, such as the one of *M. Tiraboschi, Il lavoro agile tra legge e contrattazione collettiva, Diritto delle Relazioni industriali No. 4/2017, p. 945*, according to whom agile work, is characterized by periodicity and regularity, is to be considered only as a way to define telework in the context of paid employment.

Adding to the uncertainty among the meaning of the terms “agile work” and “telework” is the widespread use of the expression “smart working” in the Italian public debate, which, during the COVID-19 pandemic, has been frequently adopted to define remote work carried out exclusively from the employees’ homes to prevent infections in the workplace.

However, according to *M. Corso, Sfide e prospettive della rivoluzione digitale: lo smart working, Diritto delle Relazioni Industriali No. 4, 2017, p. 980* and many other experts, “smart working” characterizes instead a result-oriented and trust-based management style, which, excluding the perpetual control of the employer on the employees’ activities, allows the latter to potentially carry out its tasks from outside the employers’ premises and not to be constrained by predefined time slots: in this sense, following the perspective of the position paper by Assolombarda and ADAPT, *Il Lavoro agile Oltre l’emergenza, 2021, p. 10*, agile work, as regulated by law No. 81/2017, constitutes the legal equivalent of smart working.

Therefore, as underlined by *M. Biasi, Brevi spunti sul lavoro da remoto post-emergenziale, tra legge (lavoro agile) e contrattazione (smart working), Conversazioni sul lavoro a distanza, 2021, pp. 11-13*, the concept of “smart working” has very different characteristics from the kind of “home-based agile work” that has been carried out during the COVID-19 pandemic in Italy, which, according to many, was characterized neither by a higher amount of time and space flexibility nor by an increased level of workers’ autonomy. Research carried out by the Di Vittorio Foundation, *Quando lavorare da casa è smart? 2020, p. 4* showed in fact that only 23% of the interviewed workers perceived that their way of working had significantly changed during the pandemic.

21



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The comparison between the ways to carry out telework before and after the coronavirus emergency has also been the object of ample international scientific literature published in the last months, such as *OECD, Exploring policy options on teleworking: Steering local economic and employment development in the time of remote work, 2020, pp. 7-9*, which indeed describes the “new approach to telework” brought about by the COVID-19 pandemic.

First of all, the OECD report underlines that while before 2020, telework was mostly considered as a means to improve the employees’ work-life balance, during the COVID-19 pandemic the very same instrument was primarily directed at preventing the spread of the said virus and, at the same time, ensuring business continuity.

For the same reason, in the words of the OECD, telework mutated from an “unevenly widespread option” to a “large-scale solution”: the specific data related to the increase in the number of teleworkers in Europe during the pandemic will be analysed in the following sub-paragraph.

However, according to the OECD, the COVID-19 pandemic is also to be considered as the spark that will cause a radical shift in the way telework is carried out in the future.

If before the emergency, telework replicated the working conditions of the office to the largest extent possible and was therefore regulated through well-defined legal frameworks regarding working hours, working spaces, and ICT equipment, in the post-emergency phase telework could be defined as more “objective-based” and “blended”. This new approach, therefore, entails that employees will fulfill their tasks with greater time and space flexibility, working alternatively from home and the office, to maximize the productivity of the involved firms.

In fact, according to the Joint Research Centre of the European Commission, *Telework in the EU before and after the COVID-19: where we were, where we head to, 2020, p. 8*, evidence shows that working from home during “normal times” improves the workers’ productivity: the same perspective seems to be shared by the Italian legislator since one of the mentioned reasons for the bolstering of agile work through law No. 81/2017, together with the improvement of the workers’ work-life balance, is the “enhancement of competitiveness”.

Similar predictions to those of the OECD are to be found in a recent document by the *ILO, Teleworking during the COVID-19 pandemic and beyond: A Practical Guide, 2020* aimed at advising both employees and employers on how to manage this new way of working.

The Guide states that the current “new era of teleworking”, greatly facilitated by digitalization, advanced communication, and cloud technologies, will, first of all, require wider use of trust- and results-based management (*p. 4*): a similar view is shared by *F. Contreras, E. Baykal, G. Abid, E-Leadership and Teleworking in Times of COVID-19 and Beyond: What We Know and Where Do We Go, Frontiers in Psychology, 2020*, who also highlight the challenges of handling “virtual teams” both in terms of maintaining group identity and monitoring the progress of teamwork (*p.8*).

22



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

On the other hand, however, the ILO underlines how telework will be also conceived as an extremely flexible way of working, modelled according to the individual preferences of the involved employees (p. 4).

To summarize the hereby considered sources, it can be affirmed that, according to various international actors, the so-called "smart work" will assume a lead role in the organization models of the future, considered on a global scale, while more "rigid" forms of telework will be left behind.

1.3 Quantitative data analysis

It fully comprehends the impact of the COVID-19 pandemic on telework, it appears crucial to compare the number of people who had already been teleworking before the coronavirus outbreak and the number of current teleworkers.

In this sense, the already mentioned policy brief of the JRC of the EU Commission *Telework in the EU before and after the COVID-19: where we were, where we head to*, p. 1, states that in 2019 only 5,4% of the employed population in the European Union worked from home regularly and that that percentage had not increased since 2009: however, during the same time period, the share of people that occasionally worked from home had increased from 5,2% to 9%.

According to the JRC, however, the percentage of regular and occasional teleworkers varied considerably among member states: Eurostat data showed that in 2019 the percentage of Italian teleworkers (5%), was considerably below the EU-27 average (15%), while, in Sweden, the teleworking ratio was around 35%.

The reasons for those discrepancies could be firstly identified in the distribution of employment by firm size: since larger companies are more likely to adopt telework than smaller ones, countries with a large number of SMEs used to have lower teleworking percentages. Other factors, according to the JRC, could be identified in the variable rate of self-employment, in the different levels of the workers' digital skills, and the various occupational composition of economic sectors (share of high-skilled occupations, management, and supervisory styles, different work organization models, etc.).

Relying on similar considerations, the report by Eurofound, *Teleworkability, and the COVID-19 crisis: a new digital divide? 2020*, p.18 traces a profile of the typical person that was likely to work remotely before the coronavirus outbreak: that is, an experienced, autonomous, highly educated, and well-paid knowledge worker, who had a high-level job in the service sector.

Mentioning the economic sector of occupation of the typical teleworker appears crucial, since the very same paper, quoting data from the EU Labor Force Survey carried out by Eurostat in 2018, underlines how the distribution of occasional and regular teleworkers in the Member States varied considerably among different economic sectors: for this report, it needs to be mentioned that, while in high and medium-high tech manufacturing, the general percentage of teleworkers in 2018 was around 15%,

23



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

more than 40% of workers in IT and other communication services carried out remotely at least part of their work.

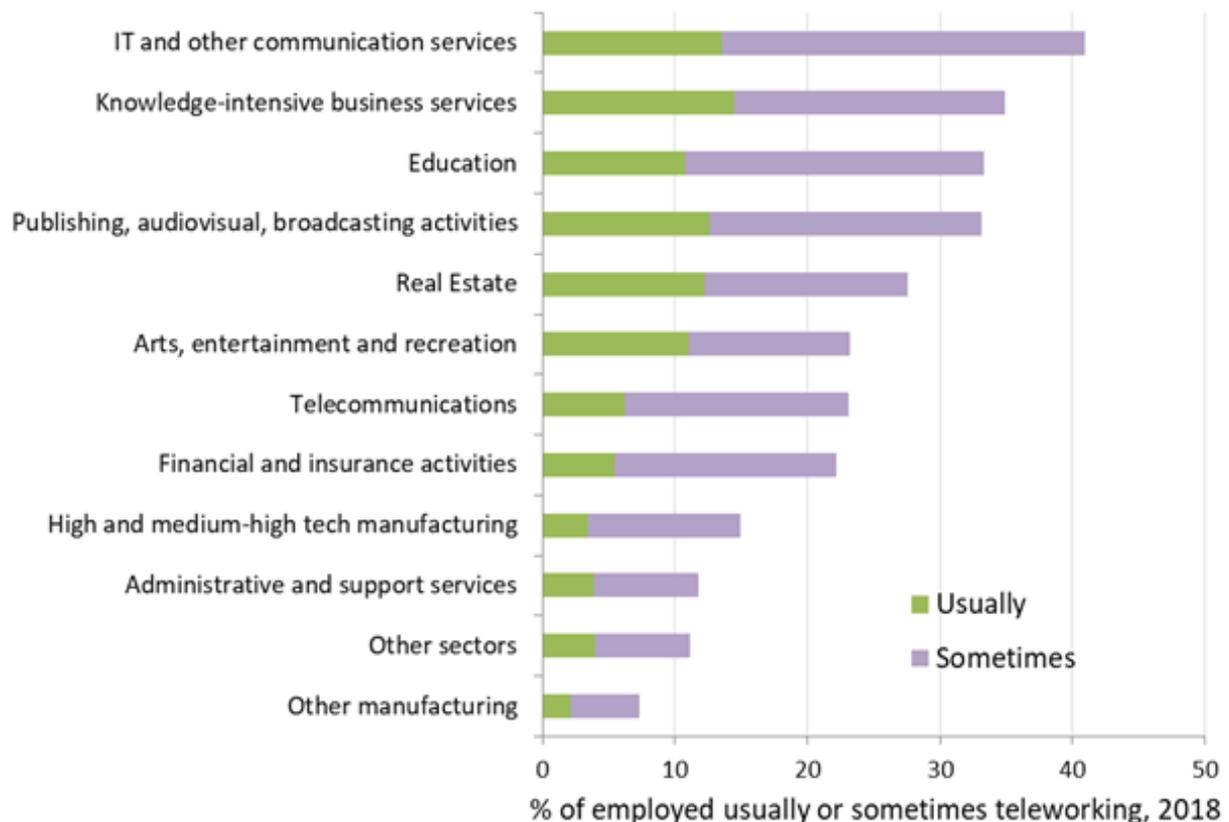


Figure 3: Prevalence of telework by sector, EU-27, 2018.

Source: Eurofound, *Teleworkability and the COVID-19 crisis: a new digital divide?* 2020, p. 10

Ever since the beginning of the COVID-19 pandemic, international organizations have been carrying out specific research aimed at registering the shifts in the number and in the distribution of teleworkers during that peculiar period. Eurofound, for example, has been keeping track of those data through various rounds of an e-survey called *Living, working and COVID-19*, whose results are periodically published in detailed factsheets.

The first of those factsheets, dating back to April 2020, showed that 37% of those currently working in the EU started teleworking because of the pandemic: in this case, the percentage of “emergency teleworkers in Italy” was higher than the EU average, exceeding 40% of the workforce (*Eurofound, Living, working and COVID-19 First findings – April 2020, p. 5*).

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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD-ES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

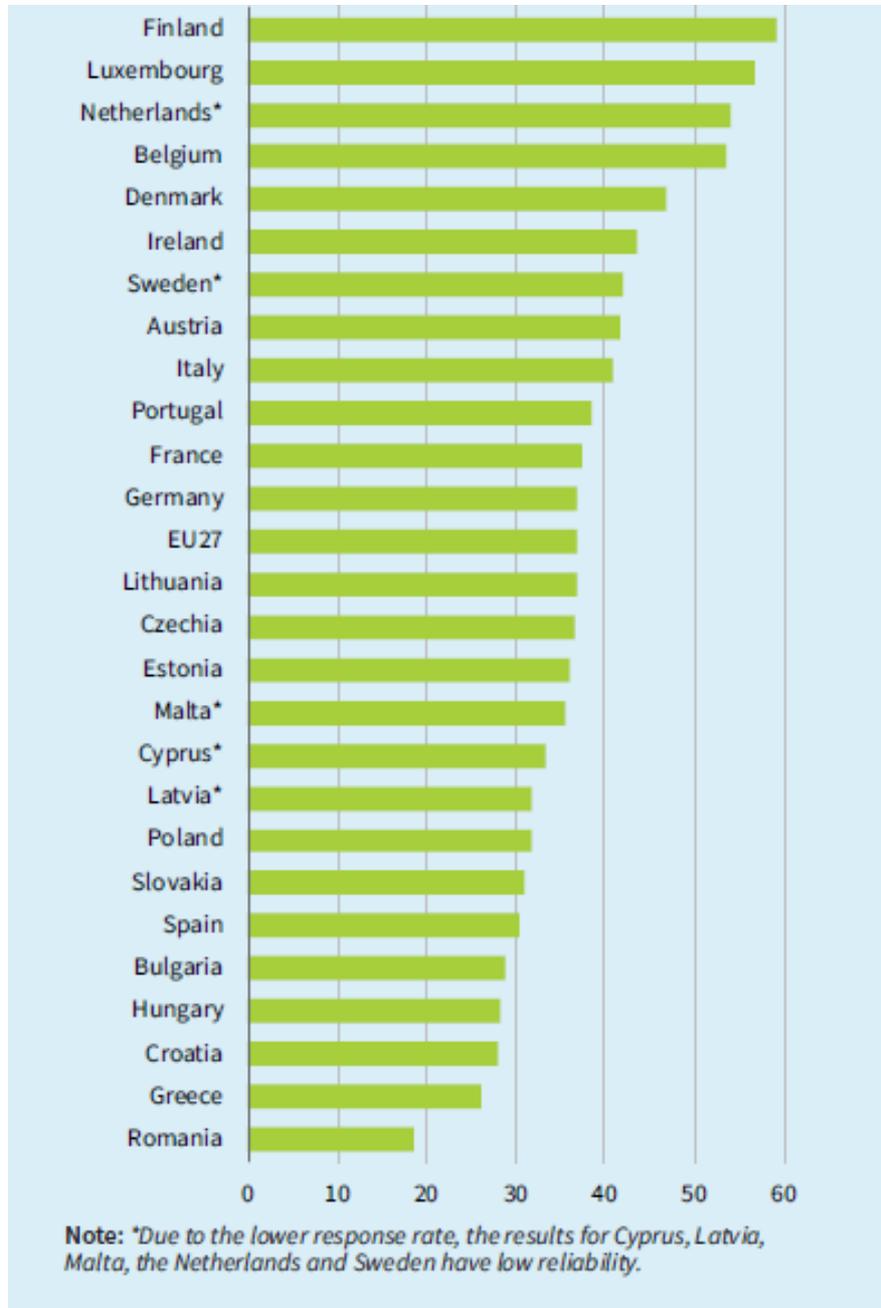


Figure 4: Proportion of workers who started teleworking as a result of COVID-19 by country, 2020

Source: Eurofound, Living, working and COVID-19 First findings – April 2020, p. 5

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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The results of the first round of the e-survey also showed that, while most of the people (56%) who worked remotely during the first part of the coronavirus outbreak had already experienced telework before, 24% had never worked from home before the pandemic.

The results of the first and the second round of Eurofound's e-survey form part of a more structured research report, published in September 2020. Compared to the first factsheet, the mentioned report also contains data related to the gender, age, occupational sector, level of education, and geographical area of the people who have worked remotely during the pandemic.

The thereby described profile of the typical emergency teleworker is fairly similar to that of the pre-coronavirus teleworker, i.e., urban-based, white-collar, well-educated, employed in the service sector: for this report, it is important to note that only around 30% of industrial workers performed their job remotely during the first half of 2020 (Eurofound, *Living, working and COVID-19*, 2020, p. 33).

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Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

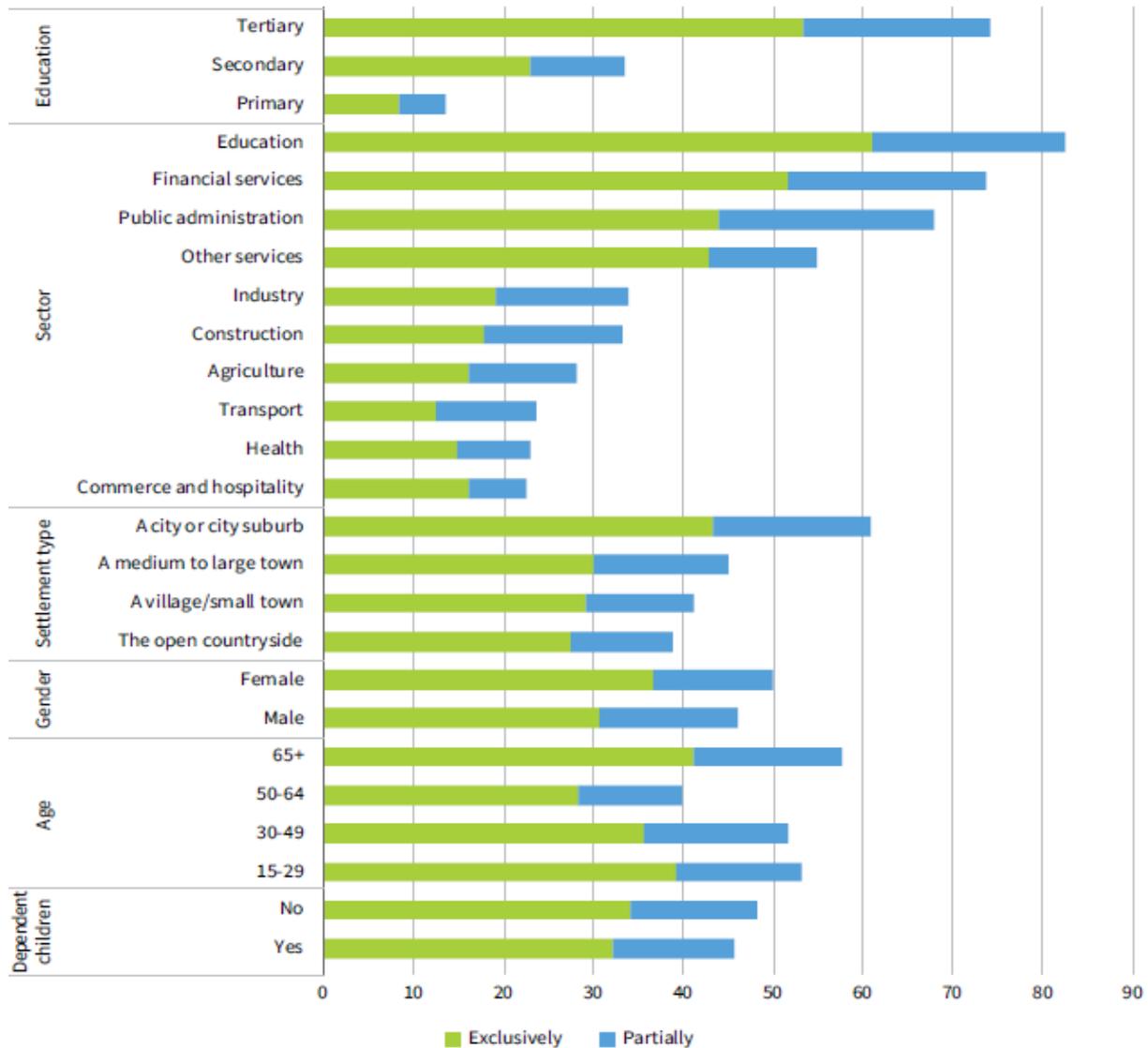


Figure 5: Working from home during COVID-19, EU27 (%), 2020

Source: Eurofound, *Living, working and COVID-19, 2020*, p. 33

Recent Eurostat data providing information regarding the geographical distribution of telework in 2020 confirms the abovementioned statements. According to *Eurostat, Eurostat Regional Yearbook, 2021* edition, p. 74, the fact that the most striking increases in the rate of teleworkers were concentrated in the capital regions and other urban European regions indeed reflects their economic structure, which provides greater teleworking opportunities for those employed in professional, financial, information and communication, education, and government sectors.

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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDS4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

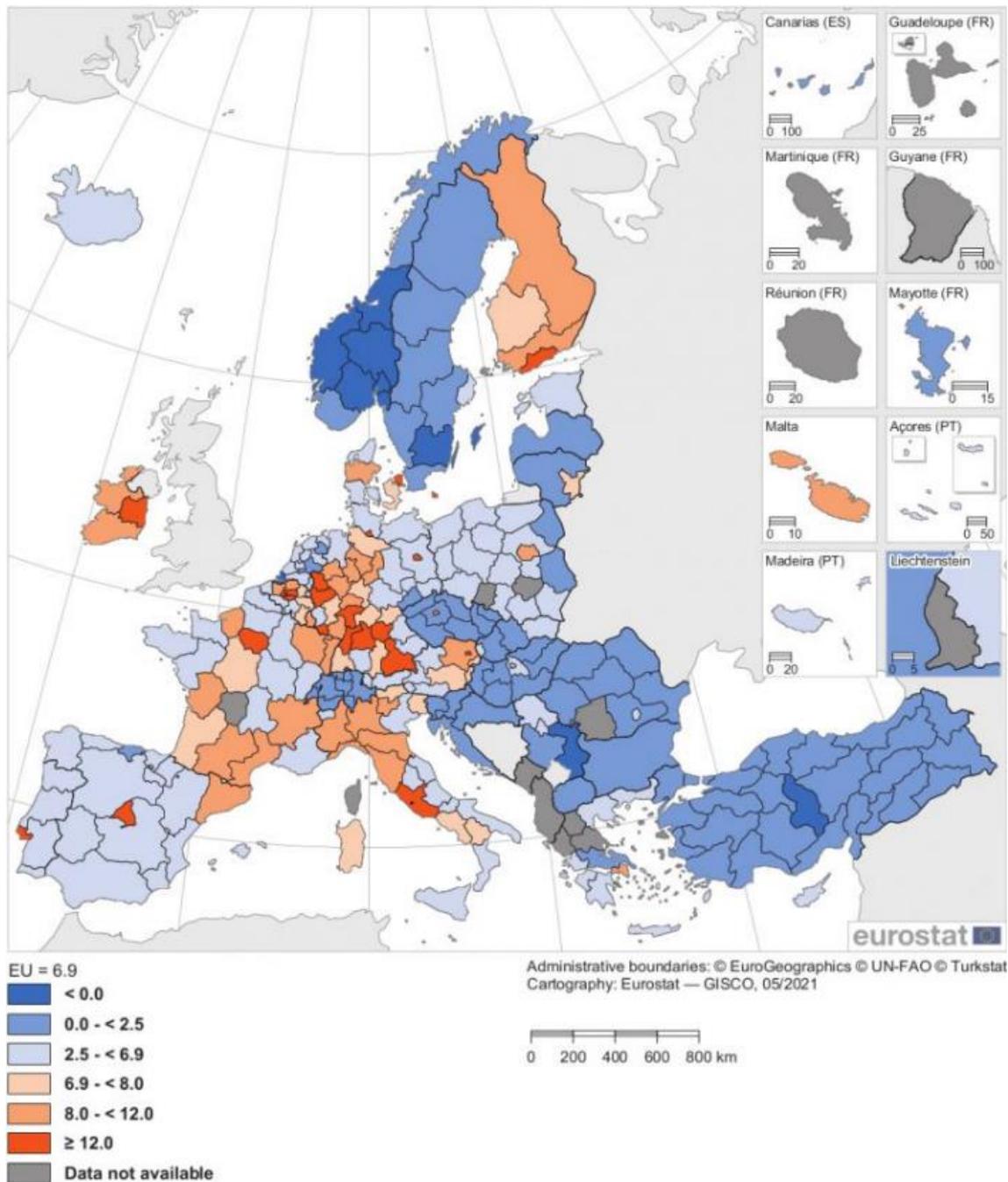


Figure 6: Annual change in the share of persons usually working from home, 2020 (percentage points, people in employment aged 20-64 years, by NUTS 2 regions).

Source: Eurostat, Eurostat Regional Yearbook, 2021 edition, p. 75

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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The third round of the e-surveys was carried out during March 2021, a period in which EU countries were still experiencing various levels of restrictions.

However, Eurofound's last factsheet reports a steep decline in the prevalence of teleworking in various member states, with a general increase in the proportion of people who started to work again exclusively from the employers' premises: the most significant drop interested the number of people carrying out their professional performances only from home, especially in Italy, whose rate of full-time teleworkers decreased from 48% to 26% (Eurofound, *Living, working and COVID-19 (Update April 2021): Mental health and trust decline across EU as pandemic enters another year, 2021*, p. 2).

To complete the present overview of the data regarding telework before and after the COVID-19 pandemic, and, notably, its focus on the Italian case, it appears also necessary to refer to publications carried out by national institutional sources, such as those of the Italian National Bank (Banca d'Italia), where D. Depalo and F. Giorgi, compare data regarding telework³¹ in the private sector before and after the pandemic, mainly focusing on the same elements that constitute the object of Eurofound's e-surveys (D. Depalo, F. Giorgi, *Il lavoro da remoto in Italia durante la pandemia: I lavoratori del settore privato*, 2021).

Firstly, the Italian National Bank researchers affirm that, in the second trimester of 2020, more than 14% of the workers of the private sector worked remotely. This constitutes a large increase compared to the 1,5% of the same period of 2019: in only one year, the total number of teleworkers of the country went from less than 200.000 to around 1,8 million (p. 3).

Similarly to the EU-wide reports, the report points out that the increase of the teleworking rate has been larger among workers with a high level of education, who work in large firms and who occupy managerial positions: however, the Italian case is also characterized by the fact that, during the COVID-19 pandemic, the increase in the number of women performing agile work (15,4%) was higher than that of men (4,1%) (p. 3).

³¹ The authors mostly refer to "agile work". In order to understand the difference in terminology regarding remote work in Italy, see paragraph 2.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

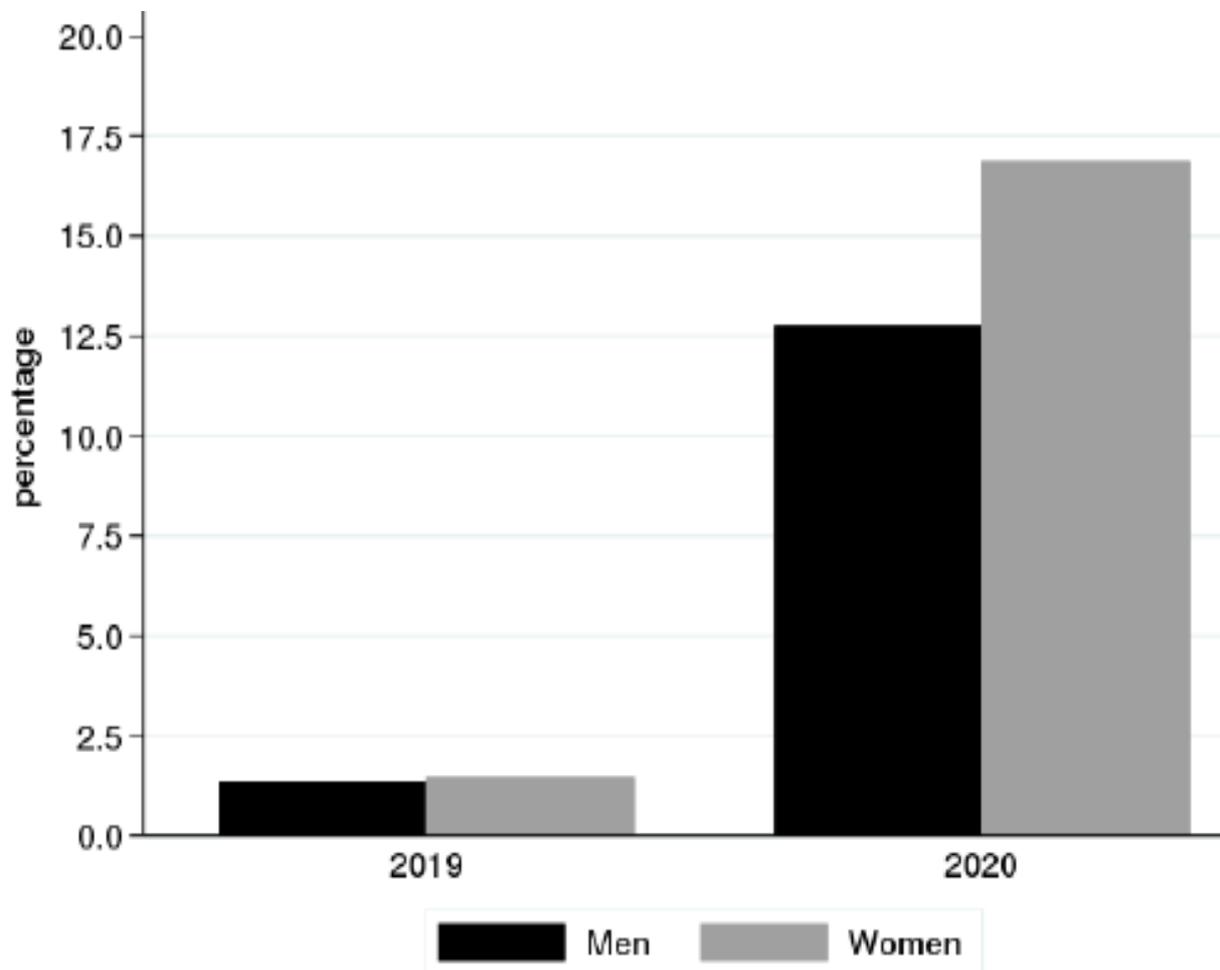


Figure 7: Gender division regarding smart workers, 2019-2020

Source: D. Depalo, F. Giorgi, *Il lavoro da remoto in Italia durante la pandemia: i lavoratori del settore privato*, 2021, p. 3. (Authors' elaboration on data from ISTAT, Labor Force Survey)

Moreover, while confirming the European data according to which the largest percentage of teleworkers, before and after the pandemic, belong to the service sector, the report links this circumstance to the fact that the mentioned sector has a high degree of so-called "teleworkability", i.e., entails a large number of professions which can easily be carried out remotely. The report underlines that in sectors with a low degree of teleworkability, like that of accommodation and food service activities, the teleworkers' ratio in 2020 remained close to that of 2019, while in highly teleworkable sectors the number of remote workers greatly increased (p. 3).

To calculate the "teleworkability" of different jobs, the authors use a composite index created by T. Barbieri, G. Basso, and S. Scicchitano, *Italian workers at risk during the Covid-19 epidemic*, Questioni

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

di Economia e Finanza, 2020, pp. 7-8, calculated based on the following factors: i) importance of performing general physical activities (considered reversely); (ii) importance of working with computers; (iii) importance of maneuvering vehicles, mechanical vehicles or equipment (considered reversely); (iv) requirement of face-to-face interactions (considered reversely); (v) dealing with external customers or with the public (considered reversely); (vi) physical proximity (considered reversely); (vii) time spent standing (considered reversely).

A partially different approach was used by the European researchers who wrote the already mentioned working paper by Eurofound (*Teleworkability and the COVID-19 crisis: a new digital divide?*, 2020), according to which the rate of "teleworkability" of a job should be calculated on the basis on three main factors, i.e., the prevalence of physical tasks (generally not teleworkable), social interaction tasks, (partially teleworkable) information-processing tasks (completely teleworkable).

Through this research method, the abovementioned working paper showed how the share of potentially teleworkable jobs in the EU (around 37%) is much greater than the actual teleworking rate before the coronavirus outbreak (15%) (p. 48).

Similarly to the Italian report, Eurofound shows how the rate of teleworkability varies among economic sectors: for this report, it is necessary to underline how, in the EU, the manufacturing sector entails a low degree of teleworkable jobs (slightly over 20%), while almost 70% of the activities of the information and communication sector can be performed remotely (pp. 50-51). The data regarding teleworkable jobs in different economic sectors appear to influence also the future diffusion of telework: according to an OECD study conducted on job postings regarding remote jobs published from January 2019 to September 2021, telework in the future will be mostly diffused in skill and digital-intensive sectors, such as IT-related services and insurance (P. Adrian et al., *Will it stay or will it go? Analysing developments in telework during Covid-19 using online job postings data*, OECD productivity working papers, 2020, No. 30, p. 5).



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

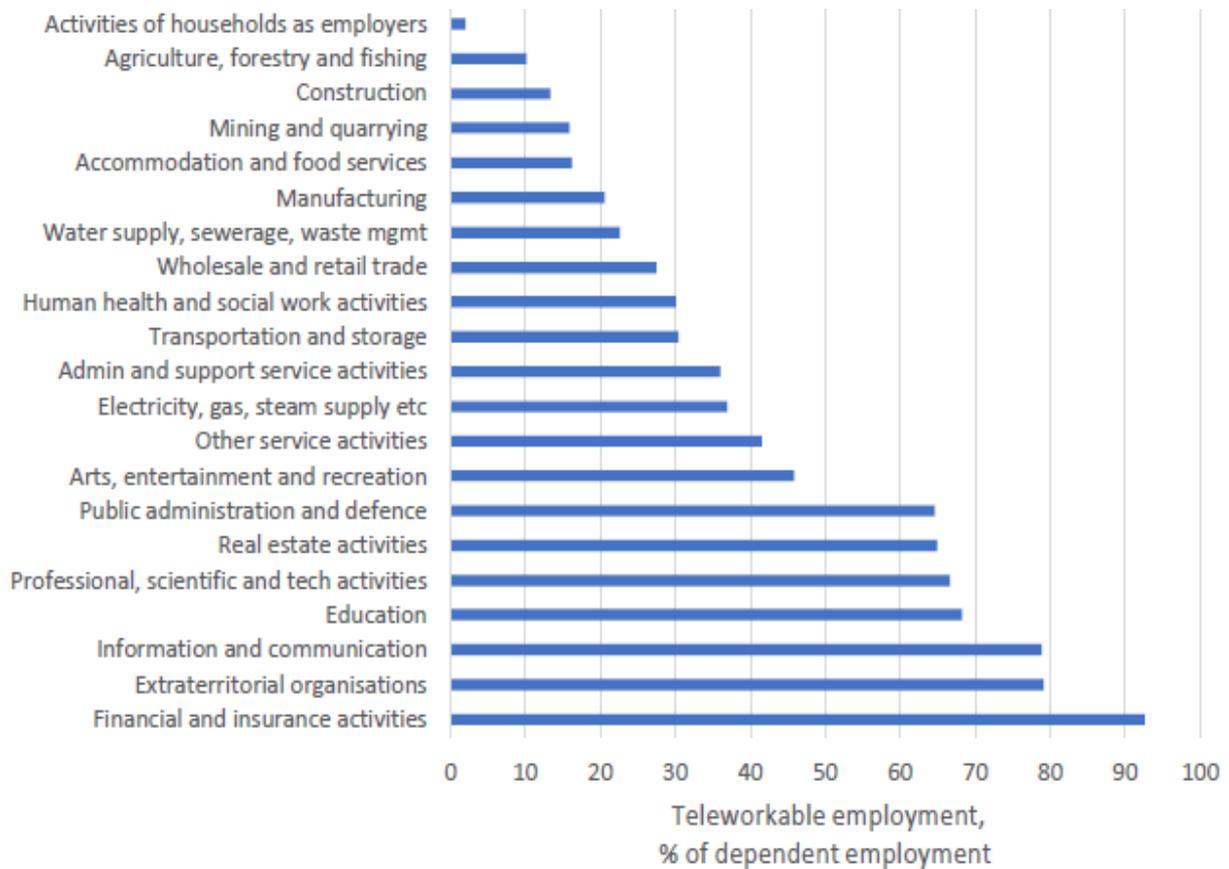


Figure 8: Teleworkability in EU27 by sector, 2020

Source: Eurofound, Teleworkability and the COVID-19 crisis: a new digital divide? 2020, p. 51 (Authors' elaboration of data from Eurofound, Labor Force Survey, COVID-19 working group)

Project Partners

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The impact of digitalization on European SMEs

On March 10th, 2021, the European Commission published a Communication called "*An SME Strategy for a sustainable and digital Europe*", aimed at enabling European SMEs to participate in the so-called "just transition"³² towards sustainability and digitalization.

The attention of the EU Commission towards SMEs is first of all justified by the fact that they constitute "the backbone of the EU economy", accounting for more than half of its GDP (p.1), two-thirds of total employment³³, and 99% of Europe's businesses:³⁴ enhancing their level of productivity and boosting their innovation processes appears therefore crucial to support the economic growth of the European Union in the next decades.

It needs to be noted, however, that the action of EU institutions finds its reasons also in the large gap in the use of digital technology currently present between large enterprises and SMEs.

The *Digital Economy and Society Index (DESI)* published by the European Commission in 2020 shows in fact that, on a European level, the abovementioned gap does not only interest complex technologies, such as advanced cloud or big data applications, but also basic digital solutions like enterprise resource planning software packages (ERP) or e-commerce (p. 16).

³² The first Communication of the 2020 EU Commission, describing its plans for the upcoming 5 years, is called *A strong social Europe for just transitions*, January 14, 2020.

³³ This data is available at the following link <https://www.digitalsme.eu/digital/uploads/Skills-for-SMEs-Strategy-2030.pdf>

³⁴ This data is available at the following link https://ec.europa.eu/growth/smes_en.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

	Large	SMEs
Use any ICT security measures	99%	92%
Make persons employed aware of their obligations in ICT 'security related issues'	91%	61%
Maximum contracted download speed of the fastest internet connection is at least 30 Mb/s	80%	49%
Use ERP software package to share information	78%	33%
Use any social media	78%	52%
Use social media for any purpose	76%	50%
Use customer relationship management (CRM) software	62%	32%
>50% of employed people use computers and the internet	55%	44%
>20% of workers with portable devices for business use	46%	36%
Sell online (at least 1% of turnover)	39%	18%
Receive electronic orders (web or EDI) from customers from other EU countries	23%	8%
> 1% of the total turnover web sales and B2C web sales > 10% of the web sales	10%	8%

Figure 9: Digital Intensity Index indicators tracking digitization processes (% enterprises), 2019

Source: European Commission, DESI Index 2020 (Elaboration on data from Eurostat, Community survey on ICT usage and e-commerce in enterprises)

According to the mentioned source, one of the main reasons for this discrepancy must be identified in the low level of digital literacy among owners, managers, and workers of SMEs (p. 12).

This view appears to be shared by extensive research conducted on the matter ever since the first decade of the century: for example, see *OECD, ICT, E-Business and SMEs, 2004*, which already identified one of the main barriers to the use of ICT in SMEs in the lack of "internal technological capabilities", but also of "managerial understanding and skills for e-business" (pp. 22-23).

This and other similar studies are mentioned in the context of a survey carried out among European and American SMEs (L. Arendt, *Barriers to ICT adoption in SMEs: how to bridge the digital divide?* Journal of Systems and Information Technology, 2008). The results of the survey, together with the abovementioned literature, brought Arendt to conclude that the main reason for the "digital divide" between SMEs and larger firms is not the lack of funds or access to the technology but the relatively low quality of human capital of SMEs, i.e., their lack of knowledge and skills (p. 106).

Naturally, the shortcomings of digital skills in SMEs do not constitute the only factor causing the abovementioned gap in the use of digital technology.

As underlined by a recent report of the Directorate-General for Research and Innovation of the European Commission, focusing mainly on the manufacturing sector (*Capitalising on the benefits of Research & Innovation Projects for Policy: The 4th Industrial Revolution*, 2018), the diffusion of advanced production technologies brought about by digitalization can be sometimes hindered by their elevated cost, the firms' limited resources or uncertainties about data security (p. 10): those elements



seem to affect mostly smaller companies, given that 90% of SMEs consider themselves lagging in digital innovation, compared to 60% of large industries (p. 22).

According to the ILO, another important factor that may hinder the use of digital technology in SMEs is their so-called "Low adoption readiness", which can be caused by the absence of risk orientation by the management, the low awareness of the benefits of digital technologies or the lack of "self-efficacy" i.e. confidence of the SME owner and staff to use them productively (ILO, *Small goes digital - How digitalization can bring about productive growth for micro and small enterprises*, 2021, pp.30-31).

However, the persistence of the problem related to the general lack of digital skills in SMEs has been considered cause for a deeper analysis: the next section of this report, therefore, will be focused on the shortcomings of the digital skills of SMEs personnel and the measures adopted to foster their development, both on a national and international level.

1.4 Fostering the development of digital skills in SMEs

As already underlined in the previous paragraph, the European Commission has recently taken action to strengthen the skills of the workforce of SMEs, therefore enabling them to adapt to the continuous challenges of the contemporary labor market, characterized by the rapidity of change of taste and technology (T. Lange, M. Ottens, A. Taylor, *SMEs and barriers to skills development: a Scottish perspective*, *Journal of European Industrial Training*, 2000, p. 5).

The importance of skills development is also highlighted in the so-called *European skills agenda for sustainable competitiveness, social fairness and resilience*, 2020, which sets ambitious objectives related to the up-and reskilling of the European workforce to be reached by 2025, and underlines how reaching these goals is particularly crucial for the competitiveness of SMEs (p. 3): a similar view appears to be shared by academic research, which is nearly unanimous in affirming that companies that are not able to develop their competences and knowledge assets accordingly to the external environment risk a sharp decline in their economic performance (P. Gubitta, D. Nicolai, *L'innovazione nelle imprese: considerazioni generali e risultati di un'indagine nelle piccole imprese*, *Microimpresa*, 2013, pp. 79-80, A. Bruzzo, *Per la trasformazione digitale delle Micro-PMI in Italia*, *Quaderni di ricerca sull'artigianato*, 2020, p. 337).

However, according to A. Halvarsson Lundkvist, M. Gustavsson, *Conditions for Employee Learning and Innovation – Interweaving Competence Development Activities Provided by a Workplace Development Programme with Everyday Work Activities in SMEs*, in *Vocations and Learning*, 2018, p. 46, skills development in SMEs is especially challenging, seeing that the conditions for its success appear to be different from those in larger enterprises: the authors identify one of the main reasons for the difficulty of SMEs to upgrade their workers' skills and competences in the lack of customized vocational education or training specifically focused on the needs and characteristics of smaller companies.

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

These findings appear to be acknowledged by the European Union, which has therefore been carrying out initiatives specifically directed at skills development in SMEs for a long time now: naturally, the lightning-fast technological progress of the last years, further boosted by the COVID-19 pandemic of 2020, has recently brought the EU institutions to adopt initiatives predominantly aimed at fostering digital skills.

An extensive overview of these initiatives can be found in the Final report of the study by Capgemini Invent, European DIGITAL SME Alliance, Technopolis Group, Skills for SMEs - Supporting specialized skills development: Big Data, Internet of Things and Cybersecurity for SMEs, 2019 written by in the context of a tender issued by the European Commission and EASME³⁵.

The report notably focuses on initiatives which, despite their differences in terms of focus areas, target groups, approach, and research methods, share the objectives of deepening the understanding of skills needs in European firms and piloting solutions to solve the related issues: according to the study, five of those initiatives are “particularly relevant” for SMEs (*IT Professionalism, Digital Skills, and Jobs Coalition, ENISA Network, Digital Innovation Hubs and makes me </digital>*) (pp. 92-93).

The *Skills for SMEs* Final Report also stresses the importance of sector-based initiatives, notably to stimulate skills development through the cooperation of several stakeholders such as businesses, trade unions, education and training institutions (p. 94).

One of the most important sectoral initiatives funded by the European Commission is the so-called *Blueprint for sectoral cooperation on skills*, firstly part of the *Skills Agenda for Europe 2016* and recently expanded within the *Pact for Skills of the Updated Skills Agenda 2020*.

The first phase of a Blueprint project entails an assessment of skills gaps in specific economic sectors carried out by the European Commission, which will then select specific “skills alliances” through a call for proposals. The alliances are composed of relevant “stakeholders” of the economic sectors in the object, such as businesses, trade unions, research, education and training institutions, public authorities. The chosen alliances will at this point have to develop a skills strategy, identify priorities, and propose concrete solutions to support the overall growth of the sector.

Given the specific focus of this report, i.e., the state-of-art of skills development in the metallurgy sector, it needs to be underlined that European stakeholders’ alliances in the sectors of automotive, additive manufacturing, steel industry, software services, and microelectronic manufacturing are currently active.³⁶

³⁵ Executive Agency for Small and Medium-sized Enterprises, which as of April 1, 2021, has been recently substituted by EISMEA (European Innovation Council and Small and Medium-sized Enterprises Executive Agency).

³⁶ The information on the Blueprint project was retrieved on the European Commission website, at this address: <https://ec.europa.eu/social/main.jsp?catId=1415&langId=en>



1.5 Insights from the metallurgy sector in Italy and Europe

Correspondingly to what has already been observed in the European context, the digitalization of Italian SMEs appears fundamental for the economic future of the country: according to the abovementioned research by A. Bruzzo, if the level of digitalization of Italian SMEs reached that of German SMEs the Italian GDP could increase by 7 points (*p. 338*), thus sensibly facilitating the economic recovery after the COVID-19 pandemic.

Following this reasoning, it appears therefore necessary to provide a sufficiently detailed description of the state of the art of digitalization in Italian SMEs, also through the analysis of some quantitative data on the matter.

Firstly, it needs to be underlined how, according to the already mentioned DESI Index of 2020, Italy appears to be sensibly below average in terms of digitalization compared to the other countries of the EU: for this report, it appears particularly relevant that, considering the human capital factor (composed of "internet user skills" and "advanced skills and development"), Italy appears to be the third last EU Member State.

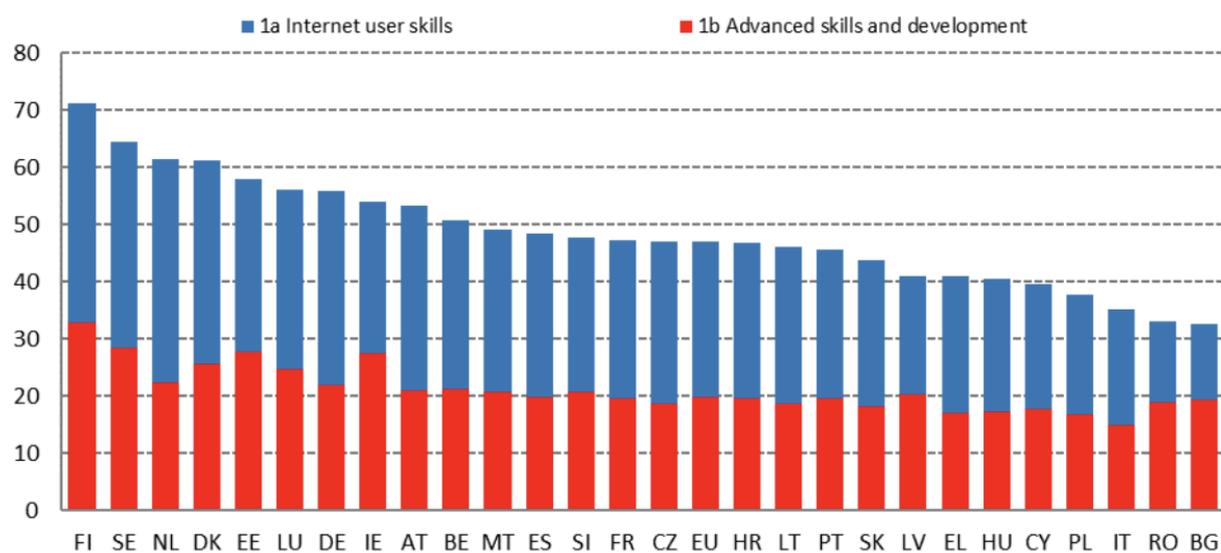


Figure 10: Human capital dimension (Score 0-100), 2021

Source: European Commission, DESI 2021

As easily predictable, similar data can be observed when focusing on the situation of Italian SMEs. According to F. Pascucci, V. Temperini, *Trasformazione digitale e sviluppo delle PMI. Approcci strategici e strumenti operativi*, 2017, p. 13, the percentage of Italian small (10%) and medium (24%) enterprises that invested in the digital upskilling of their workforce in 2016 was below the EU average (respectively 18% and 39%), confirming a previously existing trend.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Various scientific literature recently focused on this phenomenon, to understand its causes and consequences.

For example, the last-mentioned study, which focuses on the marketing strategies of SMEs in the Marche region, shows that most employers doubt the economical sustainability of digital training for their employees, despite being aware of the need for an appropriately skilled internal workforce to make the best use of new technologies (pp. 40-41).

The high level of awareness of the need for digital skills development among Italian SMEs employers and employees is also underlined by S. Baiocco, L. Westhoff, N. Lopez Uroz (CEPS), *Study on mapping opportunities and challenges for micro and small enterprises in offering their employees up- or re-skilling opportunities - Country reports - Italy*, 2020, p. 55.

The results of the mentioned study, conducted among micro and small enterprises of the country, show indeed that training is perceived as necessary to remain competitive, increase client satisfaction, and upgrade knowledge. However, the very same report demonstrates how micro and small enterprises generally lack a proper strategy for up-and re-skilling, with informal learning and self-learning being the most common form of training (p. 56).

According to G. Bandini, F. Caprio, *Le imprese italiane e le competenze mancanti. Un'analisi del Piano Industria 4.0*, Quaderni di Ricerca sull'artigianato, 2018, p. 451, one of the main factors causing the lack of structured training activities in Italian SMEs is to be identified in the perceived uncertainty of the results, in terms of profit, of a conspicuous investment on human capital. The authors also underline how this aspect is accentuated by the fact that smaller companies often do not have access to comparative studies and research on the matter, which precludes them from the possibility to perform an accurate cost-benefit analysis.

Digital skills development appears particularly crucial in the manufacturing sector, given the new production processes of Industry 4.0, based on automation, digitalization, and interconnection of machinery. Various ILO reports point also out that digitalization has the potential to help manufacturing firms to manage their value chains, improve visibility in supply chains, and reduce risks, through the use of AI and advanced analytics or blockchain technology (ILO, *Changing demand for skills in digital economies and societies: literature review and case studies from low- and middle-income countries*, 2021, p. 69). However, it needs to be noted how the mentioned digital technologies are already transforming production processes in manufacturing industries, with an evident effect on their workers' skill demand: according to G. Karacay, *Talent Development for Industry 4.0*, in A. Ustundag and E. Cevikcan, *Industry 4.0: Managing The Digital Transformation*, 2018, p. 127, the required digital skills of employees 4.0 nowadays range from "basic ICT literacy" to "advanced programming capabilities".

This, together with the abovementioned general difficulties in the implementation of training initiatives in Italian SMEs, brought both unions and employers' associations of the metallurgy sector to introduce specific provisions on the matter in the main national collective agreements applicable to

38



small and medium enterprises,³⁷ following the model of the national collective agreement for larger companies:³⁸ since 2016, most workers of the metallurgy sector dispose therefore of an individual right to 24 hours of professional training in three years, destined at acquiring linguistic, technical, management, soft and digital skills.

1.6 Managing remote work in SMEs

As already underlined in paragraph 2.1, pre-pandemic data shows that, in the context of the European Union, larger firms are more likely to adopt telework than SMEs: the report from the JRC of the EU Commission *Telework in the EU before and after the COVID-19: where we were, where we head to*, p. 7, shows that, in countries where small firms account for larger shares of employment, the rate of teleworkers is significantly lower.

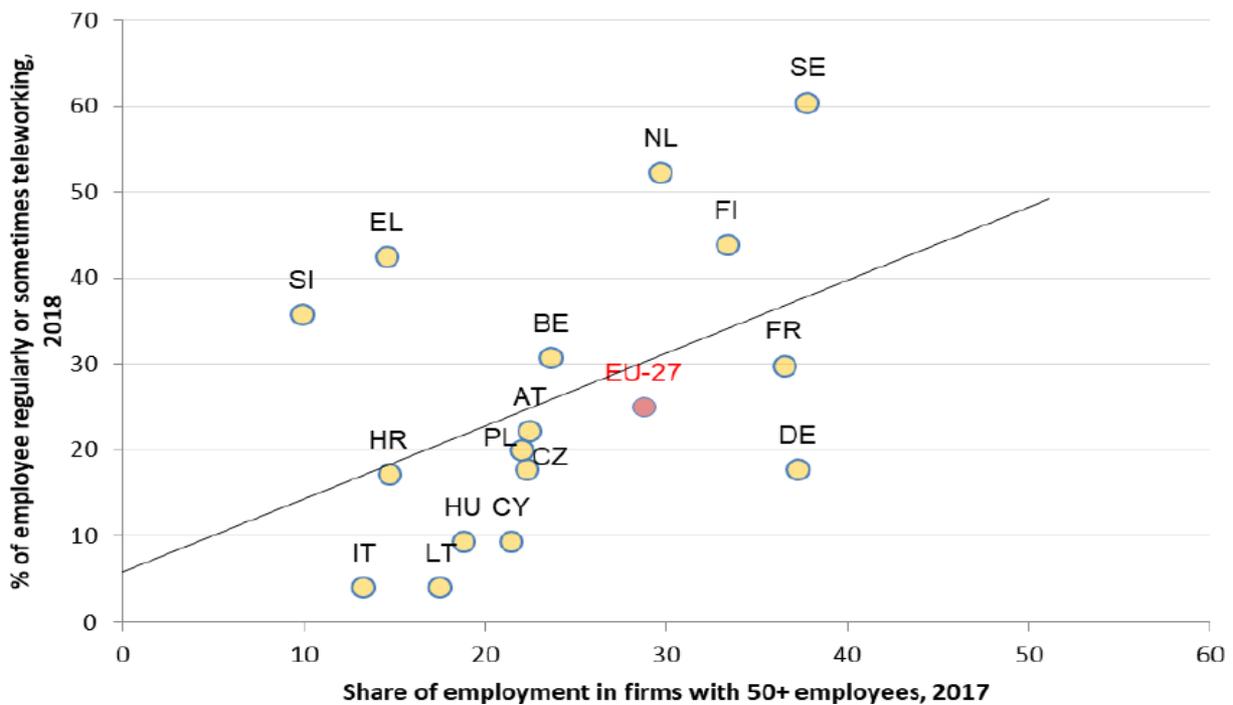


Figure 11: Telework and employment by firm size, knowledge-intensive business services, 2017

Source: European Commission, *Telework in the EU before and after the COVID-19: where we were, where we head to*, p. 7

³⁷ National collective agreement for SMEs of the metallurgy sector, signed by Confimi, FIM-CISL, UILM-UIL (2021-2024); National collective agreement for SMEs of the metallurgy sector, signed by Unionmeccanica Confapi, FIOM-CGIL, FIM-CISL, UILM-UIL (2021-2024).

³⁸ National collective agreement for the metallurgy sector, signed by Telemechanical, Assistal, FIOM-CGIL, FIM-CISL, UILM-UIL (2021-2024).

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The relevance of firm size in the adoption of telework is also confirmed by data regarding remote work in Italy: according to G. Filosa, *La IV rivoluzione Industriale alla Prova del Covid: smart working e Nuove forme di lavoro*, Professionalità Studi, 2020, p. 18, who directly quotes data collected by the Milan Polytechnic in 2019, in the pre-pandemic era 58% of large companies had implemented projects related to agile work, as opposed to only 12% of SMEs.

The reluctance of SMEs in introducing telework in their organizational models has however a long history, dating back to the years immediately following the introduction of the European Framework Agreement on Telework of 2002.

As it is shown by the results of eGap (E-society Gap Assessment Project), a survey carried out by five European countries plus Japan in 2002, most of the sample SMEs did not use telework, despite having a remarkable knowledge of the instrument and a very high level of technological growth (P. Di Nicola, *ICT and e-Work in European SMEs*, In P. Cunningham, Paul, M. Cunningham, P. Fatelnig, *Building the Knowledge Economy*, IOS Press, 2003, p. 1). The main reasons for this circumstance were identified in human and organizational factors rather than technological ones, such as the low level of the trust confided in employees working remotely, the need for better change management, and regional infrastructural support on telework adoption and practice (K. Dickson and F. Clear, *Comparative European Perspectives on the Diffusion and Adoption of Telework amongst SMEs*, in M. Sherif, T. Khalil, *Management of Technology: New Directions in Technology Management*, 2007, pp. 273-274).

More recent research, however, identifies costs as one of the most important factors influencing the relationship between telework and SMEs: according to P. Neirotti, E. Paolucci, E. Raguseo, *Mapping the antecedents of telework diffusion: firm-level evidence from Italy, New Technology, Work and Employment*, 2013, p. 31, the decrease of costs related to telework significantly contributed to its more frequent implementation in Italian SMEs between 2005 and 2009. In addition, the authors affirm that the increase in the teleworking rate was also attributable to the rise in the adoption of “mobile work” models, given the very limited success of “home-based telework”.

At first reading, the results of the last-mentioned research can appear partly outdated: it is common knowledge that, since the diffusion of portable technology has made it possible to work “anytime, anywhere”, “mobile work” models constitute nowadays the basis of most remote working relationships, with home offices being vastly replaced by “virtual offices” (J. C. Messenger, L. Gschwind, *Three generations of Telework: New ICTs and the (R)evolution from Home Office to Virtual Office, New Technology, Work and Employment*, pp. 195-201).

However, the Italian researchers’ observations regarding the cost of teleworking in SMEs are still particularly relevant, which is also confirmed by more recent studies.

40



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Surveys carried out worldwide during the COVID-19 pandemic of 2020³⁹ underline how the impact of the costs of teleworking is disproportionately higher for SMEs compared to larger firms: this factor, together with gaps in management skills and the reduced possibility to benefit from economies of scale, often results in the inability of SMEs to reap the benefits of teleworking, while at the same time fully experiencing its negative aspects and complications (OECD, *Exploring policy options on teleworking: Steering local economic and employment development in the time of remote work*, 2020, pp. 15-16).

According to the OECD Report, both national governments and subnational public institutions show a high level of awareness of the obstacles faced by SMEs in the implementation of telework and have therefore introduced, during the COVID-19 pandemic, a great number of initiatives aimed at facilitating this process.

Looking at the Italian case, for example, the OECD mentions the so-called “Digital Solidarity” program adopted by the Italian national government in 2020, which consists in the creation of an online portal where SMEs can register to receive free digital services provided by large private sector companies (p. 23). Regional initiatives, on the contrary, appear more oriented towards the provision of financial aid covering at least part of the cost of smart working plans, such as the necessary investments in digital training and/or IT equipment (p. 24).

Lastly, it needs to be underlined how the experience of the COVID-19 pandemic brought Italian unions and employers’ associations to define more specific rules regarding remote work in SMEs: the 2021 renewals of national collective agreements applicable to SMEs of the metallurgy sector⁴⁰ indeed include a fairly detailed description of the principles to be followed at the company level during the implementation of agile work.

³⁹ The mentioned survey regarding Europe underlines that, during the pandemic, only 56% of all companies with 50 or fewer employees provided remote access to email, applications, and documents for their employees, compared to 93% of all firms with more than 250 employees. Source: <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/safeguarding-europes-livelihoods-mitigating-the-employment-impact-of-covid-19>

⁴⁰ National collective agreement for SMEs of the metallurgy sector, signed by Confimi, FIM-CISL, UILM-UIL (2021-2024); National collective agreement for SMEs of the metallurgy sector, signed by Nonmechanical Confapi, FIOM-CGIL, FIM-CISL, UILM-UIL (2021-2024).



The social partners' strategies to deal with the future of work

The previous paragraphs include a comprehensive overview of the most relevant scientific literature regarding remote work and digital skills development, together with a brief analysis of the ways through which national-level collective bargaining of the metallurgy sector approached those topics through the years.

According to recent reports, social dialogue is said to be playing a slow but increasing role in addressing the effects of the digital transformation: collective agreements in most EU countries have begun to underline the importance of technological change, committing the signatory parties to continue discussing this challenge and promoting digital skills training for their employees (R.R. Contreras, *Impact of digitalization on social dialogue and collective bargaining*, Eurofound, 2021). The new activism of social partners regarding the topic is also signalled by the drafting of the European Framework Agreement on digitalization, signed by European social partners in 2020. Its goal is "to achieve a consensual transition by a successful integration of digital technologies at the workplace and by reaping the opportunities as well as preventing and minimizing the risks for both workers and employers and to ensure the best possible outcome for both employers and workers". A joint position on digitalization was also signed by the European social partners of the metallurgy sector (i.e., CEEMET and Industrial) in November 2020. The document, titled "The impact of digitalization on the world of work in the MET (Metal, Engineering, and Tech industries)" stresses the fundamental role of social partners in dealing with the new risks and opportunities brought about by digitalization, such as the flexibilization of working time, new skills needs, human-robot interaction, algorithmic management⁴¹, OSH protection technologies, data protection hazards.

European institutions have also recently adopted actions aimed at strengthening collective representation in digital work. An example of this policy is the recent *Proposal for a Directive on improving working conditions in platform work*,⁴² which provides rights of information in favour of trade unions regarding the use of automated monitoring or decision-making systems (art. 6, par. 4 and 9) together with appropriate means and channels for platform workers to communicate with each other and with their representatives (art. 15). In the Proposal's Explanatory memorandum, the European Commission stated explicitly how the purpose of these provisions is to promote social

⁴¹ For a complete picture of the algorithmic management issue from a labour law perspective see E. Dagnino, *Dalla fisica all' algoritmo: una prospettiva di analisi giuslavoristica*, Adapt University Press, 2019.

⁴² Full text available at the following link: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0762&from=EN>.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

dialogue and collective bargaining in the field of algorithmic management and, more generally, directed at platform workers⁴³.

For the purposes of the present Report, the directive on platform work would not only impact the lives of workers active in the delivery sector, given that numerous IT services are nowadays provided by digital platforms.⁴⁴

Given the abovementioned circumstances, simple desk research was not deemed sufficient to acquire a deep understanding of the dynamics of social dialogue dealing with the regulation of remote work and digital upskilling: it was therefore decided to supplement the results of the desk research with first-hand data from the protagonists of the collective process, such as union members and employers' representatives.

The abovementioned data, outlined and organized in the present paragraph, was gathered through two different methods, that is, semi-structured interviews and expert consultation.

Given the main focus of the project, i.e., Italian SMEs of the metallurgy sector, the majority of the selected interviewees (15) operate on the Italian territory. Among them, 7 are entrepreneurs and employers' representatives related to SMEs of the metallurgy sector, while the remaining 8 are union members mostly active in the Veneto region, a territory strongly characterized by the presence of SMEs.⁴⁵ Information regarding the European social partners' perspective on remote work and digital skills development was then gathered through the help of 3 additional interviewees (2 employers' representatives, 1 union member) from 3 different EU countries (Croatia, Germany, France).⁴⁶ 2 out of 3 interviews were conducted via videoconference tools, namely Zoom, and recorded.⁴⁷ Due to the unavailability of one interviewee to participate in a video call, their answers to the semi-structured questionnaire were gathered in writing.

⁴³ According to J. Nogarede, *No digitalisation without representation*, FEPS Policy Study 2021, p. 40, the mentioned proposal should additionally establish platform workers' rights to collective bargaining. For further information on this issue see also D. Porcheddu, *Proposal for a directive on platform work: algorithmic management and collective protection*, ADAPT Special Bulletin in collaboration with WEC Issue No.2, 28 February 2022.

⁴⁴ See, for example, the platform clickworker.com, which is a full-service crowdsourcing provider of data-oriented projects. The projects are automatically broken down into micro jobs and processed by qualified Clickworkers from the crowd (composed of 3.6 million freelancers from all over the world); the results are then reassembled and transmitted to the customer in a quality-assured manner.

⁴⁵ In more detail, this sample is composed of 3 company-level trade unionists, 4 territorial trade unionists, 1 national-level expert active in the considered union's research center.

⁴⁶ Despite the limited number of interviews that was carried out with regard to non-Italian employers' representatives and trade union members, the international perspective of the project is guaranteed by the insights provided by international experts during the First Expert Workshop of the November 26, 2021, described in paragraph 5.4.

⁴⁷ A dedicated privacy policy was sent to all interviewees before the interviews, in order to gather their informed consent for the purposes of the recording.



Following the input by the Framework Agreement on digitalization, which underlines the importance of taking into account existing initiatives, practices, and collective agreements, an additional paragraph, containing all best practices regarding remote work and digital skills development acquired through the interviews, was also added.

The information gathered through the desk research and the interviews was then the object of discussion during the First Expert Workshop, carried out in Bergamo on 26th November 2021, and the Second Expert Workshop, carried out in Brussels on April 29, 2022. Both events saw the participation of 16 union members, employers’ representatives, and researchers who were asked to contribute to the project (Stakeholder Board). The Experts’ observations and comments also form part of this paragraph.

1.7 Remote work

The first section of the questionnaire that was issued to union members and employers’ representatives was aimed at tracing the rate of diffusion of remote work before and during the COVID-19 pandemic in the metallurgy sector and exploring the ways through which it was regulated at the company and territorial level.

About the diffusion of remote working practices in Italian SMEs before 2020, the majority of the interviewed employers denied the presence of formal remote working projects inside their company, while at the same time indicating that some workers had nonetheless the habit of working remotely from time to time, given the “teleworkability” of their specific profession (i.e., engineers, programmers, agents).

This practice was also confirmed by a territorial union member active in the Belluno and Treviso provinces, who highlighted how informal remote work would often be used to extend the employees’ working hours or to guarantee their activity during periods of sick leave.

Other union members, however, underlined how some companies had developed remote working projects before the outbreak of the COVID-19 pandemic. According to a union member active in the Padova and Rovigo provinces, these kinds of projects were more common in firms of the IT sector: however, two company-level union members active in the Italian manufacturing sector also mentioned the presence of well-functioning remote working programs before 2020 in their firms, both realized through the means of a collective agreement.

During the pandemic, remote work in Italy seems to have been usually managed through unilateral initiatives taken by company management, with little to no involvement of the union. The interviews showed how this also happened in other countries, such as France. It needs to be mentioned, however, the case of an Italian industrial air-conditioning company, where the human resources teamed up with union representatives to identify which areas of the company would be most interested in mass remote work during the health emergency.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

To investigate the reasons for the different distribution of remote work in different companies of the same sector, interviewees were then asked about the elements that may facilitate and/or prevent its use.

One of the most common answers was that remote work cannot prescind from the presence of an advanced level of digitalization, which comprehends the availability of technological equipment to remote workers, the dematerialization of most procedures and documents, as well as a stable internet connection. It needs to be noted, however, that the last element often depends on factors which can't be controlled by companies: a German employers' representative and an employer active in the Lazio region stressed indeed how the productivity of remote workers could be negatively affected by a potential overload of the weak internet networks present on the territory.

Apart from technical pre-requisites, employers and trade unionists generally agreed that to work effectively, remote work implies a significant cultural change of both management and workers. On the management side, the traditional employer-employee control dynamics should be left behind, favoring instead a more trusting mentality, while employees should learn how to autonomously organize their working hours, adapting themselves to a result- and responsibility-based work organization.

Among other factors that may facilitate the diffusion of remote work, a company-level trade unionist mentioned the need for companies to appear attractive to workers in the recruitment phase: denying the opportunity to work remotely might hinder the company's effectiveness in attracting and retaining talent. An employer active in the IT sector instead affirmed that to prepare workers for the shift to agile work, workstations inside the company should become increasingly mobile and neutral, avoiding, for example, the displaying of personal belongings.

When asked about the elements that characterize the implementation of remote work in SMEs, some Italian employers mentioned the limited economic resources of smaller firms, which, together with the general hands-on mentality of small entrepreneurs, used to have complete control over all aspects of their organization, may hinder and/or delay digitalization. On the other hand, however, the higher degree of autonomy of SMEs compared to that of big industrial groups has been identified as a possible cause for the diffusion of more flexible organizational models, tailored to the needs of management and workers. It is to be noted that the very same view was also shared by a Croatian employers' representative.

According to an Italian employer's representative of the construction sector, it also needs to be noted that, given the reduced number of personnel, employees of SMEs usually carry out several different tasks during their workday, not all of which might be teleworkable: this view was also shared by a union representative of a manufacturing company of the Veneto region.

As a final remark on the matter, it needs to be underlined how trade unionists had radically different views regarding the accessibility of technological aspects of remote work for SMEs. According to some of them, implementing remote work is sensibly easier for bigger firms, being equipped with data

45



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

centers well-developed cloud systems, and given that most cybersecurity systems currently on the market are tailored on their specific needs; others, instead, argued that technological equipment necessary for remote work is economically accessible and, therefore, shouldn't be an obstacle to its implementation to SMEs.

A crucial element of the administered questionnaire was an inquiry about the role of social partners regarding the implementation of agile work: union members, entrepreneurs, and employers' representatives gave significantly different answers.

Union members often underlined the importance of collective bargaining not only in regulating several specific aspects related to agile work, such as the right to disconnect, OSHA requirements, supply of technological equipment, training opportunities, management by objectives and work-life balance, but also in guaranteeing equality of economic treatment between remote workers and other employees and in reducing the power of the employers in gatekeeping the access to remote work. A territorial trade unionist active in the provinces of Padova and Rovigo additionally argued that a detailed collective regulation of smart working is crucial for the enhancement of productivity.

French and Italian union members stressed the importance of a multi-level regulation of remote working: in their perspective, national-level collective agreements should provide general guidelines, following which company-level agreements should tailor remote work to the organizational needs of the interested firm. While being sometimes identified as an important means to manage remote workers' work-life balance, individual agreements are nevertheless considered not to be a sufficiently effective safeguard for their rights. As pointed out by a national-level labor law expert active in an Italian union's research center and other interviewees, territorial collective agreements could also play an important role in the regulation of remote work, especially for those SMEs lacking developed social dialogue processes.

On the other hand, the employers' perspective on collective bargaining regarding remote work appears more fragmented. Some of them shared, in fact, the trade unionists' view regarding the need for national and/or company-level collective regulation of remote work, arguing in some cases for a flexible and innovative approach by the actors of social dialogue; others, instead, stressed the need for a new intervention of the national and/or European legislator on the matter. A new legislative regulation in Italy was in some cases deemed necessary to clarify the aspects of remote work which as of today remain ambiguous and/or vague: the interviewee who expressed this view also argued in favor of the involvement of social partners in the legislative process. Another employer, however, identified a new law on remote work as a possible instrument that could let companies regulate remote work according to their production and organizational necessities, without "external interferences".⁴⁸

⁴⁸ Given that this was an answer to the question "Do you think that collective bargaining or other trade union actions can play a significant role in resolving difficulties when adopting the collective regulation of remote work in SMEs? If so, to what extent? At what level should they intervene? If not, why?" it can be inferred that the



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Lastly, an additional point of view on the regulation of remote work was offered from a non-Italian interviewee. A German employers' representative stated how remote work in Germany is comprehensively regulated by the law: however, given the new issues that emerged after the pandemic, such as that of work-life blending, it was affirmed that new sources of regulation might be needed.

Finally, when asked about a general opinion on the future of remote work in their sector/territory/company, most trade unionists shared an optimistic view, arguing that, given that both firms and workers are now more aware of the advantages connected to this new way of working, (i.e., reduction of workplace-related costs and absenteeism rates, improvement of worker satisfaction and work-life balance) remote work will be part of the organizational models of the future, especially for what concerns the IT sector. A French trade unionist, however, also underlined how the COVID-19 pandemic alerted employees' representatives on the dangers connected to the lack of face-to-face contact with and among workers. During lockdown periods, the work experience of remote workers is often translated on a one-on-one relationship with their superiors: therefore, the collective dimension of work would often be set aside. Consequently, if remote work involved more people in the future, trade unions would have to change their means of communication, their organization methods, together, perhaps, with the nature of their claims.

Other trade unionists identified nonetheless the skepticism of some employers regarding remote work, mostly connected to a supposed reduction of productivity of workers who aren't physically present in the workplace, as a factor that might hinder the development of remote work projects. The interviewees from the employers' side confirmed this suspicion: most of them indeed denied the possibility of a protagonist role of remote work in the future of companies of the Italian metallurgy sector. The reason for this was mainly identified in the need for in-person confrontation between employees and with the employer, considered to be especially important for young workers; other determining factors were the lack of involvement in the company's mission of people working remotely, and the circumstance according to which not all jobs of the metallurgy sector are teleworkable.

However, most employers agreed on the fact that, while remote work will not be as common as many think it will be, the future of work will not exactly reproduce the pre-covid reality. In fact, according to some of the interviewees, remote work will be a useful instrument for women and workers living far away from their offices, but also for more effective management of work meetings. In the view of an employer active in the Umbria region, the use of remote work might be limited to emergencies that prevent workers to enter their physical workplace (i.e., pandemics, catastrophic natural events).

"external interferences" to which the interviewee was referring are identifiable with collective bargaining and social dialogue.

47



1.8 Digital upskilling

The second section of the questionnaire was aimed at registering the social partners' opinions regarding the impact of digital innovation on the production processes of the Italian metallurgy sector, and its consequences on the need for digital skills level of its workforce. In addition, the questionnaire was also aimed at investigating whether collective bargaining was deemed to be an efficient tool to manage these changes and to foster the development of workers' digital skills, with a specific focus on SMEs.

To introduce the topic, interviewees were asked to identify which technologies will play a main role in innovating production methods in the metallurgy sector: the answers went from the Internet of Things (IOT), Big Data, automated lines of production, numerical control machines, to 3D printers, robots, artificial intelligence, and optical readers. In addition, one of the interviewed employers pointed out how many aspects of modern manufacturing processes entail some level of programming, while one trade unionist identified the cause for the need for advanced digital skills in the personalization of consumer demand, which requires more flexible production processes.

When asked if the workers' digital skills level was sufficient to fruitfully manage those new technologies, the answers of both employers and trade unionists varied significantly. Some trade unionists deemed the digital skills of workers as insufficient, highlighting how many workers lacked not only advanced digital skills but had also difficulties in correctly handling basic digital tools. One of them also underlined how the shortcomings of digital skills in the workforce especially affect SMEs.

The majority of the employers' representatives, however, judged their workers' digital skills to be adequate to the kind of production carried out inside their firms. For example, an interviewee affirmed that, given the specific kind of context in which he operated (IT), all employees had the sufficient digital skills to work productively; an entrepreneur active in the manufacturing sector underlined that many activities carried out inside his company didn't require a very high digital skill level, but also that, when innovation was needed, workers had no problem in adapting to technological changes, such as those concerning the automatization of production lines.

Most employers and employees' representatives agreed nonetheless on the presence of significant discrepancies among the workforce's digital skills level, signalling the presence of a small number of workers possessing very advanced digital skills, but also of a vast majority of workers lacking even basic competencies: an employers' representative from Croatia underlined how digital skill shortages vary also based on the geographical region taken into consideration. Lastly, it is to be noted that, according to many, age plays an important part in affecting not only workers' digital skills, but also their attitude towards training opportunities.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Some interviewees also expressed concerns regarding a possible mismatch between the digital skills needs of companies of the metallurgy sector and the professional profiles on their territory.⁴⁹

It needs to be noted that, according to Italian and French trade unionists, this circumstance can derive from the reluctance of companies to invest resources for their employees' training, while preferring to recruit already trained workers. This was partly confirmed by the view expressed by an employer of the Italian IT sector, who affirmed that, in his experience, "traditional" recruitment operations had more advantages than the creation of training programs for younger workers, given the difficulties in retaining talents after their conclusion.

When asked about ways through which companies have tried to solve the problem of digital skills shortages and mismatch, some trade unionists and one employer highlighted some initiatives regarding skill mapping inside firms, carried out with the aim of tailoring training to the workers' digital skills shortcomings. In one case, it was underlined how a company decided to carry out an annual informal meeting with the trade union representatives, directed at periodically monitoring the company's digital skills needs providing video adequate training opportunities. A trade unionist active in the Padova and Rovigo provinces argued in favor of collaboration among territorial social partners and other institutional actors, aimed at guaranteeing the constant presence of specific professional profiles and skills on the territory.

In some of the abovementioned experiences, social dialogue among union representatives and employers was deemed as crucial for the implementation of digital skills training: however, the viewpoints of the interviewees regarding the role of social partners on this topic varied considerably, especially among employers.

An employer active in the Italian manufacturing sector, for example, strongly opposed the involvement of the union in the creation of training programs, arguing that those kinds of initiatives should exclusively be developed by companies, so that they can tailor the courses to their specific needs. On the other hand, other employers appeared to be mildly favorable to the involvement of unions in training initiatives, while others stressed the fact that collective bargaining should guarantee the workers' right to continuous training.

According to a Croatian employers' representative, the phenomenon of skill mismatch should be addressed through a synergic action between companies' HR departments and trade unions, which have constantly updated information regarding the workforce's skills gaps: those entities should therefore help training institutions to put in place specific initiatives aimed at tackling the problem. The intervention of training institutions was said to be especially needed by SMEs, which often lack the human and financial resources to implement this kind of initiative.

⁴⁹ This opinion was expressed by an employers' representative and a trade unionist, both active in the Veneto region, but also by an employers' representative from Germany.



Trade unionists, on the other hand, were generally in favor of the use of collective bargaining as a means of regulating training initiatives on digital skills: some of them, however, underlined how a pre-requisite for such a process in the presence of an advanced level of dialogue between the employer's and the workers' side, a factor which falls beyond the firms' dimension.

National- and territorial-level collective bargaining was identified as the most appropriate to foster and discipline digital skills training; this, according to a company-level trade unionist, might especially benefit SMEs, which generally lack strong social dialogue processes. However, the identification of company-level unionists who can operate on this topic was also identified as a good practice.

Finally, it needs to be noted how, when talking about the role of collective bargaining in managing digital innovation, some interviewees stressed the importance of job classification, an instrument that was deemed fundamental to enhance the workers' professionalism⁵⁰ and newly acquired skills.

1.9 A selection of good and less successful initiatives

During the interviews conducted among Italian and European trade unionists and employers' representatives, some initiatives stood out as particularly successful in dealing with the topics of remote work and digital skills development.

Not all of them were realized through collective bargaining or social dialogue practices: however, they were included in the present paragraph to provide a complete overview on the matter.

Regarding the topic of remote work, the Italian trade unionists mainly reported some successful examples of collective agreements, such as that stipulated in a large firm⁵¹ of the Veneto region producing heating systems. This collective agreement dates back to 2018, and it regulates remote work for white-collar workers of the firm, favoring specific personal needs (es. those who live far from the workplace, or who need to take care of infants or disabled relatives). Before the pandemic, the mentioned collective agreement was applied only to around 20 workers: however, according to the interviewee, its presence helped to manage the massive use of remote work during 2020, given that the only operation needed was the extension of its field of application.

It needs to be noted that the mentioned firm had already expressed the intention of regulating remote work in a company-level collective agreement dating back to 2016, before the adoption of law No. 81/2017. The mentioned agreement instituted a joint committee composed of workers' and firm

⁵⁰ This term is used according to the definition of L. Evans, *Reflective Practice in Educational Research: Developing Advanced Skills*, Continuum, 2002, i.e., "an ideologically-, attitudinally-, intellectually-, and epistemologically-based stance on the part of an individual, in relation to the practice of the profession to which s/he belongs, and which influences her/his professional practice".

⁵¹ Statements about firm dimension follow the parameters of the European Commission, such as those reported at https://ec.europa.eu/growth/smes/sme-definition_en

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

representatives, invested with the task of discussing the implementation of smart working practices coming up with shared proposals.

Other good examples of remote work agreements are that of a firm producing items related to the entertainment industry (photography, video making, etc.), and that of a firm of the automotive sector, both located in the Veneto region. The first remote work agreement, dating back to 2018, introduced the possibility to work remotely for two days a week for those workers whose tasks were considered teleworkable and stated that both the firm and the trade unions should monitor its implementation every six months.

A trade unionist from France also signalled the presence of a few company-level agreements regarding telework, signed in large companies of the metallurgy sector.

However, the most interesting best practice was identified in specific guidelines issued by a national trade union to help territorial or company level representatives to negotiate the conditions of the implementation of remote work. The occasion for the creation of the mentioned guidelines was the publication, at the end of 2020,⁵² of a cross-sectoral collective agreement regarding remote work, signed by the most important employers' and employees' representative associations in France,⁵³ which updated the previous regulation⁵⁴ in light of the new issues emerged during the COVID-19 pandemic.

The publication of the new agreement was identified by the trade union as a factor that might encourage the adoption of remote work in companies of the metallurgy sector, and/or the renegotiations of its conditions: therefore, the guidelines contain practical advice for unionists involved in the process, such as the clauses that should be included in the collective agreement to guarantee a worker-friendly remote work implementation, but also the explanation of the legal consequences connected to the adoption of the new regulation.

No company-level collective agreements in SMEs on this topic were mentioned by the Italian or European interviewees. However, an Italian national-level labor law expert active in a union's research center mentioned the presence of a regional collective agreement aimed at regulating remote work in SMEs.

The agreement was stipulated after the initiative of the Veneto regional government, which funded the creation of a joint committee for its drafting, composed of both employer and employee representatives. It needs to be noted that, when adopting this initiative, the Region stressed the importance of collective bargaining in the regulation of remote work, which has the fundamental role to better define the aspects of the legislation which remain unclear but also to promote this new way of working among SMEs. The agreement, signed in December 2019, presents a series of options

⁵² Accord National Interprofessionnel de Télétravail, signed on the November 26, 2020.

⁵³ MEDEF, CPME, U2P, CFDT, CFTC, FO, CFE-CGC.

⁵⁴ Accord National Interprofessionnel de Télétravail, signed on the July 19, 2005.



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

regarding different aspects of remote work (working time, the right to disconnect, etc.) which SMEs can choose because of the specific needs of their organization. The interviewee stressed that the agreement was not intended to specifically regulate remote work, but mostly to provide a service for SMEs.

Virtuous initiatives regarding digital skills development were on the contrary described by both trade unionists and employers. However, while trade unionists mostly mentioned initiatives carried out through collective bargaining, employers instead identified as successful only initiatives carried out without any practices of social dialogue.

On the side of trade unionists, some underlined how the individual right to professional training laid down in the national collective agreement of the metallurgy sector was successfully exercised mostly where training was structured in short and agile modules and carried out through mixed methods (e-learning instruments, digital platforms, frontal lectures, etc.) This was deemed necessary since long hours of training are not fruitful for all workers: through these methods, however, most trainees were able to acquire basic and/or advanced digital skills.

A trade unionist active in a firm of the automotive sector mentioned how all workers (blue-collar included) were recently directly involved in the creation of professional training courses. Through the means of specific questionnaires, issued by an external training institution, workers self-identified their specific digital skills gaps. The results of the questionnaires helped to create training courses specifically targeted at tackling those gaps, which were then implemented through a New Skills Fund⁵⁵ collective agreement.

Another interesting experience is that of a firm producing heating systems, which recently signed a New Skills Fund collective agreement with the help of a regional training institution. Alongside the introduction of training courses, the firm also implemented a digital portal that archives, together with paychecks and corporate communications, how many training hours the worker receives. In the perspective of the trade unionist who described this experience, this system could be fruitfully used by workers who might want to find another employment opportunity, given the availability of proper certification of the acquired skills.

The firm which provided the mentioned training opportunity had already implemented a program regarding digital skills development in 2019, aimed at completing the 24 hours of professional training required by the national collective agreement of the metallurgy sector. One of the training modules of the collective agreement, called “Digital Basics”, comprehended training regarding the topics of digital transformation, Internet of Things, Big Data Analytics, and blockchain; another, instead, focused on the use of the internet and cybersecurity.

Lastly, a trade unionist active in the Belluno and Treviso provinces mentioned a collective agreement signed by a firm producing items related to the entertainment industry, aimed at providing workers

⁵⁵ See paragraph 5.1.



with skills that would facilitate the transition towards the innovative production processes of industry 4.0. It is important to mention how the skill set deemed necessary to this end was not only composed of technical skills but also by so-called soft skills, that is, behavioural and interpersonal skills.

As it was mentioned at the beginning of the present paragraph, the training experiences considered successful by employers' representatives didn't rely on collective agreements and/or social dialogue practices.

For example, when asked about virtuous initiatives in terms of digital skills development, an employer mentioned a recent call for applications of the Umbrian regional government, which allows firms to organize a 6-month-training path for unemployed young people under 30. The training course is completely funded by the region: in addition, if the firm then decides to hire the trainees, it can benefit from relevant tax reliefs.

Another employer, instead, mentioned the approach to professional training in his firm, which operates in the sector of medical prostheses in the Veneto region. Given that digital innovation deeply modified his lines of production (i.e., through the use of 3D printers), he established the habit of pre-empting the introduction of every new technological equipment in his firm with at least 30 hours of professional training. These training initiatives are usually funded through the resources of Interprofessional Funds.⁵⁶

1.10 The point of view of international experts

As mentioned at the beginning of the present chapter, the preliminary findings of the desk research of the project were presented to an International Stakeholder Board, during the First Expert Meeting, which took place on the 26th of November 2021. A latest version of the research was instead presented during the Second Expert Meeting, which took place on April 29, 2022. During both occasions, the Board, composed of both employers' and employees' representatives, presented their point of view regarding the topics of our project, at the same time providing significant insights on the realities of the countries in which they operate.

⁵⁶ Financial resources available to firms and managed by specific entities composed by employers' and employees' representative associations.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

Employers Representatives	Workers Representatives
Andrei Kelemen, 3B ICT Network	Isabelle Barthes, IndustriALL
Paul Roevens, UNIZO	Ewa kedzior, solidarnosc
Stanislav Orchanov, BASSCOM	Alena Paukrtova, ČMKOS
Jokin Garatea, CONETIC	Warda Ichir, FGMM
Amadine Zimmerle, DIGITAL SME FRANCE	Paolo Gubitta, Digital Work Research Center
Andrea Ardizzone, ASSINTEL	Antje Utecht / Thomas Habenicht, IG Metall
Eduard Filippovs, Latvijas Biznesa savienība	Giuseppe Guerini, CECOP-Europe
Maximilian Buchleitner, WKO	Stefania Marassi, Researcher

Figure 12: IRESDES4.0 European Stakeholder Board

Source: European Digital SME Alliance⁵⁷

For example, it was possible to understand how after the recent reform of the Polish Labor Code, which took place in 2020, the introduction of remote work in companies is conditioned upon its regulation through a collective agreement, and, therefore, how a surge in social dialogue activities regarding remote work can be expected shortly. On the contrary, it was underlined how, in another country of interest of our Board, i.e., the Czech Republic, remote work is not very common in the metalworking sector. Provisions regarding remote work in the Labor Code are weak and not detailed, and sectoral collective bargaining plays little to no role in this context. The most important social dialogue experiences regarding the topic occur at the company level, where some employers provide booklets to remote workers regarding topical issues such as OSHA requirements.

OSHA was one of the main topics that the Board deemed as in need of specific regulation through collective agreements regulating remote work. Per the scientific literature which underlines how remote work could enhance the possibility of psychosocial issues such as stress, work-life blending, overworking (J. Popma, *The Janus face of the 'New Ways of Work' Rise, risks and regulation of nomadic work*, WP ETUI, 2013, No. 7, pp. 10-16) and isolation (C. Spinuzzi, *Working alone together coworking as an emergent collaborative activity*, *Journal of Business Technology and Communication*, 2012, No. 26, pp. 402 e ss), the social partners stressed how this topic should be tackled by collective bargaining and social dialogue. One member of the Board, in particular, appeared in favour of an active role of trade unions in redesigning working spaces, arguing that, during the occasions in which remote

⁵⁷ <https://www.digitalsme.eu/projects/iresdes-4-0/>. The experts were selected through a public procedure of call for experts advertised through the official websites and social media of the project partners which ended on September 4, 2021. The call is available at the following link: <https://www.digitalsme.eu/european-stakeholder-board-social-dialogue-for-economy-society-4-0/>.



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

workers spend their time in the company's premises, they should work in so-called "open spaces" to make up for the isolation they might feel while working remotely.

However, the threats to remote workers' health and safety are not only related to psychosocial risks: in fact, medical literature often argues how the lack of ergonomic equipment and the sedentary lifestyle of remote workers could lead to Musculoskeletal disorders (MSK) (A. Moretti, F. Menna, M. Aulicino, M. Paoletta, S. Liguori, and G. Iolascon, *Characterization of Home Working Population during COVID-19 Emergency: A Cross-Sectional Analysis, International Journal of Environmental Research and Public Health*, 2020, No. 17). During the discussion with the Board, the creation of specific funds to cover the costs for the ergonomic equipment necessary for remote workers was highlighted as a possible solution for this issue.

Lastly, one member of the Board stressed the importance of the topic of the data protection of remote workers, underlining how the new technological equipment for the monitoring of workers' performances could potentially pose a threat to their privacy: in accordance with relevant literature on the topic (A. Todoli-Signes, *Algorithms, artificial intelligence and automated decisions concerning workers and the risks of discrimination: the necessary collective governance of data protection, Transfer*, 2019, Vol. 25, Issue 4, but also E. Dagnino, I. Armaroli, *A seat at the table: negotiating data processing in the workplace. A national case study and comparative insights, Comparative Labour Law & Policy Journal*, 2019, Vol. 41, n. 1) it was therefore concluded that the use of this kind of instruments should be thoroughly evaluated before its implementation, and that workers' representatives should be involved in the decision-making process.

Concerning the topic of digital skills development, the Experts firstly commented on the statistics regarding the low number of ICT professionals in many EU countries (Italy included) which were illustrated in the first part of this Report: during the discussion, the insufficiency of ICT specialists in Bulgaria shown by recent Eurostat's data (*Eurostat, online data code: isoc_sks_itspt*) was confirmed.

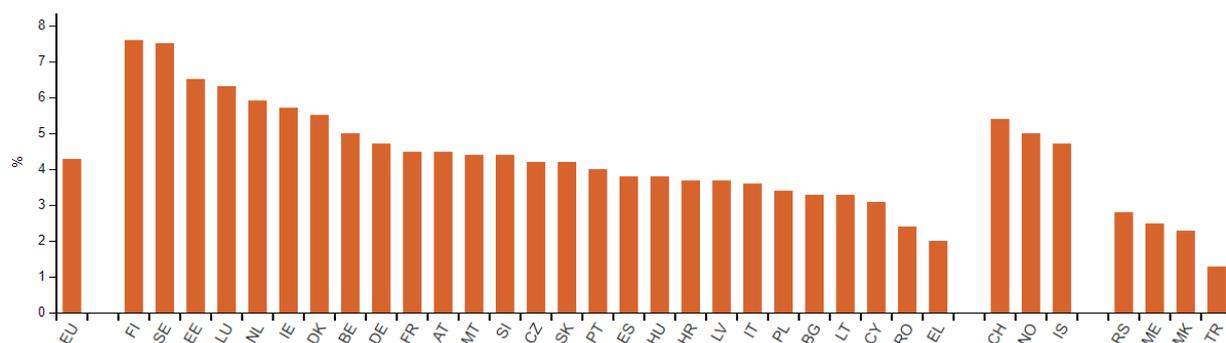


Figure 13: Proportion of ICT specialists in total employment, 2020

Source: Eurostat [isoc_sks_itspt]

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Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

However, it was also agreed upon that the European data showing a low level of digitalization in SMEs might be not accurate, given that SMEs mostly outsource their IT services, rather than having an internal worker invested with that specific task: in addition, it was underlined how ICT specialists are mostly self-employed, and therefore are usually shared by many companies. Then, it was also pointed out how data about micro-enterprises is often not considered by European surveys and analysis. European data should also increase its accuracy in terms of digital skills level, providing more precise distinctions between workers with basic and advanced digital skills.

One member of the Board affirmed that to attract workers with high digital skills in Europe, and therefore reduce the process of outsourcing, their salaries should be increased. Another possible way to increase the level of digitalization in SMEs was identified in the "education" of small and medium entrepreneurs on the importance of new technologies as a means of talent retention and competitiveness in order to better exploit the funding and training opportunities offered by private and public, supranational, national and local entities. Employers' organizations were identified as the best subject to provide SMEs with this kind of information, perhaps with training programs based on the so-called peer-to-peer approach. However, it was underlined how the action of national and local governments should also be aimed at promoting digital skills development: joint initiatives and policies of social partners and governments are therefore crucial to efficiently communicate the necessity for digital skills increase.

The importance of supporting SMEs in exploiting the opportunities stemming from digitalization and implementing digital skills training was underlined by both employers' and employees' representatives participating to the Board, who underlined how employers' organizations and, generally speaking, social dialogue, could play a crucial role in this matter. In Austria, similar initiatives have been carried out by the Chamber of Commerce: SMEs which would like to introduce digital skills training can benefit from the advice of certified experts, to provide specific training paths tailored to the needs of employers and employees.⁵⁸ In other countries, such as Bulgaria and Poland, digital skills training both in SMEs and larger companies is not generally regulated through social dialogue and collective bargaining, despite them being identified as the most suitable instruments for its introduction and management.

The creation of flexible training paths, tailored to the necessities of the single worker, was especially underlined by a member of the Board, who advocated in favor of structuring digital skills training in single modules, each concerning specific instruments and/or skills. This solution was judged as being useful to guarantee the employability of all kinds of workers: older workers could especially benefit from it, given their possible difficulties in enduring long hours of training. However, it was also argued how the ground rules for digital skills training should be defined at the EU level and/or at the supply chain level.

⁵⁸ <https://www.kmudigital.at>



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

However, the introduction of tailored training paths is also generally recognized as a useful tool to enhance the companies' productivity. During the discussion, skill mapping was sometimes identified as crucial to anticipate the companies' future needs: one member of the Board, however, offered a different point of view, by arguing that the technologies which will have a main role in the production processes of the future (Artificial Intelligence, Big Data, etc.) are already commonly agreed upon, and, therefore, skill mapping processes appear to be redundant.

Lastly, with no claims to be exhaustive and considering that the following issue is not among those of primary interest for this report, it should be noted that Board members underlined how actions should be taken to increase the level of digital sovereignty in the European Union, which could provide entrepreneurs with a wider range of different options regarding technologies to implement in their companies' production processes. Both top-down and bottom-up approaches were proposed, together with the drafting of a European Framework Agreement on the matter.

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Focus: the reaction of Italian collective bargaining to the phenomenon of digitalization

During the last years, digitalization and automation have acquired an increasingly important role in the world of work, changing and innovating the production techniques of many economic sectors.

The transition from “traditional” production methods to the use of instruments such as the Internet of Things, Big Data, Collaborative Robotics, 3D Printing, and Artificial Intelligence constitutes today a reality that needs to be faced by all the actors of the economic market, also given its forecasted occupational consequences. According to a famous study from 2018, 14% of jobs in OECD countries are highly automatable, while another 32% of jobs have a risk of automation between 50 and 70%: in the perspective of the authors, this means that a significant share of tasks of those jobs could be automated, changing their skill requirements (*L. Nedelkoska, G. Quintini, Automation, skills use and training*, OECD Social, Employment and Migration Working Papers No. 202, p. 7). The COVID-19 pandemic of 2020 has visibly sped up the process: the massive use of digital tools during the lockdown period has underlined how much the current production system depends on the workers’ ability to efficiently use them.

For these reasons, the Italian social partners have recently put in place measures that aim at governing the mentioned phenomenon, notably providing specific regulations for remote work before, during, and after the pandemic, and answering to the need for an update of the digital skills of the workforce.

It can be therefore stated that today the main source for the regulation of digitalization in Italy is collective bargaining, which in many cases integrates and/or specifies the legislative provisions on the matter.

The following paragraphs are aimed at providing an overview of the governance of digitalization in the metallurgy sector, through the analysis of 98 company-level agreements on the topics of digital up- or re-skilling and remote work.

1.11 Digital upskilling in the metallurgy sector

In the second half of 2020, the Italian Parliament issued a law (l. 77/2020, converting decree 34/2020) which created a brand-new instrument for reskilling of the national workforce, called “New Skills Fund”.⁵⁹

⁵⁹ The Italian name is “Fondo nuove competenze”. The translation is provided by Eurofound's COVID-19 EU PolicyWatch, Factsheet for case IT-2020-43/1615, which can be found at the following link https://static.eurofound.europa.eu/covid19db/cases/IT-2020-43_1615.html

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The “New Skills Fund”, set up under the premises of ANPAL (the National Agency for Active Labor Market Policies), can be used by companies to cover the costs for the training of their employees: the resources that compose the fund are in part provided by the Italian state (400 million euros for 2020, 230 million euros for 2021), in part by company-financed funds (Fondi paritetici interprofessionali, i.e. Forma.Temp), and lastly by European Social Fund (ESF) resources, originally destined to National and Regional operational programs (NOPs and NORs).

The access to the fund is conditioned upon the conclusion of a territorial or company-level collective agreement, which must define, among other elements, how many of the ordinary working hours of the single employee should be destined to training from that moment on every worker can benefit from a maximum of 250 hours of training, which must be distributed on a 90/120-day span.

It is crucial to underline that the workers involved in the training programs are not interested in a decrement in their wages despite the reduction of their working hours, given that the cost of the training hours is entirely covered by the resources from the fund and does not, therefore, constitute an additional burden on the companies.

The “New Skills Fund” has been considered a very interesting instrument by many experts, seeing that such a massive incentive to workforce up- and reskilling appears unprecedented in Italian labor law history. This view seems to be shared by the very targets of this measure, given that, up to now, around 2500 companies have chosen to provide training modules covered by the fund.

Another original feature of the “New Skills Fund” is the central role of collective bargaining, which constitutes its primary source of regulation: for this reason, to provide an overview of digital upskilling in the metallurgy sector, it appears crucial to analyse some of the agreements on the matter concluded in 2020.

This section of the report contains therefore the analysis of 14 company-level agreements, which provide specific training modules entirely financed by the fund.

First of all, it is important to focus on the premise of the agreements, which in most cases describes the reasons stated by the parties for the introduction of this measure.

Those reasons often mention the ones indicated by the law (article 88, c. 1 decree 34/2020), i.e., the transformation of the productive and organizational needs of the company or the need to foster relocation paths for the employees, adding nonetheless more information.

Some agreements also mention that the pandemic has highlighted a skills gap already present in the workforce and that the training modules are addressed to fill it (Cerrato, Omis, TF Elettra); others also add that the enhancement of the workers’ skills is considered as an opportunity to seize during the temporary reduction of the workload caused by the COVID-19 emergency (Fata Logistics Systems).

59



Also strongly connected to the pandemic is the frequent reference to the structural implementation of agile work in the companies’ organizational model, and the consequent need to update the workers’ digital skills (Technoalpin), to avoid their professional and social exclusion (Enerblue, Cerrato).

Another interesting element present in the premises of the analyzed agreements is the need to increase the “human capital” of the company⁶⁰ (Sirti, Leitner, Technoalpin), making sure that the workers maintain a high level of “culpability” (Omis, Enerblue, Cerrato).

To achieve the aforementioned results, the companies provide a variety of different training modules: it is crucial to underline that, while some of the modules are related to strictly considered digital skills,⁶¹ the majority of the training courses are connected to the innovation of the companies’ production techniques, and to the consequent need to update the workers’ skills.

Thus, the agreements include training modules related to cybersecurity and digital documents storage systems (Omis), the use of new management software (Cavart, NMLK) or Office 365 programs (Technoalpin, Cerrato), machine learning, and cloud computing (Enerblue), but also to the development of new production models in the context of Industry 4.0 (Baxi, EMTB).

According to Italian law, the agreements should also define which organization will provide the training.⁶² In most cases, digital skills training is provided by a third entity, i.e., a third company that specializes in this subject (Omis, Enerblue, Baxi): however, sometimes the agreements state that those training modules could also be conducted by internal personnel (EMTB, Leitner, Technoalpin, Cavart).

Lastly, the agreements specify which will be the teaching methods: while some agreements mention only “traditional” ones, i.e., face-to-face training (Cavart, Enerblue, Omis), others include other techniques, such as training on the job (Technoalpin, Fata Logistic Systems, Cerrato) or e-learning (Leitner, Baxi).

1.12 Smart working in company-level collective bargaining

Before entering the topic of remote work collective regulation in the metallurgy sector, it needs to be mentioned that on the 7th of December 2021, the Italian national social partners signed an intersectoral Protocol on Agile work,⁶³ drafted in collaboration with the Italian Ministry of Labor. The importance of this document stems from the fact that the Italian law regarding remote work (law No. 81 of 2017)

⁶⁰ This is mentioned in article 1 of the intermenstrual decree of October 22, 2020, related to the New Skills Fund.

⁶¹ See definition in paragraph 1.

⁶² Article 5, paragraph 3 of the intermenstrual decree of October 22, 2020, related to the New Skills Fund indicates the specific subjects who are allowed to provide the training, which comprehend both public and private training entities.

⁶³ Original translation of “Protocollo nazionale sul lavoro in modalità agile”.

Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

does not indicate the need for the involvement of social partners: remote work could potentially be regulated only through the means of an individual agreement between employer and employee.

The Protocol, instead, explicitly identifies collective bargaining as the privileged source of regulation for remote work and provides guidelines for national, territorial, and company-level collective bargaining signed by the representative associations which adhere to the Protocol, addressing all the sensible topics concerning this new way of working (working time and space; the right to disconnect, OSHA requirements, IT equipment, etc.).

It needs to be noted, however, that even before the issuing of the Protocol on agile work, Italian social partners had already started to regulate remote work through collective bargaining: the first examples of collective agreements on the topic date back to 2012, and are therefore also previous to the already mentioned law No. 81 of 2017.⁶⁴ The contents of the Protocol were drafted after the consultation, carried out by a group of remote work experts⁶⁵ during the second half of 2021, of institutional Reports, other countries' remote work legislations, but also of a vast number of company-level collective agreements.⁶⁶

This choice was made because, to provide a sufficiently clear overview of the regulation of “smart working”⁶⁷ in Italian collective bargaining, focusing on company level agreements appears crucial, since nation-wide collective bargaining usually regulates smart working only from a very generic point of view, merely establishing some ground rules regarding its discipline.

The national collective agreement of the metallurgy sector does not constitute an exception to this “rule”. Its latest version (2021) delegates the definition of a regulatory framework on the topic to a joint commission, which will be guided only by the general principles laid by the agreement itself: the right to disconnect, the right to training, union rights, data protection, etc.

For this reason, this section of the report is based on the analysis of 41 company-level agreements regarding smart working, which provide a more detailed description of its discipline in the metallurgy sector.

First of all, it needs to be noted that the premise of the collective agreements usually contains a description of the reasons why the company has decided to implement smart working in its organizational model.

⁶⁴ For a comprehensive overview of collective agreements on the topic of remote work, see *La contrattazione collettiva in Italia (2020)*, VII rapporto ADAPT, ADAPT University Press, 2021, pp. 315-396.

⁶⁵ Gruppo di studio “Lavoro agile”, created with Decree of the Ministry of Labor No. 87 of April 13, 2021.

⁶⁶ The results of the analysis conducted by the Gruppo di studio “Lavoro agile” can be found in the *Relazione del Gruppo di Studio Lavoro agile*, published on February 7, 2022.

⁶⁷ See the definition of “smart working” in paragraph 2.



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

While those reasons are often identical to those quoted in law No. 81/2017, i.e., improvement of work-life balance and enhancement of competitiveness (Lottomatica 2017, Siemens 2017, FCA 2018, Engineering 2018), some agreements also mention that the implementation of smart working aims at guaranteeing better environmental sustainability (Ansaldo 2018, Baxi 2018, One Company Leonardo 2020, Almagiva 2021).

Moreover, smart working is often regarded as a means to transform the company production model (Avio 2019, Leonardo 2021) through a more result-oriented management style (Bonfiglioli 2018, Hitachi 2019, Be Solutions 2017, Stulz 2020, Almagiva 2021).

The definition of smart working in company-level agreements is also often very similar to its legal definition, which focuses mainly on time and space flexibility through the use of IT equipment (Engineering 2018, Ansaldo 2018, Infocert 2019, FCA 2018, Stulz 2020, IBM 2021): some agreements also add that working from outside the employers' premises should be considered “occasional”, to avoid the application of the (stricter) rules regarding telework (Capgemini 2019, Ducati 2019).

Not all workers have the same opportunities in accessing smart working: part-time workers, for example, are often excluded from the potential group of agile workers (Engineering 2018, Capgemini 2019, One Company Leonardo 2020), as well as the employees who are still in trial period (Hitachi 2019, Capgemini 2019).

Generally speaking, many agreements specify that the access to smart working is restricted only to workers carrying out tasks that are compatible with remote working (Manfrotto 2018, One Company Leonardo 2020, FCA 2018, Acciai Speciali Terni 2020, Vitec Imaging Solutions 2020, Manni Group 2021, System Logistics 2021).

Workers that have access to smart working can usually work from outside the employers' premises only for a limited number of days per week (Be Solutions 2017, Schneider 2018, Lottomatica 2017, Ducati 2019, Fincantieri 2020, Manni Group 2021, Almagiva 2021) or per month (Capgemini 2019, Hitachi 2019, Tenaris 2019). Those days sometimes need to be scheduled in advance (Ansaldo 2018, Acciai Speciali Terni 2020, Tenaris 2019, Synesthesia 2020, Stulz 2020) and/or need to be agreed upon by a supervisor (Avio 2019, Bonfiglioli 2018, Be Solutions 2017, Ducati 2018, ZF 2021).

The regulation of remote working time is a crucial point in every company level agreement, seeing that the legal discipline of smart working doesn't provide detailed guidance on the matter.

The collective agreements considered in this report outline different solutions, such as the establishment of time slots during which the employee can distribute his working hours according to his needs (Siemens 2017, Infocert 2019, FCA 2018, Almagiva 2021) or after consultation with his supervisor (Bonfiglioli 2018, Ducati 2018, Baxi 2018): sometimes the agreements using this particular scheme identifies “core hours” during which “smart workers” need to guarantee their virtual presence at work (Ansaldo 2018, Acciai Speciali Terni 2020).

62



Industrial Relations and Social Dialogue for an Economy and a Society “4.0” (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

It needs to be noted, however, that many agreements do not secure great time flexibility to their remote workers, seeing that they establish that their working hours must correspond to those of the employees who work inside the employers' premises (Hitachi 2019, Avio 2019, One Company Leonardo 2020, Lottomatica 2017, System Logistics 2021).

These provisions acquire significant importance in the context of the regulation of “smart working”, since, in theory, the performance of those workers should not be evaluated through strict control of working hours by the employer, but, on the contrary, through the achievement of specific objectives.

However, it needs to be underlined that only a few of the company-level agreements that form part of this analysis outline result-oriented evaluation methods (Manfrotto 2018, Baxi 2018, Fincantieri 2020, Synesthesia 2020).

Strongly connected to the topic of working time is the so-called “right to disconnect”, which, according to Italian law, needs to be regulated by the “agile work” individual agreements. Therefore, only a few of the collective agreements that have been analyzed mention the subject, usually in general terms (Engineering 2018, Hitachi 2019, Capgemini 2019, Stulz 2020, Synesthesia 2020, IBM 2021).

The topic of working space in company-level agreements benefits from a higher degree of flexibility compared to that of working time, seeing that the choices of the smart worker regarding its remote workplace aren't usually very limited: most of the time, the collective parties state only that it should be “adequate” from a privacy and health and safety point of view (Be Solutions 2017, Avio 2019, Tenaris 2019, Manni Group 2021, IBM 2021), and that it should be equipped with a suitable internet connection (Ansaldo 2018, Ducati 2018, FCA 2018).

Some agreements also include lists of possible locations for remote work, which usually mention the house of the employee (Fincantieri 2020, Hitachi 2019) “satellite offices” of the company (Engineering 2018, Acciai Speciali Terni 2020, Manfrotto 2018, Lottomatica 2017, One Company Leonardo 2020), or co-working spaces (Synesthesia 2020): public areas are, instead, normally excluded (Manfrotto 2018, Engineering 2018, Baxi 2018, Capgemini 2019, Stulz 2020, IBM 2021, ZF 2021).

Since the Italian law regarding “agile work” does not include specific indications regarding the IT equipment necessary to work remotely, company-level agreements tend to regulate this topic in detail, specifying exactly which tools are provided by the company and which are not. The great majority of the agreements state that all necessary tools have to be provided by the company (Fincantieri 2020, Manfrotto 2018, FCA 2018, Ansaldo 2018, System Logistics 2021), while the costs related to the internet connection are generally borne by the employee (Bonfiglioli 2018, Ducati 2018, Baxi 2018, Avio 2019, ZF 2021).

The topic of occupational health and safety in the context of agile work has been the object of numerous discussions among Italian academics since many of them claim that the OSHA requirements of law No. 81/2017 (which consists in the delivery of the company OSHA policy) are not sufficient to safeguard the workers from the risks of remote working.

63



The solutions of the company level agreements regarding the subject reflect the aforementioned debate: if most of them merely reproduce provision regarding the matter (Hitachi 2019, Engineering 2018, Tenaris 2019, Avio 2019, Ansaldo 2018) others include additional requirements, such as the need for a specific OSHA training for remote workers (Bonfiglioli 2018, Telespazio 2018, Be Solutions 2017, FCA 2018, Stulz 2020, Leonardo 2021) or specify that agile work is included in the scope of application of the general Italian OSHA legislation, i.e. d.lgs. 81/2008 (Hitachi 2019, Ducati 2019, Manni Group 2021).

Moreover, the agreements often state that agile workers are to be held responsible for the confidentiality of the company data and must therefore put in place adequate measures for their safeguard (FCA 2018, Engineering 2018, Avio 2019, Fincantieri 2020, Manni Group 2021, Almaviva 2021), which include respecting the related company policies if present (Acciai Speciali Terni 2020, Siemens 2017, FCA 2018): only a few agreements mention that the workers' privacy should also be respected (Acciai Speciali Terni 2020).

Data protection is also one of the main issues of the training modules regarding remote work outlined by the agreements, together with the correct use of IT equipment (Ansaldo 2018, Infocert 2019, Telespazio 2018), and the objectives of the new organizational model (Bonfiglioli 2018, Fincantieri 2020). It is to be noted that many agreements underline how agile workers should have the same training and career opportunities as "regular" workers (Capgemini 2019, Ansaldo 2018, Infocert 2019, FCA 2018, Telespazio 2018, IBM 2021), as well as the same union rights (Telespazio 2018, One Company Leonardo 2020, Infocert 2019, Ansaldo 2018, Bonfiglioli 2018, Almaviva 2021).

In the end, many agreements create systems aimed at evaluating remote working from a collective point of view. For this reason, sometimes the agreements create joint commissions for this specific purpose (Ansaldo 2018, One Company Leonardo 2020, IBM 2021), or delegate the evaluation to the welfare (FCA 2018, Telespazio 2018) or the "equal opportunities" commission (Bonfiglioli 2018). The evaluation system can involve only the company and the workers' representatives (Baxi 2018, Fincantieri 2020, Hitachi 2019), or also the workers themselves, through the use of questionnaires (Be Solutions 2017).

1.13 Smart working and infection prevention in the Italian metallurgy sector

Ever since the very beginning of the COVID-19 pandemic, smart working has been used as a tool to prevent infection in the workplace.

In the first months of 2020, the Italian government issued a series of legal and administrative decrees⁶⁸ recommending the extensive use of agile work in companies, and also greatly simplifying the access to

⁶⁸ The first ones were the Law decree No. 6 of 2020, and Presidential Decree (DPCM) of February 23, 2020. At the time, their scope of application was limited to the "at risk areas" in Veneto and Lombardy: its extension to the entire national territory was implemented through the Presidential Decree (DPCM) of March 1, 2020.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESD4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

the instrument: in fact, until the end of the so-called "emergency state", private employers and employees will not need to conclude the individual agreements that would have been necessary to regulate agile work according to law No. 81/2017 (article 19, paragraph 1).

Among those decrees, the "Shared protocol for the regulation of the measures for the contrast and the containment of the spread of SARS-CoV-2/COVID-19 in the workplace"⁶⁹ acquires significant importance.

The document, jointly signed by the Government and the main Italian social partners on 14th March 2020, and recently updated on 6th April 2021, states that companies can use smart working to carry out every compatible task and that the application of remote work for the entire workforce should be considered.

Furthermore, remote work should be encouraged also during the gradual re-opening of the workplaces, due to its efficiency in preventing COVID-19 infection, on the condition that employers provide sufficient support to their remote workers, such as assistance in the use of IT equipment, distribution of working time and pauses, etc. The aforementioned protocol has a nation-wide scope of application: it is, therefore, to be considered, together with regional and territorial protocols, a guideline for the conclusion of anti-COVID protocols on a company level, nowadays mandatory according to Italian law (article 29 bis, d.l. 23/2020)

The following analysis, which is based on a sample of 43 agreements of the metallurgy sector dating back to 2020, shows that the company-level anti-COVID protocols, and, generally speaking, all collective agreements related to the organization of work during the pandemic, mostly contain provisions resembling those of the national protocol, including those related to agile work.

Many agreements, in fact, state that agile work is applied to all workers with compatible tasks (FCA, Unitrat, PSC, Fincantieri) to limit the presence of people inside the employers' premises as much as possible (CNHI, Electrolux, Nuovo Pignone). Sometimes, the agreements specify that training modules must be also carried out remotely (Capgemini).

Experts have argued that, during the pandemic, the purpose of smart working has undergone a major transformation, seeing that the improvement of work-life balance and the enhancement of competitiveness has been set aside to the advantage of infection prevention. This event is made evident by some of the analysed agreements, whose clauses state that "fragile workers" have priority in the access of remote work, together with the parents of underage children and people in "objective situations of distress" (Thales Alenia).

Some companies of the considered sample had already introduced smart working before the 2020 pandemic: their anti-COVID agreements often affirm that workers that did not have access to remote

⁶⁹ Original translation of "Protocollo condiviso di aggiornamento delle misure per il contrasto e il contenimento della diffusione del virus SARS-CoV-2/COVID-19 negli ambienti di lavoro".



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESEDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

work in the past can now carry out their tasks from home (Electrolux) on the condition that they are equipped with the necessary IT tools (Hitachi, Leonardo).

Lastly, it should be noted how, in general, anti-COVID agreements do not provide a specific description of the rules regarding remote work during the pandemic, merely stating its introduction or extension: only two of the considered agreements treat smart working similarly to the "traditional" company-level agreements analysed in the previous section of this report, therefore regulating the working time, IT equipment, OSHA requirements, etc. (Whirlpool, Gea Imaforni).

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Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

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J. Nogarede	FEPS	Policy study	No digitalization without representation	2021	https://fepeurope.eu/wp-content/uploads/2021/11/No-digitalisation-without-representation.pdf	Collective representation in digital work
D. Ahrendt, M. Mascherini, S. Nivakoski, E. Sándor	Eurofound	Factsheet	Living, working and COVID-19	2021	https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef21064en.pdf	Measuring remote work
L. Casano et al.	BusinessEurope, SGI Europe,	Research Report	Skills, Innovation and the Provision of, and access to Training	2021	https://www.besnesseurope.eu/publications/skills-innovation-and-provision-and-access-training-final-report-european-social	Skills; Innovation;

67



The IRSDE-ES4.0 project has received funding from the European Commission under the grant agreement No VS/2021/0052. The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

	SMEunited and ETUC					Training; Social Dialogue
D. Depalo e F. Giorgi	Banca d'Italia (Italian National Bank)	Report	Il lavoro da remoto in Italia durante la pandemia: i lavoratori del settore privato	2021	https://www.bancaditalia.it/pubblicazioni/note-covid-19/2021/Nota_Covid_1_DPGF.pdf	Measuring remote work
European Commission	European Commission	Institutional Paper	The 2021 Ageing Report Economic and Budgetary Projections for the EU Member States (2019-2070)	2021	https://ec.europa.eu/info/publications/2021-ageing-report-economic-and-budgetary-projections-eu-member-states-2019-2070_en	Demography; Pensions; Welfare
European Commission	European Commission	Report	Digital Economy and Society Index (DESI) 2021 - Human Capital	2021	https://digital-strategy.ec.europa.eu/en/policies/desi-human-capital	Human Capital; Digital Skills; ICT Skills
European Commission	European Commission	Report	Digital Economy and Society Index (DESI) 2021 - Integration of digital technology	2021	https://digital-strategy.ec.europa.eu/en/policies/desi-integration-technology-enterprises	Digital Intensity; Technology; Digital Integration
European Commission	European Commission	Report	Women in Digital Scoreboard	2021	https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021	Gender; Human Capital; Digital Skills; ICT Skills

68



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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

European Commission	European Commission	Report	European Innovation Scoreboard 2020	2021	https://ec.europa.eu/docsroom/documents/46013	Innovation
Eurostat	Eurostat	Statistical Report	Eurostat Regional Yearbook	2021	https://ec.europa.eu/eurostat/product?code=ks-ha-21-001	Statistics on the people; economy and environment for regions across the European Union (EU)
ILO	ILO	Literature review	Changing demand for skills in digital economies and societies: literature review and case studies from low- and middle-income countries	2021	https://www.ilo.org/skills/areas/skills-training-for-poverty-reduction/WCMS_831372/lang--en/index.htm	Digital skills
ILO	ILO	Report	Small goes digital: how digitalization can bring about productive growth for micro and small enterprises	2021	https://t.co/t3IAyAiXZV?amp=1	Digitalization in SMEs
M. Barbero, M. De Ramón, J. Paquette, J. M. Garcia, C. Tippet	EU	Report	European Innovation Scoreboard Exploratory Report Measuring Digital Skills	2021	https://ec.europa.eu/docsroom/documents/45666/attachments/1/translations/en/renditions/native	Digital skills and innovation



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

M. Biasi	N/A	Academic paper	Brevi spunti sul lavoro da remoto post-emergenziale, tra legge (lavoro agile) e contrattazione (smart working)	2021	Conversazioni sul lavoro a distanza	Defining remote work; Remote work
M. Chiassarini, F. Seghezzi, D. Porcheddu	Assolombarda , ADAPT	Report	Il lavoro agile oltre l'emergenza	2021	https://www.assolombarda.it/servizi/lavoro-e-previdenza/documenti/ricerca-5-2021-il-lavoro-agile-oltre-lemergenza	Defining remote work; Remote work
OECD	OECD	Report	Will it stay or will it go? Analysing developments in telework during Covid-19 using online job postings data	2021	https://www.oecd.org/publications/will-it-stay-or-will-it-go-analysing-developments-in-telework-during-covid-19-using-online-job-postings-data-aed3816e-en.htm#:~:text=Overall%2C%20these%20results%20suggest%20that,productivity%20and%20worker%20well%2Dbeing.	Telework
R. R. Contreras	Eurofound	Report	Impact of digitalisation on social dialogue and collective bargaining	2021	https://www.eurofound.europa.eu/data/digitalisation/research-digests/impact-of-digitalisation-on-social-dialogue-and-collective-bargaining	Digitalisation and collective bargaining
S. Vitello, J. Greatorex, J., S. Shaw	Cambridge University Press & Assessment	Research Report	What is competence? A shared interpretation of competence to support teaching, learning and assessment	2021	https://www.cambridgeassessment.org.uk/Images/645254-what-is-competence-a-shared-interpretation-of-competence-to-support-teaching-learning-and-assessment.pdf	Skills; Competences; Training; Teaching
A. Bruzzo	N/A	Academic paper	Per la trasformazione digitale delle Micro-PMI in Italia	2020	Quaderni di ricerca sull'artigianato, No. 3	Digitalization in SMEs

70



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Industrial RELations and Social Dialogue for an Economy and a Society “4.0” (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

A. Moretti, F. Menna, M. Aulicino, M. Paoletta, S. Liguori, G. Iolascon	N/A	Academic paper	Characterization of Home Working Population during COVID-19 Emergency: A Cross-Sectional Analysis	2020	International Journal of Environmental Research and Public Health	OSHA and remote work
CGIL, Di Vittorio Foundation	CGIL, Di Vittorio Foundation	Report	Quando lavorare da casa è smart?	2020	http://www.cgil.it/admin_nv47t8g34/wp-content/uploads/2020/05/Indagine_Cgil-Fdv_Smart_working.pdf	Remote work
D. Ahrendt, J. Cabrita, E. Clerici, M. Mascherini, E. Sándor J. Hurley, T. Leončikas, S. Riso	Eurofound	Report	Living, working and COVID-19	2020	https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef20059en.pdf	Measuring remote work
D. Ahrendt, M. Mascherini	Eurofound	Factsheet	Living, working and COVID-19	2020	https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef20059en.pdf	Measuring remote work
EU Commission	EU Commission	Report	Digital Economic and Social Index (DESI Index)	2020	https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=67086	Monitoring Europe's overall digital performance



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

F. Contreras, E. Baykal, G. Abid	N/A	Academic paper	E-Leadership and Teleworking in Times of COVID-19 and Beyond: What We Know and Where Do We Go	2020	https://www.frontiersin.org/articles/10.3389/fpsyg.2020.590271/full	Remote work
G. Filosa	N/A	Academic paper	La IV rivoluzione industriale alla prova del Covid: smart working e nuove forme di lavoro	2020	Professionalità studi, No. 4	Remote work
ILO	ILO	Technical note	Defining and measuring remote work, telework, work at home and home-based work	2020	https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_747075.pdf	Defining remote work
ILO	ILO	Report	Teleworking during the COVID-19 pandemic and beyond: A Practical Guide	2020	https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/instructionalmaterial/wcms_751232.pdf	Defining remote work; Remote work
Joint Research Centre, EU Commission	EU	Policy Brief	Telework in the EU before and after the COVID-19: where we were, where we head to	2020	https://ec.europa.eu/jrc/sites/jrcsh/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf	Measuring remote work
L. Dorigatti Eurofound	Eurofound	Report	COVID-19 EU PolicyWatch, Factsheet for case IT-2020-43/1615	2020	https://static.eurofound.europa.eu/covid19db/cases/IT-2020-43_1615.html	Digital skills and innovation



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

M. Sostero, S. Milasi, J. Hurley, E. Fernández-Macías, M. Bisello	Eurofound	Working paper	Teleworkability and the COVID-19 crisis: a new digital divide?	2020	https://ec.europa.eu/jrc/sites/jrcsh/files/jrc121193.pdf	Measuring remote work
OECD	OECD	Report	Exploring policy options on teleworking: Steering local economic and employment development in the time of remote work	2020	https://www.oecd-ilibrary.org/deliver/5738b561-en.pdf?itemId=%2Fcontent%2Fpaper%2F5738b561-en&mimeType=pdf	Remote work
S. Baiocco, L. Westhoff, N. Lopez Uroz	CEPS	Research Report	Study on mapping opportunities and challenges for micro and small enterprises in offering their employees up- or re- skilling opportunities - Country reports	2020	https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8310&type=2&furtherPubs=no	Skills development in SMEs
T. Barbieri, G. Basso, S. Scicchitano	Banca d'Italia (Italian National Bank)	Report	Italian workers at risk during the Covid-19 epidemic	2020	https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID3575598_code1745744.pdf?abstractid=3572065&mirid=1	Measuring remote work; remote work
E. Dagnino, I. Armaroli	N/A	Academic paper	A seat at the table: negotiating data processing in the workplace. A national case study and comparative insights	2019	Comparative Labour Law & Policy Journal, 2019, Vol. 41, n. 1	Data protection, collective bargaining



Industrial RELations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

A. Todolì-Signes	N/A	Academic paper	Algorithms, artificial intelligence and automated decisions concerning workers and the risks of discrimination: the necessary collective governance of data protection	2019	Transfer, 2019, Vol. 25, Issue 4	Data protection, collective bargaining
Capgemini Invent, European DIGITAL SME Alliance and Technopolis Group	N/A	Report	Skills for SMEs - Supporting specialised skills development: Big Data, Internet of Things and Cybersecurity for SMEs	2019	https://op.europa.eu/en/publication-detail/-/publication/bb5c6c09-6285-11ea-b735-01aa75ed71a1/language-en	Skills development in SMEs
E. Dagnino	ADAPT	Monograph	Dalla fisica all' algoritmo: una prospettiva di analisi giuslavoristica	2019	https://www.bollettinoadapt.it/adapt-university-press-pubblicazioni-open-access/	Algorithmic management; digitalisation; labour law
A. Halvarsson Lundkvist, M. Gustavsson	N/A	Academic paper	Conditions for Employee Learning and Innovation – Interweaving Competence Development Activities Provided by a Workplace Development Programme with Everyday Work Activities in SMEs	2018	Vocations and Learning, Vol. 11	Skills development in SMEs



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IREDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

EU Commission	EU Commission	Report	Capitalising on the benefits of Research & Innovation Projects for Policy: The 4th Industrial Revolution	2018	https://op.europa.eu/it/publication-detail/-/publication/cf1793da-184c-11e8-ac73-01aa75ed71a1	Digitalization in Europe
G. Bandini, F. Caprio	N/A	Academic paper	Le imprese italiane e le competenze mancanti. Un'analisi del Piano Industria 4.0	2018	Quaderni di ricerca sull'artigianato, No. 3	Skills development and digitalisation
G. Karacay	N/A	Academic paper	Talent Development for Industry 4.0	2018	A. Ustundag E. Cevikcan, Industry 4.0: Managing The Digital Transformation	Skills development
L. Nedelkoska, G. Quintini	OECD	Working paper	Automation, skills use and training	2018	https://www.oecd-ilibrary.org/deliver/2e2f4eea-en.pdf?itemId=%2Fcontent%2Fpaper%2F2e2f4eea-en&mimeType=pdf	Digital skills and innovation
L. Nedelkoska, G. Quintini	OECD	Working Paper	Automation, skills use and training	2018	https://www.oecd-ilibrary.org/employment/automation-skills-use-and-training_2e2f4eea-en	Automation; Skills; Training
D. Acemoglu, P. Restrepo	NBER	Working Paper	Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation	2017	NBER Working Paper, No. 23077	Skills; Automation; Economic Growth



Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

F. Pascucci, V. Temperini	N/A	Academic book	Trasformazione digitale e sviluppo delle PMI. Approcci strategici e strumenti operativi	2017	Springer Series in advanced manufacturing	Digitalisation in SMEs
J. Messenger, O. Vargas Llave, L. Gschwind, S. Boehmer, G. Vermeylen, M. Wilkens	ILO, Eurofound	Report	Working anytime, anywhere: the effects on the world of work	2017	https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1658en.pdf	Remote work
M. Corso	N/A	Academic paper	Sfide e prospettive della rivoluzione digitale: lo smart working	2017	Diritto delle Relazioni Industriali, No. 4	Defining remote work; Remote work
M. Tiraboschi	N/A	Academic paper	Il lavoro agile tra legge e contrattazione collettiva	2017	Diritto delle Relazioni Industriali, No. 4	Defining remote work; Remote work
J. C. Messenger, L. Gschwind	N/A	Academic paper	Three generations of Telework: New ICTs and the (R)evolution from Home Office to Virtual Office	2016	New Technology, Work and Employment, Vol. 31, No. 3	Remote work
World Economic Forum	World Economic Forum	Report	The Future of Jobs. Employment, Skills and	2016	https://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf	Future of work; Employment; Skills

76



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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

			Workforce Strategy for the Fourth Industrial Revolution			
World Employment Confederation	World Employment Confederation	White paper	The Future of Work. White Paper from the employment & recruitment industry	2016	https://www.bollettinoadapt.it/wp-content/uploads/2016/09/WEC-The-Future-of-Work-What-role-for-PrES.pdf	Future of work
Cedefop	Cedefop	Glossary	Terminology of European education and training policy	2014	https://www.cedefop.europa.eu/en/publications/4117	Education and Training
J. Popma	ETUI	Working Paper	The Janus face of the 'New Ways of Work' Rise, risks and regulation of nomadic work	2013	ETUI, No. 7	Mental health and remote work
P. Gubitta, D. Nicolai	N/A	Academic paper	L'innovazione nelle imprese: considerazioni generali e risultati di un'indagine nelle piccole imprese	2013	https://microimpresa.padovauniversitypress.it/system/files/papers/MI33-04.pdf	Digitalisation in SMEs
P. Neirotti, E. Paolucci, E. Raguseo	N/A	Academic paper	Mapping the antecedents of telework diffusion: firm-level evidence from Italy	2013	New Technology, Work and Employment, Vol. 28, No. 1	Remote work in SMEs
C. Spinuzzi	N/A	Academic paper	Working alone together coworking as emergent collaborative activity	2012	Journal of Business Technology and Communication	Mental health and remote work

77



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Industrial Relations and Social Dialogue for an Economy and a Society "4.0" (IRESDES4.0)

Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

The Royal Society	The Royal Society	Report	Shut down or restart? The way forward for computing in UK schools	2012	https://royalsociety.org/~media/education/computing-in-schools/2012-01-12-computing-in-schools.pdf	Digital Literacy
International Telecommunication Union	International Telecommunication Union	Report	World Telecommunication/ICT Development Report 2010: Monitoring the WSIS Targets.	2010	https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-WTDR-2010-PDF-E.pdf	Digital Literacy
L. Arendt	N/A	Academic paper	Barriers to ICT adoption in SMEs: how to bridge the digital divide?	2008	Journal of Systems and Information Technology	Digitalisation in SMEs
K. Dickson and F. Clear	N/A	Academic paper	Comparative European Perspectives on the Diffusion and Adoption of Telework amongst SMEs	2007	https://www.academia.edu/attachments/41998415/download_file?ct=MTYyMjkwNzIxOCwvNjlyOTA3MzE4LDE4OTAwOTc5OA==&s=swp-toolbar&iid=6ea6240b-0440-44d1-956c-45fecdbb9319	Remote work in SMEs
OECD	OECD	Report	ICT, E-Business and SMEs	2004	https://www.oecd.org/cfe/smes/31919255.pdf	Monitoring digital performances in SMEs
P. Di Nicola	N/A	Academic paper	ICT and e-Work in European SMEs	2003	http://scholar.google.it/scholar_url?url=https://www.academia.edu/download/3242829/ICT_and_Ework.pdf&hl=it&sa=X&ei=QZq7YP6cHYWV9YP7pOngAU&scisig=AAGBfm2UPiw3esfGBedHo2h4hWKx4VSt8Q&nossl=1&oi=scholar	Remote work in SMEs

78



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Deliverable D2.1
Report on the state-of-the-art regarding smart working and digital-skills development in social dialogue practices and CLAs

S. Dixon	N/A	Academic Paper	Implications of population ageing for the labour market	2003	Labour Market Trends, Vol. 111, No. 2	Demography and Labour Market
A. De Grip, J. Van Loo	N/A	Academic Paper	The Economics of Skills Obsolescence: A Review	2002	in A. De Grip, J. Van Loo, K. Mayhew (eds.), The Economics of Skills Obsolescence: Theoretical Innovations and Empirical Applications, Emerald	Skills Obsolescence
T. Lange, M. Ottens, A. Taylor	N/A	Academic paper	SMEs and barriers to skills development: a Scottish perspective	2000	Journal of European Industrial Training	Skills development in SMEs

