



CEDEFOP

Challenging digital myths

**First findings from Cedefop's
second European skills
and jobs survey**

POLICY BRIEF



POLICY BACKGROUND

In this section

**Two sides of the coin:
digitalisation as innovator
and disruptor**



Two sides of the coin: digitalisation as innovator and disruptor

Several years before the COVID-19 pandemic, the proliferation of Industry 4.0 digital technologies raised concerns about automation and job losses resulting from it. [Cedefop's first European skills and jobs survey](#), which collected information on the skills and work experiences of EU adult employees in 2014, showed that 43% of them had experienced change because new machines and ICT systems were introduced into their workplace. At the time, debates in popular media on the [rise of robots](#) and artificial intelligence (AI) algorithms painted a bleak picture of a forthcoming jobless and polarised [second machine age](#) society.

Early research on the implications of digitalisation signalled that as much as [half of all jobs](#) in advanced economies could be replaced by AI algorithms. With cutting-edge self-learning capacities in AI and advanced robotics, which go far beyond algorithmic or rule-based computer programming, the concern is that a wider range of previously out-of-reach, cognitively challenging tasks may [now be susceptible to machine replacement](#).

Accelerating the uptake of digital and remote working and learning, the coronavirus pandemic accentuated the long-standing digital transformation of [European enterprises](#). European economies have experienced a shift towards [greater demand for digital skills](#), not only at specialised (e.g. e-commerce, digital marketing and sales) and advanced (e.g. big data analytics, business ICT systems, programming), but also at basic level (e.g. use of digital communication tools).

In spite of unprecedented EU and national support measures, [the pandemic affected](#) particular sectors (such as hospitality, transport, arts and leisure) and worker groups disproportionately. Businesses and employees with greater digital readiness to adapt to remote workplaces and jobs more amenable to social distancing practices appear to have weathered the storm better. Some macro-level labour market imbalances may be temporary and are likely to revert to the pre-pandemic 'normal' once COVID-19 restrictions are fully lifted. But it is likely that skill mismatch tensions at micro level have been aggravated during the pandemic years, mainly for individuals and companies unprepared for the disruptive impact of digitalisation.

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...years before COVID-19, many predicted **a jobless and polarised** 2nd machine age society...



...as a wider range of previously out-of-reach, **cognitively challenging tasks** could now be **done by AI algorithms**...



...the **coronavirus pandemic accelerated demand for digital skills**, not only at specialised and advanced, but also at basic level...

The discourse on the labour market impact of digitalisation has focused on forecasting its job destruction potential. Research on future job displacement by new digital technologies has revolved around the so-called ‘[job polarisation or routine-biased technological change \(RBTC\)](#)’ hypothesis. It assumes that digitalisation tends to crowd out middle-skill, routine or manual jobs, where human input is more expendable given the precision and cost-efficiency of robots or computerised machines in carrying out codifiable, programmable tasks.

More recent studies paint a more nuanced picture. They note that, although digitalisation inevitably leads to some job losses, in most jobs it is likely to result predominantly in [task transformation](#). This shifted the focus of the debate, which increasingly became concerned with accommodating [upskilling and reskilling needs](#) and tackling [digital divides](#), which leaves vulnerable groups particularly exposed to the disruptive impact of digitalisation.

Recent evidence also points towards [a disconnect be-](#)

[tween the RBTC hypothesis and observed trends in many EU labour markets](#). This is because RBTC research relies on data that [measure the routine intensity of jobs](#) in a highly imperfect way and lacks insight into [country-specific assessment of job-skill requirements](#). It also puts emphasis on the shifting distribution of workers across occupations, neglecting that [within-occupation changes in job content](#) and the skills upgrading or downgrading resulting from it represent the lion’s share of labour market dynamics.

Early reports by ‘technology alarmists’ also failed to acknowledge that displacement of man by machine is mitigated [when technological change results in product innovation](#). Market mechanisms (e.g. positive inter-sectoral consumer demand effects and productivity-tied wage setting) and innovation-friendly or training policies may also compensate for some of the job-destroying impact of process innovation. A firm’s business case for adopting new technologies is the outcome [of a process that is driven by complex and endogenous market factors and interactions](#) and is dependent on the price of skill and labour relative to machines. Automating work also requires overcoming investment uncertainty and early adoption hurdles, such as achieving employee acceptance of new ways of working and addressing digital or other skill gaps.

It is obvious that difficulties sourcing skills and talent are persistent in the EU: 3 in 4 EU firms face [difficulties finding employees with the right skills](#). Skills shortages may have been temporarily muted by the pandemic but, since then, have been returning to pre-pandemic levels. What should be cause for concern is that in the wake of the pandemic [investment in corporate training collapsed](#) and [\(informal\) training participation](#) declined substantially.



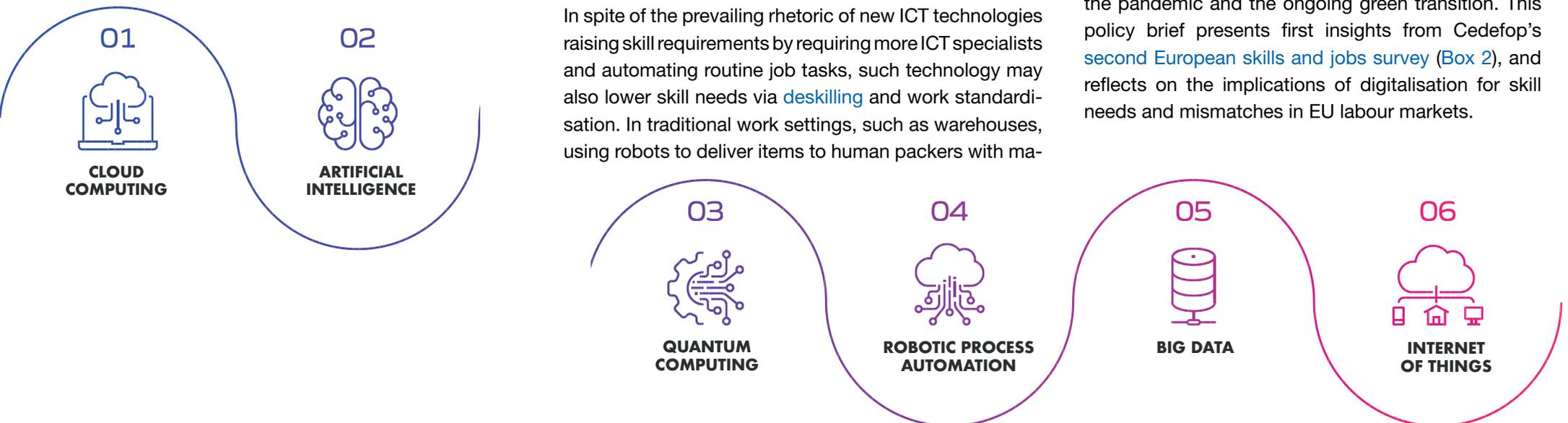
Such trends are incompatible with achieving a just digital transition. Adopting and using digital technologies require in-company skilling strategies. These strategies should [accommodate people-centred corporate human resource management practices and social dialogue](#) to counter adverse employment effects of digital technology adoption.

Adapting business practices so they become more learning-conducive has become more urgent with the ongoing coronavirus pandemic. Most EU companies saw changes in core business activities or had to adapt business operations, which has implications for staff management. Faced with change, most EU firms have focused on expanding worker autonomy, but [4 in 10 still chose to manage their staff by controlling the tasks assigned to them](#). Companies lacking a high-investment, high employee-involvement approach to work organisation were least likely to see extensive changes in knowledge and skill needs.

In spite of the prevailing rhetoric of new ICT technologies raising skill requirements by requiring more ICT specialists and automating routine job tasks, such technology may also lower skill needs via [deskilling](#) and work standardisation. In traditional work settings, such as warehouses, using robots to deliver items to human packers with ma-

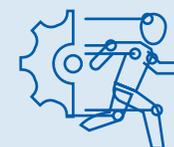
chine-driven efficiency [increases workload and work repetitiveness](#), as does [‘algorithmic management’](#) and task fragmentation when applied to [platform micro-work or gig work](#). Such ICT-driven changes increase management control over work methods and pace, limiting workers’ autonomous decision-making and task discretion. This explains the paradox in EU labour markets of jobs becoming [less routine at the same time that work is becoming more routinised](#). Skill matching policies that aim at upgrading job-skill requirements via work organisation practices that systematically involve staff, are crucial to ensuring that the EU digital transformation can yield productivity dividends in a post-COVID-19 world.

The EU has set several ambitious digital skill targets to be attained by 2030 ([Box 1](#)). Scientifically sound data and analysis are crucial for evidence-based policy-making to accompany and shape change brought about by digital technology, the challenges linked to the pandemic and the ongoing green transition. This policy brief presents first insights from Cedefop’s [second European skills and jobs survey \(Box 2\)](#), and reflects on the implications of digitalisation for skill needs and mismatches in EU labour markets.





Box 1. **EU digital skill targets to be reached by 2030**



80% of adults must be equipped with at least basic digital skills



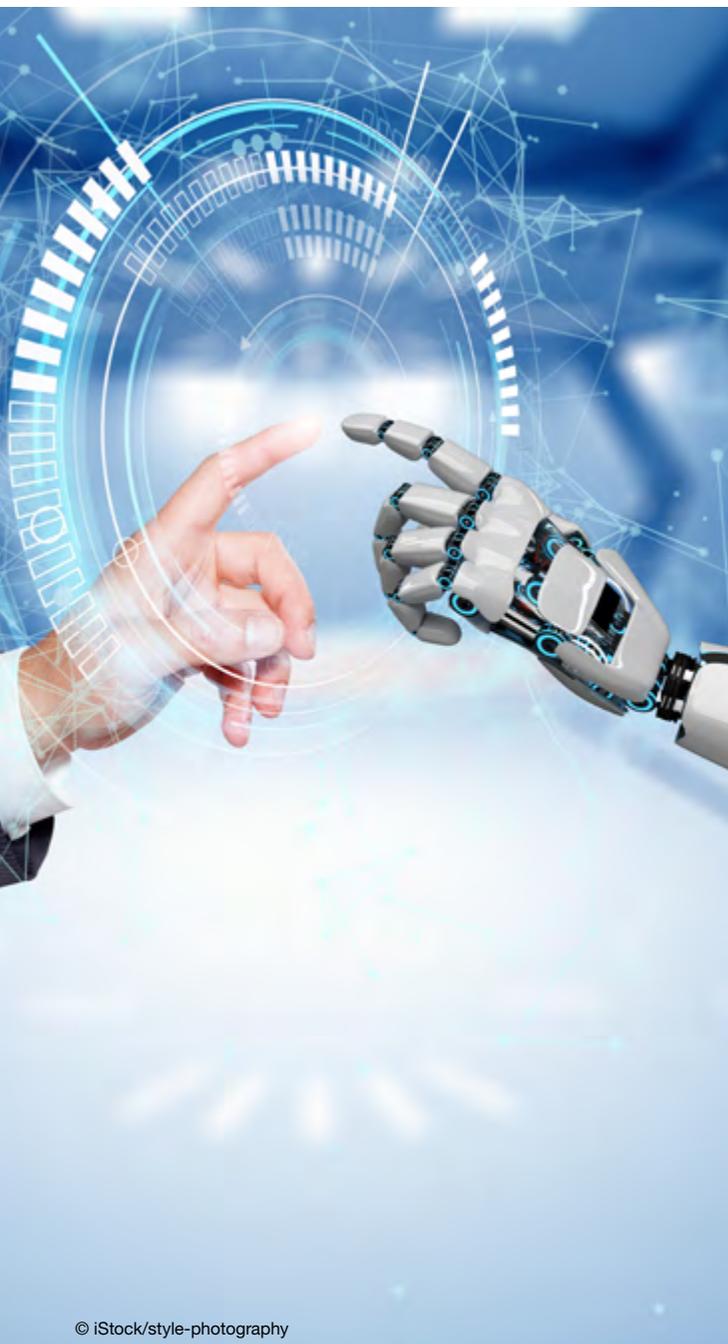
20 million ICT specialists must be employed, gender-balanced



75% of EU companies should be using cloud computing/AI/big data technologies



More than 90% of EU SMEs should reach at least a basic level of digital intensity



Box 2. In brief: Cedefop's 2nd European skills and jobs survey (ESJS2)

- 01** The ESJS2 is the second wave of a periodic survey collecting information on the job-skill requirements, work digitalisation, skill mismatches and workplace learning of representative samples of European adult workers.
- 02** It aims to inform the policy debate on the impact of digitalisation on the future of work and skills, including in the context of the COVID-19 pandemic.
- 03** Fielded in summer 2021, the ESJS2 collected information from 46 213 adult workers from the EU-27 Member States plus Norway and Iceland (EU+). Cedefop has joined forces with the European Training Foundation (ETF) to carry out the ESJS2 in more than 35 countries by 2023.
- 04** The ESJS2 questionnaire was developed by Cedefop experts with the support of a group of international experts and a leading survey company. Fieldwork was carried out using a combination of random probabilistic phone interviews (at least 500 observations per country) with sample top-ups drawn from well-established socioeconomic online survey panels.
- 05** The ESJS2 aspires to become a key tool for evidence-based policy-making in VET. Its design incorporates the growth, sustainability and resilience ambitions of the [EU Skills Agenda](#) and [European digital strategy](#) and acknowledges the importance of digital skills in VET put forward in the [2020 Council Recommendation on VET](#) and the [Osnabrück Declaration](#).
- 06** The ESJS2 also provides evidence to support the aim of making [Europe fit for the digital age](#) and to realise the ambitions of the [European Digital Education Action Plan](#), the [European Pillar of Social Rights Action Plan](#) and the [2030 digital compass](#). It complements the [Digital economy and society index \(DESI\)](#), the [European digital competence framework \(DigComp\)](#) and other EU data and information on digitalisation and its impacts.

More information on the [European skills and jobs survey \(ESJS\)](#) is available on Cedefop's web portal.

**Powering the
European digital
transition** #ESJSurvey



What can we learn from
Cedefop's 2nd European
skills and jobs survey?

9 and 13-14 December 2022
Virtual event



EVIDENCE

In this section

Digitalisation and COVID-19

**Digitalisation and
skill mismatch**

**Fear of going digital:
facts versus fiction**



Digitalisation and COVID-19

The COVID-19 pandemic accelerated the digitalisation of work and accentuated digital skill demands in the EU. Cedefop's second European skills and jobs survey (ESJS2) shows that the health crisis affected the employment of 1 in 3 EU+ workers (33%), with younger and lower-educated workers most negatively affected. Employed people responding to the survey in 2021 experienced the economic fallout from the pandemic because they lost a previous job or because of reduced or no working hours (for instance as part of a furlough scheme) in their current job. The pandemic had an unprecedented impact on the social fabric of workplaces. Compared to the situation before the pandemic, about 29% of EU+ workers worked more remotely, while 39% spent less time working together with colleagues or other people in offices, on factory floors and in other workplaces.

Driven by the take-up of remote work, almost half of EU+ workers (46%) more often used digital communication tools or platforms for work meetings or conferences: 4 in 10 adult employees (39%) more often used digital technologies to perform some of their work tasks and about one third (36%) participated in more online job-related learning.

The digital divide in the EU workforce manifested itself in significant inequalities in the use of digital tools and methods for work and learning during the COVID-19 pandemic. **As working remotely is only possible in jobs with a specific task structure**, but also because of national differences in work organisation paradigms, remote work tends to be most common for the higher-educated in high-skilled occupations. While 41% of those with tertiary level education worked more remotely during the first year of the pandemic, this was the case for only 18% of lower-educated workers. Working from home or elsewhere was also more prevalent for those employed in the ICT (63%), financial (54%) and professional services (46%) sectors. This is in stark contrast to sectors where interaction with clients or customers is the basis of many jobs, such as accommodation and food services (12%), essential utilities (19%) and human health and social work services (17%).

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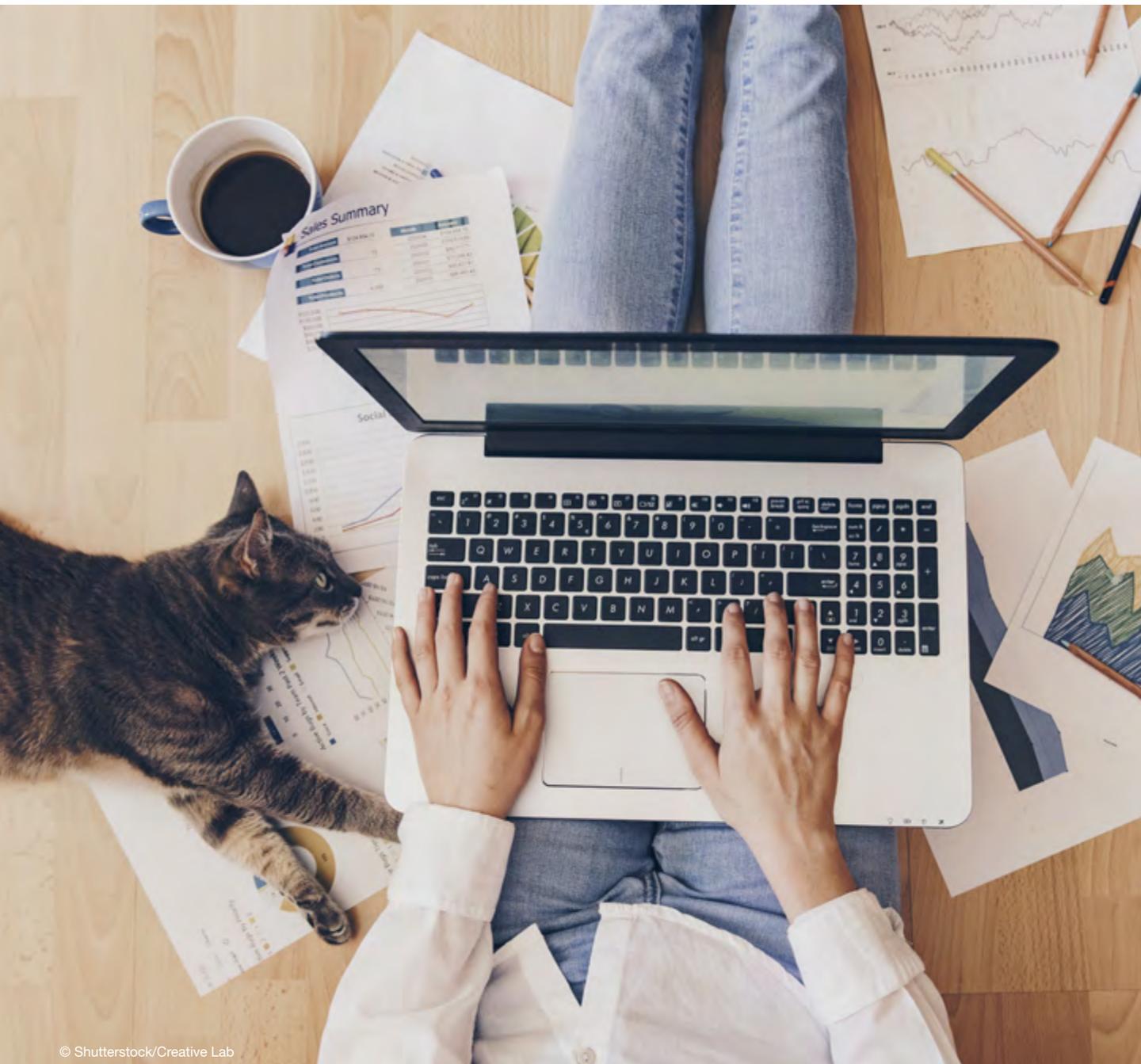
...the **pandemic** had an **unprecedented impact** on the social fabric of workplaces, with **younger and lower-educated workers** most negatively affected...



...about **29% of EU+ adult employees worked more remotely**, compared to before the pandemic, **but mostly in high-skilled jobs...**



...**4 in 10 adult employees** more often used **digital technologies** to perform some of their work tasks...



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Box 3. ESJS2 evidence on remote work in EU+



39% worked away from their employer's premises (worked from home) during (mid-)2020-21



29% worked more time away from their employer's premises, compared to before the pandemic



75% worked remotely using a computer device for all or almost all of the time



72% regular teleworkers (work remotely at least once a week)



28% occasional teleworkers

Digitalisation and skill mismatch



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...workers **use a computer** device to do their job in **87% of EU+ jobs...**

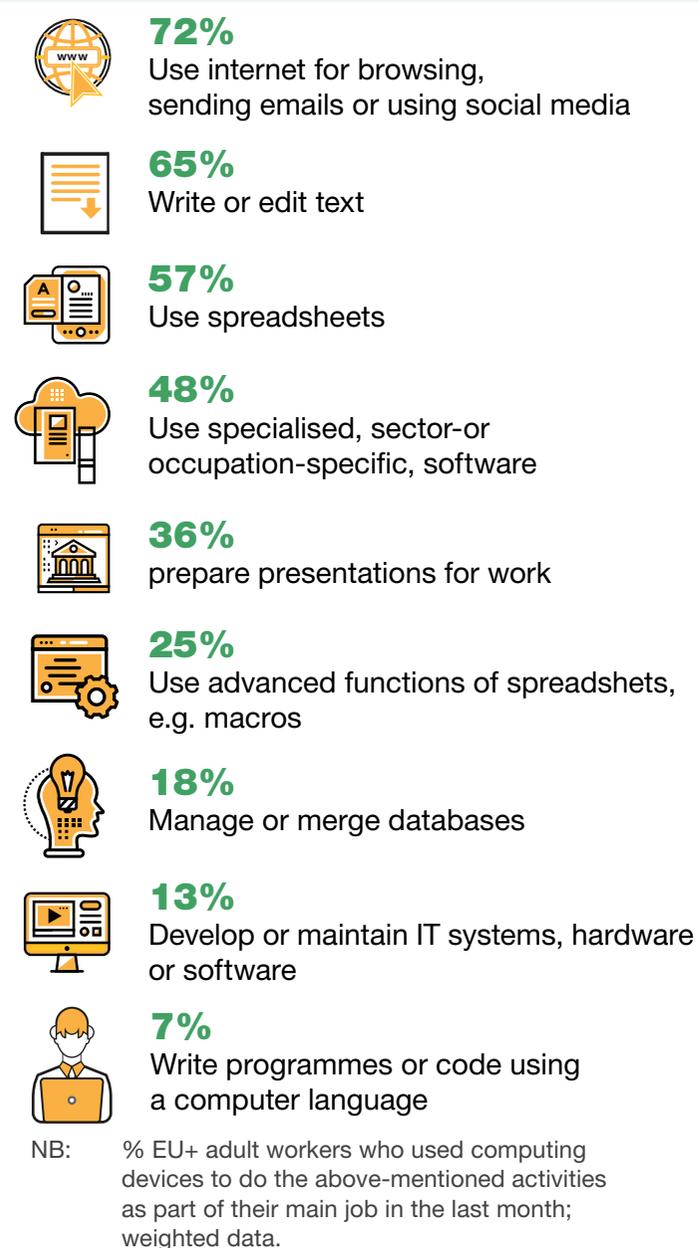


...**35% of EU+ adult workers** had to learn to **use new digital technology** to do their job during 2020-21...

Because of structural digitalisation trends and recent rapid change in EU labour markets and enterprises following the COVID-19 outbreak, digital skill needs have grown. As most EU+ adult workers use a computer device (a desktop computer, laptop or notebook, tablet or smartphone) in their work, more than 8 in 10 EU+ jobs (87%) require at least basic digital skills. Some 60-70% of EU+ workers use standard software at work that requires basic or moderate digital skills (e.g. web browsing, emailing, word processing, use of spreadsheets) and close to 1 in 2 workers use specialised software. For about 1 in 5 workers relatively advanced database management is part of their work and 1 in 10 require very high digital proficiency (e.g. to develop and maintain ICT systems). Some 7% use computer programming or coding at work (Figure 1).

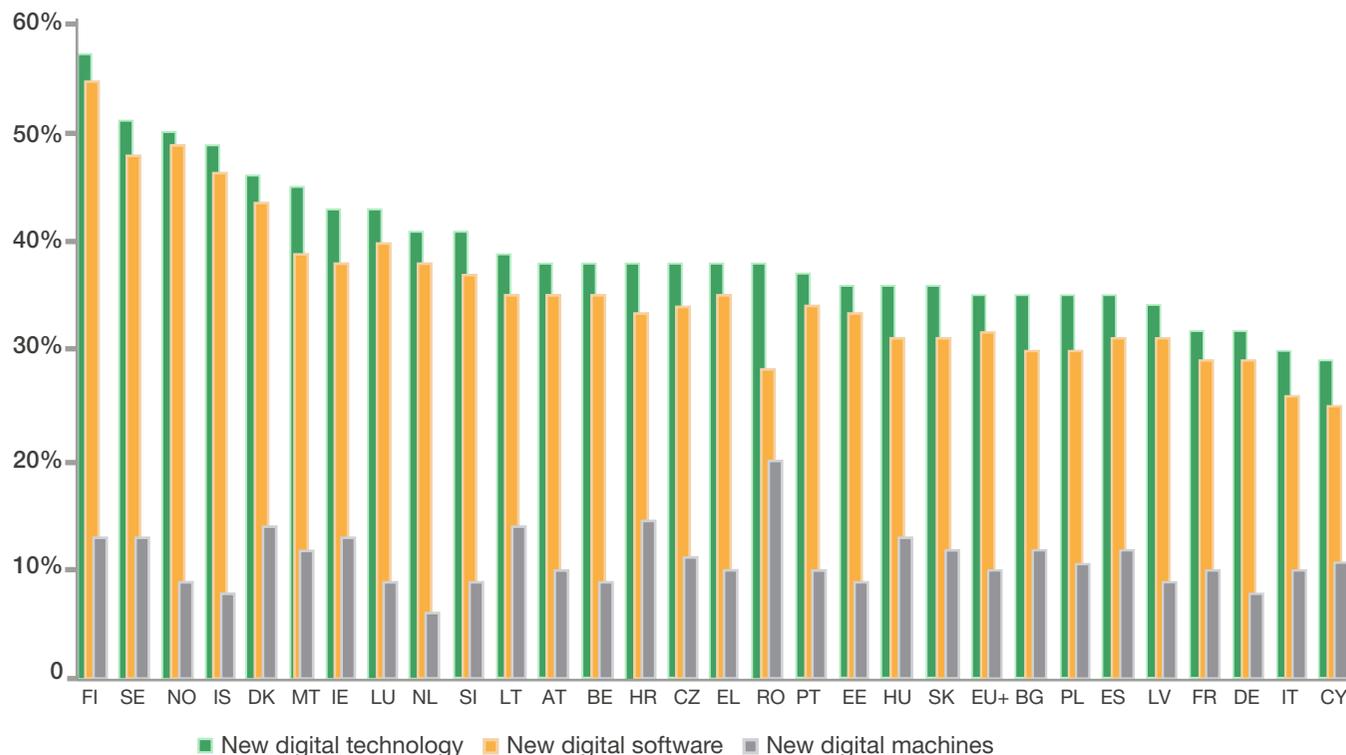
Some 35% of EU+ employees had to learn to use new digital technology to do their main job in the (mid-)2020-21 period (Figure 2). The share of workers having to learn such technology ranges from over 50% or higher in Finland, Norway and Sweden, to 30% or lower in Italy and Cyprus. 1 in 3 (32%) European workers had to learn new computer programmes or software (excluding minor or regular updates). 10% had to learn to use new computerised machines, for instance digital handheld devices, CNC machine tools, robots, programmable logic operators, 3D printers or other specialised computer-controlled machines, such as lasers or CT scanners.

Figure 1. Digital activities at work, EU+



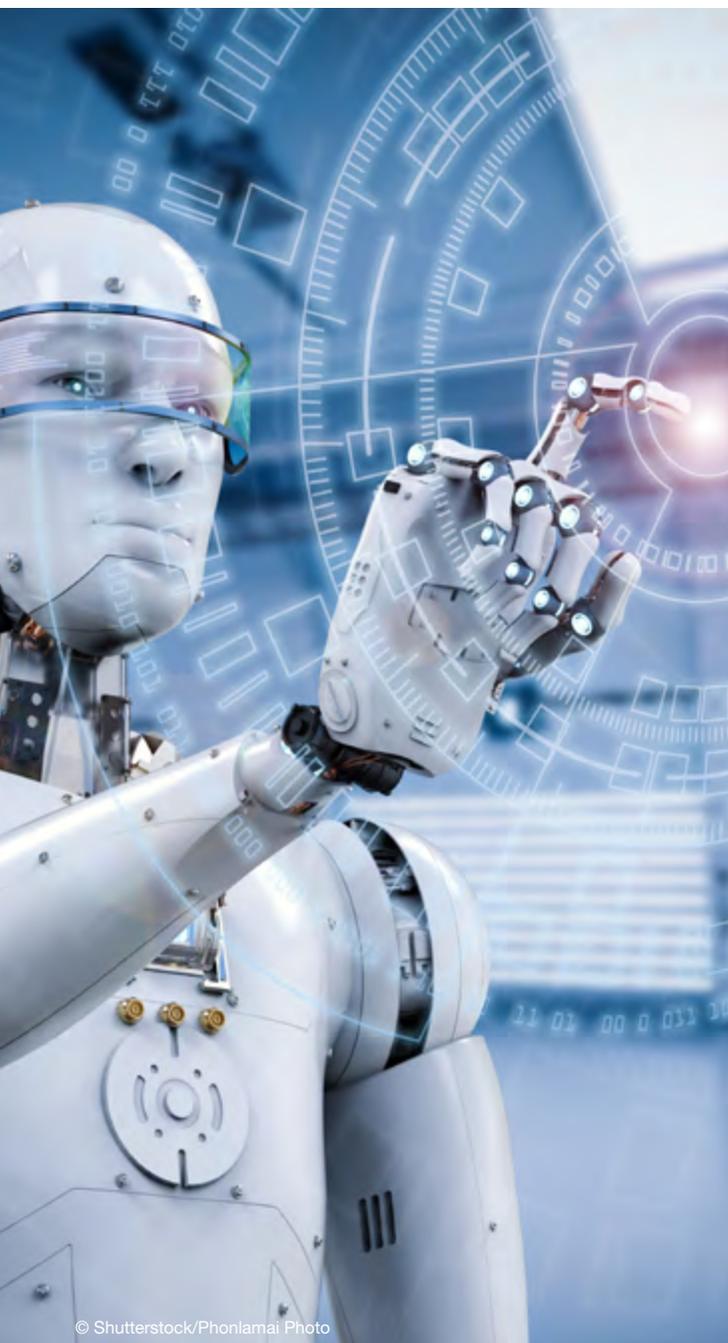
Source: Cedefop's 2nd European skills and jobs survey.

Figure 2. Digital technological change in EU+ jobs, (mid-)2020-21



NB: % EU+ adult workers who had to learn to use new digital technologies (new computer programmes or software or new computerised machinery; minor or regular updates are excluded) to do their main job (excluding other purposes, such as other/prior jobs or social or recreational purposes); weighted data.

Source: Cedefop's 2nd European skills and jobs survey.



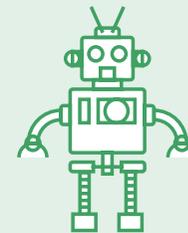
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The need to learn to work with new computer technologies challenges individuals to update, upgrade or learn new digital skills; in the short to medium term this can cause imbalances between digital skill demand and supply. The ESJS2 measures the ‘dynamic skill mismatch’ of people, acknowledging that a key aim of continuing vocational and education training (VET) policies and practices is to enable them to reach their ‘learning potential’. As some demand-driven changes in skill needs may be short-lived, the ultimate effectiveness of VET depends on whether it can transcend filling immediate skill gaps and build skillsets that expand individual productivity frontiers in jobs, ensuring that they can perform job tasks in a better way than at present.

The ESJS2 makes it possible to quantify a digital skill gap that is benchmarked to improved future job performance. Analysis shows that 52% of EU+ adult workers need to develop their digital skills further to do their main job better than at present. 13% have to improve their digital skills significantly, while 39% need to develop them to a moderate extent. Employed adults who had to learn to use one or more new digital technologies are more likely to have a digital skill gap: while over 6 in 10 EU+ adult workers (65%) affected by technological change have such a gap, this is the case for 4 in 10 (44%) who were not affected by it.

The EU has significant potential for investment in digital skills training. Looking at a range of digital activities, the ESJS2 makes it possible to quantify such potential by identifying the shares of non-digital users who do not know how to do these activities, and the shares of computer users who do not carry out these activities at work (Table 1). Not engaging in digital activities at work **compromises people’s digital skill proficiency**. About 1 in 5 EU+ adult workers in total (and 31% of non-users)

Box 4. ESJS2 evidence on Industry 4.0 technologies



8%
share of EU+ adult workers who work with **ROBOTS** as part of their main job



9%
share of EU+ adult workers who work with **3D PRINTERS** as part of their main job



18%
share of EU+ computer programmers who write code using **AI METHODS** (machine- or deep-learning algorithms) as part of their main job

DIGITAL TRANSITION

would benefit from training in the most basic of digital skills: navigating the web. Between 30% to 40% can be further trained to become better at fundamental word processing and using spreadsheets. Between 70% to 90% could be trained to acquire more advanced database management and computer programming skills.

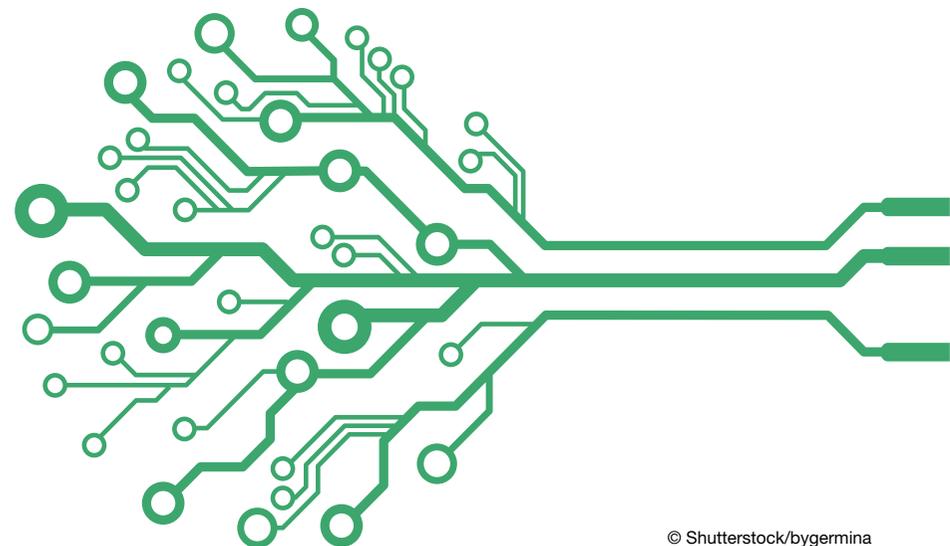
The digital transition requires nothing less than a skills revolution, but those in greatest need of digital training often do not receive it. Only 26% of EU+ workers undertook education and training activities for the purpose of further developing the digital skills required by their job in the (mid-)2020-21 period.

Looking at digital skills development actually taking place, it is obvious that – in terms of duration – much of it is not very substantial. Among those who had to learn new digital technologies for work, half (48%) required less than 1 week to learn how to use the most important technology proficiently. This shows that much digital upskilling to learn using basic digital software or simple computerised machines (e.g. digital communication

platforms, handheld scanners) is relatively modest. 30% of workers needed between 1 to 4 weeks and 22% needed more than a month or are still learning to use it, reflecting more significant skilling requirements of new digital technologies.

There is notable inequality in digital skills training intensity and participation. Males and people residing in urban areas tend to participate more in such training. Digital skills training is also more common for higher-educated workers and those employed in larger-sized firms, and is more prevalent in high-skilled occupations. The sectoral variation in the share of EU+ workers who develop their digital skills shows there are differences in the extent to which employers react to digital skill gaps in their workforce. More than 6 in 10 workers in the ICT sector focus their training activities on digital skills, but fewer than 3 in 10 do so in the accommodation and food services sector. One of the few positive patterns of digital training participation is that older EU+ workers are more inclined to focus their education and training activities on digital skills development than younger cohorts.

DIGITAL TRAINING PARTICIPATION



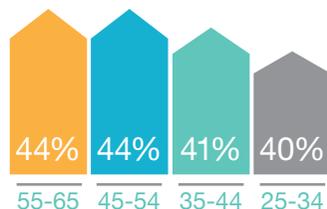
Box 5. ESJS2 evidence on digital skills training in EU

EU+ adult workers taking part in digital skills training (% of all who trained in past year)

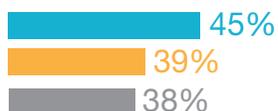
GENDER



AGE

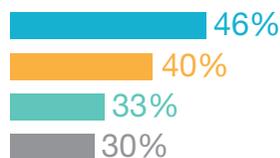


EDUCATION



HIGH
MEDIUM
LOW

OCCUPATION



SKILLED
SEMI-SKILLED
MANUAL
ELEMENTARY

FIRM SIZE



GEOGRAPHY

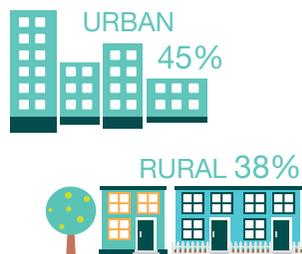


Table 1. Scope for digital skills training, EU+

	Digital non-users	Digital users	All workers
Use the internet for browsing, sending emails or using social media	31%	28%	20%
Write or edit text	44%	35%	28%
Use spreadsheets	65%	43%	38%
Use specialised sector- or occupation-specific software	87%	52%	50%
Prepare presentations for work	69%	64%	60%
Use advanced functions of spreadsheets (e.g., macros or complex formulas)	74%	75%	74%
Manage or merge databases	94%	82%	81%
Develop or maintain IT systems, hardware or software	94%	87%	87%
Write programmes or code using a computer language	96%	93%	92%

NB: Column (3) combines the share of non-digital users who do not know a specific digital activity (column 1) with users who do not deploy such activities at work (column 2); weighted data.

Source: Cedefop's 2nd European skills and jobs survey.

Fear of going digital: facts versus fiction

In times where technological alarmism often dominates the debate on the impact of digitalisation, the ESJS2 provides evidence-based insight into whether popular fears of robots or machines taking away peoples' jobs are justified. Over a third (35%) of the EU+ workforce believe that new digital technologies in their workplace can or will do their jobs partly or fully. About 45% are also concerned about technological skills obsolescence and the need to acquire new knowledge and skills to cope with digital technology.

Such worries are quite prominent even among individuals insulated from technological innovation in their jobs: 1 in 4 EU+ workers (26%) who do not use digital devices in their job, and one third (32%) of those who did not have to learn recently how to use new digital technologies, fear the negative impacts of technology. It appears such fears are largely driven by misinformation about, or lack of exposure to, technology.

The extent of concern about the potential job- or skills-displacing impact of digital technology contrasts with what happens in practice, i.e. how common task automation in jobs actually proves to be (Figure 3). Only about 14% of EU+ workers (4 in 10 of those who had to learn new digital software

or computer-controlled machines in the past year) do not perform some of the tasks they did before, because of the introduction of new digital technology. Workers affected by task automation tend to be lower-educated and are typically employed in manual and low-skilled, elementary jobs. They are mostly found in the agriculture, financial and insurance services and utilities sectors.

Many workers experiencing task automation also had to do some different or new tasks. Considering the dynamic reallocation of job tasks (**substitution and task reinstatement effect**), only 4% of the EU+ workforce saw some of their job tasks being replaced by new digital technology without taking on different or new tasks. 22% experienced both task generation and destruction, while 9% only started doing new or different tasks.

According to the routine-biased technological change hypothesis, digitalisation – in particular robotic process automation – crowds out routine, manual jobs. In such jobs, tasks can easily be codified and **tacit knowledge required is lower** compared to high-skilled or professional occupations. Replacing tasks performed by humans with robots is seen as the root cause of technological unemployment and job polarisation in advanced economies.

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...**35%** of the EU+ workforce believe that **new digital technologies** in their workplace **can or will do their jobs partly or fully...**



...**45%** of the EU+ workforce believe that they need or will **need new knowledge and skills** because of the **new digital technologies in their workplace...**



...**only 4%** of the EU+ workforce saw some of their **job tasks being replaced by new digital technology** without taking on different or new tasks...



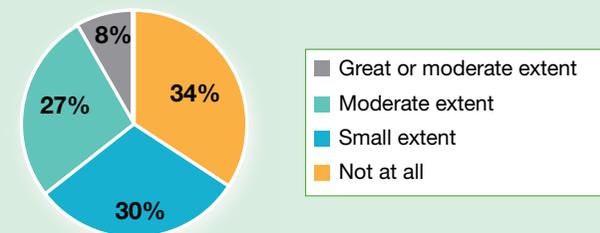
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The ESJS2 cannot provide insight into wider, system-level dynamics underlying the job destruction potential of digitalisation, as it is a one-shot survey of employees who have ‘survived’ technological labour-displacement. Nevertheless, the survey makes it possible to reflect on how job characteristics and technological upskilling are linked (Figure 4). What is clear is that EU+ jobs exposed to more digitalisation tend to be higher-quality jobs. Digital jobs typically have higher job-skill requirements, especially in terms of foundation skills (literacy and numeracy). They are less likely to be routine, although this is only the case for jobs exposed to new computer software and not for jobs where computer-controlled machines are introduced. Introducing new computerised machinery is more likely to take place in manual jobs. Such results show that the type of digital technology adopted matters for work and labour market outcomes.

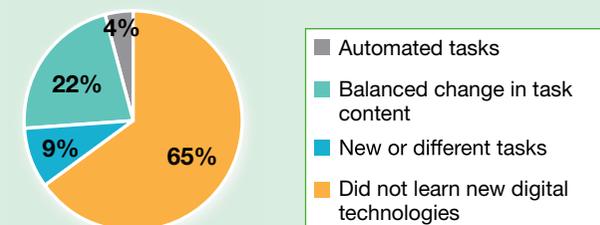
Employees in jobs requiring digital upskilling have more work autonomy, participate more in in-work learning and are more satisfied with their job. These satisfaction-productivity dividends are accentuated in more complex jobs, which require more advanced foundation and interpersonal skills. The positive influence of digitalisation in EU+ labour markets is also visible in the higher earnings of digital jobs. Digital jobs are more prevalent in workplaces that are increasing in size, rather than being downsized by automation. Such associations do not fully reflect the causal impact of digitalisation over time but do show that adopting new digital technology goes hand in hand with more productive and learning-intensive jobs.

Figure 3. Task automation in EU+ jobs: fears versus facts

3(a) Extent to which adults think digital technology can or will do their main job partly or fully



3(b) Actual change in job tasks resulting from new digital technology

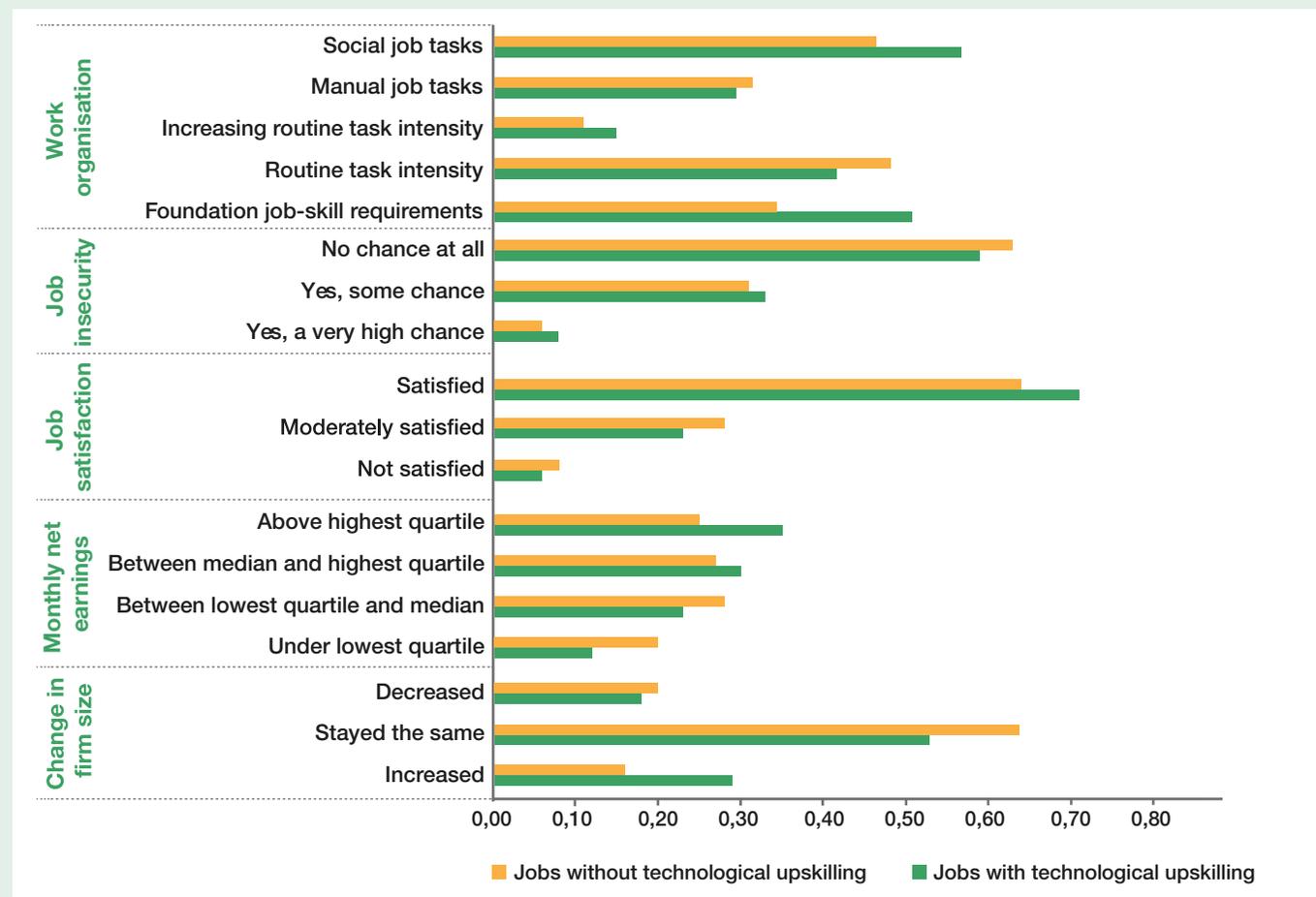


NB: Figure 3(a) shows % of EU+ adult workers with positive answers to the question ‘To what extent do you think new digital or computer technologies in your company or organisation can or will do part or all of your main job?’
Figure 3(b) shows % of EU+ workers with positive answers to the question ‘As a result of the new computer programmes or software/new computerised machinery you learned for your main job in the last 12 months, did your job tasks change in any of the following ways?’
(i) You now do not do some tasks you did before;
(ii) You now do some different or new tasks;
weighted data.

Source: Cedefop’s 2nd European skills and jobs survey.



Figure 4. **Digitalisation, work organisation and labour market outcomes**



NB: Foundation job-skill requirements is a summary index (Cronbach alpha) capturing the extent to which jobs require higher levels of literacy (reading and writing), numeracy and creativity skills, based on relevant ESJS2 items. Social and manual tasks are summary indices based on activities workers regularly do in their jobs (e.g. counselling, presentations, teaching, communicating with outside clients, lifting heavy objects or loads). Routine task intensity is a summary index based on the frequency with which workers' jobs involve short repetitive movements or tasks or standardised procedures, as opposed to having task autonomy. Increasing routine task intensity is based on whether workers spent more time over the year on short, repetitive movements. Job insecurity refers to the chances of losing the job in the next year; digital jobs are distinguished according to whether workers learned new digital technologies for their job in the past year; weighted data.

Source: Cedefop's 2nd European skills and jobs survey.

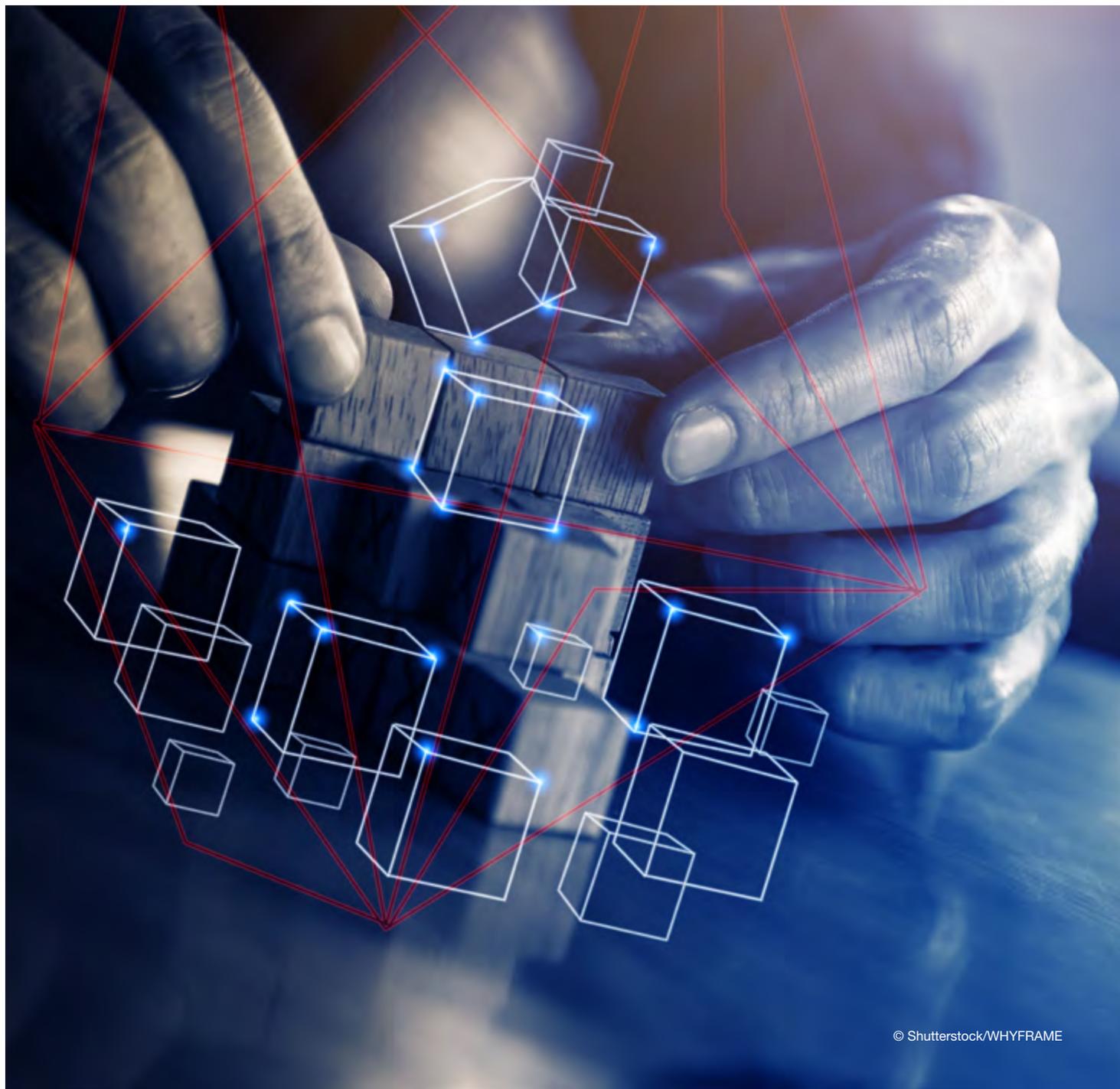


CONCLUSIONS

In this section

**VET and skills
policy priorities**

**Digital futures are
not immutable**



VET and skills policy priorities

ESJS evidence points to two key challenges for digital and skills policies. VET should enable those exposed to technological innovation to mitigate their digital skill gaps and any [skills-displacing technological obsolescence](#) in reasonable time. Lack of investment in digital infrastructure and slow progress in adapting to new digital working modes in a non-trivial share of EU jobs must also be addressed to ensure that incentives for further digital upskilling are adequate. Not doing so is likely to compromise workers' ability to reap unexploited productivity dividends in the medium to long term.

VET policy should focus first on the 13% of employed adults who do not use digital technologies at work, who are more likely to be confronted with severe digital skill gaps and whose jobs tend to be more susceptible to technological automation. Raising awareness of new realities in the world of work is essential. Many non-users of technology in work appear to be oblivious to the higher automation risk in their jobs, with the ESJS2 showing they are less convinced that new computer technologies can do part or all of their job or require new skills. Overcoming informational and psychological barriers to technology adoption is challenging, because

over 7 in 10 non-computer users have not used computing devices in previous or other jobs. Their views about the benefits and ease of computer use are less positive than those of digital users.

VET policy should [prioritise specific populations among those not using digital technology](#), particularly overrepresented groups such as older-aged (45+) and lower-educated persons, and females. They typically reside in rural areas, and many are employed in semi-skilled and low-skilled occupations, often working in smaller-sized firms. The jobs they hold are more likely to be routine, manual and temporary, with low job-skill requirements. Lack of exposure to digital technology makes it less likely they enjoy good labour market outcomes: they are mostly employed in lower-paid jobs that yield less job satisfaction. The limited possibilities for remote work made them much more vulnerable to the economic and labour market impact of the COVID-19 pandemic. Despite such challenges, such workers hit particularly hard by the health crisis were less likely to receive education and training in their jobs.

Apart from people not using technology at all, workers whose digital technology use is low, particularly those in jobs with low digital skill requirements and

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...VET policy should focus first on the **13% of employed adults** who do **not use digital technologies** at work...



...over **7 in 10 non-computer users** have **not used computing devices** in previous or other jobs...



...VET policy should **prioritise** specific populations among those not using digital technology, particularly overrepresented groups such as **older-aged** and **lower-educated persons, and females**...



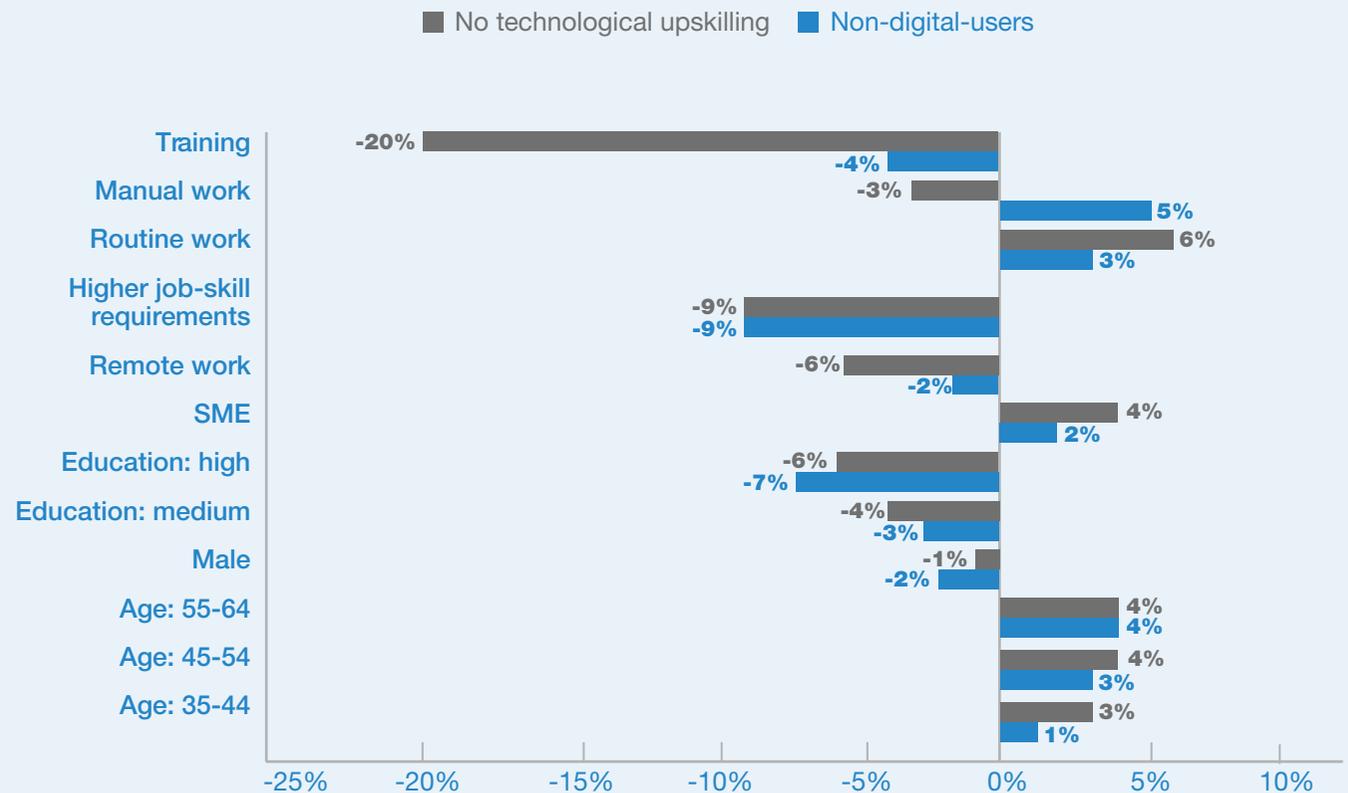
lacking technological innovation, also deserve attention from policy-makers. This group, which is insulated from the need to learn new digital technologies, tends to have somewhat similar characteristics to non-users: females, older-aged and lower-educated workers, employed in smaller-sized firms and in semi-skilled and low-skilled occupations (Figure 5).

Although the benefits of technological progress dominate, there are also negative features worthy of policy attention. Workers exposed to more digitalisation experience [higher fear of job loss](#), and this relationship is mostly driven by those for whom technological innovation led to job-task displacement. Technological innovation, especially the introduction of new computerised machines or equipment (3D printers, robots and CNC machines), is also associated with increasing work routinisation. The ESJS2 shows that the share of EU+ workers affected by digitalisation and spending more time doing short, repetitive movements or tasks increased over the 2020-21 period. This routinisation trend is accentuated for those who experienced job-task automation resulting from the introduction of new digital technology.



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Figure 5. Priority target groups for digital skills investment, EU+



NB: Marginal effects of probit regression (at sample mean values). A positive figure indicates a larger probability of individuals who either (1) do not use any computing devices to do their job; or (2) did not learn any new, major digital software or new computerised machinery in the past year for their job. Reference categories are: age: 25-34; education: low. The job-skill requirements, routine and manual work are Cronbach alpha summary indices based on relevant ESJS2 items; weighted data.

Source: Cedefop's [2nd European skills and jobs survey](#).

Digital futures are not immutable

For much of history, technological innovation has ultimately helped replace routine or dangerous work and contributed to better service provision. In the modern computer age, digitalisation has also drastically reduced the costs of coordinating economic activities. The fear is that this time around is different. The ever-increasing capacity of machines to use seamless big data for autonomous algorithmic learning and pattern recognition is seen as a threat, because it could crowd out cognitive, non-routine work, or foster disruptive business models involving skills downgrading. Such effects were not evident in earlier technological revolutions.

The early policy discourse on automation focused on quantifying the extent to which new digital technologies may completely replace jobs. More recently, it is increasingly acknowledged that, in virtually all occupations, **only some tasks are potentially automatable**. The extent to which job tasks may be affected by technological progress is, however, not immutable. So-called technological determinism, which sees technology as a relentless force that is distinct from other socioeconomic forces and policies, is frequently criticised.

ESJS2 findings show that, despite heightened concerns, only 4% of the total EU+ workforce (11% of

those who had to learn new digital technologies) experienced only task destruction in their jobs. For many more workers (31%), new task creation accompanied the introduction of new digital technologies, either on top of existing tasks or simultaneously with task replacement. The evidence further points out that different types of digital technology can have significantly different work and labour market outcomes. Computerised machinery has the potential of standardising and routinising work over time, while new computer software (including AI) may have positive effects on worker wellbeing.

Rather than speculating about jobs that may or will vanish, digital and skills policies should address a much more fundamental question: What type of work design is required, following technology-enabled changes, to ensure human-machine complementarities? Technocentric policies that do not fully consider the wider social and organisational context, and how digitalisation affects it, are likely to be either one-sided or fail in securing equitable outcomes for European citizens, organisations, and economies.

Job design must be at the heart of policies to steer technological development towards a desired future of work. It is not just technology that drives

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...For much of history, **technological innovation** has ultimately helped **replace routine or dangerous work...** The fear is that **this time around is different...**

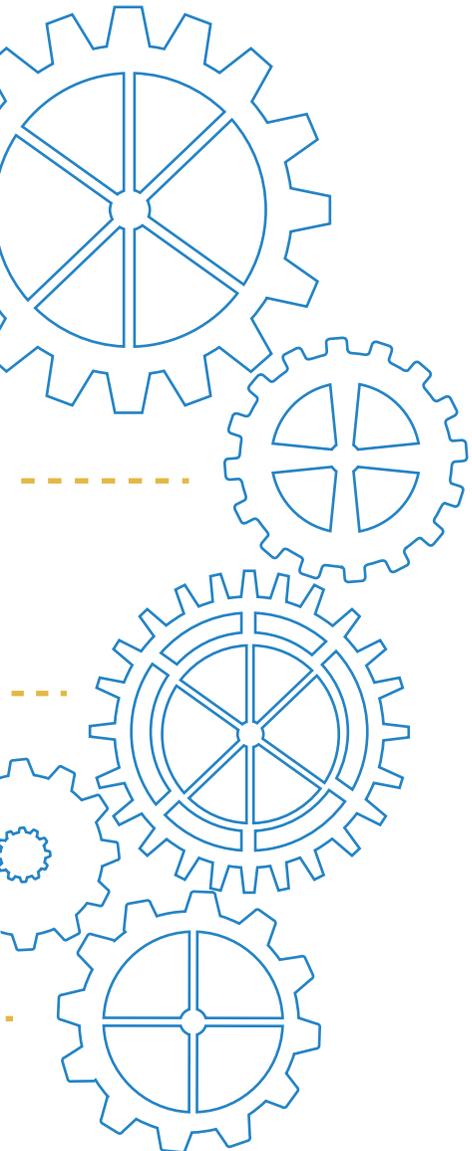


...the extent to which job tasks may be affected by technological progress is not immutable...**EU policy should not succumb to technological determinism...**



...a more fundamental question is **what type of work design** is required to **ensure human-machine complementarities...**

NEED FOR UP- AND RESKILLING POLICIES



labour market outcomes, but also the approach to developing and deploying it. A human-centred work design approach prioritises skills utilisation, and places workers at the centre of organisational policies. Technological adoption in EU companies should be accompanied by work design approaches that foster job autonomy instead of narrow [\(algorithmic\) management](#) and control systems based on ratings, recommendations and rewards. Technological change should stimulate skill variety and use, so that it motivates workers to learn and perform. Employee empowerment, scope for feedback in management practices, and positively reinforcing social relations in workplaces also drive the effectiveness of digital technology adoption in organisations.

Alongside [national innovation systems](#), wage bargaining practices and product market competition, the [adaptiveness of vocational education and training systems](#) also shapes the impact of the digital revolution on employment and job quality. The digital skill gaps and the scope for strengthening digital and complementary skillsets the ESJS2 uncovers, show how important it is to have widely accessible and effective European and national up- and reskilling policies in place: 1 in 8 EU+ workers has a fundamental digital skill gap and appears largely insulated from digital trends affecting most workplaces. Between 30% to 40% of the EU+ employee population would benefit from further training in basic word processing and spreadsheet skills.

There is a mismatch between who needs digital training most and who gets it in EU workplaces. This policy brief points towards clear significant inequalities in training access and intensity. Policy-makers should focus on expanding efforts to reach out to groups of workers most in need of digital skills training, prioritising lower-educated and older workers, females, people in low- or semi-skilled jobs and employees in smaller-sized establishments. Another equally important priority for EU digital skills policies is promoting a human-centred and empowering approach to adopting digital technology, so that it can contribute to work quality, learning, performance and – ultimately – better lives for EU citizens.

HUMAN-CENTRED WORK DESIGN

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POLICY BRIEF

Challenging digital myths

First findings from Cedefop's second European skills and jobs survey

This policy brief presents first findings from Cedefop's second European skills and jobs survey. The ESJS2 surveyed representative samples of EU+ adult workers on job-skill requirements, digitalisation at work, skill mismatches and workplace learning. It provides up-to-date evidence on how digitalisation accelerated in EU labour markets during the coronavirus pandemic. This brief identifies worker groups affected by task automation and digital skill gaps in need of targeted upskilling or reskilling, and makes the case for a human-centred and empowering approach to adopting digital technology.

Project info:

[European skills and jobs survey \(ESJS\)](#)

Project contacts:

Cedefop expert, [Konstantinos Pouliakas](#)



CEDEFOP

European Centre for the Development
of Vocational Training

Europe 123, Thessaloniki (Pylea), GREECE

Postal address: Cedefop service post, 57001 Thermi, GREECE

Tel. +30 2310490111, Fax +30 2310490020, Email: info@cedefop.europa.eu

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