

DIGITALISATION AND DIGITAL TRANSITION

Key findings from the European skills and jobs survey
in selected ETF partner countries

Disclaimer

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PREFACE

Around a decade ago, most headlines used to display a rather scary outlook: it was claimed that close to 50% of all jobs in developed countries were automatable and that robots and machine algorithms could massively displace people from jobs! New findings from some 35 European countries based on data from the second European skills and jobs survey (ESJS2)¹ now paint a rather different picture. While still accepting that digital technologies typically automate some job tasks of an occupation – but not quite entire jobs or occupations – the ESJS2 analyses contribute to a major shift in thinking².

The digital transition is all around us, and the COVID-19 pandemic accelerated digitalisation in Europe, radically changing the way we live, work and learn to a point of no return. But not all workers in our partner countries benefit equally: many are not exposed to digital technology or are employed in low-skilled, routine and non-complex jobs with low digital job-skill requirements.

Accelerating the uptake of digital and remote working or learning, the pandemic also accentuated the long-standing digital transformation, enhancing the demand for digital skills at specialised, advanced, but also basic level. The ESJS2 evidence confirms that labour markets were resilient during the pandemic, especially those that were characterised by a greater propensity towards the adoption of digital technologies. Most employees did not report significant changes in their employment status or working hours. Yet, some evidence shows that, during the pandemic, remote work tended to be most common for highly-educated employees holding high-skilled occupations³. As many of those jobs could not be performed remotely, the adverse impact for employees holding jobs at the lower/middle end of the labour market were larger than for those in skilled occupations.

This document presents key findings on digitalisation and the digital transition in six ETF partner countries⁴, in a comparative perspective. It illustrates the impact of the pandemic, maps the use of different types of digital technology, and reflects on their implications for changing tasks, skill needs and skill mismatches. The wealth of fresh and innovative evidence supports the ETF's digital and skills agendas and thematic work. This work will continue, will be extended, and further complemented in subsequent ETF knowledge products.

¹ The second European skills and jobs survey (ESJS2), developed by Cedefop, surveyed some 50 000 employees from 35 countries, gathering up-to-date, sound and robust information. Its design encompasses key EU policy frameworks such as the [EU skills agenda](#) and the [European digital strategy](#), while reinforcing the importance of digital skills and digitalisation. More information is available on [Cedefop's web portal](#).

² Cedefop (2022), *Setting Europe on course for a human digital transition. New evidence from Cedefop's second European skills and jobs survey*.

³ Joint Research Centre (2020), *Teleworkability and the COVID-19 crisis: a new digital divide?*

⁴ Albania, Bosnia and Herzegovina, Kosovo*, North Macedonia, Serbia and Israel.

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In a nutshell: Cedefop's 2nd European skills and jobs survey

The European skills and jobs survey (ESJS), a Cedefop periodic survey, collects information on the job-skill requirements, digitalisation, skills and qualification mismatches and workplace learning of nationally representative samples of adult employees. A first wave was carried out in 2014. The second wave (fielded in spring-summer 2021) aims to inform the policy debate on the impact of digitalisation on the future of work and skills, also in the context of the COVID-19 pandemic. The survey collects information in the European Union (EU) Member States, Norway and Iceland.

Cedefop joined forces with the European Training Foundation (ETF), which implemented the ESJS2 in Albania, Bosnia and Herzegovina, Kosovo*, North Macedonia, Serbia and Israel between November 2022 and January 2023. The fieldwork was carried out by Kantar Public on behalf of the ETF, targeting adults (aged 25-64) in wage and salary employment.

The European skills and jobs survey aspires to become a key tool for evidence-based policy-making. 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](#). The survey 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 data and information on digitalisation and its impacts. The data and analysis are central to the ETF's skills and labour market work, which aims to strengthen skills intelligence and support the twin – digital and green – transitions.

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

Author's adaptation based on: Cedefop (2022), [Challenging digital myths. First findings from Cedefop's second European skills and jobs survey](#) (pp. 19).

DIGITALISATION AND DIGITAL TRANSITION IN SELECTED ETF PARTNER COUNTRIES

Up until recently, the impact of digitalisation on jobs was mainly limited to its destruction potential. But the ESJS2 data and related analyses have contributed to a major shift in thinking, showing that digitalisation could also be seen as an innovator in addition to disruptor, akin to the two faces of the Greek god Janus. Digitalisation could lead to some job losses, but the doom and gloom outlook of techno-alarmism of earlier days has now made way for a more balanced perspective of the labour market effects of the digital transition, as supported by the ESJS2 data⁵.

The ESJS2 results shed new light on digitalisation in the context of the COVID-19 pandemic and the changing nature of skills demand and work and skill mismatch. They particularly provide insight into the level of demand for digital skills in labour markets and the extent of continuing skill development taking place to remedy skill mismatches. The new findings are based on innovative measurement approaches that capture the new dynamics in labour markets and how workers react and adapt to digitalisation. They provide better insight into the interlinkages between jobs, tasks, skills and learning.

This paper presents the first findings on digitalisation and the digital transition in six ETF partner countries from a comparative perspective. It illustrates the impact of the pandemic, maps the use of different types of digital technology and reflects on their implications for skill needs and skill mismatches. The findings – all covering adults aged 25-64 in wage and salary employment (i.e. paid employees) – are structured thematically and integrated. The wealth of fresh and innovative evidence supports the ETF's digital and skills agendas and thematic work. This work will continue, and will be extended and further complemented in various other ETF knowledge products.

Post-pandemic digital transformation at the workplace

Accelerating the uptake of digital and remote working or learning, the recent pandemic has also accentuated the long-standing digital transformation. The pandemic also enhanced demand for digital skills at specialised, advanced, but also basic level. Despite the unprecedented national support measures, the pandemic disproportionately affected particular sectors (such as hospitality, transport, arts and leisure) and worker groups⁶. The ESJS2 results show that remote work tends to be most common for highly educated employees holding high-skilled occupations⁷.

In 2022, some 28% of Western Balkans (WB5)⁸ employees, and 39% in Israel, worked away from their employer's premises, compared with 39% in the EU (2021). While 31% of employees with a tertiary level of education (ISCED levels 5-8) worked remotely, this was the case for only 24% of the lower-educated employees (ISCED levels 0-2). Working remotely from home or elsewhere was also more prevalent for computer programmers (54%) or those working in financial and insurance services (32%). This contrasts with sectors where interaction with clients or customers is the basis of most jobs, such as accommodation and catering (only 9%), or education (17%) and health and social work (19%). As many of those jobs could not be performed remotely, the adverse impact for employees holding jobs at the lower/middle end of the labour market were larger than for those in skilled occupations.

⁵ Cedefop (2022), *Challenging digital myths: first findings from Cedefop's second European skills and jobs survey*.

⁶ Working remotely is only possible in jobs with a specific task structure, and there are national differences in work organisation.

⁷ Joint Research Centre (2020), *Teleworkability and the COVID-19 crisis: a new digital divide?*

⁸ Albania, Bosnia and Herzegovina, Kosovo*, North Macedonia and Serbia. The averages used in this paper estimated by Kantar Public are the author's choice and are based exclusively on statistical considerations relating to country specificities, survey design and other factors. Consequently, the averages cited in this report may differ in other ETF products that may deploy alternative methods of data weighting.

Almost all employees in Israel used a computer device in 2022 (a desktop computer, laptop, notebook, tablet or smartphone) and at least three in four employees did so in the WB5 countries. Some 60% of WB5 employees and 84% of employees in Israel used the internet at work for tasks requiring basic or moderate digital skills (e.g. web browsing, emailing and social media), compared with 82% in the EU (2021). Some 28% of WB5 employees and 50% of employees in Israel used specialised software in 2022 compared with 56% in the EU (2021). For 13% of WB5 and one in five Israeli adult employees, advanced database management was part of their work, compared with 21% in the EU (2021). Only 8% of WB5 and 16% of Israeli employees needed very high digital proficiency to do their work (e.g. to develop and maintain ICT systems), while only 7% of WB5 employees (the same as in the EU) and 11% of employees in Israel used computer programming or coding at work. On average, 18% of WB5 employees and 13% of employees in Israel had to learn how to use new computerised machines (e.g. monitors/scanners), but significantly smaller numbers (3% in the WB5 and 6% in Israel) used robots or 3D printers.

ESJS2 evidence confirms that labour markets were resilient during the pandemic. Digital skill needs grew in 2022 following structural digitalisation trends and recent rapid change in labour markets and companies due to the COVID-19 outbreak. Close to 4 in 10 employees in the WB5 experienced new products or services in their workplace in the last 12 months, followed by a third of employees who changed management and working methods; some 14% of employees saw their jobs moved to another location or country.

But did such workplace changes have a direct impact on individuals' work? Did the new digital technologies adopted in companies truly mean a major change at work for employees⁹ and did they have a tangible impact on jobs? Moreover, did they trigger workers' up/reskilling? ESJS2 data imply that this is not necessarily the case: the number of employees having to learn new digital technologies ranges from only 14% in Albania or Serbia to 31% in Israel: indeed, on average, only some 15% of WB5 employees had to learn how to use new digital technology to do their main job compared to one third of EU employees (even reaching 60% in Finland and Ireland). Data shows that digital upskilling is not yet in place in the WB5 and that it is only similar to the EU level in Israel¹⁰.

Digitalisation, skills gaps and the learning potential

Skill mismatches occur when workers' education and skills diverge from those necessary to perform their current job¹¹. Based on the relevance of skills and knowledge that the workers have accumulated in their formal education and training, there are several ways used to proxy the skill requirements of jobs. One is the education level required 'to do' them¹². The ESJS2 also aims to measure the 'dynamic skill gap' of workers, where they may lack the skills necessary to perform their current job at a proficient level, recognising that the main role of (continuing) education and training is to facilitate workers reaching their 'learning potential'. The survey also quantifies the digital skill gap of employees, namely the extent of improvement required in one's digital skills to improve performance in the job¹³.

⁹ In the ESJS2, the measurement of technological change and digital upskilling implies a substantial change and a tangible impact on jobs, triggering re/upskilling. The survey is innovative in this respect by measuring some challenging concepts and constructs (e.g. digital upskilling), which otherwise resist explicit scaling because they are rather complex and differ qualitatively across jobs.

¹⁰ By asking adult employees if they had to learn new computer software or computerised machinery, the ESJS survey frames and better gauges the concept of digital upskilling.

¹¹ Specifically, skills mismatch can be used to describe vertical mismatch (usually measured in terms of over-education, under-education, over-skilling and under-skilling), horizontal mismatch (where usually individuals' fields of study and those required in jobs are compared), skills gaps (the extension to which workers lack the skills necessary to perform their current job to a proficient level), skills shortages (usually measured in terms of unfilled and hard-to-fill vacancies due to the absence of relevant knowledge, skills and competences) and skill obsolescence (skills can become obsolete due to ageing, through technological or economic change which renders certain skills unnecessary, or through the underutilisation of skills).

¹² Using the subjective opinions of employees to detect the level of education required in jobs has several advantages relative to alternative measures used in literature. They directly refer to an individual's job and rely on the information set of the job holder.

¹³ Cedefop (2022), *Setting Europe on course for a human digital transition. New evidence from Cedefop's second European skills and jobs survey*.

In 2022, one in four WB5 employees was overqualified (i.e. had a higher educational level than their job required), whereas 6% were underqualified, holding a lower educational level than their job required¹⁴. However, there are sizeable cross-country differences: one in four adult employees in Albania and Kosovo are overqualified, compared with around one in six employees in North Macedonia or Bosnia and Herzegovina. Similarly, around one in three WB5 employees said that their job exclusively requires their main subject or field of study, and one in four stated that it requires their field of study or a related one. Around 8% employees could be considered mismatched by field of study, with their jobs requiring a different field of study to their own, while for some 30% of employees their job does not require a specific field¹⁵. Nonetheless, there are important cross-country disparities: 50% of Albanian employees stated that their job exclusively required their field of study, whereas this was true only for one third of employees in Bosnia and Herzegovina or Israel.

With nearly two thirds of WB5 employees holding jobs requiring their field of study or a related one, the observed mismatch by field of study is lower than the qualification mismatch (i.e. those holding jobs requiring a different level of formal education). This is an important finding showing that the skills survey design can largely influence skill mismatch findings when they directly refer to an individual's job and rely on the information set of the job holder, compared with other occupation-based empirical approaches. The ETF's previous work on the topic, based on Labour Force Survey data, documented similar country estimates for the qualification mismatch but higher values for the mismatch by field of study¹⁶.

Data shows that in 2022 half of the jobs in the WB5 required a medium level of education (i.e. ISCED levels 3-4), whereas only one in five jobs required a low educational level (i.e. ISCED levels 0-2). One in four employees held jobs requiring tertiary education (ISCED levels 5-8) to carry out the required tasks compared with 38% in the EU+ region (2021). Previous ETF work on the topic also documented a higher incidence of overqualification among tertiary graduates in some 20 partner countries¹⁷. However, this is not completely surprising, confirming that, in most of our partner countries, graduation does not necessarily always lead to a matched integration in the labour market, signalling a human capital loss¹⁸. Landing a job below one's attained educational level can also potentially have persisting effects, especially for the young graduates, as it could even signal early, sometimes ill-informed or constrained, career choices.

Sizeable skills gaps are also documented in the survey: 38% of WB5 adult employees and 60% of those in Israel stated they will need to develop their digital skills further to a great or moderate extent in order to do their main job better than at present; the respective figure is 52% for the EU workers (see [Infographic](#)). In the case of WB5 employees, one in 10 must improve their digital skills significantly, while 28% need to develop them to a moderate extent. In Israel, 27% stated they needed to improve their digital skills significantly, while one in three needed to develop them to a moderate extent. The lower digital skill gaps of WB5 employees relative to Israel and the EU+ region reflects the modest (digital) skill demands in WB5 jobs, which fail to provide adequate incentives to workers for further digital skills training. This does not mean there is no learning potential at all: at least one in four adult employees in Serbia and up to two thirds in Kosovo stated that they needed to further improve their digital skills to do their job better. Despite the fact that these ETF partner countries have a significant potential for investment in digital skills training, workers' investment in digital skills is not very substantial: only one in three WB5 adult employees engaged in training activities aimed at further developing the digital skills required by their job in 2022. In general, adult employees who are most in need of digital skills improvement (such as low users of digital technologies or those who are insulated from digitalisation altogether), often do not do it¹⁹.

¹⁴ By adding up the two values, we can conclude that nearly one in three WB5 adult employees is mismatched, on average, holding jobs requiring a different level of formal education.

¹⁵ The first two categories are indicators of a relatively strong and weak horizontal match, respectively, whereas the third points towards a strong horizontal mismatch. The fourth category is residual and captures workers in jobs in which their generic skills may be relevant, but their subject specific skills are not. Therefore, the job position can be open to any field.

¹⁶ ETF (2021), *Skills mismatch measurement in ETF partner countries*.

¹⁷ *Ibid.*

¹⁸ ETF (2021), M. Badescu and C. Mereuta, *Skills mismatch: Measurement and policy implications in selected countries*.

¹⁹ Cedefop (2022), *Challenging digital myths: first findings from Cedefop's second European skills and jobs survey*.

Going digital: fear or facts?

Around a decade ago, most headlines used to portray a rather scary outlook of techno-alarmism: robots and machine algorithms would massively displace workers! Data shows that some 45% of WB5 adult employees surveyed in 2022 stated that there was a very high or some chance of them losing their jobs in the coming year²⁰. At times when technological alarmism often dominates the debate on the impact of digitalisation, the survey provides an insight into whether these fears are justified, based on sound, robust evidence.

So what does the ESJS2 data show? In 2022, around 28% of WB5 employees, over a third in the EU+ region (35%) and some 38% in Israel believed that new digital technologies in their workplace could or would do their jobs partly or fully. And this is not all! Job insecurity linked to workers' lack of new skills with regard to the digital transition is much higher: some 35% of WB5 employees and nearly half in the EU+ region and Israel (45%) feared they may lose their job in the coming year due to their lack of the necessary knowledge and skills implied by the advent of new digital technologies. The survey shows that a third of WB5 employees and 45% of those in the EU+ region agree that new knowledge and skills are (and will be) required to work with new digital technologies²¹.

The findings also show that the level of job insecurity relates to the type of digital technologies used: it is more pronounced for employees holding routine or manual jobs (where the introduction of new computerised machinery is more likely to happen), while others (e.g. programmers) feel less insecure. However, it is important to avoid further digitalisation, particularly in manual/routine occupations, resulting in more routine jobs where workers may feel less secure – the introduction of new computerised machine-robots may have this effect.²²

So far, digitalisation = job destruction potential; indeed, it could expectedly lead to job losses. While still accepting that most digital technologies could typically automate some job tasks of an occupation – but not quite entire jobs or occupations – the survey paves the way for a more balanced perspective. These findings have largely contributed to a major shift in thinking: digitalisation is no longer seen only as a disruptor, but increasingly also as an innovator²³. This remains, perhaps, one of the main messages here.

²⁰ The ESJS2 was fielded in spring-summer 2021 in the EU+ countries and between November 2022 and January 2023 in the ETF partner countries.

²¹ Cedefop (2022), *Challenging digital myths: first findings from Cedefop's second European skills and jobs survey*.

²² Ibid.

²³ Cedefop (2022), *Setting Europe on course for a human digital transition. New evidence from Cedefop's second European skills and jobs survey*.

What challenges? Takeaways for future reflection

The hypothesis according to which digital technology is a persistent job-destroying force that cannot be shaped by wider socioeconomic or political drivers is not supported by ESJS2 data in this analysis. While digitalisation could indeed lead to some job losses, the evidence shows that job digitalisation primarily requires massive upskilling and reskilling of workers. This concluding section recaps the key findings, reflecting on their economic and policy implications.

- **Non-users of digital technologies are oblivious to automation risks or lack awareness of new realities in the world of work.**

In 2022, seven in 10 WB5 employees believed that new digital technologies would result only in small improvements (e.g. in the speed or quality of their work) and only one in four employees in the EU+ region was concerned that technology could or would (partly) do their tasks. Most employees are aware of work changes and fear they may lose their job, but the level of job insecurity relates to the type of digital technologies used. In the future, it will be essential to avoid further digitalisation, particularly in manual/routine occupations but also increasingly in jobs with high cognitive content, resulting in more routine work where workers feel less secure²⁴.

- **The digital transition is hindered by low skill demands, and this could foster skills underutilisation.**

In 2022, over 50% of WB5 employees carried out tasks requiring some reading and numeracy skills²⁵. However, 45% of them only had to read texts shorter than one page or did not have to read at all as part of their main job, and close to 60% have written texts shorter than one page or did not have to write at all. Furthermore, nearly half of them (45%) performed only simple calculations with numbers, such as adding, subtracting, multiplying or dividing. The adult employees in jobs with low skill requirements are also most likely to use only basic digital technologies, if at all. This could be seen as a first step towards their job tasks being displaced by digital technology which in the future could carry out such routine or less complex tasks, such as artificial intelligence (AI); the next step would mean that the digital transition could become for them a pathway towards less rewarding jobs²⁶.

- **The level of digital skills demanded in labour markets remains relatively modest; and yet digitalisation is expanding.**

The ESJS2 evidence shows that digital technology does not just shape the future of work, but also most of today's jobs, and that digitalisation is expanding particularly in higher-skilled jobs. The analysis also shows that the level of digital skill demand in the WB5 countries (but also in most of Europe) is relatively modest, inhibiting incentives to employees to engage in continuing vocational education and training and digital upskilling. However, this does not mean that there is no learning potential at all: at least one in four adult employees in Serbia and up to two thirds in Kosovo stated that they needed to further improve their digital skills to do their job better. These findings highlight the fact that

²⁴ Ibid.

²⁵ In the ESJS2, basic reading requirements correspond to jobs in which workers read texts, on paper or computer screens that are 1-4 pages long; moderate reading is 5-24 pages long; high reading refers to texts that are at least 25 pages or longer. Writing requirements correspond to jobs in which workers write texts that are either at a basic level (1-4 pages), moderate level (5-24 pages) or high level (more than 25 pages). Basic maths requirements imply that workers have to perform simple calculations with numbers (adding, subtracting, multiplying or dividing) regularly as part of their job, whether on their own or with the help of a computer or calculator. Moderate mathematics requirements refer to jobs that require the use of simple algebra/mathematical formulas (for instance, calculating fractions or percentages or trying to find an unknown quantity). High maths refers to the use of any kind of more advanced mathematics, algebra or statistics, for instance calculus, regressions or simulation analysis.

²⁶ Cedefop (2022), *Setting Europe on course for a human digital transition. New evidence from Cedefop's second European skills and jobs survey*.

digitalisation could act indeed as an innovator at the higher end of the labour market, while being a disruptor at the lower end, especially for those workers who do not digitally upskill.

- **Despite widespread skill gaps, engagement in training remains relatively modest in the ETF partner countries.**

ESJS2 data shows that the digital upskilling in the WB5 countries (but also in most of Europe) is relatively modest and digital upskilling is not yet in place. The share of WB5 employees who were digitally upskilled (i.e. having to learn new digital technologies to do their main job) remained extremely low in 2022 (only one in six employees). Even though these countries all have a significant potential for investment in digital skills training (see above), much of it is not very substantial: only one in three WB5 employees has been engaged in training activities with the aim of further developing the digital skills required for their job in 2022. The findings also show high inequalities in training intensity/participation: adult employees who are most in the need of training (such as low-users of digital technologies or those who are insulated from digitalisation) often do not take it²⁷. Moreover, data shows that digital upskilling for learning using the 'basics', is modest and its duration is not substantial. The above findings on the digital skill gaps, coupled with the significant inequalities in accessing digital skills training, proves the crucial importance of having in place national up- and reskilling policies which are accessible, inclusive and effective.

²⁷ Cedefop (2022), *Challenging digital myths: first findings from Cedefop's second European skills and jobs survey*.

INFOGRAPHIC



ACRONYMS

AI	Artificial intelligence
Cedefop	European Centre for the Development of Vocational Training
ETF	European Training Foundation
ESJS	European skills and jobs survey
ESJS2	Second European skills and jobs survey
EU-27	European Union as of 1 February 2020, which consists of 27 countries: Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland and Sweden
EU+	European Union countries plus Iceland and Norway
WB5	Western Balkan five countries: Albania, Bosnia and Herzegovina, Kosovo*, North Macedonia and Serbia

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