Digital Economy and Society Index (DESI) 2022

Human Capital

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1 Human Capital

Digital transformation is on the rise and affecting every aspect of life. Digital skills are important because they underpin how we interact and how modern work is conducted. For many modern professions, digital skills are simply essential life skills. The digital skills required in the workplace are more advanced, and companies and institutions – public and private - expect most of their employees to have them. As dependence on the internet and digital technology increases, so the workforce must keep up with the evolving skill demand. Without a firm command of digital skills, there is no way to propel innovation and remain competitive. The same applies to the public that will need digital skills in the day-to-day professional or personal context.

Against this backdrop, the digital transition is a priority for the EU and the Member States. A digitally skilled workforce and public are key to making it happen. The Path to the Digital Decade proposal reflects that salience alongside infrastructure, digital transformation of businesses and public services. Specific targets are proposed to shape and encourage EU and Member States actions by 2030. The EU aims to equip at least 80% of people with at least basic digital skills and increase the number of ICT specialists to 20 million (around 10% of total employment), with convergence between men and women by 2030.

Today, 54% of Europeans have at least basic digital skills[1]: 26 percentage points below the target with stark differences among countries. Some Member States like the Netherlands and Finland approach the target with 79% of people with at least basic digital skills in 2021. In eight Member States, the share of individuals with at least basic digital skills is lower than 50%. Romania, Bulgaria, Poland and Italy rank the lowest.

ICT specialists in employment were 8.9 million in 2021 (4.5% of the total employment). Even the frontrunners are far from the Digital Decade target with Sweden at 8% and Finland at 7.4%. At the current growth rate, the EU will fall short compared to the target set for 2030.

The Digital Skills Indicator is the tool that will monitor Member States' performances in reaching the skills targets of the Digital Decade proposal and provide useful information on citizens' behaviour online and people's skills and competences in different digital domains.

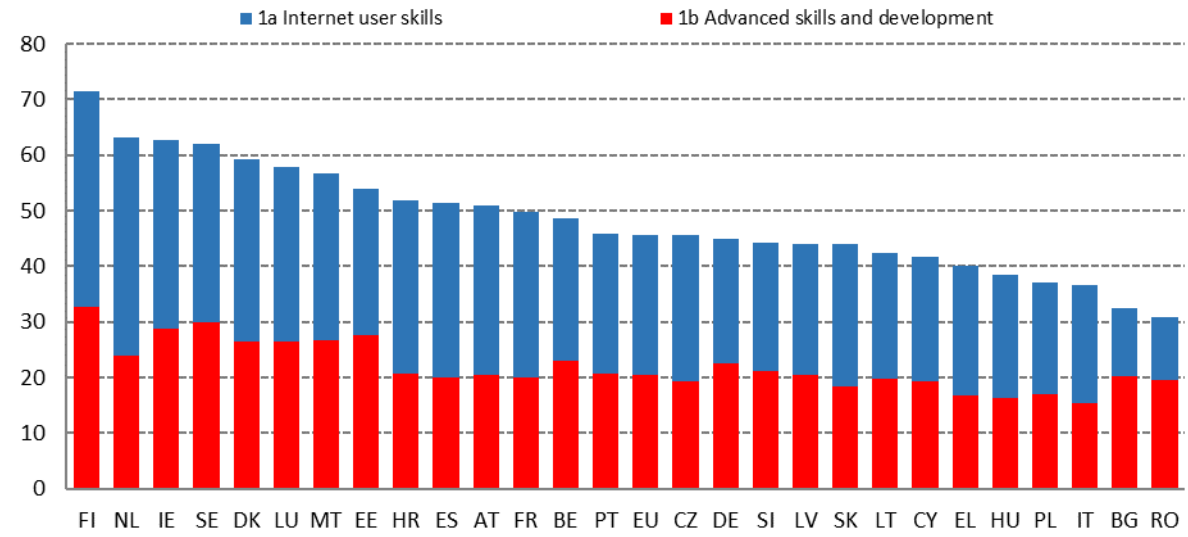
Table 1 Human capital indicators in DESI

	EU DESI 2022
1a1 At least basic digital skills % individuals	**54%** 2021
1a2 Above basic digital skills % individuals	**26%** 2021
1a3 At least basic digital content creation skills % individuals	**66%** 2021
1b1 ICT specialists % individuals in employment aged 15-74	**4.5%** 2021
1b2 Female ICT specialists % ICT specialists	**19%** 2021
1b3 Enterprises providing ICT training % enterprises	**20%** 2020
1b4 ICT graduates % graduates	**3.9%** 2020

Source: DESI 2022, European Commission

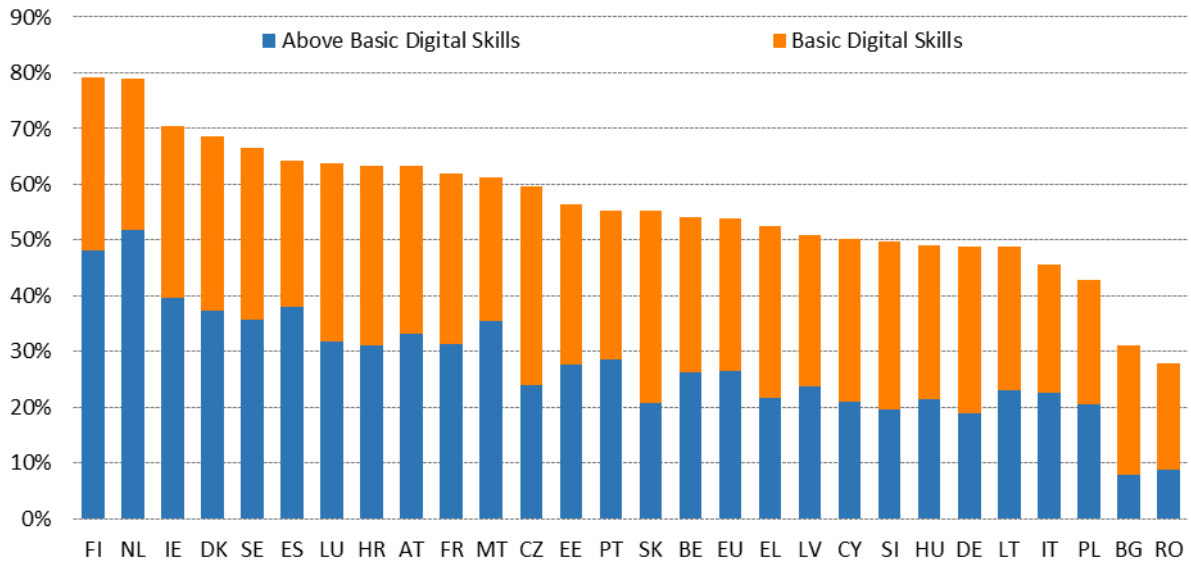
[1] 'At least basic skills' is combining together the number of individuals (16-74 years old) having either 'basic digital skills' or 'above basic digital skills'.

Figure 1 Human capital dimension (Score 0-100), 2022



Source: DESI 2021, European Commission

Figure 2 Basic and above basic digital skills (% of all individuals), 2021



Source: Eurostat, Community survey on ICT usage in Households and by Individuals

1.1 The Digital skills composite indicator

Since 2015, the European Commission has measured citizens' digital skills through the Digital Skills Indicator (DSI). It is a composite indicator based on selected activities related to internet or software use, which are performed by individuals aged 16-74. Due to significant technological changes of the ICT landscape, the methodology was updated through the Joint Research Centre of the European Commission and the Information Society Statistics Working Group with Member State representatives in 2019-2022.

The European Commission's Digital Competence Framework 2.0 was used to update the DSI methodology throughout 2020-2021. The new DSI introduced in 2022, DSI 2.0, measures citizens' activities taking place on the internet in the last 3 months in five specific areas:

- Information and data literacy;
- Communication and collaboration;

- Digital content creation;
- Safety; and
- Problem solving.

According to the Digital Skills Indicator 2.0, it is assumed that individuals having performed certain activities over the internet using digital tools and software have the corresponding skills. Therefore, the individuals' activities measured using the Digital Skills Indicator can be considered as proxy of individuals' digital skills.

According to the number of activities performed in each area, two levels of skills are calculated, i.e. 'basic' and 'above basic'. Based on the level of individual's skills in each area, an overall level is then calculated. For individuals to be considered as having overall 'above basic' level of digital skills, they need to have above basic skills in all five areas. If an individual has 'basic' in some areas and 'above basic' in others, then this individual is considered having overall 'basic digital skills'.

Besides calculating the levels of 'basic' and 'above basic', the DSI 2.0 seeks to gain further insights into different levels of nature of digital skills. The following additional breakdowns of data were calculated in 2021 to provide empirical knowledge on individuals lacking 'basic' digital skills and help policy makers to understand better the challenges related to digital skills development.

- Individuals with *low digital skills*: who have either basic or above basic level in 4 out of the 5 areas;
- Individuals with *narrow digital skills:* who have either basic or above basic level in 3 out of 5 areas;
- Individuals with *limited digital skills*: who have either basic or above basic level in only 2 out of 5 areas;
- Individuals with *no digital skills*: who have no skills in 4 areas or in all 5 areas;
- Digital skills could *not be assessed* because the individual has not used the internet in the last 3 months.

1.2 Internet use

Internet access continued to be widely available in terms of costs and accessibility. The major milestone was crossed in 2007 when 53% of European households had internet subscription. The proportion continued to rise reaching 92% households in the EU with subscription to internet in 2021. Luxembourg and the Netherlands had the highest proportion (99%) of households with internet subscription in 2021, with Ireland, Finland (both with 97%) and Denmark and Spain (96%) closely behind. Bulgaria (84%) and Greece (85%) had the lowest rate of internet take up among Member States, but both together with Cyprus, Romania, Slovenia and Lithuania have swiftly expanded by 15-20 percentage points in the proportion of households with internet subscription over 2016-2021.

The urban-rural divide in internet use persists. Households in cities, towns and suburbs had comparatively higher subscription rates (94% in cities and 92% in towns and suburbs), while those in rural areas were recording slightly lower numbers (89%). The urban-rural divide was particularly visible in Bulgaria, Greece and Portugal (where households in rural areas were recording values lower than 80%). Interestingly, Cypriot towns and suburbs recorded the highest level of internet take-up – 97% compared to cities (93%) and rural areas (91%). Other exceptions were Estonia, Sweden and Poland, where the lowest level of internet access was in towns and suburbs, not in rural areas.

In 2021, regular internet users stood at 87% (at least weekly usage), while almost 80% were using it every day or almost every day. The proportion of the EU's population that had never used the internet was 8% in 2021 (1 percentage point lower than in 2020). However, this figure is higher in some countries, like Greece and Bulgaria, where one in five individuals has never done so. In

contrast, 1% - 0% of the adult population of Ireland, Sweden and Luxembourg had never used the internet.

Although 87% of Europeans use the internet regularly, only 54% possessed at least basic digital skills. It is not enough to have access to the internet in order to make use of it. Use of internet goes hand-in-hand with the appropriate skills to benefit from the digital society.

1.3 Digital skills levels and online information and communication indicator

The new DSI 2.0 introduces more detailed variations of digital skills ('low', 'narrow' and 'limited digital skills'), which allow for a closer monitoring of the uptake of digital skills. In 2021, 3% of individuals had been classified as having no overall digital skills, 5% having skills in 2 out of 5 areas ('*limited digital skills'*) and 9% having '*narrow skills'* (3 out of 5 areas).

17% of individuals had digital skills in 4 out of the 5 areas monitored (*'low digital skills'*). This means that they are a step away from reaching basic digital skills level. Further investment and upskilling opportunities may help them advance and bring the total share of basic digital skills to 71%.

The 'Online information and communication' is a composite indicator, which captures activities in only two specific skills areas (out of five): information literacy and communication and collaboration. The respondents, captured by this indicator, have performed activities in those two areas only, without performing any activities in remaining three areas of DSI 2.0. It means that people belonging to this category use internet to either communicate or get the information. The countries where respondents have skills limited to 'online information and communication' are Romania (10%), Bulgaria (9%) and Cyprus (6%). Together with Poland, these are also the countries with the highest share of respondents having *limited digital skills* (skills in 2 areas out of 5). These individuals are lacking digital skills in categories such as Safety, which means that they are not safe online and are vulnerable to personal data breaches, online frauds and other such attempts. Targeted training for individuals in 'Online information and communication' category in areas such as 'Safety', 'Problem-solving' and 'Digital content creation' would increase their overall digital skills.

1.4 At least basic digital skills

Socio-demographic factors influence the levels of digital skills. For example, 71% of young adults (aged 16-24), 79% of individuals with high formal education[2], and 77% of higher education students have at least basic digital skills (Table 2). By contrast, only 35% of those aged 55-74 and 29% of the retired and the inactive have at least basic digital skills. The gap between rural and urban areas is still substantial regarding the digital skills of the population: only 46% of individuals living in rural areas have at least basic digital skills compared to people living in the predominantly urban areas (61%). For more information on selected socio-demographic background, see the table below.

It is worth noting that being of young age does not determine digital skills, as growing up in a digital world does not necessary make you digitally savvy. At the International Computer and Information Literacy Study (ICILS)[3] of 8th-graders' performance test, which is based on direct testing and assesses a wider set of skills than DSI, demonstrates that young people do not develop sophisticated skills just by growing up using digital devices. In 9 out of 14 EU Member States that have participated in ICILS to date, over a third of the pupils achieved scores below the threshold in digital skills.

In the Council Resolution, on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030), Member States agreed to

[2] ISCED11 levels from 5 to 8 - formal tertiary (or higher) education
[3] https://www.iea.nl/studies/iea/icils/2018.

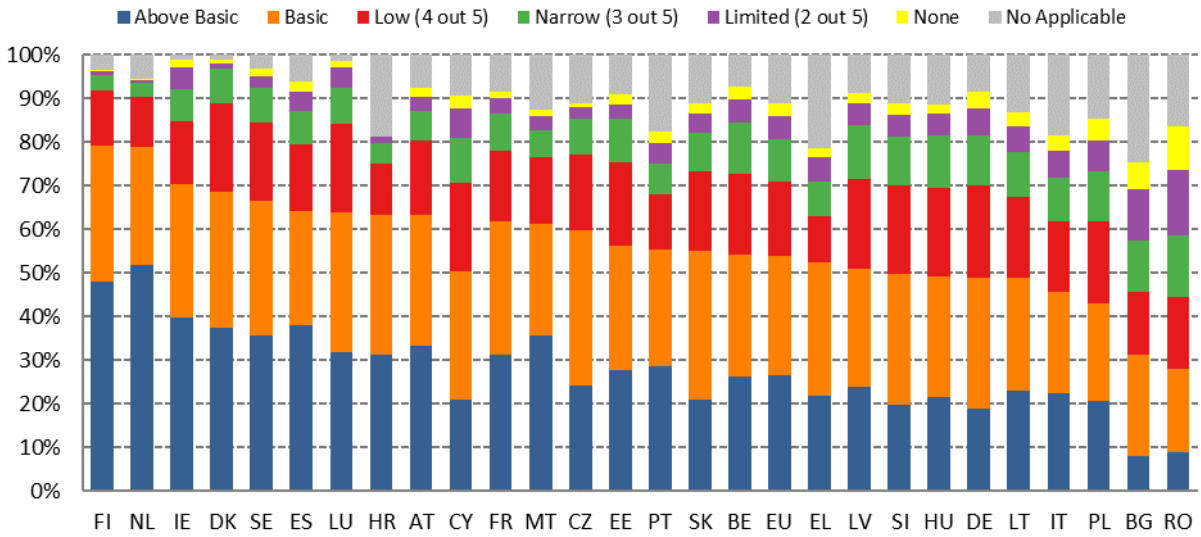
work towards reducing the share of underachievers to below 15% at EU level by 2030. The Digital Education Action Plan 2021-2027 and other EU initiatives contribute towards this goal.

Table 2 At least basic digital skills across different socio-demographic breakdowns (% of all individuals), 2021

Factor	Characteristics	At least Basic Digital Skills in 2021 - the EU average
Age	Individuals, 16 to 24 years old	71%
	Individuals, 25 to 34 years old	69%
	Individuals, 35 to 44 years old	64%
	Individuals, 45 to 54 years old	55%
	Individuals, 55 to 64 years old	42%
	Individuals, 65 to 74 years old	25%
Density	living in a predominantly urban area	61%
	living in an intermediate area	52%
	living in a predominantly rural area	46%
Education	Individuals with no or low formal education	32%
	Individuals with medium formal education	50%
	Individuals with high formal education	79%
Employment	Active labour force (employed and unemployed)	62%
	Retired and other inactive	29%
	Employees, self-employed, family workers	63%
	Students	77%
	Unemployed	49%
Gender	Females, 16 to 74 years old	52%
	Males, 16 to 74 years old	56%

Source: Eurostat, Community survey on ICT usage in Households and by Individuals

Figure 3 Digital Skills (% internet users), 2021

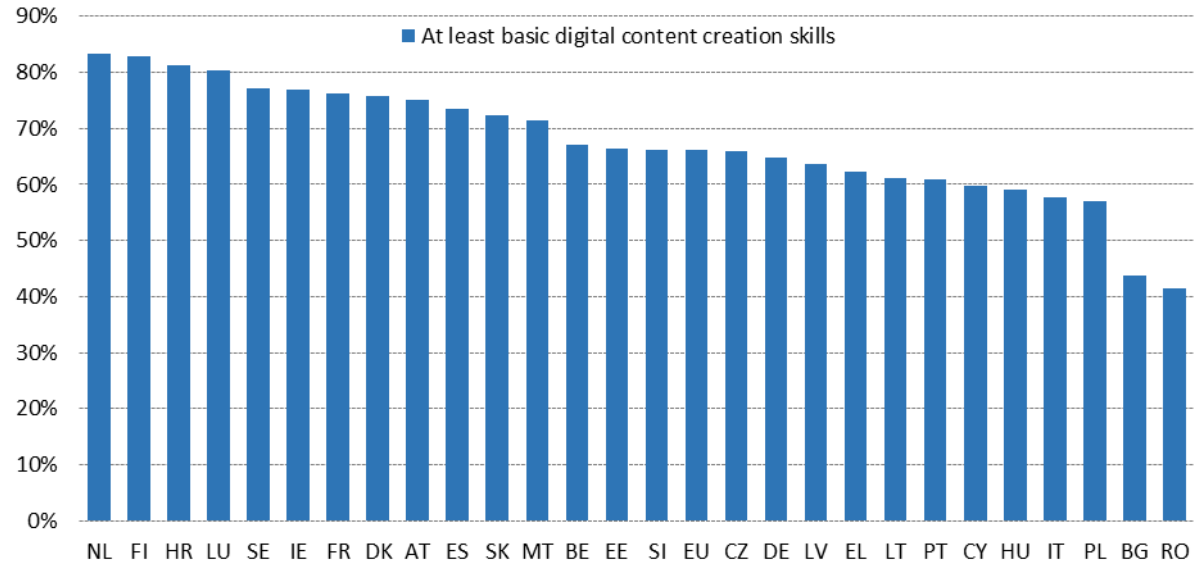


Source: Eurostat, Community survey on ICT usage in Households and by Individuals

1.5 Content creation skills

Individuals' skills in content creation[4], another key indicator of DSI 2.0 included in DESI, are varied. The Netherlands and Finland lead in at least basic digital content creation skills, closely followed by Croatia and Luxembourg with scores above 80%. Romania, Bulgaria, Poland and Italy have the lowest share of individuals with activities accounting for at least basic content creation skills in 2021.

Figure 4 At least basic digital content creation skills (% of all individuals), 2021



Source: Eurostat, Community survey on ICT usage in Households and by Individuals.

1.6 Above basic digital skills

In 2021, 26% of EU individuals had above basic digital skills. It means that they scored above basic in all five areas of the DSI. Having above basic digital skills is important both to grow competitiveness in the labour market and to enable the take-up of digital solutions in business.

1.7 Online Disinformation

The rise of disinformation, false information with the intent to deceive people, has become a major challenge worldwide. People are increasingly likely to encounter online information that misrepresents reality. However, many may not realise it as only 46% of Europeans have encountered untrue or doubtful content or information online in the last 3 months. Checking the truthfulness of information is a way to mitigate the impact of disinformation on the society. 24% of EU individuals had checked the truthfulness of the information or content found on the internet news sites or social media in the last 3 months. 15% did not check the truthfulness, as they already knew it was not reliable. Worrisomely, 5% contested that they lacked skills or knowledge to verify truthfulness.

[4] Definition in Digital Competence Framework 2.0 of 'Content creation skills' is: to create and edit digital content, to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied and to know how to give understandable instructions for a computer system.

1.8 ICT specialists

Digital skills have never been more essential to businesses and the workforce as they are no longer 'optional' but 'critical'. While this trend had been gaining momentum for decades across all industries, today's acceleration is unprecedented. Now, digital adoption and advanced digital skills needed to embrace the transformation that are critical to more secure, in-demand tech careers. Digital skills are also essential to the survival and growth of businesses. As routine tasks are becoming increasingly automated, there is a risk of job loss for workers performing mainly such tasks. A growing number of workers will need to gain new skills to work in tandem with (digital) technologies.

All Member States including frontrunners face a critical shortage of digital experts. That hinders the development, uptake and use of emerging key digital technologies. In key areas such as cybersecurity or data analysis, there are constantly hundreds of thousands of hard-to-fill vacancies.

In 2021, about 9 million people worked as ICT specialists in the EU. The highest numbers were reported in Germany (2 million ICT specialists), which provided work to more than one fifth (22.5%) of the EU ICT workforce. Germany was followed by France with 1.2 million of ICT specialists (13.9% of the EU total) and Italy with 0.8 million (accounting for 9.5% of EU total)[5]. Their combined share accounted for more than 40% of the EU's ICT workforce. The EU target requires to have 20 million of ICT specialists by 2030, representing around 10% of total employment, with a convergence between men and women.

There is still persistent gender gap: only one in five ICT specialists and ICT graduates are women, which may affect the way digital solutions are devised and deployed. This is compounded by the demographic decline across the EU, and a lack of specialised education offer in key digital areas.

In the face of a growing number of jobs for people with advanced digital skills, educational policies encouraging undergraduates to opt for tech studies can improve their employment prospects linked to higher earning potential. Many of these jobs go unfilled, making the advanced digital skills part of a solution to unemployment. Ensuring a wide range of easily accessible and relevant upskilling and reskilling opportunities to the EU workforce can help satisfy the demand for more ICT specialists, advanced digital technology users and above basic digital skills.

1.9 EU Code Week 2021

To thrive in the connected economy and society, digital skills must also function together with other abilities such as strong literacy and numeracy skills, critical and innovative thinking, complex problem solving and an ability to collaborate. EU Code Week[6] is a grassroots initiative that the European Commission supports bringing coding and digital literacy to everyone in a fun and engaging way with activities organised around the world by teachers and coding enthusiasts.

EU Code Week contributes to the target of the Digital Education Action Plan 2021-2027, which aims at reducing the share of 13-14-year-olds with insufficient computing and digital skills from 30% to 15% at the EU level by 2030. EU Code Week also contributes to the targets of the Digital Decade: increasing the number of Europeans with basic digital skills and the number of digital experts.

EU Code Week provides teachers with free resources, ready-made lesson plans, free online introductory courses and other materials to help bring coding and technology to all subjects and classrooms.

[5] Employed ICT specialist can be visualised online both as regards of percentage of total employment and in thousands of person.
[6] https://codeweek.eu/

In the last five years over, 15.5 million people have taken part in the EU Code Week to learn basic programming concepts, practise computational thinking, manipulate data, and tinker with hardware and design games. In 2021, some 4 million people participated in the initiative, with an average age of participants of 11 years and nearly half the participants being girls (49%).

Some 34 000 people, mostly teachers organised over 78 000 activities: a 15% increase compared to 2020. 88% of the activities took place in schools showing teachers' great involvement in the initiative. 11% of the activities were held online and 83% in-person (6% unspecified).

The 10 most active EU countries were Italy (18 000) and Poland (15 000), Greece (2 300 activities), Austria and Romania (both 1 800), Hungary (1 400), Croatia, Spain and Germany (all 1 000). However, in relation to the size of the population Malta and Estonia's activities topped the scoreboard.

The 10th edition of the Code Week will take place between 8 and 23 October 2022.

1.10 Digital skills in the Recovery and Resilience Plans

The EUR 723.8 billion[7] Resilience and Recovery Facility is a financial instrument to accelerate Europe's post-COVID recovery and mitigate the socio-economic consequences of the pandemic. All the 25[8] plans approved by the Council of the European Union meet or exceed the target to allocate at least 20% to digital priorities. Around 17% of the expenditure dedicated to digital objectives (EUR 22 billion), is dedicated to digital skills development. Measures include training in digital skills for SMEs (Spain), digital skills courses for vulnerable groups (France), more study places devoted to ICT in tertiary education (Sweden) and cross-border cooperation in higher education to improve the offer in advanced digital skills training (Italy). The plans also include reforms. Slovakia will update school curricula and learning materials to include digital skills and teach computational thinking. Italy will review its active labour market policies to also encourage job seekers to acquire green and digital skills, among others.

The Recovery and Resilience Facility funds are complemented by national funding as well as other European funds (Erasmus+, ESF, Digital Europe etc.)

1.11 Structured Dialogue on digital education and skills

In October 2021, European Commission President Ursula von der Leyen launched the Structured Dialogue on digital education and skills to increase the political commitments on digital education and skills in the EU and its Member States. It will also feed into two proposals for Council Recommendation on enabling factors for digital education and on improving the provision of digital skills in education and training. The Dialogue will help Member States to prepare the Digital Decade roadmaps for the two digital skills targets, namely 80% of the EU population with basic skills and 20 million ICT specialists in employment by 2030.

[7] Total RRF funds available in current prices.
[8] Except for Hungary and the Netherlands.