ICT specialists in employment

Statistics Explained

Data extracted in July 2021.
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This article provides an overview of recent developments in the demand for information and communication technology (ICT) specialists in Europe using data on employment as a proxy. ICT specialists are defined as persons who have the ability to develop, operate and maintain ICT systems and for whom ICTs constitute the main part of their job (OECD, 2004).

The introduction of new technologies and digitalisation — often referred to as the 'fourth industrial revolution' — is having an impact on society through changes to the way that people live, work and interact with one another. ICTs have already been the cause of significant changes to methods of production and patterns of employment within the European Union (EU) . Policymakers and researchers therefore have an interest in tracking employment developments for ICT specialists, as these influence a country's comparative advantage in the development, installation and servicing of ICTs.

Number of ICT specialists

In 2020, some 8.4 million persons worked as ICT specialists across the European Union (EU) . The highest number (1.9 million) worked in Germany, which provided work to more than one fifth (23.1 %) of the EU's ICT workforce. France (1.2 million) had the second largest ICT workforce (14.5 % of the EU total), followed by Italy (0.8 million; 9.8 %).

Relative share of ICT specialists in the total workforce

Across the whole of the EU, ICT specialists accounted for 4.3 % of the total workforce in 2020 (see Figure 1).

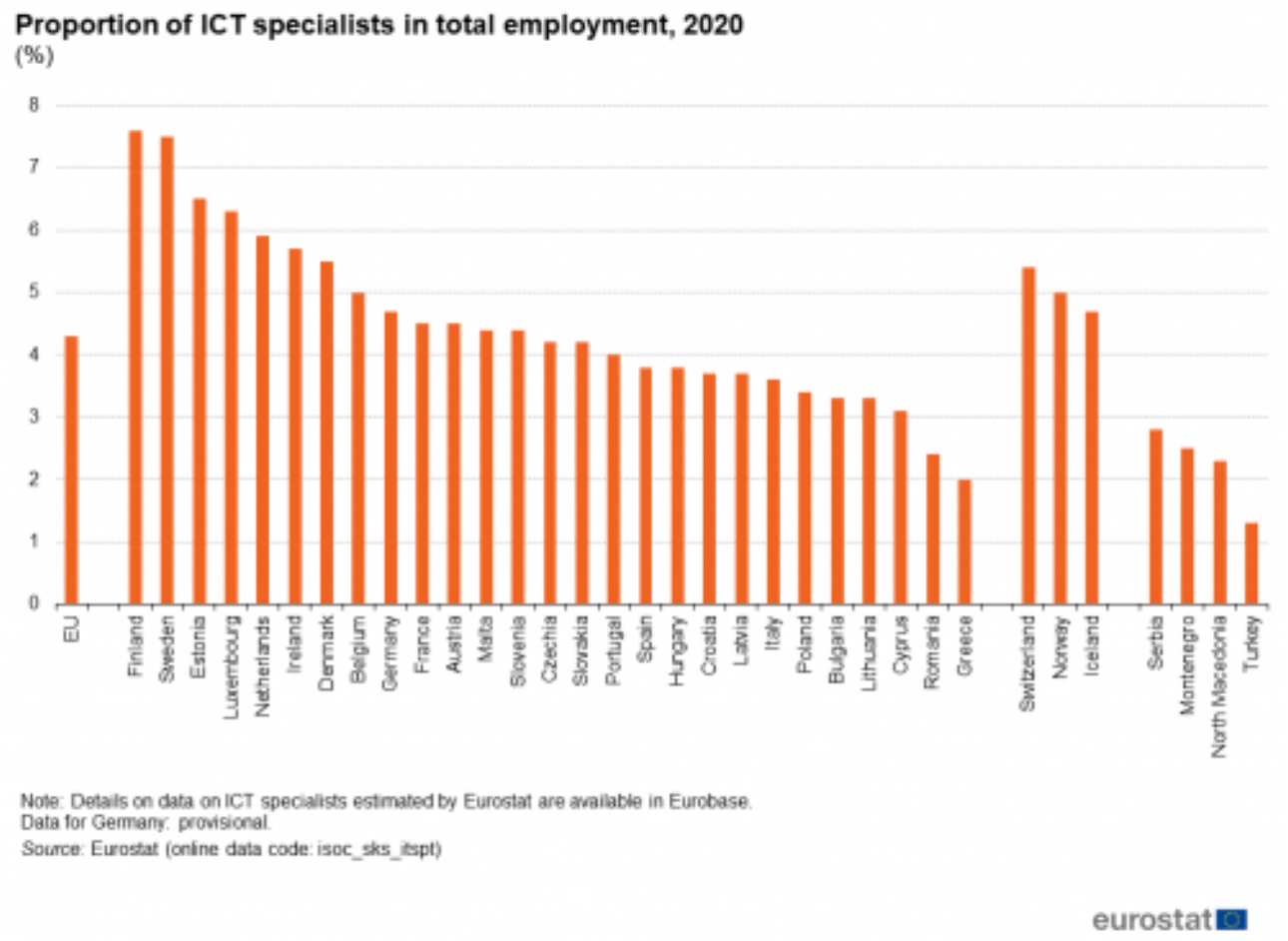

Figure 1: Proportion of ICT specialists in total employment, 2020 (%) Source: Eurostat (isoc_sks_itspt)

Finland had the highest relative share of its total workforce employed as ICT specialists, with 191 500 persons employed as ICT specialists, representing 7.6 % of total employment in Finland, followed by Sweden where about 379 700 ICT specialists represented 7.5 % of total employment in Sweden. Relatively high shares of persons employed as ICT specialists were also recorded in Estonia, Luxembourg, the Netherlands, Ireland, Denmark and Belgium in 2020, with each reporting that at least 1 in 20 persons within their total workforce was employed as an ICT specialist. By contrast, at the other end of the range, ICT specialists accounted for 2.0 % of the total workforce in Greece and by 2.4 % in Romania.

General developments in the demand for ICT specialists

During the last decade, the number of persons employed as ICT specialists in the EU generally held out against the effects of the global financial and economic crisis and the downturn experienced in many labour markets. As a consequence, the share of ICT specialists in total employment increased by 1.3 percentage points from 3.0 % in 2011 to 4.3 % in 2020 (Figure 2).

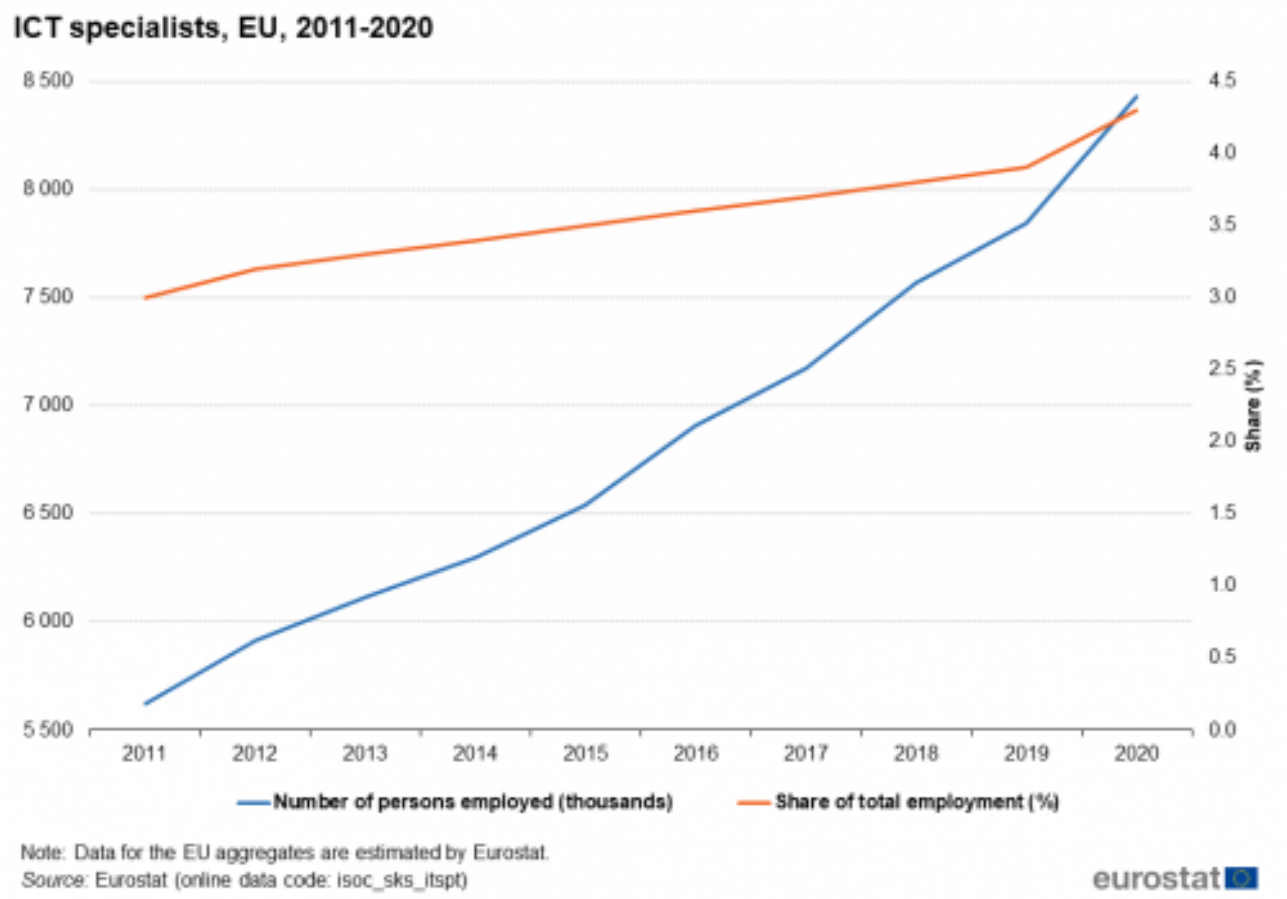

Figure 2: ICT specialists, EU, 2011-2020 Source: Eurostat (isoc_sks_itspt)

The number of persons employed as ICT specialists grew by 50.0 % during the period from 2011 to 2020, which was slightly less than 9 times as high as the corresponding increase (5.5 %) for total employment (see Figure 3). Between 2019 and 2020, the progression path became steeper (with a rate of 7.5 % compared to the average annual growth rate of 5.2 % over the decade), which could be due to the digital transformation affecting the whole economy.

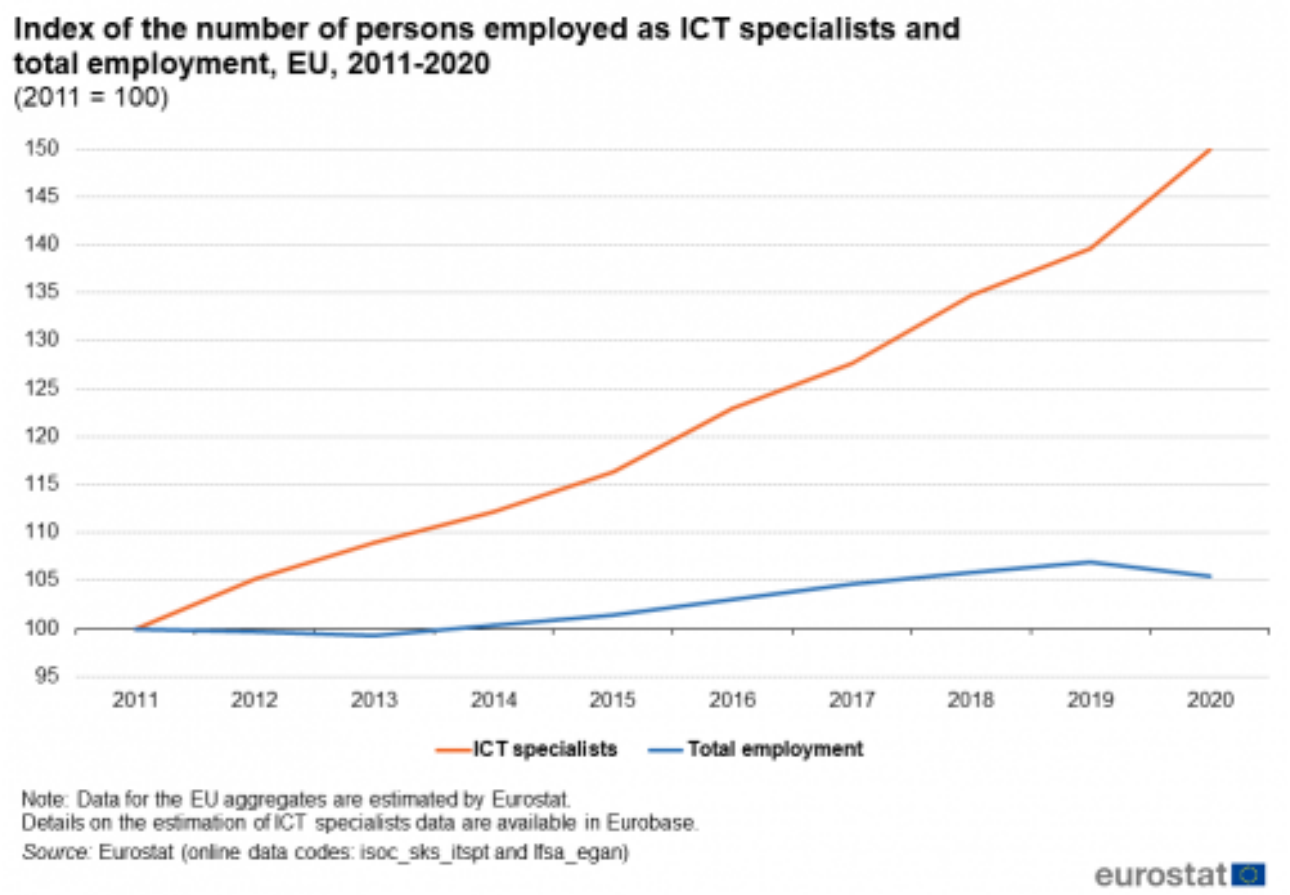

Figure 3: Index of the number of persons employed as ICT specialists and total employment, EU, 2011-2020 (2011 = 100) Source: Eurostat (isoc_sks_itspt) and (lfsa_egan)

Human capital in ICT is a driving force for digital and digital-enabled innovations and may be considered as crucial for the competitiveness of modern-day economies. Although this segment of the labour market is quite small in absolute terms, ICT employment was relatively resistant to the cyclical nature of economic events during the most recent decade for which data are available. Indeed, as can be observed in Figure 3, annual rates of change for the number of persons employed as ICT specialists were consistently higher than those recorded for total employment across the EU economy. In the first three years of the decade, the rates of change for the number of persons employed as ICT specialists in the EU and for total employment showed slightly different patterns. Whilst the number of ICT specialists in employment grew with an annual average rate of 4.3 %, total employment grew by 0.8 % each year on average. Only in 2014 did total employment recover the values attained three years before. The global financial and economic crisis and its aftermath did not seem to affect the number of ICT specialists employed in the EU. The transition between 2019 and 2020 led to the highest annual progression of the index of the number of persons employed as ICT specialists ever observed during the decade, with a jump of 10.4 points of index. In 2020, ICT specialists reinforced their progression in the total work force at the rate of 7.5 % largely above the 1.3 % decrease of total employment.

ICT specialists by sex

The vast majority of persons employed as ICT specialists in the EU are men. The share of ICT employment that was accounted for by men stood at 81.5 % in 2020, which was 1.5 percentage points lower than it had been in 2011 (see Figure 4 and Table 1). In 2020, about 9 out of 10 ICT specialists in Czechia (89.7 %), Malta (89.0 %) and Hungary (87.7 %) were men. While men accounted for about 8 out of every 10 ICT specialists in the majority of the remaining EU Member States, Bulgaria (71.8 %), Greece (73.5 %) and Romania (73.8 %) were the only Member States where the share of men was lower than 75 %.

Distribution of persons employed as ICT specialists by sex, education attainment level and age, 2011 and 2020
(%)

	Distribution by gender				Distribution by education attainment level				Distribution by age			
	Men		Women		Non-tertiary education		Tertiary education		15-34 years		35-74 years	
	2011	2020	2011	2020	2011	2020	2011	2020	2011	2020	2011	2020
EU	83.0	81.5	17.0	18.5	45.1	36.0	54.8	63.7	40.1	36.4	59.9	63.6
Belgium	83.4	82.6	16.6	17.4	30.5	22.2	69.5	77.8	36.8	34.9	63.2	65.1
Bulgaria	67.9	71.8	32.1	28.2	41.6	25.8	58.4	74.2	48.5	41.5	51.5	58.5
Czechia	89.4	89.7	10.6	10.3	48.7	43.3	51.3	56.7	45.8	34.8	54.2	65.2
Denmark	80.5	77.7	19.5	22.3	51.0	43.0	47.2	56.5	27.7	31.9	72.3	68.1
Germany	83.6	82.5	16.4	17.5	53.5	48.9	46.4	50.5	36.8	38.6	63.2	61.4
Estonia	76.2	77.9	23.8	22.1	43.9	40.1	55.5	59.9	53.1	46.9	46.9	53.1
Ireland	75.8	79.3	24.2	20.7	21.4	16.5	77.0	81.6	37.6	35.4	62.4	64.6
Greece	81.0	73.5	19.0	26.5	30.2	28.9	69.8	71.1	42.1	32.5	57.9	67.5
Spain	79.8	80.2	20.2	19.8	22.0	17.1	78.0	82.9	46.4	32.8	53.6	67.2
France	80.3	79.9	19.7	20.1	28.6	19.1	71.4	80.7	39.0	36.3	61.0	63.7
Croatia (*)	85.8	81.9	14.2	18.1	44.9	43.0	55.1	57.0	40.8	51.2	59.2	48.8
Italy	85.4	84.3	14.6	15.7	72.0	60.4	28.0	39.6	33.4	27.0	66.6	73.0
Cyprus	79.3	81.9	20.7	18.1	22.2	18.0	77.8	82.0	42.1	39.2	57.9	60.8
Latvia	76.0	77.1	24.0	22.9	40.2	33.3	59.8	66.5	59.0	54.3	41.0	45.7
Lithuania (*)	77.1	76.4	22.9	23.6	26.0	14.9	74.0	85.1	50.4	48.6	49.6	51.4
Luxembourg	87.3	80.2	12.7	19.8	34.6	22.8	64.8	76.1	27.0	39.2	73.0	60.8
Hungary	90.5	87.7	9.5	12.3	44.7	34.8	55.3	65.2	48.9	38.0	51.1	62.0
Malta	83.0	89.0	17.0	11.0	47.1	42.7	52.9	57.3	72.0	56.4	28.0	43.6
Netherlands	87.1	82.4	12.9	17.6	46.1	36.3	53.2	62.7	43.4	40.3	56.6	59.7
Austria	86.8	79.7	13.2	20.3	68.2	37.8	31.8	62.2	34.0	36.3	66.0	63.7
Poland	85.8	85.0	14.2	15.0	37.6	27.6	62.4	72.4	55.6	42.9	44.4	57.1
Portugal	81.1	78.2	18.9	21.8	53.7	37.5	46.3	62.5	48.3	38.9	51.7	61.1
Romania	78.3	73.8	21.7	26.2	36.6	23.7	63.4	76.3	50.4	46.8	49.6	53.2
Slovenia	84.2	82.7	15.8	17.3	51.5	35.7	48.5	64.3	42.6	40.3	57.4	59.7
Slovakia	82.5	84.2	17.5	15.8	45.5	34.2	54.5	65.8	55.7	39.5	44.3	60.5
Finland	80.9	76.7	19.1	23.3	40.2	31.2	59.8	68.8	38.5	29.0	61.5	71.0
Sweden	81.0	78.7	19.0	21.3	49.7	41.3	49.9	58.3	32.1	31.8	67.9	68.2
Iceland	82.9	79.1	17.1	20.9	46.9	32.0	52.1	68.0	35.0	34.4	65.0	65.6
Norway	83.4	80.6	16.6	19.4	46.5	36.9	53.4	63.7	30.6	36.1	69.4	63.9
Switzerland	87.4	83.7	12.6	16.3	44.1	34.0	55.4	65.8	37.3	39.2	62.7	60.8
Montenegro (*)	81.0	83.6	:	:	41.7	41.4	58.3	58.6	43.6	38.7	56.4	61.3
North Macedonia	77.0	76.7	23.0	23.3	51.8	40.0	48.2	60.0	49.7	54.8	50.3	45.2
Serbia (*)	81.5	75.0	18.5	25.0	51.5	42.6	48.5	57.4	32.7	50.7	67.3	49.3
Turkey	85.7	83.2	14.3	16.8	63.6	37.3	36.4	62.7	63.9	57.7	36.1	42.3

Note: Data on education attainment level reflect the distribution of ICT specialists between non-tertiary and tertiary attainment level of education only, excluding the non-response category. Many of these figures are estimated by Eurostat according to a single methodology described with details in the metadata available on Eurobase.
Breaks in series over 2011-2020: details for each breakdown are available on Eurobase. Data for Germany, 2020: provisional.

(:) Data for women, 2011: unreliable.
(*) Data on gender: 2012 instead of 2011. Data for women, 2012: unreliable. Data for non-tertiary education attainment level, 2011: unreliable.
(*) Data for women: unreliable, not available for 2011 and for 2020. Data for non-tertiary education attainment level: unreliable. Data for age group 15-34 years, 2011: unreliable.
(*) 2013 instead of 2011 data.
Source: Eurostat (online data codes: isoc_sks_itsps, isoc_sks_itspe and isoc_sks_itspa)

eurostat

Table 1: Distribution of persons employed as ICT specialists by sex, education attainment level and age, 2011 and 2020 (%) Source: Eurostat (isoc_sks_itsps), (isoc_sks_itspe) and (isoc_sks_itspa)

Indeed, in Bulgaria, women accounted for 28.2 % of ICT specialists in 2020 — the highest share among the EU Member States. Women accounting for about one quarter of all ICT specialists were also found in Greece and Romania and for one fifth or more of all ICT specialists in ten other EU countries.

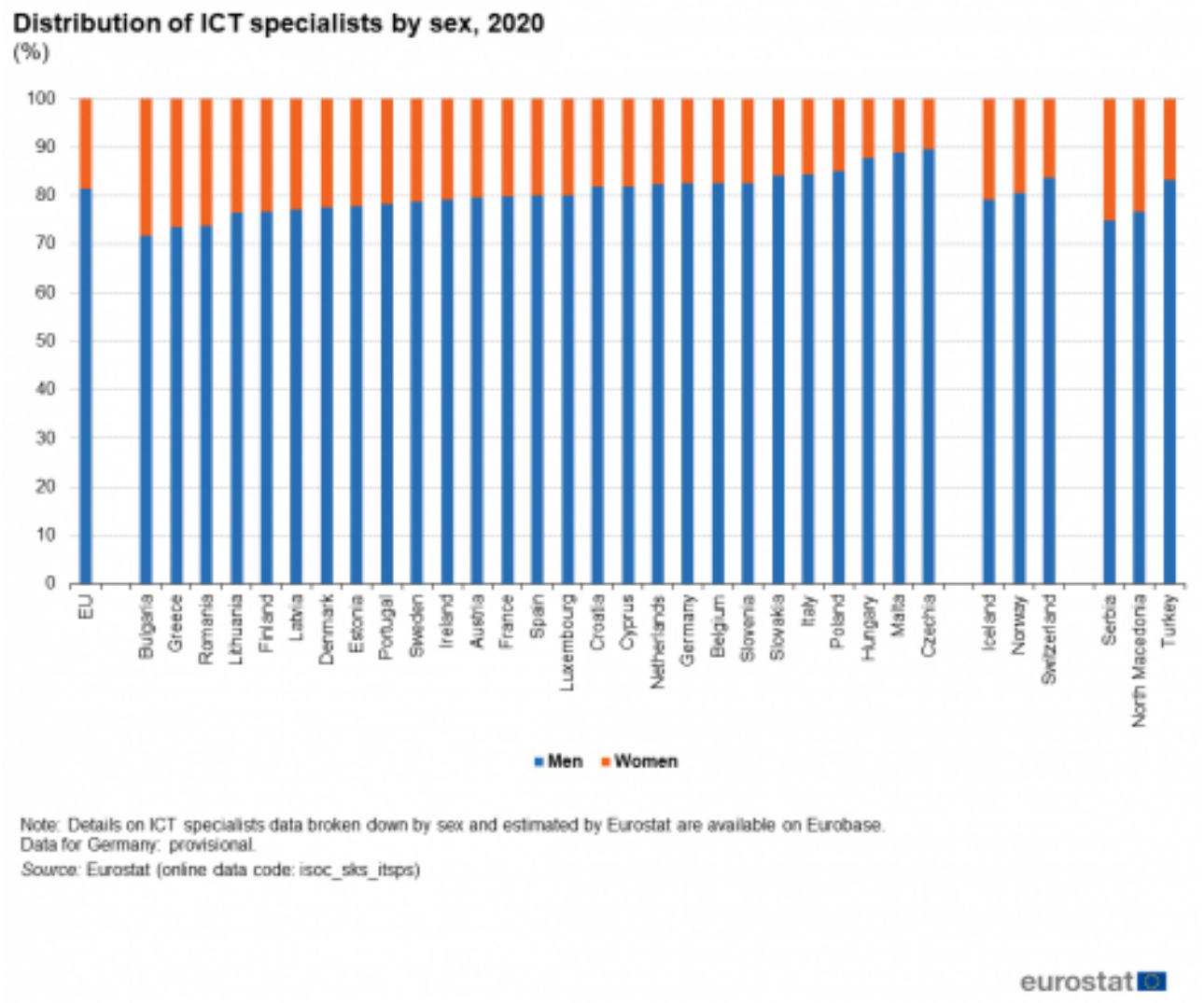

Figure 4: Distribution of ICT specialists by sex, 2020 (%) Source: Eurostat (isoc_sks_itsps)

In absolute terms, there were over one quarter of a million female ICT specialists employed in Germany (340 400) in 2020. These were, by far, the highest levels of female employment expressed in thousands, as France (244 500), Spain (144 500) and Italy (130 500) were the only other Member States to record 100 000 and more women employed as ICT specialists.

A closer analysis of this gender gap reveals that there were 18 EU Member States where the share of female ICT specialists rose during the period 2011 - 2020. The most striking progressions were observed in Greece where the share of women in the total number of ICT specialists rose from 19.0 % to 26.5 % (up 7.5 percentage points), whilst the gains recorded in Luxembourg and Austria were slightly smaller, up 7.1 percentage points both. By contrast, the relative share of men in the total number of ICT specialists rose the most in Malta, Bulgaria and Ireland, up by 6.0, 3.9 and 3.5 percentage points respectively.

Among non-EU countries, the most pronounced gender gap among ICT specialists in 2020 was registered in Turkey (where men accounted for 83.2 % of the ICT workforce compared with 16.8 % for women). In the three EFTA countries for which data are available, the gender distribution of the ICT workforce in 2020 was relatively similar to that in the EU, as the male shares of ICT specialists ranged from 83.7 % in Switzerland to 79.1 % in Iceland.

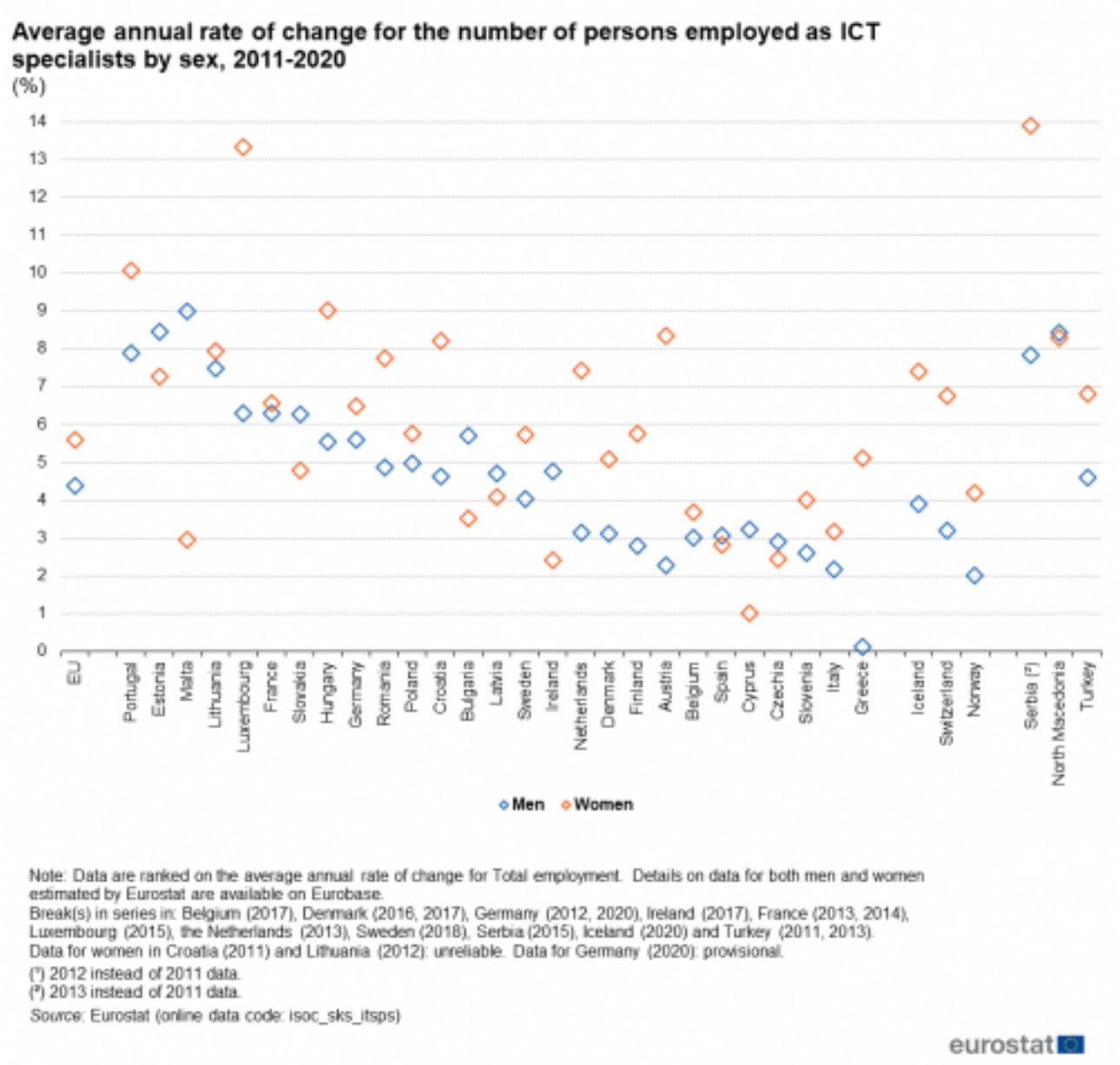

Figure 5: Average annual rate of change for the number of persons employed as ICT specialists by sex, 2011-2020 (%) Source: Eurostat (isoc_sks_itsps)

Figure 5 shows average annual rates of change for employment among ICT specialists, with data for men and women separately. On average, the number of men employed as ICT specialists in the EU rose by 4.4 % per annum during the period 2011 to 2020, while the corresponding rate for women was 5.6 % per annum. As a result, during the period 2011-2020, the overall number of male ICT specialists increased by 47.2 %, while the overall increase in the number of female ICT specialists was 63.1 %. In all of the EU Member States, both numbers of men and women employed as ICT specialists recorded steady annual growth between 2011 and 2020. At individual country level, Portugal had taken the lead with an overall average annual progression rate of 8.4 % thanks to its leading position for employing female ICT specialists at an average annual growth rate of 10.1 %, followed by Estonia (with 8.2 % and 7.3 % respectively) and Malta (with 8.2 % and 3.0 %). Between 2011 and 2020, the employment of female ICT specialists progressed on average at a higher pace in Luxembourg (13.3 %) followed by Portugal (10.1 %), Hungary (9.0 %), Austria (8.3 %) and Croatia (8.2 %). Luxembourg, Austria, and Greece were the countries where the difference between annual average growth rates of women and men were the highest. The highest rates of average annual growth of ICT specialists in employment in non-EU countries was observed in Serbia, with rates of 7.8 % for men and 13.9 % for women (over the period 2013-2020).

ICT specialists by attainment level of education

In 2020, slightly less than two thirds (63.9 %) of all ICT specialists in the EU had completed a tertiary level of educational attainment (see Figure 6 and Table 1). In Table 1, figures for tertiary and non-tertiary level of education attainment are presented without reporting the cases of non-response which are published in details on Eurobase whereas in Figure 6 the distribution among no-tertiary and tertiary level of education attainments has been recalculated so as to retain only these two categories.

The share of ICT specialists with a tertiary level of educational attainment increased during the most recent decade for which data are available, rising from 54.9 % in 2011 to 63.9 % in 2020; in other words, the share of ICT specialists that had a high level of educational attainment rose by 8.9 percentage points between 2011 and 2020.

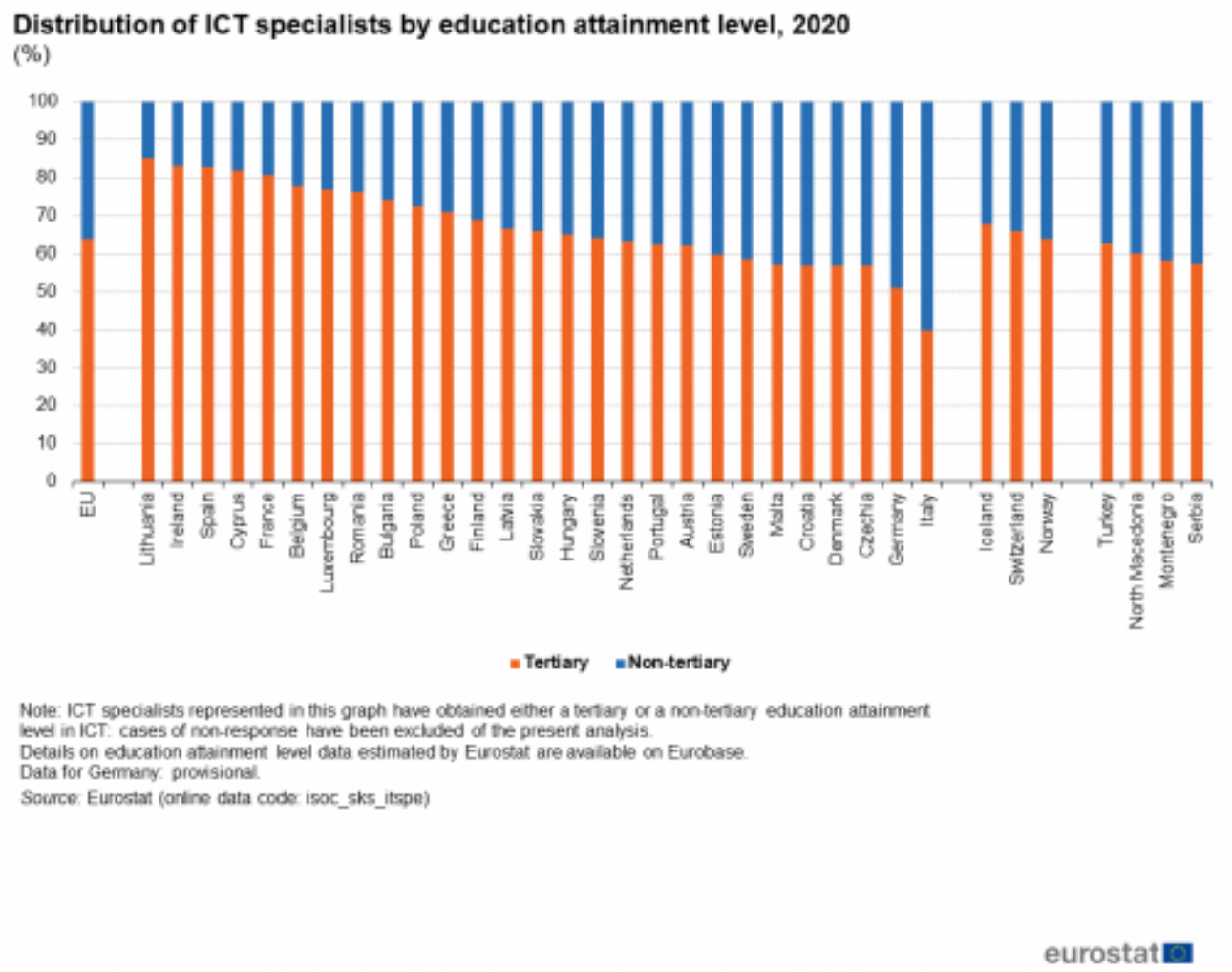

Figure 6: Distribution of ICT specialists by education attainment level, 2020 (%) Source: Eurostat (isoc_sks_itspe)

Among the EU Member States, the highest shares of ICT specialists with a tertiary level of educational attainment were recorded in Lithuania, Ireland, Spain, Cyprus and France as more than four out of every five persons had obtained such a level of education in 2020. A majority of ICT specialists had attained a tertiary level of education in all but one of the remaining EU Member States, the exception being Italy (39.6 %).

Considering now the period covering 2011 to 2020, the analysis reveals that the share of ICT specialists with a tertiary level of educational attainment rose by more than 30 percentage points in Austria, and around 16 percentage points in Portugal, Bulgaria and Slovenia. Romania, Luxembourg, Italy, Slovakia, Lithuania and Poland observed two-digit progression in percentage points. All of the remaining EU Member States reported that their share of ICT specialists with a tertiary level of educational attainment increased during this period.

The lowest tendencies of persons employed as ICT specialists to raise their educational background were observed in Croatia and Greece with only 1.8 and 1.2 percentage points respectively.

A majority of ICT specialists had completed a tertiary level of education in all non-EU member countries in 2020, with the highest share obtained in Turkey (62.7 %) and the lowest share of persons with a tertiary level of educational attainment was observed in Serbia (57.4 %). In all of the EFTA countries providing data, the share of ICT specialists in possession of a tertiary level of education is close to the European average, with 67.7 % in Iceland and 63.9 % in Norway for the lowest share.

ICT specialists by age group

The age distribution of ICT specialists has been analysed using two age groups: persons aged 15-34 years and those aged 35 years and over, with an upper age for employment limited at 74 years (see Figure 7 and Table 1).

In 2020, less than two thirds (63.6 %) of all persons employed as ICT specialists in the EU were aged 35 years and over. The proportion of ICT specialists in this older age group increased by 3.7 percentage points between 2011 and 2020. This rising share may reflect, among others, changes in the age structure of the EU population (with relatively few young compared with middle and older-aged people) and/or a growing share of young people extending their stay within the education system rather than quickly entering the labour market. This statement is illustrated by Slovakia which experienced the highest progression of the 35 years old and over ICT specialists with 16.2 percentage points difference between 2011 and 2020, whereas Luxembourg observed a rejuvenation of ICT specialists with an increase of 12.2 percentage points of the younger age group.

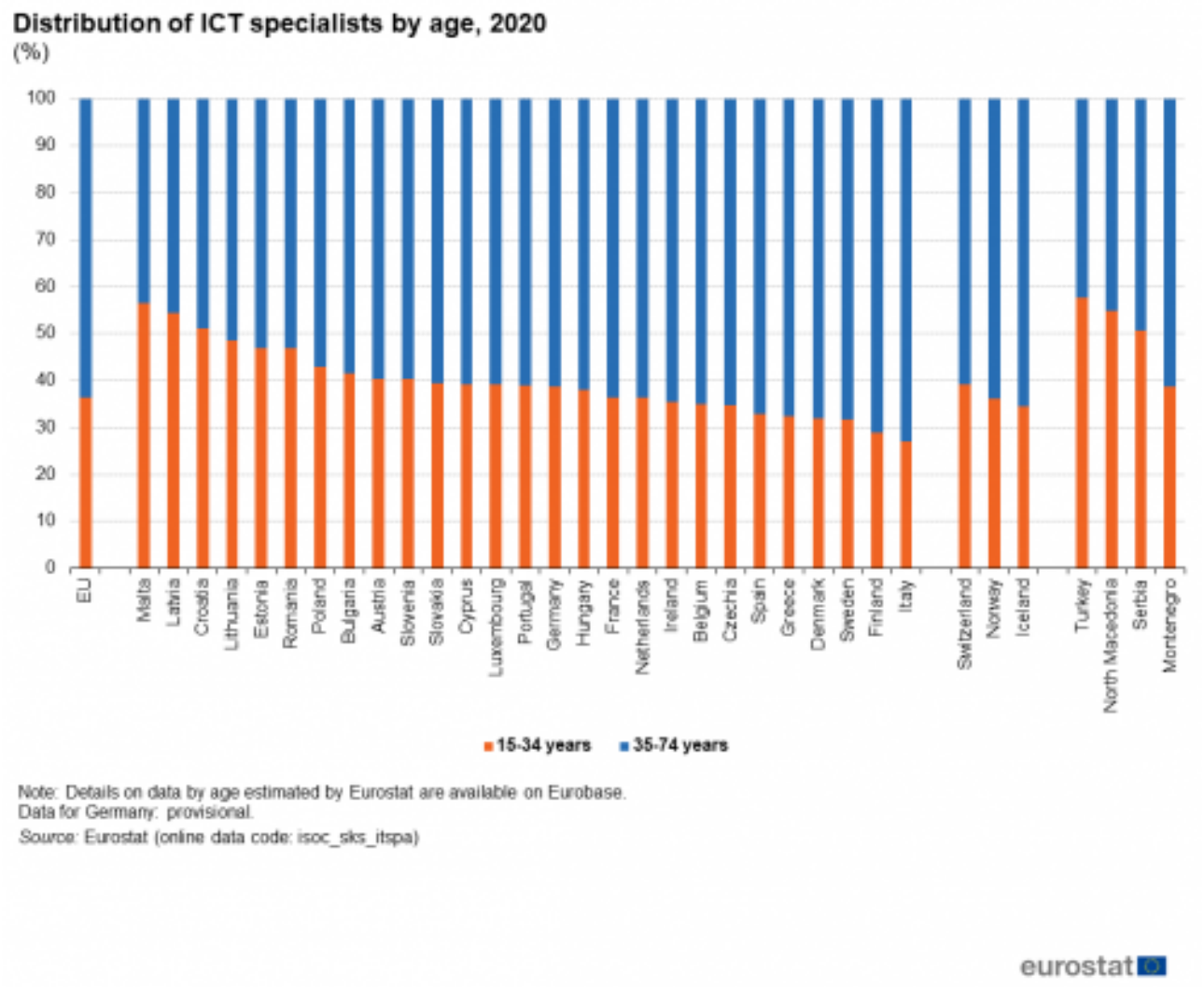

Figure 7: Distribution of ICT specialists by age, 2020 (%) Source: Eurostat (isoc_sks_itspa)

In 2020, the EU Member States where people aged 35 years and over accounted for the highest shares of ICT specialists included Italy (73.0 %), Finland (71.0 %), Sweden (68.2 %), Denmark (68.1 %) Greece (67.5 %) and Spain (67.2 %). By contrast, a majority of ICT specialists aged 15-34 years was obtained in Malta (with 56.4 %), Croatia (51.2 %) and in the Baltic Member States where Latvia, Lithuania and Estonia accounted respectively for 54.3 %, 48.6 % and 46.9 %.

Among the non-member countries, Turkey and North Macedonia stood out as a large majority (57.7 % and 54.8 % respectively) of their ICT specialists in 2020 were aged 15-34 years. The three EFTA countries observed the same pattern of age distribution as most EU Member States, with people aged 35 years and over accounting for 60.8 % of the total number of ICT specialists in Switzerland, 63.9 % in Norway, and 65.6 % in Iceland.

Source data for tables and graphs

- ICT specialists in employment: tables and figures

Data sources

The data presented in this article are secondary statistics on ICT specialists derived from the Labour Force Survey (LFS) . Data on ICT specialists cover persons working as ICT specialists in all parts of the economy; no analysis by economic activity is available.

Statistics for ICT specialists are constructed on the basis of the OECD definition (outlined at the start of

this article) which is built on the International Standard Classification of Occupations (ISCO) . For data up until 2010, the definition was based on ISCO-88 , whereas the data from 2011 onwards are based on ISCO-08 ; as such, there is a break in series in 2011. Under ISCO-08, Eurostat and the OECD define ICT specialists as people with the following occupations: ICT service managers; information and communications technology professionals (software and multimedia developers and analysts, and database specialists and systems administrators); information and communications technicians (ICT operations and user support technicians, and communications technicians); electronic engineers; telecommunication engineers; graphic and multimedia designers; information technology trainers; ICT sales professionals; electronics engineering technicians; electronics mechanics and servicers; ICT installers and servicers.

The International Standard Classification of Education (ISCED) provides a standard framework for education statistics. Data by level of educational attainment up until 2013 are classified according to ISCED 1997 and data from 2014 onwards are classified according to ISCED 2011 , under which tertiary education is covered by levels 5-8. The 2011 edition of the ISCED classification defines education systems with respect to the following levels: Level 0 — less than primary education; Level 1 — primary education; Level 2 — lower secondary education; Level 3 — upper secondary education; Level 4 — post-secondary non-tertiary education; Level 5 — short-cycle tertiary education; Level 6 — bachelor's or equivalent level; Level 7 — master's or equivalent level; Level 8 — doctoral or equivalent level. For a more detailed listing and corresponding ISCO and ISCED codes, please refer to the metadata for statistics on ICT specialists in employment (see section on 'Methodology'). Labour Force Survey reference metadata should be consulted for further information relating to the underlying primary source data.

Context

Digitalisation and automation can generate new business opportunities through the development of new production processes, new products and new markets. Indeed, the impact of information and communication technologies within the workplace has generally resulted in increased productivity and efficiency, as well as a range of possibilities for more flexible working practices. While these changes have generated a wide range of new jobs, the introduction of ICTs has also led to job losses, for example, as a result of automation.

Digital transformation is high on the European policy agenda, with making Europe fit for the digital age and empowering its citizens and businesses with a new generation of technologies being one of the main political priorities of the European Commission for the coming years. On 9 March 2021, the Commission presented the Digital Decade Communication, which sets a vision and targets for a successful digital transformation of Europe by 2030. The Commission proposed a digital compass, which sets out a way for achieving the EU's ambitions for a human centred, sustainable and prosperous digital future. In particular, digitally skilled citizens and highly skilled digital professionals forms one of the fours cardinal point of the digital compass. The objective is to reach 20 million employed ICT specialists in the EU by 2030, coupled with a greater convergence of gender balance in taking up such jobs. Monitoring the employment of ICT specialists is therefore important. In recent years, EU policies have given greater attention to ICT skills and in particular to the employment of ICT specialists as strong digital skills should strengthen the EU's competitive position in the digital world and drive Europe towards a more equal society. The European Skills Agenda launched to ensure that the right training, the right skills and the right support are available for people in the EU, have been extended by the Digital Skills and Jobs Coalition to support cooperation between education, employment and industry to develop a pool of digital talent in the EU. Individuals and the labour force in general shall be equipped with adequate digital skills to prevent the loss of key ICT jobs in the European Union to other regions of the world. In parallel, the European Commission is bringing together EU Member States and a range of stakeholders to pledge actions and to monitor progress in developing digital skills through its Digital Progress Report and the Digital Economy and Society Index .

Other articles

- ICT specialists — statistics on hard-to-fill vacancies in enterprises
- ICT education - a statistical overview

Database

- Digital economy and society (isoc) , see:

Digital skills (isoc_sk)

ICT specialists (isoc_sks)

ICT specialists in employment (isoc_skslf)

Employed ICT specialists - total (isoc_sks_itspt)
Employed ICT specialists by sex (isoc_sks_itsps)
Employed ICT specialists by educational attainment level (isoc_sks_itspe)
Employed ICT specialists by age (isoc_sks_itspa)

Dedicated section

- Digital economy and society
- Employment and unemployment (Labour force survey)

Methodology

- Employment and unemployment (labour force survey) (ESMS metadata file — employ_esms)
- ICT employment statistics in Europe: measurement methodology
- ICT specialists in employment (ESMS metadata file — isoc_skslf_esms)

External links

- Europe's Digital Decade: digital targets for 2030
- The Digital Compass
- Shaping Europe's digital future
- Digital Skills and Jobs Coalition
- EU e-skills strategy
- European e-Competence Framework
- European Skills Agenda
- Skills Panorama

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