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Digital Economy and Society Index (DESI) 2018

Digital Economy and Society Index Report 2018

Contents

2. Human capital: Digital Inclusion and Skills

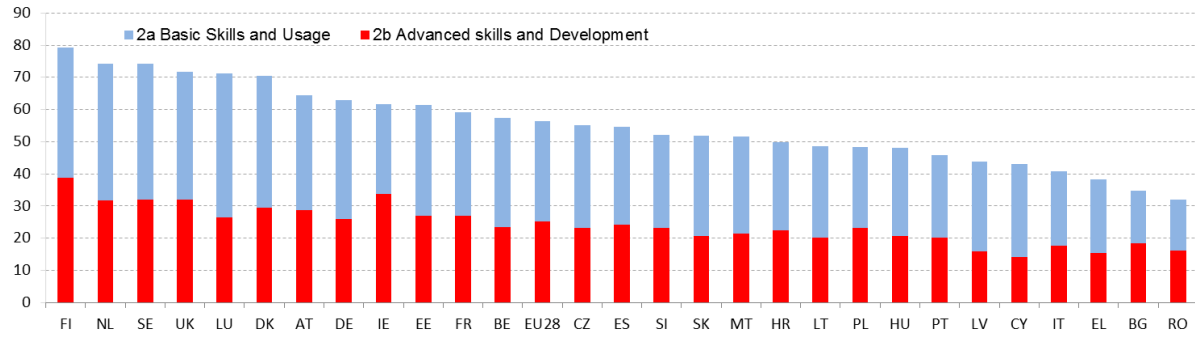
In the Human Capital dimension of DESI 2018, Finland, the Netherlands, Sweden, the United Kingdom, Luxembourg and Denmark obtained the highest scores. Romania, Bulgaria, Greece and Italy had the lowest ones.

The Human Capital dimension of DESI has two sub-dimensions covering **'basic skills and usage'** and **'advanced skills and development'**. The former includes indicators on internet use by individuals and digital skills (individuals with at least basic skills as per the Digital Skills Indicator). The latter includes indicators on ICT specialist employment and graduates in STEM (Science, Technology Engineering and Mathematics) disciplines. According to 2017 data, the Netherlands, Sweden, and Luxembourg are the top performers in basic skills and usage; Finland, Ireland, Sweden and the UK had the highest scores in advanced skills and development. Romania, Bulgaria, Greece and Italy rank lowest overall on DESI's Human Capital dimension.

Figure 2.1 Human Capital indicators in DESI 2018

2a1 Internet Users % individuals	81% 2017
2a2 Basic Digital Skills % individuals	57% 2017
2b1 ICT Specialists % total employment	3.7% 2016
2b2 STEM Graduates Graduates in STEM per 1000 individuals (aged 20 to 29)	19.1 2015

Figure 2.2 Digital Economy and Society Index (DESI) 2018, Human Capital

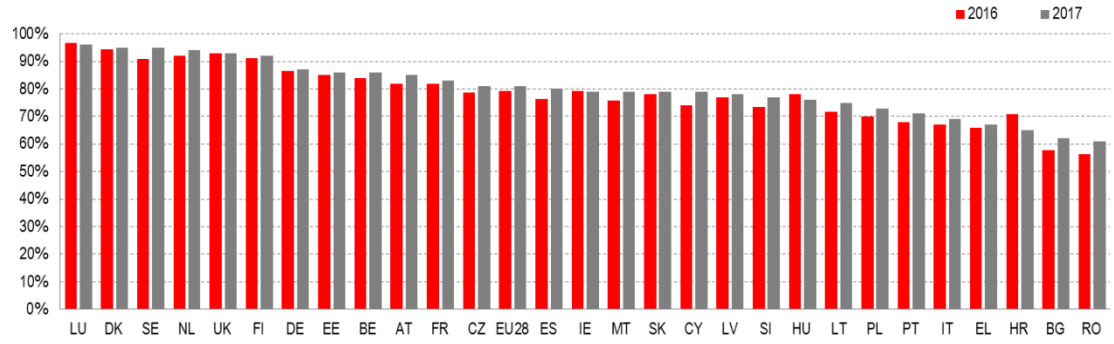


Source: DESI 2018, European Commission

The differences in regular internet use shrank further in 2017. However, in some Member States, over a third of the population still does not go online on a regular basis.

In Member States such as **Luxembourg, Denmark, Sweden and the Netherlands**, the **vast majority of the population uses the internet at least once a week**. Those countries in the process of **catching up** with top-performing Member States, such as **Austria, Belgium, Germany and Estonia**, saw further improvements in this respect in 2017. **Cyprus, Spain and Slovenia** also made significant progress and now stand very close to the EU average. Noteworthy increases were likewise recorded in both **Romania** (+ 5pp. compared with 2016) and **Bulgaria** (+ 4pp.), although 39% and 38% of their respective populations still do not go on line on a regular basis. Both Member States are also among those with the largest increases in their rates of regular internet use over the period 2010-2017, together with Cyprus (+29pp.), Greece (+26 pp.), the Czech Republic (+23pp.), Spain (+22pp.) and Italy (+21pp.).

Figure 2.3 Regular Internet use in the EU, 2017 (% of individuals aged 16-74 using the internet at least once a week)

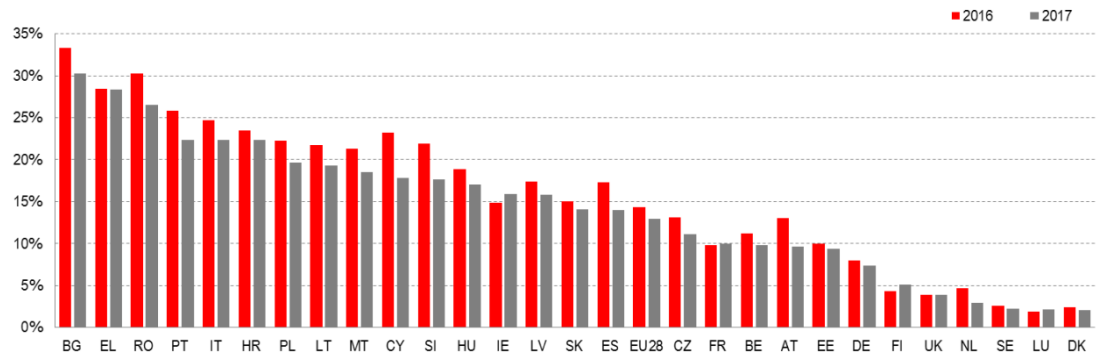


Source: Eurostat

The share of people in the EU who have never gone online decreased again in 2017, although the current share of 13 % warrants further efforts. Despite convergent trends, large disparities remain across Member States.

The share of EU citizens not using the Internet fell in nearly all Member States in 2017. On average, it decreased by 1 pp. in 2017 (to 13 %) compared to a year earlier. Proportionally, the Members States featuring the largest reductions were **Cyprus**, where the share of people aged 16-74 who have never used the internet shrank by 5 pp., **Slovenia** and **Romania** (both -4 pp.). Austria, Bulgaria, Poland, Portugal and Spain also made good progress in this respect (-3 pp.) The Member States where the share of non-internet users fell the most between 2010 and 2017 are Romania (-31 pp.), Cyprus (-27 pp.), Greece (-24 pp.), and Portugal (-23 pp.).

Figure 2.4 EU citizens who have never used internet, 2017 (% of individuals aged 16-74)



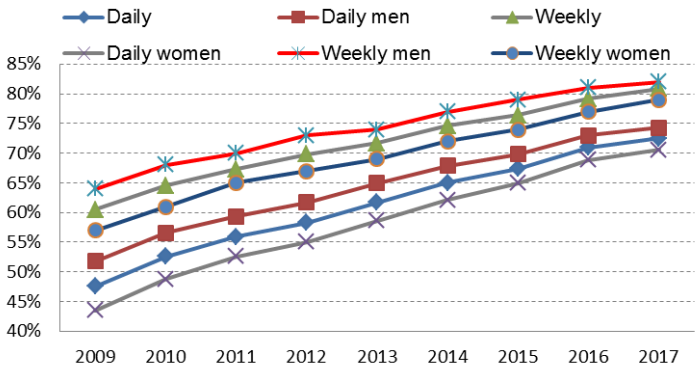
Source: Eurostat

81 % of EU citizens go online at least weekly and 72 % do so every day. A gender gap persists but it is narrowing. Despite ongoing improvements, particularly in some Member States, the elderly and those with low education levels or on low incomes continue to be at risk of digital exclusion.

In 2017, **81% of Europeans used the internet at least weekly** and about **72 % daily or almost,** compared, respectively, with 79 % and 71 % a year earlier. Proportionately, **men use the internet more than women** (at least weekly: 82 % vs. 79 %; daily or almost: 74 % vs. 71 %), although **the difference is narrowing** (at least weekly: from 5 pp. in 2015 to 3 pp. in 2017).

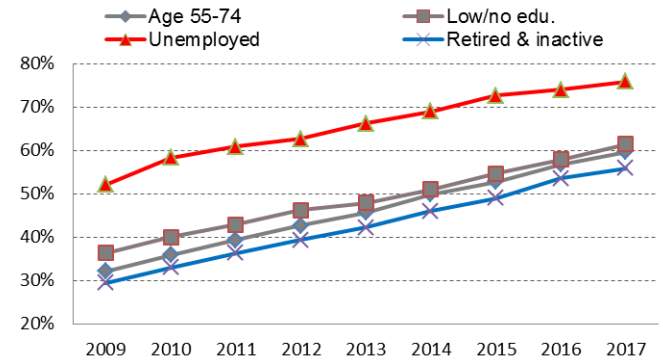
People with **low education levels** or on **low incomes**, as well as the **elderly** and the **retired or inactive tend to be comparatively less active internet users**: although internet use rates among these groups are increasing, within each of them, about 4 in 10 people do not use the internet regularly. This means that **digital exclusion risks** are **particularly high** for people from these groups.

Figure 2.5 Daily and weekly use of internet in the EU, 2017 (% of individuals)



Source: Eurostat

Figure 2.6 Weekly internet use in 2017, selected pop. groups (% of individuals)

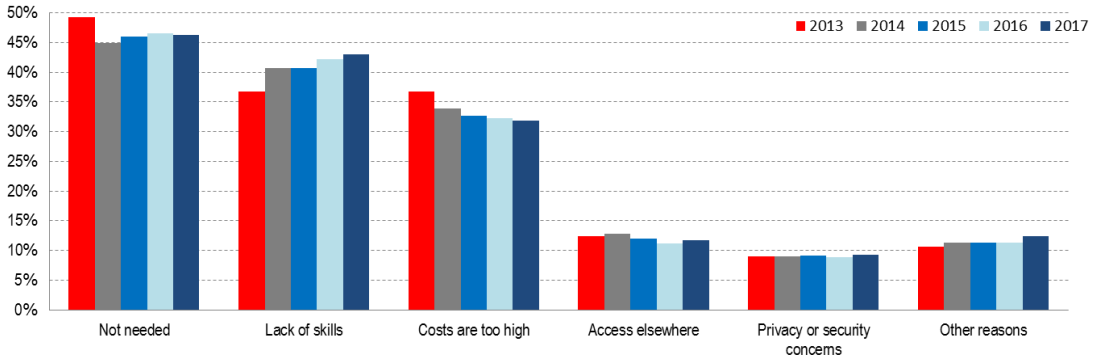


Source: Eurostat

Lack of need or interest, insufficient skills and cost-related barriers continue to be the most common reasons given by households for not having internet access at home. 2017 data confirms the growing importance of digital skills in the fight against digital exclusion.

The three main reasons evoked by households for not having internet access remain, respectively, the **lack of need or interest** (46 % of households without internet access in 2017), **insufficient skills** (43 %) and **high access and equipment costs** (32 %). The deterring effect of each of these factors varies significantly in strength across Member States. For example, only 8 % of Danish households without internet access mentioned costs as a barrier but as many as 57 % did so in Croatia and Hungary. **Lack of relevant skills remains by far the fastest-growing factor deterring households from having internet access at home** (+11 pp. since 2010) and, to the extent that it **limits awareness of potential benefits from digitisation**, may also be among the reasons behind the large numbers of European households still claiming that they do not have internet access at home because they do not need it.

Figure 2.7 Barriers to internet access at home in the EU, 2017 (% households without internet access)



Source: Eurostat

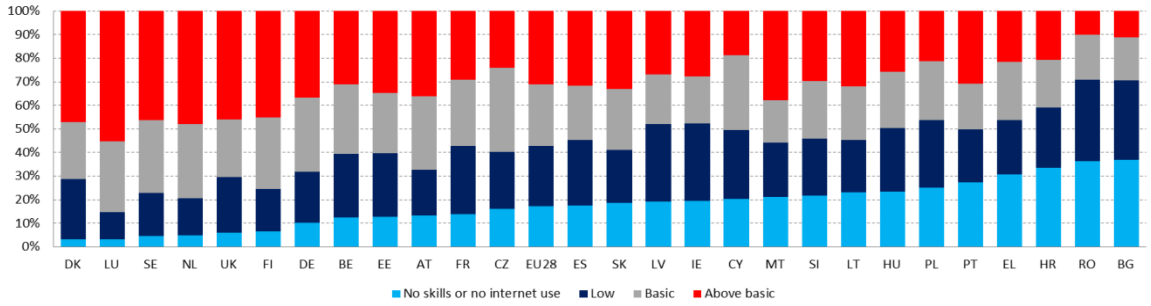
In 2017, 43 % of the EU population had an insufficient level of digital skills. 17 % had none at all, as they did not use the internet or barely did so.

According to the **Digital Skills Indicator**, a composite indicator based on the Digital Competence Framework for Citizens[1], **17 % of the EU population had no digital skills in 2017**, the main reason being that they did not use the internet or did so only seldom. This represents an improvement (i.e. decrease) of 2 pp. compared to 2016. The share of EU citizens without basic digital skills, in turn, went down by 1 pp. (to 43 %). However, these figures imply serious risks of digital exclusion in a context of rapid digitisation. There are **proportionally more men than women with at least basic digital skills** (respectively, 60 % and 55 %). In addition, only about 31 % of people with low education levels or no education have at least basic digital skills. This figure is also significantly lower among those living in rural areas (49 %), who tend to be relatively older, than for their city-dwelling counterparts (63 %).

There are still **major disparities across Member States**. The share of people with at least basic digital skills ranges from 29 % in Bulgaria and Romania (despite noticeable progress in both these countries in 2017) to 85 % in Luxembourg and 79 % in the Netherlands.

[1] https://ec.europa.eu/jrc/digcomp

Figure 2.8 Digital skills of the EU population, 2017 (% of individuals, by skills level)*



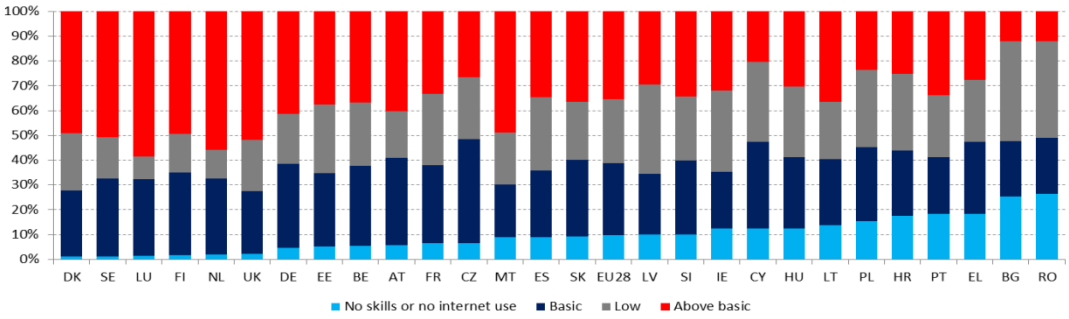
* Data not available for Italy

Source: Eurostat

In 2017, 10 % of the EU labour force had no digital skills, mostly because they did not use the internet. 35 % did not have at least basic digital skills, which are now required in most jobs.

The share of the **EU's active labour force** (employed and unemployed) that can be considered to have **no digital skills** (essentially because they do not use the internet or do so only seldom) **went from 11 % in 2016 to 10 % in 2017**. This share is much higher in Member States like Romania (26 %), Bulgaria (25 %) and Portugal (18 %), although they are among those showing the largest improvements in this respect compared to last year's figures. Conversely, **a very large proportion of the labour force** (between 82 % and 89 %) **in Member States such as Luxembourg, the Netherlands, Finland and Sweden has at least basic digital skills**, and half of it or more have above basic skills. Digital skills are of critical importance not only for **accessing the labour market** but also for being able to **harness the benefits** of transformation currently underway. Bridging this gap, as well as **addressing digital skills deficits** in certain segments of the labour force, such as older cohorts or blue-collar workers, will thus be essential to bring about an inclusive digital economy and society.

Figure 2.9 Digital skills of the EU labour force, 2017 (% of individuals, by skills level)*



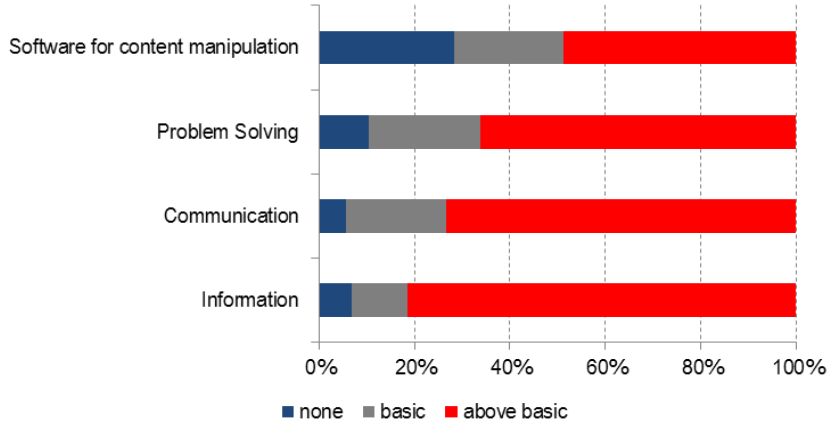
* Data not available for Italy

Source: Eurostat

The share of the EU's internet users without software-related skills (28%) remained stable in 2017

Advanced **digital skills are becoming a prerequisite for entry into many jobs**[2] and have a wide range of applications, even beyond domains where they are needed for core tasks. Across competence dimensions, the **largest skills deficit,** both among the active labour force and the population at large, relates to the **use of software for content manipulation**. **Almost one in three internet users in the EU has no skills in this area** (i.e. they declared to not to have carried out any of the activities considered under this dimension, which range from relatively basic text treatment and spreadsheet-based work to video editing and coding). **This share is particularly large in Member States like Bulgaria, Romania (about 51 % of internet users)** as well as Latvia (40 %) and Ireland (39 % down from 44 % in 2016). Conversely, in others like **Luxembourg, Portugal, the UK and the Netherlands**, a **large majority of internet users has above basic software skills** (69 %, 58 % -both- and 57 % respectively). By type of activity, only about 7 % and 30 % of EU internet users had, respectively, **written code** and used **spreadsheet advanced functions**. In contrast, 82 % and 73 % can be considered to have above basic skills in, respectively the **information** and **communication** dimensions.

Figure 2.10 Digital skills, by competence dimension and level, 2017 (% of internet users)



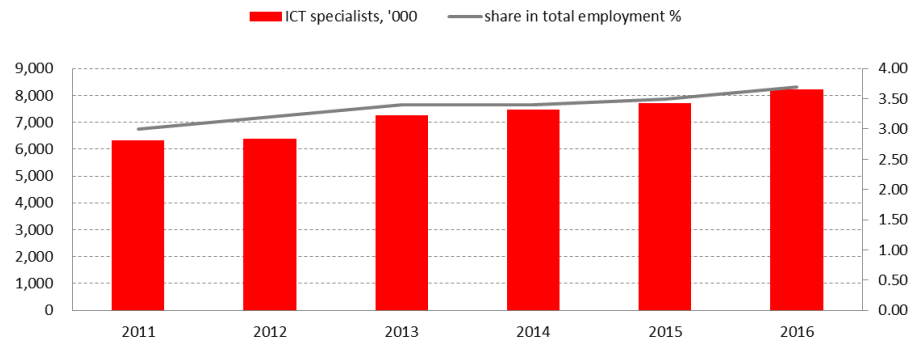
Source: Eurostat

Employment of ICT specialists in the EU grew by 500,000 between 2015 and 2016 to reach 8.2 million workers. However, the employment potential of specialised ICT skills remains underexploited.

[2] Berger and Frey (2016), quoted in Cedefop (2016), 'The Great Divide: Digitalisation and digital skill gaps in the workforce', #ESJsurvey Insights, No. 9, Thessaloniki: Greece.

8.2 million persons were employed as Information and Communication Technologies (ICT) specialists in the EU in 2016. This amounts to about 3.7 % of total employment. These figures represent an improvement compared with a year earlier (7.7 million and 3.5 % of employment), thus confirming the positive trends observed in recent years (between 2011 and 2016, the number of ICT specialists grew by 1.8 million and their share in total employment went from 3 % to 3.7 %). 83 % of all ICT specialists employed in the **EU in 2016 were men, and nearly 62 % had at least** tertiary education. The Member States employing the most ICT specialists were the **UK** (1.6 million), **Germany** (1.5 million) and **France** (1.0 million). The highest shares of ICT specialists in total employment were recorded in **Finland** (6.6 %), **Sweden** (6.3 %) and **Estonia** (5.3 %); the lowest in **Greece** (1.4%), **Romania** (2.0%), **Cyprus** and **Latvia** (both 2.2 %). In 2016, 1 in 5 enterprises in the **EU** employed ICT specialists and nearly 1 in 10 (9 %) recruited or tried to recruit ICT specialists. However, 41 % of enterprises which recruited or tried to recruit them had difficulties in filling vacancies. Despite the positive evolution in recent years, the **gap between demand and supply of ICT specialists in the EU is expected to widen further** and, as suggested also by the growing numbers of vacancies, the employment potential of specialised ICT skills remains underexploited.

Figure 2.11 Employment of ICT specialists in the EU, 2011-2016



Source: Eurostat

Through its Digital Skills and Jobs Coalition, the Commission seeks to further reduce digital skills gaps by fostering the sharing, replication and upscaling of best practices in areas such as training and matching for digital jobs, certification and awareness raising.

At the end of 2016, the Commission launched the **Digital Skills and Jobs Coalition**, which brings together Member States and stakeholders from the private and public sectors to **develop a large digital talent pool** and **ensure that Europe's citizens and labour force are equipped with adequate digital skills**. By means of pledging action and identifying and sharing best practices that can be replicated and scaled up, the Coalition's activities have so far benefited several million citizens, with over 3.7 million trainings in digital skills provided, more than a million digital skills certifications, 4,500 events having reached over a million people and more than 9,000 job placements and internships offered.

The Commission monitors progress annually as part of the DESI. The Digital Skills and Jobs Coalition is one of the 10 concrete actions under the **New Skills Agenda for Europe**, which prioritises digital skills in all its actions. **More than 100 pledges** have been made by enterprises, education providers and NGOs committing to reduce digital skills gaps by taking actions such as training courses, matching for digital jobs, certification and awareness raising. **18 National Coalitions** for Digital Skills and Jobs have also been launched in Member States. The **Digital Opportunity Traineeship** has been launched to help young people improve their digital skills and consider a career in the digital sector. This pilot initiative provides cross-border trainee-ships to 6,000 students and recent graduates of all disciplines so they get hands-on digital experience in fields demanded by the market.

In June 2017, the European conference on IT professionalism[3] focused on the development of a European Framework for the IT profession building on the European e-Competence Framework (e-CF) for IT professionals[4], a new version of which will be presented in 2019.

[3] http://ictprofessionalism.eu/
[4] http://www.ecompetences.eu/

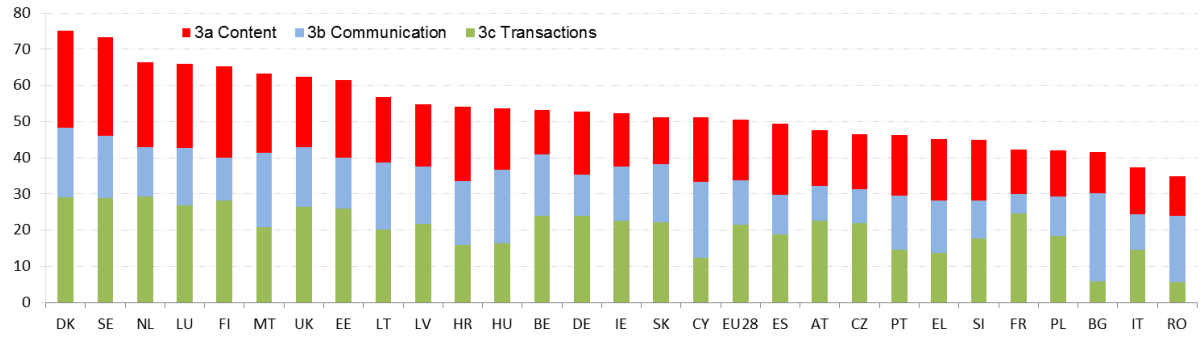
3. Use of Internet Services

Large disparities across EU Member States remain in terms of use of Internet services.

People in the EU engage in a **range of online activities** — they **consume content**, **communicate**, **shop**, use **online banking** services and much more. Such activities are captured in DESI's **Use of Internet Services** dimension. Denmark, Sweden, the Netherlands and Luxemburg have the most active internet users, followed by Finland, Malta, the UK and Estonia. Romania, Bulgaria and Italy are, in turn, the least active.

Romania is the Member State having registered the **largest improvement** in this dimension compared with the previous edition (nearly 6 pp.). Germany, Malta, Ireland and the Netherlands also made significant progress.

Figure 3.1 Digital Economy and Society Index (DESI) 2018, Use of internet Services

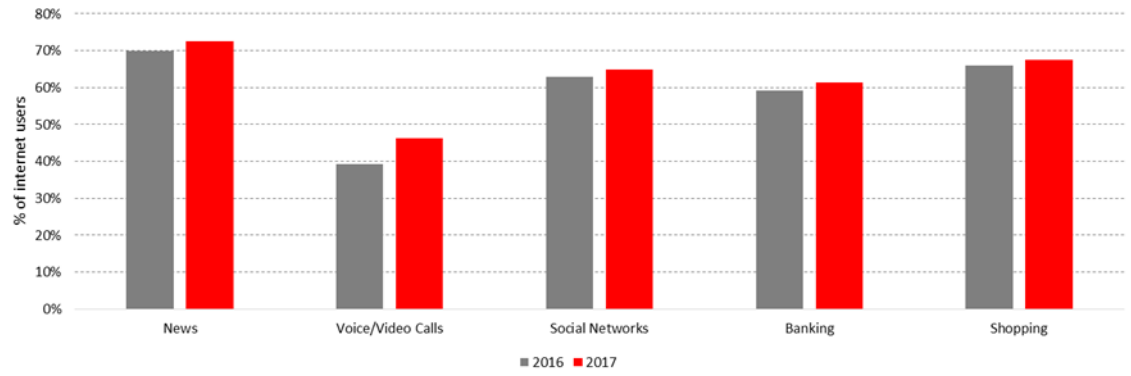


Source: DESI 2018, European Commission

Growth in the use of online services is generally slow, although the use of the internet for voice or video calls picked up significantly in 2017

As in the previous edition of DESI, annual variation in the different activities considered in the Use of Internet Services dimension has been limited. Indeed, **moderate increases** were observed in the percentage of internet users **reading news online, participating in social networks, shopping online** and **using internet banking** (about 2 pp. each). The largest increase relates to **use of the internet for voice or video calls**, where the share of internet users went **from 39 % in 2016 to 46 % in 2017**.

Figure 3.2 Use of Internet Services in the EU, 2016-2017, selected indicators (% of internet users)



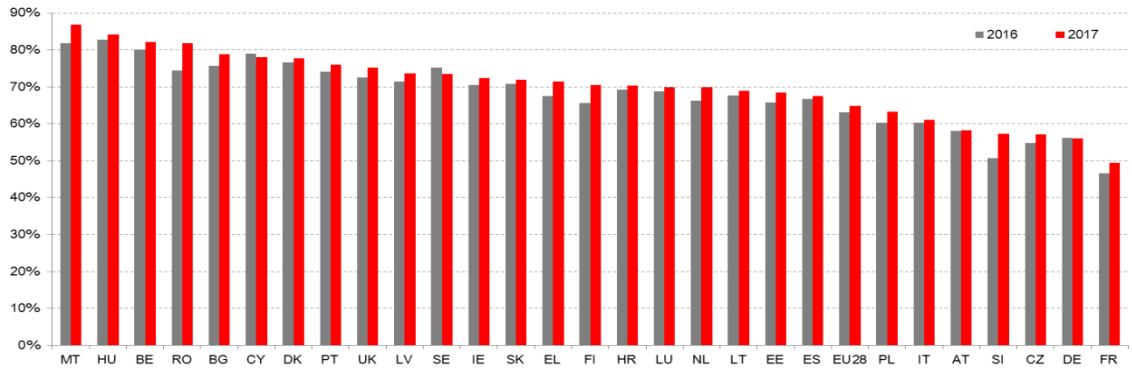
Source: Eurostat

Participation in online social networks increased moderately in the EU in 2017, to reach 65% of internet users.

In 2017, **65 % of internet users participated in social networks**, that is a 2 pp. increase compared with 2016 levels. Among **16- to 24-year-olds**, the share of users participating in social networks neared **90 %**, whereas this figure was of 68 % and 40 % for the 25-54 and 55-74 cohorts respectively (both 2 pp. annual increase).

The country with the **largest proportion of internet users on social networks** was **Malta** (87 %), followed by Hungary (84 %), Belgium and Romania (both 82 %).The **largest increases** in the share of internet users participating in social networks between 2016 and 2017 were registered in **Romania (8 pp.) and Slovenia (7 pp.)**, followed by Malta (5 pp.) and Finland (4 pp.). France had the lowest share of users (49 %), followed by Germany (56 %), the Czech Republic and Slovenia (both 57 %)..

Figure 3.3 Use of the internet to participate in social networks , 2016-2017 (% of internet users in previous 3 months)



Source: Eurostat

The upward trend in eCommerce continued in 2017, with about 68% of EU internet users now shopping online.

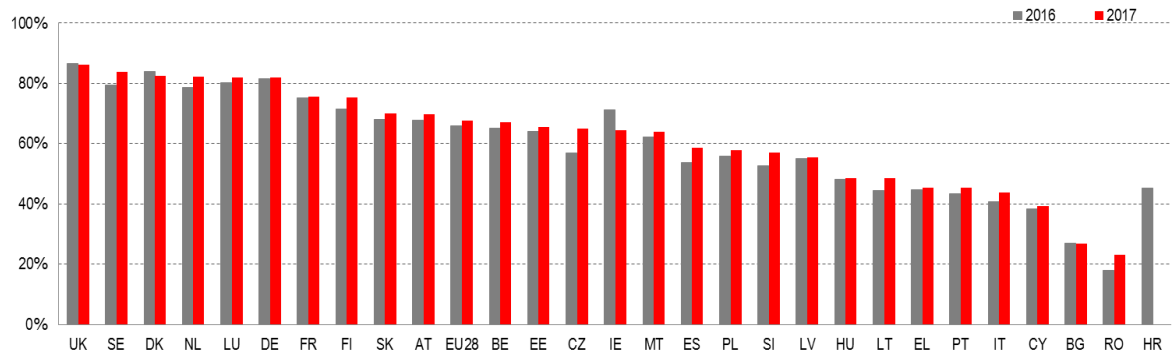
Since 2010, the **proportion of internet users ordering goods and services online** (over the previous 12 month period) **has increased by 12 pp.**, to **68 % in 2017**. As with many other online activities, **eCommerce is higher among younger, higher educated and employed people**. These groups also had higher growth in recent years.

eCommerce intensity varies greatly across EU Member States. In 2017, 86 % of internet users in the UK shopped online compared to only 23% in Romania (up from 18 % a year earlier). The largest annual increase in the proportion of internet users engaging in eCommerce took place in the Czech Republic (8 pp.), followed by Romania, Lithuania and Spain.

About 70 % of online shoppers reported not to have encountered any problem when making online purchases. The most **frequently reported problems** relate **to longer than expected delivery times** (17 %), **technical impediments** (11 %) and receiving **wrong or damaged goods/services** (9 %).

As to those internet users who **did not buy online**, the most cited reason (69 % of internet users) was a **preference for shopping in person,** either to see the products beforehand, out of loyalty to shops or by force of habit. Concerns regarding **privacy or security** when paying online, **lack of skills or knowledge** and about **receiving or returning goods** were mentioned, in turn, by 25 %, 19 % and 16 % of internet users respectively.

Figure 3.4 Internet users who ordered goods or services online in the previous 12 months, 2016-2017 (%)



Source: Eurostat

Although most EU internet users engage in online shopping, only about 22% of them ordered goods or services from other Member States online in 2017, which suggests the existence of important barriers.

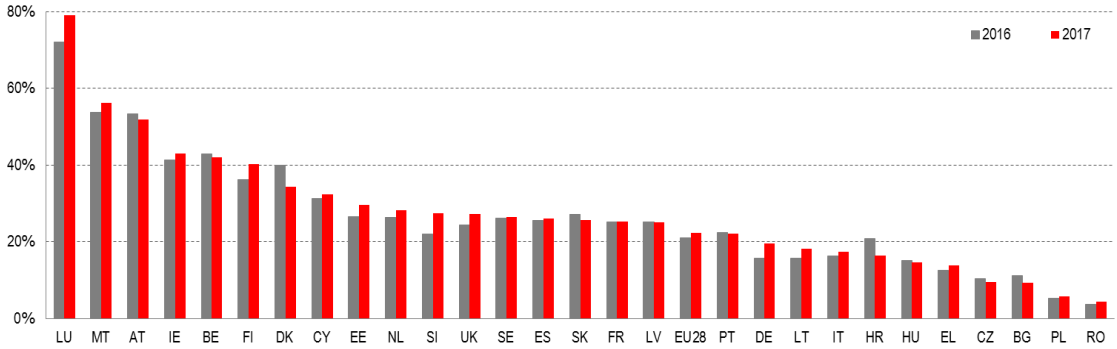
In 2017, although **68 % of internet users in the EU shopped online**, only **22 % engage in cross-border eCommerce** (1 pp. more than a year earlier). While cross-border online shopping

is advancing, it is doing so rather slowly, having increased 10 percentage points since 2010. Among **online shoppers, 33 %** made online purchases **from sellers in other EU countries** and **23 % from sellers in non-EU countries** in 2017, compared, respectively, with 25 % and 13 % in 2012.

Among online shoppers who made purchases from sellers outside their own country, **80 % bought physical goods** such as electronics, clothes, toys, food and groceries and books, whereas fewer of them purchased **travel, accommodation or holiday arrangements** (34 %) or **products downloaded or accessed from websites or apps** (25 %).

The extent of cross-border eCommerce **differs substantially between Member States**, as it ranges from 4 % of internet users in Romania to 79 % in Luxembourg. Buying from other EU Member States is influenced by a number of factors including country size and language. For example, Luxemburg, Malta and Austria, which have relatively small home markets and language connections with other large European countries, exhibit higher shares of cross-border eCommerce.

Figure 3.5 Internet users who ordered goods or services online from other EU Member States in the previous 12 months, 2016-2017 (%)



Source: Eurostat

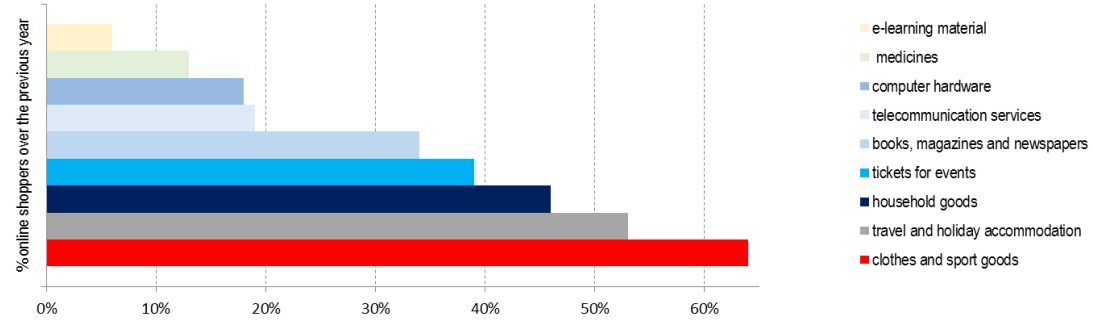
The goods and services most frequently bought online in 2017 were clothes and sport goods, followed by, accommodation services and household goods.

In 2017, the most popular categories of goods and services purchased online in the EU were **clothes and sport goods** (64 % of online buyers), **travel and holiday accommodation** (53 %), **household goods** (46 %), **tickets for events** (39 %) and **books, magazines and newspapers** (34 %). By age group, online shoppers aged **16-24 and 25-54** favoured clothes and sports goods in their online purchases (71 % and 67 % respectively); **55-74** year-olds, travel and holiday accommodation (57 %).

About **40 % of online shoppers declared to have spent between EUR 100 and EUR 499 on online purchases** over the previous three-month period. Those aged **16-24** made, on average, **smaller online purchases** (less than EUR 100) than their older counterparts. People aged **25-**

54, in turn, tend to make **more frequent purchases**: 17 % of online shoppers in this group had bought online 6-10 times and 16 % even more often.

Figure 3.6 Goods and services bought online in the EU, 2017 (in % of online shoppers)



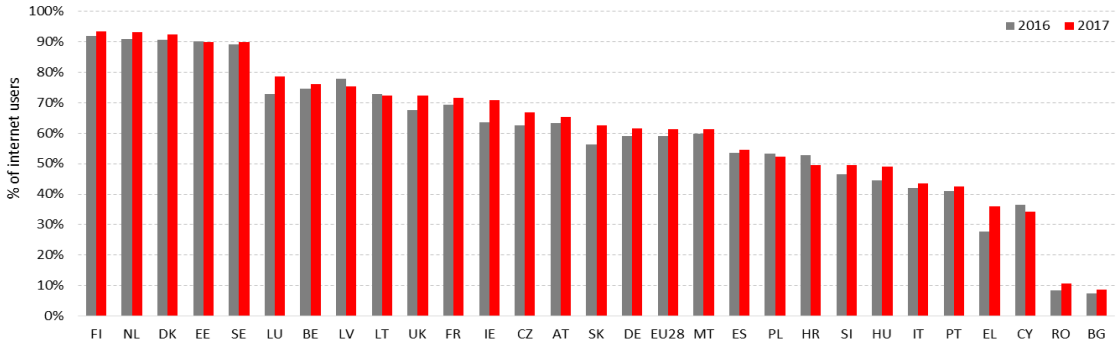
Source: Eurostat

61 % of EU Internet users used online banking in 2017, although a large majority of them still does not do so in a number of Member States.

Online banking is a relatively common activity among internet users in the EU. **61 %** of internet users in the EU **used internet banking 2017, a 2 pp. annual increase** from 2016.

High shares of internet users doing online banking were recorded in **Finland and the Netherlands (both 93 %), Denmark (92 %), Estonia and Sweden (both 90 %)** in 2017. **Large differences remain across Member States**, with Bulgaria (9 %) and Romania (11 %) having the lowest shares of internet users engaging in online banking despite improvements observed over the past year**.** Countries with **high levels of online banking** among internet users also tend to have **higher rates of eCommerce**. Overall in the EU, **the use of online banking is gradually progressing**. Over the period **2010 to 2017**, the percentage of internet users doing online banking grew **from 52 % to 61 %**.

Figure 3.7 Individuals who used internet banking in previous 3 months (% of internet users)



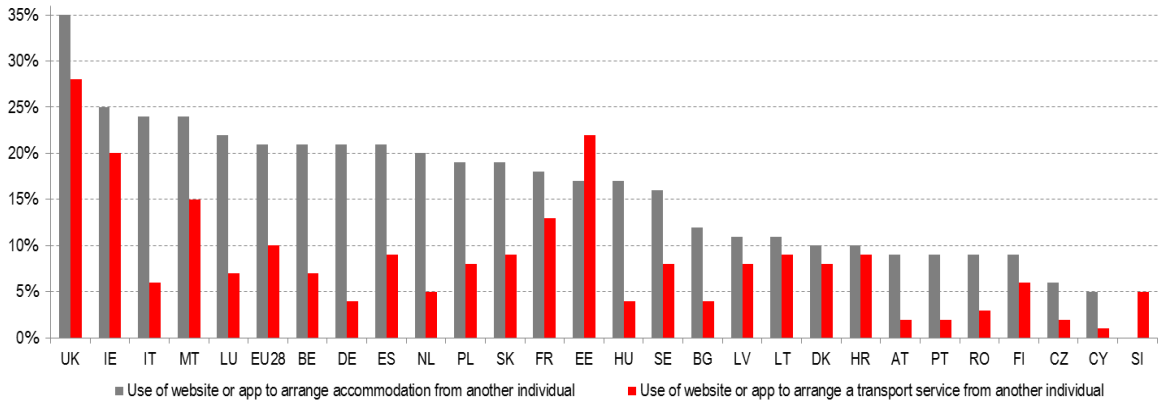
Source: Eurostat

About one-fifth of internet users in the EU used websites or apps to arrange accommodation services from other individuals in 2017; about 10 % used them to arrange transport services from other individuals.

On average, **21 % of internet users in the EU used websites or apps to arrange accommodation from other individuals in 2017**, in most cases by means of dedicated platforms. By Member State, this figure ranges from over 35 % in the UK to 6 % in the Czech Republic and 5 % in Cyprus. About **10 % of EU internet users** in the EU, in turn, **used websites or apps to arrange transport services from other individuals**. Again, large differences exist across Member States. **Institutional, legal and market-related aspects** partly explain such disparities.

Internet users with high education levels are considerably **more active** in this respect: for both transport and accommodation, the share is more than threefold for this category compared to the low-or-no-education group.

Figure 3.8 Use of websites or apps to arrange transport or accommodation from other individuals, previous 12 months, 2017 (% internet users)*



**Data not available for Greece.*

Source: Eurostat

4. Integration of Digital Technologies

On Integration of digital technology, Denmark scored highest, followed by Finland, Ireland and Sweden. Romania, Poland, Bulgaria and Hungary scored lowest.

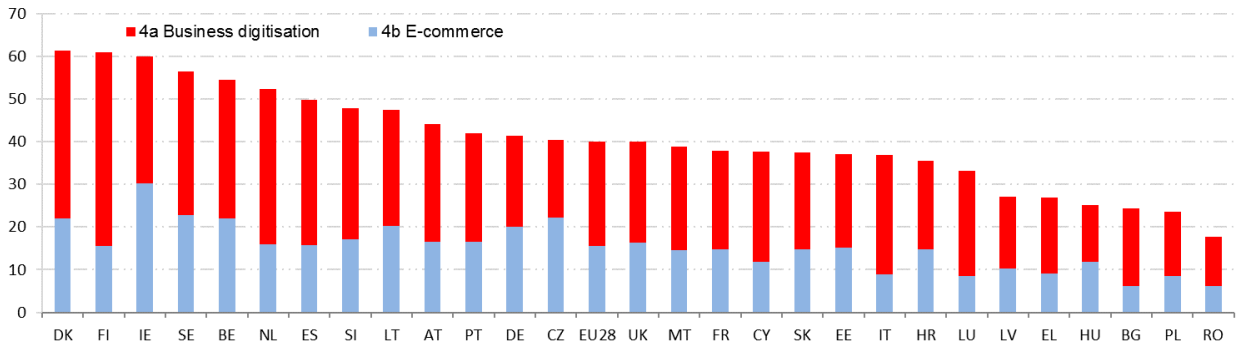
Integration of digital technology covers (a) 'business digitisation' and (b) 'e-commerce'. 'Business digitisation' has five indicators (as % of firms using): electronic information sharing, Radio Frequency Identification (RFID), social media, eInvoices and cloud solutions. E-commerce has three indicators: the percentage of small and medium-sized enterprises (SMEs) selling online; e-commerce turnover as a percentage of total turnover of SMEs; and the percentage of SMEs selling online cross-border.

Northern countries continue to be leading in the integration of digital technologies.

Figure 4.1 Integration of digital technology indicators in DESI 2018

EU 28	Value 2018		Value 2017
4a1 Electronic Information Sharing % enterprises	34% 2017		NA 2015
4a2 RFID % enterprises	4.2% 2017	↑	3.9% 2014
4a3 Social Media % enterprises	21% 2017	↑	20% 2016
4a4 eInvoices % enterprises	NA 2017		17.7% 2016
4a5 Cloud % enterprises	NA 2017		13.5% 2016
4b1 SMEs Selling Online % SMEs	17.2% 2017	→	17.2% 2016
4b2 E-commerce Turnover % SME turnover	10.3% 2017	↑	9.4% 2016
4b3 Selling Online Cross-border % SMEs	8.4% 2017	↑	7.5% 2015

Figure 4.2 Digital Economy and Society Index (DESI) 2018, Integration of technology

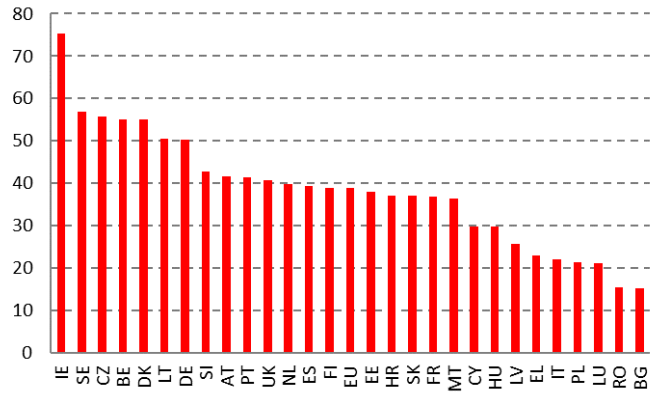


Source: European Commission services based on Eurostat data

The opportunities of e-commerce have been largely exploited by Ireland, Sweden and the Czech Republic whereas the adoption of eBusiness technologies is larger in Finland, Denmark and the Netherlands.

Enterprises are, to a similar extent, implementing both eBusiness and e-commerce solutions. When analysing the relative shares, e-commerce is the main driver of digitisation in the Czech Republic, while Italy, Bulgaria, Finland and Luxemburg are mainly investing in eBusiness.

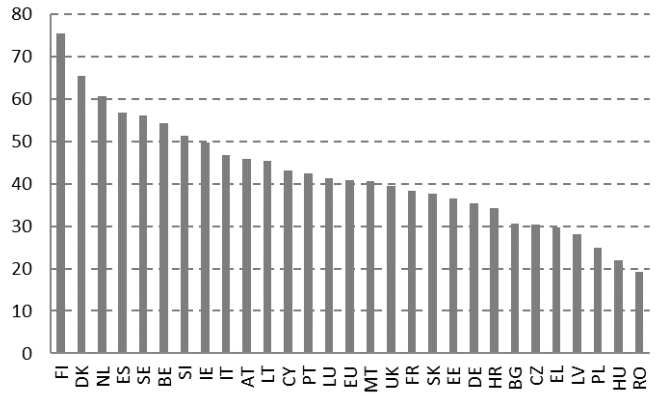
Figure 4.3 DESI 2018 – e-commerce index



Source: European Commission services based on Eurostat data

SMEs in Ireland over-perform in all the e-commerce dimensions considered in the indicator. 29.5 % of Irish SMEs are selling online (more than half of them are selling cross-border). This helps them to generate nearly a quarter of their turnover (22.9 %).

Figure 4.4 DESI 2018 - Business digitisation index



Source: European Commission services based on Eurostat data

More than half of the businesses in Belgium have implemented an electronic information sharing system (54 %). The adoption of RFID in Bulgaria (9.2 %) is more than the double of the EU average. 42.4 % of the United Kingdom enterprises are active on social media while 31.7 %

of the Spanish companies make use of eInvoices. Cloud services turn out to be adopted by almost half of the enterprises in Finland (48.4 %).

Only a fifth of companies in the EU-28 are highly digitised, but the situation across countries is varied: while 40% of companies in Denmark and the Netherlands are highly digitised, in Bulgaria and Romania it is 1 in 10.

The Digital Intensity Index (DII) measures the availability at firm level of 12 different digital technologies:

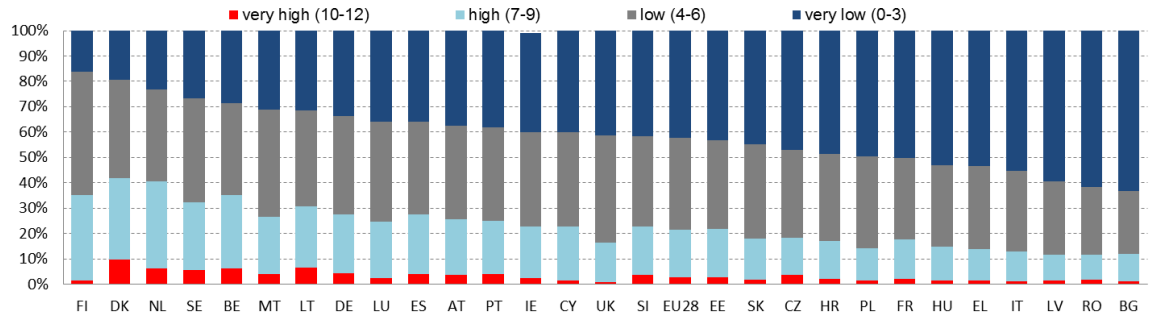
- internet for at least 50 % of persons employed;
- recourse to ICT specialists;
- fast broadband (30 Mbps or above);
- mobile internet devices for at least 20 % of persons employed;
- a website or homepage;
- a website with sophisticated functions;
- social media,
- sharing supply chain management data electronically;
- the use of Enterprise Resource Planning (ERP) software packages;
- the use of Custumer Relationship Management (CRM);
- e-commerce web sales accounting for over 1 % of total turnover and
- business-to-consumer (B2C) web sales of over 10 % of total web sales.

The value for the index therefore ranges from 0 to 12.

Denmark is the only country in the EU where the percentage of firms with a very high DII (i.e. possessing at least 10 out of the 12 monitored digital technologies) is close to 10 % .

By contrast, in some countries such as Bulgaria, Romania, Latvia, Italy, Greece, Hungary and France, the majority of businesses (more than 50 %) have not yet invested heavily in digital technologies (i.e. have a very low DII), often having just a simple website and a few computers.

Figure 4.5 Digital Intensity Index 2017 (% of enterprises by level)



Source: Eurostat

Digital transformation of European businesses is driven by fast broadband connections, social media and mobile applications.

The table below shows the degree of penetration and speed of adoption of the different technologies monitored by the DII. Large companies are more digital than SMEs. While some dimensions seem to be reaching saturation (e.g. having a simple website), at least for large companies, for most there is still room for improvement.

Figure 4.6 Key indicators tracking digitisation processes

Key indicators tracking digitisation processes	Year	% of EU28 enterprises		Variation 2017-2015 (pp)	
		Large	SMEs	Large	SMEs
Having a **web site** or homepage	2017	94%	76%	0	2
Website has some **interactive functionalities**	2017	74%	58%	2	3
Use any **social media**	2017	72%	47%	9	8
>50% of the persons employed **use computers** & Internet	2017	50%	40%	3	2
Fastest **broadband** connection is at least 30 Mb/s	2017	69%	37%	15	12
Have **ERP** software package to share information	2017	76%	33%	Not comparable with 2015	
Use Customer Relationship Management **(CRM)**	2017	62%	32%	0	1
>20% of workers with **portable devices** for business use	2017	38%	32%	7	5
Employ **ICT specialist**		75%	18%	-3	-1
Selling online (at least 1% of turnover)	2017	39%	17%	1	1
Share electronically **supply chain** management data	2017	47%	17%	-1	1
Exploit **B2C eCommerce**	2017	9%	7%	1	1

Source: European Commission services based on Eurostat data

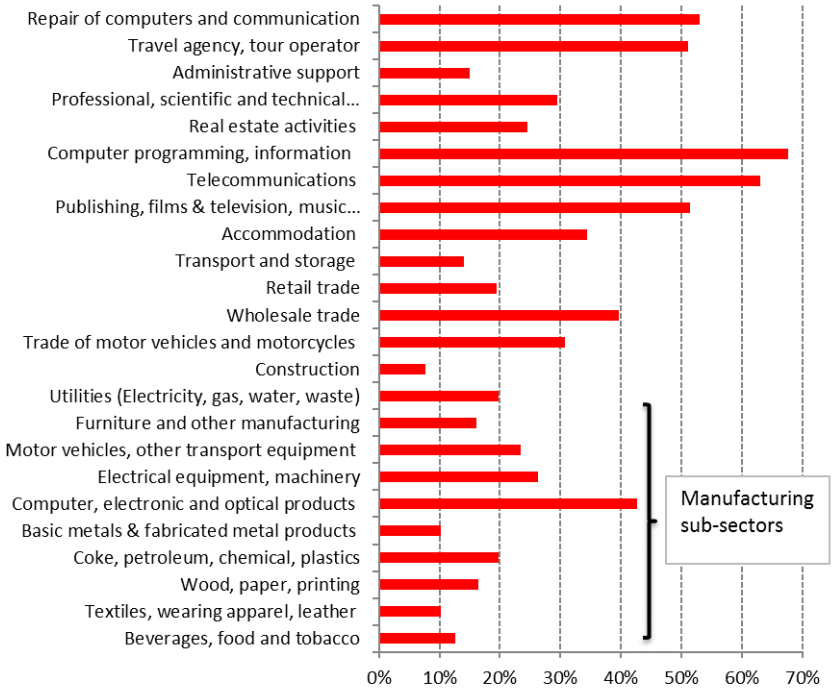
The digitisation of economic sectors is progressing at different speeds, according to their own specific needs and starting points.

As expected, it is the different segments of the ICT sector (from telecoms to the manufacture of computers) that tend to be the most digitised sectors of the economy. However, other sectors such as “Repairs of computers and communication”, travel agencies and the media are also highly digitised.

Some sectors are still impervious to digital changes: for example, in the construction sector only 7.7% of the businesses have a high or very high DII.

The distribution of the DII by economic activity is similar across EU countries. Denmark, The Netherlands, Finland and Sweden are over performing in many of the sectors. Some positive exceptions of higher digitisation exist in the “accommodation” sector (Malta, Lithuania, Slovenia, Spain, Estonia, Portugal and Croatia), “professional scientific and technical activities” (Belgium, Malta and Lithuania), “real estate” (Cyprus and Spain) and “transport and storage” (Cyprus).

Figure 4.7 Enterprises with high or very high digital intensity index by economic activity, EU, 2017 (% enterprises)



Source: European Commission based on Eurostat data

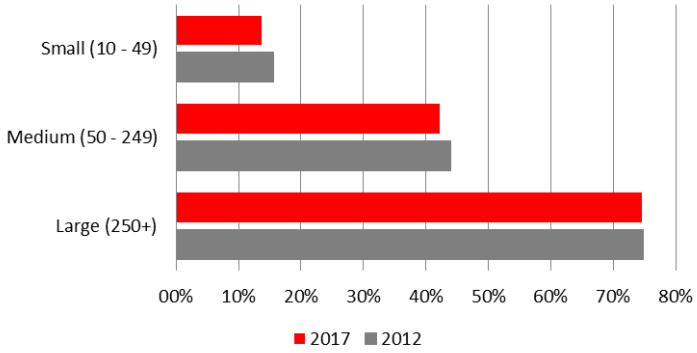
Size is a major factor enabling companies to digital transform. SMEs are closing the gap with large companies but there are a lot of opportunities still to be exploited.

The adoption of digital technologies varies strongly with company size. Large enterprises have a scale advantage and more capacity to employ at least some internal ICT specialists.

The result is that data sharing infrastructure such as ERP is much more common in large companies. SMEs are relatively active on social media (47 %) and, to a limited extent, they try to exploit e-commerce possibilities by selling through marketplaces.

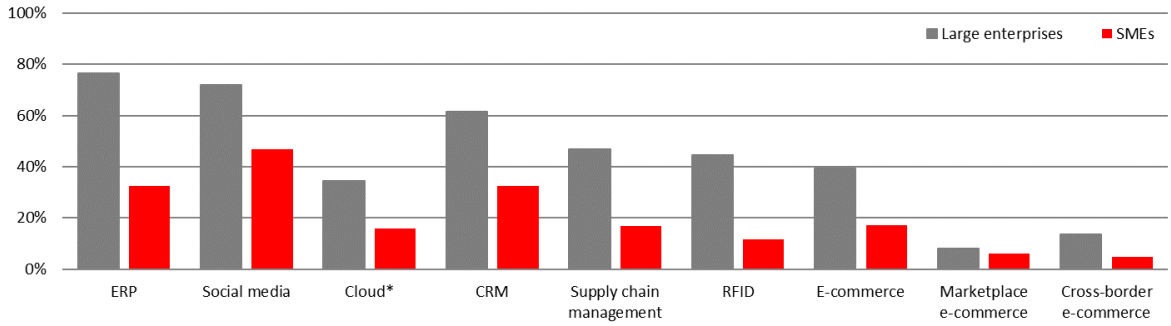
Nevertheless, there are a lot of technological opportunities still to be exploited by SMEs such as cross-border e-commerce, cloud services and automation.

Figure 4.8 Enterprises employing ICT specialists, EU (% of enterprises)



Source: Eurostat

Figure 4.9 Adoption of digital technologies, EU (% of enterprises)



**EU average based on 17 countries*

Source: Eurostat

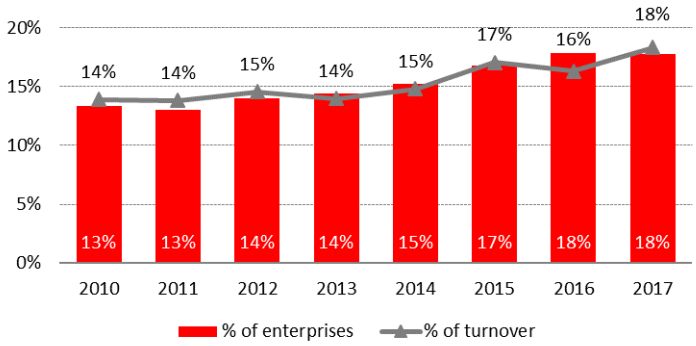
E-commerce: slow progress in electronic sales by companies. One out of five made electronic sales. Larger enterprises are better at exploiting the possibilities of e-commerce[5]

One out of five enterprises in the EU-28 made electronic sales. The percentage of turnover on e-sales amounted to 18 % of the total turnover of companies with 10 or more persons employed.

In the EU-28, during the period 2010-2017, the percentage of companies that had e-sales increased by 5 pps and the companies' turnover resulting from e-sales increased by 4 pps.

[5] Eurostat data presented in the report are organised according to the survey year. E-commerce figures refer to the year preceeding the survey year. See DESI methodological note for further information.

Figure 4.10 Trends in e-commerce, EU (% of enterprises, % of turnover)



Source: Eurostat

The share of companies conducting e-sales and the turnover from e-sales varies significantly according to their size.

The share of small enterprises making e-sales (15.8 %) is less than half compared to the share of the large ones (39.3 %). Even more striking is that the share of the e-sales' turnover on the total turnover by small enterprises (7.4 %) is less than a third of the share generated by the large ones (25.7 %).

25.5 % of medium sized enterprises made e-sales, corresponding to 13 % of total turnover in this size class.

Figure 4.11 E-sales and turnover from e-sales , by firm size, EU, 2010 - 2017 (% of enterprises, % of turnover)

	Enterprise with e-sales			Turnover from e-commerce		
	2010	2014	2017	2010	2014	2017
All enterprises	13.3%	15.2%	17.8%	13.9%	14.8%	18.3%
Large (250+)	31.3%	35.3%	39.3%	19.1%	20.2%	25.7%
Medium (50-249)	19.8%	22.0%	25.5%	11.3%	11.1%	13.0%
Small (10-49)	11.6%	13.4%	15.8%	4.9%	5.8%	7.4%

Source: Eurostat

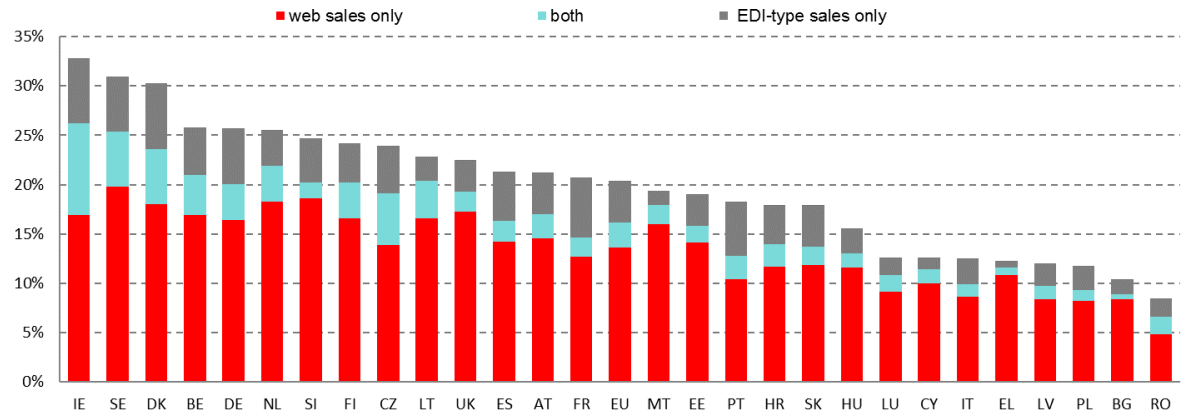
Different types of e-commerce: Web and EDI-type

E-commerce can be broadly divided into two types: web sales and EDI-type sales referring to the way customers place orders for the products that they wish to purchase; companies may offer one or both options to their clients. The Electronic Data Interchange (EDI) type is the interchange of data between information systems, through a dedicated channel and in a defined standard so as not to require human intervention except in exceptional cases.

Among the EU-28, the percentage of enterprises making e-sales (web or EDI-type) ranged from 8 % in Romania to 33 % in Ireland, closely followed by Sweden (31 %).

Web sales, made through the enterprise own website or through third parties one (including marketplace), is by far the most common option for e-sales. At EU level around 14 % of the enterprises are selling through a website, 2 % are exploiting both channels while slightly more than 4 % is making use of EDI-type sales.

Figure 4.12 E-sales broken down by web sales and EDI-type sales, 2017 (% enterprises)



Source: Eurostat

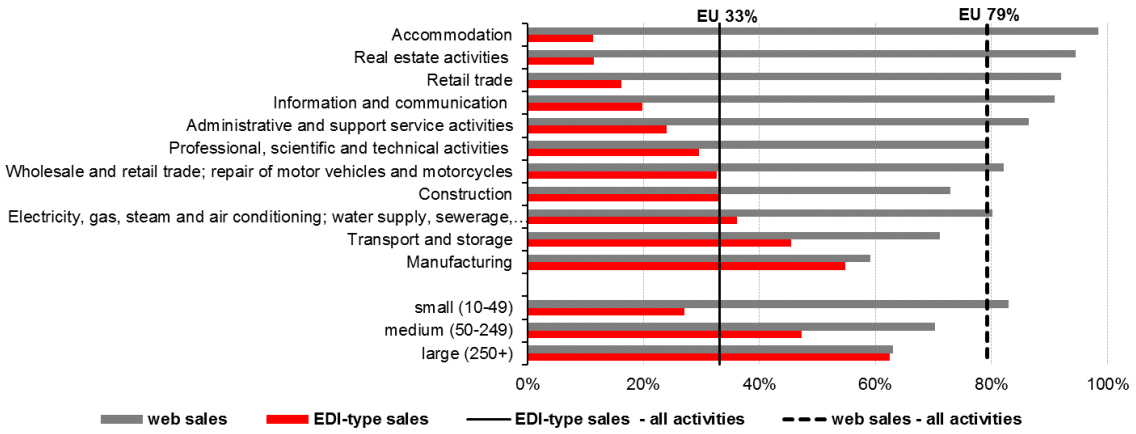
Almost all enterprises making e-sales in the 'accommodation' branch received orders via a website. Large enterprises use web sales and EDI-type sales to the same extent

Companies received their orders in most cases via websites or apps independently of the economic activity (close to 100 % for businesses in the "accommodation" sector).

Orders received via EDI-type messages are reported by more than half of 'manufacturing' companies making e-sales, followed by companies in the 'transport and storage' sector (46 %).

When analysing e-sales by enterprise dimension, it becomes evident that large companies are using web sales and EDI-type sales to the same degree. The small enterprises making e-sales are mainly relying on web sales (83 % of enterprises) while the percentage reduces to 63 % for large enterprises that received orders via websites.

Figure 4.13 E-sales broken down by web and EDI-type sales, by economic activity and size, EU, 2017 (% enterprises with e-sales)



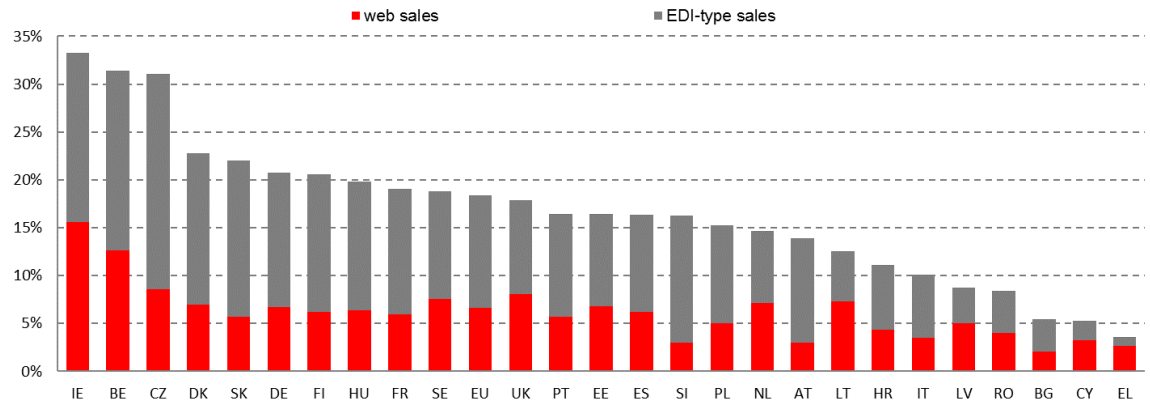
Source: Eurostat

The share of turnover from EDI-type sales is greater than that from web sales

Among all Member States, the percentage of turnover from e-sales ranged from 4 % in Greece to 33 % in Ireland. In the EU28, the turnover from EDI-type sales was 12 % of total turnover, while the turnover from web sales was only 7 %. 4 % of this turnover from web sales is mainly generated by e-sales to other businesses and public authorities (B2BG), while 3 % came from e-sales to private consumers (B2C).

The share of the total turnover from EDI-type sales as well as that from web sales is very diverse across countries. The share from EDI-type sales ranged from less than 1 % in Greece to 22 % in the Czech Republic while the share of total turnover from web sales ranged from 2 % in Bulgaria to 16 % in Ireland.

Figure 4.14 Turnover from e-sales broken down by web and EDI-type sales, 2017 (% total turnover)



Source: Eurostat

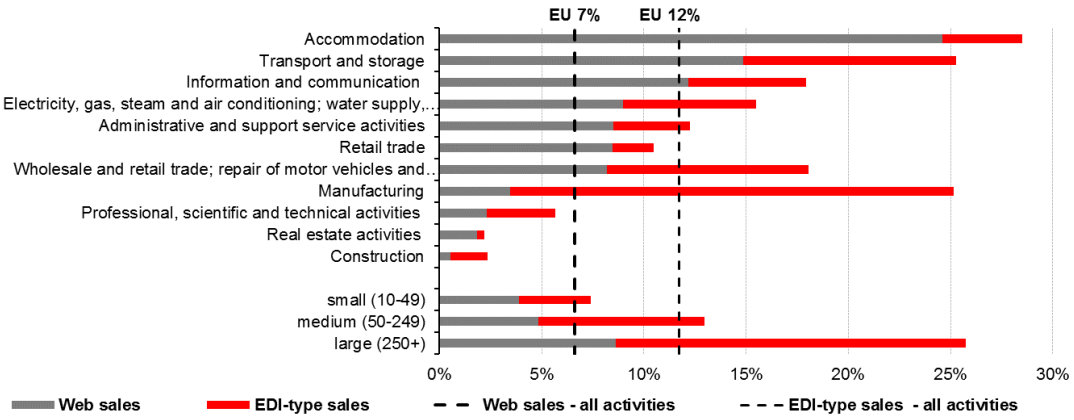
Large enterprises mainly rely on ICT and standards that integrate EDI-type sales within their business processes

Large enterprises, with 250 persons employed or more, reported the highest share of turnover from e-sales (26 %), most of it from EDI-type sales (17 %).

As already underlined, small enterprises are lagging behind larger companies in terms of share of turnover from e-sales (7.4 %) which is derived in equal parts from EDI-type sales and web sales.

Businesses in the 'accommodation' sector reported the highest share of total turnover from e-sales (29 %), followed by those in the 'transport and storage' and 'manufacturing' (25 % each). However, businesses in 'accommodation' gained most of their turnover from web sales (25 %), while those in 'manufacturing' gained it from EDI-type sales (22 %). Businesses in 'transport and storage' gained more turnover from web sales (15 %) than from EDI-type sales (10 %).

Figure 4.15 Turnover from e-sales broken down by web and EDI-type saes, by economic activity and size, 2017, (% total turnover)



Source: Eurostat

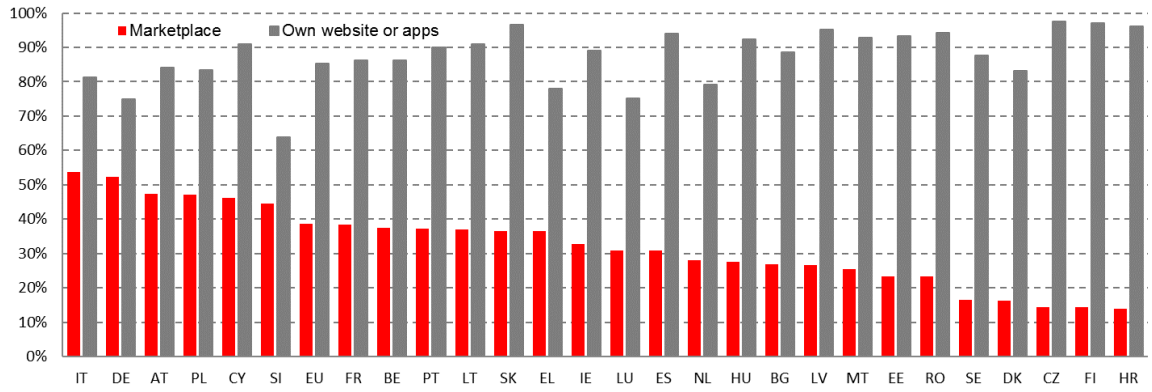
Businesses are starting to be active in marketplaces

Looking further into web sales, it is of some interest to disentangle web sales made through a marketplace, available on external websites, from those done through a company's own website. E-commerce marketplaces and general online platforms may facilitate economic growth by enabling sellers to access new markets and reach new customers at lower cost. This option has been exploited by 39% of EU enetrprises with web sales (against 85 % of EU enterprises using their own website).

The Czech Republic (98 %), Finland and Slovakia (both 97 %) reported the highest percentages of enterprises with web sales via own sites. The lowest was registered in Slovenia (64 %). At

the same time, companies in the Czech Republic, Finland and Croatia have the lowest percentages of web sales via marketplaces (14 % each). Selling online via marketplaces was the most common option in Italy (54 %) and Germany (52 %).

Figure 4.16 Web sales broken down by own website or apps and marketplace, 2017 (% enterprises with web sales)



Source: Eurostat

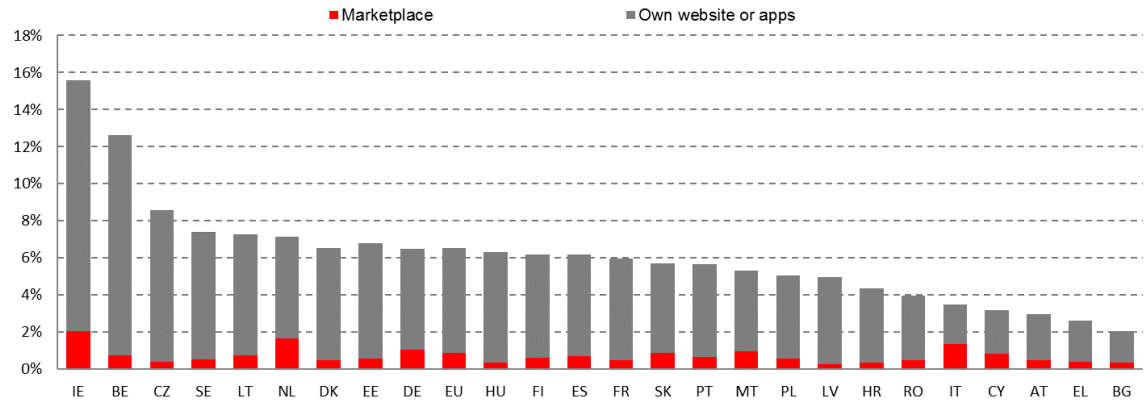
The share of turnover from web sales via companies' own website is greater than that from web sales via marketplaces

As already underlined, in the EU-28, companies gained 7 % of their total turnover from web sales. 85% of it (equal to 6 % of total turnover) was gained from web sales via own website or apps and only 15% (equal to 1 %) from sales via online marketplaces.

The highest share of turnover (over the total turnover of the firm) from selling via the marketplace was gained in Ireland and the Netherlands (around 2%).

When looking at the composition of the turnover, Italian companies gained half of their turnover generated through web sales into marketplaces.

Figure 4.17 Turnover from web sales broken down by own website or apps and marketplace, 2017 (% total turnover)



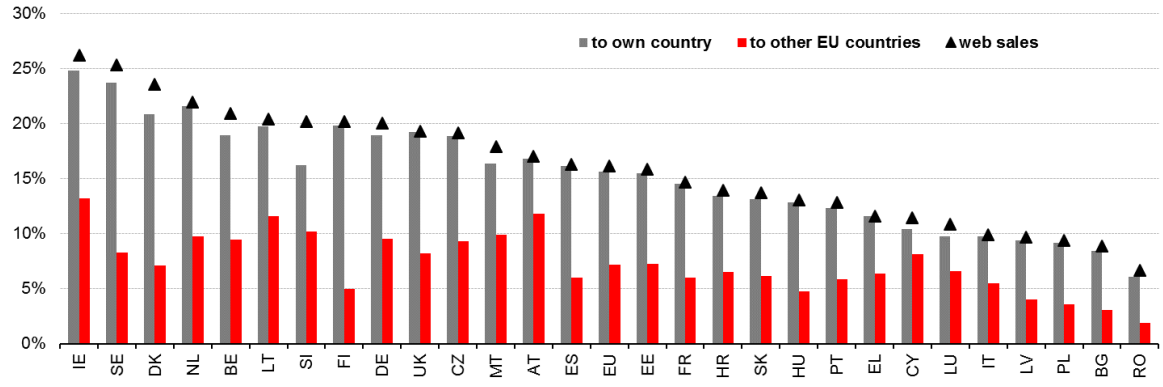
Source: Eurostat

Companies are not fully exploiting cross-border e-commerce

Businesses benefit from cross-border e-commerce by exploiting economies of scale which reduce costs, increase efficiency and promote competitiveness, and by improving total factor productivity. In many cases, without these economies of scale an on-line business may not be viable at all. This could be especially significant for SMEs that remain confined to a small home market with high production costs.

In the EU-28, only 7 % of enterprises made web sales to customers in other EU countries, while almost all enterprises with web sales (16 %) reported that they sold in their own country. The largest proportions of EU companies with web sales to other EU countries were recorded in Ireland (13 %), followed by Austria and Lithuania (both 12 %). Romania (2 %) and Bulgaria (3 %) are the two countries with the lowest share of web sales to customers in other EU countries.

Figure 4.18 Web sales to own country and other EU countries, 2017 (% enterprises)

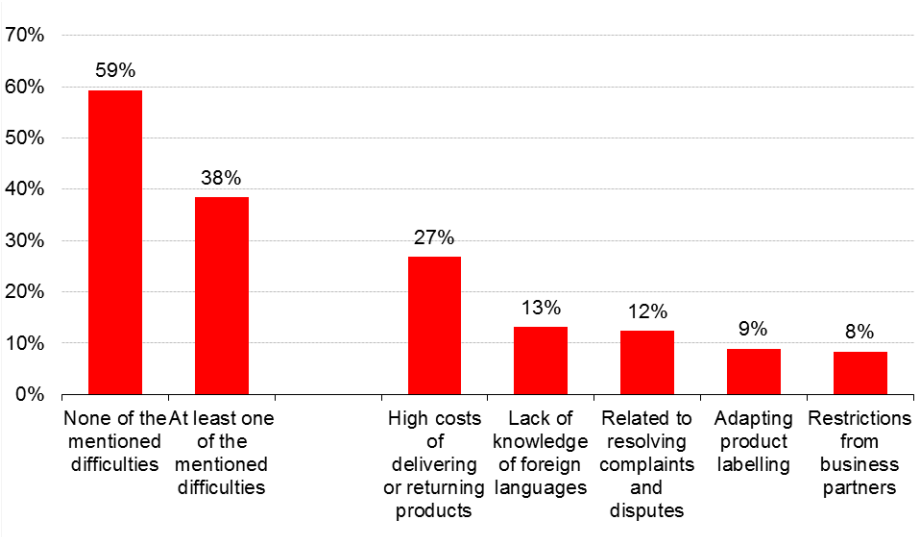


Source: Eurostat

Obstacles to e-commerce with other EU countries

The majority (59 %) of EU companies that received orders via a website or via apps had no difficulties when selling to customers in other EU Member States. However, almost 4 in 10 (38 %) reported obstacles that were mainly related to economic factors, such as the high costs of delivering or returning products (27 %). Other aspects such as linguistic and judicial reasons were also significant. The lack of knowledge of foreign languages and problems related to resolving complaints and disputes were also highlighted, respectively, by 13% and 12% of the enterprises selling online to other EU countries.

Figure 4.19 Difficulties experienced when selling to other EU countries, EU, 2017 (% of enterprises with web sales to other EU countries)



Source: Eurostat

5. Digital public services

In digital public services, Finland has the highest score, followed by Estonia, Denmark and Spain. Greece, Hungary and Romania have the lowest scores.

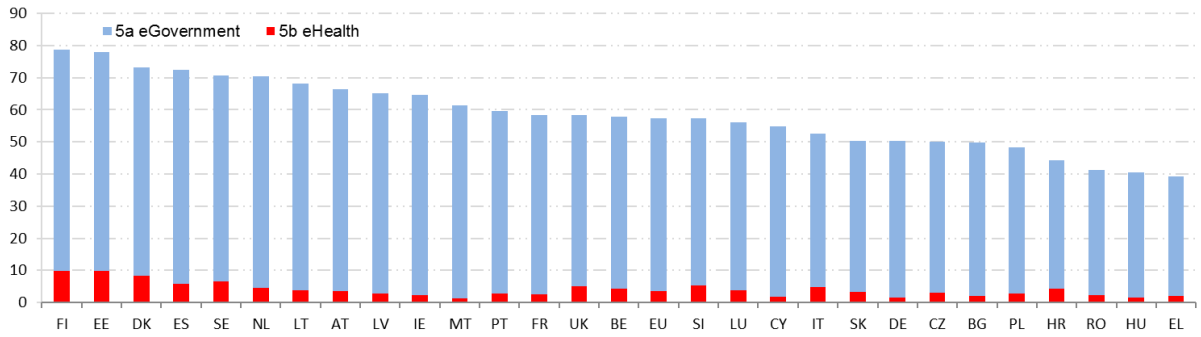
The digital public services dimension consists of six indicators:

- the eGovernment users measured as a percentage of those internet users who need to submit forms to the public administration (the eGovernment users indicator);
- the extent to which data that is already known to the public administration is pre-filled in forms presented to the user (the pre-filled forms indicator);
- the extent to which the various steps in dealing with the public administration can be performed completely online (the online service completion indicator);
- the degree to which public services for businesses are interoperable and cross-border (the digital public services for businesses indicator);
- the government's commitment to open data (the open data indicator); and
- the percentage of people who used health and care services provided online without having to go to a hospital or doctors surgery (the eHealth services indicator).

Figure 5.1 Digital Public Services Indicators in DESI 2018

5a1 eGovernment Users % internet users needing to submit forms	**58%** 2017
5a2 Pre-filled Forms Score (0 to 100)	**53** 2017
5a3 Online Service Completion Score (0 to 100)	**84** 2017
5a4 Digital Public Services for Businesses Score (0 to 100) - including domestic and cross-bo	**83** 2017
5a5 Open Data % of maximum score	**73%** 2017
5b1 eHealth Services % individuals	**18%**

Figure 5.2 Digital Economy and Society Index (DESI) 2018, Digital Public Services



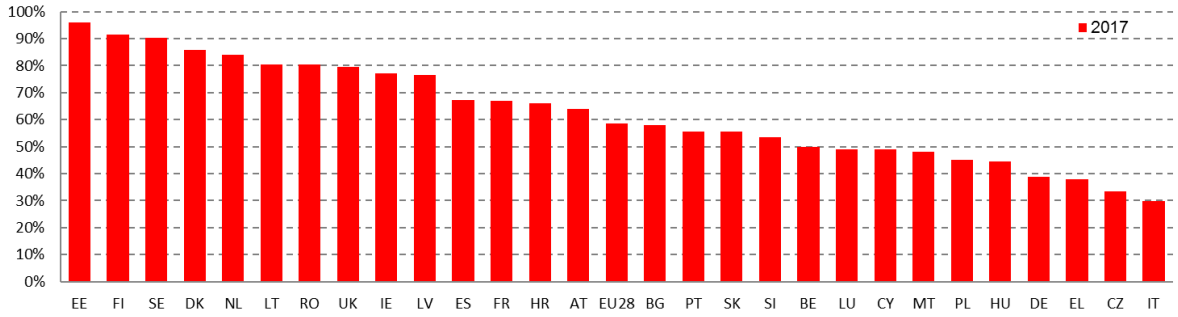
Source: DESI 2018, European Commission

eGovernment users: 58% of EU citizens who need public services choose to go online.

The extent to which e-services reduce the time spend in public administrations encourage citizens to use them. Indicatively, Estonia, Finland, Sweden, Denmark, the Netherlands and Lithuania are performing very well, with more than 80% of internet users who need to submit forms to the public administration choosing governmental portals. 14 Member States are above the EU average (58.5%), while Italy, the Czech Republic, Greece and Germany perform below 40%.

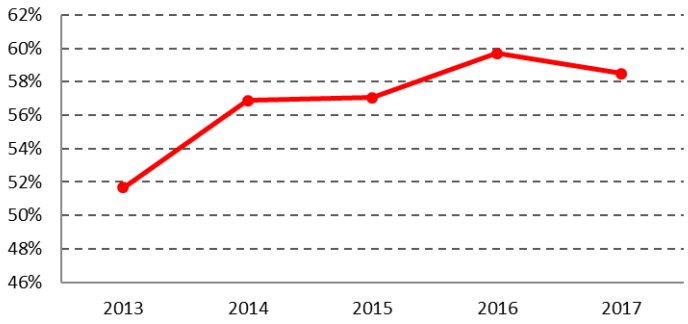
Compared to recent years, the upward trend from 2015 to 2017 stopped in 2017 with a fall of 1 percentage point.

Figure 5.3 eGovernment Users, 2017



Source: Digital Scoreboard.

Figure 5.4 eGovernment Users, 2013-2017



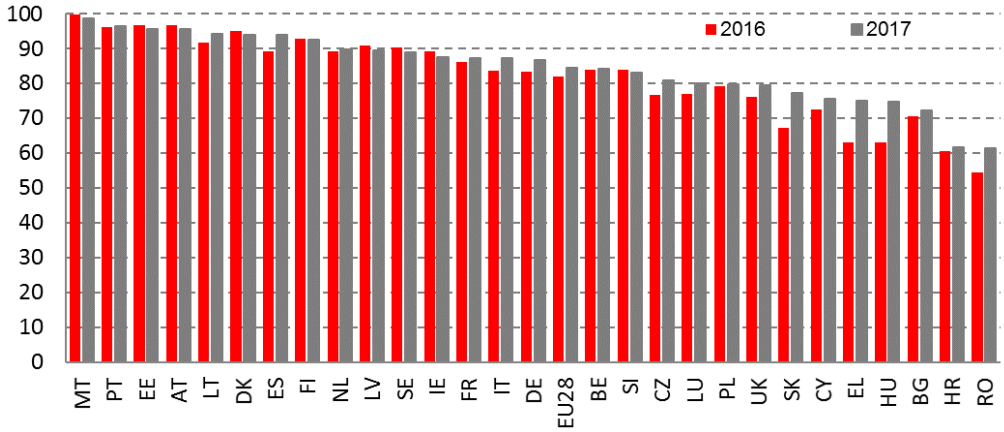
Source: Digital Scoreboard.

The provision of government services online is progressing, especially in Member States that are lagging behind.

Online service completion refers to the share of administrative steps related to major life events (birth of a child, new residence, etc.) that can be done online.

The countries that perform the best are Malta, Portugal, Estonia, Austria, Lithuania, Denmark, Spain and Finland with over 90 points (out of 100). However, Romania, Croatia, Bulgaria and Hungary have low scores.

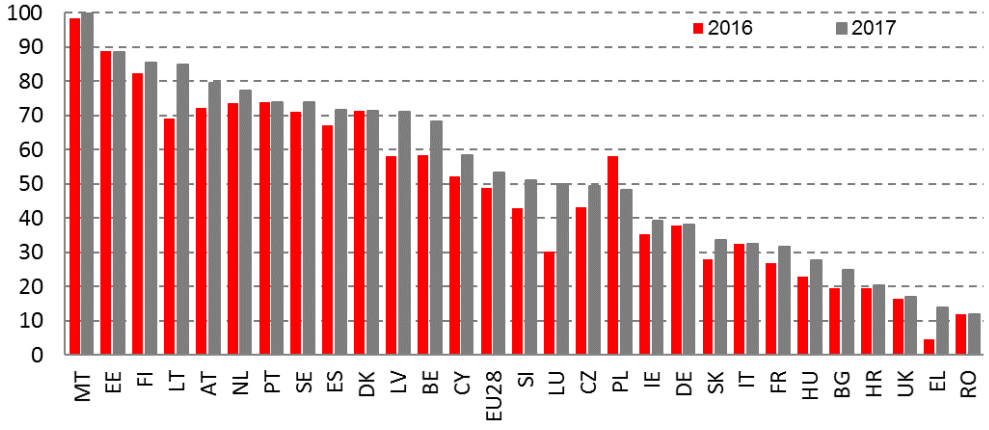
Figure 5.5 Online Service Completion, 2016-2017



Source: eGovernment Benchmark Report

The use of inter-connected registers so users can avoid having to re-submit data is not yet widespread. Pre-filled forms are available, but in the majority of Member States, the amount of data available in public services'online forms is not satisfactory. Member States are working towards improving the provision of pre-filled forms, noting a small increase compared to 2016, with Malta, Estonia, Finland and Latvia leading.

Figure 5.6 Pre-filled Forms, 2016-2017



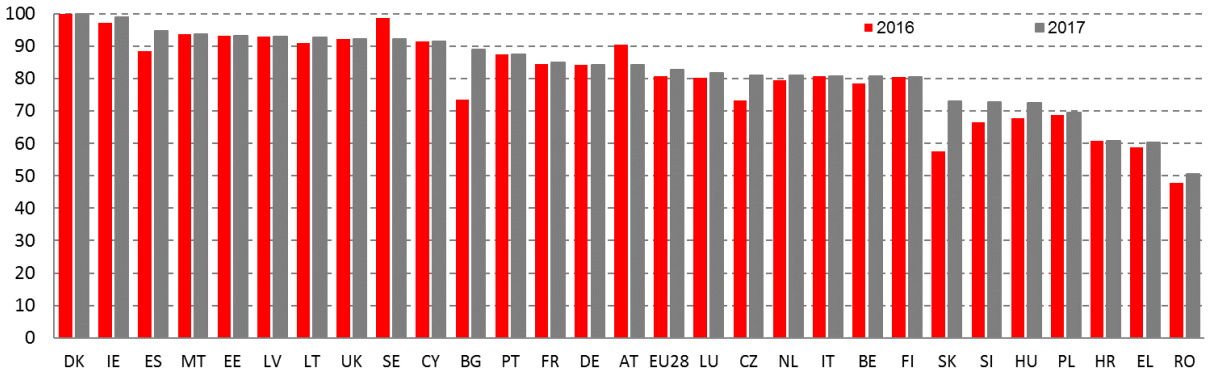
Source: eGovernment Benchmark Report

The provision of digital public services for businesses is progressively improving.

The indicator broadly reflects the share of public services needed for starting a business and for conducting regular business operations that are available online for domestic as well as for foreign users. Services provided through a portal receive a higher score, while services which provide only information (but have to be completed offline) receive a lower score.

10 Member States (Denmark, Ireland, Spain, Malta, Estonia, Latvia, Lithuania, the United Kingdom, Sweden and Cyprus) score more than 90 points (out of 100), while the EU average is 82. On the other hand, Croatia, Greece and Romania underperform.

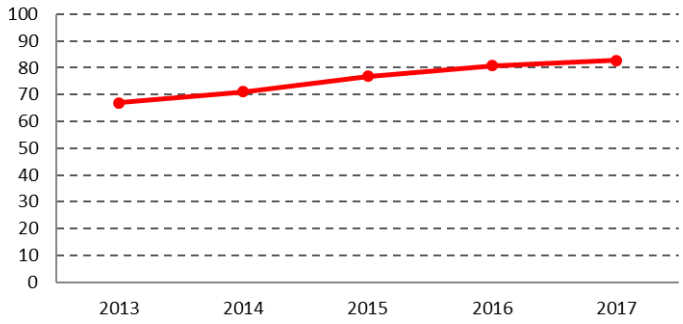
Figure 5.7 Digital Public Services for Businessses, 2016-2017



Source: eGovernment Benchmark Report

Indicatively, the progress recorded in the period 2013-2017 is 23.5%.

Figure 5.8 Digital Public Services for Businesses, 2013-2017



Source: eGovernment Benchmark Report

Open data: More and more Member States make data available for reuse and analysis.

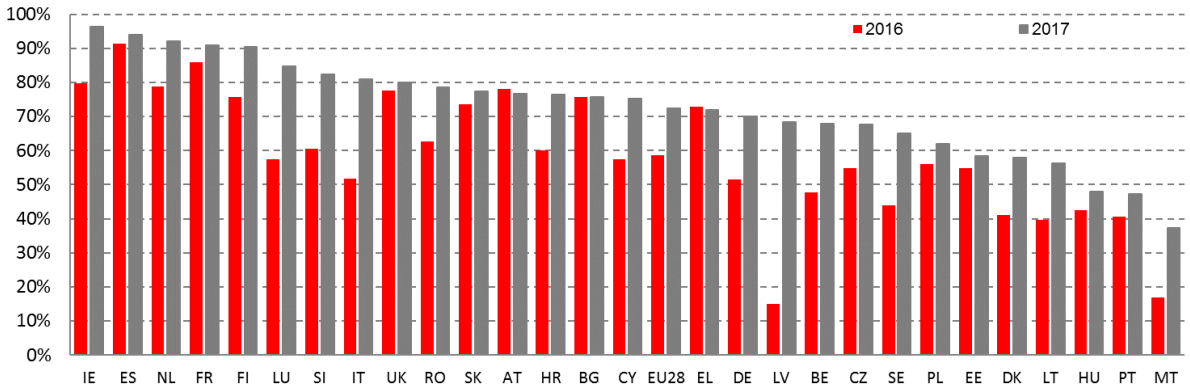
The level of maturity of open data is based on two indicators:

- Open data readiness: this assesses to what extent countries have an open data policy in place, licensing norms, and the extent of national coordination regarding guidelines and setting common approaches.
- Portal maturity: assesses the portal's usability regarding the availability of functionalities, the overall re-usability of data such as machine readability and accessibility of datasets, as well as the spread of data across domains.

All Member States have improved their score, with Ireland, Spain, the Netherlands, France and Finland exceeding 90% on the index.

Latvia and Malta showed the most significant progress. In 2017, Latvia progressed by 350% and Malta by 120% compared to 2016.

Figure 5.9 Open Data, 2016-2017



Source: European Data Portal

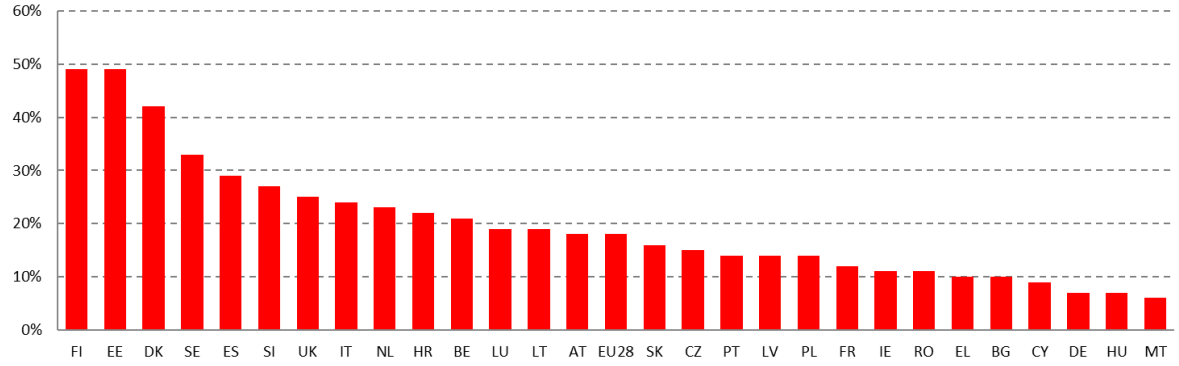
eHealth services: Less than one in five EU citizens have used health and care services provided online.

In the last 12 months, only 18 % (EU average) of EU citizens have used health and care services provided online without having to go to a hospital or a doctors surgery (for example, by getting a prescription or a consultation online). Almost 50 % of Finnish and Estonian citizens use eHealth services, while in Denmark the percentage is slightly lower (42 %).

According to Eurobarometer, 52 % of all citizens would like online access to their medical and health records. EU citizens are much more willing to share data on their health and wellbeing

with doctors and healthcare professionals (65 %) than with companies (14 %) or with public authorities even if anonymised and for research purposes (21 %).

Figure 5.10 eHealth Services, percentage of users, 2017



Source: Eurobarometer, Special Eurobarometer 460: Attitudes towards the impact of digitisation and automation on daily life, 2017

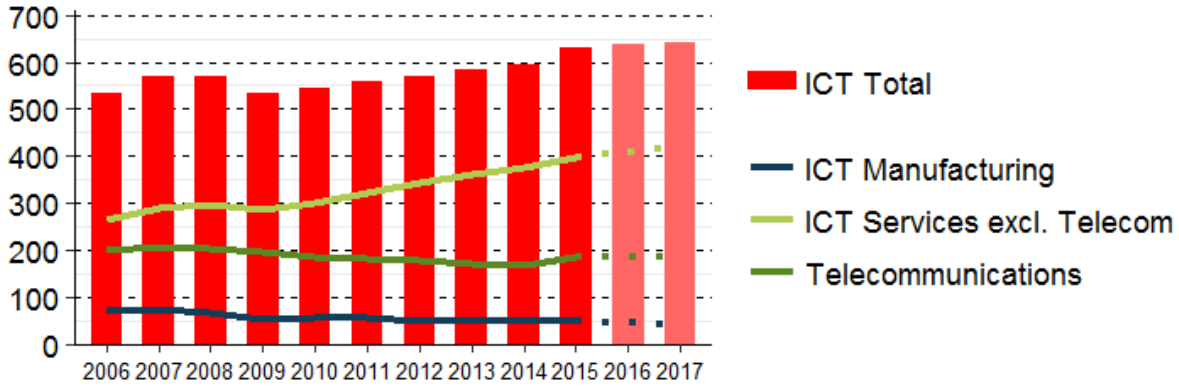
6. The EU ICT sector and its R&D performance

The ICT sector value added amounted to EUR 632 billion in 2015. ICT services represented 92 % of total ICT sector value added. ICT services (excluding telecoms) were the dominant sector and the only one to be expanding.

The EU ICT sector value added amounted to EUR 632 billion in 2015, having recovered after a slowdown in 2009. A breakdown by sub-sector shows the predominance of ICT services (EUR 582 billion and 92 % of total ICT sector value added in 2015) over ICT manufacturing industries (EUR 50 billion and 8 % of total ICT sector value added in 2015).

The ICT services sector (excluding telecommunications) is the only one that saw an increase in value added over the medium-term period (2006-2015) up to EUR 398 billion. Over the same period, the communication equipment sector experienced the sharpest decline: after peaking at EUR 32 billion in 2007, it fell to EUR 13 billion in 2015 (historical low over the considered period).

Figure 6.1 Value added in the ICT sector, EUR billion, 2006-2017



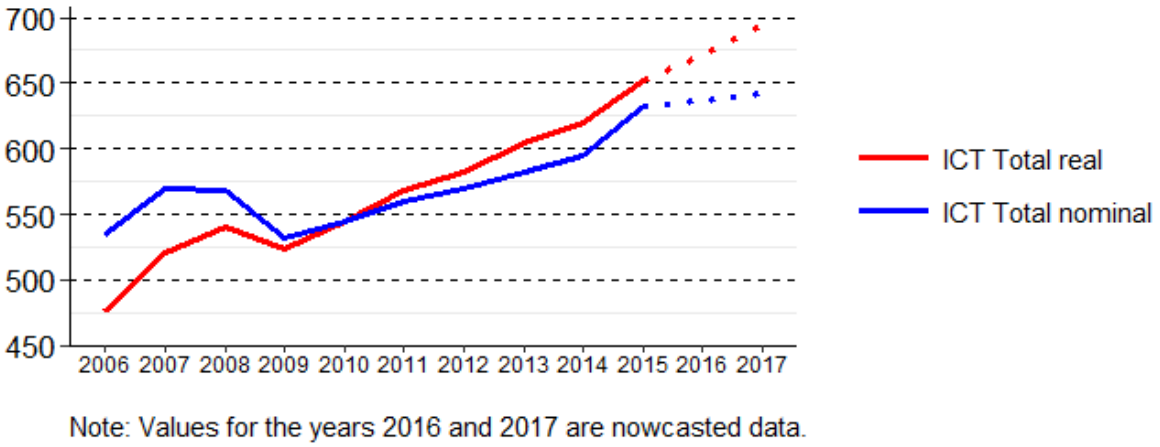
Note: Values for the years 2016 and 2017 are nowcasted data.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

The value added of the ICT sector grew much faster than the rest of the economy in real terms. At global level, the share of the ICT sector value added in EU's GDP is lagging behind the main competitors (Japan, United States, China).

Although the value added of the ICT sector increased by 18 % in nominal terms (in line with GDP: + 21 %), it increased by 37 % in real terms over the period 2006-2015 (well above of the GDP: + 7 %).

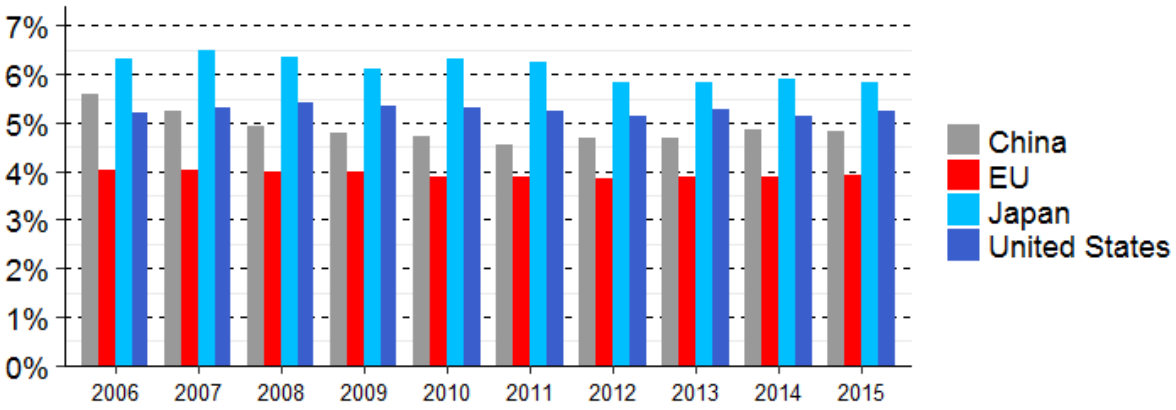
Figure 6.2 ICT sector gross value added (GVA), nominal and deflated, EUR billion, 2006-2017



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Value added in the ICT sector accounted for 4.3 % of EU GDP in 2015 (comprehensive definition). However, according to the operational definition which enables world comparisons, value added in the ICT sector in the EU (3.9 %) was behind Japan (5.8 %), the US (5.2 %), and China (4.8 %) in 2015.

Figure 6.3 ICT sector share of GDP, percentage, 2006-2015

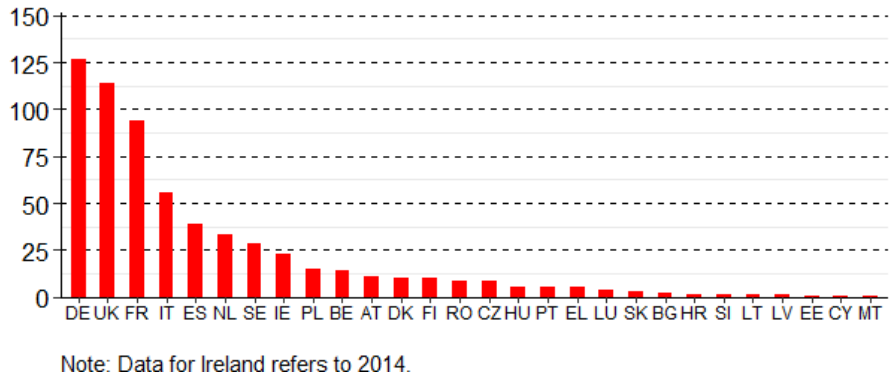


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data, OECD and other sources, PREDICT project

The EU's five largest economies (Germany, the United Kingdom, France, Italy, and Spain) were the five biggest contributors to ICT sector value added in 2015. However, Ireland, a medium-sized country, has by far the highest ICT sector share of GDP (11.6 % in 2014, latest data available).

Unsurprisingly, the EU's five largest economies were also the five biggest contributors to ICT sector value added in 2015: Germany (EUR 127 billion or 20 %), the United Kingdom (EUR 115 billion or 18 %), France (EUR 94 billion or 15 %), Italy (EUR 56 billion or 9 %), and Spain (EUR 39 billion or 6 %). Together, these five countries represented 68 % of total EU ICT sector value added in 2015.

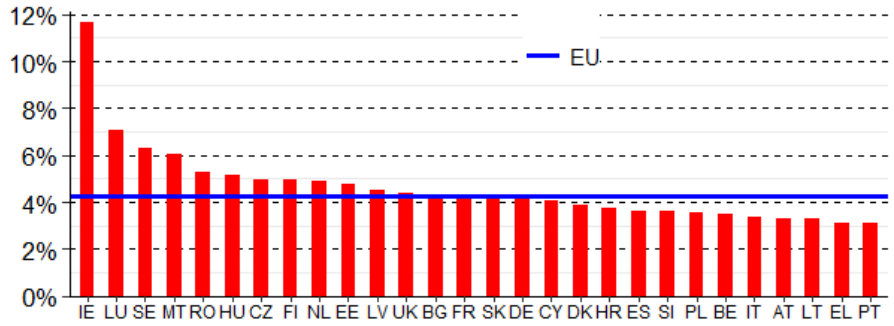
Figure 6.4 Value added in the ICT sector, EUR billion, 2015



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Ireland had by far the highest ICT sector share of GDP, with a rate of 11.6 % in 2014 (latest data available), while Portugal and Greece were lagging behind with a mere 3.1 %. After Ireland, countries with the highest share of ICT sector included Luxembourg (7.1 %) and Sweden (6.3 %). Some eastern Member States (Romania, Hungary, and the Czech Republic) also had a high rate (5 % or higher) of ICT sector as a share of GDP. In most other Member States, ICT sector remained broadly stable as a proportion of GDP over the medium-term period (2006-2015), except in Ireland where the rate increased by 3.7 pps and in Finland where the rate fell by 3.3 pps.

Figure 6.5 ICT sector share of GDP, percentage, 2015



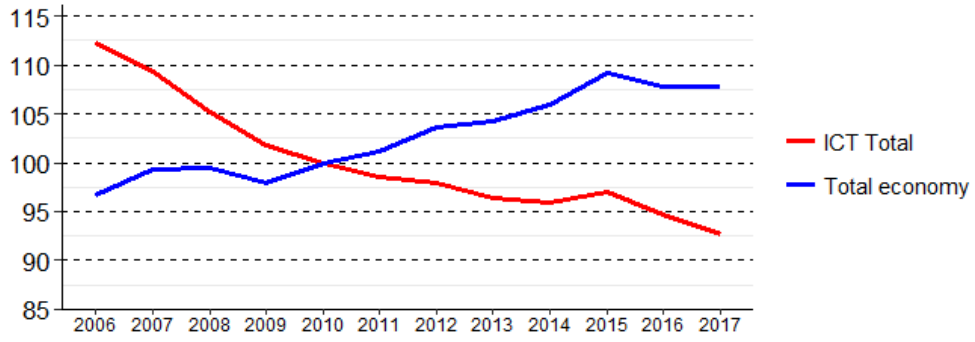
Note: Data for Ireland refers to 2014.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Unlike the general economy, the ICT sector saw a drop in prices over the medium term. The telecommunications sub-sector experienced the largest decline.

Prices in the ICT sector fell by 14 % over the medium term (2006-2015), while the general price level increased by 13 % over the same period. This highlights the particular nature of the prices of products in the ICT sector.

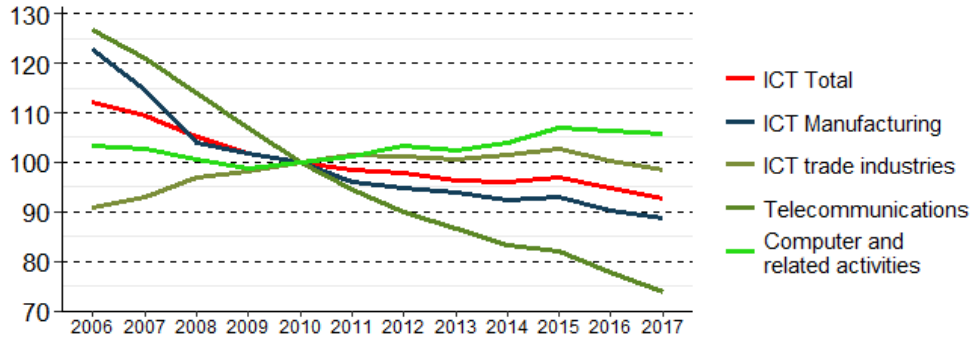
Figure 6.6 Price Index, ICT sector and GDP, Index base 2010=100, 2006-2017



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

However, an analysis by sector shows a contrasting situation: while some sectors experienced a dramatic drop in prices (telecommunications: - 35 %, ICT manufacturing industries: - 24 %), other sectors saw a moderate increase (the ICT trade industry: + 13 %) or even a stagnation (computers and related activities: + 4 %) over the medium term (2006-2015). In addition, prices in the ICT sector stabilised somewhat towards the end of the period (2013-2015), which may indicate a form of normalisation.

Figure 6.7 Price Index, ICT by sector, Index base 2010=100, 2006-2017

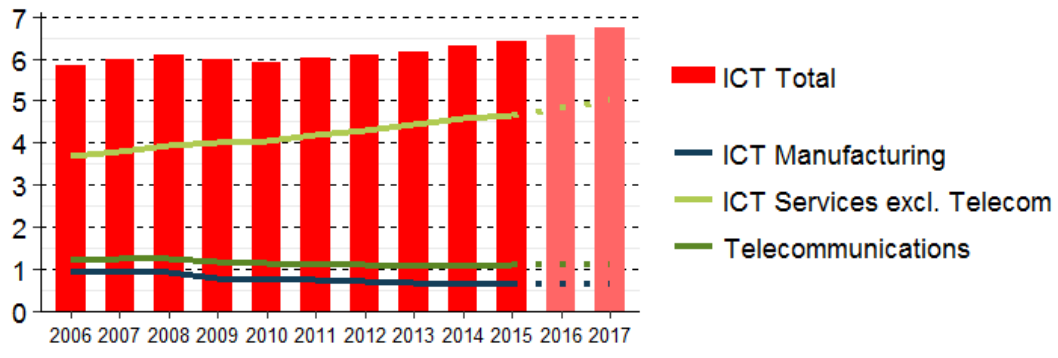


Source: JRC – Dir. B calculations and estimates, based onavailable Eurostat data and other sources, PREDICT project

The ICT sector employed 6.4 million people in 2015. The main employer was the ICT services sector (excluding telecommunications) with 4.7 million people in 2015. The share of employment in the ICT sector relative to total employment was 2.8 % in the EU in 2015.

The ICT sector employed 6.4 million people in 2015, the highest in the observed period. The ICT services sector (excluding telecommunications) employed 4.7 million people and accounted for 73 % of total ICT employment in 2015. It is the only sector that recorded a structural increase (of 26 %) over the medium-term period (2006-2015). The telecommunications sector employed 1.1 million people in 2015, a number which fell over the medium-term period by 9 %. The ICT manufacturing industries sector (excluding communication equipment) employed 477 000 people in 2015, a drop of 26 % since 2006. The communication equipment sector recorded the sharpest structural decline in 2015, falling to 160 000 people (- 43 %).

Figure 6.8 Employment in the ICT sector, million people, 2006-2017

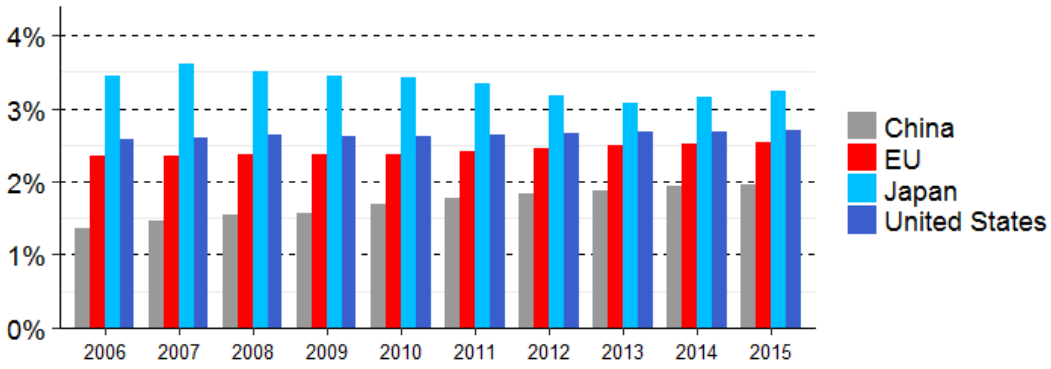


Note: Values for the years 2016 and 2017 are nowcasted data.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources , PREDICT project

Employment in the ICT sector represented 2.8 % of EU total employment in 2015 (comprehensive definition), having remained stable over the medium-term period. According to the operational definition which enables world comparisons, as with the US (2.7 %), the EU (2.5 %) fared better than China (2.0 %), but all three lagged markedly behind Japan (3.2 %) in 2015.

Figure 6.9 ICT sector share of total employment, percentage, 2006-2015

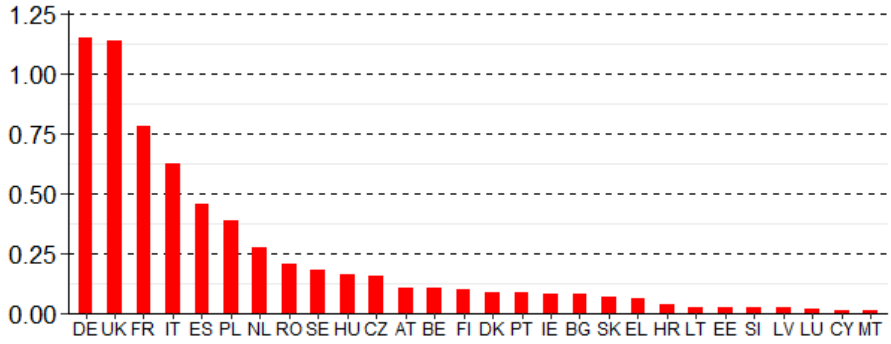


Source: JRC – Dir. B calculations and estimates, based onavailable Eurostat data, OECD and other sources, PREDICT project

The EU's five largest economies (Germany, the United Kingdom, France, Italy, and Spain) were the five biggest employers in the EU's ICT sector in 2015. However, small countries like Malta and Estonia had the highest rate of ICT sector employment as a share of total employment in 2015.

As in the case of value added, the EU's five largest economies were also the five largest employers in the EU's ICT sector in 2015: Germany (over 1.2 million people or 18 %), the United Kingdom (1.1 million people or 18 %), France (777 000 people or 12 %), Italy (624 000 people or 10 %), and Spain (458 000 people or 7 %). Together, the five largest employers represented 65 % of total ICT sector employment in 2015.

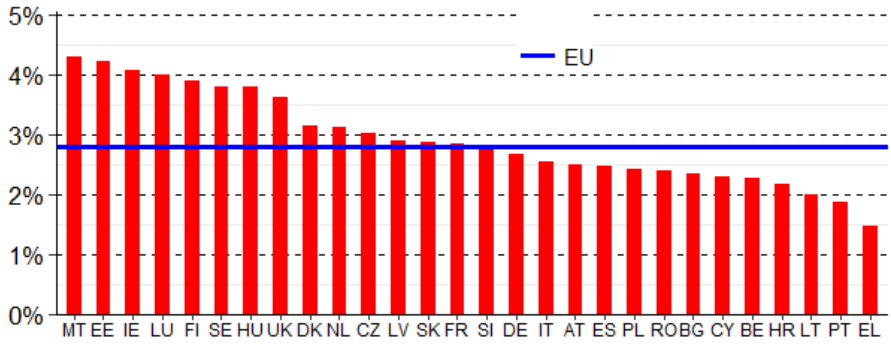
Figure 6.10 Employment in the ICT sector, million people, 2015



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Malta was in pole position with 4.3 % of ICT sector employment as a share of total employment in 2015, and Greece had the lowest rate of only 1.5 %. Other countries that were performing well in 2015 included Estonia (4.2 %) and Ireland (4.1 %). Luxembourg, Sweden, and Finland followed closely behind with rates just below 4 %. Over the medium-term period (2006-2015), the share of ICT sector employment as a proportion of total employment remained stable in most countries, but small countries like Estonia and Latvia made significant progress, increasing by more than 1 pp.

Figure 6.11 ICT sector share of total employment, percentage, 2015



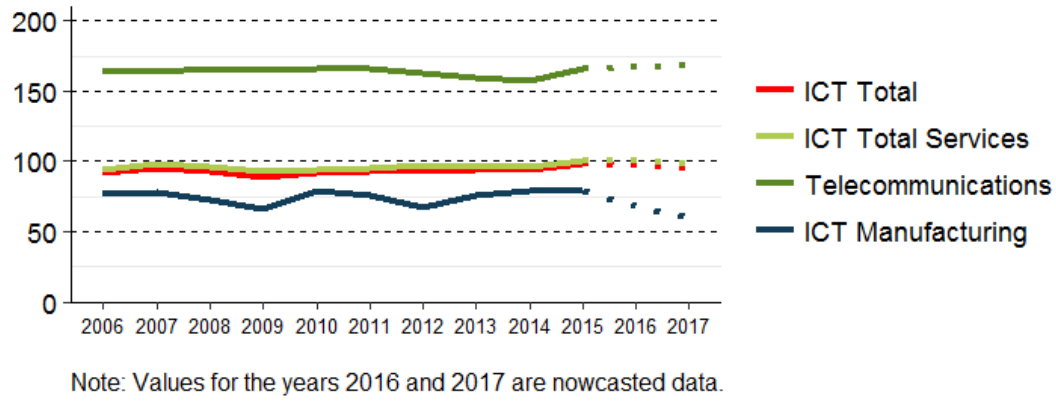
Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Productivity in the ICT sector amounted to EUR 99 000 per person in 2015. Productivity in the telecommunications sector is by far the highest.

Productivity in the ICT sector (comprehensive definition) amounted to EUR 99 000 per person in 2015, remaining broadly stable over the medium-term period (2006-2015). In the ICT manufacturing sector, productivity was below average (EUR 79 000 per person in 2015); moreover, it is volatile and pro-cyclical in relation to the business cycle. The communication equipment sector is even more sensitive to the business cycle.

Unlike the ICT manufacturing sector, productivity in the ICT services sector as a whole (i.e. services and trade), which stood at EUR 101 000 per person in 2015, is not sensitive to business cycles. Productivity in the telecommunications sector is by far the highest (at EUR 166 000 per person in 2015).

Figure 6.12 Productivity in the ICT sector, thousand EUR per person, 2006-2015

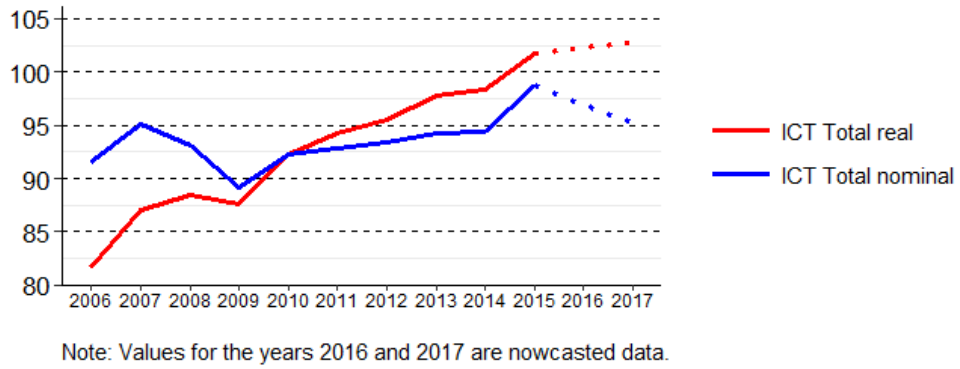


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

The ICT sector had a higher productivity (in nominal terms) and was growing faster (in real terms) over the period 2006-2015. At global level, as regards productivity in the ICT sector, the EU compares with Japan but lagged markedly behind the US.

While the productivity of the ICT sector seemed to grow at a higher level than the rest of the economy (EUR 99 000 per person vs. EUR 65 000 per person in 2015) but less quickly in nominal terms (+ 8 % vs. + 18 % over the period 2006-2015), the growth was faster for the ICT sector than for the general economy in real terms (+ 25 % vs. + 5 % over the period 2006-2015).

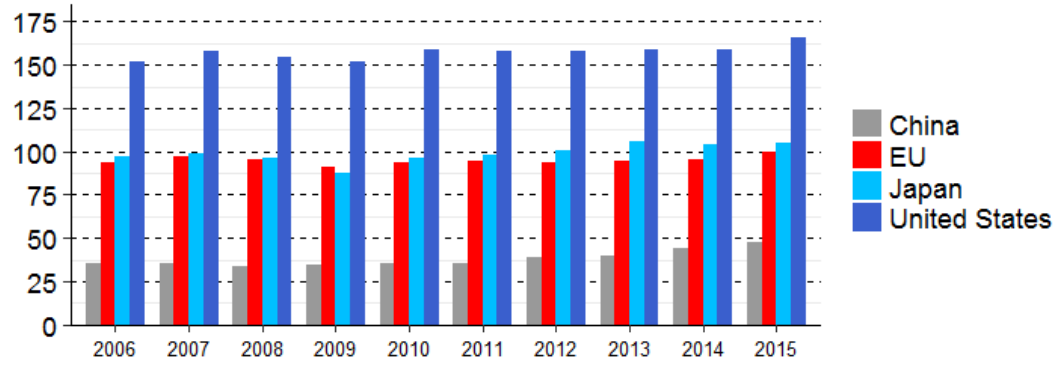
Figure 6.13 Labour productivity, nominal and deflated, thousand EUR per person, 2006-2017



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Regarding the productivity of the ICT sector (according to the operational definition which enables world comparisons), the EU (EUR purchasing power standard 100 000 per person) is markedly behind the US (EUR purchasing power standard 166 000 per person), in line with Japan (EUR purchasing power standard 105 000 per person), but far higher than China (EUR purchasing power standard 47 000 per person), which in this respect is still an emerging country.

Figure 6.14 Productivity, thousand purchasing power standard **per person, 2006-2015**

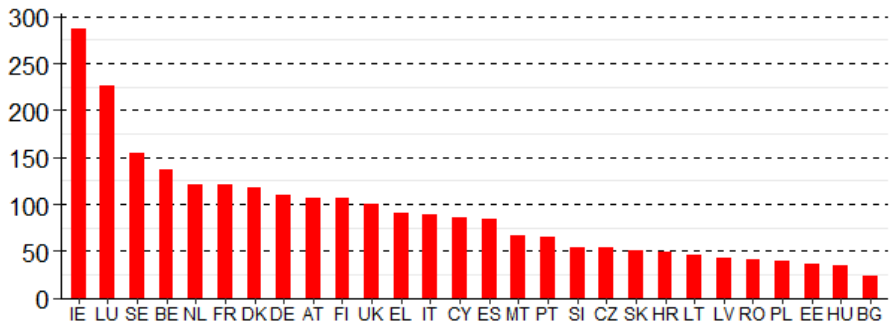


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data, OECD and other sources, PREDICT project

As for labour productivity, the highest score was registered by Ireland followed by Luxembourg, Sweden and Belgium. Bulgaria, Hungary, and Estonia had the weakest performance.

In terms of labour productivity in the ICT sector, Ireland (EUR 286 000 per person) by far led the way in 2014 (latest data available), but Luxembourg (EUR 227 000 per person) and Sweden (EUR 154 000 per person) also fared well in 2015. At the opposite end of the scale were Bulgaria (EUR 24 000 per person), Hungary (EUR 35 000 per person), and Estonia (EUR 37 000 per person).

Figure 6.15 Productivity in the ICT sector, thousand current EUR per person, 2015

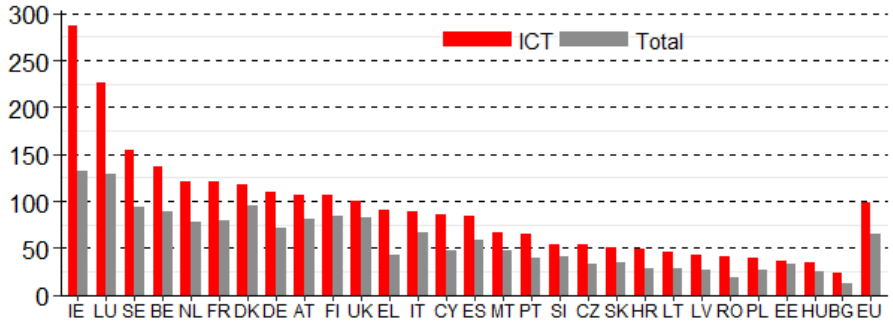


Note: Data for Ireland refers to 2014.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

The picture for labour productivity in the economy as a whole was broadly similar. Ireland (EUR 132 000 per person) and Luxembourg (EUR 128 000 per person) were the best-performing countries, while Bulgaria (EUR 13 000 per person) and Romania (EUR 19 000 per person) were at the bottom of the table.

Figure 6.16 Productivity - ICT sector and total, thousand current EUR per person, 2015



Note: Data for Ireland refers to 2014.

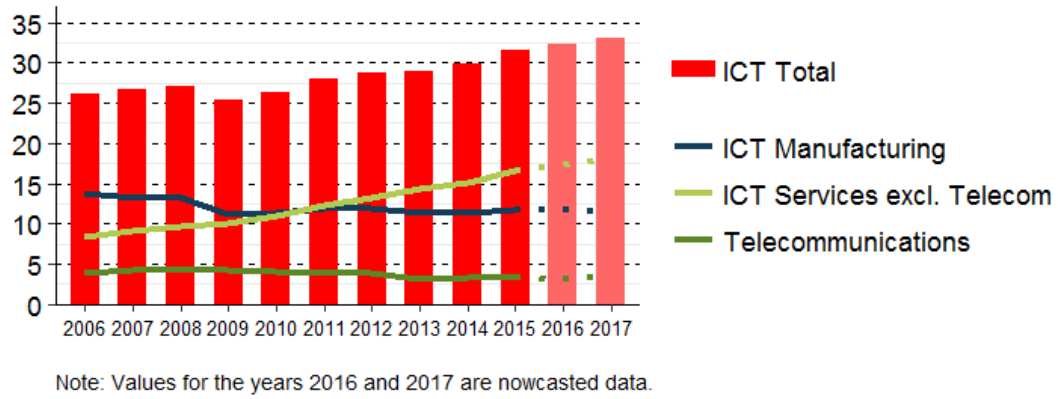
Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

R&D expenditure by business companies (BERD) in the ICT sector amounted to EUR 32 billion in 2015. The ICT services sector was responsible for 63 % (EUR 20 billion) of ICT BERD in 2015.

R&D expenditure by business companies (BERD) in the ICT sector amounted to EUR 32 billion in 2015, its highest point over the medium-term period (2006-2015), an improvement on its lowest point of EUR 25 billion in 2009. A breakdown by sub-sector reveals a more balanced situation for BERD than for value added – despite accounting for only 8 % of ICT sector value added, the ICT manufacturing sector was responsible for 37 % of total ICT BERD (EUR 12 billion) while the ICT services sector was responsible for 63 % (EUR 20 billion) of ICT BERD in 2015.

Over the medium-term period (2006-2015), the situation was quite different. The ICT manufacturing sector saw a structural decline (falling by 14 % from 2006 to 2015), whereas the ICT services sector saw a structural increase (rising by 60 % over 2006-2015), particularly in the ICT services sector excluding telecoms, which saw an increase of 95 % from 2006 to 2015.

Figure 6.17 R&D expenditure of business companies in the ICT sector(BERD), EUR billion, 2006-2017



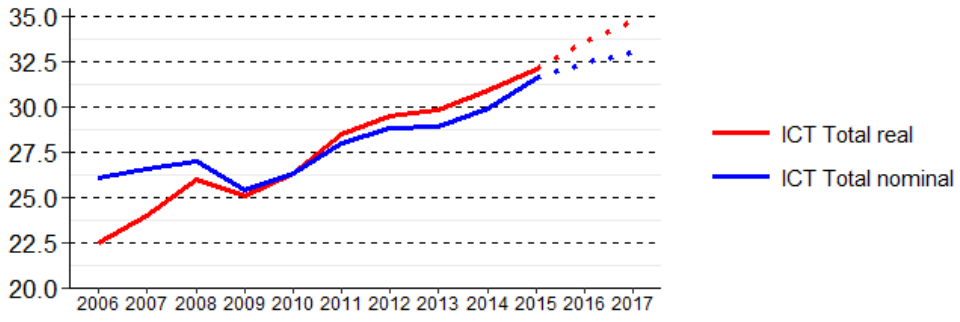
Note: Values for the years 2016 and 2017 are nowcasted data.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

R&D expenditure (in real terms) by business companies in the ICT sector grew faster than in the general economy. ICT R&D intensity amounted to 5 % in 2015 in the EU, markedly behind the US and Japan. It remained stable around 4.9 % over the period 2006-2015.

In real terms, R&D expenditure by business companies in the ICT sector grew faster than in the general economy (+ 42 % vs. + 25 % over the period 2006-2015).

Figure 6.18 R&D expenditure of business companies in the ICT sector (BERD), nominal and deflated, EUR billion, 2006-2017

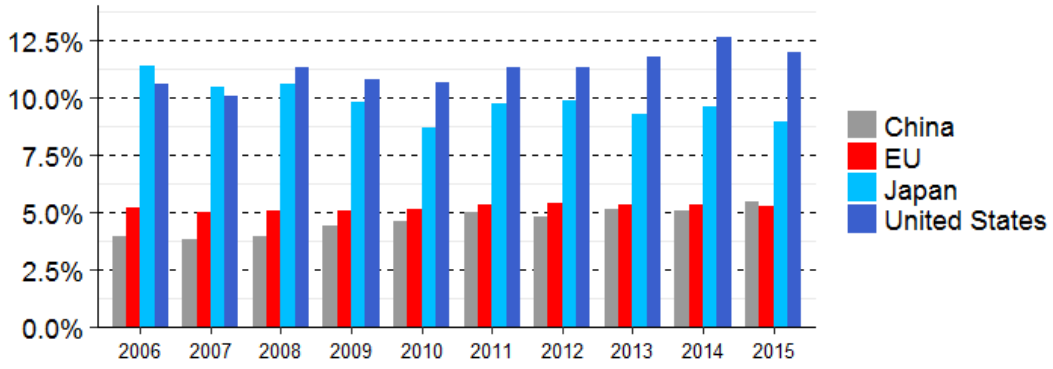


Note: Values for the years 2016 and 2017 are nowcasted data.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

R&D intensity in the ICT sector (comprehensive definition) amounted to 5.0 % in 2015. It remained stable around 4.9 % over the period 2006-2015. According to the operational definition which enables world comparisons, despite China (5.5 %) slightly surpassing the EU (5.2 %) for the first time, both the EU and China lagged behind the US (12.0 %) and Japan (9.0 %) in 2015.

Figure 6.19 ICT R&D Intensity (BERD/VA), nominal and deflated, percentage, 2006-2015

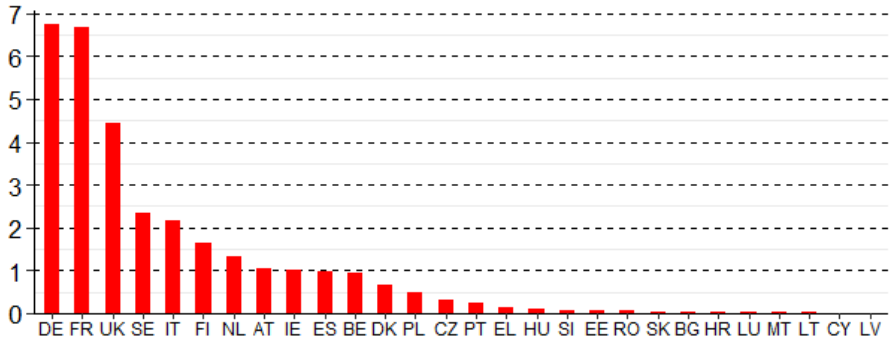


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data, OECD and other sources, PREDICT project

The EU's six main contributors in terms of R&D expenditure by business companies in the ICT sector in 2015 were the EU's four largest economies: Germany, France, the United Kingdom, and Italy, together with two Nordic countries: Sweden and Finland.

The EU's six main contributors in terms of R&D expenditure by business companies in the ICT sector in 2015 were the four largest economies in the EU – Germany (EUR 6.8 billion or 21 %), France (EUR 6.7 billion or 21 %), the United Kingdom (EUR 4.4 billion or 14 %), and Italy (EUR 2.3 billion or 7 %), together with two Nordic countries – Sweden (EUR 2.3 billion or 7 %) and Finland (EUR 1.6 billion or 5 %), confirming the importance of Nordic countries for ICT R&D. Together, the six largest contributors represented 76 % of total ICT Business R&D expenditure in 2015.

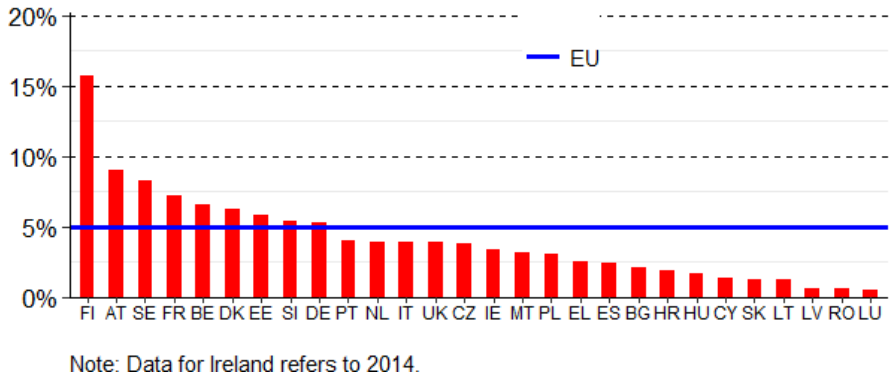
Figure 6.20 R&D Expenditure by business companies in the ICT sector, EUR billion, 2015



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Finland was by far leading the way in the EU with a 15.7 % ICT BERD intensity rate in 2015. Of the Nordic countries, Sweden had a rate of 8.2 % and Denmark had a rate of 6.3 %. Other strong performers include Austria (9.0 %), France (7.2 %), and Belgium (6.6 %). Over the medium-term period (2006-2015), ICT R&D intensity remained broadly stable, but some eastern countries (Poland, Slovakia, and Lithuania) made significant progress.

Figure 6.21 ICT R&D Intensity (BERD/VA), percentage, 2015



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

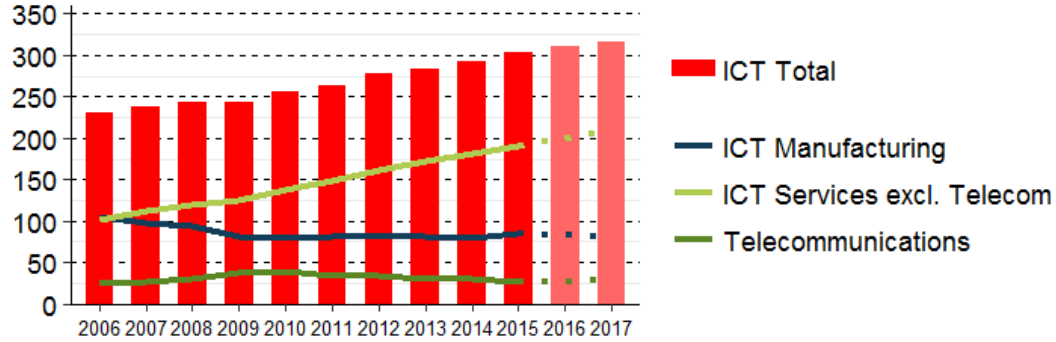
R&D personnel in the ICT sector included 303 000 full-time equivalents (FTEs) in 2015. The top employer was the ICT services sector (excluding telecoms), employing 191 000 FTEs in 2015 (63 % of ICT R&D personnel). R&D personnel in the ICT sector made up 19 % of total R&D personnel in 2015.

R&D personnel in the ICT sector included 303 000 full-time equivalents (FTEs) in 2015, a figure which rose over the medium-term period (2006-2015), growing faster after 2009. The ICT services sector (excluding telecommunications) employed 191 000 FTEs in 2015 (62 % of R&D

personnel in the ICT sector, making it the top employer), with a rising trend. The ICT manufacturing sector (excluding communications equipment) employed 46 000 FTEs in 2015, representing a slight fall over the medium-term (2006-2015) despite signs of recovery after 2010. The communication equipment sector recovered in 2015. The telecommunications sector employed 28 000 FTEs in 2015 (9 % of R&D personnel in the ICT sector), and was on a downward trend (falling about 29 % from its peak of 39 000 FTEs in 2010).

R&D personnel in the ICT sector (comprehensive definition[6]) made up 19 % of total R&D personnel in 2015, a figure which remained stable over the medium-term period. However, according to the operational definition[7] which enables world comparisons, the EU (19 %) and China (16 %) were behind Japan (24 %) in 2015 and over the medium-term period (no data available for the US).

Figure 6.22 R&D Personnel in the ICT sector, 2006-2017, thousand FTE

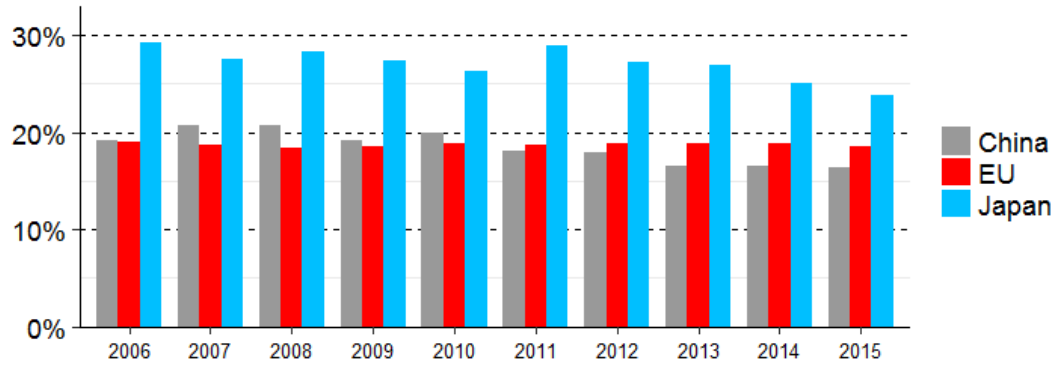


Note: Values for the years 2016 and 2017 are nowcasted data.

Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

[6] See methodological note
[7] See methodological note

Figure 6.23 ICT sector share of total PERD, percentage, 2006-2015

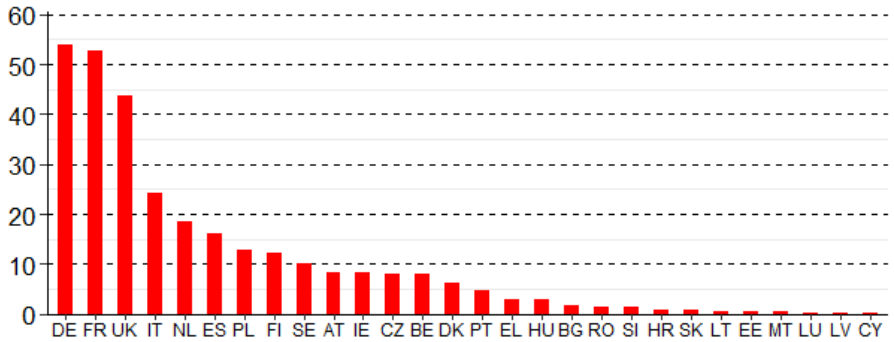


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data, OECD and other sources, PREDICT project

The EU's four largest economies were also the four biggest employers of R&D personnel in the ICT sector in 2015: France, Germany, the United Kingdom, and Italy. Malta and Ireland were the two countries with the highest concentration of R&D personnel in the ICT sector in 2015.

The EU's four largest economies were also the four biggest employers of R&D personnel in the ICT sector in 2015 – Germany (54 000 or 18 %), France (53 000 or 17 %), the United Kingdom (44 000 or 14 %), and Italy (24 000 or 8 %). Together, the four biggest employers represented 58 % of total R&D personnel in the ICT sector in 2015.

Figure 6.24 R&D Personnel in the ICT sector, thousand FTE, 2015

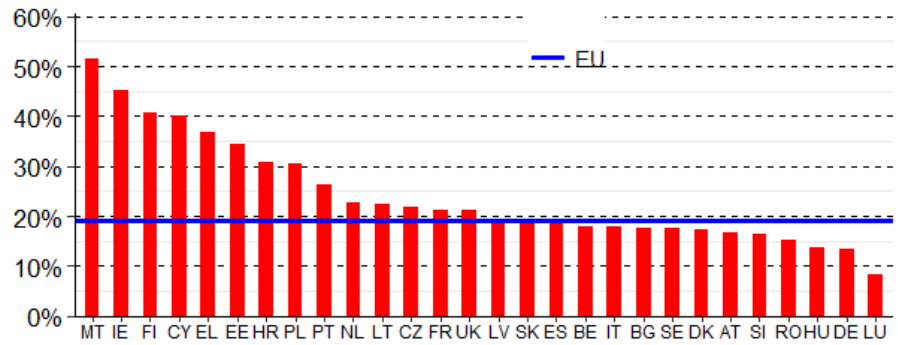


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Malta (52 %) and Ireland (45 %) were the two countries with the highest concentration of R&D personnel in the ICT sector in 2015. Luxembourg had the lowest concentration (7 %).

Other strong performers were Finland (41 %), Cyprus (40 %), and Greece (37 %).

Figure 6.25 PERD in the ICT sector as share of total PERD, percentage, 2015



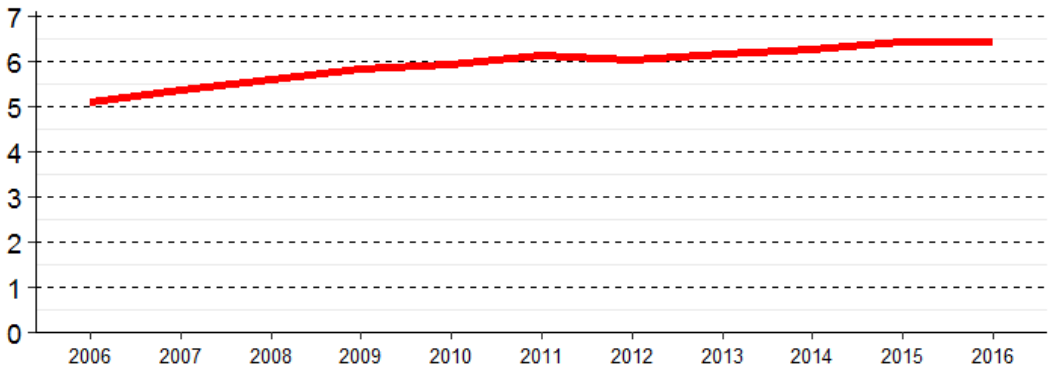
Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

The estimated level of publicly funded expenditure on R&D in the ICT sector in the EU reached EUR 6.4 billion in 2016. Estimated public R&D expenditure in the ICT sector was more than 25 % below the necessary trend line for doubling publicly funded R&D in the ICT sector between 2007 and 2020.

After rising for several years, the estimated level of publicly funded expenditure on R&D in the ICT sector in the EU fell in 2012, but recovered in 2013, and has stabilized since 2015 at its historical peak, reaching EUR 6.4 billion in 2015 and 2016.

The digital agenda target of doubling publicly funded R&D in the ICT sector between 2007 and 2020 requires an annual growth rate of 5.5 % (assuming constant annual growth rate). Estimated public R&D expenditure in the ICT sector was below the necessary trend line in 2016, with a gap of more than 25 %.

Figure 6.26 GBARD in the ICT sector, EUR billion, 2006-2016



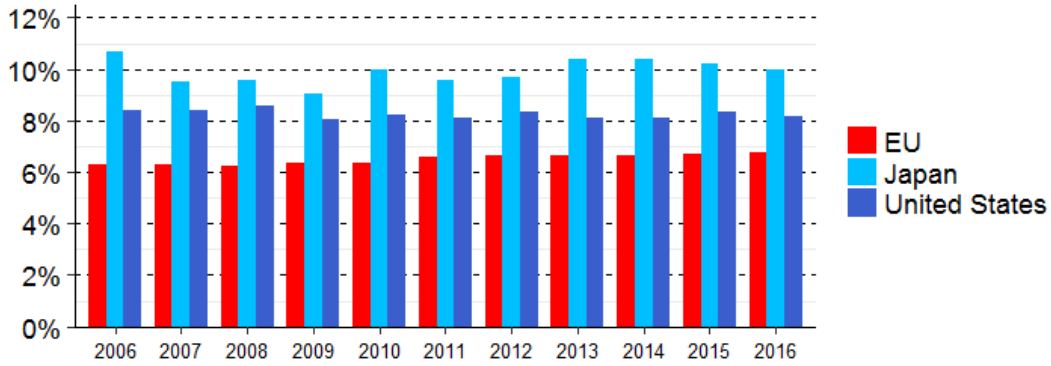
Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

In 2016*, public funding of R&D in the ICT sector represented 6.8 % of EU total 'government budget allocations for R&D' (GBARD), a figure which remained broadly stable over the medium-term period.

The EU was lagging behind the US (8.2 %) and Japan (10.0 %), a relative position that remained stable over the medium-term period (no data available for China).

** Official statistics on public expenditure are available one year before business statistics.*

Figure 6.27 GBARD in the ICT sector as share of total GBARD, percentage, 2006-2016



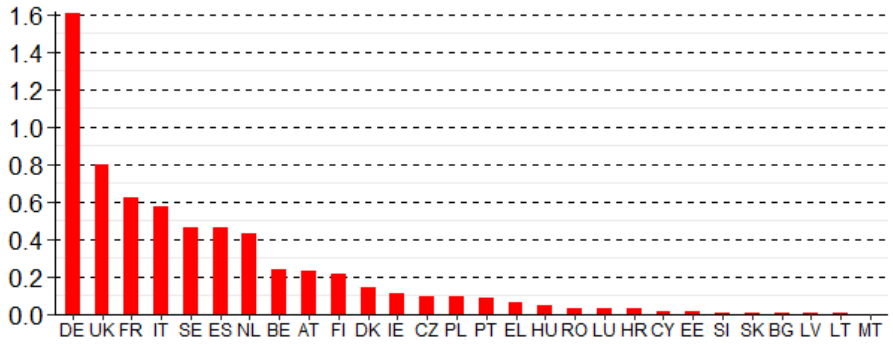
Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

The EU's five biggest public funders of R&D in the ICT sector in 2016 were Germany, the United Kingdom, France, Italy, and Sweden. Surprisingly, Cyprus was leading the way in the EU with the highest rate of GBARD in the ICT sector as a share of total GBARD in 2016.

The EU's five biggest public funders of R&D in the ICT sector in 2016 were Germany (EUR 1.6 billion or 25 %), followed by the United Kingdom (EUR 799 million or 12 %), France (EUR 620 million or 10 %), Italy (EUR 577 million or 9 %), and Sweden (EUR 462 million or 7 %).

Together, those five countries represented 63 % of total public funding for R&D in the ICT sector.

Figure 6.28 Public funding of R&D Expenditure in the ICT sector, EUR billion, 2016

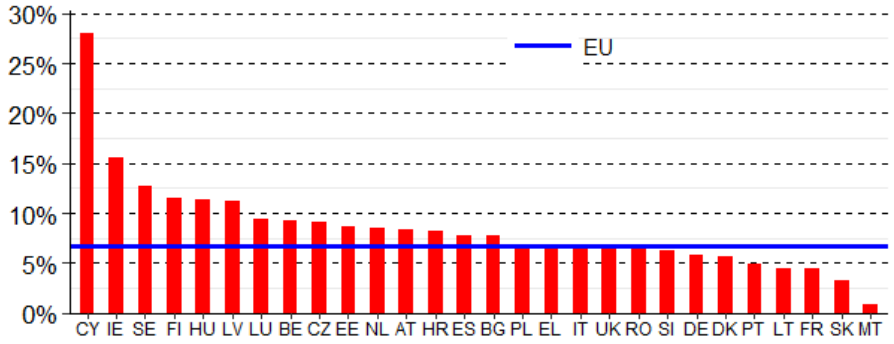


Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

Cyprus was surprisingly leading the way in the EU with the highest rate (28.1 %) of GBARD in the ICT sector as a proportion of total GBARD in 2016. Unsurprisingly, the ranking in 2016 again reveals a strong performance by Ireland (15.6 %) and Nordic countries: Sweden (12.7 %) and Finland (11.5 %).

However, some other countries also attribute special importance to the ICT sector in their R&D public spending, such as Hungary and Latvia (both 11.3 %).

Figure 6.29 GBARD in the ICT sector share of total GBARD, percentage, 2016



Source: JRC – Dir. B calculations and estimates, based on available Eurostat data and other sources, PREDICT project

METHODOLOGICAL NOTE

Definition of the ICT sector

In this section, the ICT sector is defined according to the definition provided by the OECD on the basis of the NACE (Statistical Classification of Economic Activities in the European Community) Rev.2 (2008) nomenclature. The ICT sector has 12 sub-sectors:

ICT manufacturing

C261 Manufacture of electronic components and boards

C262 Manufacture of computers and peripheral equipment

C263 Manufacture of communication equipment

C264 Manufacture of consumer electronics

C268 Manufacture of magnetic and optical media

ICT services

G4651 Wholesale of computers, computer peripheral equipment and software

G4652 Wholesale of electronic and telecommunications equipment and parts

J5820 Software publishing

J61 Telecommunications

J62 Computer programming, consultancy and related activities

J631 Data processing, hosting and related activities; web portals

S951 Repair of computers and communication equipment

Comprehensive vs operational definition

The comprehensive definition of the ICT sector applies to EU Member States for the period 2008-2015. It corresponds to the definition provided by the OECD in 2007.

The operational definition of the ICT sector enables the EU to be compared with non-EU countries over a longer period (2006-2015), as some of these countries do not have the necessary disaggregated information to estimate all the ICT sub-sectors included in the comprehensive definition. The operational definition does not include the following sectors: manufacture of magnetic and optical media (268) and ICT trade industries (465).

Sector analysis

In the previous section, a sector analysis is made for each indicator. The 12 sub-sectors are aggregated into four sectors: ICT manufacturing (excluding communication equipment), communication equipment, ICT services (excluding telecommunications) and telecommunications.

Source

Joint Research Centre – Dir. B Growth and Innovation (JRC – Dir. B) calculations and estimates, based on Eurostat, the OECD's structural analysis database (STAN), EU-KLEMS data and other national sources, from the JRC's PREDICT project.

All data contained in these databases come from official sources (e.g. Eurostat, OECD, national statistical institutes). However, there may be some discrepancies with the original sources, e.g. due to updates of the original data or the use of multiple auxiliary sources and variables.

7. Research and Innovation: ICT projects in Horizon 2020

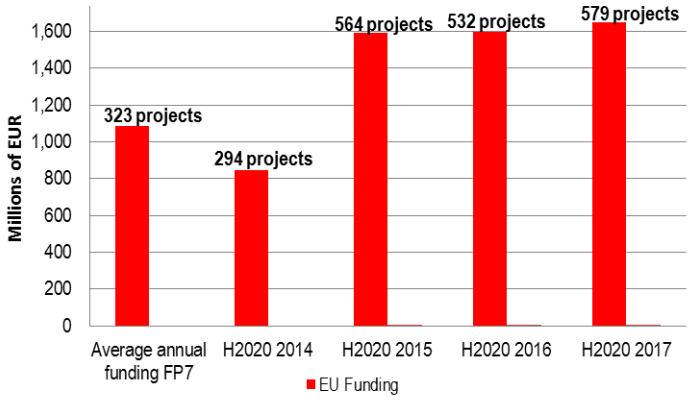
In its first four years, Horizon 2020 (H2020) has allocated EUR 5.7 billion of EU funding to 1 969 projects in the field of ICT, attracting 6 250 organisations.

Annual funding has increased compared with the previous framework programme, FP7, where the average annual funding was EUR 1.08 billion a year. Leadership in enabling and industrial technologies (LEIT) ICT (including the SME instrument) accounts for the majority of funding (62 %), participations (63 %) and 76 % of projects.

Excellence in science (e-infrastructures, future emerging technologies (FET) open, FET proactive, FET flagships) accounts for slightly over one fifth of the budget (21 %), 19 % of participations and 12 % of projects. Societal challenges (SC) 1, 6 and 7 account for 12 % of the budget, 10 % of projects and 14 % of participations.

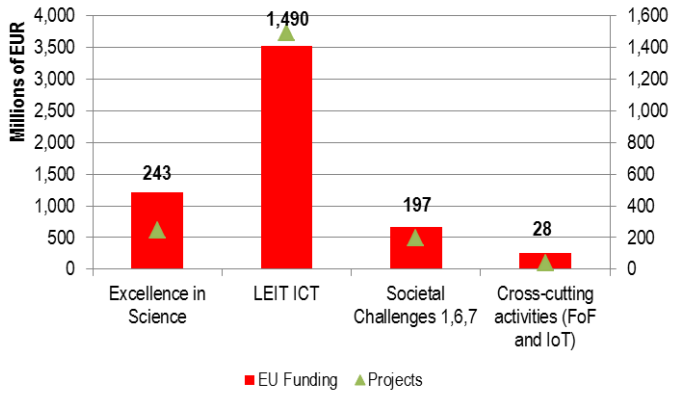
The number of participants has also increased compared with FP7, whereby on average 1 830 legal entities took part every year. 48 % of participants are new compared to FP7, and of these, the vast majority (80 %) are private for-profit organisations. So far H2020 has been able to attract 1 674 new SMEs.

Figure 7.1 EU funding and projects funded, 2014-2017 (H2020) and annual average FP7



Source: the report is based on CORDA data elaborated by the Directorate-General for Communications Networks, Content and Technology (DG CONNECT). The source of data for ICT value added is PREDICT.

Figure 7.2 EU funding and projects by pillar, cumulated values, 2014-2017

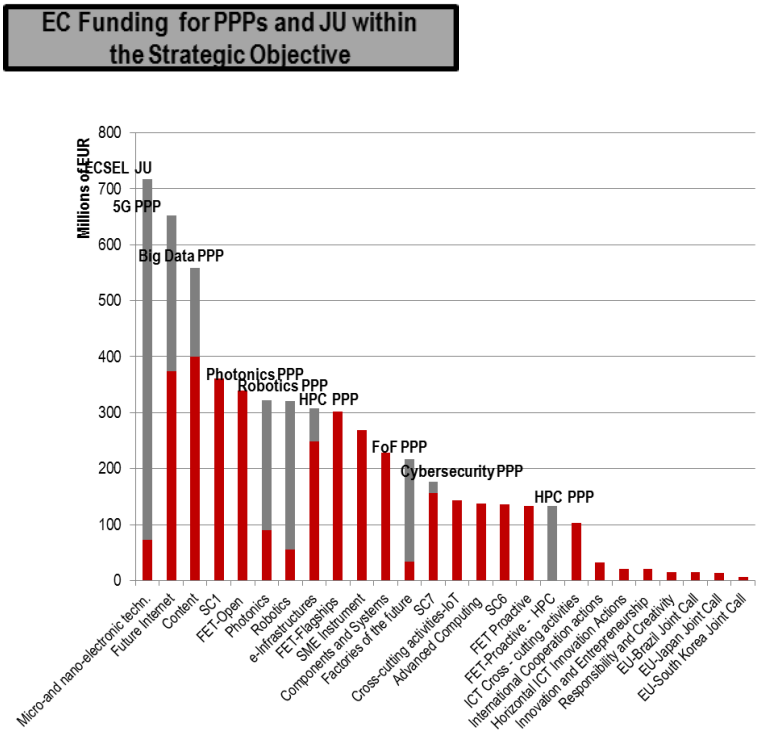


Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT Value Added is PREDICT.

Micro- and nano-electronic technologies and future networks and internet are the areas that attract the highest number of participants and funding.

- The area of 'micro- and nano-electronic technologies' includes funding of EUR 645 million for the electronic components and systems for european leadership (ECSEL) joint undertaking.
- Within the strategic objective 'future networks and internet', the contractual private public partnership (cPPP) for 5G accounts for EUR 278 million.
- Within 'content technologies and information management', the big data cPPP account for EUR 159 million, whereas the EU funding to the robotics cPPP amounts to EUR 266 million.
- The cPPPs high performance computing (HPC) and photonics account for EUR 134 million and EUR 231 million, respectively.
- SC1 on 'health, demographic change and wellbeing' receives the highest funding among the SCs: EUR 361 million, followed by SC7 on secure societies (EUR 176 million).
- Projects for inclusive, innovative and reflective societies (SC6) receive EUR 137 million.
- 'FET Open' has total funding of EUR 339 million, FET proactive and the two flagships EUR 134 million and EUR 302 million respectively.

Figure 7.3 EU funding by work programme area, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT Value Added is PREDICT.

The principal types of action are those in the area of research and innovation.

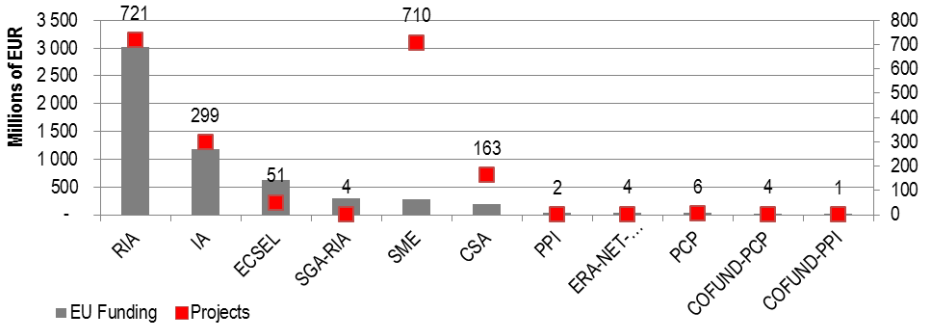
Research and innovation actions (RIAs) account for 53 % of funding, and 37 % of projects. Innovation actions follow, with 21 % of funding, and 15 % of projects.

Coordination and support actions account for 8 % of projects, and 3 % of funding.

The SME instrument projects (LEIT ICT, SC1 and SC6) account for 36 % of projects, and 5 % of funding.

The three european research area (ERA-NET) actions (in FET proactive, FET flagships and photonics) account for 0.5 % of funding.

Figure 7.4 EU funding and project by type of action, cumulated values, 2014-2017



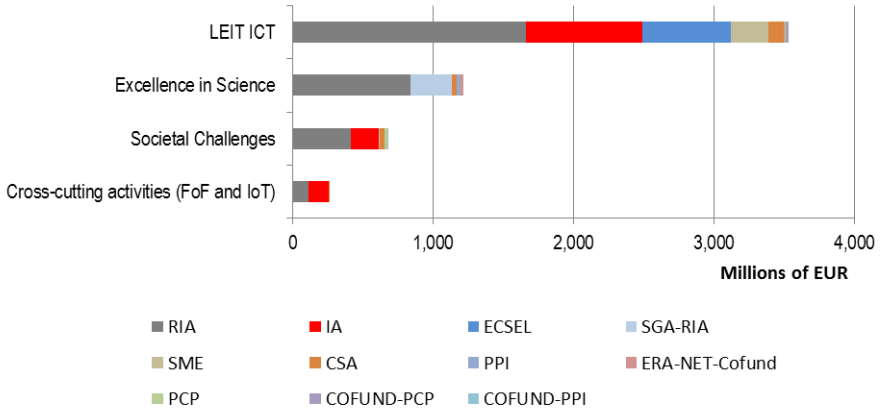
Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT Value Added is PREDICT.

RIAs receive EUR 1 658 million in LEIT ICT, EUR 412 million in SCs and EUR 839 million in excellence in science. Innovation actions (IAs) receive EUR 833 million in LEIT ICT and EUR 200 million in SCs.

Coordination and support actions (CSAs) receive EUR 183 million, whereas pre-commercial procurement (PCP) and public procurement for innovation (PPI) actions receive as much as EUR 28 million and EUR 31 million respectively.

The ERA-NET actions account for EUR 22 million in Excellence in Science and EUR 6 million in LEIT ICT.

Figure 7.5 EU funding by type of action and pillar, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

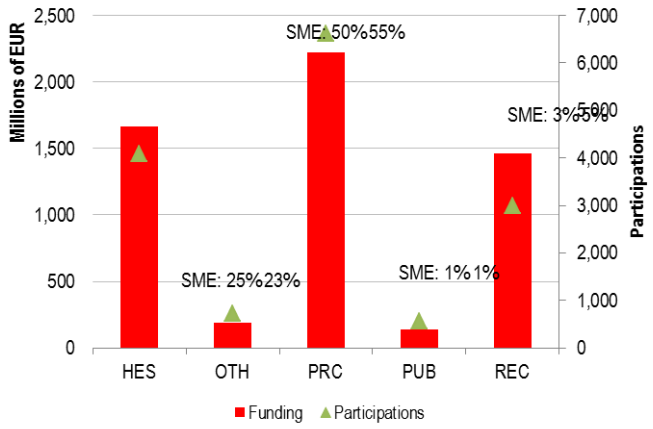
Under H2020 the business sector shows an increase in participation compared with FP7, accounting for 44 % of participations and 39 % of the budget, with 21 % of the budget going to SMEs.

Secondary and higher education establishments (HES) and research organisations (REC) taken together account for almost half of all project participations (47 %) and receive the highest funding (55 %). Their relative size has decreased in comparison with FP7, where they accounted for 57 % of participations and 64 % of the budget.

Conversely, there has been an increase in enterprise participation, with private organisations (PRC) accounting for 39 % of the budget and 44 % of participations, up from 33 % and 35 %, respectively, under FP7. Funding for SMEs has also increased, from 15 % to 21 %, along with the share of SME participations, which has risen from 16 % to 26 %.

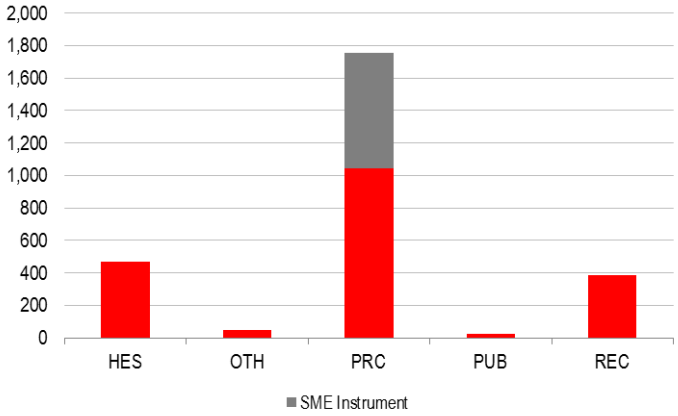
HES/REC and PRC coordinate 43 % and 53 % of the projects. SMEs coordinate 45 % of projects; however, this is influenced by the high number of SME instrument projects. In the other areas, the share of projects coordinated by SMEs is at 9 %, slightly lower than under FP7 (10 %). Large companies coordinate a lower share of projects (10 %) than under FP7 (18 %).

Figure 7.6 Participations and EU funding by type of organisation, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

Figure 7.7 Projects coordinators by type of organisation, cumulated values, 2014-2017



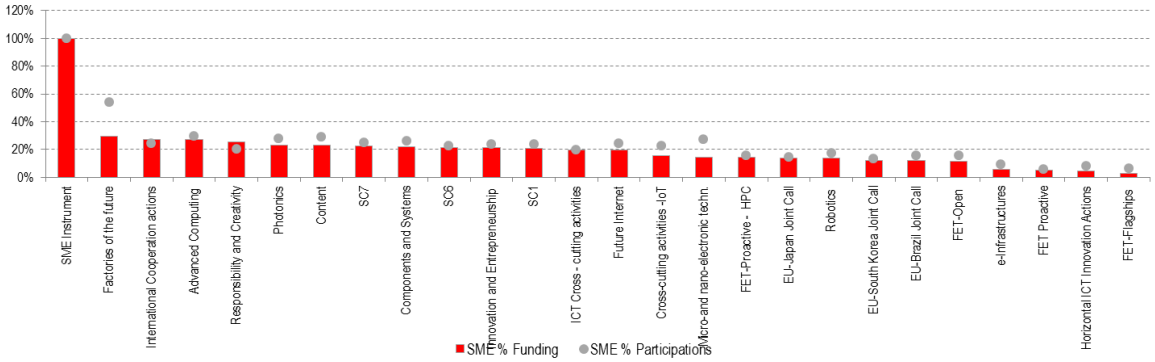
Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

SMEs make up more than 25 % of the participating organisations. The SME instrument is designed for for-profit SMEs from any sector.

SMEs make up more than 25 % of the participating organisations and their participation varies according to pillar and work programme area. They are strongly present in 'factories of the future', in 'advanced computing', in 'content technologies', in 'photonics', and in 'micro-and nano-electronic technologies'. The SME instrument is designed for for-profit SMEs, including young companies and start-ups, from any sector.

As for the public-private-partnerships and the joint undertakings, the presence of SMEs (in terms of funding) ranges from 11 % in robotics, to 12 % in HPC, 14 % in ECSEL, 17 % in cybersecurity, 18 % in big data, 20 % in 5G, 25 % in photonics, 32 % in factories of the future. In certain Member States, SMEs account for the large majority of the total funding going to the country: in Estonia the share is 61 %, in Hungary 51 %, in Cyprus and Lithuania 47 %, and in Bulgaria 45 %.

Figure 7.8 The involvement of SMEs by work programme area (as a percentage of total funding and participations), cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

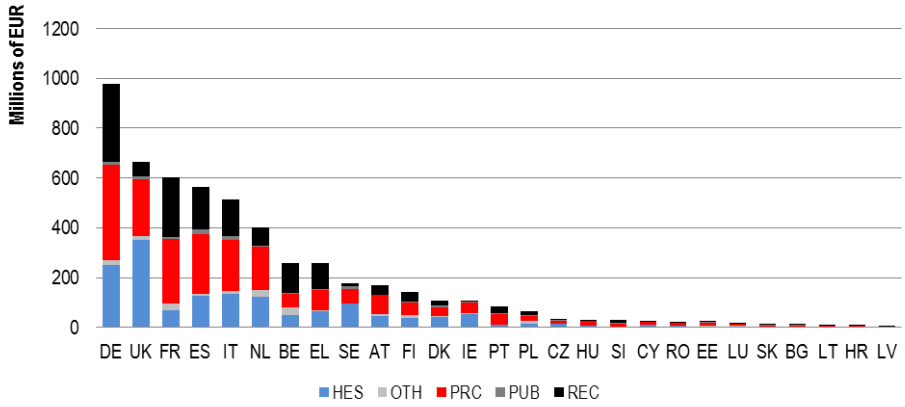
In absolute terms, Germany and the United Kingdom are the biggest recipients of EU funding, but Greece and Cyprus receive the highest funding in relation to the size of their ICT sector.

Germany, the United Kingdom, France, Spain and Italy account for 64 % of total EU funding and 62 % of participations in the first four years of H2020. These countries also lead in terms of projects coordinated (61 %), with Spain ranked in first position.

Greece, Cyprus, and Estonia are also among the Member States with the highest amounts of funding compared to the size of their ICT sector.

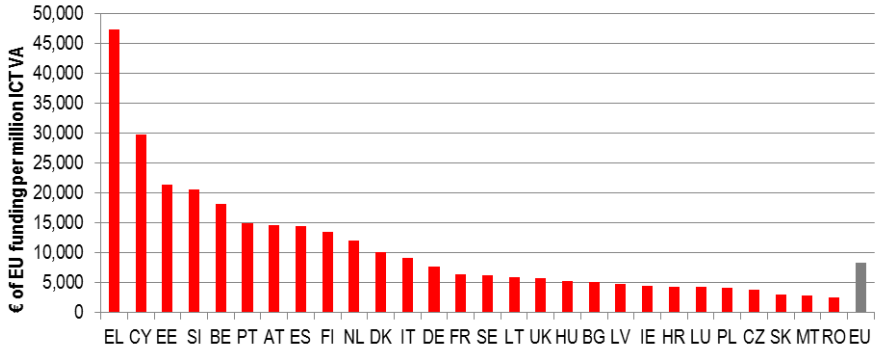
When looking at the total funding by country and its distribution among H2020 pillars, it is notable that in all the countries the majority of funding (out of the total funding for the country) is allocated to LEIT-ICT, ranging from the lowest level at 41 % for Malta, to the highest level at84 % for Lithuania. In Malta, 42 % of funding goes to Excellent Science whereas in Luxembourg this figure is as low as 2 %. In Luxembourg and Romania, 33 % and 30 % respectively of funding is allocated to Societal Challenges.

Figure 7.9 EU funding by Member State and type of participant organisation, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

Figure 7.10 EU funding by Member State per million of ICT sector value vdded, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT value added is PREDICT.

95 % of EU funding in H2020 is allocated to EU Member States, followed by associated countries. Third countries take part in H2020 but with little EU funding (1 %).

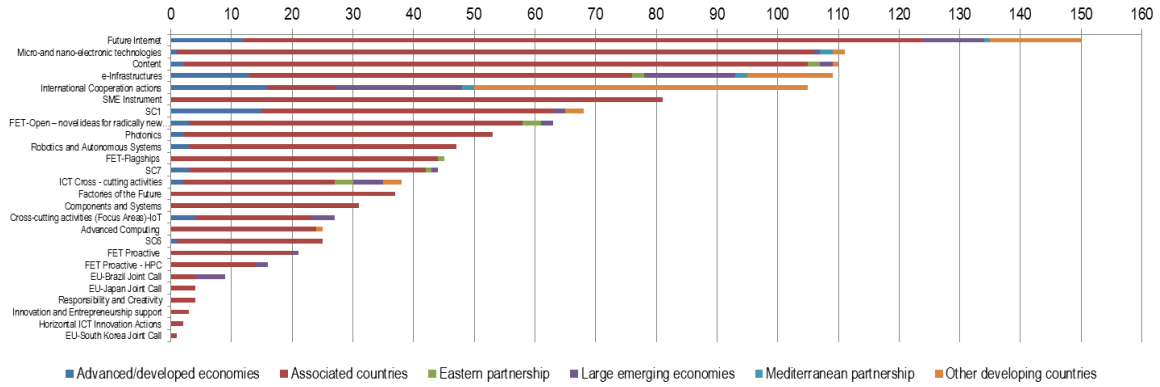
Between 2014 and 2017, 1 229 organisations from countries other than the Member States participated in H2020 projects.

About 5 % of participations and funding is allocated to associated countries, mainly due to the presence of research-oriented players such as Norway, Israel and Switzerland.

The rest of the budget and participations are equally distributed among other third countries.

Most of the projects with international participants fall under the specific objectives 'future internet' (150 projects), 'micro-and nano-electronic technologies' (111 projects), 'content' (110 projects), 'e-infrastructures' (109 projects), 'international cooperation actions' (105 projects), and 'SME instrument' (81 projects).

Figure 7.11 International participation: number of participations by country group and work programme area, cumulated values, 2014-2017



Source: the report is based on CORDA data elaborated by DG CONNECT. The source of data for ICT alue dded is PREDICT.

Notes

This report covers all the projects signed by 31 December 2017.

Annual comparisons are made by taking projects signed by 31 December of the relevant year into account.

Acronyms for types of organisations:

PRC: private for profit companies

PUB: public bodies (excluding research and education)

REC: research organisations

HES: secondary and higher education establishments

OTH: other entities

The following Country Groups are used for the chart on international participation:

Associated countries (Art. 7 of H2020 Regulation): Iceland, Norway, Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Israel, Moldova, Switzerland (partial association: Excellent Science Pillar only), Faroe Islands

Advanced / developed economies: US, Japan, Canada, Australia, New Zealand, South Korea, Singapore

Large emerging economies: BRICS (with South Africa); Mexico, Indonesia, Nigeria (the MINT group), South America (Argentina, Chile, Uruguay, Colombia).

Eastern Partnership: Ukraine, Belarus, Armenia, Azerbaijan, Georgia

Mediterranean Partnership: Morocco, Algeria, Tunisia, Libya, Egypt, Lebanon, Jordan, Syria

Other developing countries: all other third countries