EUROPEAN
COMMISSION

Brussels, 11.6.2019
SWD(2019) 206 final

PART 4/6

COMMISSION STAFF WORKING DOCUMENT

Digital Economy and Society Index (DESI) 2019

Digital Economy and Society Index Report 2019

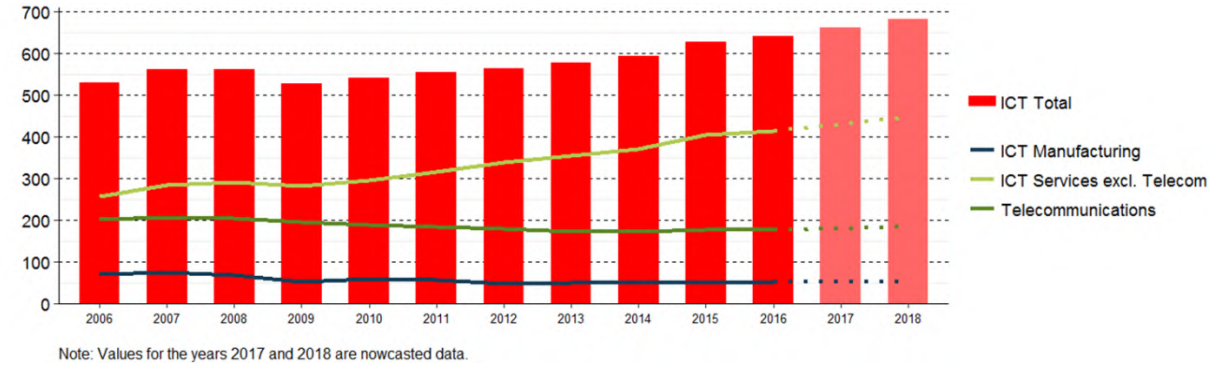
7. The EU ICT sector and its R&D performance

The value added of the ICT sector was EUR 642 billion in 2016. ICT services made up 92 % of total ICT sector value added. ICT services (excluding telecommunications) were the dominant sub-sector and the only one expanding in the medium to long term.

The value added of the EU ICT sector was EUR 642 billion in 2016, and it is expected it will have continued to grow in the two years following that. A breakdown by sub-sector shows the predominance of ICT services (EUR 590 billion and 92 % of total ICT sector value added in 2016) over ICT manufacturing.

The ICT services sub-sector (excluding telecommunications) is the only one that saw an increase in value added over the medium term (2006-2016), up to EUR 414 billion. Both the telecommunications and ICT manufacturing sub-sectors experienced a decline in the same period, only slightly recovering in the last two years.

Figure 7.1 ICT sector Value Added, EUR billion, 2006-2018

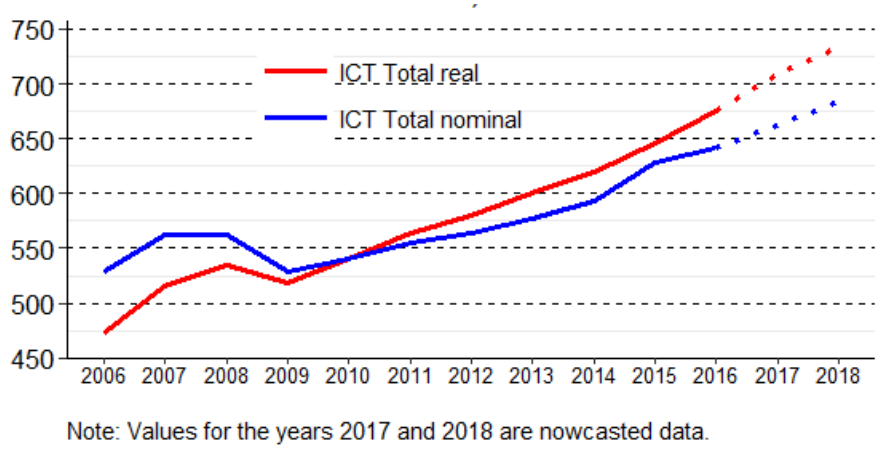


Source: Commission services' calculations and estimates based on PREDICT project

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

Although the value added of the ICT sector increased by 21 % in nominal terms (in line with GDP: + 22 %), it increased by 44 % in real terms over 2006-2016 (well above GDP: + 9 %). These trends are explained by the decline in prices in the ICT sector over 2006-2016 (see Figure 7.6).

Figure 7.2 ICT sector Value Added, nominal and deflated, EUR billion, 2006-2018

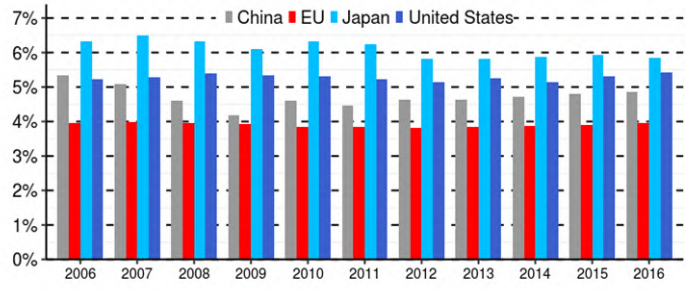


Note: Values for the years 2017 and 2018 are nowcasted data.

Source: Commission services' calculations and estimates based on PREDICT project

The value added of the ICT sector accounted for 4.3 % of EU GDP in 2016 (comprehensive definition*). According to the operational definition*, which enables world comparisons, the value added of the ICT sector in the EU (4 %) was lower than that of Japan (5.8 %), the US (5.4 %), and China (4.9 %) in 2016. The EU's ICT sector grew marginally as a percentage of GDP from the previous year, but so did that of most of its competitors, except Japan which, however, had the highest percentage.

Figure 7.3 ICT sector share of GDP, percentage, 2006-2016



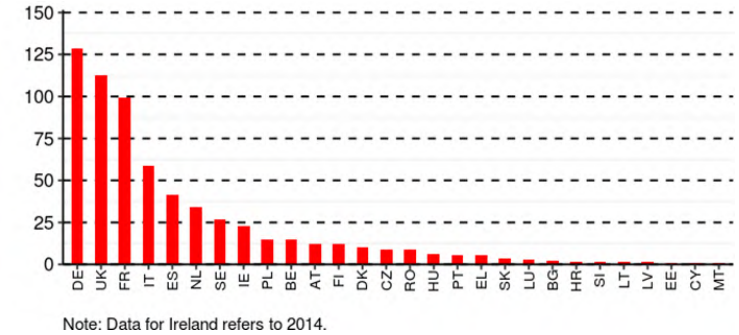
** See methodological note.*

Source: Commission services' calculations and estimates based on 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 2016. 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 biggest economies were also the five biggest contributors to ICT sector value added in 2016; Germany (EUR 129 billion or 20 % in terms of shares), the United Kingdom (EUR 112 billion or 18 %), France (EUR 99 billion or 15 %), Italy (EUR 58 billion or 9 %), and Spain (EUR 41 billion or 6 %). Together, these five countries accounted for 69 % of total EU ICT sector value added in 2016.

Figure 7.4 ICT sector Value Added, EUR billion, 2016

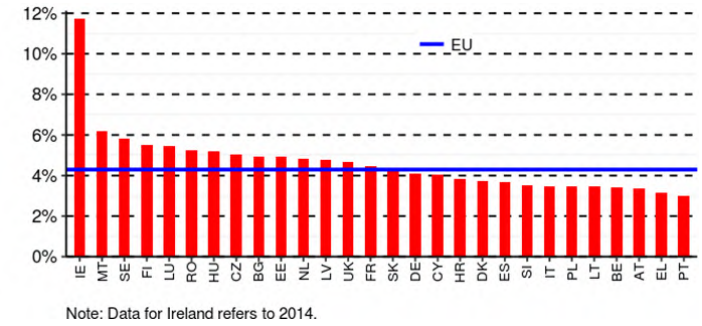


Source: Commission services' calculations and estimates based on PREDICT project

Ireland had by far the highest ICT sector share of GDP, 11.6 % in 2014 (latest data available), while Portugal lagged behind at 3 %. After Ireland, the countries with the highest share of ICT sector included Malta (6.2 %), Sweden (5.8 %), Finland (5.5 %) and Luxembourg (5.4 %).

Romania, Hungary, and Czechia also had a high ICT sector share of GDP (5 % or higher). The biggest changes in ICT as a proportion of GDP over the medium term (2006-2016) were in Ireland, where it grew by 3.5 percentage points (due to the process of relocation of European operations of many non-EU ICT multinationals) and in Finland, where it fell by 3.1 percentage points (due mainly to the crisis at Nokia, the Finnish ICT manufacturer).

Figure 7.5 ICT sector share of GDP, percentage, 2016

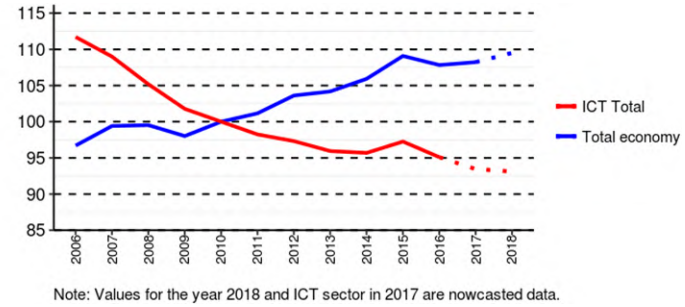


Source: Commission services' calculations and estimates based on PREDICT project

ICT prices continued to go down in 2016-2017 after a spike in 2015, but the decline in prices is forecast to slow down in 2018. The telecommunications sub-sector experienced the largest decline.

Prices in the ICT sector fell by 16 % over the medium term (2006-2017), while prices in general grew by 12 % over the same period. This highlights the particular nature of product prices in the ICT sector, which also incorporates improvements in the quality of products (e.g. CPUs' speed). This different price evolution of the ICT sector with respect to the overall economy explains the fact that, in the EU, the share of the ICT sector in total GDP remained stable (around 4%) between 2006 and 2016 (see Figure 7.3).

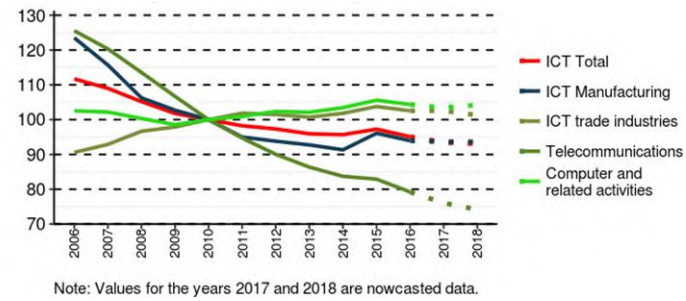
Figure 7.6 Price Index, ICT sector and overall economy, Index base 2010=100, 2006-2018



Source: Commission services' calculations and estimates based on PREDICT project

An analysis by sub-sector shows a contrasting situation: while some sub-sectors experienced a dramatic drop in prices (telecommunications: - 39 %, ICT manufacturing: - 24 %), other saw moderate growth (the ICT trade industry: + 13 %) or stagnation (computers and related activities: + 1 %) over the medium term (2006-2017). In addition, prices in the ICT sector stabilised somewhat towards the end of 2013-2017.

Figure 7.7 Price Index, ICT by sub-sector, Index base 2010=100, 2006-2018

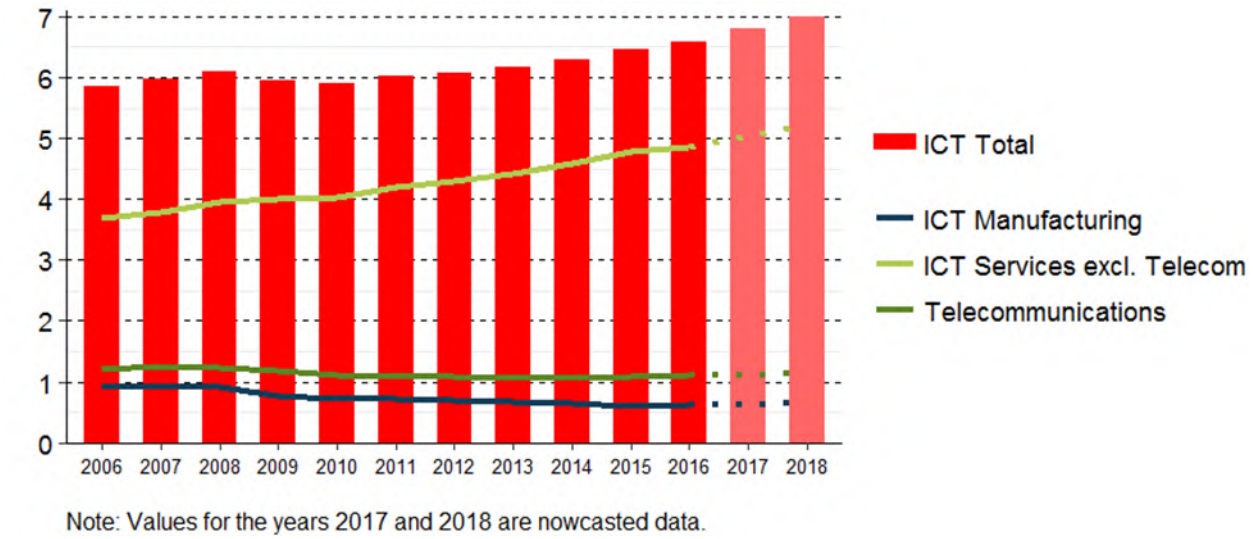


Source: Commission services' calculations and estimates based on PREDICT project

The ICT sector employed 6.6 million people in 2016. The main employer was the ICT services sub-sector (excluding telecommunications), with 4.9 million people in 2016. The share of employment in the ICT sector relative to total employment was 2.8 % in the EU in 2016.

The ICT sector employed 6.6 million people in 2016, continuing on an upward trend since 2010. The ICT services sub-sector (excluding telecommunications) employed 4.9 million people, accounting for 74 % of total ICT employment in 2016. This is the only sub-sector that recorded growth (of 31 %) over the medium term (2006-2016). The telecommunications sub-sector employed 1.1 million people in 2016, a number which fell over the medium term by 9 %. The ICT manufacturing sub-sector employed 625,000 people in 2016, a drop of 32 % since 2006.

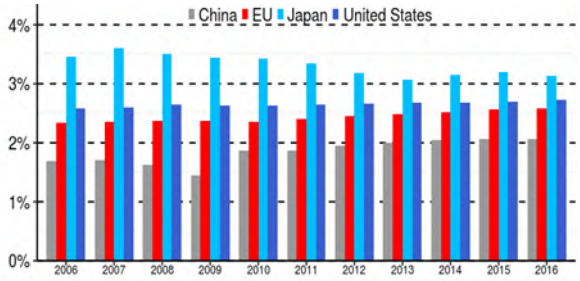
Figure 7.8 Employment in the ICT sector, million people, 2006-2018



Source: Commission services' calculations and estimates based on PREDICT project

Employment in the ICT sector accounted for 2.8 % of total EU employment in 2016 (comprehensive definition*), an increase of 8 % over the medium term. In the operational definition* which enables world comparisons, the US (2.7 %) was slightly ahead of the EU (2.6 %), which in turn was ahead of China (2.1 %). All three lagged well behind Japan (3.1 %) in 2016, however.

Figure 7.9 ICT sector share of total employment, percentage, 2006-2016

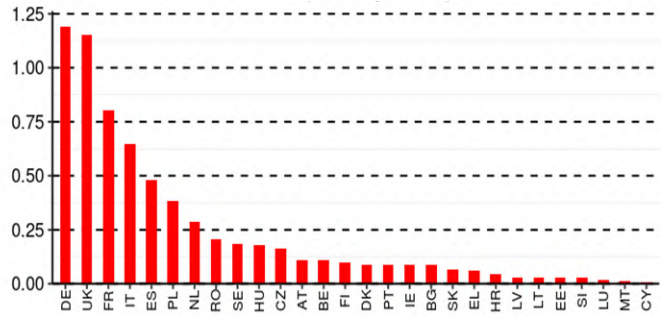


Source: Commission services' calculations and estimates based on PREDICT project

The five biggest EU economies (Germany, the United Kingdom, France, Italy, and Spain) were the five biggest employers in the EU ICT sector in 2016. However, small countries like Malta and Estonia had the highest rate of ICT sector employment as a share of total employment in 2016.

As was the case for value added, the EU's five largest economies were also the five largest employers in the EU ICT sector in 2016: Germany (over 1.2 million people or 18 % of total EU ICT sector employment), the United Kingdom (1.1 million people or 18 %), France (803,000 people or 12 %), Italy (646,000 people or 10 %), and Spain (480,000 people or 7 %). Together, the five largest employers accounted for 65 % of total ICT sector employment in 2016.

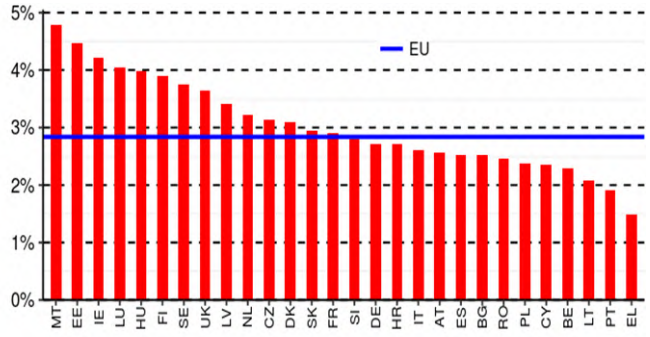
Figure 7.10 Employment in the ICT sector, million people, 2016



Source: Commission services' calculations and estimates based on PREDICT project

In 2016, Malta had the highest share of ICT sector employment in total employment (4.8 %) and Greece the lowest (1.5 %). Other countries that performed well in 2016 included Estonia (4.5 %) and Ireland (4.2 %). Luxembourg and Hungary were close behind with rates around 4 %. Over the medium term (2006-2016), ICT sector employment as a share of total employment remained stable in most countries; small countries like Estonia and Latvia made significant progress, showing growth of almost 2 percentage points.

Figure 7.11 ICT sector share of total employment, percentage, 2016

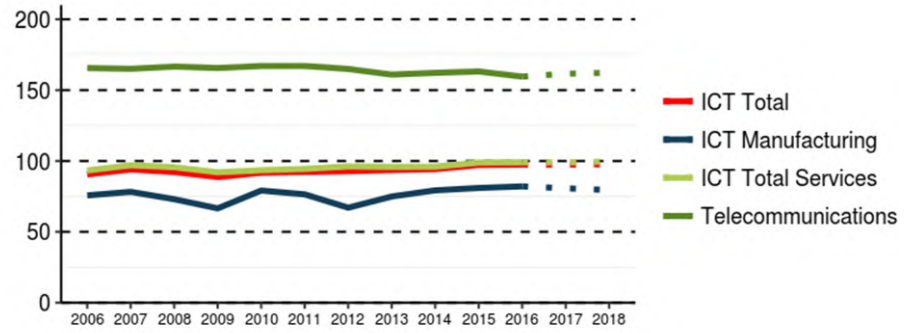


Source: Commission services' calculations and estimates based on PREDICT project

Labour productivity in the ICT sector was EUR 97,000 per person employed in 2016. Labour productivity in the telecommunications sub-sector was by far the highest.

Labour productivity in the ICT sector (comprehensive definition*) was EUR 97,000 per person employed in 2016, a slight increase over the medium term (2006-2016). Labour productivity in the ICT manufacturing sub-sector (EUR 82,000 per person employed in 2016) was below the average of the total ICT sector, and volatile. Labour productivity in the ICT services (i.e. services and trade), which was EUR 99,000 per person employed in 2016, is less sensitive to business cycles and was closer to the total ICT sector average than that of the ICT manufacturing. Labour productivity in the telecommunications sub-sector was by far the highest (at EUR 160,000 per person employed in 2016).

Figure 7.12 Productivity in the ICT sub-sector, thousand EUR per person employed, 2006-2018



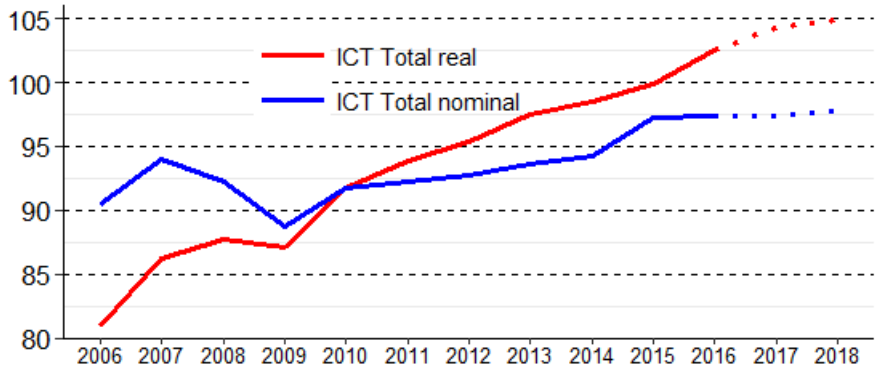
Note: Values for the years 2017 and 2018 are nowcasted data.

Source: Commission services' calculations and estimates based on PREDICT project

The ICT sector had higher labour productivity (in nominal terms) and grew faster (in real terms) over the period 2006-2016 than the overall economy. At global level, the EU ICT sector labour productivity was comparable with that of Japan but lagged markedly behind the US.

Labour productivity in the ICT sector was higher than in the rest of the economy (EUR 97,000 per person employed versus EUR 64,000 per person employed in 2016). Although it grew less quickly in nominal terms (+ 7 % versus + 16 % over 2006-2016), labour productivity in the ICT sector grew faster than that of the general economy in real terms (+ 23 % versus + 6 % over 2006-2016).

Figure 7.13 Productivity, nominal and deflated, thousand EUR per person employed, 2006-2018

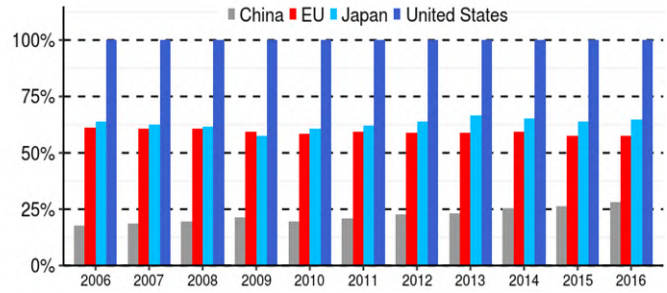


Note: Values for the years 2017 and 2018 are nowcasted data.

Source: Commission services' calculations and estimates based on PREDICT project

According to the operational definition* which enables world comparisons, labour productivity in the EU ICT sector is considerably below that of the US (index: 57.8; index US=100) and also lower than Japan's (index: 64.6), but is far ahead of China (index: 28.0), which is however rapidly catching up.

Figure 7.14 ICT sector Productivity, thousand EUR PPS per person employed, Index US=100, 2006-2016

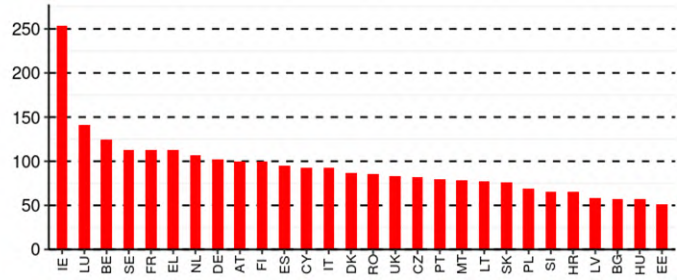


Source: Commission services' calculations and estimates based on PREDICT project

Labour productivity was highest in Ireland followed by Luxembourg and Belgium. Estonia, Hungary, and Bulgaria had the weakest performance.

In terms of labour productivity in the ICT sector, Ireland (EUR PPS 252,000 per person employed) by far led the way in 2014 (latest data available), but Luxembourg (EUR PPS 141,000 per person employed) and Belgium (EUR PPS 124,000 per person employed) also fared well in 2016. At the opposite end of the scale were Estonia (EUR PPS 52,000 per person employed), Hungary (EUR PPS 57,000 per person employed), and Bulgaria (EUR PPS 57,000 per person employed).

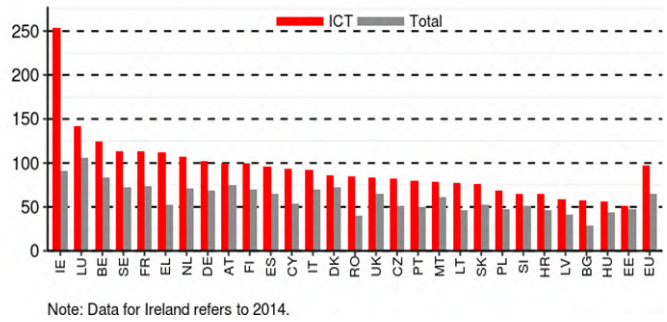
Figure 7.15 Productivity in the ICT sector, thousand EUR PPS per person employed, 2016



Source: Commission services' calculations and estimates based on PREDICT project

The picture for labour productivity in the economy as a whole was broadly similar. Luxembourg (EUR PPS 105,000 per person employed) and Ireland (EUR PPS 93,000 per person employed) were the best-performing countries, while Bulgaria (EUR PPS 29,000 per person employed) and Romania (EUR PPS 40,000 per person employed) were at the bottom of the scale.

Figure 7.16 Productivity, ICT sector and total, thousand EUR PPS per person employed, 2016



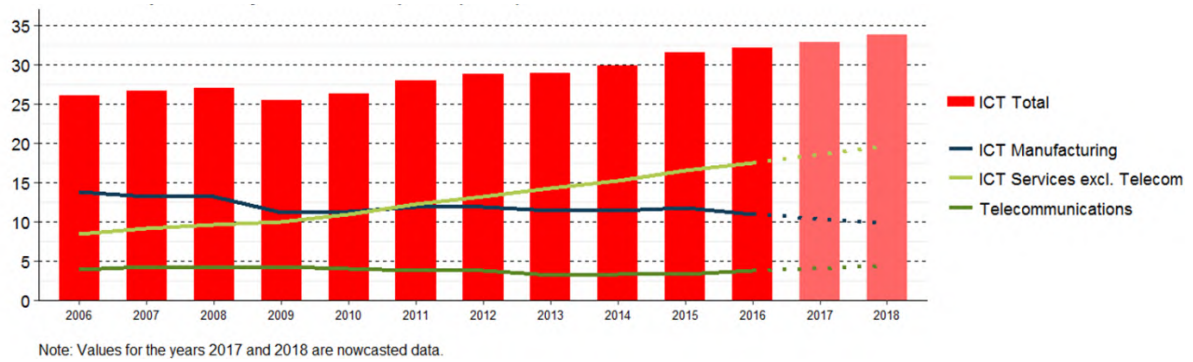
Source: Commission services' calculations and estimates based on PREDICT project

R&D expenditure by business enterprises (BERD) in the ICT sector was EUR 32 billion in 2016. The ICT services sector was responsible for 66 % (EUR 21 billion) of ICT BERD in 2016.

R&D expenditure by business enterprises (BERD) in the ICT sector amounted to EUR 32 billion in 2016, its highest value over the medium term (2006-2016) and far from its low 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 sub-sector was responsible for 34 % of total ICT BERD (EUR 11 billion) while the ICT services sub-sector was responsible for 63 % (EUR 21 billion) of ICT BERD in 2016.

Over the medium term (2006-2016), the situation was quite different. The ICT manufacturing sub-sector experienced structural decline (falling by 21 % in 2006-2016), whereas the ICT services saw a structural increase (rising by 72 % in 2006-2016), particularly the ICT services sub-sector excluding telecommunications, which saw an increase of 106 % in 2006-2016.

Figure 7.17 R&D expenditure by business enterprises (BERD) in the ICT sector, EUR billion, 2006-2018

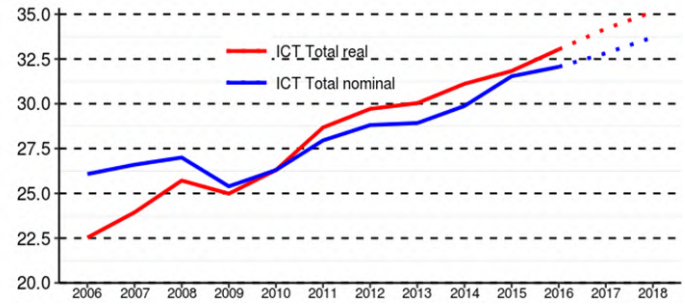


Source: Commission services' calculations and estimates based on PREDICT project

R&D expenditure by business enterprises grew faster in the ICT sector than in the general economy in real terms. ICT R&D intensity was 5 % in 2016 in the EU, far behind the US and Japan.

In real terms, R&D expenditure by business enterprises in the ICT sector grew faster than in the general economy (+ 38 % versus + 26 % in 2006-2015).

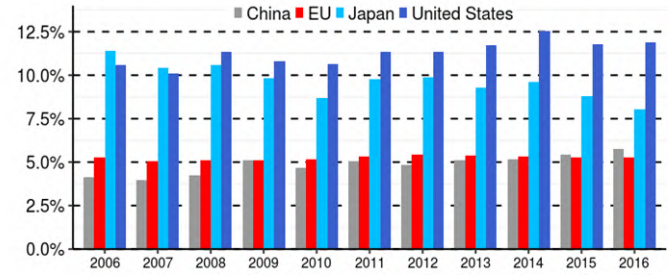
Figure 7.18 R&D expenditure by business enterprises (BERD) in the ICT sector, nominal and deflated, EUR billion, 2006-2018



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

R&D intensity (BERD/VA) in the ICT sector (comprehensive definition*) amounted to 5 % in 2016. According to the operational definition* which enables world comparisons, China (5.5 %) surpassed the EU (5.2 %) for the second time, and both the EU and China lagged behind the US (12 %) and Japan (8 %) in 2016.

Figure 7.19 ICT sector R&D Intensity (BERD/VA), percentage, 2006-2016



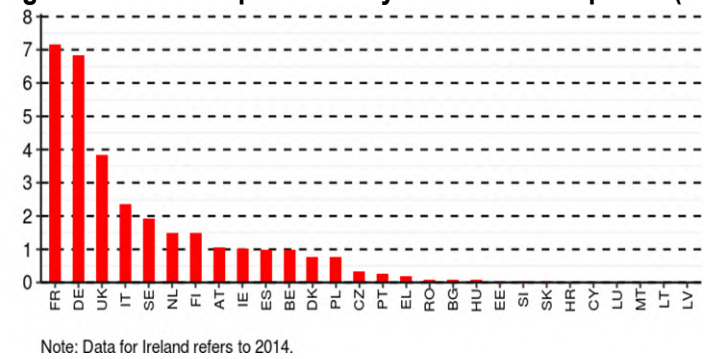
** See methodological note.*

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

The EU's six main contributors in terms of R&D expenditure by business enterprises in the ICT sector in 2016 were the EU's four biggest economies (France, Germany, the United Kingdom, and Italy) together with Sweden and the Netherlands.

The EU's six main contributors in terms of R&D expenditure by business enterprises in the ICT sector in 2016 were the four largest economies in the EU (France, Germany, the United Kingdom and Italy), followed by Sweden and the Netherlands: France (EUR 7.2 billion or 22 %), Germany (EUR 6.9 billion or 21 %), the United Kingdom (EUR 3.8 billion or 12 %), Italy (EUR 2.3 billion or 7 %), Sweden (EUR 1.9 billion or 6 %) and the Netherlands (EUR 1.5 billion or 5 %). Together, these six accounted for 74 % of total R&D expenditure by business enterprises in the ICT sector.

Figure 7.20 R&D expenditure by business enterprises (BERD) in the ICT sector, EUR billion, 2016

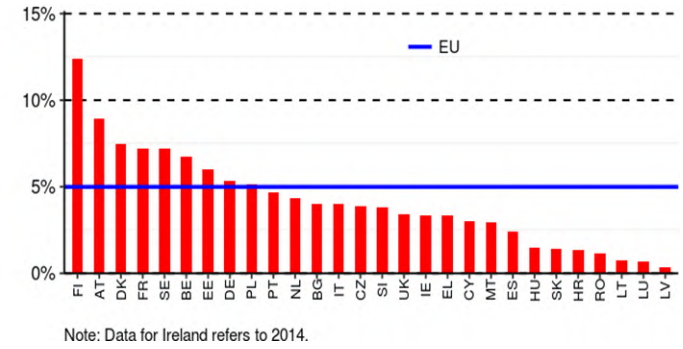


Note: Data for Ireland refers to 2014.

Source: Commission services' calculations and estimates based on PREDICT project

Finland led the EU with 12.4 % ICT R&D intensity rate (BERD/VA) in 2016; Denmark had a rate of 7.5 % and Sweden 7.2 %. Other strong performers include Austria (8.9 %), France (7.2 %), and Belgium (6.7 %). Over the medium term (2006-2016), ICT R&D intensity remained broadly stable, but some countries, such as Poland and Bulgaria, made significant progress.

Figure 7.21 ICT R&D Intensity (BERD/VA), percentage, 2016



Note: Data for Ireland refers to 2014.

Source: Commission services' calculations and estimates based on PREDICT project

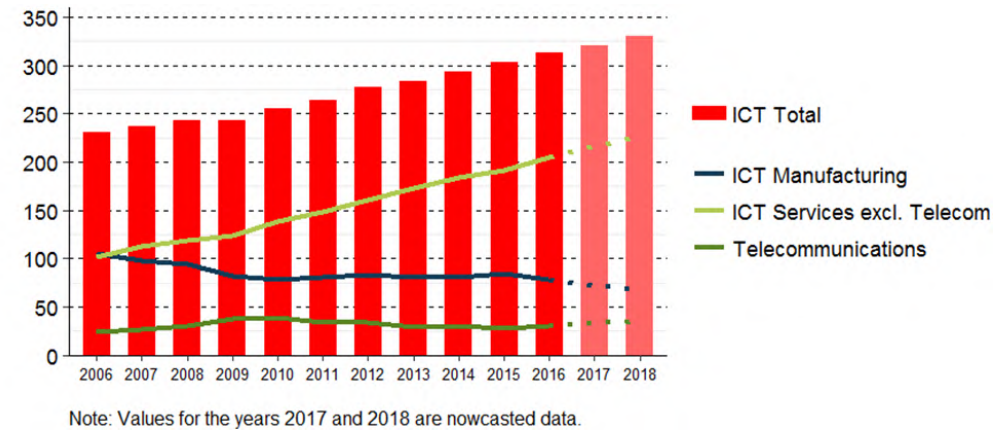
R&D personnel in the ICT sector included 313,000 full-time equivalents (FTEs) in 2016. The top employer was the ICT services sub-sector (excluding telecommunications), employing 205,000 FTEs in 2016 (65 % of ICT R&D personnel). R&D personnel in the ICT sector made up 19 % of total R&D personnel in 2016.

R&D personnel in the ICT sector included 313,000 full-time equivalents (FTEs) in 2016, a figure which rose over the medium term (2006-2016), growing faster after 2009. The ICT services sub-sector (excluding telecommunications) employed 205,000 FTEs in 2016 (65 % of R&D personnel in the ICT sector, making it the top employer), with a rising trend. The ICT manufacturing sub-sector employed 78,000 FTEs in 2016, with a downward trend in the medium term (2006-2016) despite an uptick in 2015. The telecommunications sub-sector employed 31,000 FTEs in 2016 (10 % of R&D personnel in the ICT sector), down by about 29 % from a peak of 39,000 FTEs in 2010.

R&D personnel in the ICT sector (comprehensive definition*) made up 19 % of total R&D personnel in 2016, a figure which remained stable over the medium term. However, according

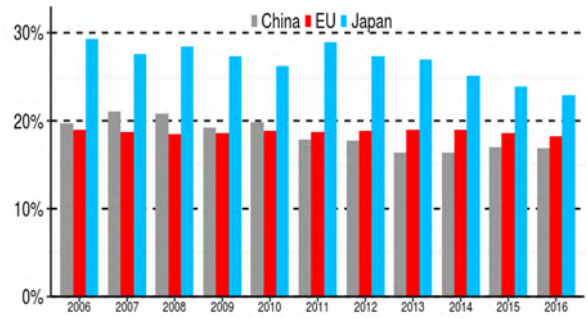
to the operational definition* which enables world comparisons, the EU (18 %) and China (17 %) were behind Japan (23 %) in 2016 and in the medium term (no data available for the US).

Figure 7.22 R&D Personnel (PERD) in the ICT sector, thousand FTEs, 2006-2018



Source: Commission services' calculations and estimates based on PREDICT project

Figure 7.23 ICT sector share of total R&D Personnel, percentage, 2006-2016



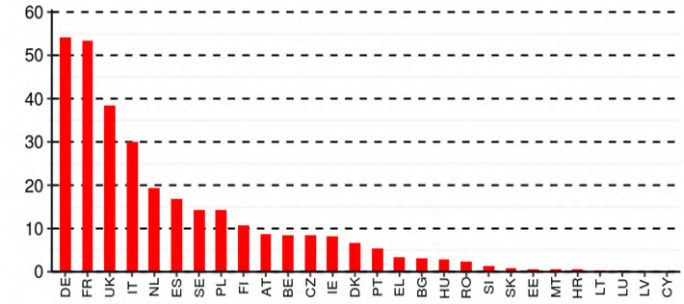
** See methodological note.*

Source: Commission services' calculations and estimates based on PREDICT project

The EU's four biggest economies were also the four biggest employers of R&D personnel in the ICT sector in 2016: 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 2016.

The EU's four biggest economies were also the four biggest employers of R&D personnel in the ICT sector in 2016. These were Germany (54,000 FTEs or 17 %), France (53,000 FTEs or 17 %), the United Kingdom (38,000 FTEs or 12 %), and Italy (30,000 FTEs or 10 %). Together, the four biggest employers represented 56 % of total R&D personnel in the ICT sector in 2016.

Figure 7.24 R&D Personnel (PERD) in the ICT sector, thousand FTEs, 2016

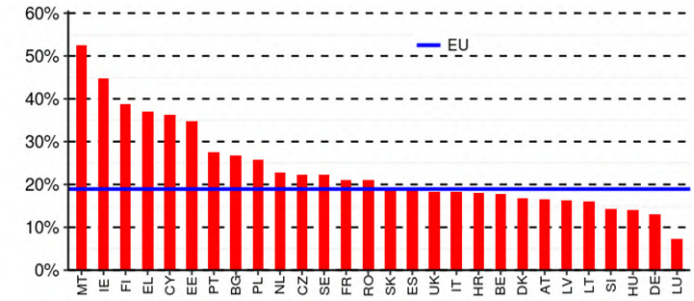


Source: Commission services' calculations and estimates based on PREDICT project

Malta (53 %) and Ireland (45 %) were the two countries with the highest concentration of R&D personnel in the ICT sector in 2016. Luxembourg had the lowest concentration (7 %).

Other strong performers were Finland (39 %), Greece (37 %) and Cyprus (36 %).

Figure 7.25 ICT sector share of total R&D Personnel (PERD), percentage, 2016



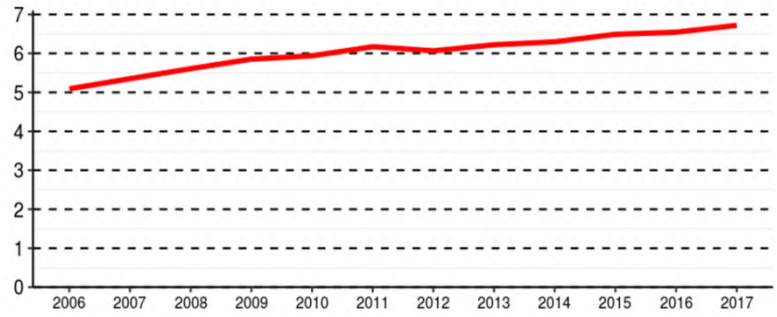
Source: Commission services' calculations and estimates based on PREDICT project

Estimated publicly funded expenditure on ICT R&D in the EU grew to EUR 6.7 billion in 2017. This was more than 26 % below the necessary trend line for doubling publicly funded ICT R&D between 2007 and 2020.

The estimated level of publicly funded expenditure on ICT R&D (in any sector of the economy) in the EU was on an increasing trend in the medium term (2006-2017), interrupted only by a fall in 2012, and reached EUR 6.7 billion in 2017.

The Digital Agenda target of doubling publicly funded ICT R&D between 2007 and 2020 requires an annual growth rate of 5.5 % (assuming a constant annual growth rate). Estimated public ICT R&D expenditure was below the necessary trend line in 2017, with a gap of more than 26 %.

Figure 7.26 Public funding of ICT R&D (ICT GBARD), EUR billion, 2006-2017

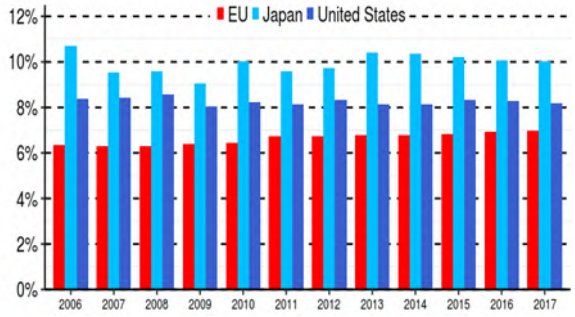


Source: Commission services' calculations and estimates based on PREDICT project

In 2017[1], public funding of ICT R&D represented 7.0 % of EU total 'government budget allocations for R&D' (GBARD), a figure which remained broadly stable over the medium term.

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

Figure 7.27 ICT GBARD share of total GBARD, percentage, 2006-2017



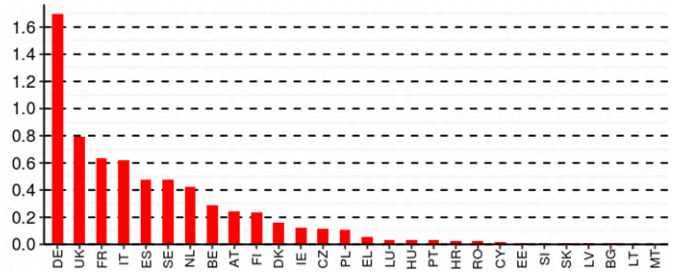
Source: Commission services' calculations and estimates based on PREDICT project

The EU's five biggest public funders of ICT R&D in 2017 were Germany, the United Kingdom, France, Italy and Spain. As in previous years, Cyprus had the highest rate of ICT GBARD as a share of total GBARD in 2017.

The EU's five biggest public funders of ICT R&D in 2016 were Germany (EUR 1.7 billion or 25 %), followed by the United Kingdom (EUR 793 million or 12 %), France (EUR 636 million or 9 %), Italy (EUR 623 million or 9 %) and Spain (EUR 477 million or 7 %).

Together, those five countries accounted for 63 % of total public funding for ICT R&D.

Figure 7.28 Public funding of ICT R&D (ICT GBARD), EUR billion, 2017



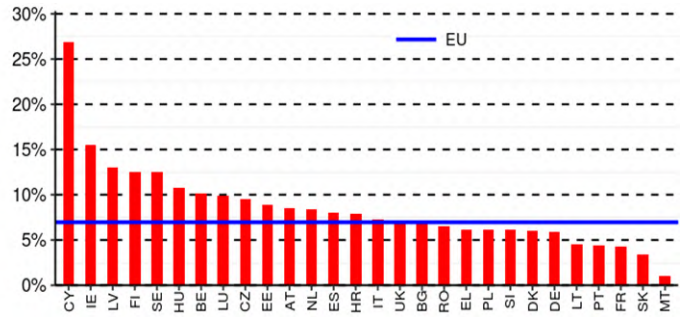
[1] Official statistics on public expenditure are available one year before business statistics.

Source: Commission services' calculations and estimates based on PREDICT project

As in previous years, Cyprus was leading the way in the EU with the highest rate (27 %) of ICT GBARD as a proportion of total GBARD in 2016. The ranking in 2016 again reveals strong performances by Ireland (15.5 %), Sweden and Finland (both 12.5 %).

However, some other countries also pay special attention to ICT in their public spending on R&D, such as Latvia (at 13.1 %) and Hungary (at 10.7 %).

Figure 7.29 ICT GBARD as share of total GBARD, percentage, 2017



Source: Commission services' calculations and estimates based on 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 and based on the NACE (Statistical Classification of Economic Activities in the European Community) Rev.2 (2008) nomenclature. The ICT sector has 12 'industries':

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 versus operational definition

The comprehensive definition of the ICT sector applies to EU Member States for the period 2008-2016. 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 (2006-2016), as some of these countries do not have the necessary disaggregated information to estimate all the ICT industries included in the comprehensive definition. The operational definition does not include the following industries: manufacture of magnetic and optical media (268) and ICT trade industries (465).

Sector analysis

In the previous section, an analysis by ICT sub-sectors is made for each indicator. The 12 industries are aggregated into three sub-sectors: ICT manufacturing, 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.

8. Research and Innovation: ICT projects in Horizon 2020

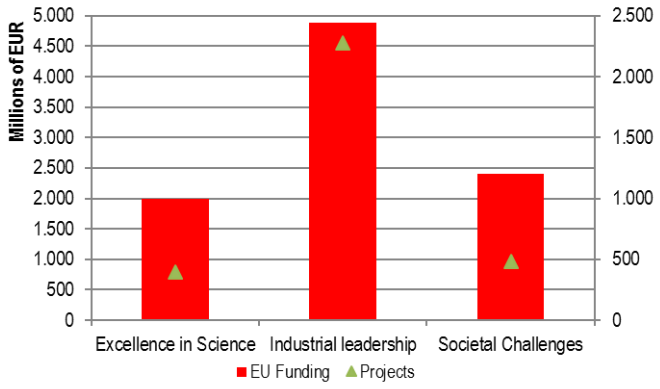
After five years of implementation, Horizon 2020 has allocated approximately EUR 9.3 billion in EU funding to more than 3,000 projects in ICT-related areas.

The Industrial Leadership pillar covers R&I activities on generic ICT technologies driven by either industrial roadmaps or bottom-up processes. It accounts for about EUR 4.9 billion, or more than half of all funding for ICT-related projects. EUR 4.2 billion (86 % of the total) correspond to its LEIT ICT component. Industrial Leadership also accounts for about 2,280 projects (or 72 % of the total), of which more than half from LEIT ICT.

The Excellent Science pillar (e-infrastructures and Future & Emerging Technologies, or FET) supports research to uncover radically new technological possibilities and ICT contributions. Areas covered include high performance computing, quantum technologies and brain science. It accounts for about 20% of both funding (EUR 2 billion) and participations and 12 % of projects (483).

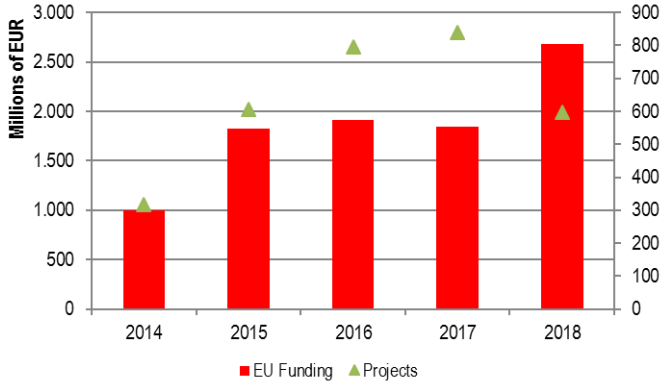
The Societal Challenges pillar addresses application-driven R&I from a multi-disciplinary perspective. Projects to some extent involving ICT are financed in all of the seven societal challenges, particularly health and wellbeing, clean and efficient energy, smart transport, inclusive and innovative societies and security and freedom. This pillar accounts for about 26 % of funding (EUR 2.4 billion), 15 % of projects and 28 % of participations.

Figure 8.1 Horizon 2020 EU funding and projects by pillar, cumulated values 2014-2018



Source: Commission Services based on CORDA data

Figure 8.2 Horizon 2020 EU funding and projects, by year 2014-2018

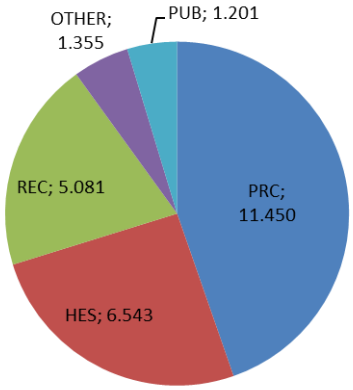


Source: Commission Services based on CORDA data

More than 10,500 organisations, including an increasing number of private-sector companies, have participated in ICT-related projects in Horizon 2020 between 2014 and 2018.

About 10,500 organisations have participated in ICT-related projects during the first five years of H2020. Business involvement has continued to rise, with private for-profit companies (PRC) accounting for about 40 % of the budget and 45 % of participations (compared with 35 % and 33 %, respectively, under FP7).

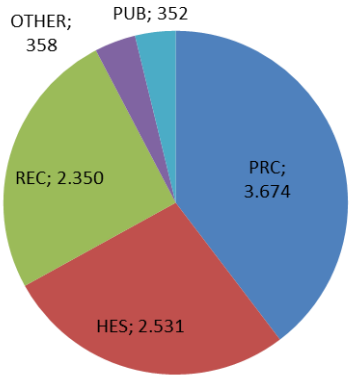
Figure 8.3 Participations, by type of organisation, cumulated values 2014-2018



Source: Commission Services based on CORDA data

Secondary and higher education establishments (HES) and research organisations (REC), taken together, account for about 46 % and more than half of total funding. This represents a lower share than in FP7, which is partly explained by the higher involvement of the private sector.

Figure 8.4. EU funding, by type of organisation, cumulated values 2014-2018 (in EUR million)



Source: Commission Services based on CORDA data

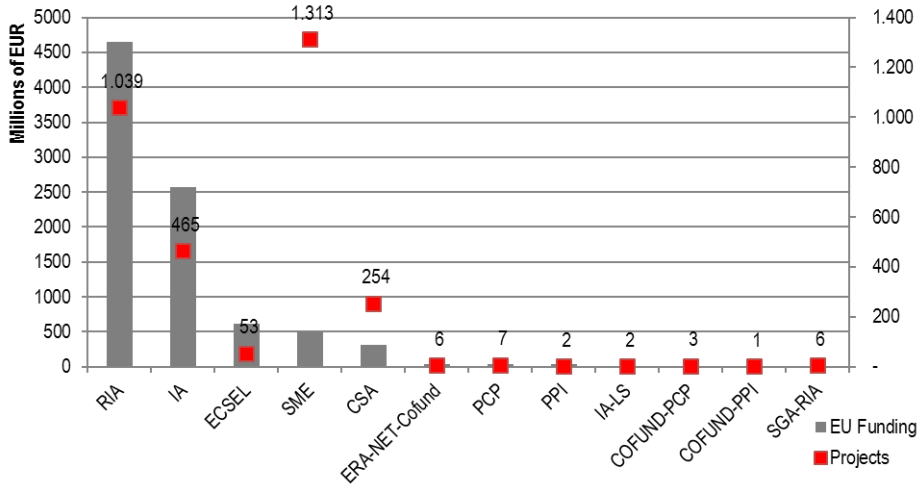
Public organisations other than those involved in research and education account for a relatively small share of both funding and participations (about 5 % and 4 % respectively), similar to the 'other' organisations category.

HES and REC are much more likely to be involved in a number of projects (roughly 5 to 6 participations on average) than their private sector counterparts (fewer than 2). This is partly explained by the fact that there are fewer education establishments or research organisations than companies (which in turn affects the likelihood of engaging in multiple projects).

Research and innovation actions account for the bulk of funding in ICT-related topics in Horizon 2020. The SME instrument accounts for the largest number of projects, although these typically receive smaller amounts.

Research and innovation actions (RIA) aim to uncover new knowledge and/or explore the feasibility of a new or improved technology, products, processes, services or solutions. They account for the largest share of funding overall as well as in the Industrial Leadership and Excellent Science pillars. They have received approximately EUR 4.6 billion between 2014 and 2018. Innovation actions (IA) are the second most important instrument in terms of funding (EUR 2.6 billion) and the preferred action type under the Societal Challenges pillar. They aim to produce plans and arrangements or designs, and may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication. SME instrument projects account for a large share of projects but, given their relatively small size, a much smaller share of funding.

Figure 8.5 EU Funding and projects by type of action, cumulated values 2014-2018



Source: Commission Services based on CORDA data

Coordination and support actions (CSA) involve accompanying measures such as standardisation, dissemination, awareness-raising and communication. They received EUR 310 million and accounted for over 250 projects between 2014 and 2018.

Other action types, such as pre-commercial procurement (PCP) actions, public procurement for innovation (PPI) actions and European research area (ERA-NET) actions have a more limited scope of application. They therefore account for a relatively small share of both projects and funding.

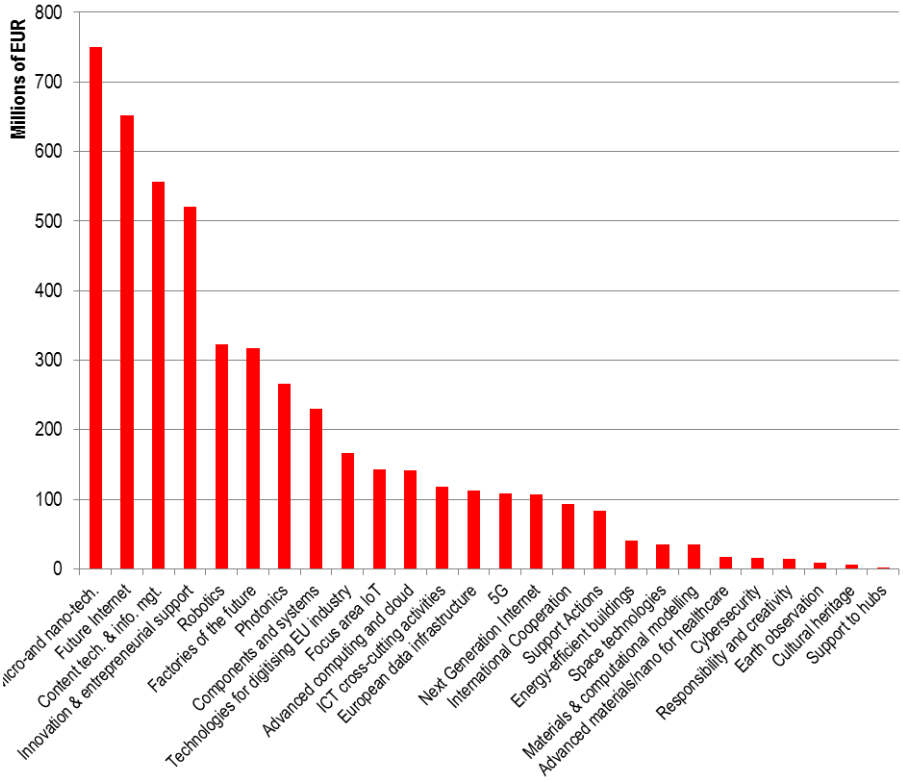
Micro- and nano-electronic technologies and future networks and internet continue to attract a sizeable share of both funding and participants. Many ICT-relevant projects are also financed within the Societal Challenges pillar.

Within *Industrial Leadership*, projects in the areas of micro- and nano-electronic technologies (including the ECSEL joint undertaking on electronic components and systems) and future/next generation internet and 5G (taken together, including the 5G cPPP) have received the largest funding amounts (nearly EUR 800 million each). Content technologies and information management (including funding for the Big Data cPPP) received nearly EUR 560 million.

Within *Excellent Science*, e-Infrastructures are a major area of work (EUR 520 million), as are the different components of Future and Emerging Technologies (FET): FET Open and the FET flagships received approximately EUR 530 million each; FET proactive, nearly EUR 400 million.

Many ICT-relevant projects are also financed under *Societal Challenges*, notably in the areas of smart transport, health and wellbeing and secure societies, which encompasses a number of relevant cybersecurity projects.

Figure 8.6 EU funding, Industrial Leadership, by area, cumulated values 2014-2018



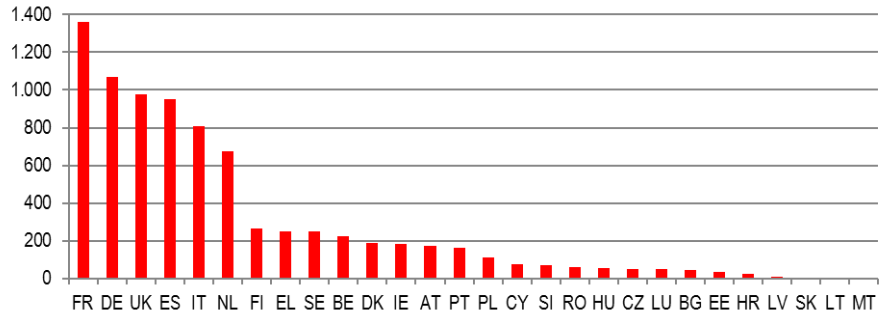
Source: Commission Services based on CORDA data

In absolute terms, France, Germany and the United Kingdom are the biggest recipients of EU funding. Cyprus, Greece and Slovenia receive the highest levels of funding relative to the size of their ICT sector.

In absolute terms, the EU's largest economies are the main recipients of EU funding for ICT-related projects under Horizon 2020. France, Germany, the United Kingdom, Spain and Italy alone accounted for about 63 % of total EU funding and a similar share of participations in the first five years of implementation. These countries also lead in terms of the number of projects coordinated. When considering the recipient countries' ICT sector value added, Cyprus, Greece and Slovenia are among the Member States having received the highest amounts of funding in proportional terms.

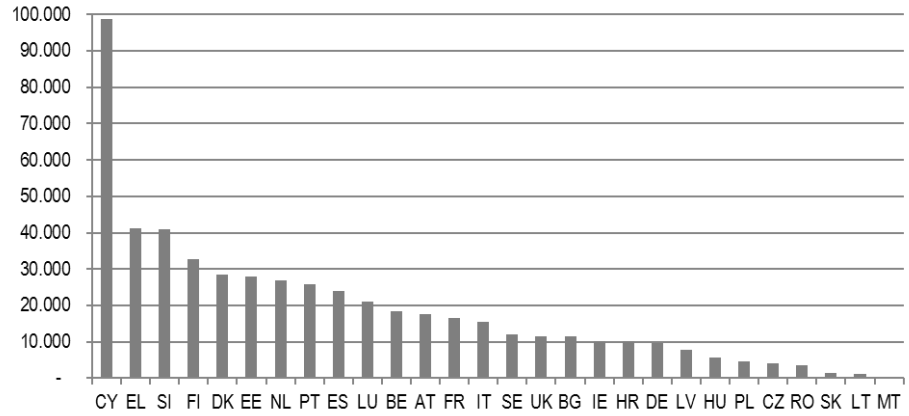
In all Member States, the largest share of funding has gone to projects from the Industrial Leadership pillar, particularly LEIT ICT. There are relatively large variations across Member States with regard to the amount of funding having come from the other parts of the programme.

Figure 8.7 EU funding by Member State, cumulated values, 2014-2018, in EUR million



Source: Commission Services based on CORDA data

Figure 8.8 EU funding by Member State, cumulated values, 2014-2018 in EUR per million ICT VA



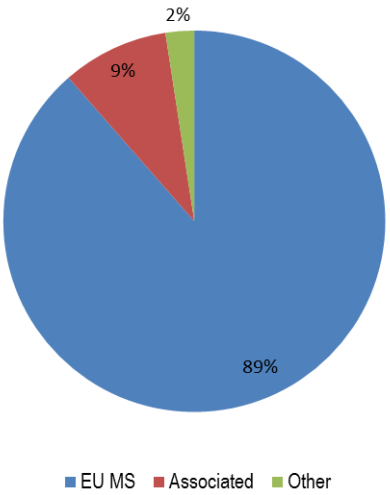
Source: Commission Services based on CORDA data

There is significant involvement of international participants in ICT-related projects in Horizon 2020: between 2014 and 2018, 11 % of funding went to non-EU countries, primarily associated countries with a strong R&I sector.

Although beneficiaries from the EU Member States account for the vast majority of funding and projects, Horizon 2020 projects (including ICT-related) are becoming increasingly attractive for international participants, who contribute valuable knowledge and expertise in return.

This is illustrated by the fact that, between 2014 and 2018, organisations from non-EU countries received approximately EUR 1 billion in funding (about 11 % of the total). These figures do not capture EU affiliates of non-EU companies.

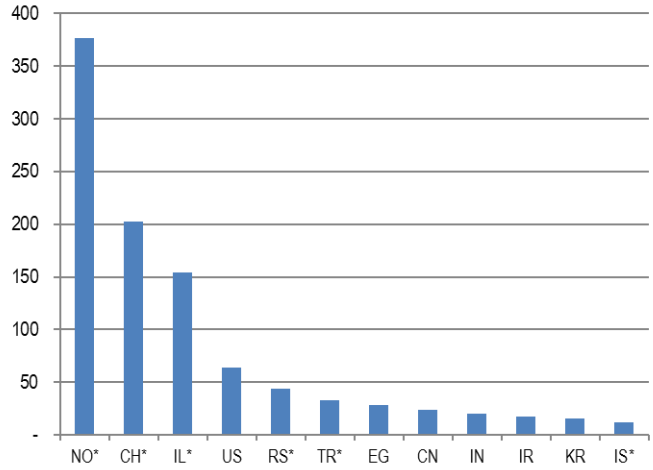
Figure 8.9 EU funding of Horizon 2020 ICT-related projects 2014-2018, by country type (in % of total)



Source: Commission Services based on CORDA data

Close to 80 % of funding for non-EU beneficiaries went to associated countries. Research-oriented players such as Norway, Switzerland and Israel are the largest recipients within this group. The remainder of the budget went to other non-EU countries countries.

Figure 8.10 EU funding to selected non-EU countries (having received at least EUR 10 million), in EUR million , 2014-2018



❖ *Associated country.*

Source: Commission Services based on CORDA data

Notes

Coverage:

This report considers projects supported through Horizon 2020 funding in ICT-related topics, as defined in the Commission's "Guide to ICT-related activities"*.

To ensure full consistency with the Guide, the criteria for the inclusion of projects for analytical purposes have been slightly updated compared with previous editions. As this has broadened the scope of the analysis, the results presented here are not fully comparable with those from previous years. In the same vein, the categories and structure used correspond to those in the Guide (i.e. for the sake of clarity, SMEInst topics are included under Industrial Leadership).

The Fast Track to innovation pilot and parts of the European Innovation Council pilot are excluded from the analysis.

The report considers projects signed as of 31 December 2018. Only projects for which the signature year was known at the time of writing are taken into account.

Acronyms for types of organisations:

- PRC: Private for profit companies
- SME: small and medium-sized enterprises
- PUB: public bodies (excluding research and education)
- REC: research organisations
- HES: secondary and higher education establishments
- OTH: other entities

The following country groupings are used for the chart on international participation:

Associated countries (art. 7 of the 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.

Other: all other non-EU countries.

Source:

The report is based on the Commission's "Guide to ICT-related activities" as well as on CORDA data elaborated by DG CONNECT. The source of data for ICT Value Added is PREDICT.

**For further details:*

https://ec.europa.eu/digital-single-market/en/news/guide-ict-related-activities-horizon-2020; https://ec.europa.eu/digital-single-market/en/news/guide-ict-related-activities-horizon-2020-work-programme-2018-20