Council of the European Union

Brussels, 12 May 2017
(OR. en)

9139/17
ADD 5

TELECOM 118
MI 412
IND 123
COMPET 342
PI 58
RECH 137
DIGIT 135

COVER NOTE

From:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	11 May 2017
To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2017) 160 final -PART 6/62
Subject:	COMMISSION STAFF WORKING DOCUMENT Europe's Digital Progress Report 2017

Delegations will find attached document SWD(2017) 160 final -PART 6/62.

Encl.: SWD(2017) 160 final -PART 6/62

EUROPEAN
COMMISSION

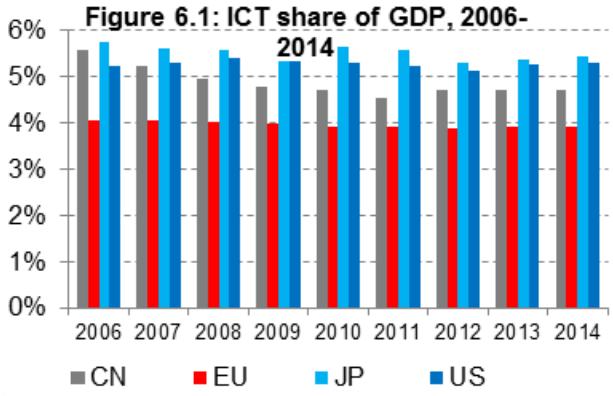
Brussels, 10.5.2017
SWD(2017) 160 final

PART 6/62

COMMISSION STAFF WORKING DOCUMENT

Europe's Digital Progress Report 2017

6. R&D AND ICT SECTOR



The Information and Communication Technologies (ICT) sector value added amounted to EUR 593 billion in 2014. ICT services represented 91% of total ICT value added. ICT services (excluding telecoms) were the main sector and the only one to be expanding.

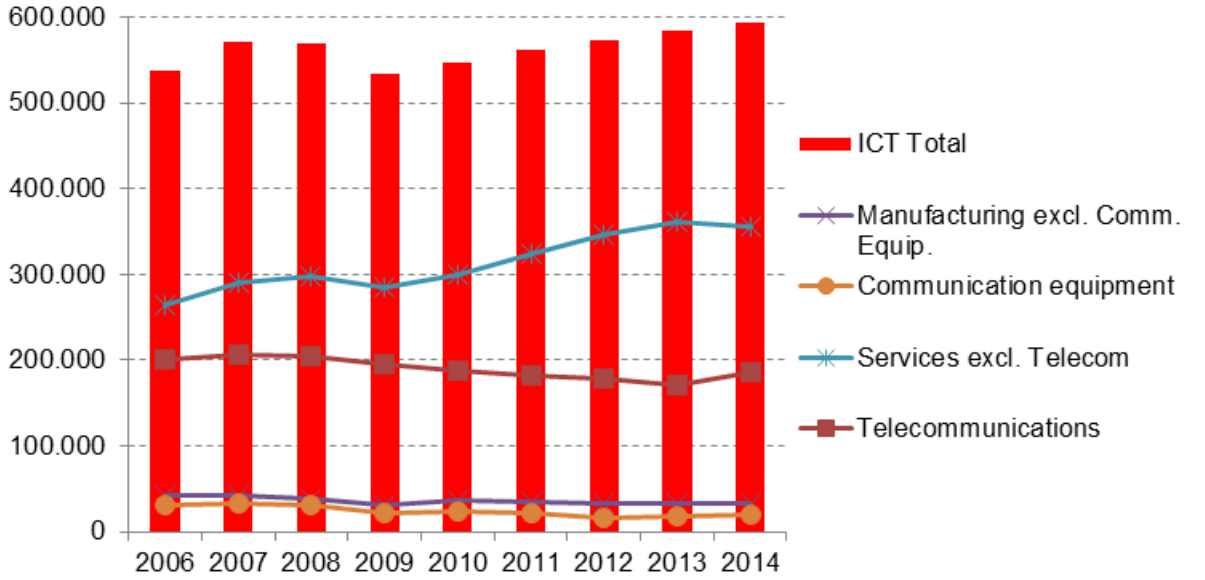
Value added in the ICT sector accounted for 4.2 % of EU GDP in 2014 (comprehensive definition*). However, according to the operational definition* which enables world comparisons, value added in the ICT sector in the EU (3.9 %) was behind Japan (5.4 %), the US (5.3 %) and China (4.7 %) in 2014.

Source: European Commission, PREDICT database

The EU ICT sector **value added** amounted to EUR 593 bn in 2014. After a slowdown in 2009, the ICT sector experienced a recovery. A breakdown by sub-sector shows the predominance of ICT services (EUR 541 bn and 91 % of total ICT value added in 2014) over ICT manufacturing industries (EUR 52 bn and 9 % of total ICT value added in 2014). The ICT services sector (excluding telecommunications) is the only one that saw an increase in value added over the medium-term period (2006-2014) up to EUR 356 bn. The communication equipment sector experienced the sharpest decline over the medium-term period (2006-2014). After peaking at EUR 33 bn in 2007, it fell to EUR 15 bn in 2012, but recovered to EUR 19 bn in 2014.

** See methodological note.*

Figure 6.2: Value Added in the ICT sector, 2006-2014 (€m)

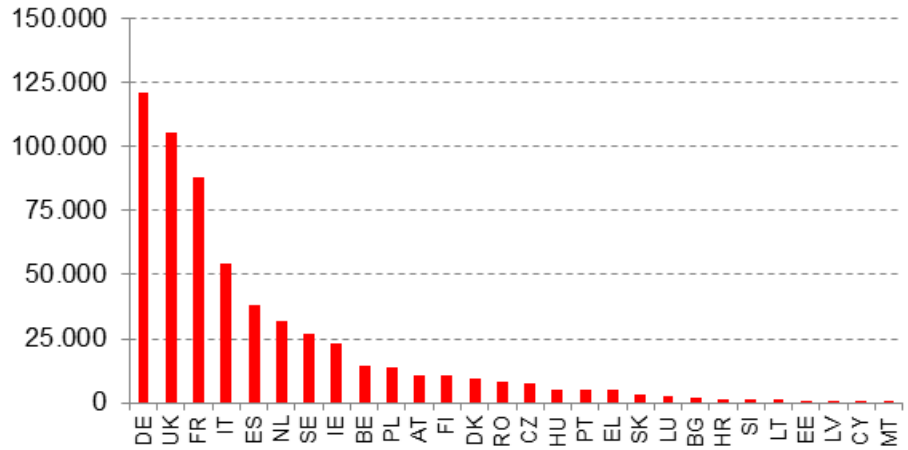


Source: European Commission, PREDICT database

The five largest economies (Germany, the United Kingdom, France, Italy and Spain) are the five biggest contributors to ICT value added in 2014. However, a medium-sized country like Ireland has by far the highest ICT share of GDP (12.1 % in 2014).

Unsurprisingly, the five largest economies were also the **five biggest contributors** to ICT value added in 2014: Germany (EUR 121 bn or 20 %), the United Kingdom (EUR 105 bn or 18 %), France (EUR 88 bn or 15 %), Italy (EUR 54 bn or 9 %) and Spain (EUR 38 bn or 6 %). Together, these five countries represented 68 % of total EU ICT value added in 2014.

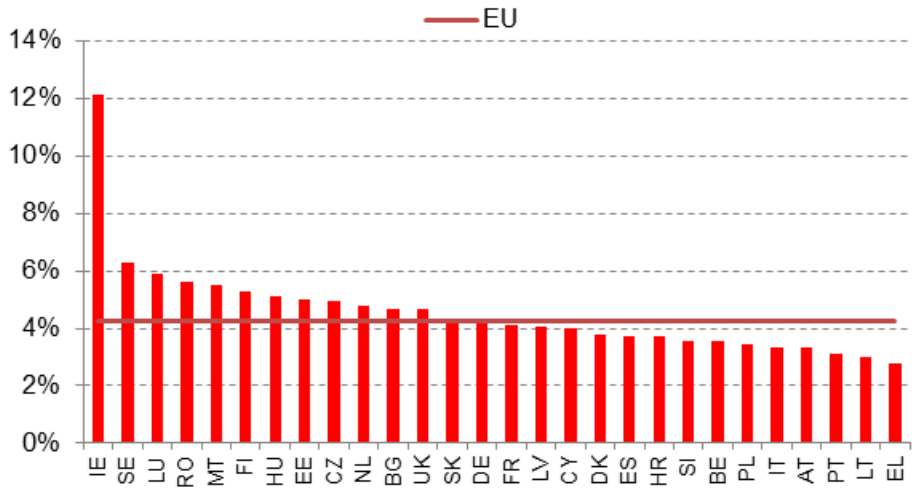
Figure 6.3: Value Added in the ICT sector, 2014 (€m)



Source: European Commission, PREDICT database

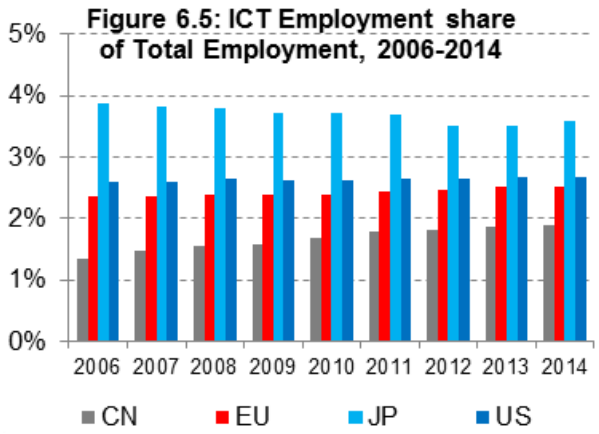
Ireland had by far the highest ICT share of GDP, with a rate of 12.1 % in 2014, while Greece was lagging behind with less than 3 %. After Ireland, countries with the highest share of ICT included Sweden (6.3 %) and Luxembourg (5.9 %). Some Member States (Romania, Hungary, and Estonia) also had a high rate (5 % or higher) of ICT as a share of GDP. In most other Member States, ICT remained broadly stable as a proportion of GDP over the medium-term period (2006-2014), except in Ireland where the rate increased by 4.2 pp. and in Finland where the rate fell by 3.3 pp..

Figure 6.4: ICT share of GDP, 2014



Source: European Commission, PREDICT database

The ICT sector employed 6.3 m people in 2014. The main employer was the ICT services sector (excluding telecommunications) with 4.5 m people in 2014. The share of employment in the ICT sector relative to total employment was 2.8 % in Europe in 2014.



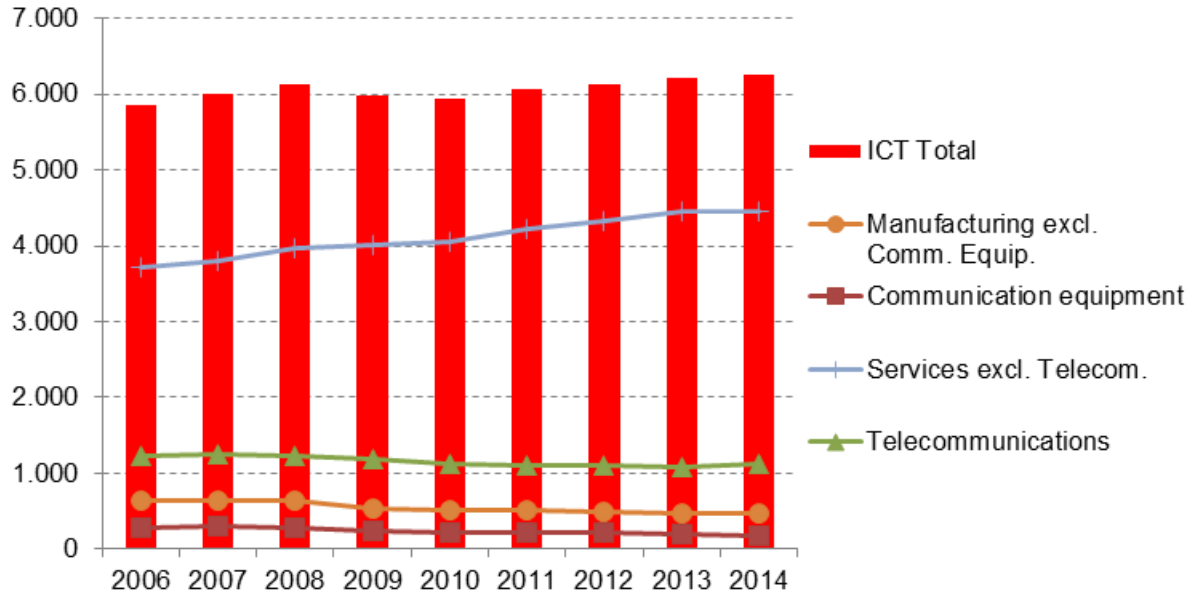
Employment in the ICT sector represented 2.8 % of EU total employment in 2014 (comprehensive definition*), remaining stable over the medium-term period. According to the operational definition* which enables world comparisons, in comparison with the US (2.7 %), the EU (2.5 %) fared better than China (1.9 %), but all three lagged markedly behind Japan (3.6 %) in 2014.

Source: European Commission, PREDICT database

The ICT sector employed 6.3 m people in 2014, the highest in the observed period. The ICT services sector (excluding telecommunications) employed 4.5 m people and accounted for 71 % of total ICT employment in 2014. It is the only sector that recorded a structural increase (of 20 %) over the medium-term period (2006-2014). The telecommunications sector employed 1.1 m people in 2014, a number which fell over the medium-term period by 7 %. The ICT manufacturing industries sector (excluding communication equipment) employed 477 000 people in 2014 and this number fell since 2006 by 26%. The communication equipment sector recorded the sharpest structural decline in 2014, falling to 186 000 people (-34 %).

** See methodological note*

Figure 6.6: Employment in the ICT sector, 2006-2014 (1000 persons)

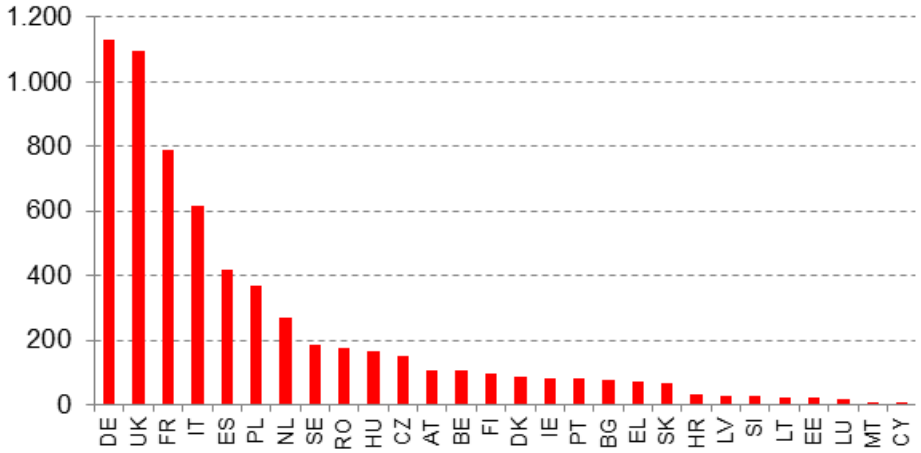


Source: European Commission, PREDICT database

The five largest economies (Germany, the United Kingdom, France, Italy and Spain) are the five biggest employers in the ICT sector in 2014. However, small countries like Luxembourg and Malta had the highest rate of ICT employment as a share of total employment in 2014.

As in the case of value added, the five largest economies were also the **five largest employers** in the ICT sector in 2014: Germany (over 1.1 m people or 18 %), the United Kingdom (1.1 m people or 17 %), France (787 000 people or 13 %), Italy (614 000 people or 10 %) and Spain (416 000 people or 7 %). Together, the five largest employers represented 64 % of total ICT employment in 2014.

Figure 6.7: Employment in the ICT sector, 2014 (1000 persons)

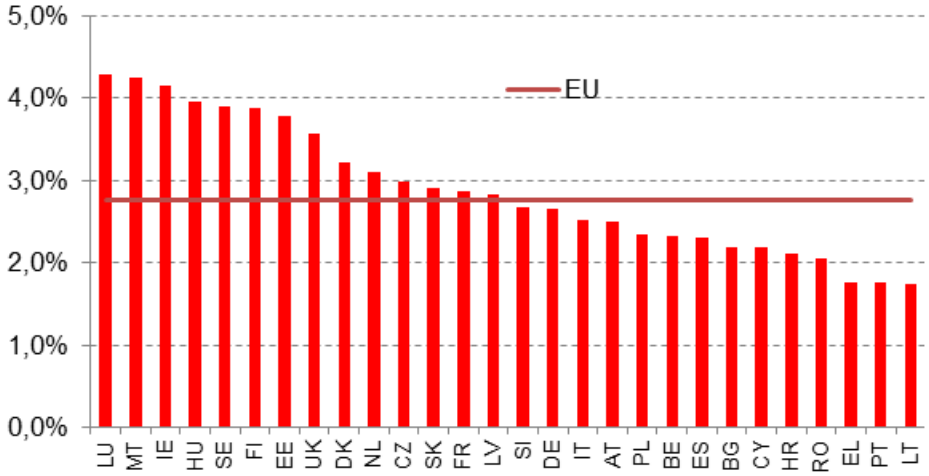


Source: European Commission, PREDICT database

Luxembourg and Malta were in pole position with 4.3 % of ICT employment as a share of total employment in 2014, and Lithuania had the lowest rate of only 1.8 %. Other countries that were performing well in 2014 included Ireland (4.2 %) and Hungary (4.0 %). Sweden and Finland

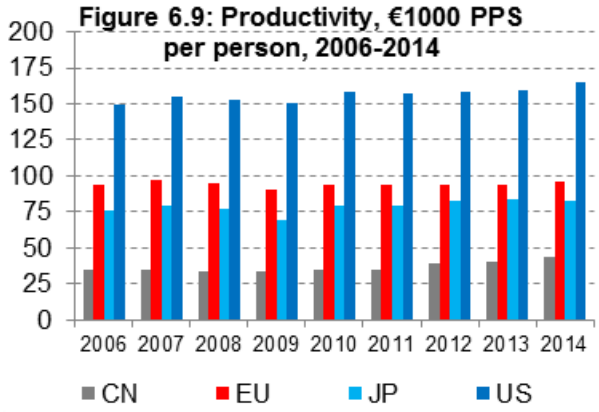
followed closely behind with 3.9 % rates. Over the medium-term period (2006-2014), the share of ICT employment as a proportion of total employment remained stable in most countries, but small countries like Latvia, Estonia and Luxembourg made significant progress, increasing by more than 1 p.p..

Figure 6.8: ICT Employment share of Total Employment, 2014



Source: European Commission, PREDICT database

Productivity in the ICT sector amounted to EUR 95 000 per person in 2014. Productivity in the telecommunications sector is by far the highest. However, as regards productivity in the ICT sector, the EU compares with Japan but lagged markedly behind the US.



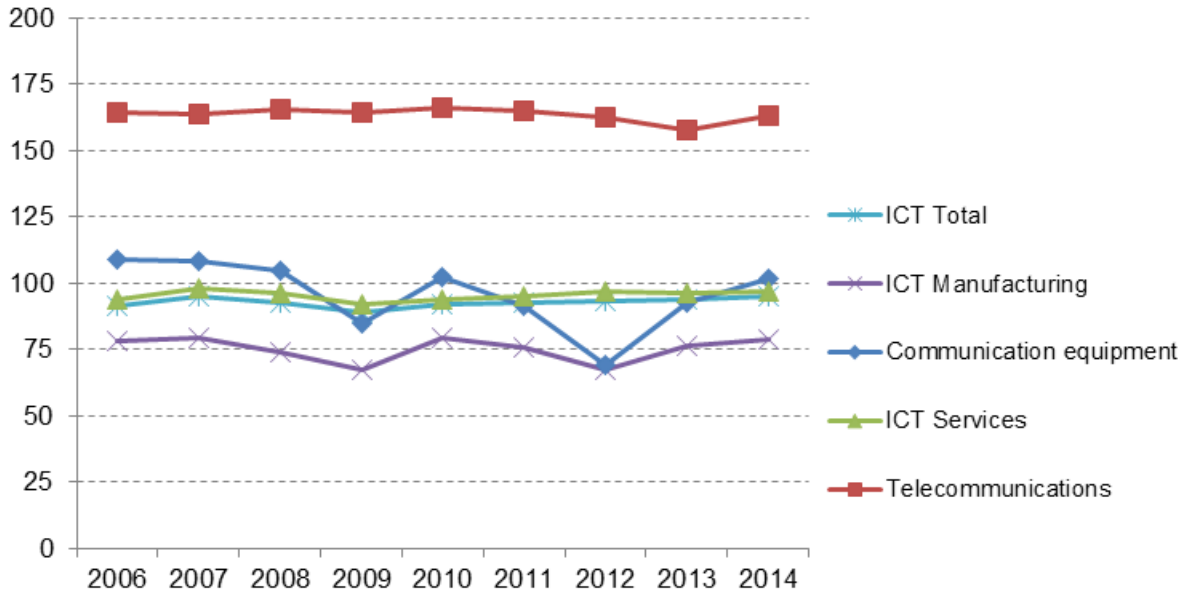
Regarding the **productivity** of the ICT sector (according to the operational definition* which enables world comparisons), the EU (EUR PPS 96 000 per person) is markedly behind the US (EUR PPS 165 000 per person), higher than Japan (EUR PPS 83 000 per person), but far higher than China (EUR PPS 44 000 per person), which in this respect is still an emerging country.

Source: European Commission, PREDICT database

Productivity in the ICT sector (comprehensive definition*) amounted to EUR 95 000 per person in 2014, remaining broadly stable over the medium-term period (2006-2014). In the ICT manufacturing sector, productivity was below average (EUR 79 000 per person in 2014); 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 manufacturing sector, productivity in the ICT services sector as a whole (i.e. services and trade), which stood at EUR 97 000 per person in 2014, is not sensitive to business cycles. Productivity in the telecommunications sector is by far the highest (at EUR 163 000 per person in 2014).

** See methodological note.*

Figure 6.10: Productivity - ICT sector (Comprehensive definition), Thousands of current euros per person, 2006-2014

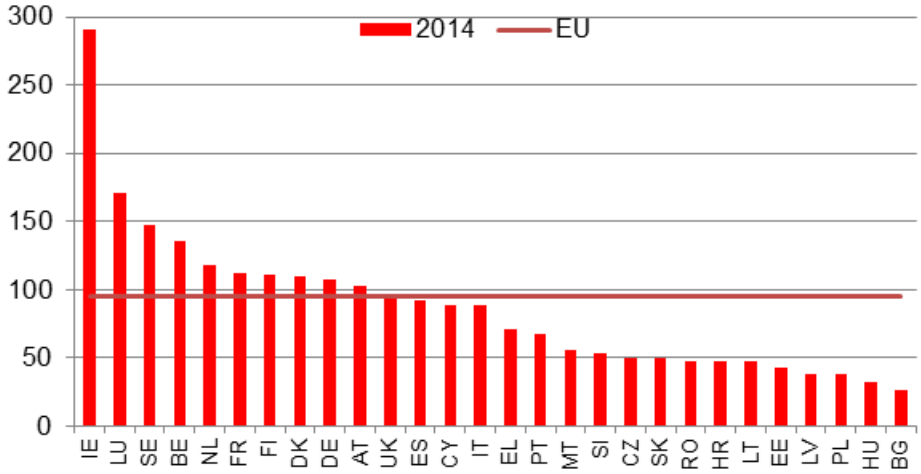


Source: European Commission, PREDICT database

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

In terms of labour productivity in the ICT sector, Ireland (EUR 291 000 per person) by far led the way in 2014, but Luxembourg (EUR 171 000 per person) and Sweden (EUR 147 000 per person) fared well too. At the opposite end of the scale were Bulgaria (EUR 27 000 per person), Hungary (EUR 32 000 per person) and Poland (EUR 38 000 per person).

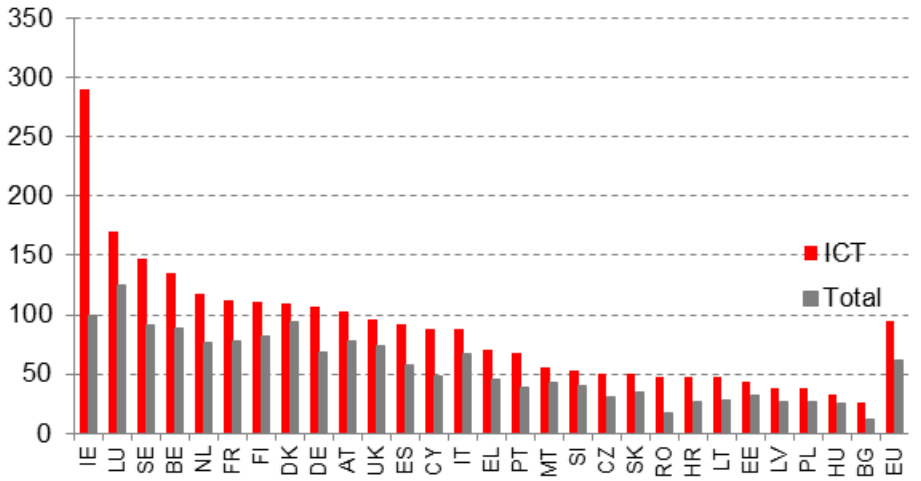
Figure 6.11: Productivity - ICT sector (Comprehensive definition), Thousands of current euros per person, 2014



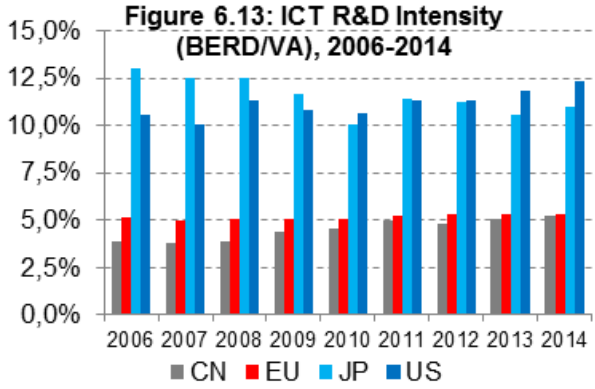
Source: European Commission, PREDICT database

The picture for labour productivity in the economy as a whole was broadly similar. Luxembourg (EUR 125 000 per person) and Ireland (EUR 100 000 per person) were the best-performing countries, while Bulgaria (EUR 12 000 per person) and Romania (EUR 17 000 per person) were at the bottom of the table.

Figure 6.12: Productivity - ICT and Total, Thousands of current euros per person, 2014



Source: European Commission, PREDICT database



Business Enterprise R&D expenditure (BERD) in the ICT sector amounted to EUR 30 bn in 2014. The ICT services sector was responsible for 62 % (EUR 18 bn) of ICT BERD in 2014. ICT R&D intensity amounted to 5 % in 2014 in the EU, markedly behind the US and Japan.

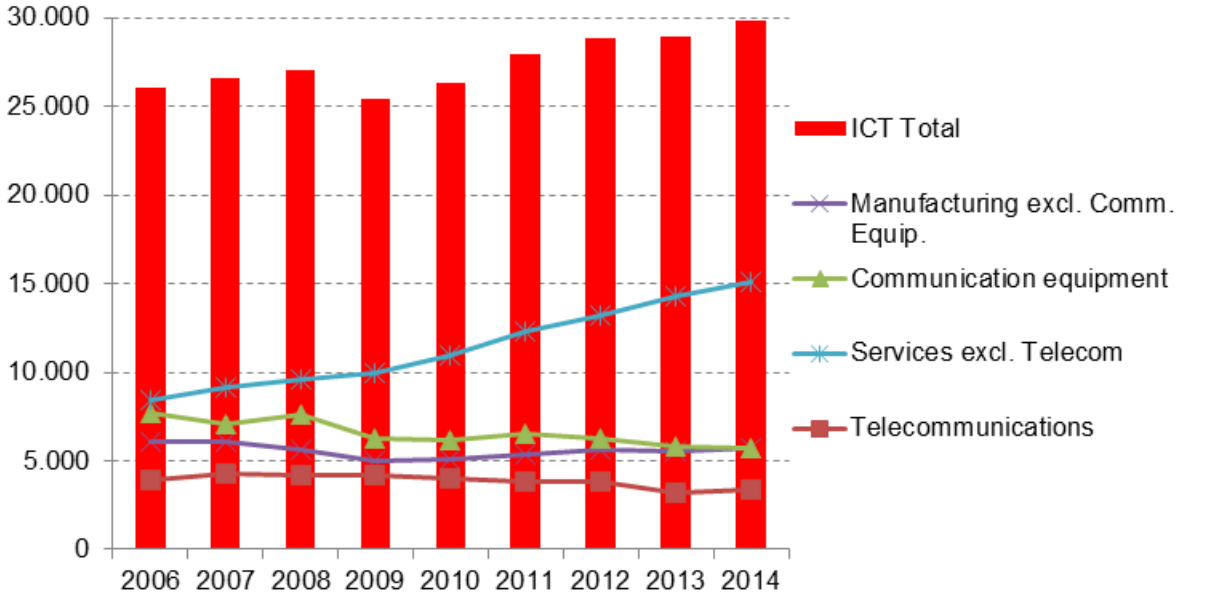
R&D intensity in the ICT sector (comprehensive definition*) amounted to 5 % in 2014. According to the operational definition* which enables world comparisons, although the EU (5.3 %) compares to China (5.2 %), both the EU and China lagged behind the US (12.3 %) and Japan (11 %) in 2014.

Source: European Commission, PREDICT database

Business Enterprise R&D expenditure (BERD) in the ICT sector amounted to EUR 30 bn in 2014, its highest point over the medium-term period (2006-2014), an improvement on its lowest point of EUR 25 bn reached in 2009. A breakdown by sub-sector reveals a more balanced situation for BERD than for value added – despite accounting for only 9 % of ICT value added, the ICT manufacturing sector was responsible for 38 % of total ICT BERD (EUR 11 bn) while the ICT services sector was responsible for 62 % (EUR 18 bn) of ICT BERD in 2014. Over the medium-term period (2006-2014), the situation was quite different. The ICT manufacturing sector saw a structural decline (falling by 17 % from 2006 to 2014), whereas the ICT services sector saw a structural increase (rising by 49 % over 2006-2014), particularly in the ICT services sector excluding telecoms, which saw an increase of 79 % from 2006 to 2014.

** See methodological note*

Figure 6.14: ICT Business Expenditure in R&D (BERD), 2006-2014 (€mio)

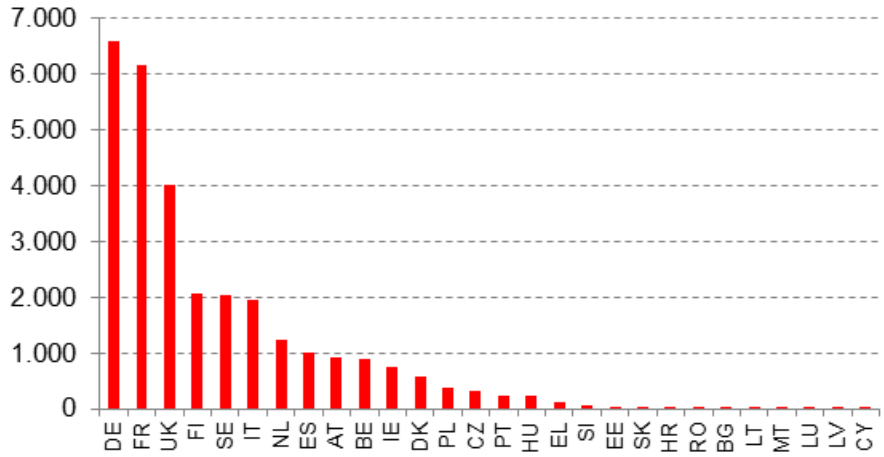


Source: European Commission, PREDICT database

The six main contributors in terms of ICT R&D expenditure in 2014 were the four largest economies in the EU: Germany, France, the United Kingdom and Italy, together with two Nordic countries: Finland and Sweden.

The six main contributors in terms of R&D expenditure in the ICT sector in 2014 were the four largest economies in the EU – Germany (EUR 6.6 bn or 22 %), France (EUR 6.2 bn or 21 %), the United Kingdom (EUR 4.0 bn or 13 %) and Italy (EUR 2.0 bn or 7 %), together with two Nordic countries – Finland (EUR 2.1 bn or 7 %) and Sweden (EUR 2.0 bn or 7 %), confirming the importance of Nordic countries for ICT R&D. Together, the six largest contributors represented 77 % of total ICT Business R&D expenditure in 2014.

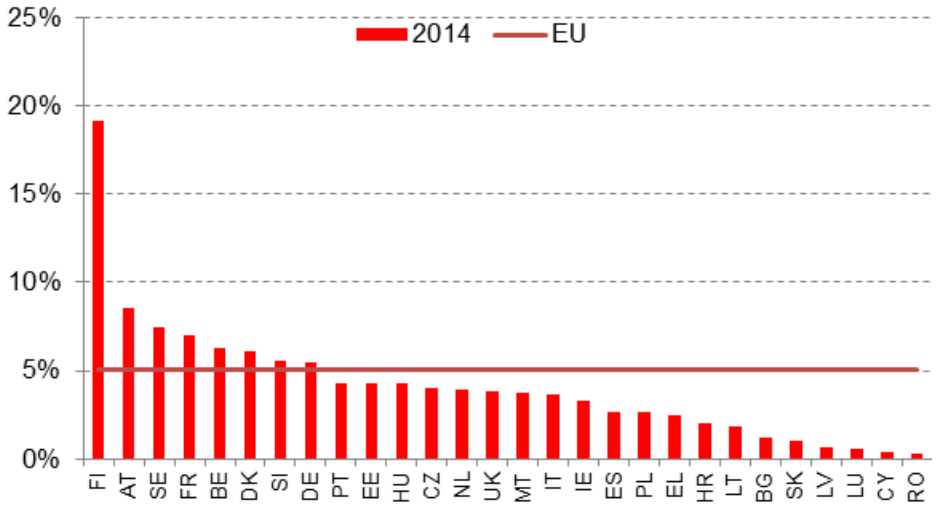
Figure 6.15: R&D Expenditure in the ICT sector, 2014 (€m)



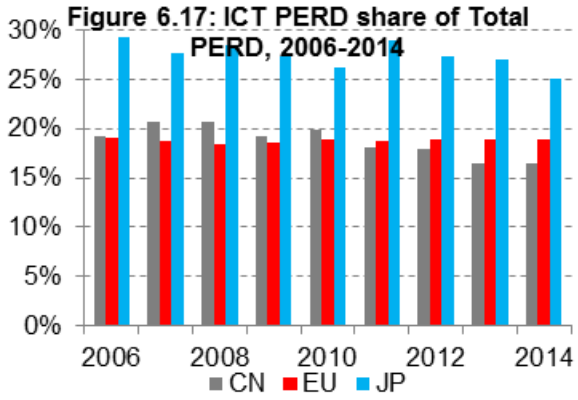
Source: European Commission, PREDICT database

Finland was by far leading the way in the EU with a 19.2 % ICT BERD intensity rate in 2014. Romania was the poorest performer with a rate of 0.3 %. Of the Nordic countries, Sweden had a rate of 7.5 % and Denmark had a rate of 6.1 %. Other strong performers include Austria (8.6 %), France (7 %), and Belgium (6.2 %). Over the medium-term period (2006-2014), ICT R&D intensity remained broadly stable, but some eastern countries (Poland, Hungary, and Lithuania) made significant progress.

Figure 6.16: ICT R&D Intensity (BERD/VA), 2014



Source: European Commission, PREDICT database



ICT R&D personnel included 292 000 full-time equivalents (FTEs) in 2014. The top employer was the ICT services sector (excluding telecoms), employing 181 000 FTEs in 2014 (62 % of ICT R&D personnel). ICT R&D personnel made up 20 % of total R&D personnel in 2014.

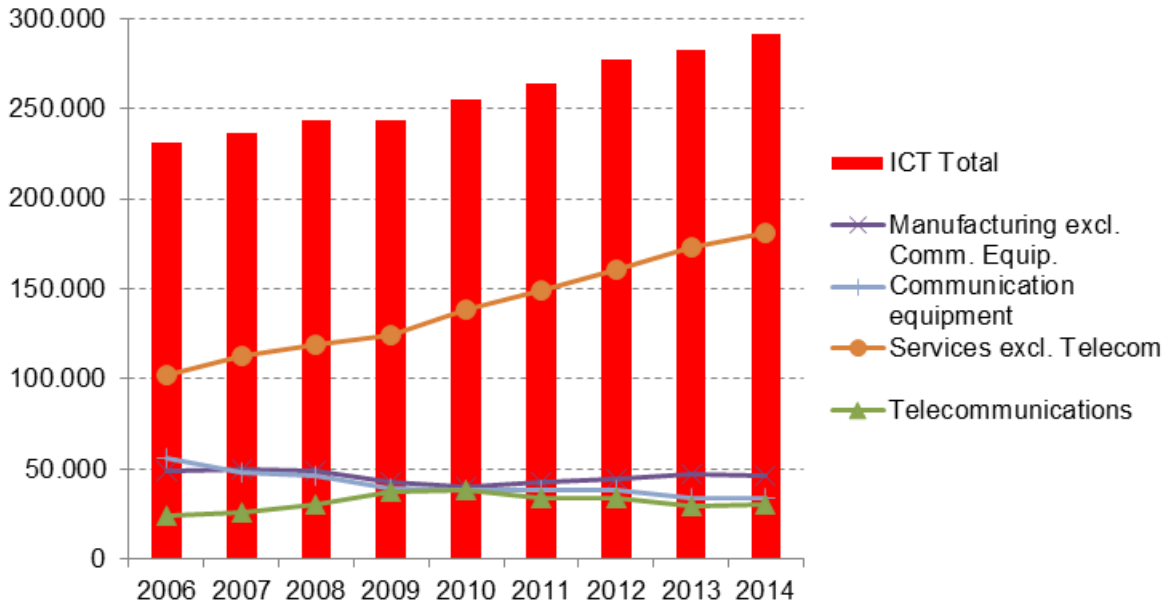
R&D personnel in the ICT sector (comprehensive definition*) made up 20 % of total R&D personnel in 2014, a figure which remained stable over the medium-term period. However, according to the operational definition* which enables world comparisons, the EU (19 %) and China (17 %) were behind Japan (25 %) in 2014 and over the medium-term period (no data available for the US).

Source: European Commission, PREDICT database

R&D personnel in the ICT sector included 292 000 full-time equivalents (FTEs) in 2014, a figure which rose over the medium-term period (2006-2014), growing faster after 2009. The ICT services sector (excluding telecommunications) employed 181 000 FTEs in 2014 (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 2014, representing a slight fall over the medium-term (2006-2014) despite signs of recovery after 2010. The communication equipment sector stabilized in 2014. The telecommunications sector employed 30 000 FTEs in 2014 (10 % of R&D personnel in the ICT sector), and was on a downward trend (falling about 22 % from its peak of 39 000 FTEs in 2010).

** See methodological note.*

Figure 6.18: ICT Business R&D Personnel, 2006-2014 (FTE)

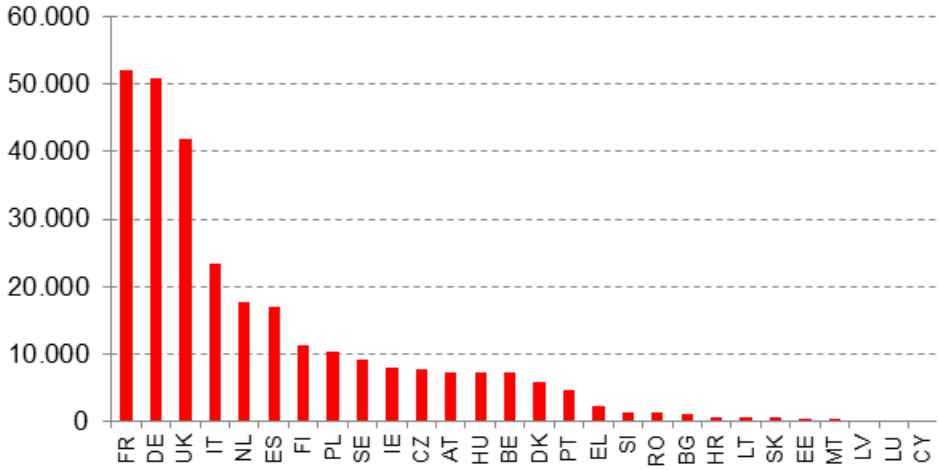


Source: European Commission, PREDICT database

The four largest economies were also the four biggest employers of ICT Business R&D personnel in 2014: France, Germany, the United Kingdom and Italy. Malta and Ireland were the two countries with the highest concentration of ICT Business R&D personnel in 2014.

The four largest economies were also the **four biggest employers** of R&D personnel in the ICT sector in 2014 – France (52 000 or 18 %), Germany (51 000 or 17 %), the United Kingdom (42 000 or 14 %) and Italy (23 000 or 8 %). Together, the four biggest employers represented 58 % of total R&D personnel in the ICT sector in 2014.

Figure 6.19: ICT Business R&D Personnel, 2014 (FTE)

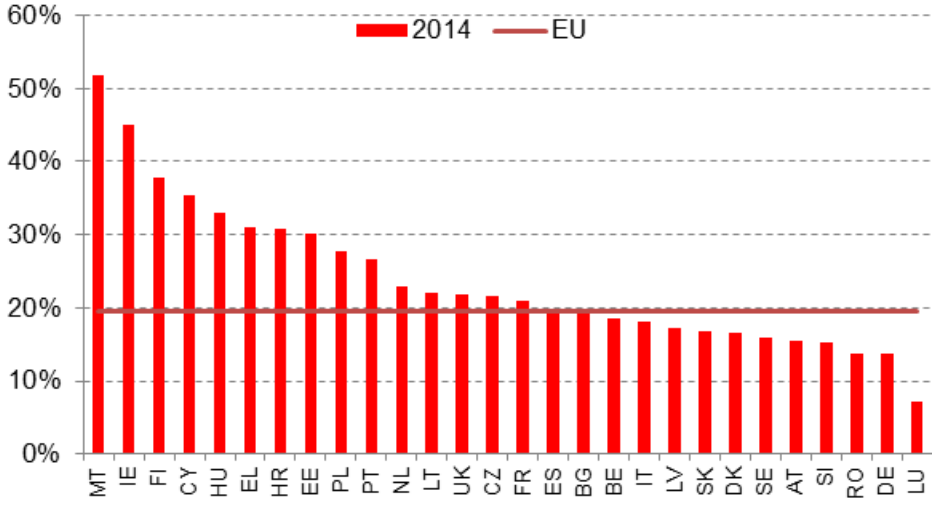


Source: European Commission, PREDICT database

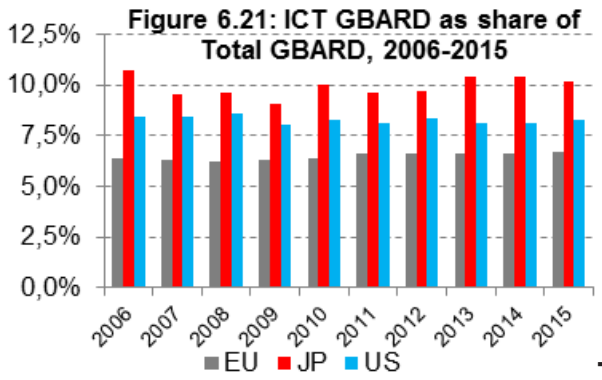
Malta (52 %) and Ireland (45 %) were the two countries with the highest concentration of R&D personnel in the ICT sector in 2014. Luxembourg had the lowest concentration (7 %).

Other strong performers were Finland (38 %), Cyprus (35 %) and Hungary (33 %).

Figure 6.20: ICT PERD as share of Total PERD, 2014



Source: European Commission, PREDICT database



The estimated level of publicly funded expenditure on ICT R&D in the EU reached EUR 6.3 bn in 2015. Estimated public ICT R&D expenditure was more than 20 % below the necessary trend line for doubling publicly funded R&D in ICT between 2007 and 2020.

In 2015*, ICT **public funding** represented 6.7 % 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 (8.3 %) and Japan (10.2 %), a relative position that remained stable over the medium-term period (no data available for China).

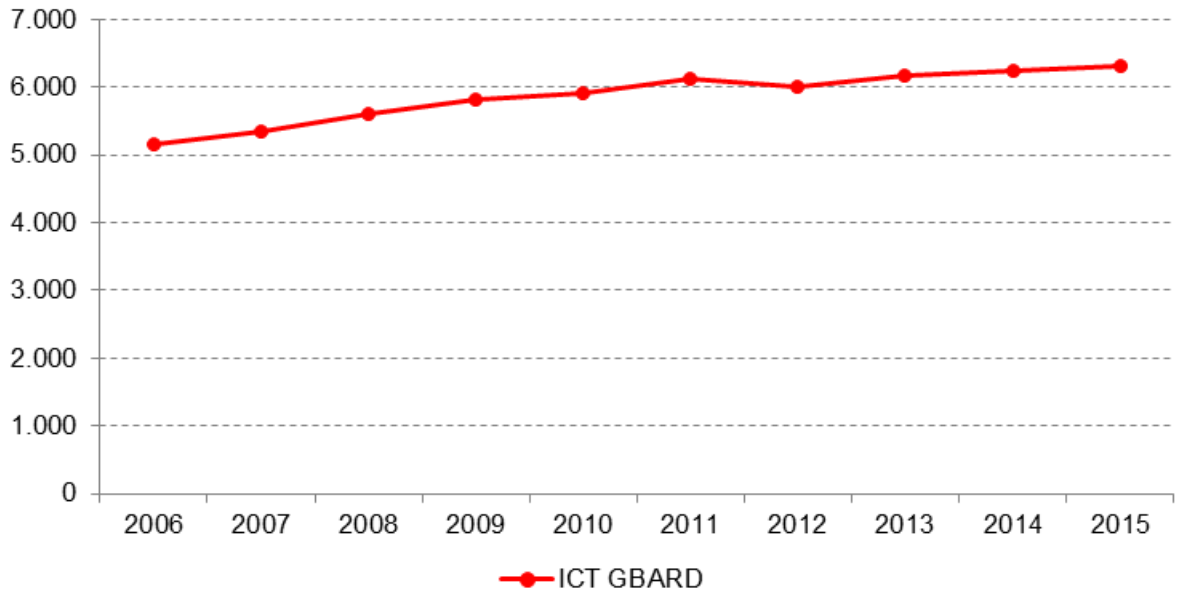
Source: European Commission, PREDICT database

After rising for several years, the estimated level of publicly funded expenditure on ICT R&D in the EU fell in 2012, but recovered in 2013, and by 2015 had exceeded its historical peak of EUR 6.2 bn in 2014, reaching EUR 6.3 bn.

The Digital Agenda target of doubling publicly funded R&D in ICT between 2007 and 2020 requires an annual growth rate of 5.5 % (assuming constant annual growth rate). Estimated public ICT R&D expenditure was below the necessary trend line in 2015, with a gap of more than 20 %.

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

Figure 6.22: ICT GBARD, 2006-2015 (€m)



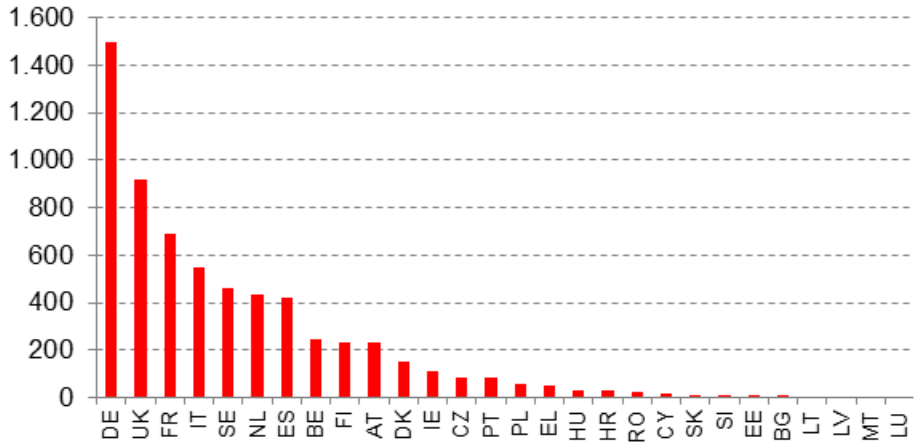
Source: European Commission, PREDICT database

The five biggest public funders of R&D in ICT in 2015 were Germany, followed by the United Kingdom, France, Italy and Sweden. Cyprus was surprisingly leading the way in the EU with a 2.11 % ICT GBARD as a proportion of ICT VA in 2014.

The **five biggest public funders** of R&D in ICT in 2015 were Germany (EUR 1.5 bn or 24 %), followed by the United Kingdom (EUR 915 m or 15 %), France (EUR 689 m or 11 %), Italy (EUR 550 m or 9 %) and Sweden (EUR 458 m or 7 %).

Together, those five countries represented 65 % of total public funding for R&D in ICT.

Figure 6.23: Public funding ICT R&D Expenditure, 2015 (€m)

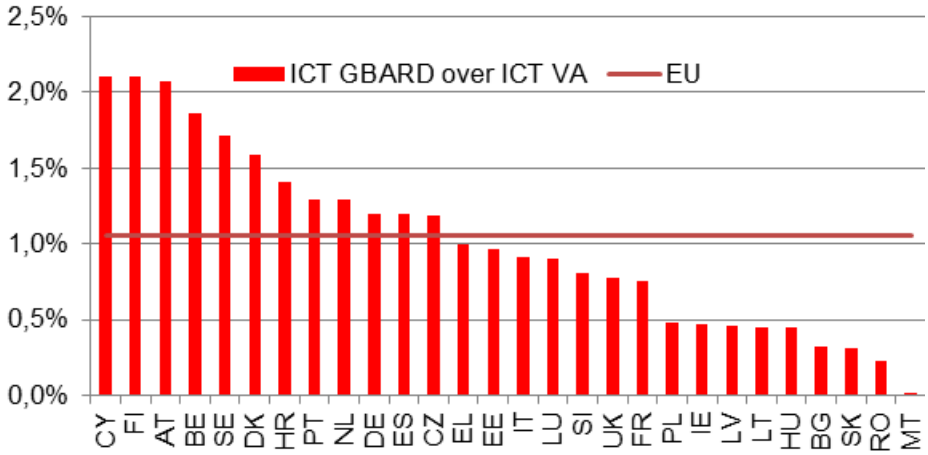


Source: European Commission, PREDICT database

Cyprus was surprisingly leading the way in the EU with a 2.11 % ICT GBARD as a proportion of ICT VA in 2014. Unsurprisingly, the ranking in 2014 again reveals a strong performance by Nordic countries: Finland (2.10 %), Sweden (1.71 %) and Denmark (1.59 %).

However, some other countries also attribute special importance to ICT in their R&D public spending, such as Austria (2.07 %) and Belgium (1.87 %).

Figure 6.24: ICT GBARD share of ICT VA, 2014



Source: European Commission, PREDICT database

A group of three countries takes a significant lead with scores above 150 (the benchmark has been set to equal 100 for Europe in 2011) in the innovation output indicator: Finland (177), Ireland (162) and Sweden (153).

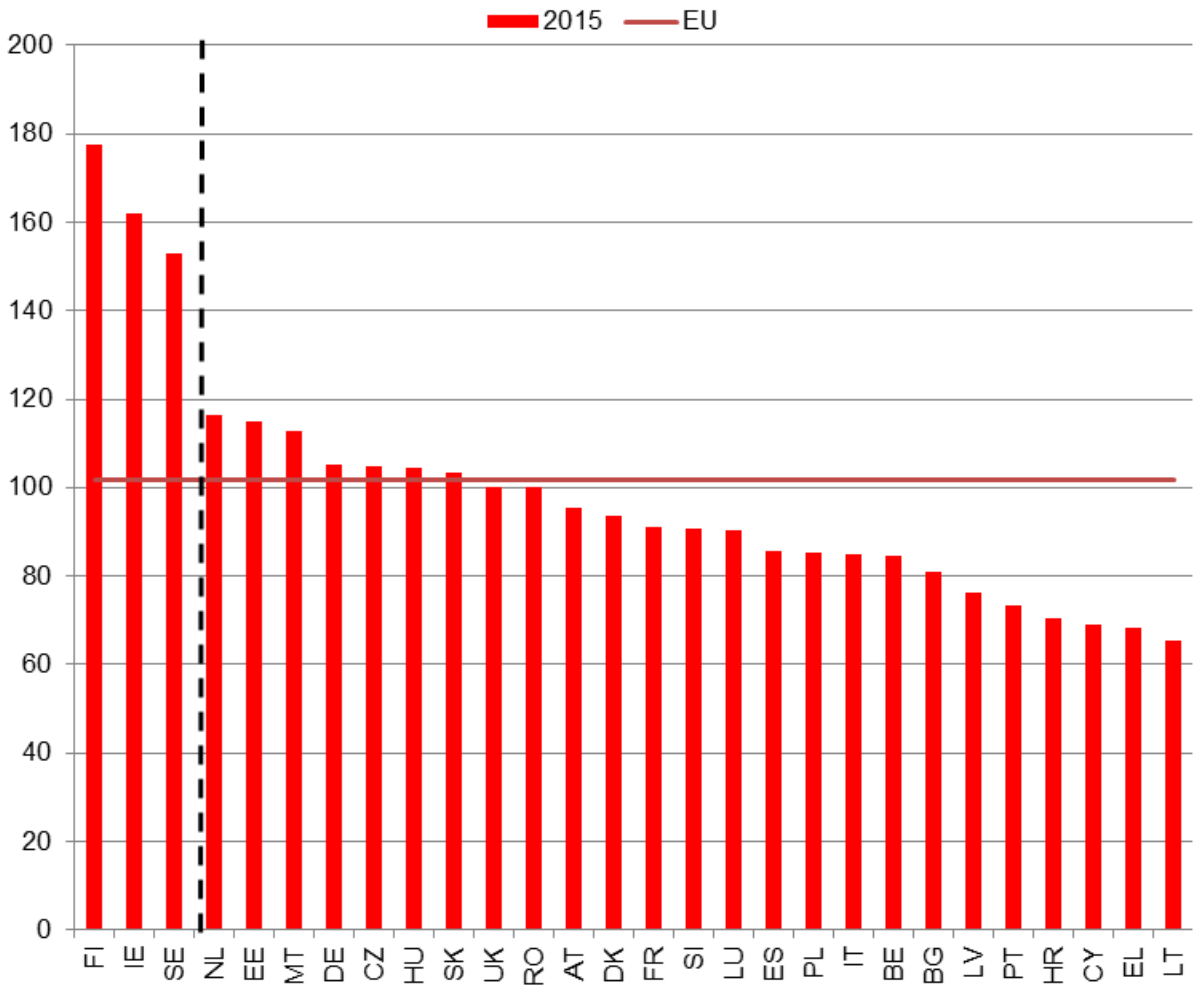
The innovation output indicator is a composite indicator that focuses on four output-oriented innovation measures (see methodological note).

A group of three countries takes a significant lead with scores above 150 (the benchmark has been set to equal 100 for Europe in 2011): Finland (177), Ireland (162) and Sweden (153).

The three top scores in ICT innovation output result from very high ICT contributions in the trade of knowledge-intensive services, above average levels of fast-growing innovative ICT employment for Ireland and remarkable results for ICT patenting in Finland and Sweden.

At the lowest end of the scale are Cyprus (69), Greece (68) and Lithuania (65).

Figure 6.25: ICT Output Indicator, 2015



Source: European Commission, EURIPIDIS database

ICT INNOVATION OUTPUT INDICATOR
by Component

The contribution of ICT has been computed for each underlying component of the innovation output indicator. The ICT contributions for Europe are:

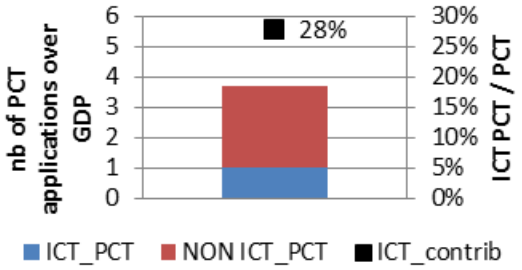
1. 28% in technological innovation as measured by patents (PCT_ICT)

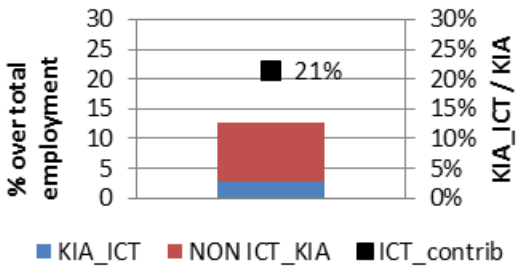
2. 21% in absorption of skills as measured by employment in knowledge intensive activities (KIA_ICT)

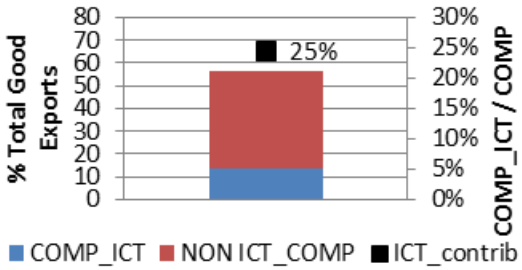
3. 25% in competitiveness of knowledge goods as measured by exports of medium-high tech goods (COMP_GOOD_ICT)

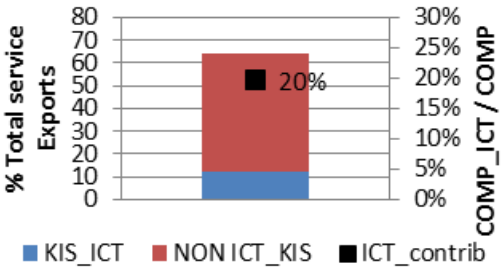
4. 20% in competitiveness of knowledge services as measured by exports of knowledge intensive services (KIS_ICT)

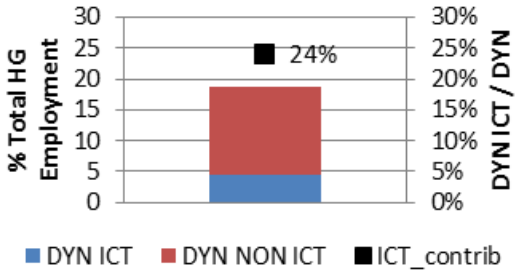
5. 24% in innovative firm's dynamics as measured by average innovativeness scores (employment-weighted) of fast-growing firms (DYN_ICT)











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 2008-2014. It corresponds to the definition provided by the OECD in 2007.

The **operational definition** of the ICT sector enables an international comparison with non-EU countries over a longer period (2006-2014), 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 following 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 the JRC's PREDICT and RISES projects.

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. owing to updates of the original data or the use of multiple auxiliary sources and variables.

ICT INNOVATION OUTPUT INDICATOR
Methodology

The Innovation output indicator is a composite indicator that focuses on four output-oriented innovation measures (see list)

$$I_{ICT} = w_1 PCT_{ICT} + w_2 KIA_{ICT} + w_3 COMP_{ICT} + w_4 DYN_{ICT}$$

The weights *w1, w2, w3, w4* are the weights of the component indicators, fixed over time and country

The weights are calculated in such a way that the linear correlations between each single component and the final scores of the composite indicator are almost the same (i.e. balanced). Each single weight is different from the other but the correlation coefficients are the same (or very close).

See sources (below) for further details on the methodology.

- PCT_{ICT}: patent applications per billion GDP
- KIA_{ICT}: employment in knowledge-intensive activities in business industries as a % of total employment

KIA measures the percentage of highly educated (tertiary degree level) employees in each sector (i.e. is a proxy of employees' skills efficiency)

- $COMP_{ICT}$= 0.5*GOOD+0.5*SERV

GOOD: The share of medium-tech and high-tech products in total goods exports

SERV: Knowledge-intensive services as a share of the total services exports

- DYN_{ICT}: average (employment-weighted) innovativeness scores of fast-growing firms

DYN is a measure of fast-growing firms based on the average innovativeness scores of fast-growing enterprises

Sources: JRC Technical report, how much does ICT contribute to innovation output? An analysis of the ICT component in the innovation output indicator, Annarosa PESOLE, 2015

"Developing an indicator of innovation output", Commission Staff Working Document- SWD (2013) 325 final.

7. Research and Innovation: ICT projects in Horizon 2020

In its first three years of implementation, Horizon 2020 has allocated EUR4 billion of EU funding to 1 369 projects in the field of ICT, attracting 4 832 organisations.

Annual funding has increased compared with the previous Framework Programme, FP7, where average annual funding was EUR 1.08 bn a year. **Leadership in Enabling and Industrial Technologies** (LEIT) **ICT** (including the SME instrument) accounts for the majority of funding (65 %), participations (64 %) and 73 % of projects.

Excellence in science[1] accounts for slightly over one fifth of the budget (22 %) and participations (21 %) and 13 % of projects. **Societal Challenges** (SC) 1,6 and 7 account for 13 % of the budget, 14 % of projects and 15 % of participations.

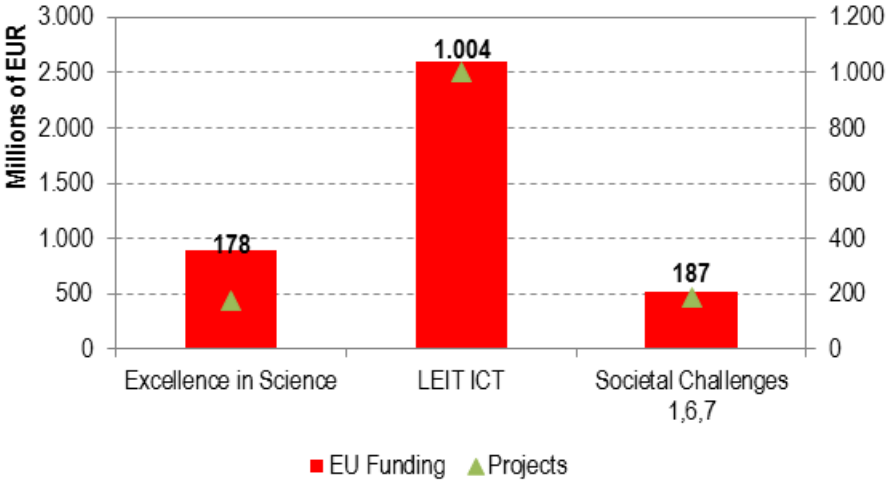
H2020 has been able to attract **new participants**: about 2 000 organisations (41 %) had not participated in FP7. The vast majority (80 %) of new participants are private entities.

Slightly more than 1 950 SMEs have taken part to H2020 so far, the majority of which (1 086) had not participated in FP7.

Figure 7.1: EU Funding and projects funded, 2014-2016 (H2020) and annual average FP7

[1] eInfrastructures, FET Open, FET Proactive, FET Flagships and High Performance Computing.

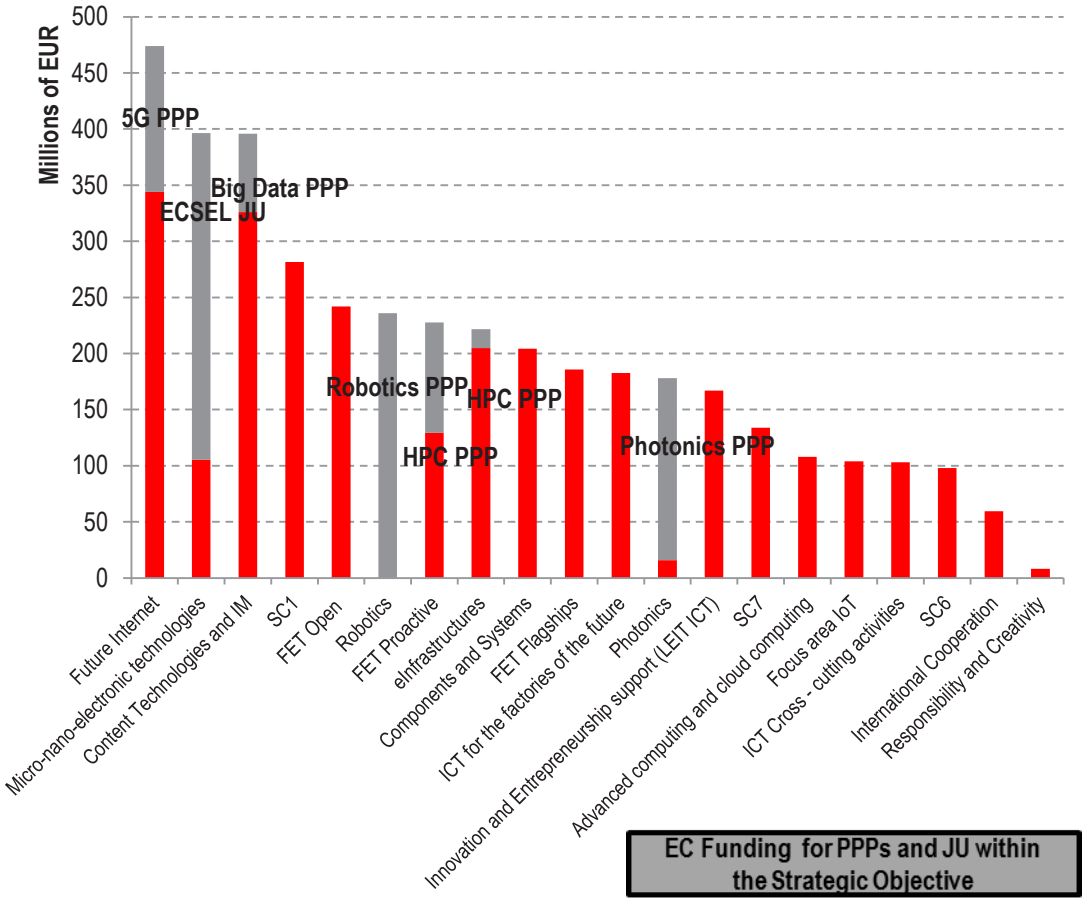
Figure 7.2: EU Funding and projects by Pillar, cumulated values 2014 - 2016



Future Internet and Micro – and Nanoelectronic technologies are the areas that attract the highest number of participants and funding.

Within the Work Programme Area 'Future Internet', the contractual **Private Public Partnership** (cPPP) **for 5G** accounts for EUR 130 m. 'Micro–Nanoelectronic technologies' includes funding for the **Electronic Components and Systems for European Leadership** (**ECSEL**) **Joint Undertaking** of EUR 291 m. Within 'Content Technologies and Information Management', the Big Data cPPP accounts for EUR 70 m, whereas the EU funding to the **Robotics cPPP** amounts to EUR 236 m. The **High Performance Computing** (**HPC**) and **Photonics** cPPPs account for EUR 116 and EUR 162 m, respectively. SC1 on 'Health, demographic change and wellbeing' receives the highest funding among the SCs: EUR 282 m, followed by SC7 on Secure Societies (EUR 134 m). Projects for inclusive, innovative and reflective societies (SC6) receive EUR 98 m. 'FET Open' has total funding of EUR 242 m, FET Proactive and the two Flagships EUR 228 and EUR 128 m respectively.

Figure 7.3: EU funding by Work Programme Area, cumulated values 2014-2016



Source: European Commission, based on CORDA

Research and Innovation Actions are the prevailing type of action.

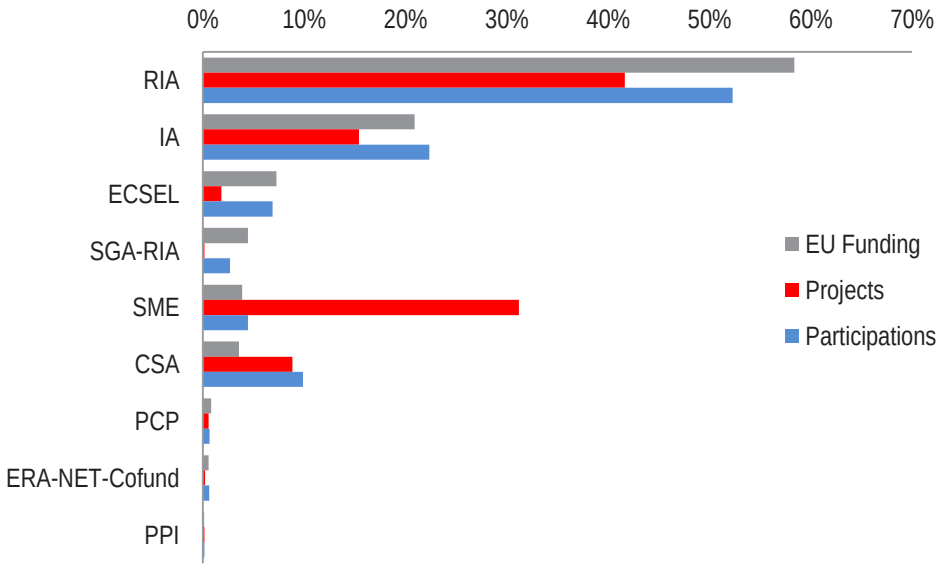
Research and innovation actions account for 58 % of funding, 52 % of participations and 42 % of projects. **Innovation actions** follow, with 21 % of funding, 22 % of participations and 15 % of projects.

Coordination and support actions account for 9 % of projects, 10 % of participations and 4 % of funding.

The **SME instrument** projects (LEIT ICT, SC1 and SC6) account for 31 % of projects, and 4 % of funding and participations.

The three **ERA-NET actions** (in FET Proactive, FET Flagships and Photonics) account for 1 % of funding and participations.

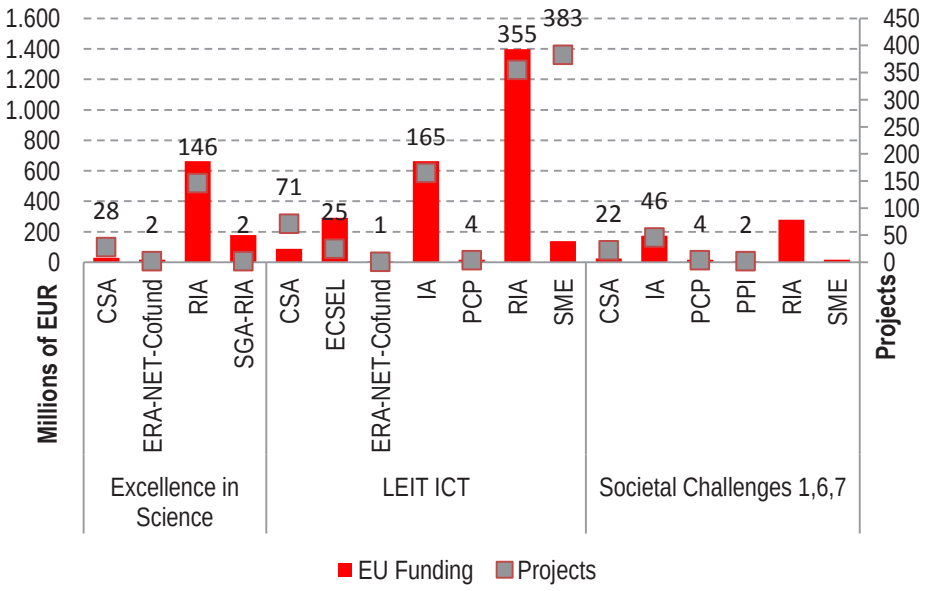
Figure 7.4: EU Funding, projects and participations by type of action, cumulated values 2014-2016



Source: European Commission, based on CORDA

The **average project size** differs by action and pillar: RIAs are projects of EUR 3.9 m in LEIT ICT, EUR 4 m in SCs and EUR 4.5 m in Excellence in Science. The average IA receives EUR 4 m on in LEIT ICT and 3.8 m in SCs. The average size of the CSAs is EUR 1.1 m, whereas Pre-Commercial Procurement (PCP) and Public Procurement for Innovation (PPI) actions are as big as EUR 4.2 m and EUR 2.7 m respectively. The ERA-NET actions account for an average EUR 8.8 m in Excellence in Science and EUR 5.7 m in LEIT ICT.

Figure 7.5: EU Funding and projects by action and Pillar, cumulated values 2014-2016



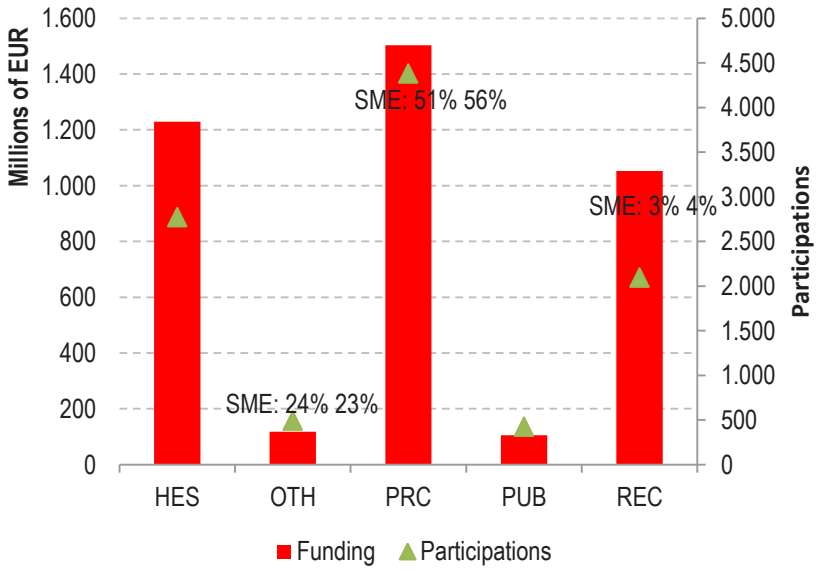
Source: European Commission, based on CORDA

Under H2020 the enterprise sector shows an increase in participation compared with FP7, accounting for 43 % of participations and 38 % 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 **half of all project participations** (48 %) and receive the **highest funding** (57%). 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 38 % of the budget and 43 % 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 %.

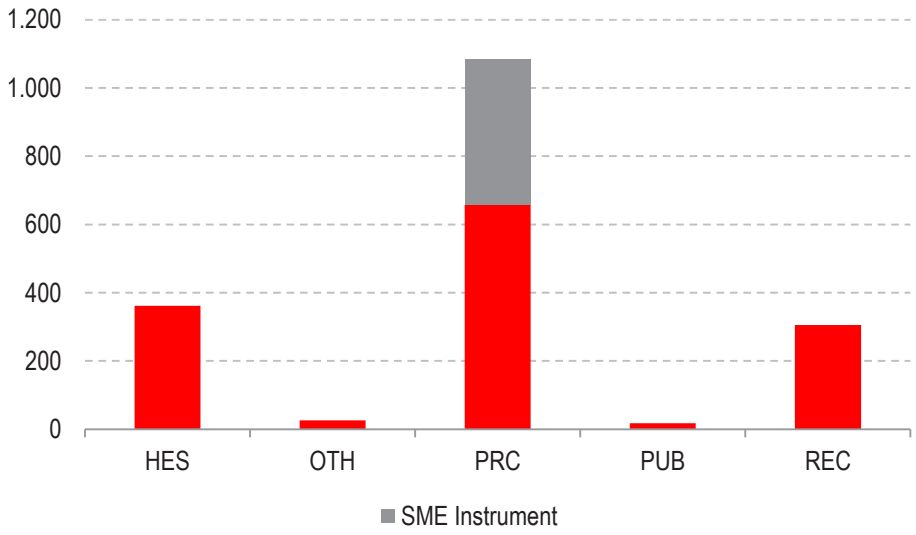
Figure 7.6: Participations and EU funding by type of organisation, cumulated values 2014-2016



Source: European Commission, based on CORDA

HES/REC and **PRC** coordinate 48 % of projects respectively. SMEs coordinate 40 % of projects; this is however 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 enterprises coordinate a lower share of projects (9 %) compared with 18 % under FP7.

Figure 7.7: Project coordinators by type of organisation, cumulated values 2014-2016



Source: European Commission, based on CORDA

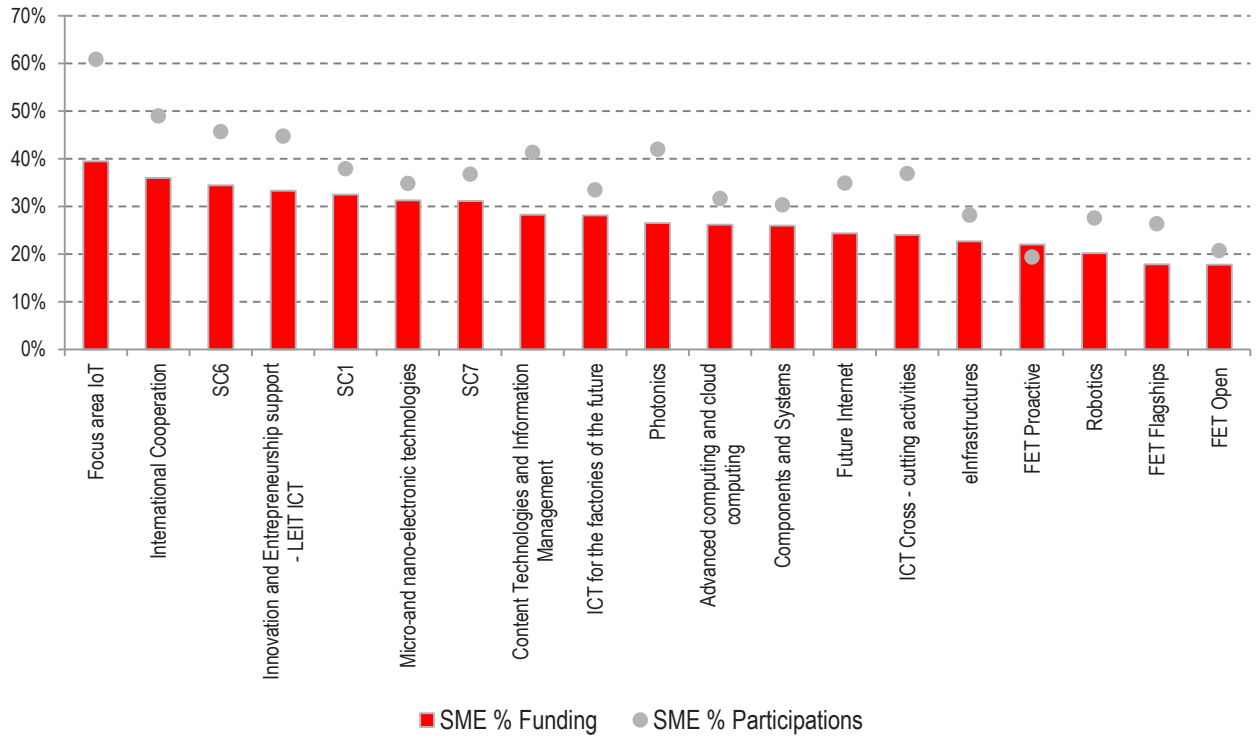
SMEs are especially present in the Work Programme area Focus Area Internet of Things, International Cooperation and Societal Challenge 6

SMEs represent 40 % of participating organisations and their participation varies according to pillar and Work Programme Area. They are very present in the 'Focus Area IoT', in the Societal Challenges and within LEIT ICT in 'Micro-and Nanoelectronic technologies', 'Content Technologies and Information Management' and in 'Factories of the Future'.

The SME Instrument attracted mostly new SMEs: 90% of organisations had not participated in FP7. SMEs are particularly weak in FET, 'Robotics' and 'e-Infrastructures'. As for the public-private-partnerships and the joint undertakings, the presence of SMEs ranges from 11 % in robotics and in HPC, 13 % in ECSEL, to 17 % in 5G, 19 % in Big Data and 25 % in Photonics.

In certain Member States, SMEs account for the large majority of the total funding going to the country – in Estonia the share is 58 %, in Latvia and Slovakia 55 % and in Hungary 44 %.

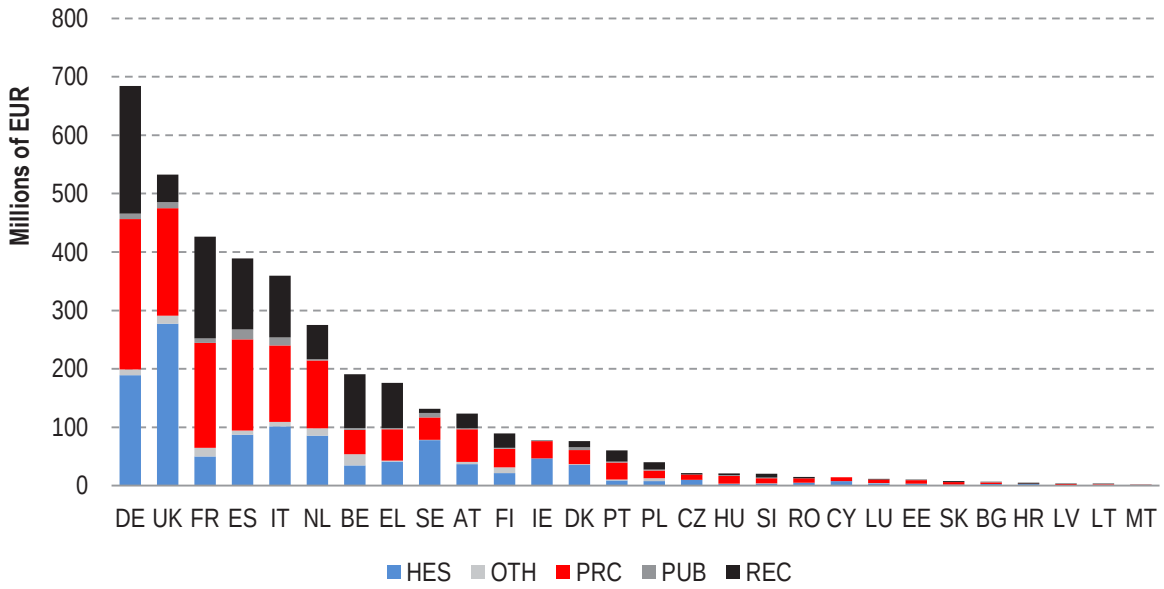
Figure 7.8: Incidence of SMEs by Work Programme Area (as % of total funding and participations), cumulated values 2014-2016



In absolute terms, Germany and the United Kingdom are the biggest recipients of EU funding, but Greece and Cyprus are the countries with 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 three years of H2020. Participants from Spain coordinate 18 % of projects, from Germany 12 % and from Italy 10 %.

Figure 7.9: EU Funding by Member State and type of participant organisation, cumulated values 2014-2016

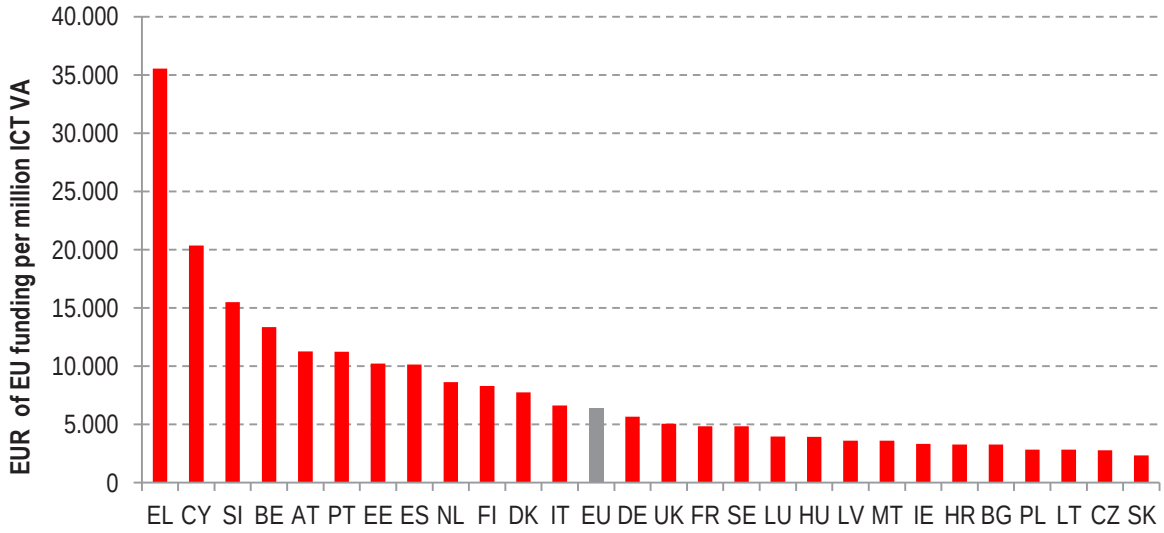


Source: European Commission, based on CORDA

Slovenia, Belgium, Austria and Portugal 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, 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 43 % for Malta, to 80 % for Lithuania. In Hungary and Malta 39 % of funding goes to Excellent Science; Sweden has also 30% of its EU funding in this Pillar. In Luxembourg 37 % of funding is allocated to Societal Challenges, in Romania and Estonia it is 34 %.

Figure 7.10: EU funding by Member State per million of ICT sector Value Added, cumulated values 2014-2016



Source: European Commission, based on CORDA and PREDICT data for ICT Value Added

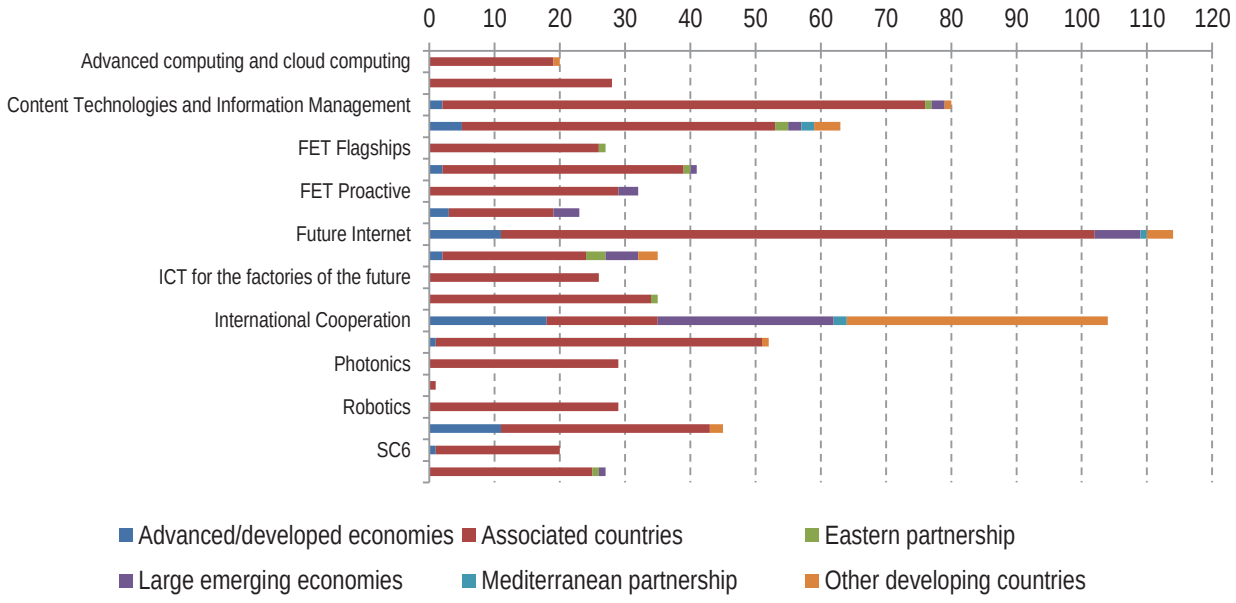
94 % of EU funding for ICT in H2020 is allocated to EU Member States, followed by associated countries. Third countries take part in the Research Programme but with little EU funding

In the first three years of H2020, 460 organisations from 65 non-EU countries participated in 445 ICT projects. About 5.5 % of participations and funding is allocated to associated countries, mainly due to the presence of research-oriented players such as Norway, Israel and Switzerland.

Most of the projects with international participants fall under the Work Programme Area 'Future Internet' (72 projects), 'Content Technologies and Information Management' (45 projects), 'Innovation and Entrepreneurship support' (32 projects) and 'Societal Challenge 1' (31 projects).

Over three years, EUR 17 m of EU funding were allocated to calls with Japan for R&D cooperation in IoT, Future Internet and Robotics; EUR 7 m in projects in IoT and Cloud Computing with Brazil and EUR 6 m with Korea in the areas of Future Internet, IoT and Cloud Computing. EUR 12 m of EU funding were invested in support to policies and international cooperation for eInfrastructures. In 2016, calls for cooperation with China on Future Internet and with Mexico in ICT were launched (EUR 1 m of EU funding each). EUR 12 m of funding were for International partnership building in low and middle income countries.

Figure 7.11: International participation: number of participations by country group and WP Area, cumulated values 2014-2016



Note

This report covers all the projects signed by 31 December 2016.

Annual comparisons are made by considering projects signed by 31 December of the relevant year.

The following Country Groups are used for the international cooperation part:

- 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, Korea, Singapore
- Large emerging economies: BRICS (with South Africa); Mexico, Indonesia, Nigeria and Turkey (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

Source: the report is based on CORDA data elaborated by the European Commission - DG CONNECT.

The source of data for ICT Value Added is PREDICT.