



ICT professionals: skills opportunities and challenges (2019 update)

11/2019  [ICT services](#), [Professionals](#), [ICT professionals](#), [EU](#), [Skills opportunities and challenges in occupations](#)

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Summary

Information and communications technology (ICT) professionals conduct research, plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications.

Key Facts

- Around 3.5 million people were employed as ICT professionals in 2018. Employment in the occupation grew by just over 29 per cent between 2006 and 2018.
- Employment is projected to grow by a further 11 per cent over the period 2018 to 2030. In doing so, an additional 395,000 new jobs will be created. If one adds this to the number of people who are expected to leave the occupation over the same period for reasons such as retirement – an estimated 1.2 million – then it is clear to see that there will be a substantial demand for people to work in the

occupation. There will be 1.6 million ICT professional jobs that will need to be filled between 2018 and 2030.

- ICT professionals are highly-qualified: in 2018, 71 per cent had a high level qualification which is expected to increase to 74 per cent in 2030. Those with medium level qualifications accounted for 25 per cent of the workforce in 2018 and this will remain more or less unchanged to stand at 23 per cent in 2030.
- In the workplace, *using ICT, being autonomous, gathering and evaluating information* are the most important tasks of ICT professionals.
- ICT is a general-purpose technology, and so changes and disruptions in the economy can have significant influence on the future skill demands for these professionals.

Tasks and skills

Information and communications technology (ICT) professionals¹ conduct research, plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications. They also develop associated documentation and design, develop, control, maintain and support databases and other information systems to ensure optimal performance and data integrity and security.

According to [Eurofound's Job Monitor](#), *using ICT, being autonomous, gathering and evaluating information* are the most important tasks of ICT professionals.

Figure 1: Importance of tasks of ICT professionals

Intellectual



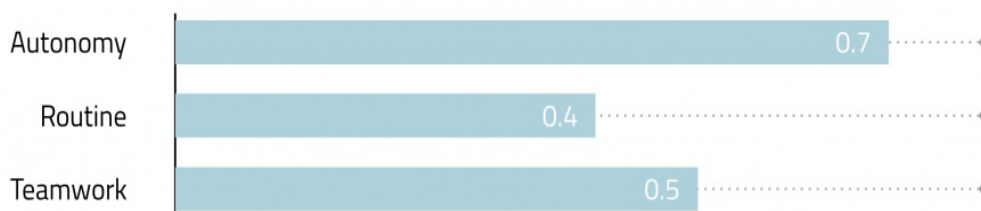
Physical



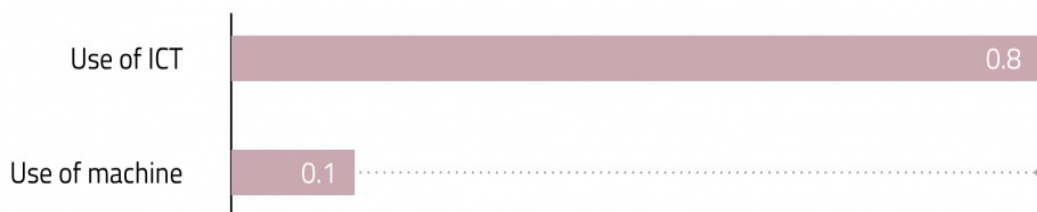
Social



Use of methods



Use of technology

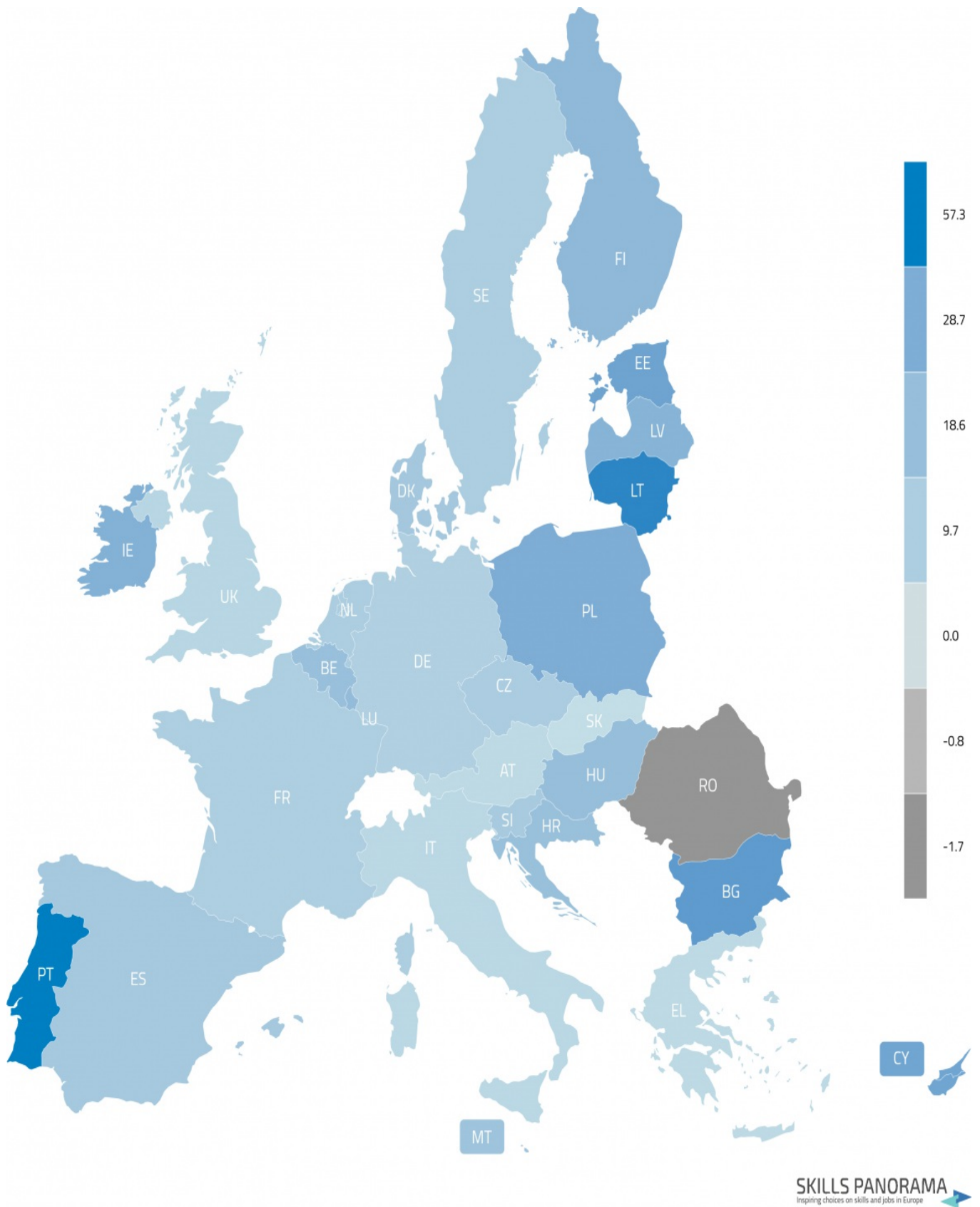


Note: The importance of tasks and skills is measured on 0-1 scale, where 0 means least important and 1 means most important.

What are the trends for the future? ²

Employment in the ICT professionals occupation is expected to grow by 11 per cent between 2018 and 2030, following the 29 per cent growth observed over the period 2006 to 2018. The 11 per cent growth will result in there being an additional 395,000 new jobs in the occupation by 2030. 27 out of 28 analysed European countries are expected to create more jobs for ICT professionals.

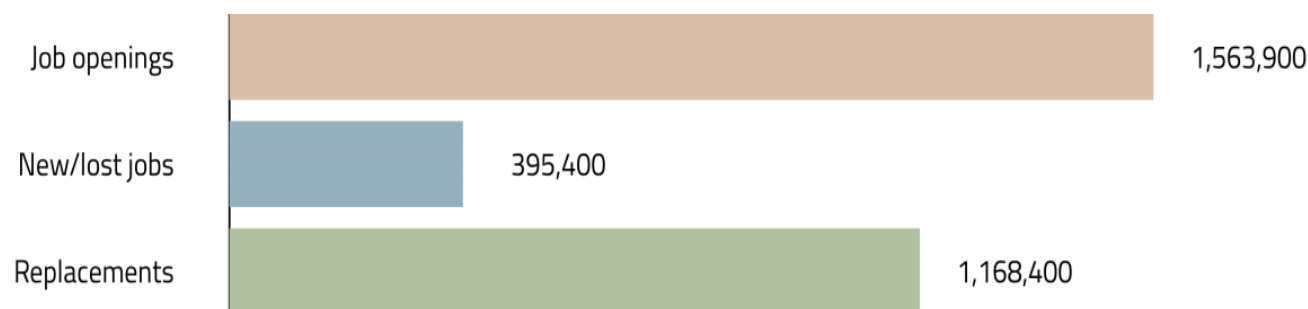
Figure 2: Future employment growth of ICT professionals in European countries (2018-2030, in %)



This understates the growth in demand for people to work as ICT professionals. Over the period 2018-

2030 an estimated 1.2 million people are projected to leave the occupation for one reason or another such as retirement ³. Given the projected increase in employment over the same period, this will result in there being around 1.6 million job openings that will need to be filled between 2018 and 2030.

Figure 3: Future job openings of ICT professionals (2018-2030)



SKILLS PANORAMA
Inspiring choices on skills and jobs in Europe

With regards to education level, the qualifications profile of the occupation will not change much over the period 2018 to 2030. It is an occupation where most of the workforce are highly qualified. In 2018, 71 per cent of ICT professionals had a high level qualification and is expected to rise to 74 per cent in 2030. A quarter of the workforce – 25 per cent – held medium level qualifications in 2018 and this will remain more or less unchanged to stand at 23 per cent in 2030. The penetration of ICT across business processes, production and services will sustain the trend for high qualification requirements in the period 2018 to 2030.

Half of ICT professionals work in ICT services sector and the other across all sectors of the economy, especially in manufacturing, professional services and finance and insurance services.

More information on employment trends for this occupation can be found on the Skills Panorama, [here](#).

Which drivers of change will affect their skills?

ICT is a general-purpose technology ⁴, and so changes and disruptions in the economy can have significant influence on the future skill demands for these professionals.

- Overall, increased demand for highly-skilled ICT professionals is expected. However, developments in technology and value chains will likely shift the balance from technical ICT skills to sector-specific knowledge and soft skills such as management and planning.

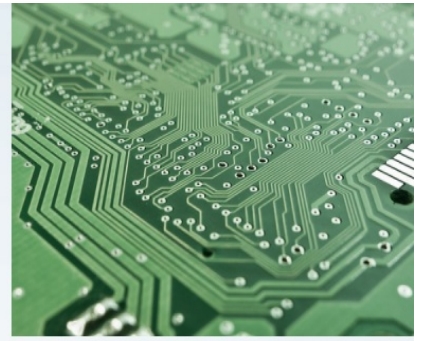
As ICT penetrates more and more activities of the economy, numerous software applications have been and continue to be developed. This has enabled growth and success of various application developers/providers, often focusing on niche markets. Technological developments such as **module applications** empower skilled end-users in lieu of ICT professionals.

Additionally, ICT technical skills services are increasingly **outsourced** to non-EU, cheaper markets. EU professionals will need to have skills such as managing of supply chain in the context of ICT, in a variety

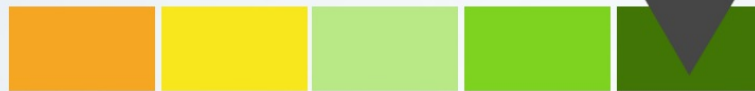
of sectors.

- On top of outsourcing, further digitalisation of economy will boost demand for people with deep knowledge of these sectors, who are able to develop efficient, custom-built ICT solutions for any company or organization, from health-care providers and sewage network companies to farms and logistics companies.
- More powerful computers will increase the amount and the variety of the data generated⁵. The '**Big Data** trend' should lead to an increased demand for strong data analytical skills and skills for scaling and managing the data for enterprises⁶. New occupations are expected to emerge, e.g. data scientists, data managers, and chief data officer⁷.
- The shift towards cloud computing⁸ has been slow, but is expected to accelerate for both enterprises and consumers. **Cloud computing** reduces the demand for technical knowledge on the part of its users, since services are outsourced to cloud providers⁹. This will mean that enterprises will need skills on service integration, service management, designing and managing clouds, and building and optimising cloud data centres.
- As the research and industry investment in **automation**, such as in advanced robots, virtual personal assistants, autonomous vehicles (e.g. driverless cars), and smart-home hubs grows, there will be increasing demand for software and hardware expertise (with high levels of numeracy and domain knowledge)¹⁰. These professionals will be valuable both for established organisations, hoping to consolidate their market, as well as start-ups that challenge the status quo.
- Likewise, the growth of the **Internet of Things (IoT)**¹¹ will drive demand for skills and occupations related to architecture and design, knowledge of and skills in handling diversified systems, and understanding of standardisation and interoperability between connected (and to-be-connected) systems. Technical knowledge of IoT networks, and skills for managing the multiple network configurations that are part of IoT networks, are also expected to be in demand.
- As the various components of ICT infrastructure become more interconnected with the growth in "smart systems", the threats posed by **cybercrime and cyberterrorism**¹² will expand beyond the conventional confines of computing systems. In particular, increased demand is foreseen for data science and analytics skills, paired with business acumen¹³. The demand for **cybersecurity** skills relating to both software and hardware systems will grow. Besides sector-specific expertise, these professionals will probably need to have high-level qualifications to meet the demands of the interconnected "smart" infrastructure systems of the future.
- **Risk of Automation:** As a part of its [Digitalisation and future of work project](#), Cedefop estimates the [risks of automation](#) for occupations. The most exposed occupations are those with significant share of tasks that can be automated – operation of specialised technical equipment, routine or non-autonomous tasks – and those with a small reliance on communication, collaboration, critical thinking and customer-serving skills. The risk of automation is further accentuated in occupations where employees report little access to professional training that could help them to cope with labour market changes. ICT professionals are reportedly an occupation with very low risk of automation.

AUTOMATION RISK for ICT professionals



Very high



Very low

Automation risk means that most of occupation's tasks can be automated and workers in this occupation do not have sufficient access to training to find better jobs

How can these skill needs be met?

As ICT technicians ¹⁴, ICT professionals' skills are vulnerable to swift and constant technological advancements. They are also challenged by parameters that stress the need for action to respond to yet ever-changing information technology developments.

Anecdotal evidence ¹⁵ supports that the share of computer science graduates has increased in ICT recruitment over the last decade; yet other graduates, from mathematics, natural sciences, engineering or social sciences that possess the IT skills demanded fill ICT positions that would otherwise remain vacant. As ICT professionals very often come from non-pure IT studies, enriching curricula across specialisation of studies with STEM and other ICT-pertinent skills can support people's transition to ICT professional jobs, regardless of their educational background.

As continuous vocational education is indispensable for career progression, there are several professional certifications that ICT professionals could pursue through private providers and academic institutions. Certifications are designed to keep the knowledge and skills of the workforce updated. The e-skills QUALITY study ¹⁶ shows that certification has become essential for ICT practitioners across all backgrounds. Not surprisingly, about half of them reportedly hold at least one certification ¹⁷.

The increased emphasis on sectoral expertise poses a challenge though, as cross-skilling - i.e. acquiring knowledge and expertise of a specific sector or multiple sectors - would also need to be part of the training provided at work.

To promote mobility of ICT professionals across sectors in the economy and/or EU Member States, the European Commission offers a "common European framework for ICT professionals in all industry sectors". Figure 1 below offers an overview of the e-competences identified, level of expertise required

etc.

A common European framework for ICT Professionals in all industry sectors

□

| Dimension 1 | Dimension 2 | Dimension 3 | | | | |
|------------------------------|------------------------------------------------|------------------------------------------------------------------------|-----|-----|-----|-----|
| 5 e-competence areas (A - E) | 40 e-competences identified | e-competence proficiency levels e-1 to e-5 (related to EQF levels 3-8) | | | | |
| | | e-CF levels identified for each competence | | | | |
| | | e-1 | e-2 | e-3 | e-4 | e-5 |
| A. PLAN | A.1. IS and Business Strategy Alignment | | | | | |
| | A.2. Service Level Management | | | | | |
| | A.3. Business Plan Development | | | | | |
| | A.4. Product/ Service Planning | | | | | |
| | A.5. Architecture Design | | | | | |
| | A.6. Application Design | | | | | |
| | A.7. Technology Trend Monitoring | | | | | |
| | A.8. Sustainable Development | | | | | |
| | A.9. Innovating | | | | | |
| B. BUILD | B.1. Application Development | | | | | |
| | B.2. Component Integration | | | | | |
| | B.3. Testing | | | | | |
| | B.4. Solution Deployment | | | | | |
| | B.5. Documentation Production | | | | | |
| | B.6. Systems Engineering | | | | | |
| C. RUN | C.1. User Support | | | | | |
| | C.2. Change Support | | | | | |
| | C.3. Service Delivery | | | | | |
| | C.4. Problem Management | | | | | |
| D. ENABLE | D.1. Information Security Strategy Development | | | | | |
| | D.2. ICT Quality Strategy Development | | | | | |
| | D.3. Education and Training Provision | | | | | |
| | D.4. Purchasing | | | | | |
| | D.5. Sales Proposal Development | | | | | |
| | D.6. Channel Management | | | | | |
| | D.7. Sales Management | | | | | |
| | D.8. Contract Management | | | | | |
| | D.9. Personnel Development | | | | | |
| | D.10. Information and Knowledge Management | | | | | |
| | D.11. Needs Identification | | | | | |
| | D.12. Digital Marketing | | | | | |
| E. MANAGE | E.1. Forecast Development | | | | | |
| | E.2. Project and Portfolio Management | | | | | |
| | E.3. Risk Management | | | | | |
| | E.4. Relationship Management | | | | | |
| | E.5. Process Improvement | | | | | |
| | E.6. ICT Quality Management | | | | | |
| | E.7. Business Change Management | | | | | |
| | E.8. Information Security Management | | | | | |
| | E.9. IS Governance | | | | | |

“The European e-Competence Framework (e-CF) provides a reference of 40 competences as required and applied at the Information and Communication Technology (ICT) workplace, using a common language for competences, skills and proficiency levels that can be understood across Europe.

As the first sector-specific implementation of the European Qualifications Framework (EQF), the e-CF fits for application by ICT service, demand and supply organizations, companies, for managers and HR departments, for education institutions and training bodies, including higher education, for market watchers and policy makers, public and private sectors”.

Source: [European E-Competence Framework](#)

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All web-links were last accessed December 2nd, 2019.

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