ICT professionals: skills opportunities and challenges (2016)

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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:

- 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.
- From 2005 to 2015, employment for ICT professionals grew by one third. From 2015 to 2025, about
10% growth is expected, translating into some 400 thousands new jobs.

- Such growth may increase already heavy pressure on supply of ICT professionals. They are a shortage occupation in twenty-four EU Member States and a surplus one in just one EU country.
- The five key skills required for ICT professionals are advanced ICT skills, problem solving, moderate ICT skills, learning and job-specific skills.
- ICT professionals are a high-skilled occupation: in 2015, seven out of 10 people held high qualifications and about one quarter of them hold medium-level qualifications.
- 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.

**Who are they?**

Information and communications technology (ICT) professionals 1 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.

**What skills do they need?**

According to Cedefop's European skills and jobs survey (ESJS) the key 5 skills for ICT professionals are advanced ICT skills, problem solving, moderate ICT skills, learning and job-specific skills. These skills could support employees in this occupation to also tackle anticipated future skill challenges (see drivers of change below).

*Figure 1: Most important skills required for ICT professionals*
Where are they mostly in demand?

The labour market dynamics for this occupation differ across EU Member States:

Figure 2: Shortages and surpluses for ICT professionals across the EU
According to Cedefop, ICT professionals are among the most demanded workers in the EU. Not surprisingly, all member states but Estonia, Greece, Portugal, and Finland are likely to face shortages of these workers. Shortages appear in a substantial number of economies for both software and developer analysts and database and network professionals. The latter sub-occupation, however, is reported to be in surplus in the Netherlands.

What are the trends for the future? 2

From 2005 to 2015, employment for ICT professionals grew by one third. From 2015 to 2025, about 10% growth is expected, translating into some 400 thousands new jobs. In addition to new jobs, replacement demand 3 is expected to vacate around 1.5 million jobs, quadrupling the total demand for ICT professionals during the 2015-2025 period.

Aside from IT technology and information services, rising ICT intensity will increase demand for these professionals namely in warehousing and postal services (paralleling the growth of e-commerce), in financial services (where further growth of web-based services and data exploration is expected) and in real estate, professional, scientific and technical activities. Digitalisation will also bring many more ICT
professionals also to manufacturing, education and health.

ICT professionals are a high-skilled occupation: in 2015, seven out of 10 people held high qualifications and about one quarter of them hold medium-level qualifications. The penetration of ICT across business processes, production and services will sustain the trend for high qualification requirements in the period 2015-2025.

Which drivers of change will affect their skills?

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.

- 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 generated. The ‘Big Data’ trend should lead to an increased demand for strong data analytical skills and skills for scaling and managing the data for enterprises. New occupations are expected to emerge, e.g. data scientists, data managers, and chief data officer.

- The shift towards cloud computing 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 providers. 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). 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) 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 will expand beyond the conventional confines of computing systems. In particular, increased demand is foreseen for data science and analytics skills, paired with business acumen. 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.

How can these skill needs be met?

As ICT technicians, 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 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 shows that certification has become essential for ICT practitioners across all backgrounds. Not surprisingly, about half of them reportedly hold at least one certification.

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
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

<table>
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<th>Dimension 1</th>
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<td>5 e-competence areas (A - E)</td>
<td>40 e-competences identified</td>
<td>e-competence proficiency levels e-1 to e-5 (related to EQF levels 3-6)</td>
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**A. PLAN**
- A.1. IS and Business Strategy Alignment
- A.2. Service Level Management
- A.3. Business Plan Development
- 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.8. Information Security Management
- E.9. IS Governance
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

References


[3] The need to replace workers leaving a profession for various reasons, such as retirement. For more information on replacement demand and how it drives employment across sectors, can be found on the Skills Panorama here.


[9] Darrow, B, 2015 'The battle for cloud supremacy: Amazon's AWS vs. legacy IT juggernauts' Fortune.com viewed 1 June 2016


