

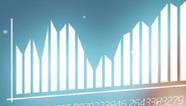


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# e-Skills for Jobs in Europe

## Measuring Progress and Moving Ahead

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# e-Skills for Jobs in Europe

Measuring Progress and Moving Ahead

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## Imprint

This brochure has been prepared by empirica Gesellschaft für Kommunikations- und Technologieforschung mbH on behalf of the European Commission, Enterprise and Industry Directorate General. It is a publication of the European “Monitoring e-Skills Policies and Partnerships” service contract.

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## Foreword

The ability of European enterprises to compete and evolve at the beginning of the 21st century is increasingly dependent on the innovative and effective use of new information and communication technologies (ICT). The e-skills strategy is a component of the Digital Agenda for Europe, and of the Employment Package to boost competitiveness, productivity and employability of the workforce. Europe needs to create better framework conditions for innovation and growth, and for new digital jobs. It must also ensure that the knowledge, skills, competences, and inventiveness of the European workforce - including ICT professionals - meet the highest world standards, and are constantly updated in a process of effective lifelong learning.

Despite high levels of unemployment, shortages of e-skills continue to increase in all sectors. The mismatch between available skills and the needs of the labour market concern all Member States, even if it affects them to varying degrees. The demand for ICT practitioners, with growth of around 4% a year, is outstripping supply. Vacancies by 2015 are forecasted to approach 500,000, and many will remain unfilled unless more is done to attract young people into computing degrees, and to retrain unemployed people.

Governments in Europe are increasing their efforts to address the skill shortage through dedicated policies, initiatives and partnerships, although most countries still lack a strategy. Positive recent signals include national coalitions set up in Lithuania and Poland as part of the „Grand Coalition for Digital Jobs“ launched by the European Commission in March 2013. Other Member States from Southern and Eastern Europe are preparing to launch national coalitions in 2014.



In 2013 e-Leadership skills appeared on the European policy agenda, and the subject has generated positive feedback from stakeholders. Skills for e-Leadership comprise a body of knowledge and set of competences which an individual requires for initiating and guiding ICT-related innovation at all levels of enterprises, from the start-up to the largest of corporations, from private to public. There is agreement that Europe urgently needs to tackle the leadership issue and mobilise stakeholders in a joint Europe-wide effort to develop suitable e-leadership initiatives that meet the needs of enterprises in the digital age - not only large corporations, but those of the SMEs that account for the vast majority of jobs in Europe.

These were key messages from the „European e-Skills 2013 Conference“ organised by the European Commission on 10 December 2013. This brochure highlights the progress of e-skills activities in Europe. The results were welcomed, and a broad consensus emerged on the urgency of action to fill the impending skills gap. The European Commission and national governments need to and will continue to be active in this area.

### **Michel Catinat**

Head of Unit  
Key Enabling Technologies and Digital Economy  
DG Enterprise and Industry  
European Commission

## Background

The goal of this study has been to monitor the supply and demand of e-skills across Europe, benchmarking national policy initiatives and multi-stakeholder partnerships in the European Union. We have analysed the evolution of the supply and demand over the last ten years, to provide a basis for:

- understanding the impact of initiatives launched at EU and national level since 2007;
- proposing remedies where necessary; and
- identifying efficient methods of fostering multi-stakeholder partnerships so as to reduce e-skills shortages, gaps and mismatches.

The European policy response to the e-skills challenges found concrete shape in the European Commission's 2007 Communication on e-Skills for the 21st Century, which was rapidly endorsed by Member States. Further impetus came from the 2010 launch of the Digital Agenda for Europe, and the 2012 Communication "Towards a Job-rich Recovery" from 2012, with their proposals on tackling the e-skills challenge. More recently, the Grand Coalition for Digital Jobs was launched by the European Commission at a conference in Brussels on 4-5 March 2013.

Our study builds on previous work for the Commission on supply and demand of e-skills across the EU, and on the policy / stakeholder initiatives as Member States aim to ensure their labour markets are adequately supplied with ICT practitioners. An 2010 evaluation (eSkills21 – Evaluation of the Implementation of the Communication on "e-Skills for the 21st Century") identified impressive (if variable) progress across the EU in the two years following adoption of the European e-Skills Agenda: Member States were increasingly developing e-skills strategies, and using innovations such as partnerships incorporating stakeholders not traditionally part of education system. But more was needed to address skills shortages and to implement the European e-Skills Agenda, the study concluded.



Klaus Behrla,  
CEO, LPI Central  
Europe

*The Linux Professional Institute  
fully supports partnerships that help to  
bridge the e-skills gap in the EU.*



Frits  
Bussemaker  
Liaison Euro-  
pean Relations  
CIONET

*The global transition to a digital society  
makes it essential to understand which  
European policies can develop the  
relevant e-skills.*

# Demand and supply of e-skills in Europe

## Who's in the ICT crowd and how many are they?

The ICT workforce in Europe in 2012 comprised 7.4 million workers, or 3.4% of the European workforce. There were about 1.5 million management, architecture and analysis jobs, 3.4 million professionals such as developers, engineers or administrators, and 2.5 million workers at associate and technician level.

## Stable but insufficient flow of budding ICT professionals from formal education systems

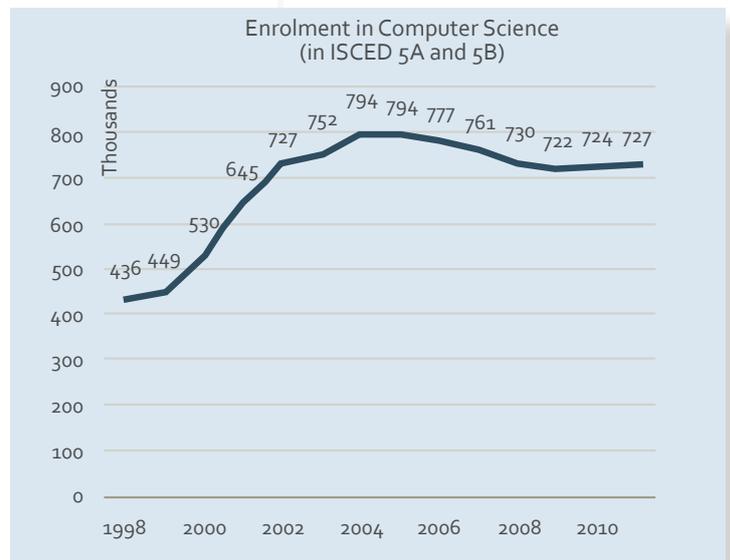
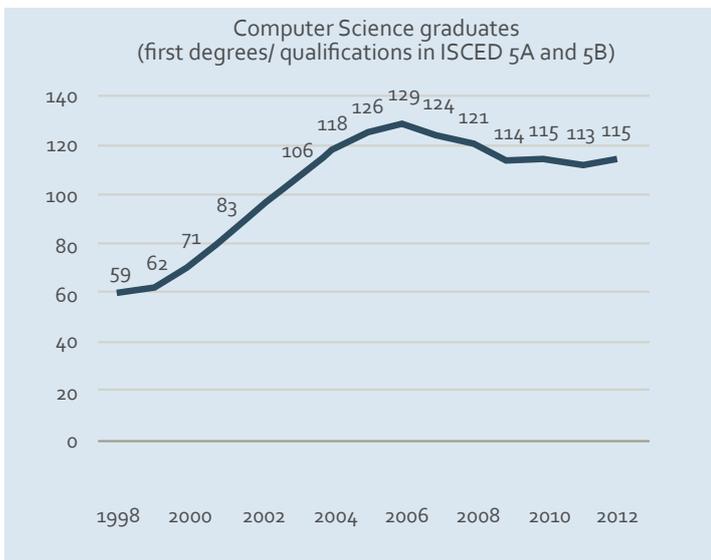
Interest in ICT careers has declined from its peak in the middle of the last decade, and the number of computer science graduates has fallen steadily in Europe since 2006.

The UK has seen sharpest fall in graduate numbers, down today to 63% of the 2003 level, but decreases are apparent in many other countries - except Germany and France.

France is now the leading university educator of ICT graduates, contributing 18% of the European total of entries to the labour market, displacing the UK (17%). Ten years ago the UK produced almost a third of Europe's computer scientists (30%), while Germany produced just 7% - compared to 15% now.

Enrolment peaked in 2004 and 2005, then found some stability, with a slight increase since 2009.

**Enrolment in and graduates from Computer Science studies (ISCED 5A and 5B) in Europe (EU27) 1998 - 2012**



Source: Eurostat, some imputations and assumptions apply

The downturn in computer science graduates entering the ICT workforce has greater impact in Europe because of increasing retirements among ICT practitioners.

The situation is similar for vocational graduates. The 2011 figure was 67,000 entering the labour market - way down on the 2005 figure of 97,000. Poland is the leading producer of vocational education, with 30% of all European graduates, and Poland, Germany, Spain and the Netherlands between them produced 75% of all vocational graduates.

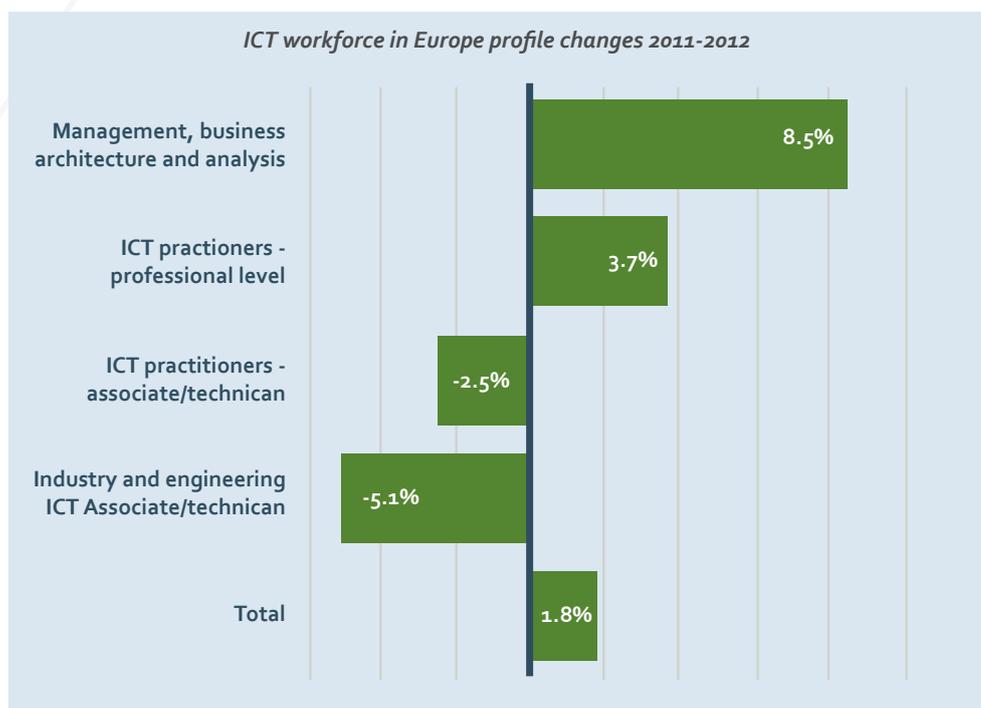
## Re-emerging demand for skills prompts rapid changes in skills profiles and job titles

The demand for ICT workers is today outstripping supply - as has been the case for many years, except after the burst of the dotcom bubble. An empirica survey of CIOs and HR managers in eight European countries in 2012 estimated the demand for e-skills (ICT professionals and practitioners) across the EU at 274,000. This includes 73,000 vacancies for ICT management, architecture and analysis skills, and about 201,000 for ICT practitioners.



Sebastiano Toffaletti  
Secretary General,  
PIN SME

*The e-skills landscape in Europe is a certification jungle. SMEs demand political leadership to enforce simple and non-partisan e-skills standards.*



Source: empirica 2013: Calculations based on Eurostat LFS data. Some imputations and assumptions apply

The demand structure is also visible in employment broken down by occupations, with some marked changes. While the overall ICT workforce grew by 1.8% between 2011 and 2012, the increase in management, business architecture and analysis level jobs was 8.5%, and in ICT practitioners at professional level (ISCO level 2) it was 3.7%. At the same time, ICT practitioners at technician or associate level fell by 3.9%, with core technician groups (ISCO 35) down 2.5% and industry and engineering ICT technicians down 5.1%.



Prof Liz Bacon  
Deputy Pro Vice-Chancellor,  
University of Greenwich

*I applaud the initiatives described in this report which highlight multi-stakeholder approaches to addressing the development of e-skills at all levels and across society.*

## Where are we going?

Three scenarios have been prepared in the course of this study. One represents the most likely - and most optimistic - future. Alongside this, a stagnation scenario assumes a less favourable future, and a 'disruptive boost' scenario envisages demand rising because of ICT-based disruptions of one or more industries.

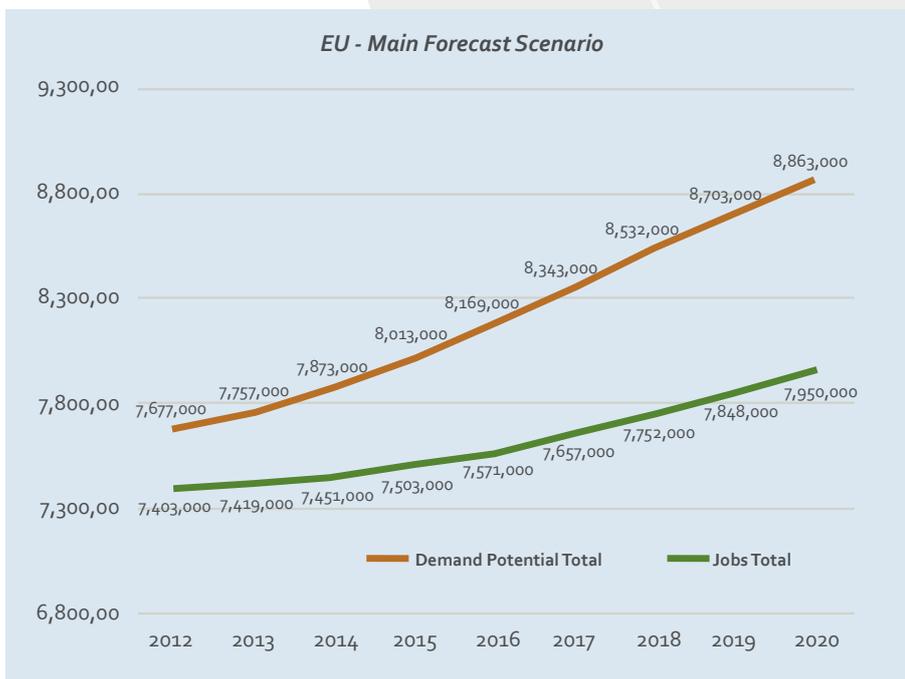
The first scenario assumes modest economic growth (European GDP increasing from 1.0 % annual growth in 2012-2015, then 1.7 % a year in 2015-2020) and moderate IT investments (2.2 % p.a. growth until 2015, 3.0 % in the rest of the decade). IT investments will be largely driven by rapid diffusion of mobile devices, apps, cloud services and other new delivery models. Significant growth is foreseen for big data applications and services through to 2020.



John Higgins  
CBE, Director  
General,  
DIGITALEUROPE

*Provided we focus on helping employers fill their gaps and encouraging companies to create new jobs, I'm sure we can make a significant difference.*

**ICT workforce development and ICT worker demand potential in Europe (EU27)  
2012 – 2020 (main forecast scenario)**



Source: empirica 2013

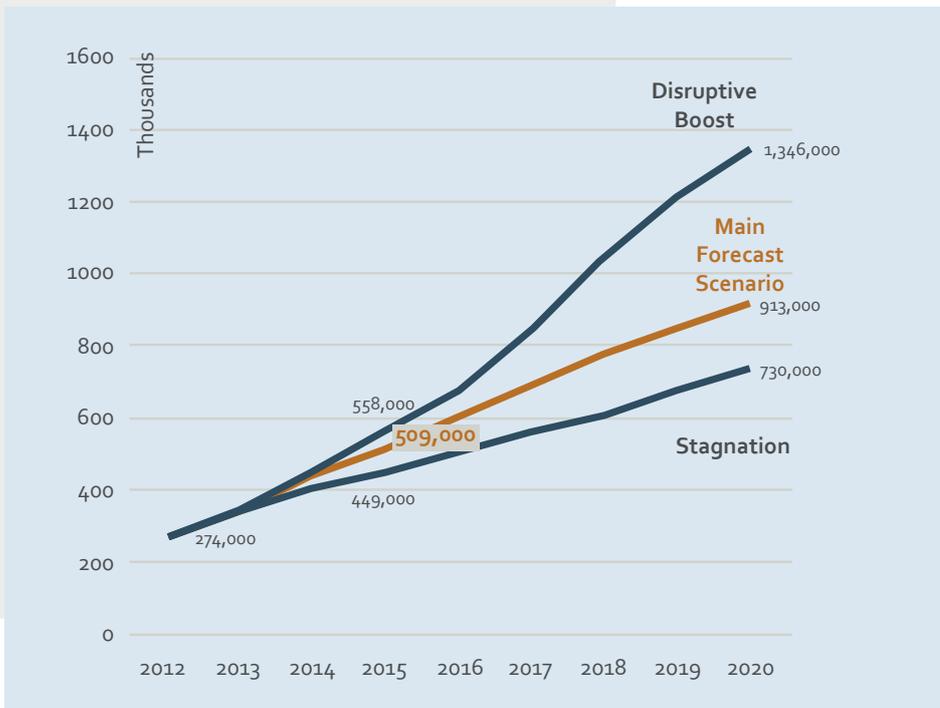
This scenario would imply modest job growth of 100,000 until 2015, with a structural shortage of 509,000 caused by lack of available talent. It also suggests that 509,000 jobs could be created if the skills were available. The bottlenecks are largest in the UK, Germany, and Italy - which together would account 60% of all vacancies in Europe.

Comparing the three scenarios, potential vacancies range from 449,000 to 558,000 in 2015, and from 730,000 to 1.3 million in 2020.

# e-Skills for Jobs in Europe

## Measuring Progress and Moving Ahead

*e-skills shortages (potential vacancies) in Europe (EU27) from 2012 – 2020: comparison of the three scenarios*

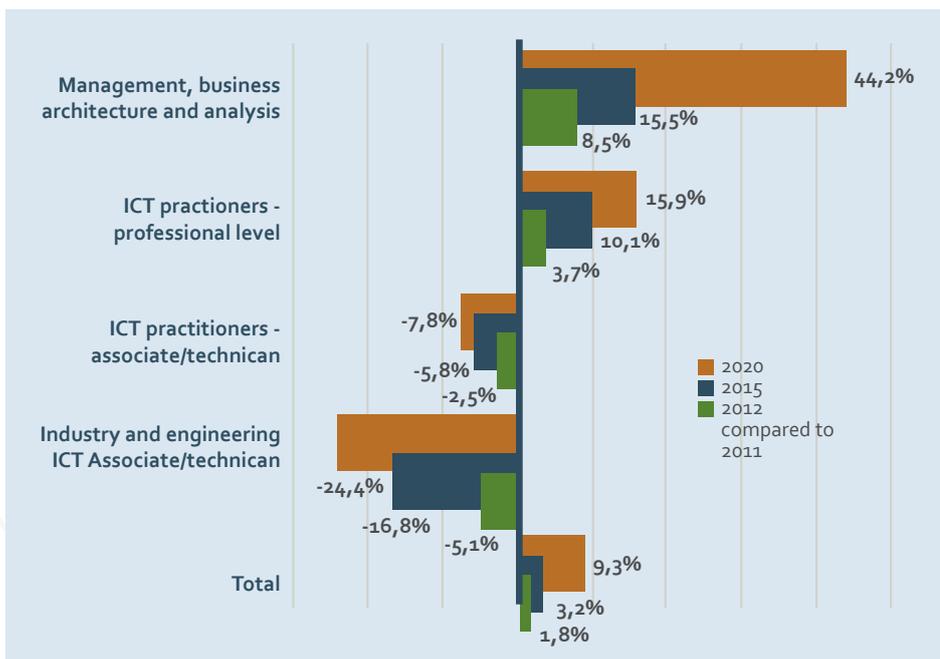


Source: empirica 2013

## Who will be in demand?

The trend towards higher-level skills is expected to continue, although at a less dramatic rate than in the changes seen in 2011/2012. The main forecast scenario suggests that management, architecture and analysis jobs are expected to grow by 44% compared to 2011, and professional level jobs (ISCO level 2) by 16%, while technicians' jobs will continue to disappear as a result of automation, off-shoring, and productivity gains.

*Expected ICT workforce profile changes in Europe (EU27) from 2011 - 2020 (main forecast scenario)*



Source: empirica 2013; forecast based on Eurostat LFS data



Michael Hobbs,  
Pearson VUE,  
EMEA Channel  
Manager

*Pearson VUE fully supports the development and delivery of a European e-Competence framework.*

## The future remains uncertain...

The results require prudent interpretation. The projection of **demand potential** - a fragile construct - does not mean that huge numbers of vacancies will actually occur. Vacancies that cannot be filled year after year will disappear – projects cannot be realised, tenders not submitted, innovations will simply not be made. Persistent skills shortages are likely to lead to increased outsourcing and off-shoring, with untapped innovation potential, and unwanted or enforced productivity gains accompanied by wage increases and sub-optimal production structures.

A further caveat concerns the workarounds that have existed in IT since the sector came into being. Our approach recognises a limited number of side entries & non-ICT graduates. In the principal scenario, about 1 million **side entries and non-ICT graduates** over the eight years enter the workforce, compared to 1.4 million graduates. However, CIOs have confirmed the tendency for side entries to occur much less frequently than in the 1990s.

But our **demand estimate is very conservative**, with a model heavily reliant on ICT workforce growth and GDP/IT spending growth of the 1990s and early 2000's. In fact the workforce has increased significantly more recently, even through the crisis years of 2008-2012.

We are also cautious in our projections of new and emerging jobs. These are not yet part of the forecasting model, and many that are appearing around third-platform technologies are not yet accounted for in job statistics. Big Data, cloud computing, social media, mobile platforms and other megatrends will deliver new capabilities and jobs that will require new skills. In addition, many third-platform jobs that are not strictly IT jobs will be at professional level, in finance, marketing, or consulting, as new business processes are defined and implemented.

Another current imponderable is the impact of the Grand Coalition for Digital Jobs. But the sheer size of this exercise, engaging industry, policymakers and other stakeholders, and the wide scope of the pledges made within it, will certainly affect the statistical picture across Europe.



Alfonso Fuggetta  
CEO & Scientific  
Director CEFRIEL

*We have to combine technology, management, and creativity to educate the professionals needed for the challenges of the next decades.*

## The bottom line

Demand for ICT skills continues to grow rapidly. Core ICT jobs have seen a growth trend of up to 4% p.a., and management jobs are up by as much as 8% p.a. At the same time, there is a decline in demand for associate and technician jobs with medium level skills. There is a corresponding need to increase the quality and relevance of e-skills, particularly since the supply of university graduates is not keeping pace.

The significant growth in highly skilled jobs, such as management, architecture and analytics positions, reinforces the need for e-Leadership skills. Since these positions are usually filled by recruits from a pool of seasoned practitioners and other (non-ICT) managers, a recruitment bottleneck can be anticipated over time.

The pace of change in ICT jobs is leading to new job profiles - such as Big Data and Cloud computing specialists, rather than classic ICT jobs - which are not yet fully covered in statistical classification.

New jobs are likely to be created in all industry sectors, beyond the traditional pathway of ICT studies, but with a strong imperative for ICT to permeate other and new educational trajectories.

The tradition in the ICT sector for outsiders – in terms of formal education or career trajectory – to play a crucial role is likely to continue, but so too is the newer demand for constant professionalisation through formal qualifications. But these need not be the consequence of university or vocational education, and can instead be acquired later in the career. There is an immense opportunity today for new education approaches, new modes of delivery, better curricula and learning outcomes to fill this gap.

## European Commission e-Skills policies

The European Commission's decade-long record of e-skills policies and initiatives has culminated in the Grand Coalition for Digital Jobs in 2013

European Commission e-skills policy activities date back to the early years of this century. With the European e-Skills Forum the European Commission DG ENTR established a multi-stakeholder dialogue on this topic. In 2007 the European Commission adopted the Communication on "e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs", and the Competitiveness Council of Ministers adopted „Conclusions on a long term e-skills strategy" on 22-23 November 2007. European e-skills conferences were organised in subsequent years, followed by the launch of Europe 2020, the Digital Agenda for Europe 2010-2020, and the Communication „Towards a job-rich recovery" in 2012.



Olivier Crouzet,  
42,  
Dean of Studies

*42 is a new school that is breaking down old pedagogical rules and aims to increase e-skilled professionals.*

The European Commission Grand Coalition for Digital Jobs Tube Map



Source: <http://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs-o>



Photo: Manuel Barroso

2013 was marked by the launch of the Grand Coalition for Digital Jobs by the President of the European Commission, José Manuel Barroso in 2013 together with the European Commission Vice Presidents Neelie Kroes and Antonio Tajani, Commissioners László Andor and Androula Vassiliou as well as Richard Bruton, Irish Minister for Jobs, Enterprise and Innovation, holding the EU Presidency at that time. Organisations made concrete pledges to the Grand Coalition at the launch conference, and more of these have been made since.

## Benchmarking national e-skills policies in Europe

Policy activity in relation to e-skills has significantly increased at national level over the past five years. However, there are sharp differences between countries: some are e-skills policy frontrunners, while others are low performers.

The increase in policy activities emerges from analysis and benchmarking of national policies on e-skills, e-leadership skills and digital literacy carried out for the European Commission in all EU Member States in 2013, and a comparison with results from 2009.



Silvia Leal  
Director of ICT  
Programmes  
at IE Business  
School

*Academic organisations need to adapt their curricula to the demands of technological innovation. A European Quality Label will be a critical factor to generate synergies.*



Peter  
Hagedoorn,  
Secretary  
General, EuroCIO  
The European  
CIO Association

*The ICT community has to work seriously on certification and quality labels both for industry-based training as well as training by educational institutes like universities.*

Benchmarking of the national policy activities against a 5-point e-skills activity index shows an average activity level of 2.9 in 2013 compared to 2.4 in 2009. This is a clear sign of the progress made in the Member States in implementing national e-skills policies and strategies in line with the 2007 e-skills Communication endorsed by national governments.

The country-by-country results clearly show where activity levels and progress are at an appropriate level, and where there is a lag in policy development and implementation to close the e-skills gap.

*e-skills Policy Index in European countries 2009 and 2013*

Country	2013	2009	Evolution
AT Austria	●●●● 3,5	●● 2,0	+1,5
BE Belgium	●●●● 4,0	●●●●● 4,5	-0,5
BG Bulgaria	●●● 2,5	●● 1,5	+1,0
CY Cyprus	●● 2,0	●● 1,5	+0,5
CZ Czech Republic	●● 1,5	●● 1,5	0,0
DE Germany	●●●● 4,0	●●●● 3,5	+0,5
DK Denmark	●●●● 4,0	●●● 2,5	+1,5
EE Estonia	●●●● 3,5	● 1,0	+2,5
EL Greece	●● 1,5	●● 1,5	0,0
ES Spain	●● 2,0	● 1,0	+1,0
FI Finland	●●● 2,5	●● 1,5	+1,0
FR France	●●●● 4,0	●●● 3,0	+1,0
HU Hungary	●●● 2,5	●●● 3,5	-1,0
IE Ireland	●●●●● 4,5	●●●● 4,0	+0,5
IT Italy	●●● 2,5	●● 1,5	+1,0
LT Lithuania	●● 2,0	● 1,0	+1,0
LU Luxembourg	●●● 2,5	●● 1,5	1,0
LV Latvia	●●● 2,5	●●● 3,0	-0,5
MT Malta	●●●● 4,0	●●●● 4,0	0,0
NL Netherlands	●●●● 4,0	●●● 3,0	+1,0
PL Poland	●●● 3,0	●●● 2,5	+0,5
PT Portugal	●● 1,5	●● 1,5	0,0
RO Romania	●● 1,5	●●● 2,5	-1,0
SE Sweden	●●●● 4,0	●●● 2,5	1,5
SL Slovenia	●● 1,5	●● 1,5	0,0
SK Slovak Rep.	●● 1,5	●● 2,0	-0,5
UK United King.	●●●●● 5,0	●●●●● 5,0	0,0

Source: Gareis, K., Hüsing, T., Bludova, I., Schulz, C., Birov, S. Korte, W.B.: e-Skills: Monitoring and Benchmarking Policies and Partnerships in Europe (Final Report for the European Commission), January 2014

## e-Skills for Jobs in Europe

Measuring Progress and Moving Ahead

Of the then-27 Member States, 12 show a value of 3 or higher on the 5-point index scale for e-skills activity. The leading countries, the UK, Ireland, Belgium, Germany, Denmark, France, Malta, the Netherlands and Sweden, also perform strongly in activity for ensuring adequate supplies of ICT practitioners on the labour market today and in the future.

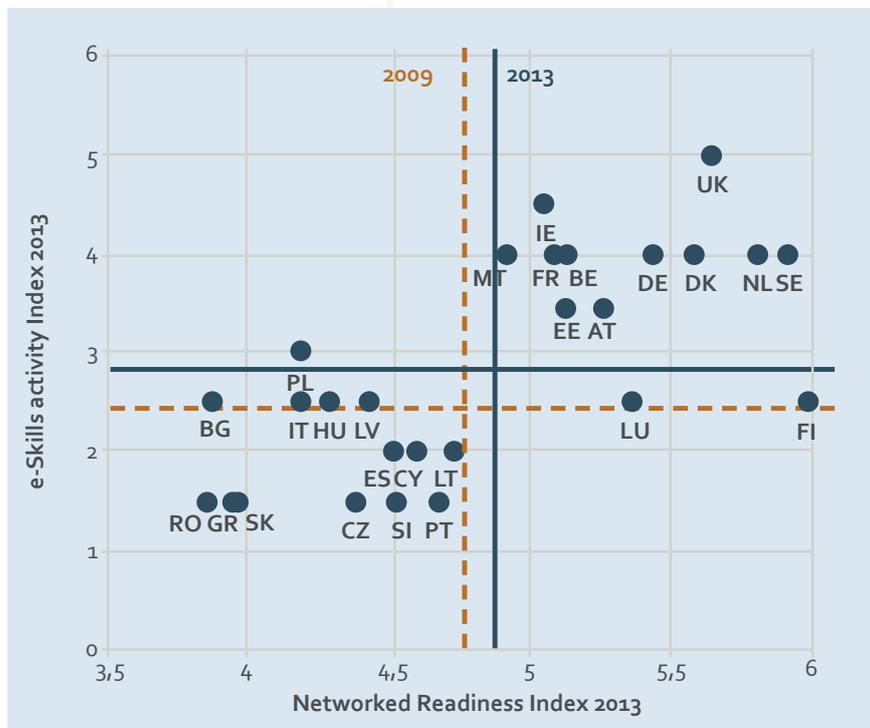
The range of interventions used by policy makers and other stakeholders is very broad. Clearly, the 2007 e-Skills Agenda and subsequent Commission initiatives have prompted Member States to public debate about e-skills, and helped them to develop appropriate responses.

The degree of integration and consistency of policy-making is still limited in many Member States, where there is no master strategy or no continuous attention across policy areas.

It is striking that countries with significant activity in the e-skills domain also have the highest share of ICT workers in their workforce, and rank highest on innovation and competitiveness indices such as the Networked Readiness Index (NRI), which measures the capacities of economies to leverage ICT for increased competitiveness and development<sup>1</sup>.

It is also positive that some countries that which could be described as 'low performers' have become more active, with two of them (Lithuania and Poland) starting e-skills programmes as national Grand Coalitions for Digital Jobs, as part of the Commission initiative with the same name. Ten further Member States, mainly from Southern and Eastern Europe, are also planning to launch national programmes.

*European Country Landscape on 'e-Skills Policy Activity' versus 'Innovation Capability' 2013*



Source: Gareis, K., Hüsing, T., Bludova, I., Schulz, C., Birov, S. Korte, W.B.: e-Skills: Monitoring and Benchmarking Policies and Partnerships in Europe (Final Report for the European Commission, January 2014)



Prof Sharm Manwani  
Executive Professor, Henley Business School

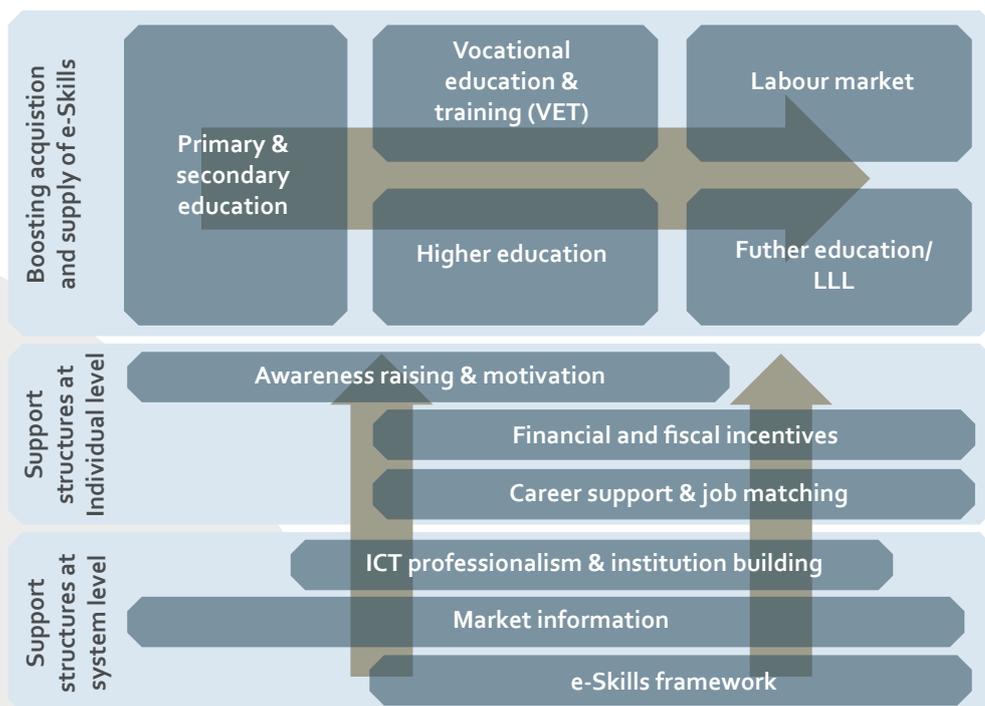
*The development of curriculum profiles for e-leaders provides an important bridge between business organisations and educational institutions.*

1. e-Skills Activity Index 2009, 2013 measures national policy and stakeholder activity by assessing national policies and initiatives in the e-skills domain (first in 2009, latest in 2013); three indexes: e-skills activity index, digital literacy activity index, e-leadership skills activity index. Source: Gareis, K., Hüsing, T., Korte, W.B., Birov, S., Bludova, I., Schulz, C. (empirica): Monitoring and Benchmarking e-Skills Policies and Partnerships. Final Report for the European Commission (January 2014); Networked Readiness Index 2013 measures economics' capacities to fully leverage ICT for increased

## Initiatives on e-skills and multi-stakeholder partnerships

### The multi-stakeholder approach has proven most effective in tackling the e-skills policy challenge

Multi-stakeholder partnerships (MSPs) are joint initiatives bringing together organisations from the education and training sector with industry associations and private-sector employers, who take over some of the responsibilities that have traditionally been held largely by the public sector.



The logic is that the private sector can complement and extend services provided by the public sector, enhancing available resources and permitting faster and greater impact. For success, MSPs depend on involving all relevant stakeholders, to ensure self-sustaining and comprehensive progress, and to avoid piecemeal or uncoordinated approaches that can - and often do - impede modernisation of higher education and VET in Europe. From an industry viewpoint, MSPs offer a valuable bridge between the public education system, with its influence on the supply of formalised skills to the labour market, and private sector employers, with their demands for particular skills.



Bernd Taselaar  
CEO, EXIN

*Bridging the gap between demand and supply of e-skills in Europe will require innovative approaches in learning and validation of e-competence.*



Jan Muehlfeit  
Chairman Europe,  
Microsoft Corporation

*The European Commission e-leadership initiative is exactly what is needed at a time where Europe requires professionals to lead qualified staff in utilizing emerging ICT opportunities.*

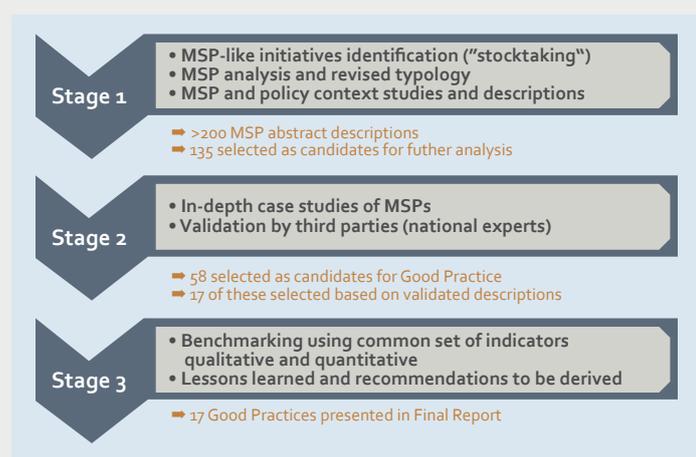


Dr. George Sharkov  
Director,  
European Software Institute

*If you work in IT qualification or IT-intensive competitive business, the competences you develop or require should be expressed in a commonly understood language.*

## Benchmarking multi-stakeholder partnerships

Our methodology for identifying and analysing best practices uses SWOT analysis (investigating strengths – weaknesses – opportunities – threats) as well as experience from predecessor work on MSPs for e-skills. The unit of observation has been the initiative, together with the policy context it is embedded in. Selection and benchmarking through a multi-stage process have applied criteria including: To what extent does the initiative represent a multi-stakeholder partnership? Does it target ICT practitioner skills rather than digital literacy in general?



To what extent is the partnership embedded in a broader policy context? Do its size and scope ensure relevance to the country's e-skills related development? Has the initiative been in operation for long enough to make it possible to assess its experience? Is it innovative in either approach or objectives? Has it shown sufficient flexibility to adapt to changing circumstances? Has it achieved the expected outputs, and are there tangible outcomes in ensuring sufficient supply of suitably qualified ICT practitioners today and in the future?

## Awareness-raising among the right targets

Awareness-raising activities assume limited understanding of ICT-linked employment, the role of ICT practitioners within the economy, their relevance for the performance of SMEs, and career prospects in ICT. Typical target groups are young people prior to career decision-making, whether in primary, secondary or tertiary education. Approaches across Europe range from competitions and event-type „meet your future employer“ activities to tools and platforms that seek to make ICT an attractive career choice among teenagers. Women are significantly underrepresented among current ICT practitioners and ICT students, and many of these initiatives explicitly target school-age girls and young women. In Germany and Austria, such programmes started in the early years of the century, and many other Member States have followed suit, often sending female ICT students or graduates into schools as role models and mentors.

Austria's Sparkling Science is a funding scheme for collaborative projects between universities and schools that aim to bring children into contact with science in real-world settings. It has succeeded in making research (much of it directly or indirectly related to ICT) appealing to youngsters, including by launching „Children's Universities“.

The well-established "women into technology" programme in Austria makes use of mentoring via an ambassador programme that uses female ICT students and graduates as role models. Crucially, measures target teachers and parents as well as pupils.

## Laying the ground at an early age

Some initiatives aim at adapting primary and secondary education not only to provide basic ICT user skills at an early age, but also to raise interest in continuing with computing-related studies after secondary school. In recent years all Member States have been updating and modernising school curricula and ICT infrastructure to match technical innovation and the evolving needs of industry and society. Success has varied, partly related to each country's ability to invest in its education system, but some countries have reviewed their entire primary and secondary education system and mainstreamed pupils' exposure to science, technology and engineering-related subjects to increase interest at an early age. Some have overhauled curricula to embed ICT use and media literacy throughout the learning process. Denmark's new subject, „Computational thinking and practice“, is an innovation in teaching computing related issues at school, and the UK is developing a similar approach.



James Whelton,  
CoderDojo  
Co-Founder

*Understanding and quantifying the skills Europeans have with tech is vital to our society's future and this is why work on e-skills is vital.*

Coder Dojo is a grassroots movement that organises programming sessions („Dojos“) for school children of all ages. It started in Ireland, and operates today in 29 countries. It is an example of bottom-up digital social innovation, based on word-of-mouth through social networks.

In Denmark, a new school subject “computational thinking and practice” has been designed through a multi-stakeholder partnership and successfully introduced. It moves the focus from mere ICT user skills to creative applications of ICT for real-world challenges.



Marianne Mikkelsen,  
It-vest

*In 'Create IT', high school teachers share online teaching resources oriented towards students' interests, and university professors produce teaching resources for high school teachers.*

## Development and provision of tailored education & training

Developing and providing education and training offers tailored to the needs of the labour market is one of the most important areas for MSPs. Faced by rising unemployment at a time when there are hard-to-fill vacancies for ICT practitioners, many Member States have attempted to channel graduates and other jobseekers towards ICT jobs for which there is strong demand.

Ireland has been especially successful in this area. New approaches to VET are being sought as well: some initiatives seek to provide students and workers with alternative channels of educational achievement and to offer improved means for “on-the-job” and “just-in-time learning”.

The IT Academy program in Estonia is a joint effort by government, higher education and industry to boost the quality of ICT higher education and to promote education offers within Estonia and beyond. The objective is to establish Estonia as an attractive place for young Europeans to study ICT.



Prof Jaak Aaviksoo,  
Estonian Minister of Education and Research

*By investing in IT curricula we contribute to welfare and economic growth in Estonia. Estonian universities have found their strength in niche areas, especially in the Cyber Defence curriculum.*

The ITMB Degree in the UK is a tailored education programme combining ICT and management skills in a bachelor's degree. The design is driven by the needs of major UK employers, who seek graduates who combine ICT practitioner with business and leadership skills.

Malta has succeeded in channelling students to parts of the economy deemed essential for the country's development. The Get Qualified Scheme provides grants to students who choose qualifications required by industry, with an emphasis on ICT practitioners.

The Level 8 Conversion Programme in Ireland is offered to unemployed academics from non ICT areas. It represents a prime example of how to boost numbers of ICT professionals in the short term via close collaboration between government, employers and education providers.

## Career support, lifelong learning and e-leadership training

It is difficult for people who are making career choices to perceive the ICT labour market clearly, because the professions it offers are less well defined than in other, longer-established, sectors. Initiatives have been taken for career support of those who are already ICT practitioners, often providing market information tailored to individual needs. Some are aimed at individuals seeking (re)training in professional e-skills, supplying advice on training offers on the market.

The development of widely recognised e-skills frameworks and definitions has been underway at national level since the 1990s (such as AITTS and APO-IT in Germany; SFIA in the U.K.; Les Métiers des Systèmes d'Information dans les Grandes entreprises – Nomenclature RH in France). The process has been stimulated more recently with the development of the e-Competence Framework (e-CF). Many European schemes for education and certification of e-skills make use of, or are closely aligned with, the e-CF. Coherent systems have also been developed at sub-national level to steer relevant professional skills to where there is demand for ICT practitioners, and to counsel job seekers on re-skilling and certification. Workforce mobility across regions and countries can play a major role, as exemplified by CompeTIC, a project between the Belgian Walloon region and the neighbouring French Nord-Pas-de-Calais region. Other measures include providing user-centred internet portals/knowledge databases, and running awareness-raising campaigns among employers, especially SMEs.



Jean-Pierre  
RUCCI,  
Director,  
EVOLIRIS asbl

*The EVOLIRIS ICT Reference Centre for the Brussels region is boosting transparency on the market for ICT education, training and the ICT practitioner labour market.*

The ICT reference centre for the Brussels region is successfully boosting transparency on the market for ICT education, training and the ICT practitioner labour market. EVOLIRIS has helped overcome the inefficiencies and obstacles of a heterogeneous and bilingual market.

The RETE Competence Network for the Digital Economy in Italy is a collaboration between major companies for exploiting the potential of the e-CF. Its underlying assumption is that one of the solutions to Italy's economic difficulties lies in an effective e-skills framework.

The ECF-NL Working Group has developed a strategic approach to exploiting the e-CF at national level, so major stakeholders in the public and private sector are now using it extensively in human resource management.

Finish-IT is a fast-track training and certification programme for ICT practitioners who lack formal qualifications - including university dropouts and immigrants with qualifications not recognised in Germany.



Jari  
Handelberg,  
Aalto University's  
Small Business  
Centre

*The motivation of Nokia Bridge support recipients to set up companies is high, and about 90 per cent of the enterprises continue to function actively with a strong focus on internationalisation.*

Nokia Bridge supports laid-off employees, and has become a major enabler of digital entrepreneurship in Finland and in Nokia's other locations around the globe.



Johann  
Kempe,  
CIO, Holtzbrinck  
Publishing Group

*Encourage and foster talented engineers and scientist to become successful Entrepreneurs and Intrapreneurs! That's what Software Campus stands for.*

Germany's Software Campus offers scholarships to outstanding PhD and Master students in ICT, providing optimal conditions for them to develop into tomorrow's e-leaders.



Anne-Marie Fransson,  
Director General,  
The Swedish IT

*Our leadership development and mentoring program Womentor since 2007 is an important long-term competitive factor for the Swedish IT and Telecom sector. It's important we have a growth in women wanting to work within the IT-industry.*

Womentor is a Swedish programme that uses mentoring to help women in lower management positions to develop their leadership skills and to build professional networks, so as to boost the proportion of women in ICT-related top management positions.



Kay P. Hradilak,  
SAP

*Improved e-skills are key in fighting youth unemployment and skill shortage in Europe. This is a joint task for industry partners, academia and public stakeholders.*

## Comprehensive, national e-skill partnerships

In addition to these focused initiatives, some Member States operate government-supported partnerships across a range of e-skills-related initiatives, based on long-term strategic policy - notably e-Skills UK, the ICT Skills Sector Council, which is subject to government control, but has benefitted from significant public funding and strong policy support. Budget cuts have made this kind of governance model more difficult.

In other countries, comprehensive partnerships in the e-skills domain have been established with little or no government influence. France's P@scaline, which has strong support from the business sector as well as trade unions, is not closely embedded in the government's policy agenda.

e-Skills UK is an industry-driven initiative for addressing the e-skills challenge. Granted formal status by the government as the Sector Skills Council for the ICT domain, it is strongly embedded in policy. It remains the benchmark for comprehensive national e-skills partnerships, and has been able to keep up the level of activity in spite of cuts in government funding.

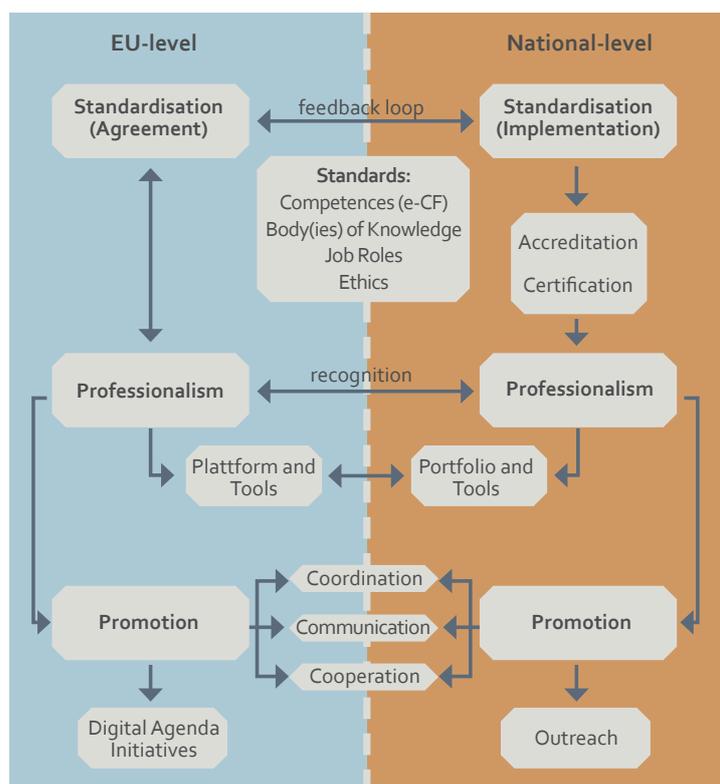
Pasc@line has been an effective platform for cooperation between industry and higher education to match supply and demand for ICT professionals. Trade unions take a strong role.

## Governance framework for ICT professionalism

Maturing of the ICT profession can help in attract more people to become an ICT practitioner or professional. The Commission has been paving the way towards this for more than a decade, and one result is the European e-Competence Framework. e-CF is now being further developed, to become a European standard, to provide associated ICT professional job profiles, and - it is proposed - to offer a governance framework for ICT professionalism that can be implemented by industry and other stakeholders.

The e-Competence Framework (e-CF) ([www.ecompetences.eu](http://www.ecompetences.eu)) represents a common standard that can be used across Europe by practitioners, employers and educators to assess practitioner competences and proficiencies, and to define professional ICT job roles and relevant certifications and qualifications. It might also be used to define entry criteria and requirements for progression within the profession.

## ICT Professionalism: High-level Overview of an Institutional and Governance Framework



Source: Governance Framework for ICT Professionalism. Report from the European Commission DG ENTR service contract, 'Monitoring and benchmarking e-skills policies and partnerships', December 2013

The CEN Workshop on ICT Skills has delivered the e-CF and the ICT professional profiles. It is a European workgroup of national and international representatives from the ICT industry, vocational training organisations, social partners and other institutions (approximately 100 entities in all).

The decision was taken in 2013 to set up a CEN Committee, with representatives of national standardisation bodies, to adopt the e-CF as a formal European standard. The kick-off meeting of this new CEN Committee took place in Milan on 28 January 2014. The e-CF was released in its version 3.0 in December 2013.

These activities form part of the wider European agenda to establish a mature ICT profession, which would include a pan-European institutional and governance framework for the ICT profession.

A multi-layered approach to implementing a structure for ICT professionalism in Europe has been proposed. This would have a number of key functions at a pan-European level, and would be reflected at a national level across the Member States. The three key functions are: standards, professionalism, and promotion.

It is proposed to create an MSP to take responsibility for professionalism and promotion at a European level. A model has also been proposed for the national level, featuring an MSP to support all three functions: the implementation of standards, national ICT professionalism, and promotion.

Where possible, existing initiatives and mechanisms would be retained and built into the process. Each Member State will most likely implement the model differently, in line with existing institutions and initiatives, the maturity of ICT professionalism, and national priorities and objectives. Recommendations for action were made in a Commission report in early 2014, after their presentation at the European e-Skills 2013 Conference in December 2013. The emerging ecosystem of associated online support tools already includes the "European e-skills landscape and self-assessment tool" ([www.eskillslandscape.eu](http://www.eskillslandscape.eu)), CEPIS e-Competence Benchmark ([www.cepis.org/ecompetencebenchmark](http://www.cepis.org/ecompetencebenchmark)) and the service e-Competence Assessment (<http://www.ecfassessment.org/en/1/home>).

Attaining full maturity for the ICT profession will take many years, and these are only the first steps in proposing an institutional and governance model for the profession across Europe.

## Policy Recommendations

The following recommendations are proposed for ensuring Europe has sufficient e-skills and e-leadership skills. They are intended as input for a comprehensive roadmap of actions at EU and national levels.

### FIRST RECOMMENDATION: LAUNCH INITIATIVES IN COUNTRIES LAGGING BEHIND

The rise in activity on e-skills in Europe in 2013 is encouraging - although it still does not apply to all Member States. As documented in the report mentioned above, 40% of Member States are showing strong policy activity, 10% are on the way, but 50% still exhibit only modest levels of commitment, and need urgently to step up their efforts. Approaches followed by national governments<sup>2</sup> and stakeholder initiatives provide a valuable pool of good practice examples.

Governments in countries with low levels of e-skills activity should establish comprehensive strategies, foster multi-stakeholder partnerships, and engage in related measures and initiatives. Momentum is growing across Europe for such actions, and the Conclusions of the European Council of 25 October 2013 state that "part of the European Structural and Investment Funds (2014-2020) should be used for ICT education, support for retraining, and vocational education and training in ICT, including through digital tools and content, in the context of the Youth Employment Initiative"<sup>3</sup>.

National e-skills initiatives need a long-term strategic approach - such as e-Skills UK, the national Skills Sector Council for the ICT sector, which has received public funding and strong commitment from industry, or P@scaline, supported by academia, industry and unions. Funding can be leveraged from the European Structural and Social Funds to implement eligible e-skills initiatives. Public authorities at national and regional level can be advised on how best to incorporate e-skills in their Research and Innovation Strategies for Smart Specialisation<sup>4</sup> - particularly in the Smart Specialisation Platform<sup>5</sup>.

The Commission and national and regional governments should support awareness-raising, based perhaps on the pan-European „e-Skills for Jobs“ campaign in 2014. Member States should help employers (especially SMEs) to offer work placements and provide guidance to students, and new sources of funding should be identified, from industry associations, CSR activities, and social partners.

Implementation rests mainly with Member States in launching national initiatives, supporting the „Grand Coalition for Digital Jobs“, and mobilising funding instruments. National and regional innovation strategies should integrate e-skills, and the European Commission network launched in 2014 to support the Grand Coalition activities can help by supporting the development of activities with potential for learning from existing pledges and initiatives, and by motivating local stakeholders to replicate them in a format suited to their needs.

2. National policy frameworks need to include a wide spectrum of activities and will have to range from:

- Awareness raising activities and those providing the basis at early age in primary and secondary education, others aimed at the provision of tailored education and training to meet labour market needs,
- Career support to help improve skills and qualifications of those ICT workers threatened by automation processes and newly emerging trends with completely new demands for different types of skills not available to these individuals,
- Lifelong learning including higher education and executive education activities responding to changing market demands through the development of new curricula or e-skills partnerships etc.

3. [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/139197.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/139197.pdf)

4. [http://ec.europa.eu/regional\\_policy/sources/docgener/informat/2014/smart\\_specialisation\\_en.pdf](http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_en.pdf)

5. <http://s3platform.jrc.ec.europa.eu/home>

## SECOND RECOMMENDATION: SCALE UP EFFORTS THROUGH LONGER TERM POLICY COMMITMENT

Experience suggests that activities that embedded in a coherent long-term national policy - as exemplified by the U.K. or Ireland - have a better chance of survival after initial funding comes to an end. Initiatives driven only by individuals or a small number of industry players can be vulnerable to changes in business strategies.

All national governments should put in place a long-term strategy, with clear goals and measures, to ensure sustainability of successful activities and partnerships that can address the e-skills challenge. To strengthen the link between e-skills development, promotion of entrepreneurship and innovation leading to growth and employment, every effort should be made to incorporate e-skills into policies on education, training, innovation and entrepreneurship, at EU, Member State and regional/local level.

Since 2007, the Commission<sup>6</sup> has provided a solid knowledge base of information on Member States e-skills policies and multi-stakeholder partnerships for national policy decision making. This continuous exercise in stock taking, monitoring and benchmarking progress has put into the hands of national governments the evidence on which to agree on and implement the necessary policies and actions.

## THIRD RECOMMENDATION: ADAPT EDUCATION AND TRAINING TO THE DIGITAL AGE

The European Council conclusions of 25 October 2013 urge “a higher degree of integration of digital skills in education, from the earliest stages of school to higher education, vocational education and training and lifelong learning”. Success has been variable in Member States<sup>7</sup> efforts to update school curricula and ICT infrastructure in line with the rapid pace of technical innovation and the evolving needs of industry and society. While some countries have overhauled their curricula with the purpose of embedding ICT use and media literacy within all segments of the learning process, most Member States have not yet gone so far. Multi-stakeholder partnerships are important to the development and provision of education and training offers corresponding to the needs of the labour market. Many Member States have attempted to channel graduates and jobseekers towards particular ICT jobs for which there is strong demand, and some aim to provide students and workers with alternative channels of educational achievement, with improved means for “on-the-job” and “just-in-time learning”. Some of the examples<sup>8</sup> in this report may lend themselves to localised replication.

National and regional authorities should ensure that primary and secondary school curricula embed ICT use and media literacy throughout the learning process, with a focus on creative ICT applications for real-world challenges. National governments and stakeholders should dedicate resources to job placement and adjustment services, to help willing workers find positions that use their skills. Member States need to improve the matching of new graduates with industry requirements. The German and Austrian VET dual and apprenticeship system also offer alternative ICT career paths for those interested in a more practical vocational job in this field. So do further education and training activities, where approaches can build on previous work experiences. Cooperation with employment agencies and the recruitment industry to ensure placement of graduates from these schemes and programmes is important, and implementation should aim at the adaptation or integration of recognised industry-based training and certification schemes. Other valuable stakeholders will be leading ICT companies offering industry-based certification courses, international certification and examination providers, industry representatives, associations and unions.

## FOURTH RECOMMENDATION: FOSTER IT PROFESSIONALISM AND QUALITY

Because the ICT profession is not clearly defined, making informed career choices runs up against the opacity of the ICT education and training market. Career support is starting to become available at national level for ICT practitioners to remedy this difficulty, with programmes providing market information tailored to individual needs, and advice about training offers on the market for individuals seeking (re)training in professional e-skills. And an increasing number of schemes for education and certification in Europe make use of, or are closely aligned with, the e-CF, which should become a European standard by 2015. Facilitating geographical workforce mobility across regions and countries can be an important aid, along with user-centred Internet portals, knowledge databases, and awareness-raising campaigns.

6. As a contribution to the implementation of its Communication on „e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs”, COM (2007) 496

7. Denmark introduced a new subject „Computational thinking and practice” which represents the state-of-the-art in the didactical approach to teaching computing related issues at school.

The UK is advancing along similar lines. Coder Dojo has been set up as a grassroots movement which organises programming sessions („Dojos”) for school children of all ages, at first in Ireland and today in 29 countries around the world.

8. The „IT Academy program” in Estonia; the „ITMB Degree” in the UK and the „Get Qualified” scheme in Malta; the „Level 8 Conversion program” in Ireland etc.

National and EU-level Initiatives should be fostered to strengthen ICT professionalism, to steer professional skills to where there is demand for ICT practitioners using the e-Competence Framework (e-CF) and online tools for career support and lifelong learning, and to counsel job seekers on re-skilling and certification. These activities would benefit from a coordinated approach at EU level. The implementation in each Member State will depend on the national situation, but should include stakeholders from industry, certification institutions, national or regional government, associations representing ICT professionals, and employment agencies. Europe-wide industry activities to promote ICT professionalism, initiated in March 2013 by the Council of European Professional Informatics Societies, the European e-Skills Association and several other stakeholders within the „Grand Coalition for Digital Jobs“, will need to be closely coordinated with those of CEN and of the Commission.

## FIFTH RECOMMENDATION: BUILD BRIDGES FOR ALL STUDENTS, GRADUATES AND WORKERS

Too few students pursue a career in science, technology, engineering and mathematics (STEM), although these offer promising job and career opportunities, irrespective of whether the skills are obtained through university, an apprenticeship, or vocational training with work placements. Unbiased and high quality career information and support services are needed<sup>9</sup> for young people and their parents, advising on job opportunities and demonstrating that such skills are in demand. Companies which have not been able to directly recruit ICT professionals also regard STEM graduates as a suitable pool for recruiting staff to ICT-related jobs after training. Promoting the use of ICT industry certification and dedicated courses and certifications<sup>10</sup> for non-ICT STEM graduates and employees can increase the number ICT professionals urgently needed by industry. Commission awareness-raising campaigns have also shown their worth.

National governments should offer access to high quality information and career-support services for young people, providing advice on existing and future job opportunities and industry demand, and demonstrating that they could quickly find a job. Governments have a role in collecting the data needed to determine which skills are in demand and what kind of education and training is effective - perhaps through an observatory that would provide the labour-market data that could allow students to make informed choices, and would track students' progress - including their studies, their first employment, their starting salaries etc. Prospective students could thus obtain a clearer picture of their future prospects. Initiatives for ICT career development for students, such as the Academy Cube, should be evaluated and lessons drawn about scaling up, replication and roll-out in other countries. National governments and employment institutions should be responsible for quality career-support and advice services at postsecondary and university institutions. But for motivating widespread use of ICT industry certification and dedicated courses and certifications for non-ICT STEM graduates and employees, the responsibility should be shared among ICT industry players, user industries, universities and education institutions as well as employment agencies and the recruitment industry.

9. At present only 25% of experts see the current career support initiatives addressed to STEM students, graduates and employees but also those from other disciplines interested in an ICT professional career as appropriate and effective, slightly more are satisfied with these. However, almost 70% see these as a relevant element of future policies and initiatives (Source: empirica survey, October 2013).

10. The 'Academy Cube' is an online learning platform for ICT practitioners open to all ICT companies. It was started in Germany and developed to become a pledge for the Grand Coalition for Digital Jobs to cover and be rolled out in further European countries.

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