E-SKILLS FOR JOBS IN EUROPE: MEASURING PROGRESS AND MOVING AHEAD

FINAL REPORT

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Prepared for the European Commission

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Objectives, background and research methods

The general goal of this service contract is to monitor the supply and the demand of e-skills across Europe and to benchmark national policy initiatives and multi-stakeholder partnerships in the European Union. To this end, the service contract analyses the evolution of the supply and demand in the last ten years, with the objective to provide a basis for:

- understanding the impact of the initiatives launched at EU and national level since 2008;
- propose new approaches (wherever appropriate) to remedy the situation; and
- identify successful ways and efficient means to foster multi-stakeholder partnerships to reduce e-skills shortages, gaps and mismatches.

The service contract has to be seen against the Commission's Communication on "e-Skills for the 21st Century" (2007) which presented a long term e-skills agenda, "The Digital Agenda" (2010) and the Communication "Towards a Job-rich Recovery" (2012) which include new proposals regarding e-skills. Recent developments include the launch of the Grand Coalition for Digital Jobs by the European Commission at a Conference in Brussels on 4-5 March 2013, which was hosted by President José Manuel Barroso 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.

This service contract builds on previous work, commissioned by the EC, on supply and demand of e-skills across the EU and on policy / stakeholder initiatives Member States are taking to make sure that their labour markets receive the required quantities and qualities of ICT practitioners.

An evaluation carried out in 2010 (eSkills21 – Evaluation of the Implementation of the Communication on "e-Skills for the 21st Century") came to the conclusion that the first two years after adoption of the European e-Skills Agenda have seen impressive (if variable) progress across the EU: Member States were increasingly developing e-skills strategies, making use also of innovative approaches such as multi-stakeholder partnerships incorporating stakeholders who are not traditionally part of education system. Nevertheless, it was widely recognised that more needed to be done to address innovation skills shortages and to implement the European e-Skills Agenda. As the 2012 Communication 'Towards a job-rich recovery' and the associated Staff Working Document on 'Exploiting the employment potential of ICTs' states, according to the most reliable estimates "by 2015 Europe is expected to face a shortage of approximately 700,000 ICT practitioners. Lack of skilled workers, often referred as ICT skills gap, remains one of the reasons. Education in science, technology, engineering and mathematics needs to be strengthened and the career image of these fields improved, in particular for women."

Policy and stakeholder initiatives related to e-skills development

Our analysis shows a significant level of activity in the large majority of Member States. This applies to the **digital literacy** domain, where the target audience is the entire population or specified subgroups thereof, such as people at risk of being excluded from the knowledge-based society. It also applies, to almost the same extent, to the area of **ICT practitioner skills**.

Our assessment of national policy and stakeholder initiatives in the e-skills domain across all (then [1]) EU Member States shows high or even very high levels of activity in many countries not only in the Digital Literacy domain but also in the e-Skills area where the focus is on ICT practitioners and professionals rather than the population at large.

[1] Croatia, which joined the EU after the start of the service contract, has not been covered

Of the 27 Member States, 12 have a value of 3 or higher on the 5-point index scale for e-Skills activity. The group of leading countries includes the U.K. and Ireland. Belgium, Germany, Denmark, France, Malta the Netherlands and Sweden also perform strongly in terms of the level of activity for ensuring adequate supply of ICT practitioners on the labour market today and in the future. The range of interventions used is very broad. There are clear indications that the 2007 e-Skills Agenda and the subsequent initiatives by the European Commission have triggered Member States to engage in public debates about the e-skills issue and helped them to develop appropriate responses.

Level of policy and stakeholder activity on e-skills (2013)			
Country	e-Skills activity index	Digital Literacy activity index	e-Leadership skills index
AT	●●●◖	●●●●	●
BE	●●●●	●●●●	●◖
BG	●●◖	●●	●◖
CY	●●	●●	●◖
CZ	●◖	●●◖	●
DE	●●●●	●●●	●●◖
DK	●●●●	●●●●◖	●●◖
EE	●●●◖	●●●●	●●
EL	●◖	●●●	●◖
ES	●●	●●●●	●
FI	●●◖	●●●◖	●●◖
FR	●●●●	●●●	●●
HU	●●◖	●●●●	●◖
IE	●●●●◖	●●●	●
IT	●●◖	●●◖	●◖
LT	●●	●●●◖	●◖
LU	●●◖	●●	●◖
LV	●●◖	●●●◖	●◖
MT	●●●●	●●●●	●●◖
NL	●●●●	●●●●	●●◖
PL	●●●	●●●●	●◖
PT	●◖	●●◖	●◖
RO	●◖	●●●	●
SE	●●●●	●●●●	●●
SI	●◖	●●●●	●◖
SK	●◖	●●●	●
UK	●●●●●	●●●●◖	●●◖

However, the degree of integration and consistency of policy-making is still limited in a significant number of Member States. Most countries lack a master strategy or the topic still does not attract continuous attention in policy-making across the different policy areas concerned. Typically, measures are taken for adapting the education system to the demands of a knowledge-based economy, but in some countries little reference is being made to ICT practitioner skills and the need to boost supply of suitably qualified ICT professionals (e.g. **Czech Republic**, **Luxembourg**). Initiatives targeting young people, especially girls, with the intention to develop a positive attitude towards STEM subjects in general and a career in ICT in particular, are widespread, which is not surprising given their modest cost and strong (if short-lived) attraction for the media. They do, however, sometimes seem to lack sustainability and make use of questionable pedagogical/methodological approaches.

Since the onset of the current economic crisis in Europe and the resulting jump in unemployment rates across most of Europe, policy-makers have tended to direct their attention away from the issue of (current or upcoming) skilled worker shortages. The widespread problem of budget deficits appears to have a negative impact on some Member States' ability to follow through with plans to address the e-skills topic more full-heartedly and in a systematic way, especially in countries with below average GDP/head. This appears to apply, for example, to **Portugal**, **Greece**, **Slovenia** and **Cyprus**. In their place, available sources of financial support (such as ESF funds) are being used to re-train unemployed persons for jobs in the ICT domain, but national experts tend to be very sceptical about the effectiveness of such measures in terms of the success in providing e-skills needed on the labour market, especially in the countries with the highest rates of unemployment.

Other countries, however, have taken the route of strategic, long-term policy making in the e-skills domain, with strong engagements from a wide range of stakeholders in the public sector as well as the business and civic sectors. The **United Kingdom** has extensive experience in e-skills related policy development and remains a benchmark for multi-stakeholder partnership in this domain. The **Netherlands** and **Ireland** also benefit from strong policy leadership in the e-skills domain; these

countries have a master strategy in place as well as a comprehensive infrastructure for adapting measures closely to changes in supply and demand for different types of ICT practitioners. **Sweden** has an e-Skills Council and shows evidence of a high level of maturity in terms of mainstreaming the e-skills issue throughout all parts of the country's education system.

Some countries, such as **Denmark** and **Austria**, use their ambitious e-government strategies as a horizontal lever to promote e-skills policy goals across a wide spectrum of policy domains, with a focus on the education sector, which is dominated by public education providers in both countries. In Denmark, a range of initiatives driven by universities in cooperation with other national stakeholders have been taken. There is already strong evidence for substantial success in attracting young people to ICT study courses over the last 10 years in the country.

Significant policy leadership and vision in the s-skills area is also found in countries with below-average economic strength (as indicated by GDP/head). This applies to **Estonia** which, as it places ICT at the heart of its strategy for economic development, is fully aware of the need to ensure a steady supply of sufficiently qualified ICT practitioners for medium and long-term prosperity. Neighbouring **Latvia** also has become active with a master strategy to develop e-skills.

The general picture suggests that most Member States have responded to the European e-Skills Agenda with a delay of a few years. For example, **France** has developed a comprehensive policy strategy with its Roadmap on Digital Policy in 2013, after a lengthy period during which national experts have complained that the country lacked policy leadership in the e-skills domain. Given the newly established policy framework, the situation in the country is expected to improve much now, also because of the strong engagement of the non-governmental sector. **Spain** may be on the same path as it has stepped up activities in the context of the new Digital Agenda, but it appears to early to tell yet how strong policy commitment will be.

The long-term continuity and sustainability of state programmes on e-skills has been negatively affected by the electoral cycle in some Member States. In **Malta**, a country that has shown policy leadership in the e-skills area as exemplified by set-up of the eSkills Malta Alliance in 2010, a change of government in 2013 resulted in the future of the Alliance being in doubt. At the time of writing, however, the Alliance is about to be re-established in a new format. In **Hungary**, the Orbán government after coming to power set out to overhaul the tertiary education system, which in the face of strong opposition by stakeholders in the university system has diverted attention away from the challenge of how to improve the country's ability to produce sufficient numbers of ICT practitioners.

Some countries are seeking to secure public investments in grants offered to ICT students against the risk that graduates leave the country in search for higher wages elsewhere. To this end, **Hungary** has introduced legislation according to which state subsidies to university education (scholarships) must be paid back if a graduate seeks employment abroad within a certain number of years after graduation. In Malta, education grants under the "Get Qualified" scheme are paid out as tax incentives, i.e. only in the case that the graduate is employed in **Malta**.

In other Member States again, governments have shown limited commitment to the e-skills issue, but other stakeholders – industry, trade unions, and the civic sector – show high levels of activity. **Bulgaria** lacks a strategic policy approach on e-skills development, but the country's strong software industry has stepped in to fill the gap with a range of ambitious initiatives. In **Germany**, major industry players have taken the lead for instance in e-skills training and certification. Here, the focus is increasingly moving from the national to the regional, as key stakeholders on a region's market for ICT practitioner supply & demand join forces to address current shortcomings and projected shortages and mismatches.

In **Belgium**, most of the policies related to e-skills (e.g. education and training) are in the remit of the federated bodies, and the country's regions have long-established programmes which are generally regarded to be successful in spite of serious administrative hurdles, such as in the

Brussels region. Some of these initiatives have even started to cross borders, i.e. to address supply & demand issues concerning e-skills in a border region.

Other countries still concentrate mainly on digital literacy activities with no e-skills related policies apart from promotion and awareness raising measures (e.g. Greece but also Italy, Hungary) and show little e-skills policy activity (e.g. **Lithuania**, **Romania**, **Slovak Republic**). Poland used to belong to this group as well, but has very recently shown strong efforts to e-skills development, reflected by the Broad Agreement for Digital Skills in Poland signed in July 2013. In Lithuania, as well, developments are pointing in the right direction: In early November 2013 a Lithuanian National Digital Coalition was officially launched with the commitment of the Lithuania's government educational, library and digital and ICT sectors to boost digital skills and jobs in Lithuania.

Finland presents a very interesting example as it has to deal with a decreasing ICT sector as a result of the poor performance in recent years of the sector's national giant, Nokia. The short-term issue here is not shortage of ICT practitioners, but quite the opposite: a surplus of ICT professionals who have been shed by Nokia (or one of Nokia's suppliers) and who now must be enabled to find re-employment, including the option of self-employment, i.e. setting up their own business. Nokia in cooperation with the country's tertiary education providers as well as local/regional governments have set up a major programme for this purpose. Evidence so far suggests that this programme promises to become the most successful campaign for entrepreneurial activity based on ICT practitioner skills in the whole of Europe.

Developments since 2009

Research that preceded the present one already found evidence for a huge variation concerning the level of activity by national governments and stakeholders in the e-skills area. There is a need, of course, to interpret such differences in the context of the overall economic development of the respective countries and the maturity of its ICT practitioner labour market. It is for this reason that our previous research suggested that the analysis should be carried out by taking into account each Member States' performance on the Networked Readiness Index (NRI) published by the World Economic Forum.

Using a grouping of Member States according to the NRI in 2009 (the reference year for our last study on the subject), the 2013 research allows exploring to what extent different strategies have been used by countries according to their position in terms of Networked Readiness.

- **Group A** included countries with very high levels of digital literacy and e-skills availability in the workforce but only modest level of activity in terms of policy and stakeholder initiatives in the e-skills domain in 2009: Denmark, Sweden, Finland, Austria, and Estonia. All of these have seen sharply increasing levels of policy and stakeholder activity between 2009 and 2013. Our research suggests that the Nordic countries have reached a higher level of maturity by now, as initiatives are focusing not on boosting supply of ICT practitioners in general, but rather on channeling ICT students to those segments of the ICT labour market where the risk of shortages is expected to be highest. At the same time, the large number of ICT practitioners in these countries' workforces means that retraining of ICT practitioners has become an issue – especially in Finland, where there are now too many people with skills in mobile telephony and too few in parts of the market which are more dynamic. In this situation, efforts are focusing on boosting entrepreneurial activity, which explains why there is increasing debate about the need for the provision of e-leadership skills.
- **Group B** included countries with high levels of digital literacy and e-skills availability in the workforce as well as significant levels of policy and stakeholder activity in the e-skills domain (the U.K. and – to a lesser extent – the Germany, France and the Netherlands). In all of these, levels of policy and stakeholder activity have further increased, especially so in France and the Netherlands, both of which are seing strong policy leadership. Germany does not have a

national e-skills strategy, but benefits from a strong role of stakeholders from industry. The UK's approach in the last decade has relied on strong financial engagement by the state and industry, which the recent economic crisis has made difficult to sustain. Nevertheless, the country's initiatives in the e-skills domain remain a worldwide benchmark for policy intervention in the area, with e-skills UK, the Sector Skills Council for the area, at the core of most activities.

The second category had been composed of countries with medium range NRI figures. It had been split in two subgroups:

- **Group C** comprised countries with high levels of activity and at the same time large e-skills gaps as reported by industry, which meant that these countries could be expected to close existing gaps over the medium to long term. This included Ireland, Belgium and Malta, which were recommended to continue with high levels of effective activity. These Member States have indeed continued to show strong commitment to the e-skills topic, in spite of considerable challenges in the form of administrative hurdles (Belgium), strong budgetary constraints (Ireland); and termination of established multi-stakeholder partnerships following a change in government (Malta).
- **Group D** included Cyprus, the Czech Republic, Luxembourg, Portugal, Slovenia and Spain with modest levels of policy and stakeholder activity but also smaller e-skills gaps, with the exception of Slovenia. In the period 2009 to 2013, this group has again displayed medium to low levels of policy and stakeholder activity. In all of these countries with the exception of Luxembourg, the economy has been hit hard by the Eurozone debt crisis, leading to high rates of unemployment. This might have resulted in labour shortages being given little priority by policy makers. These countries will require, however, a strong ICT workforce in order to manage the structural shift of their economies towards sectors that offer room for strong growth.

The third category of countries was represented by:

- **Group E**, with comparatively low NRI figures in the range of 4.40 to 3.80. This included some countries with medium levels of activity in the e-skills area (Hungary, Latvia and to a lesser extent Romania and Poland), raising the expectation that policy and stakeholder initiatives would help improve the situation in the years to come. In the period 2009 to 2013, however, three of these four have displayed decreased levels of policy and stakeholder activity, which suggests that governments found it hard to sustain a focus on shortages of ICT practitioners in the face of growing budget deficits. Much of the activity in these countries appears to be related to the use of Structural Funds money for providing unemployed workers with ICT user skills and – sometimes – to retrain them to become ICT professionals. While this approach may bring short-term benefits in terms of availability of sufficiently e-skilled workers on the national labour market, it is unlikely to be of use for ensuring that employers will have an adequate supply of ICT practitioners in the medium to long term. Positive exceptions in this group are Poland, which has shown increasing efforts to secure future supply of suitably qualified ICT practitioners; and Bulgaria, in which non-government stakeholders mainly from the ICT industry have taken the lead in the absence of policy leadership by the government.

e-Leadership skills policy activities in 2013

Our research indicates that e-leadership skills have started to become an issue in policy and stakeholder initiatives of 21 of 27 EU Member States. Developments are still in their infancy, though, with the exception of Denmark, Germany, Finland, Malta, the Netherlands and the U.K.:

Denmark has a well-developed system for entrepreneurship training, with e-leadership skills on the way to become a key component of the education programmes.

In **Finland** initiatives in response to the contraction of the Nokia ecosystem have included large-scale promotion of entrepreneurship predominantly in the digital domain. These have included comprehensive training measures to equip prospective entrepreneurs with e-leadership and traditional business skills. Education providers have responded by developing training in e-leadership skills.

In **Germany** the Software Campus set up in 2012 is among the first major initiatives in Europe that focuses explicitly on e-leadership skills. It has lead to an increased awareness about the need for e-leadership skills and related training and education offers.

In **Malta** skills for e-Leadership and digital entrepreneurship attract considerable attention amongst policy-makers and other national stakeholders. The Centre for Entrepreneurship and Business Incubation at Malta University and the Microsoft Innovation Centre have started to provide training in this area.

In **the Netherlands** some first stakeholder initiatives which explicitly deal with e-leadership skills and digital entrepreneurship have been launched in recent years. Examples include integrated business development initiatives such as the Brainport Talent Region; and national campaigns and training schemes targeting SMEs such as 'Slimmer & veilig ondernemen in 1 minuut'. Several Dutch universities (Nyenrode, Tias Nimbas Tilburg, TU Delft) are also actively involved in the EuroCIO Executive Education Programme addressed to EuroCIO members which addresses the e-skills shortage in industry and are since recently also addressing e-leadership skills.

In the **United Kingdom** increasing emphasis is put on e-leadership skills with the advent of the Information Economy Strategy and Council and the proposed joint action by government, business and academia on digital skills. Education providers have started to develop innovative offers at the interface between ICT and business management.

It becomes apparent that e-leadership skills have only become an issue in countries which rank at the top in Europe in terms the propensity for a country to exploit the opportunities offered by ICTs (as reflected in the NRI Index).

Multi-stakeholder partnerships (MSPs) on e-skills

Multi-stakeholder partnerships (MSPs) are defined as initiatives jointly operated by organisations from the established education and training sector and private-sector partners (industry associations, employers from the private sector). The latter take over responsibilities which in traditional education systems have been held (more or less) exclusively by public sector or civic sector institutions. MSPs build on the idea that the private sector can complement and extend services provided by the public sector, with the objective to enhance available resources and thus achieve faster and stronger impact. To be successful MSPs need to have an emphasis on involving all key stakeholders which are of relevance for a certain e-skills related issue. This is seen as the best way to ensure that progress will be self-sustainable and all-encompassing, as opposed to the piecemeal, uncoordinated approaches which too often dominate the modernisation of systems of higher education and VET in Europe. From an industry viewpoint, multi-stakeholder partnerships present the possibility of overcoming the traditional polarisation between the public education system, which is the main factor behind supply of (formalised) skills on the labour market, and private sector employers, which exert demand for particular skills.

Our 2013 research on multi-stakeholder partnerships on e-skills showed that existing initiatives can be clustered into eight categories according to their main focus:

- **Awareness raising** activities: These initiatives are based on the premise that there is limited understanding about ICT practitioners, their role within the economy in quantitative and qualitative terms, their relevance for the performance of SMEs, career prospects in ICT, etc. Typical target groups include young people prior to taking decisions which have a bearing on

their later career, i.e. students in primary, secondary and tertiary education. There is a huge variety of approaches being used to address this particular target group across Europe, ranging from competitions and event-type "meet your future employer" activities to tools and platforms that seek to make ICT a "cool" career choice among teenagers.

- **Providing the basis at early age**: This includes initiatives for adapting primary and secondary education in order 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 engaged in a updating and modernising school curricula and ICT infrastructure to fit the rapid pace of technical innovation as well as the evolving needs of industry and society. The success has been variable and depends to some extent, of course, on the ability of each country to finance investments in its education system. Some countries have subjected their complete system of primary and secondary education to scrutiny and developed ways to mainstream pupils' exposure to STEM related subjects, as a means to increase interest in technological subjects from an early point onwards. Curricula have been overhauled with the purpose of embedding ICT use and media literacy within all segments of the learning process. Denmark, for example, has introduced a new school subject "Computational thinking and practice" which represents the state-of-the-art in the didactical approach to teaching computing related issues at school. The U.K. are advancing along similar lines.
- **Initiatives focussing on girls/women**: A sub-group of the former type of MSPs targets school age girls and young women. With very few exceptions, women are significantly underrepresented among both current ICT practitioners and ICT students. Some of the longest-running initiatives mentioned in the present report have the objective to make ICT-related study fields more interesting for young women. In both Germany and Austria, these programmes have started in the early years of the last decade already. Many other Member States have initiatives specifically targeting girls and young women as well, often using mentor programmes through which female ICT students or graduates are sent into schools as role models.
- Development and provision of **tailored education & training** according to the needs of the labour market: In the face of, on the one hand, increasing rates of unemployment and, on the other hand, hard-to-fill vacancies for ICT practitioners, many Member States have attempted to channel graduates and other jobseekers towards particular ICT jobs for which their is strong demand. The Republic of 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”.
- **Career support, lifelong learning and e-leadership training**: The fact that the ICT profession is less clearly defined as other, more established professions means that the transparency of the ICT labour market for employees seeking to make career choices is less than optimal. Initiatives for career support of ICT practitioners have been set up to help improve this situation. Often such programmes provide users with market information tailored to their individual needs. They also intend to help individuals who look for (re)training in professional e-skills by supplying advice for finding appropriate training offers on the market.
- **e-Skills competence frameworks, certification and job matching**: The development of widely recognised e-skills frameworks and definitions has been taken place at the national level in the 1990s already (e.g. AITTS with APO-IT in Germany; SFIA in the U.K.; Les Métiers des Systèmes d’Information dans les Grandes entreprises – Nomenclature RH in France). It received a strong push in recent years with the development of the European e-Competence Framework (e-CF). A large number of schemes for education and certification of e-skills in Europe make use of, or are closely aligned with, the e-CF. There also is increasing activity at sub-national level to

establish coherent systems to steer relevant professional skills to where there is demand for ICT practitioners, and to counsel job seekers in issues concerning re-skilling and certification. Facilitating geographical workforce mobility across regions and countries is an important element in this, as shown by the example of CompeTIC, a cross-boarder project between the Belgian Walloon Region and the French Region North-Pas-de-Calais. Related measures include the implementation of strongly user-centred Internet portals/knowledge databases plus campaigns for raising awareness among employers, especially SMEs with limited HRM capabilities.

- **Comprehensive, national e-skill partnerships with strong government role**: In addition to the focused initiatives discussed above, a number of Member States feature strongly government-supported partnerships that are engaged in a whole range of e-skills related measures and initiatives, based on a long-term strategical approach in close alignment with policy-making. The most well-known example is e-skills UK, which as Skills Sector Council for the ICT sector is subject to control by the government, but has also benefitted from significant public funding as well as from strong policy support. Budget cuts have made it more difficult to maintain this kind of governance model, in the U.K. but also elsewhere.
- **Comprehensive, national e-skill partnerships with limited government role**: In other countries, such comprehensive partnerships in the e-skills domain have been established with little or no government influence. One example is France's P@scaline, which enjoys strong support from the business sector as well as the relevant trade unions, but is not embedded in the government's policy agenda to the same degree as this is the case with e-skills UK.

Stakeholder and expert survey on effectiveness and relevance of EU and national e-skills policies

Stakeholder opinions and views on the effectiveness and relevance of e-skills policies were obtained through an interview survey, which was administered online and accompanied by telephone interviews. The survey was addressed to around 1,000 experts from national governments and governmental agencies involved in e-skills policy making; higher education; research and academia; ICT industry and the business sector at large; social partners; associations; and consultants. The response rate of was 17% with 171 experts getting involved and responding. 111 responses could be used for the statistical analysis.

Those types of policies which were most widely perceived as appropriate and effective include:

- Provision of market information on current and future e-skills supply and demand;
- Activities by universities on new ICT curricula and programme development for Bachelor and Master courses;
- Vocational school activities teaching dedicated subjects for students to become an ICT practitioner,
- Initiatives around e-skills frameworks and associated online tool development;
- Institution building: establishment of a dedicated (possibly government funded) institution (like e-skills UK) to promote and support the ICT profession through a multitude of activities.

Respondents almost unanimously state that nearly all existing types of e-skills policies and initiatives will be of high or even very high relevance in the near future.

When it comes to the role of the European Commission and Member States governments, experts and stakeholders call on both to step up their efforts in the e-skills domain. This applies especially to the national governments level, which according to the large majority of respondents needs to become much more active to prove capable of meeting the challenges surrounding shortage of suitably qualified ICT practitioners in Europe.

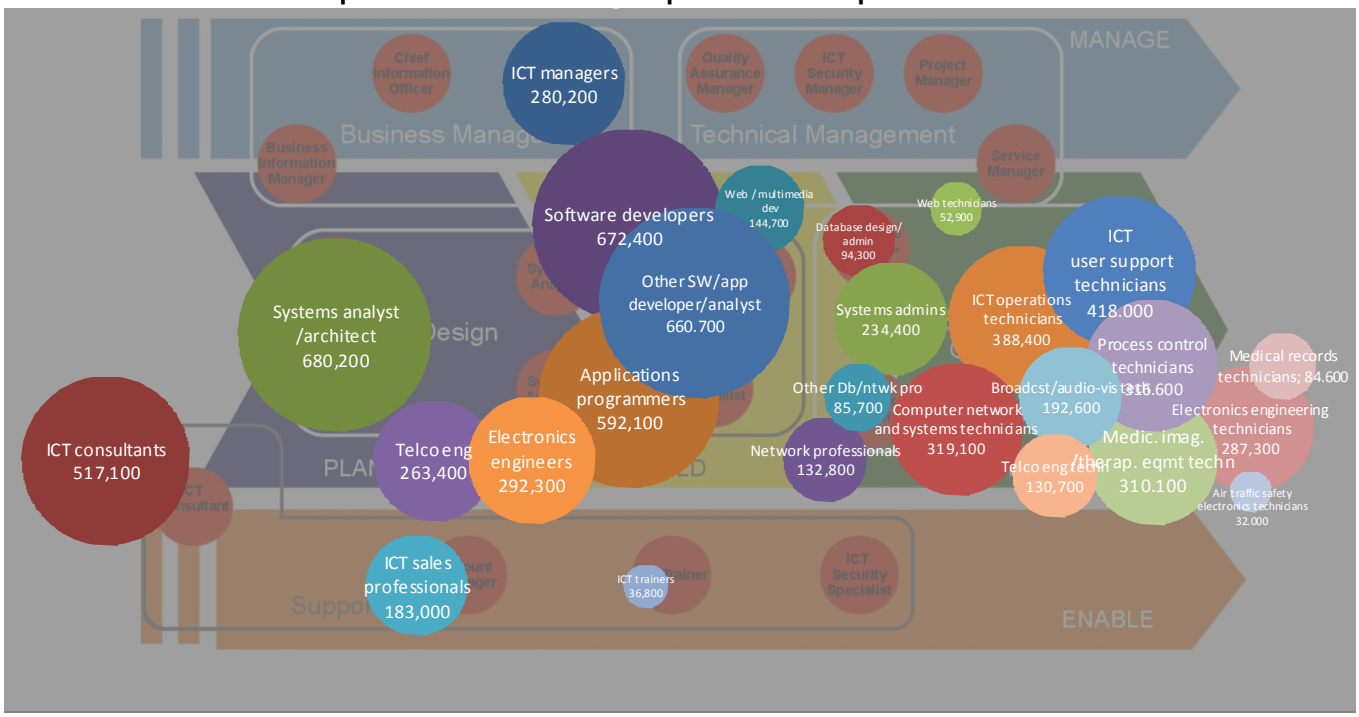
e-Skills supply and demand in Europe 2000-2020

The ICT workforce in Europe in 2012 includes 7.4 million workers, which is 3.4% of the European workforce. The workforce of ICT professionals as used in this report includes:

- Management and architecture and analysis level skills (1.5 million);
- ICT practitioners at professional level (3.4 million);
- ICT practitioners at associate/technicians level (2.5 Million).

A mapping the available statistical classification data (ISCO-08) to the CEN ICT job profiles is done in the following picture and gives an overview of the occupational structure of the ICT workforce.

ICT profiles as a definition template of the ICT profession



Source: *empirica*

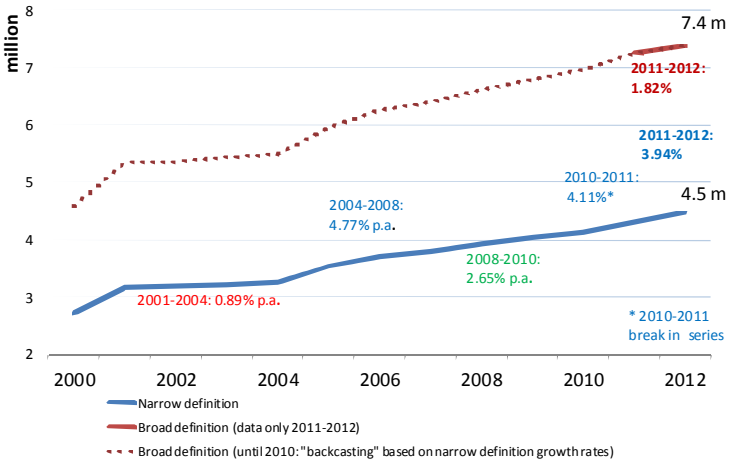
ICT practitioners are working in almost all industries of the economy and not just in the ICT industry sector, and it appears reasonable to assume that almost full employment of this occupational group exists in Europe.

Three countries already account for half of today's jobs, namely the United Kingdom, Germany and France. Adding Italy, Spain, Poland and the Netherlands, already this group of seven would reflect three quarters of the European ICT professional workforce.

The share of the ICT professional workforce within the total workforce is 3.4% in Europe and varies significantly across the European countries. United Kingdom, Luxembourg, Sweden, Finland and Denmark with a share of above 5% can be found at the highest ranks in this regards.

The Netherlands feature the largest share of management, architecture and analysis jobs within the IT workforce, their share is 40%, followed by Sweden (35%) and Finland (30%).

Development of ICT employment and average annual growth rates in Europe 2000 – 2012



Source: Eurostat LFS. Narrow definition: 2000-2010 ISCO-88 groups 213, 312: "Computing professionals" and "Computer associate professionals". Break in series 2011: ISCO-08 groups 25 "ICT professionals", 35 "Information and communications technicians". Broad definition: see elsewhere in this document.

The development of the ICT workforce in Europe between 2000 and 2012 has been very dynamic. The size of "ICT workforce" naturally depends on the definition used. Using a minimum definition, that only includes a core set of practitioners but is comparable across the time span of interest here, from 2000-2010 we have seen an average growth rate of 4.3% per year and of 3.9% between 2011 and 2012 (with a break in series 2010/11).

In a broader definition, where today's ICT workforce in Europe amounts to 7.4 million workers, the growth of workforce according to this broader definition has however been "only" 1.8% between 2011 and 2012.

The major inflows into the ICT workforce would obviously come from the ICT graduates from Higher, and in some countries Vocational, Education. The e-skills supply in Europe in 2011 from ICT graduates from Higher Education can be estimated to sum up to 113,000 ICT graduates. A closer look at the developments over the past 10 years shows a trend indicating decreasing numbers throughout Europe for the past years, but especially in the United Kingdom and Sweden. After a continuous increase and a peak of 127,000 ICT graduates leaving universities in 2006 the figures went down.

Development of the number of tertiary level computer science graduates in European countries 2000 – 2011

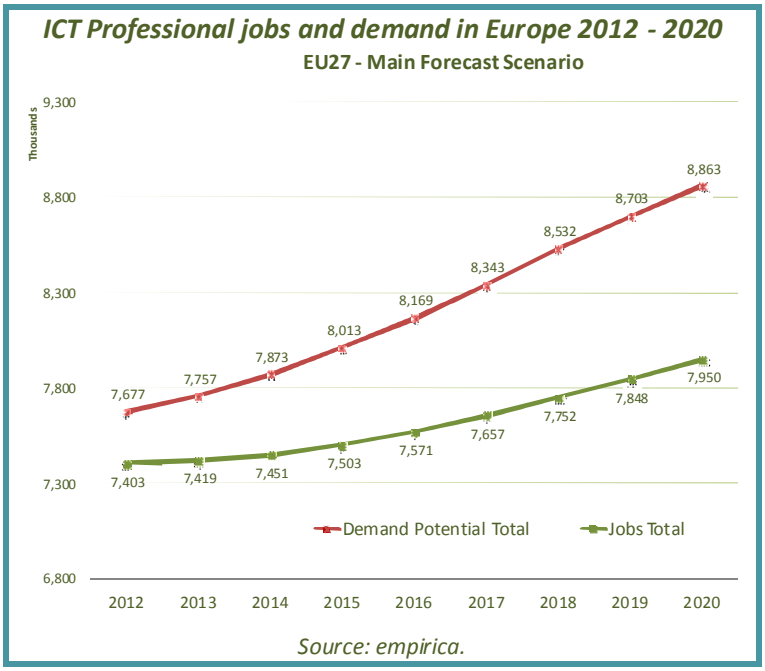
Total number	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
EU-27	71,000	83,459	92,685	104,362	115,692	123,202	125,326	120,185	121,118	113,965	114,565	112,918
France	11,447	14,841	15,461	16,081	18,088	20,094	19,673	18,409	17,551	19,136	20,431	20,431
United Kingdom	21,918	24,992	27,009	30,767	27,670	29,557	28,239	25,156	23,802	19,154	19,180	19,535
Germany	5,630	5,860	6,617	8,368	11,090	12,767	14,238	16,092	16,515	17,194	16,800	16,526
Spain	10,963	13,727	16,152	19,323	19,718	18,559	17,298	15,760	14,551	15,071	15,068	14,790
Poland	1,912	3,542	4,112	5,879	10,681	13,116	14,788	14,209	13,023	12,406	12,535	12,315
Netherlands	1,308	1,454	1,645	1,754	3,611	3,969	4,650	4,385	4,083	3,928	3,858	3,651
Czech Republic	2,328	2,676	2,734	1,215	1,498	1,643	2,133	2,406	2,909	3,047	2,939	2,846
Italy	1,626	1,519	2,423	2,843	3,211	3,459	3,541	3,385	2,933	2,870	2,778	2,420
19 other Member States	16,544	17,994	20,026	22,066	24,486	24,682	25,489	24,913	25,751	21,159	20,976	20,404
Relative to peak	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EU-27	57	67	74	83	92	98	**100**	96	97	91	91	90
France	56	73	76	79	89	98	96	90	86	94	**100**	**100**
United Kingdom	71	81	88	100	90	96	92	82	77	62	62	63
Germany	33	34	38	49	64	74	83	94	96	**100**	98	96
Spain	56	70	82	98	**100**	94	88	80	74	76	76	75
Poland	13	24	28	40	72	89	**100**	96	88	84	85	83
Netherlands	28	31	35	38	78	85	**100**	94	88	84	83	79
Czech Republic	76	88	90	40	49	54	70	79	95	**100**	96	93
Italy	46	43	68	80	91	98	**100**	96	83	81	78	68
19 other Member States	64	70	78	86	95	96	99	97	**100**	82	81	79

***Source:** Based on Eurostat, some estimates.*

Today, like in almost all recent years except for the aftermath of the dotcom-bubble bursting, the demand for ICT workers is outstripping supply. The results of a representative empirica survey of CIO's and HR managers in eight European countries in 2012 show that the demand for e-skills, i.e. ICT professionals and practitioners, extrapolated to the whole of Europe (EU-27) can be estimated at around 274,000 in 2012. This is based on the numbers given by CIOs and HR managers in European organisations for the number of vacancies in ICT-related occupations.

Among these, we find a demand of about 73,000 vacancies for the EU-27 for "ICT management and business architecture" skills and about 201,000 for "Core ICT practitioners" and "Other ICT technicians" jobs. As percentage of existing workforce, there are 3.4% open positions for practitioners and 5.0% for management, architecture and analysis jobs.

Three scenarios have been prepared in the study. The main forecast scenario represents the most likely future as we foresee it, while a stagnation scenario assumes a slightly less favourable future and a disruptive boost scenario is meant to describe a future of increased demand due to ICT based disruptions of one or several industries of yet unknown kind. Scenarios are meant to span the space of likely possible futures.



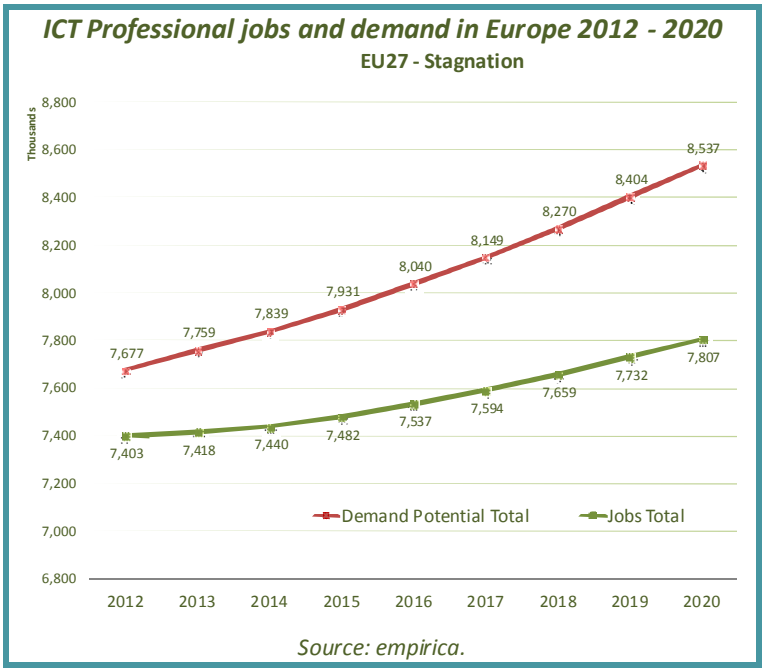
The first scenario features an economic growth scenario based on ECFIN forecasts until 2014 and a slow recovery afterwards. GDP growth across Europe is assumed at an average of 1.0 % compound annual growth rate between 2012 and 2015 and increases to 1.7 % on average annually between 2015-2020.

Moderate IT investments will be reflected in 2.2 % p.a. growth until 2015, with an increasing trend from 2014 on, so that the second half of the decade will see a growth rate of 3.0 % on average. IT investments will not least build upon a rapid diffusion of mobile devices and apps and of cloud services and other new IT delivery models. Big data applications and services are expected to grow considerably over the complete period of the forecasting.

In the 'Main Forecast Scenario', the ICT workforce in Europe will grow from 7.4 million in 2012 to 7.9 million in 2020, of which 5.9 million will be ICT practitioners and 2 million ICT management level employees.

The **excess demand** or shortage (calculated as the number of open posts) amounts to **509,000 in 2015** and **913,000 in 2020**. This figure can best be described as **'demand potential' or 'job potential' for ICT jobs**. It should be seen as a (theoretical) figure describing the demand potential for new ICT jobs which could theoretically be additionally created in Europe due to an e-skills demand likely to occur especially in the years closer to 2020.

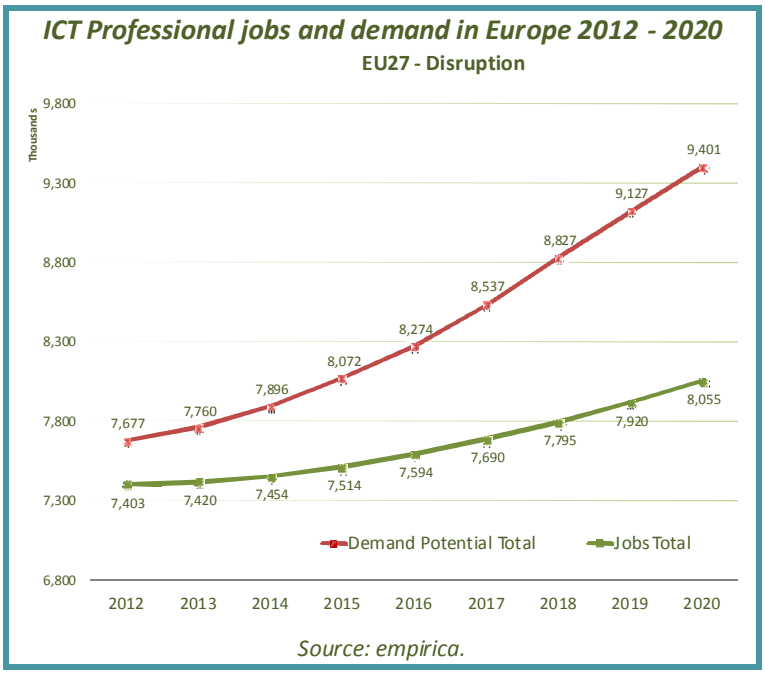
The second synthesis scenario called "Stagnation Scenario" features a stalling economic recovery: Southern European economies remain in recession – with high taxes and austerity prevailing. The US budget fight repeats itself and the impact is felt in the rest of the world.



Source: empirica.

Growth in China and other emerging markets slows down, with effects felt in Germany and many European countries which relied on increasing business from emerging economies as a strategy of recovery. As a consequence of the continued economic mire, IT budgets and investments are once again under pressure – new projects once again put on hold. Again, the focus of IT expenditure is on "keeping the lights on". A vicious cycle entails as lack of investments stops innovation, increases technical glitches and security breaches which in turn makes it difficult for companies to focus on top line growth. This will mean that ICT investments will continue to hover around the 2% mark.

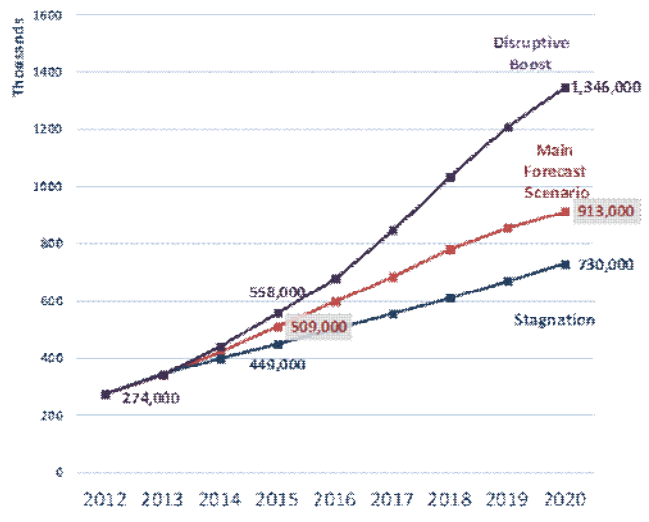
As a result, the number of jobs will not increase as much, growing from 7.4 million to 7.48 in 2015 and 7.8 million in 2020. Excess demand will come in at 450,000 in 2015 and 750,000 in 2020.



Source: empirica.

The third synthesis scenario called "Disruptive boost" features some disruptive innovations taking effect in some industries, exactly which is – naturally - yet unknown. The drive towards adopting 3rd platform technologies (mobility, social, big data, cloud) increases dramatically as a new "killer app" emerges. This could for example be from the Internet of Things applications, where Line of Business budgets get released to fund ICT investments to a much higher degree; it could be the use of 3D printers where again investments may be channelled from production budgets to ICT investments; it could be a major security breach that pushes mass adoption of virtualised (or cloud) based workplace environments to control data access; or it could be faster adoption of big data/social in dealing with customers, which again lets ICT spending tap into other parts of the organisation's budget. This will produce ICT investment growth back to the rates seen at the end of the 1990s - a phenomenon that would not have been expected.

Excess demand in Europe 2012 – 2020, comparison of the three scenarios



Source: empirica.

The increased innovation leads to higher economic growth from 2017 onwards. We have assumed that there is a general improvement in economic conditions from 2014 onwards to open up for the new "investment spree". Thus GDP growth will come back after 2014 and exceed the 2 percent mark again. After the disruptive boost setting in in 2017, growth will even surpass 2.5%. IT spending is assumed to increase slightly in anticipation of the disruptive boost and then still be felt in the following years.

As a result, the number of jobs will increase from 7.4 million to 7.5 in 2015 and 8.1 million in 2020. Excess demand will be at 560,000 in 2015 and 1.3 million in 2020.

Policy recommendations

Five policy 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

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”. 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 – particularly in the Smart Specialisation Platform . 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.

SECOND RECOMMENDATION: SCALE UP EFFORTS THROUGH LONGER TERM POLICY COMMITMENT

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 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

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 ICT PROFESSIONALISM AND QUALITY

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

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.

1 Introduction

1.1 Objectives and background of the study

The general goal of this service contract is to monitor the supply and the demand of e-skills across Europe and to benchmark national policy initiatives and multi-stakeholder partnerships in the European Union. To this end, the service contract analyses the evolution of the supply and demand in the last ten years, with the objective to provide a basis for: (a) understanding the impact of the initiatives launched at EU and national level since 2008, (b) propose new approaches (wherever appropriate) to remedy the situation and (c) identify successful ways and efficient means to foster multi-stakeholder partnerships to reduce e-skills shortages, gaps and mismatches.

The European e-skills agenda had its roots in earlier EU-level dialogues around the issue, the main conclusions from which the European Commission in 2007 summarised as follows:

- The topic "e-skills" is still not really recognised as a major political challenge;
- There is no comprehensive and consistent e-skills strategy in the EU;
- The image problem, misperceptions and resulting decline in the supply of highly-skilled ICT practitioners are creating mismatches and a labour deficit in this field. It must be remedied;
- An even larger gap is opening up between the supply and the demand of specific e-skills, while digital illiteracy persists.

In its Communication to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions of 7 September **2007**, entitled "**e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs**", the European Commission laid out a long-term e-skills agenda and proposed a number of corresponding actions in the field of ICT. The document identified e-skills as a major issue for EU competitiveness in a globalised world and thus for productivity, growth and jobs. The EU and its Member States were called upon to quickly adopt rapidly-developing ICT in order to bridge the e-skills gap and be in a position to create a leading knowledge-based economy.

In the document, the European Commission emphasised the need to: (a) establish a long-term e-skills agenda at national and EU levels; (b) improve co-operation between the public and private sectors in order to make an effective link between basic e-skills training, higher education and professional development; and (c) get industry and policy to act more decisively and consistently regarding their strategies to promote the attractiveness of ICT education, jobs and careers.

After extensive stakeholders' consultations and a number of exploratory studies, the European Commission proposed five action lines to be pursued at the adequate level in the EU:

- Promoting long-term cooperation and regular dialogue between stakeholders (Member States, industry, associations, trade unions), and monitoring progress;
- Developing supporting actions and tools. This includes: supporting the development of a European e-Competence Framework, further promoting the Europass, setting up fast-track schemes for third-country ICT practitioners to the EU;
- Raising awareness by encouraging exchange of information and good practices between Member States and by promoting awareness and information campaigns at European and national level;
- Fostering employability and social inclusion as part of the initiative on e-inclusion;
- Promoting better and greater use of e-learning and the development of e-learning exchange mechanisms of training resources and the networking of training and research centres.

Implementation of these measures has mainly been the responsibility of the Member States, with supporting actions at EU level only to the extent that they create real added value.

In **2010** the European Commission published the results of an "**Evaluation of the Implementation of the Communication on 'e-Skills for the 21st Century'**", carried out by empirica. The research demonstrated that good progress had been made and that Member States were increasingly developing e-skills strategies. Moreover, important e-skills activities had commenced under the umbrella of the "Digital Agenda for Europe" and the "Innovation Union", both of which were adopted in the same year (2010). Nevertheless the report, as well as subsequent research conducted on the subject, concluded that more needed to be done to address innovation skills shortages and to implement the European e-skills agenda.

The continuing need for policy intervention follows most obviously from the fact that there are still sizeable gaps, shortages and mismatches regarding e-skills today: The 2012 Communication 'Towards a job-rich recovery' and the associated Staff Working Document on 'Exploiting the employment potential of ICTs' reported that, according to the most reliable estimates available, "by 2015 Europe is expected to face a shortage of approximately 700,000 ICT practitioners. Lack of skilled workers, often referred as ICT skills gap, remains one of the reasons. Education in science, technology, engineering and mathematics needs to be strengthened and the career image of these fields improved, in particular for women."

1.2 Definition of e-Skills used in this report

Already in 2004 the European e-Skills Forum distinguished between three categories of e-skills: ICT user skills; e-Skills (ICT practitioner skills); and e-business skills (a hybrid of technology and business skills sets). This definition has been used in the multitude of studies and projects and e-skills carried out by different actors and stakeholders in Europe since then. It has also been referred to and presented in the Tender Specifications of the present call for tender stating that the term "e-skills for competitiveness and innovation" should be used as the overarching term covering three main categories:

- **ICT practitioner skills**: the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems.
- **ICT user skills**: the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialised tools supporting business functions within industry. At the general level, they cover "digital literacy": the skills required for the confident and critical use of ICT for work, leisure, learning and communication.
- **e-Leadership skills**: these cover a range of skills, attributes and attitudes related to: knowledge of the capabilities and limitations of software systems and information systems in use; ability to quickly assess new capabilities of existing systems and the relevance of offers of software and web services emerging on the market; ability to describe prototype solutions; understanding of the fundamentals of alignment of business and IT functions in an organisation.

2 E-skills policies and stakeholder initiatives in Europe

2.1 Policies and initiatives at Member State level

The present chapter provides a brief summary and an overview of the results from the e-skills policy activity analysis carried out in 2009 followed by a brief summary of results from a first analysis of the e-skills policy activities in the EU Members States in 2013. In the final section a brief comparison of results obtained and achieved at both points in time and elaborating on developments which occurred over the past almost five years will be given to identify and describe the changes that occurred in the different countries.

Most of the results will be presented in overview and tabular format to allow the reader to easily grasp the key results from and messages for each country. These will be condensed in an overall overview table summarising the results from 2009 and 2013 along two indices: an 'eSkills activity index' and a 'Digital Literacy index', putting these into a broader context by relating these to the 'Networked Readiness Index (NRI)' which measures the propensity for countries to exploit the opportunities offered by information and communications technology. This has been done for each country and for both years.

Finally an 'e-Leadership skills activity index' has been developed for each country describing the level of activity in terms of policies and initiatives in this area in the Member States.

2.1.1 Key objectives of e-skills policies at national level

We can identify the following key objectives of policy action in the e-skills domain:

- **Adapting the national education system to improve its capability for producing the required skills and competences** (both in qualitative and quantitative terms): This refers to the development and provision of education & training. All Member States are engaged in a process to update and modernize school curricula and ICT infrastructure to fit the rapid pace of technical innovation as well as the evolving needs of industry and society. The success has been variable and depends to some extent, of course, on the ability of each country to finance investments in its education system. Some countries have subjected their complete system of primary and secondary education to scrutiny and developed ways to mainstream pupils' exposure to STEM related subjects, as a means to increase interest in technological subjects from an early point onwards. Curricula have been overhauled with the purpose of embedding ICT use and media literacy within all segments of the learning process. In some countries such as Denmark, a new school subject "Computational Thinking and Practice" has been introduced with the objective to move the emphasis away from digital literacy to creational and constructional competencies. The U.K. will follow along similar lines in 2014. New approaches to VET are being sought as well: Many countries 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".
- **Awareness raising**: These policies are based on the premise that there is limited understanding about ICT practitioners, their role within the economy in quantitative and qualitative terms, their relevance for the performance of SMEs, career prospects in ICT, and so forth. Typical target groups include: (a) young people prior to taking decisions which have a bearing on their later career, i.e. students in primary, secondary and tertiary education; (b) SMEs who lack understanding of the relevance of e-skills for their competitiveness; (c) stakeholders in the education system, who are to accept responsibility for ensuring that students acquire the necessary e-skills and develop an interest in STEM careers; (d) the general public.

- **Improving job matching for ICT practitioners**: There is evidence suggesting that Europe's Public Employment Systems (PES) do not perform well when it comes to job matching for ICT practitioners. There are a number of reasons for this, including lack or low uptake of occupational and competence frameworks in the e-skills area. Member States have embarked on policy actions, at national and sub-national level, to establish coherent systems to steer relevant professional skills to where there is demand for ICT practitioners, and to set up the infrastructure for counselling job seekers in issues concerning re-skilling and certification. Career support has become particularly important on labour markets where ICT practitioners are faced with unemployment, such as in Finland. Here, it is combined with industrial policy to lure employers to regions with an oversupply of well-qualified ICT practitioners.
- **e-Skills frameworks and certification**: The development of widely recognised e-skills frameworks and definitions has been taking place at national level in the 1990s already (e.g. AITTS with APO-IT in Germany; SFIA in the U.K.). It received a strong push in recent years with the development of the European e-Competence Framework (e-CF). A large number of schemes for education and certification of e-skills in Europe make use of, or are closely aligned with, the e-CF. Progress in e-skills certification independently from related training measures appears still very much limited to the European Computer Driving Licence (ECDL), which concentrates on ICT user skills.
- Provision of **market information** on current and future supply of and demand for ICT practitioners: This includes regular gathering, analysis and publication of information about supply and demand in e-skills, and the skills gaps, mismatches and shortages resulting from these, as well as future needs for e-skills. While the majority of Member States still relies on ad-hoc commissioned research for this purpose, the more advanced countries have comprehensive market monitoring systems in place. Integration with existing systems of occupational research still tends to be insufficient, which is partly due to the nature of the ICT practitioner market, which is characterised by rapid changes in skills demands and related nomenclature.

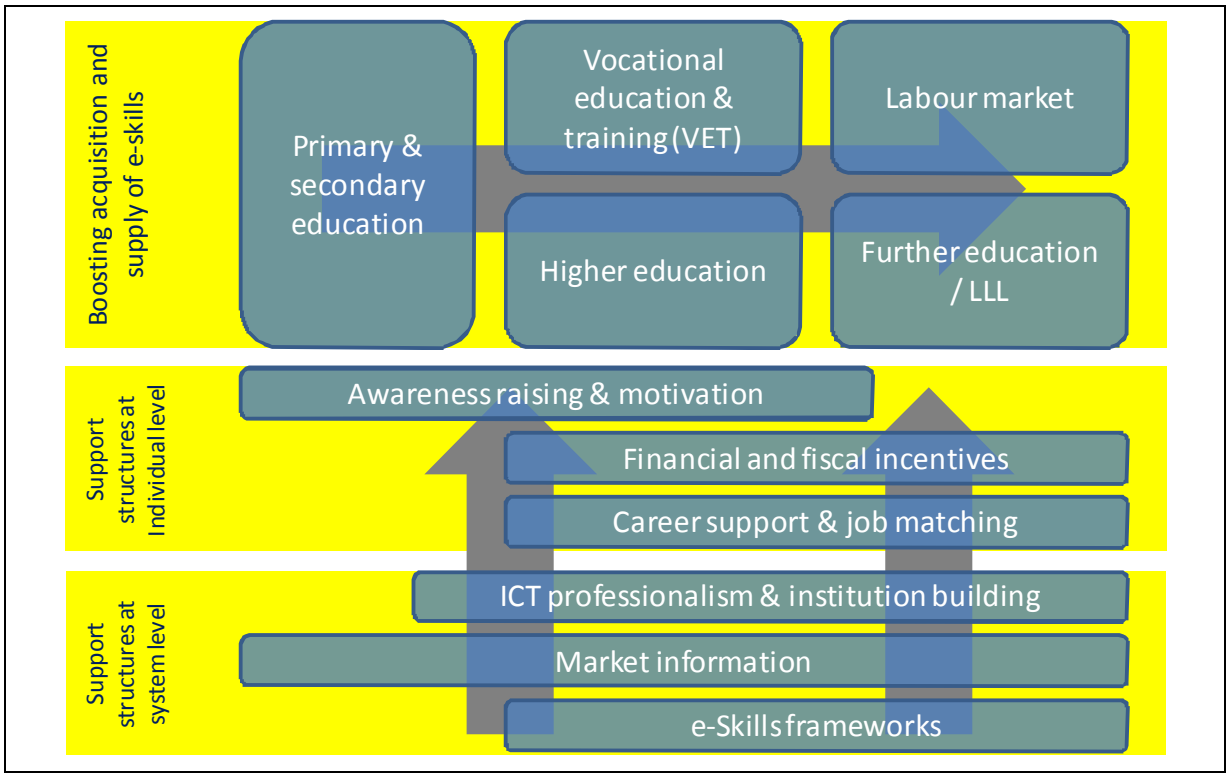
2.1.2 Policy approaches to e-skills development

These policy objectives can be pursued through a range of policy instruments. The depiction in Exhibit 1 distinguishes between instruments that intervene directly in the provision of education and supply of e-skills on the labour market (top layer), support structures that focus on individuals such as IT practitioners, job seekers and employers (middle layer) and support structures that operate at the system level in order to improve the framework conditions for improvements in the e-skills area (bottom layer).

Financial and fiscal incentives for individuals play an important role in channeling students and job-seekers into education and VET programmes that supply skills for which there are shortages in the labour market.

At system level, efforts to mature the ICT profession are widely understood to be essential for creating an equilibrium between supply and demand on the ICT practitioner labour market.

Exhibit 1: Digital Literacy and e-Skills Policy and Stakeholder Initiatives 2009



2.1.3 A look back: E-skills policy activities at Member State level in 2009

In the predecessor studies to the present one an analysis of multi-stakeholder partnerships on e-skills was already carried out in 2006 / 2007[2] followed by a further one which then also included an analysis of related national policies in 2009-2010[3]. Both studies were commissioned by the European Commission (DG Enterprise and Industry); the latter one with the objective to perform an evaluation of the implementation of the European Commission's 2007 Communication on "e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs".

From these studies it became apparent that there is a huge variation of levels of activity by national governments and stakeholders. In the latest study the level of activity has been assessed by way of two general activity indexes, one for e-skills (with a focus on ICT practitioners' skills) and one for digital literacy. In the following overview the index values for the countries investigated are displayed reflecting the state-of-the-play in 2009/10. The values of the indexes indicate the levels of activity in these two fields since the adoption of the Communication in 2007 in the respective countries, i.e. a low index value indicates a modest level of activity.

There is a need, however, to interpret these values in the context of the overall skills and education landscape of the respective countries. A low level of activity in terms of policy and stakeholder initiatives does not necessarily indicate that the country is ill-prepared to meet the demand for suitably qualified ICT practitioners in the future or that it does not offer its population the required means to develop their ICT user skills. For example, low index values on digital literacy for countries like Sweden and Finland only indicate that the need for further action, initiatives and policies in this domain no longer really exists or only at a reduced level for minority groups since the vast majority

[2] Korte, W.B. et al. (2007) "Benchmarking Policies on Multi-stakeholder Partnerships for e-skills in Europe", URL: http://www.eskillspolicy-europe.org/downloads/documents/Benchmarking%20MSPs%20final_report_final.pdf;

[3] Hüsing, T. and Korte, W.B. (2010) "Evaluation of the Implementation of the Communication of the European Commission 'e-Skills for the 21st Century'", URL: http://ec.europa.eu/enterprise/sectors/ict/files/reports/eskills21_final_report_en.pdf

of the population has already achieved high digital literacy levels. This shows that different types and intensity levels of policies and initiatives are needed depending on the stage of digital literacy or e-skills availability and supply in the workforce a country has reached.

It is for this reason that the table below (Exhibit 2) also includes a column presenting the world-wide ranking of each country in the Networked Readiness Index (NRI) published by the World Economic Forum in March 2010 and an indicator on 'e-skills gap' which is the result from the responses of company representatives on the question on hard to fill vacancies for ICT positions in the latest Eurostat ICT Enterprise survey.

Exhibit 2: Digital Literacy and e-Skills Policy and Stakeholder Initiatives 2009

Country	NRI *)	NRI Rank (total)	NRI Rank (EU 27)	e-Skills activity index	Digital Literacy activity index	e-Skills Gap as reported by enterprises
DK	5.85	1	1	●●◖	●●●●	✖✖✖✖✖
SE	5.84	2	2	●●◖	●●●	✖✖✖
FI	5.53	6	3	●◖	●●●	✖✖✖✖
NL	5.48	9	4	●●●	●●●◖	✖✖✖✖✖
UK	5.27	15	5	●●●●●	●●●●◖	✖✖✖
AT	5.22	16	6	●●	●●●	✖✖✖
EE	5.19	18	7	●	●●●●◖	✖✖✖
FR	5.17	19	8	●●●	●●	N/A
DE	5.17	20	9	●●●◖	●●●	✖✖✖✖✖
LU	5.10	21	10	●◖	●◖	✖✖✖✖
IE	5.02	23	11	●●●●	●●	✖✖✖✖✖
BE	5.02	24	12	●●●●◖	●●●●◖	✖✖✖✖✖✖✖
MT	4.79	26	13	●●●●	●●●	✖✖✖✖✖✖
PT	4.63	30	14	●◖	●●◖	N/A
SI	4.57	31	15	●◖	●●●●◖	✖✖✖✖✖✖
CZ	4.53	32	16	●◖	●●	✖✖✖✖
CY	4.52	33	17	●◖	●●●	✖✖
ES	4.50	34	18	●	●●◖	✖✖
LT	4.40	35	19	●	●●●●	✖✖✖✖✖
HU	4.28	41	20	●●●◖	●●●◖	✖
SK	4.19	43	21	●●	●●◖	✖✖✖
IT	4.16	45	22	●◖	●◖	✖
LV	4.1	48	23	●●●	●●●●◖	✖✖
EL	4	55	24	●◖	●●●	✖
RO	3.97	58	25	●●◖	●●◖	✖✖✖
BG	3.8	68	26	●◖	●●	✖✖✖
PL	3.8	69	27	●●◖	●●●◖	✖✖✖

*) Networked Readiness Index (NRI)
Note: Skills Gap indicator values have been fitted to a 1-7 scale range.

The table shows that, in 2009, the national e-skills strategy and implementation had still been in their infancy in quite a number of Member States.

When ranking Member States by their performance on the the Network Readiness Index (NRI), three loose categories of Member States can be distinguished (each of which containing seven countries): frontrunners, followers and low activity countries. Comparison with countries' performance concerning digital literacy and e-skills availability and supply in the workforce leads us to conclude that the frontrunner category was made up of two subgroups of countries in 2009:

- **Group A** included countries with high levels of digital literacy and e-skills availability in the workforce (expressed by values on the NRI between 5.2 and 5.9) but only modest levels of activity in terms of policy and stakeholder initiatives in the e-skills domain (Denmark, Sweden, Finland, Austria, Estonia). In the Nordic countries, a high degree of digital literacy among the population and the workforce had been achieved early already as a result of successful policies launched in the past, strongly helped by a very well developed education and training system producing large numbers of IT practitioners. However, in 2009 national industry representatives had pointed out that these countries still suffered from significant gaps in ICT practitioner skills (especially highly qualified ICT practitioners). The recommendation was therefore to step up efforts by national governments and key stakeholders.
- **Group B** included countries with high levels of digital literacy and e-skills availability in the workforce as well as medium to high levels of policy and stakeholder activity in the e-skills domain (the U.K., Germany, France and the Netherlands). These countries were facing medium to large e-skills gaps as reported by industry; they were recommended, therefore, to continue with high levels of activity to close existing gaps and to adapt to newly emerging challenges in the e-skills domain.

The second category had been composed of countries with medium range NRI figures ranging from 5.10 to 4.50. It could be split in two subgroups as well:

- **Group C** comprised countries with high levels of activity and at the same time large e-skills gaps as reported by industry, which meant that these countries could be expected to close existing gaps over the medium to long term. This included Ireland, Belgium and Malta, which were recommended to continue with high levels of effective activity.
- **Group D** included Cyprus, the Czech Republic, Luxembourg, Portugal, Slovenia and Spain with modest levels of policy and stakeholder activity but also smaller e-skills gaps, with the exception of Slovenia.

The third category of countries is represented by:

- **Group E**, with comparatively low NRI figures in the range of 4.40 to 3.80. They showed medium levels of activity in the e-skills domain and medium to high activity in the digital literacy area, raising the expectation that policy and stakeholder initiatives would help improve the situation in the years to come. Exceptions included Italy, Bulgaria and possibly also Greece, ranking in the bottom group of countries on the NRI as well as showing medium to low levels of policy and stakeholder activity. This suggested that there were structural barriers to the introduction of effective e-skills related policy making in these countries, which should be identified and subsequently addressed in order to achieve progress in the medium term.

The study concluded that several national governments in 2009 still needed to reach higher overall levels of activity, and that key national stakeholders should turn their focus on improving the impact of their initiatives by boosting effectiveness, scalability and sustainability.

In the period 2009-2013 most Member States have embarked on new policy initiatives and many stakeholders have shown high levels of inititive across all of Europe. It is the purpose of the present study to shed light on these activities with a special emphasis on the further impact of the European Commission's e-Skills Agenda in the years after 2009.

2.1.4 The situation in 2013

Policies focusing on ensuring sufficient supply of suitably qualified ICT professionals in 2013

Our assessment of national policy and stakeholder initiatives in the e-skills domain across all (then[4])EU Member States shows high or even very high levels of activity in many countries not only in the Digital Literacy domain but also in the e-Skills area where the focus is on ICT practitioners and professionals rather than the population at large.

Of the 27 Member States, 15 have a value of 3 or higher on the 5-point index scale for e-Skills activity. The group of leading countries includes the U.K., Ireland and the Netherlands. Austria, Belgium, Germany, Denmark, France, Malta and Sweden also perform strongly in terms of the level of activity for ensuring adequate supply of ICT practitioners on the labour market today and in the future. The range of interventions used is broad, as can be seen in the summary assessment overview table in Exhibit 3. There are clear indications that the 2007 e-Skills Agenda and the subsequent initiatives by the European Commission have triggered Member States to engage in public debates about the e-skills issue and helped them to develop appropriate responses.

However, the degree of integration and consistency of policy-making is still limited in a significant number of Member States. Most countries lack a master strategy or the topic still does not attract continuous attention in policy-making across the different policy areas concerned. Typically, measures are taken for adapting the education system to the demands of a knowledge-based economy, but in some countries little reference is being made to ICT practitioner skills and the need to boost supply of suitably qualified ICT professionals (e.g. **Czech Republic**, **Luxembourg**). Initiatives targeting young people, especially girls, with the intention to develop a positive attitude towards STEM subjects in general and a career in ICT in particular, are widespread, which is not surprising given their modest cost and strong (if short-lived) attraction for the media. They do, however, sometimes seem to lack sustainability and make use of questionable pedagogical/methodological approaches.

Since the onset of the current economic crisis in Europe and the resulting jump in unemployment rates across most of Europe, policy-makers have tended to direct their attention away from the issue of (current or upcoming) skilled worker shortages. The widespread problem of budget deficits appears to have a negative impact on some Member States' ability to follow through with plans to address the e-skills topic more full-heartedly and in a systematic way, especially in countries with below average GDP/head. This appears to apply, for example, to **Portugal**, **Greece**, **Slovenia** and **Cyprus**. In their place, available sources of financial support (such as ESF funds) are being used to re-train unemployed persons for jobs in the ICT domain, but national experts tend to be very sceptical about the effectiveness of such measures in terms of the success in providing e-skills needed on the labour market, especially in the countries with the highest rates of unemployment.

Other countries, however, have taken the route of strategic, long-term policy making in the e-skills domain, with strong engagements from a wide range of stakeholders in the public sector as well as the business and civic sectors. The **United Kingdom** has extensive experience in e-skills related policy development and remains a benchmark for multi-stakeholder partnership in this domain. The **Netherlands** and **Ireland** also benefit from strong policy leadership in the e-skills domain; these countries have a master strategy in place as well as a comprehensive infrastructure for adapting measures closely to changes in supply and demand for different types of ICT practitioners. **Sweden** has an e-Skills Council and shows evidence of a high level of maturity in terms of mainstreaming the e-skills issue throughout all parts of the country's education system.

[4] Croatia, which joined the EU after project start, has not been covered

Some countries, such as **Denmark** and **Austria**, use their ambitious e-government strategies as a horizontal lever to promote e-skills policy goals across a wide spectrum of policy domains, with a focus on the education sector, which is dominated by public education providers in both countries. In Denmark, a range of initiatives driven by universities in cooperation with other national stakeholders have been taken. There is already strong evidence for substantial success in attracting young people to ICT study courses over the last 10 years in the country.

Significant policy leadership and vision in the s-skills area is also found in countries with below-average economic strength (as indicated by GDP/head). This applies to **Estonia** which, as it places ICT at the heart of its strategy for economic development, is fully aware of the need to ensure a steady supply of sufficiently qualified ICT practitioners for medium and long-term prosperity. Neighbouring **Latvia** also has become active with a master strategy to develop e-skills.

The general picture suggests that most Member States have responded to the European eSkills Agenda with a delay of a few years. For example, **France** has developed a comprehensive policy strategy with its Roadmap on Digital Policy in 2013, after a lengthy period during which national experts have complained that the country lacked policy leadership in the e-skills domain. Given the newly established policy framework, the situation in the country is expected to improve much now, also because of the strong engagement of the non-governmental sector. **Spain** may be on the same path as it has stepped up activities in the context of the new Digital Agenda, but it appears to early to tell yet how strong policy commitment will be.

The long-term continuity and sustainability of state programmes on e-skills has been negatively affected by the electoral cycle in some Member States. In **Malta**, a country that has shown policy leadership in the e-skills area as exemplified by set-up of the eSkills Malta Alliance in 2010, a change of government in 2013 resulted resulted in the future of the Alliance being in doubt. At the time of writing, however, the Alliance is being re-established in a new format. In **Hungary**, the Orbán government after coming to power set out to overhaul the tertiary education system, which in the face of strong opposition by stakeholders in the university system has diverted attention away from the challenge of how to improve the country's ability to produce sufficient numbers of ICT practitioners. As a means to keep graduates (especially in the STEM area) from moving to countries with higher wages after finishing their studies, Hungary has introduced legislation according to which state subsidies to university education (scholarships) must be paid back if a graduate seeks employment abroad within a certain number of years after graduation – an example which so far has not been followed by any other country in Europe.

In other Member States again, governments have showed limited commitment to the e-skills issue, but other stakeholders – industry, trade unions, and the civic sector – show high levels of activity. **Bulgaria** lacks a strategic policy approach on e-skills development, but the country's strong software industry has stepped in to fill the gap with a range of ambitious initiatives. In **Germany**, major industry players have taken the lead for instance in e-skills training and certification. Here, the focus is increasingly moving from the national to the regional, as key stakeholders on a region's market for ICT practitioner supply & demand join forces to address current shortcomings and projected shortages and mismatches.

In **Belgium**, most of the policies related to e-skills (e.g. education and training) are in the remit of the federated bodies, and the country's regions have long-established programmes which are generally regarded to be successful in spite of serious administrative hurdles, such as in the Brussels region. Some of these initiatives have even started to cross borders, i.e. to address supply & demand issues concerning e-skills in a border region.

Other countries still concentrate mainly on digital literacy activities with no e-skills related policies apart from promotion and awareness raising measures (e.g. Greece but also Italy, Hungary) and show little e-skills policy activity (e.g. **Lithuania**, **Romania**, **Slovak Republic**). Poland used to belong

to this group as well, but has very recently shown strong efforts to e-skills development, reflected by the Broad Agreement for Digital Skills in Poland signed in July 2013.

Finland presents a very interesting example as it has to deal with a decreasing ICT sector as a result of the poor performance in recent years of the sector's national giant, Nokia. The short-term issue here is not shortage of ICT practitioners, but quite the opposite: a surplus of ICT professionals who have been shed by Nokia (or one of Nokia's suppliers) and who now must be enabled to find re-employment, including the option of self-employment, i.e. setting up their own business. Nokia in cooperation with the country's tertiary education providers as well as local/regional governments have set up a major programme for this purpose. Numbers so far suggest that the programme is successfully boosting entrepreneurial activity based on ICT practitioner skills in the country.

e-leadership skills policy activities in 2013

Our research indicates that e-leadership skills have started to become an issue in policy and stakeholder initiatives of 21 of 27 EU Member States. Developments are still in their infancy, though, with the exception of Denmark, Germany, Finland, Malta, the Netherlands and the U.K.:

Denmark has a well-developed system for entrepreneurship training, with e-leadership skills on the way to become a key component of the education programmes.

In **Finland** initiatives in response to the contraction of the Nokia ecosystem have included large-scale promotion of entrepreneurship predominantly in the digital domain. These have included comprehensive training measures to equip prospective entrepreneurs with e-leadership and traditional business skills. Education providers have responded by developing training in e-leadership skills.

In **Germany** the Software Campus set up in 2012 is among the first major initiatives in Europe that focuses explicitly on e-leadership skills. It has lead to an increased awareness about the need for e-leadership skills and related training and education offers.

In **Malta** skills for e-Leadership and digital entrepreneurship attract considerable attention amongst policy-makers and other national stakeholders. The Centre for Entrepreneurship and Business Incubation at Malta University and the Microsoft Innovation Centre have started to provide training in this area.

In **the Netherlands** some first stakeholder initiatives which explicitly deal with e-leadership skills and digital entrepreneurship have been launched in recent years. Examples include integrated business development initiatives such as the Brainport Talent Region; and national campaigns and training schemes targeting SMEs such as ‘Slimmer & veilig ondernemen in 1 minuut’.

In the **United Kingdom** increasing emphasis is put on e-leadership skills with the advent of the Information Economy Strategy and Council and the proposed joint action by government, business and academia on digital skills. Education providers have started to develop innovative offers at the inter-face between ICT and business management.

It becomes apparent that e-leadership skills have only become an issue in countries which rank at the top in Europe in terms the propensity for a country to exploit the opportunities offered by ICTs (as reflected in the NRI Index).

A summary overview from the differentiated assessment of national policy and stakeholder initiatives in the e-skills domain in each country is provided in the following table.

Exhibit 3: Summary assessment of national policy and stakeholder initiatives in the e-skills domain

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
AT	Austria	●●●◖ Recent years have seen increased activity for promotion of careers in IT and better coordination of education, RTD and innovation policies. Special attention is being placed on attracting more women to choose IT-related study subjects, and in promoting the STEM field among young Austrians, such as through "Child Universities".	●●●● A wide range of digital literacy activities focusing on schools, pupils and e-learning in the school context, older people and other people at risk of exclusion. The country's high-profile e-government strategy has acted as a means to convince more citizens of the benefits from going online, thus increasing digital literacy.	● No policy initiatives on e-leadership skills were identified.
BE	Belgium	●●●● Belgium, in its regions, has ICT competence/ reference centres. The VET sector is well equipped with ICT infrastructure and ICT-related teacher and worker training measures. Especially the private sector accounts for the good rating of Belgium here, as it runs a range of activities including promotion / awareness raising, certification, and training measures.	●●●● For digital literacy, Belgium had a national action plan against the digital divide over the period 2005-2009. Its evaluation showed largely positive results. Eurostat statistics suggest that these initiatives may have been contributing to the country's much improved performance in terms of share of the population with strong computer and Internet skills.	●◖ No policy initiatives on e-leadership skills were identified, but some universities have started to offer e-leadership related courses. Moreover, both Wallonie and Flanders have set up institutions that provide targeted support to digital entrepreneurs.
BG	Bulgaria	●●◖ Bulgaria for the time being lacks a master strategy towards e-Skills. The country's IT industry is stepping in to fill this gap at least to some extent by initiating a range of programmes for defining and implementing improvements to the education system to address the sizeable gap in IT professionals. Good use appears to be made of EU funding for improving the education infrastructure.	●● Bulgaria has taken actions to improve IT related education in schools, which will help the level of digital literacy of generations entering the labour market. Still no master strategy is visible with regards to equipping the labour force with the required skills in the IT area. Lack of resources has become an even bigger problem since the onset of the latest economic crisis.	●◖ Very little policy initiatives are in place which explicitly deal with e-leadership skills or digital entrepreneurship, except for the start-up accelerator programmes Eleven and LAUNCHub.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
CY	Cyprus	●● Cyprus lacks a master strategy on e-skills. Efforts by the HRDA (Human Resource Development Authority) to develop a National Qualifications Scheme have not achieved tangible results yet. The 2012 Digital Strategy for Cyprus makes little reference to IT practitioner skills.	●●◖ Cypriot measures include training of teachers in ICT, curricula reform, training measures targeted towards specific groups and certification and support for enterprises acquiring skills.	●◖ Support of Digital Entrepreneurship is one of six overarching objectives of the 2012 Digital Strategy for Cyprus. The process of identifying e-leadership skill requirements and developing initiatives for promoting them is still in its infancy, though.
CZ	Czech Republic	●◖ The government has defined a list of strategic priorities in the e-skills area, but the topic is not high on the policy agenda. Some measures are taken for adapting the education system to the demands of a knowledge-based economy, but little explicit reference is being made to ICT practitioner skills and the need to boost supply of suitably qualified ICT professionals.	●●◖ Some support of teachers in the area of methodology and didactics is made as well as support for the usage of ICT in schools. Indirect effects are hoped for through strengthening ICT use in public administration, where a large share of officials has been provided with ECDL training. Strong policy support for lifelong learning in general.	● IT-related entrepreneurship receives support through funding schemes, but little reference is being made to specific e-leadership skills.
DE	Germany	●●●● Although little top level commitment towards an e-Skills Master Strategy could be detected, a large range of policy and stakeholder initiatives is in evidence in Germany. There is an institutionalised stakeholder summit, and a regular monitoring exercise of e-skills (broadly) demand and supply. Major industry stakeholders are very active in training and certification. The level of activity at the regional (Länder) level has significantly increased in recent years.	●●● Some measures are taken in the areas of promotion/awareness raising, self learning/self assessment tools and broad training measures. IT-Fitness and IT 50 plus are initiatives reaching out to disadvantaged groups.	●●◖ The Software Campus set up in 2012 is among the first major initiatives in Europe that focuses explicitly on e-leadership skills. It has lead to an increased awareness about the need for e-leadership skills and related training and education offers.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
DK	Denmark	●●●● Strategic policy making at national level takes place as part of the eGovernment Strategy 2011-2015. A range of practical activities driven by universities in cooperation with other national stakeholders. Evidence of substantial success in attracting you people to ICT study courses over the last 10 years.	●●●●◖ For a long time already, Denmark has seen an extensive range of well-integrated measures in for raising digital literacy. These include infrastructure-related initiatives and the "Learn more about IT" programme. Additional initiatives are implemented as demand arises.	●●◖ Denmark has a well-developed system for entrepreneurship training, with e-leadership skills on the way to become a key component of the education programmes.
EE	Estonia	●●●◖ Strong level of activity for promoting careers in ICT and for modernising the education system to enable it to provide the required ICT practitioner skills. Significant policy leadership and vision.	●●●● Strong commitment to improving digital literacy. Strong take-up of ICTs and online public services are understood as key factors for competitiveness and social progress. Wide uptake of public sector e-services and the electronic ID-card are also seen as vehicles to increase digital literacy and positive attitudes towards innovation and ICTs.	●● Recent initiatives such as the IT Academy have started to look into skills for e-leadership and digital entrepreneurship. The strong role of the ICT sector for the country's economy and self-image means that e-leadership is likely to become a widely recognised issue in the near future.
EL	Greece	●◖ Greek policies concentrate mainly on digital literacy, and no e-Skills policies apart from promotion/ awareness raising measures were reported.	●●● Greek digital literacy activities include training measures of the workforce, promotion of ICT take-up as well as measures targeted towards the education system. GetBusy is a good example of a multi-stake-holder partnership for motivating young people to improve their e-skills and employability.	●◖ e-Leadership skills and digital entrepreneurship have not yet entered the policy agenda. Industry-led initiatives such as the Microsoft Innovation Centre have started to provide training in the area, however. The GetBusy initiative represents a promising approach towards teaching entrepreneurial skills to young Greeks.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
ES	Spain	●● Spanish policies have long concentrated mainly on digital literacy. Initiatives for securing sufficient supply of ICT practitioners have recently gaining ground, most notably in the context of the new Digital Agenda and at Autonomous Community level (e.g. Catalonia).	●●●● Spanish Digital Literacy Activities are extensive and include training measures of the workforce and promotion measures as well as measures targeted towards SMEs. Grassroots initiatives such as Cibervoluntarios have been instrumental for boosting digital literacy as well.	● No initiatives have been identified.
FI	Finland	●●◖ The education system for ICT practitioner skills is well developed. The country does not have an e-skills strategy, though, and little in terms of high-profile policy initiatives dealing with the issue. The ICT 2015 Working Groups's proposals, once translated into policy action, will radically improve the situation (as they are mostly still at planning stage at the time of writing, they are not reflected in the score for Finland).	●●●◖ Excellent infrastructure for the provision of training in ICT user skills across the country, but few high-profile projects dealing with digital literacy.	●●◖ Initiatives in response to the contraction of the Nokia ecosystem have included large-scale promotion of entrepreneurship predominantly in the digital domain. These have included comprehensive training measures to equip prospective entrepreneurs with e-leadership and traditional business skills. Education providers have responded by developing training in e-leadership skills.
FR	France	●●●● Until adoption of the Roadmap on Digital Policy in 2013, France was lacking policy leadership in the e-skills domain, apart from activities for promotion and awareness raising and those focusing on certification, the VET system and the European e-competence framework. The situation is expected to improve much now, also because of the strong engagement of the non-governmental sector (Pasc@line, CIGREF and Syntec Numérique).	●●● French Digital Literacy Activities include training measures of the workforce and promotion measures as well as measures regarding ICT equipment kits and Public Access Points (NetPublic programme for Digital Public Spaces).	●● The need to enable the education system to provide e-leadership skills is acknowledged by more and more key stakeholders, and some education providers are running or developing course programmes in the area. The Digital Policy Roadmap calls for support to digital entrepreneurship under its Second Pillar ("Reinforcing the Competitiveness of Firms").

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
HU	Hungary	●●◖ Hungary has little in terms of a master strategy for e-skills, but the Digital Literacy Action Plan includes the objective to "increase competitive-ness of ICT intensive business in Hungary by training IT-Professionals in line with the market demand and high standards". In practice the focus of policy-making has been mainly on infrastructure development in the education system.	●●●● Hungary has a master strategy for digital literacy, the Digital Literacy Action Plan from 2007. The extensive network of PIAPs called eHungary points has been cleverly used as the basis for provision of e-skills to large parts of the population, with a focus on employability. The NetReady scheme has been important for supporting non-profit initiatives targeting disadvantaged communities.	●◖ The Digital Literacy Action Plan (2007) as well as the Digital Renewal Action Plan (2010) include measures for helping raise the competiveness of Hungarian SMEs by providing training in ICT-focused business skills. The process of identifying e-leadership skill requirements and developing initiatives for promoting them is still in its infancy, though.
IE	Ireland	●●●●◖ A Master Strategy is in evidence in Ireland and a whole range of measures are being taken in the areas of promotion/ awareness raising, stakeholder dialogue / summits, certification, monitoring and forecasting of supply and demand, and training measures. Evidence for strong multi-stakeholder partnership.	●●● A Master Strategy exists, and there is a range of initiatives for providing individuals with ICT user skills, with a clear focus on employability, i.e. enabling citizen to perform successfully on the labour market. There appear to be shortcomings, however, in mainstreaming ICT training in primary and secondary education.	● Very little policy or stakeholder initiatives are in place which explicitly deal with e-leadership skills or digital entrepreneurship.
IT	Italy	●●◖ Italy lacks a master strategy, and activities are concentrating on infrastructure and teacher training in universities. There is strong industry support, however, for application and mainstreaming of the e-CF. In this respect, the Italian Competence Network for the Digital Economy has been a very important initiative.	●●◖ Italy has no master strategy for e-inclusion, but a range of activities concentrating on infrastructure and teacher training are in evidence. Computer science is now taught starting from primary school.	●◖ No policy initiatives are in place which explicitly deal with e-leadership skills or digital entrepreneurship. The education system, however, has started to develop some course programmes providing such skills.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
LT	Lithuania	●● Lithuania's activities are concentrating on distance learning education and PIAPs. The Lithuanian Information Society Development Programme for 2011-2019 makes explicit mention of ICT practitioner skills, though. In 2013, a National Digital Coalition was launched to step up efforts in developing e-skills and supply of suitably qualified ICT practitioners.	●●●◖ Lithuania has a range of activities covering the full spectrum of digital literacy activities, with the Programme for Universal Computer Literacy at its core.	●◖ The country has some initiatives that aim to foster digital entrepreneurship but are as yet limited in their scope.
LU	Luxembourg	●●◖ The country's activities are concentrating on university infrastructure (especially e-learning) and curricula adaptation. Luxembourg's Digital Agenda reflects high strategic importance being given to development of ICT practitioner skills.	●● The country's activities are concentrating on promoting public awareness and providing basic education in e-commerce and e-security.	●◖ Little reference is being made in policy-making to e-leadership or digital entrepreneurship. Education providers have started to offer related training courses, however.
LV	Latvia	●●◖ Latvia has a master strategy to develop e-Skills, but focusing mainly on ICT user skills of groups at risk of exclusion. Activities for improving skill supply from ICT practitioners are concentrating on training measures and awareness raising activities as well as supporting SMEs and other enterprises.	●●●◖ Latvia has a master strategy regarding digital literacy. Measures include awareness raising, support for disadvantaged groups, training of teachers, self-assessment tools, training measures targeted towards specific groups and support for enterprises acquiring skills.	●◖ No policy initiatives are in place which explicitly deal with e-leadership skills, but digital entrepreneurship is mentioned in some strategic policy papers, and entrepreneurship training has been included in ICT-related university study programmes.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
MT	Malta	●●●● Malta has strong policy leadership in the e-skills area. The eSkills Alliance Malta, set up in 2010, has been particularly instrumental in bringing together all stakeholders and developing targeted policy actions. The Alliance is currently be re-established in a new format to increase effectiveness and stakeholder buy-in.	●●●● Malta's actions in the area of digital literacy focus on providing training to the workforce, awareness raising, and infrastructure (Public Internet Access Points), all of which have recently been integrated in a new National e-Inclusion Strategy for 2012-15. Currently, a new National Literacy Strategy for Malta is open for consultation, also including digital literacy as a core priority.	●●◖ Skills for e-Leadership and digital entrepreneurship attract increasing attention amongst policy-makers and other national stakeholders. The Centre for Entrepreneurship and Business Incubation at Malta University and the Microsoft Innovation Centre have started to provide training in this area.
NL	Netherlands	●●●● The Netherlands have a strong set of measures for securing supply of sufficiently qualified ICT practitioners, including the whole spectrum of instruments – awareness raising, stakeholder dialogue / summits, certification, training measures and macro level monitoring of demand and supply. Broad implementation of e-CF in the Netherlands is being pushed by the multi-stakeholder partnership "Digivaardig & Digiveilig".	●●●● The digital literacy policy strategy focuses on awareness raising through media campaigning, the establishment of a network of actors and fostering research. The Digivaardig & Digiveilig partnership has built up a national support infrastructure for digital illiterates. The programme has more recently established a focus on the ICT user skills of the working population.	●●◖ Some first stakeholder initiatives which explicitly deal with e-leadership skills and digital entrepreneurship have been launched in recent years. Examples include integrated business development initiatives such as the Brainport Talent Region; and national campaigns and training schemes targeting SMEs such as 'Slimmer & veilig ondernemen in 1 minuut'.
PL	Poland	●●● Numerous activities focus on e-skills, based on an understanding that the country needs a sufficient number of suitably qualified ICT practitioners. Poland's education system is being modernised with a view to better align student output with the needs of employers. The recent launch of the Broad Agreement for Digital Skills is expected to improve coordination of the large variety of existing initiatives in the e-skills area.	●●●● Digital literacy features prominently among the Polish government's goals for national development. A large number of initiatives are in evidence. The extensive network of telecentres (currently about 8,000) plays an essential role here, with activities being focused on boosting employability.	●◖ Some programmes seek to boost entrepreneurship in the digital domain, e.g. in the context of the Operational Programme Innovative Economy 2007-2013. Moreover, the need to provide e-leadership skills is reportedly taken into account by more and more tertiary education providers in the STEM area.

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
PT	Portugal	●◖ Although there is a national strategy for the Information Society and the promotion of access to the broadband, e-skills are only touched cursorily. Some efforts going into universities may transpire into increased e-skills supply.	●●◖ Portugal focuses on educational infrastructure and indirect effects through e-Government and infrastructure measures.	●◖ Development of (digital) entrepreneurship skills is part of the Strategic Program for Entrepreneurship and Innovation.
RO	Romania	●◖ Very little policy activity apart from participation in the European e-Skills Week, to which Romanian stakeholder have shown strong commitment.	●●● The Knowledge Based Economy project (KBE) has proven to be effective in spreading ICT user skills among the Romanian population, making good use of resources by targeting people who can act as multipliers: teachers, librarians, entrepreneurs and public sector workers.	● No initiatives identified.
SE	Sweden	●●●● Strong commitment to efforts for assessing supply & demand dynamics related to ICT practitioners, and for developing adequate policies. An eSkills Council was set up and the issue is included as one of the key challenges in both the Digital Agenda for Sweden and the Swedish Innovation Strategy.	●●●● A well-developed network of adult education providers has been essential for providing the general population with digital literacy skills. Public sector investments in ICT have always been accompanied by investments in user training. The Digidel 2013 campaign is a good example of a broad multi-stakeholder approach for addressing the digital literacy challenge.	●● There is widespread understanding in the country about the need for e-leadership skills. Entrepreneurship has been included as compulsory component in curricula for upper secondary education, as called for in the government's Strategy for Entrepreneurship in the Field of Education.
SI	Slovenia	●◖ Slovenia does not have a master strategy towards e-skills and lacks measures taken with direct regards to e-skills. Existing initiatives in the area tend to focus on ICT-related modernisation of the country's education system, e.g. the e-Education programme.	●●●● In the last decade Slovenia's government had implemented a broad range of measures targeted at ICT users, especially disadvantaged groups. Some of these initiatives have continued, but they appear to have lost in priority. Grassroots projects have tried to fill the gap, often with considerable success as in the case of the Simbioz@ project.	●◖ No initiatives identified apart from some focus on e-leadership within the primary and secondary school system (within the context of the e-Education Programme).

		National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
SK	Slovak Republic	●◖ Slovakia does not have a master strategy towards e-skills and lacks measures taken for securing future supply of ICT practitioners apart from some university based programmes and general measures targeting improvements in the system for initial education.	●●● There is a National Strategy of the Slovak Republic for digital inclusion. Educational measures play a major role, as do indirect measures such as e-government or public infrastructures and SME support.	● No initiatives identified.
UK	United Kingdom	●●●●● The United Kingdom has extensive experience in e-skills related policy development. It remains a benchmark for multi-stakeholder partnership building, monitoring & policy design for matching supply + demand for ICT practitioners.	●●●●◖ A large number of activities addressing ICT user skills are in evidence, the latest major example being the GO ON UK initiative.	●●◖ Increasing emphasis is put on e-leadership skills with the advent of the Information Economy Strategy and Council and the proposed joint action by government, business and academia on digital skills. Education providers have started to develop innovative offers at the inter-face between ICT and business management.

2.1.5 Progress in recent years: E-skills policy activities at Member States level in 2013

Like in the precursor study the assessment of the information gathered resulted in two activity indices, one for digital literacy and one for e-Skills computed for each country. It was enhanced by a third index, the e-leadership skills activity index which was developed based on the results from the recent policy analysis for 2013.

The figure in Exhibit 4 displays the index values for the countries investigated and puts them in the wider context of each country's propensity to exploit the opportunities offered by information and communications technology, data which can be obtained from the country values on the Networked Readiness Index (NRI). In the table a comparison of the results from 2009 and 2013 is provided.

The analysis revealed that in 15 of 27 EU Member States an increase in **e-skills** policy and stakeholder activities between 2009 and 2013 can be observed. In six countries the situation has remained rather stable with activities at about the same level and intensity as in 2009. In five countries (Belgium, Hungary, Latvia, Romania, Slovak Republic) a slight decrease of e-skills related policy activities and initiatives could be observed.

The corresponding figures for **digital literacy** policy and stakeholder initiatives show an increase of activities in 16 of 27 EU Member States, a rather stable situation compared to 2009 in five countries, and six countries (Belgium, Cyprus, Latvia, Romania, Slovakia) having reduced their activity level, albeit only slightly.

Overall and on average, for e-skills as well as digital literacy related policy and stakeholder initiatives, a strong increase in level of activity over the period 2009 to 2013 can be identified. This is encouraging news.

A look at Member States' positions in the **NRI ranking** (Networked Readiness Index) reveals that again, those countries with high NRI positions also show high e-skills policy activity levels. Countries like Finland, Denmark, Sweden and the Netherlands rank top on all indices. The countries that were able to significantly improve their rank by four or five positions include Germany, Luxembourg and Poland. In contrast, countries falling back include Slovakia, Estonia, Austria, Ireland, the Czech Republic and the United Kingdom. At a first glance there does not seem to be a direct relationship between these developments and changes in the e-skills activity levels. However, this requires further research and analysis to obtain a better and more complete picture.

Exhibit 4: Comparison of country performance 2009 to 2013

Country	NRI		NRI Rank (total)		NRI Rank (EU 27)		Digital Literacy Activity Index		e-Skills Activity Index		
	2009/10	**2012/13**	2009/10	**2012/13**	2009/10	**2012/13**	**2009**	**2013**	**2009**	**2013**	
Austria	5.22	**4.90**	16	**21**	6	**9**	●●●	●●●●	●●	●●●◖	**AT**
Belgium	5.02	**4.80**	24	**23**	12	**10**	●●●●◖	●●●●	●●●●◖	●●●●	**BE**
Bulgaria	3.80	**3.79**	68	**68**	26	**26**	●●	●●	●◖	●●◖	**BG**
Cyprus	4.52	**4.50**	33	**31**	17	**14**	●●●	●●	●◖	●●	**CY**
Czech R	4.53	**4.27**	32	**40**	16	**18**	●●	●●◖	●◖	●◖	**CZ**
Germany	5.17	**5.14**	20	**13**	9	**5**	●●●	●●●	●●●◖	●●●●	**DE**
Denmark	5.85	**5.29**	1	**7**	1	**3**	●●●●	●●●●◖	●●◖	●●●●	**DK**
Estonia	5.19	**4.76**	18	**26**	7	**11**	●●●●◖	●●●●	●	●●●◖	**EE**
Greece	4.00	**3.83**	55	**64**	24	**24**	●●●	●●●	●◖	●◖	**EL**
Spain	4.50	**4.33**	34	**37**	18	**17**	●●◖	●●●●	●	●●	**ES**
Finland	5.53	**5.43**	6	**3**	3	**2**	●●●	●●●◖	●◖	●●◖	**FI**
France	5.17	**4.92**	19	**20**	8	**8**	●●	●●●	●●●	●●●●	**FR**
Hungary	4.28	**4.03**	41	**49**	20	**20**	●●●◖	●●●●	●●●◖	●●◖	**HU**
Ireland	5.02	**4.71**	23	**29**	11	**13**	●●	●●●	●●●●	●●●●◖	**IE**
Italy	4.16	**3.97**	45	**51**	22	**21**	●◖	●●◖	●◖	●●◖	**IT**
Lithuania	4.40	**4.20**	35	**42**	19	**19**	●●●●	●●●◖	●	●●	**LT**
Luxembourg	5.10	**5.14**	21	**14**	10	**5**	●◖	●●	●◖	●●◖	**LU**
Latvia	4.10	**3.93**	48	**52**	23	**22**	●●●●◖	●●●◖	●●●	●●◖	**LV**
Malta	4.79	**4.76**	26	**27**	13	**11**	●●●	●●●●	●●●●	●●●●	**MT**
Netherlands	5.48	**5.19**	9	**11**	4	**4**	●●●◖	●●●●	●●●	●●●●	**NL**
Poland	3.80	**3.84**	69	**62**	27	**23**	●●●◖	●●●●	●●◖	●●●	**PL**
Portugal	4.63	**4.50**	30	**32**	14	**14**	●●◖	●●◖	●◖	●◖	**PT**
Romania	3.97	**3.81**	58	**65**	25	**25**	●●◖	●●●	●●◖	●◖	**RO**
Sweden	5.84	**5.60**	2	**1**	2	**1**	●●●	●●●●	●●◖	●●●●	**SE**
Slovenia	4.57	**4.44**	31	**34**	15	**16**	●●●●◖	●●●●	●◖	●◖	**SI**
Slovakia	4.19	**3.79**	43	**69**	21	**26**	●●◖	●●●	●●	●◖	**SK**
U.K.	5.27	**5.12**	15	**15**	5	**7**	●●●●◖	●●●●◖	●●●●●	●●●●●	**UK**

Using the grouping of Member States according to Network Readiness Index (NRI) carried out on the basis of the 2009 data (see above), the 2013 research allows exploring to what extent different strategies have been used by countries according to their position in 2009.

- **Group A** included countries with very high levels of digital literacy and e-skills availability in the workforce but only modest level of activity in terms of policy and stakeholder initiatives in the e-skills domain in 2009: Denmark, Sweden, Finland, Austria, and Estonia. All of these have seen sharply increasing levels of policy and stakeholder activity between 2009 and 2013. Our research suggests that the Nordic countries have reached a higher level of maturity by now, as initiatives are focusing not on boosting supply of ICT practitioners in general, but rather on channelling ICT students to those segments of the ICT labour market where the risk of shortages is expected to be highest. At the same time, the large number of ICT practitioners in these countries' workforces means that retraining of ICT practitioners has become an issue – especially in Finland, where there are now too many people with skills in mobile telephony and too few in parts of the market which are more dynamic. In this situation, efforts are focusing on boosting entrepreneurial activity, which explains why there is increasing debate about the need for the provision of e-leadership skills. Estonia, a country with significantly lower GDP/head than all other ones in this group, has stepped up efforts dramatically, and now has a level of policy activity and stakeholder initiatives in the e-skills domain which is higher than in most Member States.
- **Group B** included countries with high levels of digital literacy and e-skills availability in the workforce as well as significant levels of policy and stakeholder activity in the e-skills domain (the U.K. and – to a lesser extent – Germany, France and the Netherlands). In all of these, levels of policy and stakeholder activity have further increased, especially so in France and the Netherlands, both of which are seeing strong policy leadership. Germany does not have a national e-skills strategy, but benefits from a strong role of stakeholders from industry. The UK's approach in the last decade has relied on strong financial engagement by the state and industry, which the recent economic crisis has made difficult to sustain. Nevertheless, the country's initiatives in the e-skills domain remain a worldwide benchmark for policy intervention in the area, with e-skills UK, the Sector Skills Council for the area, at the core of most activities.

The second category had been composed of countries with medium range NRI figures. It had been split in two subgroups:

- **Group C** comprised countries with high levels of activity and at the same time large e-skills gaps as reported by industry, which meant that these countries could be expected to close existing gaps over the medium to long term. This included Ireland, Belgium and Malta, which were recommended to continue with high levels of effective activity. These Member States have indeed continued to show strong commitment to the e-skills topic, in spite of considerable challenges in the form of administrative hurdles (Belgium), strong budgetary constraints (Ireland); and break-up of established multi-stakeholder partnerships following a change in government (Malta).
- **Group D** included Cyprus, the Czech Republic, Luxembourg, Portugal, Slovenia and Spain with modest levels of policy and stakeholder activity but also smaller e-skills gaps, with the exception of Slovenia. In the period 2009 to 2013, this group has again displayed medium to low levels of policy and stakeholder activity. In all of these countries with the exception of Luxembourg, the economy has been hit hard by the Euro zone debt crisis, leading to high rates of unemployment. This might have resulted in labour shortages being given little priority by policy makers. These countries will require, however, a strong ICT workforce in order to manage the structural shift of their economies towards sectors that offer room for strong growth.

The third category of countries was represented by:

- **Group E**, with comparatively low NRI figures in the range of 4.40 to 3.80. This included some countries with medium levels of activity in the e-skills area (Hungary, Latvia and to a lesser extent Romania and Poland), raising the expectation that policy and stakeholder initiatives would help improve the situation in the years to come. In the period 2009 to 2013, however, three of these four have displayed decreased levels of policy and stakeholder activity, which suggests that governments found it hard to sustain a focus on shortages of ICT practitioners in the face of growing budget deficits. Much of the activity in these countries appears to be related to the use of Structural Funds money for providing unemployed workers with ICT user skills and – sometimes – to retrain them to become ICT professionals. While this approach may bring short-term benefits in terms of availability of sufficiently e-skilled workers on the national labour market, it is unlikely to be of use for ensuring that employers will have an adequate supply of ICT practitioners in the medium to long term. Positive exceptions in this group are Poland, which has shown increasing efforts to secure future supply of suitably qualified ICT practitioners; and Bulgaria, in which non-government stakeholders mainly from the ICT industry have taken the lead in the absence of policy leadership by the government.

Like in the precursor study[5] the assessment of the information gathered resulted in two activity indices, one for digital literacy and one for e-skills computed for each country. These were computed based on data from 2009 and 2013. The e-leadership skills activity index was computed only for 2013, as no data had been collected on this topic in 2009. In the following the focus will be on the e-skills activity index; we first mapped the e-skills activity index values against the Networked Readiness Index (NRI)[6] for each of the 27 Member States.

This allows for putting the results of the e-skills policy and activity analysis in the different countries in the wider context of each country's propensity to exploit the opportunities offered by ICT using data which can be obtained from the country values on the Networked Readiness Index (NRI).

The figure in Exhibit 6 allows a comparison of the results from this exercise for 2009 and 2013. In the graphical illustrations four quadrants are shown which are built by using the European averages on the NRI and those on the e-skills policy activity index for the respective years in order to group the countries into four main clusters.

[5] Hüsing, T. and Korte, W.B. (2010) "Evaluation of the Implementation of the Communication of the European Commission 'e-Skills for the 21st Century'", URL: http://ec.europa.eu/enterprise/sectors/ict/files/reports/eskills21_final_report_en.pdf

[6] The World Economic Forum's Networked Readiness Index (NRI) measures the propensity for countries to exploit the opportunities offered by ICT. It is published annually as part of the Global Information Technology Report. The NRI is a composite of three components: the environment for ICT offered by a given country (market, political and regulatory, infrastructure environment), the readiness of the country's key stakeholders (individuals, businesses, and governments) to use ICT, and finally the usage of ICT amongst these stakeholders. For further information on the NRI see www.weforum.org/issues/global-information-technology.

Exhibit 5: European country landscape on 'e-skills policy activity' versus 'ICT innovation capability' 2009

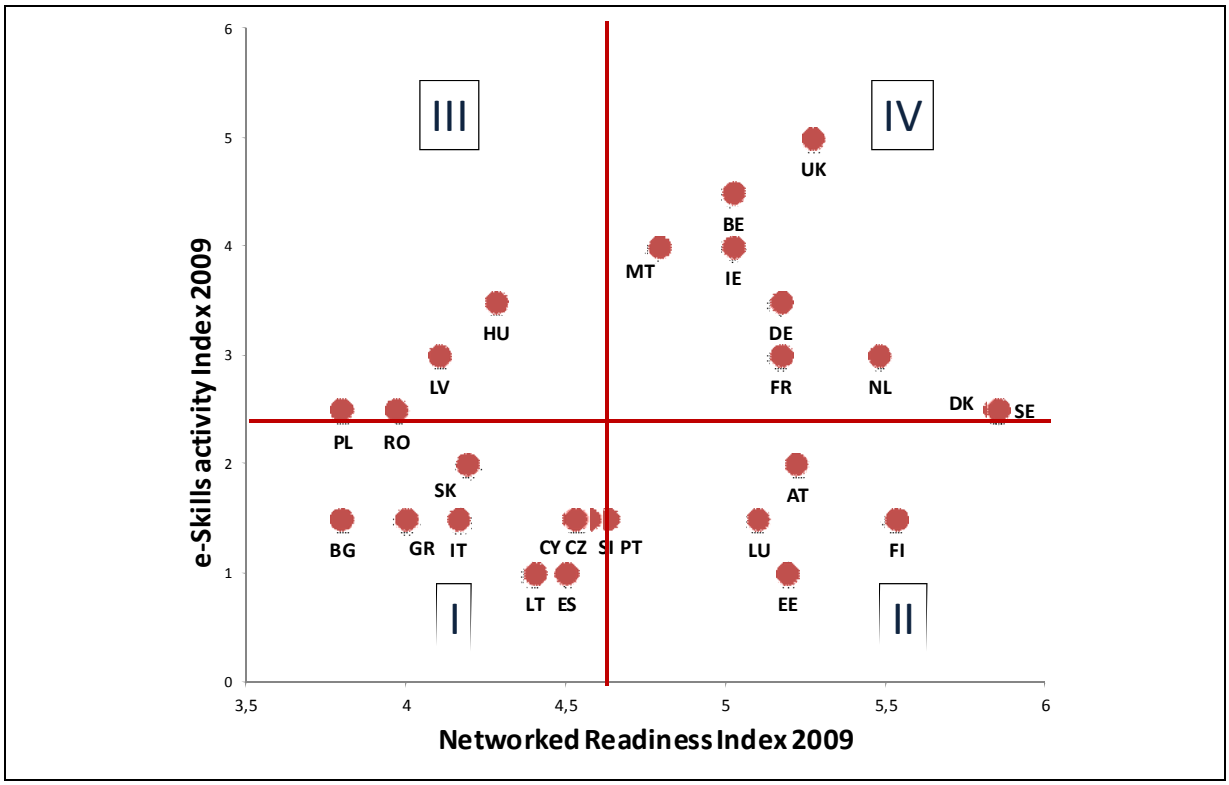
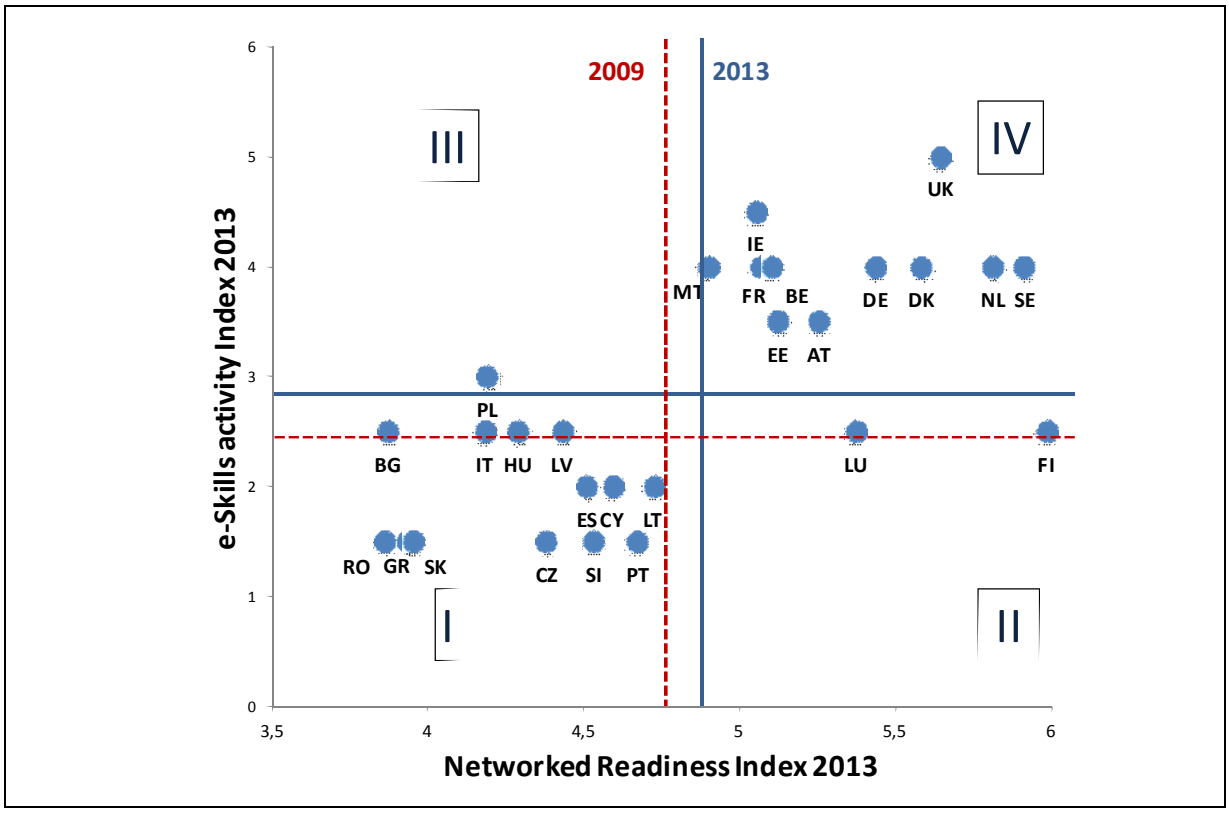


Exhibit 6: European country landscape on 'e-skills policy activity' versus 'ICT innovation capability' 2013



Overall and for e-skills related policies and initiatives a strong increase of activity levels over the five-year time span can be identified. The unweighted average e-skills policy index score increased from 2.4 to 2.9 between 2009 and 2013. This is encouraging news.

Our analysis revealed that in 2009 three of the four quadrants are well populated by different countries with only 7 countries belonging to the group of top performers both, in terms of e-skills policy index as well as NRI, and 11 Member States constituting those best described as low activity countries (bottom left quadrant).

Five years later the situation has changed significantly; we are now faced with a situation which can be described as a dichotomy in Europe on these indicators: top performing countries as opposed to countries with low activity levels and NRI performance, with only three countries (Poland, Luxembourg and Finland) in transition phases between these clusters.

The group of top performers has grown from 7 to 11 with Sweden, Denmark, Austria and Estonia entering this cluster to which the United Kingdom, the Netherlands, Belgium, Ireland, Malta, Germany and France already belonged in 2009. However, the group of low activity countries is still substantial in terms of numbers of countries with 13 EU Member States – almost 50% showing a below average performance on the NRI and on the e-skill skills policy activity index.

EU Member States fall into two very distinct groups: 41% of the Member States are top performers, almost 50% are low activity countries, and 11% located between these two clusters.

While the former have been successful on the e-skills front and capable of exploiting ICT to become innovative and more competitive the latter group of low activity countries still has a rather long way to go to achieve both.

A look at the Member States' positions in the NRI ranking (Networked Readiness Index) reveals that again, those countries with high NRI positions also show high e-skills policy activity levels. The countries moving up in terms of migrating into the 'top performers' cluster include Sweden, Denmark, Austria and Estonia, as well as the Netherlands and France which managed to further increase their e-skills policy activity level.

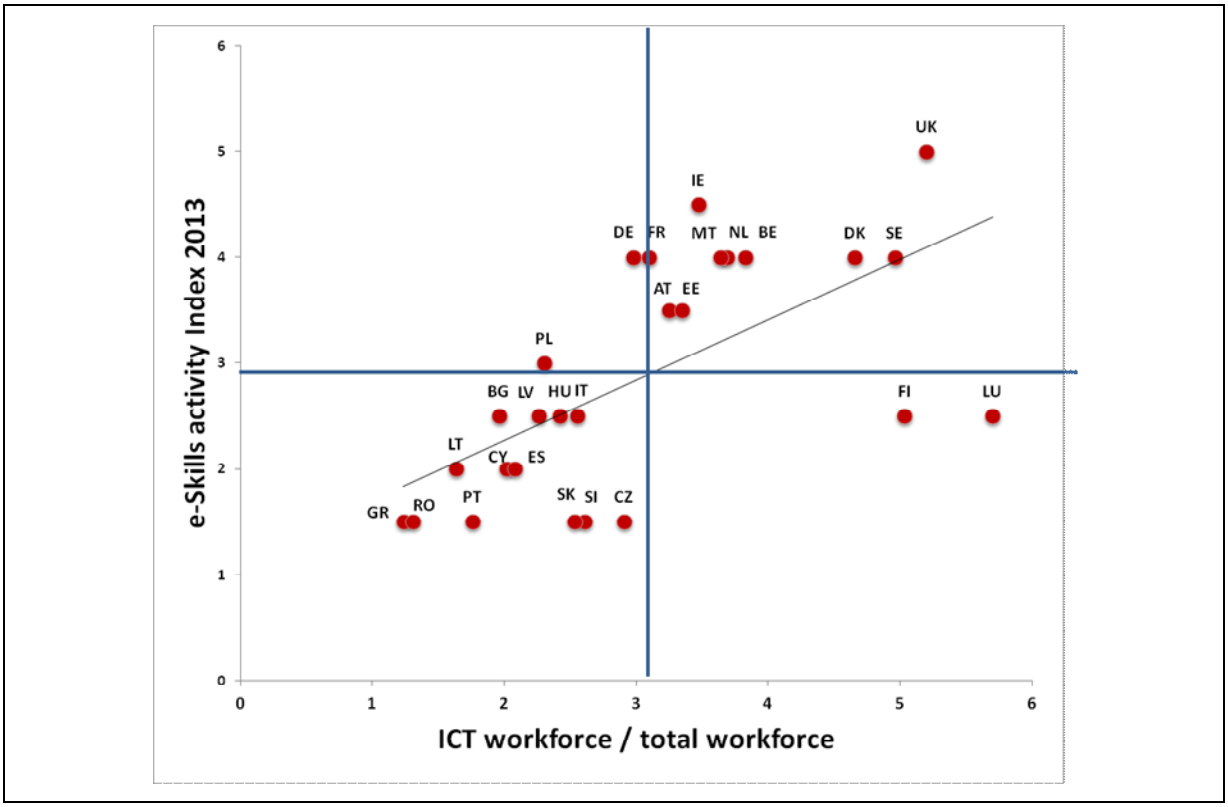
Countries at the risk of losing ground include Hungary, Latvia and Romania which dropped down into the first cluster of countries, i.e. those lagging behind.

Exhibit 7: European country clusters on 'e-skills policy activity' versus 'ICT innovation capability' 2013

I : low NRI + Low level of e-skills policy activity	**II : High NRI + low level of e-skills policy activity**
Romania, Greece, Slovakia, Czech Republic, Slovenia, Portugal, Spain, Cyprus, Lithuania, Bulgaria, Italy, Hungary, Latvia	Luxembourg, Finland
III : Low NRI + high level of e-skills policy activity	**IV : High NRI + high level of e-skills policy activity**
Poland	United Kingdom, Ireland, Sweden, Netherlands, Denmark, Germany, Belgium, France, Malta, Austria, Estonia

At first glance there seems to be a strong correlation between the e-skills activity level and the number of ICT workers as share of total employment (see figure below). However, further research and analysis is required to obtain a better and more complete picture.

Exhibit 8: European country landscape on 'e-skills policy activity' versus 'Share of ICT Workforce' 2013



Evolution of e-skills shortage in different countries

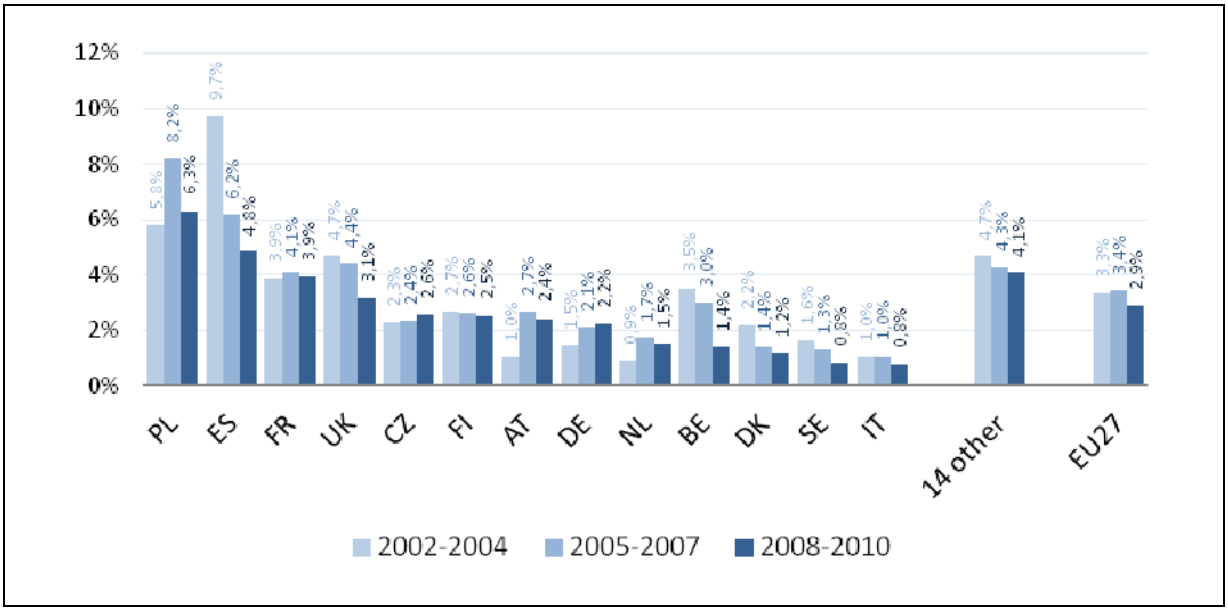
There are no comparable historical data on the evolution of any demand–supply gap in Member States. The only data available are the number jobs and the number of computer science graduates.

However, the relation between number of annual graduates and the size of the workforce is an indication of the structural ability to cope with new ICT job openings and replacement demand.

The following graph[7] depicts the averages of annual graduates per ICT workforce.

[7] Based on the „old" ISCO 88 core definition.

Exhibit 9: Annual graduates per core ICT workforce (3 year averages) in European countries 2002-2010



The European total shows a rate of around 3% of new graduates meaning that per 100 existing core ICT practitioner jobs, 3 new graduates left universities. Taking account of the fact that the broader definition of ICT workforce is about two thirds larger, this is not a sustainable rate, giving way to both the persisting problem of unfilled vacancies and to the number of side entry employees in ICT jobs.

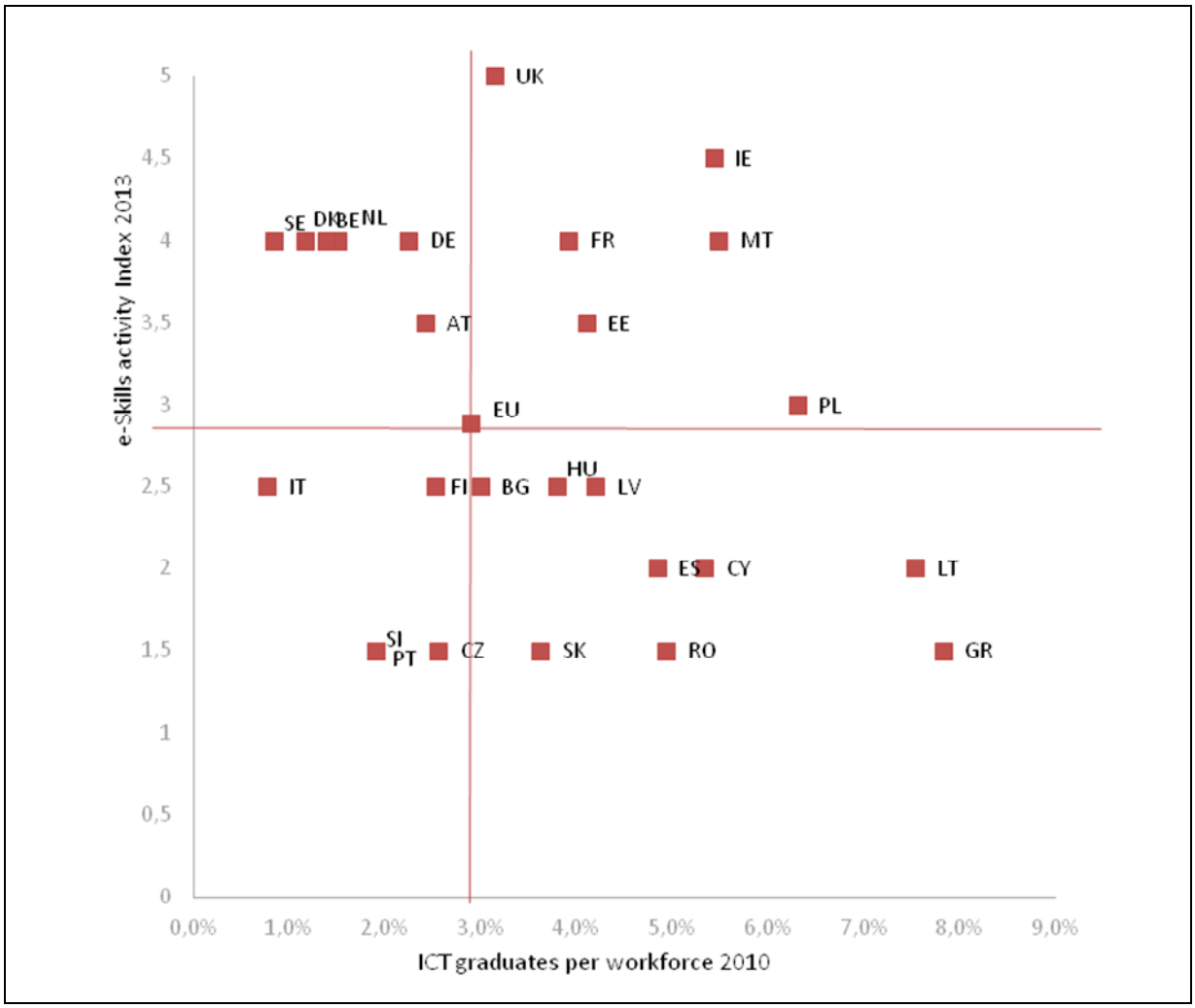
While no historical shortage data is available, comparing graduate rates per country can however give an assessment of where the problem of structural shortages is gravest. This also puts into perspective for instance the finding for the UK where the number of graduates has significantly decreased, while it has increased in Germany and France. While France has overtaken the UK, still a greater number of graduates have left universities in relation to the country's workforce in the UK (3.1%) than for instance in Germany (2.2%)[8].

Comparing this proxy for the sustainability of new ICT workforce supply from universities with e-skills activity is quite interesting. In the following graph, countries on the left hand side are most unsustainable in their ICT talent supply. This includes Italy, Sweden, Denmark, Belgium, the Netherlands, Slovenia, Portugal Germany, Austria, the Czech Republic and Finland.

On the other hand, the most sustainable talent flow seems to exist in Greece, Lithuania and Poland, followed by Malta, Ireland, Cyprus, Romania and Spain.

[8] There is however an issue with the break in series of the job classification ISCO after 2010. Figures for the UK after 2010 are hardly comparable to pre-break in series figures, as the workforce has grown – per difinition it seems – by 300,000 in a year, from 674,000in 2010 (old definition) to 974,000 (new definition).

Exhibit 10: Annual graduates per core ICT workforce (3 year averages) in European countries 2010 by e-skills activity index 2013



2.2 Multi-stakeholder partnerships for e-skills

2.2.1 Definition and background

Multi-stakeholder partnerships (MSPs) have been defined and operationalized within earlier EU studies coordinated by empirica, subsequently approved by DG ENTR, as follows:

The key feature of MSPs is that private-sector partners (industry, employers from the private sector) take over responsibilities which in traditional education systems have been held (more or less) exclusively by public sector or civic sector institutions. MSPs build on the idea that the private sectors can complement, supplement and extend services provided by the public sector by increasing the available resources.

As such, MSPs are closely related to the more well-known public-private partnerships (PPP), which are usually defined as systems in which a government service is funded and operated through a partnership of government and one or more private sector companies. As opposed to PPPs, however, MSPs do not necessarily include the public sector – participating non industry partners can also come from the civil sector (e.g. trade unions). Another difference between more traditional PPPs and MSPs is the latter's emphasis on involving all key stakeholders which are of relevance for a certain e-skills related issue – rather than just a couple of partners who join forces to stem a fixed-term assignment. This is seen as the best way to ensure that progress will be self-

sustainable and all-encompassing, as opposed to the piecemeal, uncoordinated approaches which too often dominate the modernisation of systems of vocational education in Europe.

From an industry viewpoint, multi-stakeholder partnerships present the possibility of overcoming the traditional polarisation between the public education system, which is the main factor behind supply of (formalised) skills on the labour market, and private sector employers, which exert demand for particular skills.

Over the years, multi-stakeholder partnerships on e-skills have been developed for different purposes. In order to identify and categorise the main areas in which these can be active, it is useful to look at the idealised e-skills development process which distinguishes between the following elements: (1) market information (2) design and delivery of education and training (3) e-skills frameworks and certification (4) job matching (5) support for career development and lifelong learning and (6) awareness raising.

A stocktaking exercise undertaken in 2007[9] found up-and-running MSPs mainly of the following types:

- Industry-driven (Workforce development and e-skills certification of IT practitioners)
  - MSPs of private sector partners together with partners from the public and civic sector (e.g. trade unions, NGO);
  - Vendor initiated MSPs and industry-based e-skills training and certifications ("vendor qualifications").
- Education system-driven (E-skills development through vendor-based qualification offers, from awareness to courses and certification)
  - Initiatives of governments, universities, IT companies and associations and the like to create an awareness and promote IT-based studies at universities;
  - Initiatives of governments and universities together with vendors aimed at considering vendor-based trainings and certifications (e.g. CNAP) in IT studies.
- Citizen-focused (Digital literacy, basic e-skills development to support employability of individuals)
  - Digital literacy initiatives
- Europe-wide Schemes
  - Specific types of European-wide multi-stakeholder partnerships which indirectly result in e-skills related MSPs.

This typology has been used as the starting point for the investigations of the current state-of-play in MSPs across Europe.

Institutional and governance frameworks concerning the development of MSPs in the field of e-skills can take many different forms and have for the first time been analysed in a more structured way for the European Commission in 2009 with the study on 'Financial and fiscal incentives for e-skills in Europe'. The study identified a number of financial and fiscal incentives of relevance in such frameworks. The prerequisites for a good incentive are described as:

- It should be cost effective and the returns from the input should be reasonable
- It should demonstrate a high level of internal as well as external efficiency and should be capable of being targeted to address the needs
- It should be scalable, and

[9] Korte, W.B. et al. (2007) "Benchmarking Policies on Multi-stakeholder Partnerships for e-skills in Europe", URL: http://www.eskillspolicy-europe.org/downloads/documents/Benchmarking%20MSPs%20final_report_final.pdf

- To assure its continuity, there should be a reasonable level of sustainability.

The major financial incentives identified include: subsidised courses, cost reimbursement, educational/training loans, training grant, training vouchers/individual Learning Accounts, educational leave schemes whereas the key fiscal incentives mentioned are: tax incentives for employers, human capital investment tax credits, tax incentives for individuals, reduced social contributions.

The study concluded that as far as financial incentives are concerned, subsidising training courses and reimbursing the cost of training expenses are most likely to be effective. Among fiscal incentives, providing tax breaks for enterprises that invest in staff training is seen as the best incentive.

2.2.2 Stock-taking of MSPs on e-skills in Europe: A great variety of approaches

Our research on multi-stakeholder partnerships on e-skills showed that existing initiatives can be placed in eight clusters according to their main focus:

- **Awareness raising** activities: These initiatives are based on the premise that there is limited understanding about ICT practitioners, their role within the economy in quantitative and qualitative terms, their relevance for the performance of SMEs, career prospects in ICT, etc. Typical target groups include young people prior to taking decisions which have a bearing on their later career, i.e. students in primary, secondary and tertiary education. There is a huge variety of approaches being used to address this particular target group across Europe, ranging from competitions and event-type "meet your future employer" activities to tools and platforms that seek to make ICT a "cool" career choice among teenagers.
- **Providing the basis at early age**: This includes initiatives for adapting primary and secondary education in order 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 engaged in a updating and modernising school curricula and ICT infrastructure to fit the rapid pace of technical innovation as well as the evolving needs of industry and society. The success has been variable and depends to some extent, of course, on the ability of each country to finance investments in its education system. Some countries have subjected their complete system of primary and secondary education to scrutiny and developed ways to mainstream pupils' exposure to STEM related subjects, as a means to increase interest in technological subjects from an early point onwards. Curricula have been overhauled with the purpose of embedding ICT use and media literacy within all segments of the learning process. Denmark, for example, has introduced a new school subject "Computational thinking and practice" which represents the state-of-the-art in the didactical approach to teaching computing related issues at school.
- **Initiatives focussing on girls/women**: A sub-group of the former type of MSPs targets school age girls and young women. With very few exceptions, women are significantly underrepresented among both current ICT practitioners and ICT students. Some of the longest-running initiatives mentioned in the present report have the objective to make ICT-related study fields more interesting for young women. In both Germany and Austria, these programmes have started in the early years of the last decade already. Many other Member States have initiatives specifically targeting girls and young women as well, often using mentor programmes through which female ICT students or graduates are sent into schools as role models.
- Development and provision of **tailored education & training** according to the needs of the labour market: In the face of, on the one hand, increasing rates of unemployment and, on the other hand, hard-to-fill vacancies for ICT practitioners, many Member States have attempted to channel graduates and other jobseekers towards particular ICT jobs for which their is strong

demand. The Republic of 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".

- **Career support, lifelong learning and e-leadership training**: The fact that the ICT profession is less clearly defined as other, more established professions means that the transparency of the ICT labour market for employees seeking to make career choices is less than optimal. Initiatives for career support of ICT practitioners have been set up to help improve this situation. Often such programmes provide users with market information tailored to their individual needs. They also intend to help individuals who look for (re)training in professional e-skills by supplying advice for finding appropriate training offers on the market.
- **e-Skills competence frameworks, certification and job matching**: The development of widely recognised e-skills frameworks and definitions has been taken place at the national level in the 1990s already (e.g. AITTS with APO-IT in Germany; SFIA in the U.K.; Les métiers des Systèmes d'Information dans les grandes entreprises – Nomenclature RH in France). It received a strong push in recent years with the development of the European e-Competence Framework (e-CF). A large number of schemes for education and certification of e-skills in Europe make use of, or are closely aligned with, the e-CF. There also is increasing activity at sub-national level to establish coherent systems to steer relevant professional skills to where there is demand for ICT practitioners, and to counsel job seekers in issues concerning re-skilling and certification. Facilitating geographical workforce mobility across regions and countries is an important element in this, as shown by the example of CompeTIC, a cross-boarder project between the Belgian Walloon Region and the French Region North-Pas-de-Calais. Related measures include the implementation of strongly user-centred Internet portals/knowledge databases plus campaigns for raising awareness among employers, especially SMEs with limited HRM capabilities.
- **Comprehensive, national e-skill partnerships with strong government role**: In addition to the focused initiatives discussed above, a number of Member States feature strongly government-supported partnerships that are engaged in a whole range of e-skills related measures and initiatives, based on a long-term strategical approach in close alignment with policy-making. The most well-known example is e-skills UK, which as Skills Sector Council for the ICT sector is subject to control by the government, but has also benefitted from significant public funding as well as from strong policy support. Budget cuts have made it more difficult to maintain this kind of governance model, in the U.K. but also elsewhere.
- **Comprehensive, national e-skill partnerships with limited government role**: In other countries, such comprehensive partnerships in the e-skills domain have been established with little or no government influence. One example is France's P@scaline, which enjoys strong support from the business sector as well as the relevant trade unions, but is not embedded in the government's policy agenda to the same degree as this is the case with e-skills UK.

2.2.3 Selected Good Practices

The research conducted for the present study identified a number of good practice cases in multi-stakeholder partnerships for e-skills, understood here as focusing on securing a sufficient supply of suitably qualified ICT practitioners and development of e-leadership skills. These are briefly presented in the following. More detailed information on each of the cases can be found in the Annex (section 7.2).

Coder Dojos

Coder Dojos is an example of social innovation driven by a grassroots movement rather than a centrally initiated strategy of established stakeholders in the e-skills area. In 2011, high school

student James Whelton gained some popularity for hacking a popular digital player gadget. Consequently, some of the younger students at his Cork school became interested in learning how to code. Whelton set up a school code club for teaching basic HTML and CSS skills. Once this became known through social networks, requests from other parts of the county came in to extend the courses beyond Cork.

A meeting with angel investor Bill Liao, co-founder of Xing, led Whelton to set up an initiative and brand it as Coder Dojos, the Japanese word “dojo” meaning a training place for Japanese martial arts. The first Coder Dojos was opened in Cork in June 2011. Since then the initiative has extended to 28 other countries. More than 16,000 children have received training already.

The initiative follows a strictly open source policy, meaning that the training material can easily be utilised by other people and places for their purposes. Dojos can be set up by anybody who is interested, but need to be approved by the organisation to maintain a common identity and protect the initiatives core values. These values include that Dojos shall pursue a community-based approach by showing children that Computer Science can be "cool", and that it comprises more than text documents and spreadsheets.

Detailed instructions are available for volunteers on how to set up their own Dojo sessions. The website offers a growing range of teaching materials from which local organisers can select for designing their own training sessions.

Dojos focus on the young participants’ own ideas for what kind of programming task they want to pursue; this can be a website, a mobile app, a computer game or any other piece of software. The target group are school children of all ages. Participants younger than 12 years are required to be accompanied by a parent during the sessions, which might have the side effect of influencing the family members' attitudes to a career in ICT. The initiative wants to spread free and enjoyable computer science activities to as many children as possible and also promote ICT as a possible career choice. Another emphasize is on community work, i.e. developing applications which help address social challenges at community level.

The principle is that the initiative expands in line with interest, with very little requirements in terms of resources and without central funding. While having little in terms of a major budget, the initiative is supported by a number of industry stakeholders including Hays Consulting, Intel, Plunkett Communication and Enterprise Ireland. Public sector supporters include the Lumingh Institute of Technology and the Gaisce President’s Award, Ireland's National Challenge Award for young people. Much of the support comes in the form of premises, training staff and practical support for the training sessions carried out at the different localities around the world. Key figures from the ICT world have been won as guest lecturers and spoken to young Dojos participants at local training events.

The initiative has been intensely featured first in the Irish and then the international media. In April 2013 a Coder Dojo Conference united some of the stakeholders as well as speakers from other organisations engaged in activities for making programming attractive to children.

The bottom line

Initiatives for boosting interest in ICT among school children do not necessarily require central planning and a big budget. Coder Dojos, a grassroots initiative with its origins in Ireland, makes best use of the open source concept and social networks to organise programming sessions for school children of all ages in 28 countries around the world. By helping to make ICT skills of major appeal to youngster, Coder Dojos presents a powerful example of digital social innovation for e-skills.

New High School Subject 'Computational Thinking and Practice'

Like most Member States, Denmark's curricula for secondary education include the subject computer sciences. Dissatisfaction with the current situation has been strong in recent years, mainly because of a steadily decreasing number of students choosing ICT subjects in high schools, at a time when ICT is becoming ever more all-pervasive and the country's industry badly needs well-qualified ICT practitioners.

In this situation, the decision was taken to develop a new, consolidated subject. The conceptual framework was derived from ideas related to computational thinking, with a strong focus on creativity and the principle of co-creation instead of simply covering ICT user skills and digital literacy. The foundational theses for the development of the subject were the following:

- In general, young people do not consider computing a proper subject, and they certainly do not realise the importance and potential of computing in modern society. For this reason, they need to learn that, through computing, people can create, share, and handle thoughts, processes, products and services that create new, effective, and boarder-crossing opportunities which would be impossible without the digital technology.
- There exists a common and shared foundational set of computational concepts, principles and practices, which can be applied purposefully within science & technology, business and social science, arts and humanities, and health and life sciences.

Thus, the subject's design represents the state-of-the-art in didactical principles for teaching of computational thinking[10], strongly guided by the ambition to offer a course that inspires pupils to continue with computing studies after high school.

The learning materials developed for the subject is offered on the website of the Danish Association of High School Teachers in Computing in the format of "learning activity packages", for which an open source approach is being applied. Teachers are encouraged to develop and share their own learning activity packages. Using Wiki methodologies, the content can continuously be updated and improved by teaching staff as well as by students and other involved parties. This innovative, bottom-up approach to material development encourages diversity and multiplicity, which appears highly appropriate for this subject area as it stimulates creativity and co-operation. It does, however, provide a challenge to traditional understandings of how to develop learning content and equip school students with knowledge.

Establishment of a new subject in Denmark's secondary education system is closely regulated and follows a number of steps, including a 4-year evaluation period in which the subject is offered to schools with experiences being evaluated towards the end of the period. The government does not, however, makes available funds for the development of the subject's content. This means that funding for development of learning content (online textbooks etc.) and teacher training needs to come from somewhere else. To address this challenge, a multi-stakeholder partnership (MSP) was set up in 2011 to take charge of development of new learning resources and teacher training. The MSP consisted of the Centre for Science Education at Aarhus University; It-vest – Networking Universities; Egaa Gymnasium; Danish Association of High School Teachers in Computing; and the Region Midtjylland, plus the Association of Technical Colleges' High School Department, the Association of Private High Schools, the Organisation of Principals in High Schools and two industry organisations, ITB and ITEK.

Once a new subject has been established as an elective subject, Danish high schools have discretion whether to offer it or not, which means a new subject has to appeal to head teachers and teaching

[10] Caspersen, M.E. and Nowack, P. (2013) 'Computational Thinking and Practice — A Generic Approach to Computing in Danish High Schools', in: Carbone, A. and Whalley, J. (Eds.) 'Conferences in Research and Practice in Information Technology (CRPIT), Vol. 136.

staff as much as it has to be attractive to the students themselves. In the first year of the test period (2011-2014), 18% of the high schools taught the new subject; the number increased to 26% in the second year, which is a very high figure given that this is still the test phase. Feedback received from teachers, examiners and pupils has been very positive. Likewise, industry has responded enthusiastically to the innovative approach taken.

The bottom line

Many countries are introducing or modernising ICT curricula for secondary education, but arguably none has gone as far as Denmark in re-thinking how education in "computational thinking" needs to be conceptualised to make the subject appealing to students. Denmark's new high school subject focuses on computational thinking and practice with a strong emphasis on creational and constructional competencies as opposed to mere computer literacy. Feedback so far has been strongly positive.

e-CF NL Work Group, Netherlands

For a number of years, various stakeholders in the Netherlands had undertaken attempts to get broad support for implementation of the European e-Competence Framework (e-CF), with limited success.

This only changed in 2011 when the Taskforce e-Skills, set up in 2009 at the initiative of the Ministry of Economic Affairs, Agriculture and Innovation, published a much-discussed report about e-skills supply and demand in the country's labour market. The Taskforce's analysis indicated a substantial shortage of ICT practitioners and the risk that the situation will worsen dramatically over the coming years. The Taskforce predicted a significant shortage of ICT practitioners by 2015, both within the ICT sector and in other companies using ICT. The main underlying causes are an increase in business sectors in which ICT is used intensively in combination with the dynamics in the ICT sector in which knowledge becomes obsolete quickly. Furthermore, the report pointed out insufficient intake in ICT training courses, a lack of alignment between course content and the needs of the labour market, and insufficient coordination between supply and demand on the labour market for ICT professionals. This concerned both outdated skills as well as opaque qualifications of workers.

Based on this evidence, the Taskforce made a number of recommendations. In particuar, it called for a national ICT professionals e-skills strategy, at the core of which should be the e-CF as the key reference model.

The national stakeholders responded swiftly. They sat up up the e-CF NL Work Group, which began operation in early 2012 based on strong cooperation between government, education and certification providers, professional societies, industry associations, and individual business partners, including Capgemini, IBM Netherlands and Eneco. The main aim of the e-CF Work Group is to facilitate job matching on the ICT market through broad implementation of the e-CF framework in the Netherlands. The e-CF Work Group considers the e-CF as a tool to systematically eliminate information asymmetries. Standardizing ICT functions is seen as indispensable to improve coordination of the various points of the market finding appropriate personnel for employers, choosing the right training and adapting education to the needs of the market. The e-CF also makes it easier to assess foreign applicants, which is especially important for a small country like the Netherlands.

To reach its aim, the MSP acts on two fronts. First, it translated and adapted the framework to the Dutch situation, and has conducted awareness raising campaigns throughout the country. Second, its stakeholders have been pioneering in using the competence catalogue for their own activities in recruitment and self-assessment of employees.

This method of combining the establishment of the framework with concrete implementation in the member institutions has been very effective. In November 2013, 21 of the main stakeholders signed an agreement declaring that the framework is being or will be used in their organisations. There are already a number of institutions which adapted the e-CF. Eleven Dutch Ministries, the National Police, IBM as well as Pinkelephant, a major Dutch IT Training and IT Service Management Consultancy, use the framework in shaping ICT vacancies and drafting employee resumes. HBO-I, a cooperation between 69 ICT programmes within Higher Professional Education in the country (Universities of Applied Sciences), is in the process of mapping its course offers to the e-CF.

Experience so far has been positive, with most of the participating stakeholders declaring that they will use the e-CF as a reference or conduct a mapping of their existing framework onto the e-CF. Expansion is expected as a result of companies as well as parts of the public sector using the e-CF in applications or services for clients or in procurement. Real progress has been achieved, but additional efforts will be needed in the coming years to keep up the momentum and to achieve full buy-in from all key stakeholder groups across the country.

The bottom line

When a taskforce, backed by all major stakeholders in the Netherlands, found that the country is affected by a substantial and growing shortage of suitably qualified ICT practioners, the response was not long in coming: By making best use of the European e-Competence Framework (e-CF), the e-CF NL Work Group has demonstrated how buy-in for e-CF implementation can be obtained from a large group of national stakeholders within a short period of time. The Work Group is driven by a strong partnership between government, education sector and industry, all of which pioneer use of the e-CF for their own purposes, e.g. design and promotion of education and certification offers, recruitment, job analyses, and procurement. This is likely to have knock-on effects that go much beyond the organisations directly affected, preparing the ground for broad take-up of the e-CF in the Netherlands.

e-skills UK

The UK's Sector Skills Councils (SSCs) are independent, employer-led organisations that aim to empower employers to invest in skills which are to push forward their companies, thereby create new jobs and drive sustainable economic growth. Founded in 2003, e-skills UK, the SSC for the ICT labour market, was one of the first Councils to be supplied with a 5-year license by the UK government. The license is an identifier to the government and employers that they are a focal point for addressing the current and future needs of the ICT sector.

In 2009, e-Skills UK was assessed for re-licensing by the National Audit Office, which rated it 'outstanding' and noted breadth and depth of employer involvement; strategic vision; excellence in research; innovation in standards and qualifications; and the pioneering programmes address the most important ICT skills issues facing the UK.

e-skills UK is a not-for-profit organization, licensed by the UK government, limited by guarantee and led by its constituency. There is a very high level of commitment from all board members, who represent leading companies and organisations in the UK. The strategic plans are developed in close cooperation with employers and stakeholders, following in-depth, primary research plus analysis of secondary sources. In this way, e-skills UK can address issues companies find difficult to handle on their own. England, Scotland, Northern Ireland and Wales each have their individual five-years strategic plan.

The dual strategy of e-skills UK consists of first individual programmes for reaching particular targets, based on clear strategic goals; and second integration of the various activities by companies, the education system, and individuals. Benefitting from the support from a large

network of employers and training providers, e-skills UK has been able to develop a large variety of programmes to foster supply of suitably qualified ICT practioners today and in future. These reach out to different target groups, ranging from school children over ICT practitioners to higher education and SMEs. Employers and ICT practitioners can find high quality training with the National Skills Academy for IT. The Behind the Screen project let secondary level students choose modern applications of ICT as a subject in some schools. University students can kick-start their career with the ITMB (Information Technology Management for Business) degree. Younger school girls make first steps in ICT basics at the Computer Club for Girls, preparing the ground for increasing levels of participation of women in the ICT labour force.

e-skills UK offers various options for stakeholders to get involved. For example, companies can train young apprentices in ICT and offer placements for students. ICT professionals and academics can share their passion for ICT with teenagers by acting as so-called IT Ambassadors. Also SMEs with a small budget can make a change in ICT education through sponsoring a local Computer Club for Girls for a fee of about € 600 per year.

Bringing ICT Skills into different areas of economy and society requires is a challenge requires a holistic approach, buy-in from as many key stakeholders as possible – and a long breath. This is amply demonstrated by e-skills UK's experience. When cuts in government funding for the UK's Sector Skills Councils were announced earlier this decase, some observers claimed that this would endanger e-skills UK's ability to operate successfully. Today most national experts seem to agree, however, that the organisation's role for e-skills related developments in the UK has not been affected by cuts in government funding (i.e. increased reliance on project funding).

The bottom line

e-skills UK remains the European benchmark for comprehensive initiatives addressing the e-skills challenge, in spite of recent cuts in government funding and increased reliance on project funding. The partnership benefits from strong government backing, formalised through its status (since 2003) as a Sector Skills Council. Other success factors include effective coordination of all main national stakeholders, while being driven by the requirements of employers. The range of activities cover nearly all types of initiatives discussed in the present report. The programmes offer companies, institutions and individuals a wide range of opportunities to participate and benefit.

EVOLIRIS ICT Reference Centre for the Brussels region, Belgium

Evoliris is a non-profit organization that aims at promoting ICT careers and education in the Brussels region. It wants to ensure that the number of ICT practitioners, as well as the training offered, meet the demand of the job market.

In 2006, the ICT Reference Centre for the region was set up following the initiative of Benoit Cerexhe, Minister of the Government of the Brussels Region. Given a situation with many unemployed individuals without an adequate qualification on one hand and a huge number of ICT companies on the other, the idea to use e-skills education to link both sides emerged. Training in Computing should be coordinated, evaluated and advertised by one single entity. This reference centre has the objective to improve the quality of training offers and provide adequate and up-to-date equipment. The target group for this training offer were unemployed individuals.

In 2009, this reference centre merged with other ICT training unities and included also the observation of the labour market and job matching in its work. Nowadays, Evoliris also targets employees and young students (potentially) involved in ICT. It is funded partly by its members and partly from the government. It involves stakeholders from companies, trade unions, the government and the educational sector. Partners include the employment agency ACTIRIS, the regional government, social partners such as unions and company associations, Brussels

universities, education providers and the Microsoft Innovation Center Brussels. It supports the activities of employers, school and other education in the sector.

Its activities have shown remarkable impact on different levels. For example, in 2012 an ICT workshop for teenagers reached over 1,000 pupils, making 60% of them change their opinion on ICT professions from predominantly negative to positive. Over 100 adult training courses are scheduled for 2013.

Ensuring a good communication between these actors, Evoliris wants to adapt ICT education to the required profile for ICT practitioners. This also involves the development of new training schemes according to the market's needs. In addition, the MSP is keeping track of unemployed ICT professionals in the region, creating a data base of ICT formations and professions and raising awareness for a career in the sector.

Thus, Evoliris broadened its focus, now including not only job-seekers but also other potential ICT practitioners. It joins the different stakeholders in ICT professions in the region and helps avoid mismatches in qualification and job offers. This is a demanding task in a region with two official language zones and with a high number of ICT companies. Evoliris addresses both Flemish and French speaking industry and individuals by appliying bilingualism throughout all its activities.

Evoliris has been pursuing these goals with a variety of approaches. Apart from information and job matching tools, it created a serious online game for teens that simulates the daily challenges of an ICT company. This has proven highy popular among youngsters in the region and beyond.

The bottom line

Evoliris has proven that it is possible to overcome the inefficienes typical for the highly heterogenous e-skills market, made more challenging because the Brussels region is bilingual. It offers a platform for ICT which helps eliminating information asymmetries by boosting transparency on the market for ICT education, training and the ICT practitioner labour market. Evoliris carefully studies existing initiatives of relevance to the ICT sector and on this basis develops and offers tailored services to its different target audiences. Its success is based on a long-term approach underpinned by a strong partnership between all major stakeholders in the area, with effective coordination at all levels.

Finish IT, Germany

The ICT labour market is characterised by a high number of individuals who do not have a formal ICT degree, or who have a foreign degree that is not recognised by the German education system. In the region of Karlsruhe, a medium-seized city in the south of Germany, around 15,000 students start an ICT degree every year. Around 30% of them leave university without a degree, equalling 4,500 individuals per year. In fact, a lot of skilled ICT practitioners are not fully integrated in the ICT labour market in a satisfactory way. This contributes to a job mismatch which is not caused by lack of the required skills, but by lack of a valid certification. Available data suggest that the other European countries face this problem as well.

Against this background, various stakeholders in Karlsruhe, a medium-sized German city with a high share of ICT and high-tech companies, noticed that a lot of well-qualified ICT dropouts, as well as immigrants, are interested in fast-track vocational education in order to obtain a valid degree. At the same time, companies are open towards this kind of candidates. However, these informal ICT practitioners often underestimate their potential and do not recognise themselves when employers voice demand for ICT professionals.

To tackle this dilemma, a concept addressing advanced university dropouts and ICT skilled immigrants was developed in 2010 by CyberForum and the Karlsruhe Chamber of Commerce, in co-operation with the city of Karlruhe, the local public employment service, local companies and an

education provider. To qualify for participation, candidates have to be at least 25 years old and a minimum of one year of experience in an ICT job. In the German tradition of dual vocational training, the course combines classroom teaching with extensive on-the-job training in employer organisations.

The course duration is only about one third compared to a regular vocational training, and remuneration considerably higher. This means that candidates are more likely to afford to participate in spite of the effort involved and the possible loss of earnings from their regular job.

The first class started in 2011. Since it was launched, the program has received more than 200 applications, 30% of which came from immigrants. In 2013, 31 of 40 participants had already graduated from the programme. The training is financed on a case-by-case basis depending on circumstances; most funding comes from the German public employment service and the companies that take on apprentices; in some cases, participants themselves contribute to the costs.

From 2010 to 2013 Finish IT is being evaluated within the project Perspektive Berufsabschluss. The evaluation report is not yet available, but initial feedback from local stakeholders has been very positive; most observers realised that the scheme creates a real win-win situation for all parties concerned. Most applicants, who typically have not been able to exploit their full potential in career terms before, are showing strong motivation when offered fast-track training for a vocational degree. Participating companies praise the candidates' qualification and state that Finish IT is allowing them to broaden their competence portfolios. They acknowledge, in particular, that graduates with previous work experience can be integrated more easily into their organisations in comparison to university graduates. In addition, due to their previous knowledge, participants already during their apprenticeship spend less time for studying and contribute more on the job.

From the perspective of the region, Finish IT is able to contribute more ICT practitioners to the local economy in a shorter period of time compared to traditional ICT education at universities.

The bottom line

ICT practitioners without a formal degree – or with a foreign degree which is not recognised by the German education system – represent an important segment of the ICT labour market. These individuals are, however, faced with serious barriers affecting their long-term employability and labour mobility. Finish IT offers a fast-track training programme to allow such ICT practitioners to gain a formal degree, opening the door to full integration in the labour market. The programme is designed to attract candidates with knowledge gained through employment.

Frauen in die Technik (Women Into Technology, FIT)

Women Into Technology (FIT) is an initiative for gaining young women's interest in studying technical subjects, commonly referred to in Austria as MINT (= STEM) subjects. For this purpose education opportunities and professional perspectives are being demonstrated to students at secondary schools. Much use is made of role models (called "ambassadors"), who are university students or graduates who explain their choice of a technical subject of study in direct interaction with pupils.

FIT has been operating for over 20 years now. Started as a countrywide initiative, today FIT operates in the larger provinces (*Länder*) only after the federal government stopped its funding in 2010 because of budgetary pressures. In the Steiermark, Upper Austria and Vienna regions, regional stakeholders pushed for a continuation of activities as FIT was considered to play a vital role for further increasing the share of young women in STEM. While ICT is only one focus among other subjects that are being promoted, the reference to the STEM area appears more suitable for German speaking countries – both the government and employer representatives usually speak of

the shortage of STEM practitioners also when referring to the more narrowly defined field of ICT professionals.

The observation which originally triggered the initiative is still very much valid today – Austrians girls tend to perform better than boys in natural sciences at school, but are much underrepresented among STEM students and graduates. This is a situation which – in the face of a growing shortage of STEM practitioners in general and ICT professionals in particular – cannot any longer be tolerated. Means are needed for changing the mindset of young Austrian women so that they not only gain interest in STEM subjects but also develop the confidence that they can perform successfully in a related job, e.g. as ICT practitioner. One of the main lessons learned through FIT's long-term experience concerns the need to address not only girls and young women directly, but also their social context such as parents and teachers, who often play a crucial role in career decisions of young persons.

FIT is communicating through ambassadors and information days at universities. The former are female STEM students who promote technical subjects to girls in secondary schools. This peer-group approach has proven very effective in the past, since students pass on their own experiences while still being young enough to empathize with the feelings of girls at school age. Information days at universities are used to let regional education providers present themselves and promote their STEM course programmes. In addition, HR Manager of local employers are invited to discuss with students about career prospects in highly practical terms.

The initiative is organized in Styria by the Office for Gender Equality and Affirmative Action of the Technical University in Graz in cooperation with the regional government, industry associations, the public employment service, and individual companies. These are also jointly funding the initiative. In Vienna, the coordinator is the Verein Sprungbrett, in Upper Austria the Policy Unit for Equal Opportunities of the Johannes Kepler University Linz. Over the years, the initiative has developed extensive networks at regional level which ensure that changing employer demands are translated directly into new FIT activities.

FIT, together with other related initiatives across Austria, has contributed to numbers of female ICT students rising steadily. In 1994, the share of female STEM graduates was 14%, while it is about 25% today.

The bottom line

Over many years, the FIT initiative has shown a lot of resourcefulness in developing effective approaches to enhance the share of female students in STEM education, with a particular focus on ICT. FIT uses mentoring and peer-networks (via so-called "FIT ambassadors") and related techniques to address girls and young women within their local social environment. In addition to directly communicating with school pupils, the initiative targets teachers and parents – groups which have proven to play a key role in influencing career decisions of persons at school age. FIT is organised at regional level in close collaboration with local partners from industry and the education sector.

Get Qualified Scheme

This scheme, the successor of the MyPotential programme, offers grants to individuals who seek qualifications which are in strong demand by Maltese employers. The incentive is applicable to individuals following a course of studies leading to a certification, diploma, degree or post-graduate degree which is categorised as eligible by the Local Qualifications Council. This incentive is mainly intended to support persons who have completed formal education and who now seek to further their education in areas that are relevant to Maltese Industries – including the ICT industry.

The Local Qualifications Council takes decisions based on the government's long-term industrial policy, which has been translated into a number of sectors which are given priority for the development of Malta's economy. While the MyPotential scheme, which was launched in 2006 in the face of increasing signs that the country suffers from a shortage of ICT practitioners, was limited to ICT related qualifications, GetQualified has a broader sectoral focus. This is due to the fact that the ICT industry was particularly hit by the economic crisis that set in at the end of the last decade, which made policy-makers seek additional growth sectors to base the country's economic development on. Still, more than half of the grants are currently allocated to persons choosing a qualification in ICT, as industry demand for ICT practitioners has rebounded.

This programme has proved to be an extremely important action that contributed to an increase in the number of ICT professionals in the country. The number of providers enrolling their ICT courses under the scheme has increased on a yearly basis. The courses which are eligible today for support under the scheme provide a wide range of options for professional development, including; industry-based training and certification courses, vocational courses and academic degrees.

The grant is provided in the form of a tax incentive. When successfully completing the program, students receive a tax credit covering 80% of the costs occurred (which can range from about € 2,000 to more than € 20,000). The approach ensures that individuals can choose on their own (or jointly with an employer) which qualification they want to obtain. The latter are not limited to qualifications offered by Maltese providers of education and training – course programmes from foreign universities or business schools are supported as well. This is necessary because Malta does not offer all kinds of often highly specialised qualifications demanded by Maltese employers.

Because grants are paid in the form of tax incentives, only graduates who choose to work in Malta (within a time span of 10 years after graduation) can enjoy the subsidy. This reduces the risk of free-riding, thereby safeguarding the programme's impact on the national economy.

From 2006 to 2012, more than 3,300 students have been granted over € 13 million in tax credits. In September 2013, the list of courses eligible for the incentives counted over 200 offers from more than 30 providers. Get Qualified is administered by Malta Enterprise, a national development agency for international investment on the Maltese Islands and national enterprises. It is funded by the government via MITA, the Maltese IT Agency.

The success of MyPotential is partly grounded in the strong partnership between all key stakeholders, including the Chambers of Commerce, the education providers, and larger companies. Feedback obtained from employers is strongly positive. While the scheme is formally scheduled to last until the end of 2013 only, there is strong demand from employers to keep it running over the coming years.

The bottom line

GetQualfied is a funding programme for students who choose qualifications required by industry, with a focus on persons who completed formal education. Qualifications that are eligible for funding (mainly ICT) are selected based on government strategy for development of the country's economy. Since grant are paid in the form of tax incentives, free-rider effects are avoided: graduates must seek employment in Malta to benefit from the tax deductions.

IT Academy Programme, Estonia

IT Academy Estonia is an MSP coordinated by the Estonian Information Technology Foundation (EITF) in cooperation with the government and the country's main universities with the goal to boost the quality of Estonian higher ICT education.

Like many other countries, Estonia is facing a gap in ICT practitioners for the local labour market. Despite being a country that has ICT at the very core of its development strategy, it struggles with too few students choosing a Computer Science degree and high drop-out rates.

In 2009, EITF, Tallinn University of Technology, University of Tartu, Tallinn University, Estonia and the Estonian Information Technology College and the Estonian Development Fund signed a cooperation memorandum "Estonian IT Academy". This is the umbrella name given to a joint initiative, which aims at bringing Estonian ICT to a new, internationally competitive level. A second aim is to reduce the dropout rate in these curricula. The original idea was to establish a new university. Later, the form of the umbrella project, involving single courses from different universities, was preferred.

Its objective is to create a world-class ICT education, which is: 1. Interdisciplinary; 2. Attractive to talented national and international students; 3. Attracts top professors and researchers; 4. Contributes to the Estonian companies with international ICT or ICT-based business; 5. Prompt a new wave of foreign investments in Estonia.

The IT Academy programme started in 2012 and today comprises four different Master's degrees at different universities, receiving a total of 400 students. In 2013, the campaign had an annual budget of € 2.7 million, which is spent on separate programmes of the different universities and also on scholarships for students showing promise. Each year the IT Academy invests € 680,000 on scholarships for Bachelor, Master and PhD students in computer science. Skype Technologies and LHV Bank Skype have been won as cooperation partners; they provide scholarships as well as internships. In the academic year of 2012/2013 four curricula.

Nearly half of the students in the participating master's courses are from abroad, contributing to an international atmosphere in the Academy. The curricula are entirely or partly in English. A further goal is to retain exchange students for the local labour market and also to attract more international lecturers. This equally benefits the local students, who train to work in an international context. Furthermore, the grants are expected to lower dropout rates, since a lot of aspiring ICT graduates used to abandon their studies because of a lack of income.

Universities have discretion to decide how to apply the funds. This can range from purchasing better equipment to inviting guest lecturers and supporting individual projects. The initiative thus leaves a lot of space for the participating institutions to develop their own profile.

Through its coordination body EITF, the programme has the advantage of joining all relevant players in ICT practitioner questions at one spot. Companies know their recruitment needs in ICT. Universities educate these professionals and the government sets the framework for those activities. Thus, the initiative is governed by one entity that represents all relevant stakeholders and works to supply more ICT practitioners to the labour market.

The bottom line

The IT Academy Estonia is a joint effort of government, higher education and industry to boost the quality of ICT curricula and to streamline and better promote existing education offers. It also seeks to make Estonia more competitive as a place to study ICT. The initiative benefits from being well embedded in government policy for using the ICT sector as a cornerstone of the country's economic development. A strong coordination body that joins all relevant stakeholders safeguards the initiative's efficiency.

ITMB Degree, United Kingdom

Around 2003 e-skills UK, the country's Skills Sector Council for the ICT industry, together with a number of employers, discussed measures against the skills gap in ICT. The priority was to adapt the relevant academic curriculum to industry needs. Particular emphasis was placed on the need for employees with sufficient competence to be able to blend into the workplace without extensive additional training and education. To address this need for instantly work ready graduates who are able to immediately contribute to business, employers

There was strong interest from ICT supply companies (and vendor certification providers) such as IBM and Cisco alongside ICT user companies such as Procter & Gamble and Sainsbury's to cooperate in creating a new degree meeting these needs.

The result is the ITMB Degree programme, managed by e-skills UK, which coordinates the collaboration between universities and companies. The ITMB (Information Technology Management for Business) bachelor degree education programme has been running since 2005 and is today available at 14 universities across the UK. The ITMB does not simply merge existing vendor education with publicly recognised education curriculum; it reverts to basics and establishes a highly innovative approach to building a curriculum based upon industry needs. Industry partners worked together to create a fresh curriculum unbounded by the constraints of vendor certifications or existing ICT bachelor degree programs.

The unique feature of the ITMB is that the conceptual roots were based upon industry requirements with programme content created by the ICT industry. Universities then provided the disciplines and structures necessary to formulate a formal publicly recognised degree.

The ITMB is designed to supply graduates with the technical capacity to perform in an enterprise ICT function and to develop the business acumen that allows them to engage with clients, understand business needs and network successfully. It also provides opportunities to regularly meet and network with industry leaders from over 60 leading organisations though structured network events.

The format of the ITMB contains a number of features that add value to the student experience: Guru Lectures from industry experts (at least 10 employer lectures per academic year); Team-based work overseen by business mentors; and a significant amount of project work.

Available evidence suggests that the degree program is producing graduates that are in high demand. According to an investigation by e-skills UK in 2011, 85% of ITMB graduates found employment within six months of leaving university, with the remainder continuing with more higher education. Since it was developed, the number of applications to the programme has risen on average by 24% every year. Awareness of the ITMB degree is rising with nearly 50% of current ITMB students stating that they applied to ITMB at more than one university. 33% of the current students are female – more than double the amount of females across all computing degree courses. Student satisfaction amongst ITMB was found to be significantly higher than the national average. In 2012, the number of active ITMB students was 1,029.

The bottom line

The ITMB degree is a tailored education programme that meets the very core of e-leadership. It does not leave this special mix of competences to masters or PhD training. ICT and management skills are taught in a demanding bachelor's degree that forms the basis for future e-leaders. This is an example for a successful co-operation between the industry and the academic world. By putting employers in the driving seat, the design process applied for the ITMB fully reflects the ICT practitioner related requirements of major private sectors employers in the U.K., and has helped fill a gap for graduates who combine ICT practitioner with business and leadership skills.

Level 8 Conversion Programme

Level 8 Conversion Programme is a one year scheme that leads honours bachelor graduates from non ICT areas to a higher diploma in ICT. It was initiated by the Higher Education Authority in cooperation with 14 Irish universities and different companies

Ireland made it a priority to remain a favourite destination for foreign ICT investments. Yet, during the last years the country has been facing a situation with a job mismatch in the ICT branch. On one side, there is a gap of high-skilled ICT practitioners. On the other, a lot of talented university graduates from areas other than ICT find difficulties in getting employed due to the economic recession.

Recognizing this potential, the Higher Education Authority encouraged higher education providers to develop programmes addressing skills conversion needs. The objective was to launch a short-term response to convert engineering or other graduates to e-skills careers as the country waits for mainstream provision of higher education in ICT to catch up with growing demand. The Industry was intensely involved in elaborating the scheme. Courses started in March 2012.

The courses qualify graduates with numerical skills to be an ICT professional for a certain area. This certainly does not substitute a full computing degree, but qualifies skilled ICT practitioners for special topics, such as Cloud Computing and Multimedia Programming. Tuition fees are paid for by the Higher Education Authority, with a total budget of €5 million. Partner companies offer internships as part of the course. Candidates are required to work hard to complete the scheme, but can be sure to have much better career perspectives once they graduated.

On the demand side, the scheme supplied around 800 graduates with relevant skills to the labour market in 2013. The scheme can supply a relatively large number of ICT practitioners in only one year. This is possible because of the participants' previous knowledge and cognitive skills. Furthermore the participating companies already get to know the students during internships that are part of the programme. It is therefore not only an education- but potentially also a recruitment programme.

Overall, this approach is innovative because it specially targets individuals with a high learning curve, but with an education that is not valued by the market. The fast-track and high quality upskilling relates both to participants' and companies' needs.

Level 8 Conversion Programme is rooted in the educational sector and managed by the official policy development body in this field. Industry participates in the elaboration and implementation. It is impressive how the curricula have been created in a short time in way that is suitable for the economy as well for participants. Also, participants can choose from a variety of courses all over the country.

One of the main lessons learned from the programme is the need for addressing the risk of non-completion by participants: When encouraging a participant to undertake a reskilling journey it is important to have a realistic employment opportunity at the end of it. To do this well the reskilling has to be intensive so that the skills levels are appropriate to employers' needs. While the prospect of excellent employment opportunities on completion is usually motivating enough to keep participants from dropping out, candidates need to be made fully aware during the application process of the effort expected from them.

The bottom line

Ireland's Level 8 Conversion Programme is an outstanding example of how to boost numbers of ICT professionals in the short term via close collaboration between government, employers and education providers. It makes best use of the untapped potential of unemployed academics from non ICT areas without compromising the quality of the education. The programme has been very successful in swiftly addressing shortages in the ICT practitioner area. This is of particular

importance for Ireland's economy with its high share of employers from the ICT sector, including many multinationals which have chosen this location partly because of a good supply of ICT practitioners.

NOKIA Bridge, Finland & worldwide

Bridge is a programme for supporting employees dismissed by Nokia following a major wave of restructuring since the start of this decade. Nokia downsized its workforce in Finland by 5,000 employees in 2011–2013. The company expressed a strong feeling of responsibility for its employees and thus chose to set up a scheme assisting those who had been laid off. Launched in April 2011, Bridge has been applied at 20 different R&D and manufacturing locations in 13 different countries, but most intensively in Finland. The programme offers outplacement services such as career coaching and CV clinics as well as skill specific training and university collaboration for learning opportunities for increasing chances for re-employment. Bridge also offers start-up funding, exposure to angel investors and venture capitalists, and entrepreneurship training to those with a new business idea in need of backing.

The programme has resulted in over 1,000 business start-ups worldwide, over 400 of which in Finland alone. This is of special relevance given the country's traditional lack of enthusiasm for entrepreneurship, particularly when compared to the United States but also many European countries. National experts report that it is increasingly becoming 'cool' in Finland to set up a business; a lot of excitement has been generated around the topic.

The entrepreneurship programme comprised grants normally in the range of € 10,000 – 25,000 (subject to income tax) being awarded to former employees who were found to have a strong potential for successful starting a business. Of an overall budget of several tens of millions Euros, between one third and one half has been spent on entrepreneurship grants. Extensive education packages have been designed in cooperation with different educational institutions, and offered to laid-off employees free of charge (e.g. in Finland co-funded with the state). For example, a training programme (LIKE) at Tampere University of Technology and the University of Tampere has been offered to help former Nokia employees develop their leadership and business skills as they pursue other career options or entrepreneurship.

While the circumstances of the Nokia Bridge programme are bound to remain unique, many of the lessons learned have broad applicability to European Member States that seek to boost digital entrepreneurship. The programme was designed to offer easy-to-understand decision support to anybody with an interest in starting a business. Close collaboration was sought with local stakeholders such as start-up incubators, city authorities, public employment services and providers of business education to supply every candidate with a support package tailored to her or his needs and the local context. One practical finding was that most education offers available from Finnish universities and public sector business schools were found to be too comprehensive to be of direct applicability for the purpose of supplying prospective entrepreneurs with the skills required.

In 2012 the Bridge program won a European Excellence Award in the Change Communication category. The programme's impact in Finland and elsewhere is currently evaluated by external researchers, with results becoming available in late 2013.

The bottom line

Nokia Bridge is a major programme for enabling former Nokia employees to find re-employment or to succeed as entrepreneurs. In close collaboration with local stakeholders including public employment services, business incubators and providers of business education, persons with the potential and interest to set up a business are supplied with e-leadership skills and tailored support,

including start-up funding. This has resulted in more than 400 digital start-up in Finland within a short period of time, giving a significant boost to entrepreneurial culture in the country. While the circumstances of the programme are unique – the need for a major restructuring of Nokia, the by far largest employer of ICT practitioners in the country – many of the lessons learned have broad applicability to European Member States that seek to boost digital entrepreneurship.

Pasc@line Association, France

Pasc@line is a co-operation of over 1,200 companies, two ICT trade unions and over 75 higher education institutions. Its main aim is to boost the attractiveness of ICT professions and develop a method for assessing e-skills.

The main motivation to establish Pasc@line was the future members' wish to have an evaluation method for e-skills. Each engineer school could then develop this method according to its courses' special focus, such as industrial ICT, robotics, information systems etc. The approach does not merely aim at creating a catalogue of skills. It rather wants to establish a methodology to adapt the competences required by the industry to higher education. This is considered to be a necessary evolution, due to the need for certification on a national and European scale.

Pasc@line targets ICT practitioners as well as (future) ICT students and the respective education institutions. Its aim is to have a good connection to all individuals and entities that focus on e-skills and reach an overall consensus in measuring the competences.

The recent guidelines for this method have been produced in 2011 and 2012 by Pasc@line's commission. In adapting the scheme, Pasc@line's principal drawback was the unwillingness of academic professors to pass on the new competences to their students.

In addition to this framework initiative, the MSP has been promoting ICT careers for high school students. One of the measures is a series of videos presenting different professions. Another important step was the introduction of ICT as an A-levels school subject in 2012 in high schools, with Pasc@line's support. This combination of awareness raising and framework activities characterized Pasc@line and insures that ICT education and job matching are always close to the industry's needs.

This focus has been maintained since the initiative's creation. Yet, there are new focuses in the future. One of them is e-leadership, with a focus on engineers in ICT. Furthermore, Pasc@line is participating in the CEN workshop for ICT skills.

The principal initiators for Pasc@line's methodology were the universities and companies who are members of its pedagogic commission. Around ten representatives participated in monthly meetings to establish the concept. Decisions are made by the commission's co-presidents. Thus, the roles are not institutionalised. The initiative works with a few full-time employees, supported by volunteers from its member organisations.

Since Pasc@line is funded by its members' contributions only, it is independent from government finances. Thus, the companies are free to shape their activities according to the employers' priorities.

The bottom line

Pasc@line is a platform for effective cooperation between industry and higher education to match the profile of ICT graduates with employer needs. Pasc@line runs a range of programmes at different levels, from programmes targeting high school students to initiatives for development of e-leadership skills of managers. Pasc@line has taken a long-term approach to improving supply of suitably qualified ICT practioners and e-leaders in France, made possible by strong commitment of

the large number of participating stakeholders from industry, the education sector, and trade unions. Coordination with government policies, however, has been limited so far.

RETE Competenze per l'EconomiaDigitale - Italian Competence Network for the Digital Economy, Italy

The e-CF is still in an early stage of dissemination in Italy. The Fondazione Politicnico de Milano has been working with the framework since 2004. Recently, it became clearer that disseminating e-CF further would facilitate ICT culture and job matching in Italy. The starting point was the CEN project "e-CF into SMEs" (2011), carried out by some of the future founders of Rete. After that, FPM started to recruit partners for setting up a national MSP in this field.

The initiative's aim is to introduce the e-CF to Italy and assist especially SMEs in being internationally competitive in ICT. RETE was set up in July 2012. The stakeholders, who are otherwise competitors, agreed to engage in a joint approach to disseminate the framework and further objectives of the Grand Coalition for Digital Jobs. It targets ICT and end user companies as well as public administration.

In Italy an overall ICT culture has not emerged yet. Especially SMEs are little embedded in a context based on e-leadership competences. Also, the ICT labour market is influenced by skills mismatches, further complicating the employment situation. Rete considers the e-CF to be a good lever to disseminate ICT culture and job matching.

The network promotes the e-CF in workshops and presentations, but also created a job matching tool for ICT practitioners. Thus, it addresses entrepreneurs and employees likewise. This approach contributes to further networking between the different players on the ICT labour market, including supply and demand side as well as companies of different scale.

A precompetitive framework is regarded to be the most productive approach to the challenges. The stakeholders work together to apply initiatives and activities in favour of the e-CF and be part of the European Dialogue. The initiative is facing difficulties in securing funding due to Italy's budgetary crisis. However, RETE's member companies continue to contribute in the form of man hours.

The main decision-makers are the five industry representatives, Assintel, Assinter Italia, CAN Comunicazione, Confindustria and Unimatica-Confabi. FPM advices the members and provides consultancy.

The bottom line

RETE is a collaboration between a group of major Italian companies for the support of the European e-Competence Framework (e-CF) and e-skills across Italy. The initiative is based on the understanding that Italy's economic difficulties demand rather than impede implementation of an effective e-skills framework. Strong personal engagement by members companies has ensured that Italy is now well placed to become one of the first EU Member States to widely implement the e-CF, thus benefitting from significant increases in efficiency on the market for ICT qualification, certification and the related labour markets.

Software Campus, Germany

Software Campus is a unique cooperation between government, education and industry that supports young researchers in ICT. Each participant works on an academic project, which is funded by Software Campus. Apart from that, the candidates receive high quality leadership training. Therefore, they collaborate with a partner company, where they are mentored by an experienced manager and contribute with their research. In addition, training for leadership and social competences is an important part of the scheme.

Software Campus was originated from the idea to create a new generation of managers with an advanced ICT background. These competences are of great importance since all classical industrial domains are influenced by the evolution of ICT nowadays. New players enter the scene, new rules apply and disruptive scenarios might occur. Classical business economists might not anymore have the relevant knowledge to assess these new developments and decide what is appropriate for their company. In this way, the new leaders have to have both economic competences and excellent ICT skills.

A total of 18 stakeholders, consisting of universities, companies and research institutions, contribute to the MSP. Industry partners include major names such as DHL, Siemens, SAP and Robert Bosch GmbH. It was a major priority to include companies from different economic sectors and foster a platform for precompetitive work.

The first steps for Software Campus were taken at the German National IT Summit in 2010. The working group for Education and Research, together with SAP CEO Jim Hagemann Snabe, developed the idea of a scheme that brings ICT researchers closer to industry. In a next step, academic and industrial partners were recruited. One important aspect was to include companies from different branches. In 2011 the project entered into a pilot phase that was launched at that year's IT Summit. An evaluation is planned for 2014/2015 and should be conducted by one of the partner universities.

Software Campus's approach is unique in the European ICT landscape. It addresses the very core of e-leadership, providing participants with an academic and an industrial partner. Also the financial support is exceptional, totalling up to 100,000€ per candidate and project.

EIT Lab Berlin coordinates the initiative. During the application process, the universities and companies both assess the candidates' qualifications. After the participants are selected, the grants are required with the Ministry of Education and Research. Software Campus' daily business is managed by EIT Lab working groups, who receive contributions from the industrial and academic partners.

The bottom line

Software Campus is an innovative scholarship programme for excellent PhD and Master students in ICT, focusing on outstanding individuals who show promise to address a shortage in suitably qualified e-leaders, as it is widely perceived in Germany. Apart from the scholarship grants, which are generous (up to 100,000€ per candidate and project), the initiative is providing the infrastructure for systematically supporting acquisition of e-leadership skills. Software Campus also offers career support via measures for networking and mentoring. Participants are to develop skills as researchers and managers at the same time, acquiring high quality working experience at several of the participating employers.

Research Programme Sparkling Science, Austria

With Sparkling Science, Austria's Federal Ministry for Science and Research has established an unconventional way of promoting young talent. Since 2008, € 3.5 million have been invested in the programme in the form of subsidies to individual projects which have successfully applied for funding. The result is a highly innovative and unique approach to raising young people's interest in research & technical development, mostly with a strong ICT component. The initiative also sees teenagers as excellent promoters for science.

The long term objective of the scheme is to build a lasting institutional partnership between, on the one hand, primary, secondary and vocational schools and, on the other hand the country's universities and research institutions. All projects funded should bring school children in close contact with the world of universities, thereby triggering increased interest in tertiary education in general, and in choosing a STEM study programme (including computer sciences and other ICT-related courses) in particular. Moreover, the projects should help identify talent among school children and enable them to participate in real-world research efforts while still at school.

Examples of successful endeavours include the two-year AAS Endurance project, which built a robotic sailing boat for research on marine mammals. In another project, a Vienna school, an Austrian institute and a US university developed a multi-sensor platform that completed a several-day-mission in the Baltic Sea. The projects resulted in a number of scientific publications as well as pupils' term papers.

By 2013, scientists have been working side by side with youngsters in a total of 211 projects, 156 of which have already been completed, involving 60,000 children and adolescents. In addition, 102 partners from industry and society have been involved already. The scheme will run until 2017, with an annual budget of € 3 million.

Projects are selected carefully in order to ensure not only an excellent scientific quality of the research output but also a productive participation of the pupils. The initiative is supervised by a scientific board assembling highly experienced university professors. Universities or research institutions apply with their projects; the administration selects the initiatives and assists institutes in finding partner schools and companies. The projects selected afford children experiences that go far beyond what is offered in schools. Grants of up to 187,000€ are given to each project.

A total of 211 projects have been conducted up to May 2013. 157 of these were research projects, 54 were school projects. 55 are currently running now. Altogether, 763 scientists cooperated with 60,000 pupils – either directly by engaging them in the research process or indirectly by letting them contribute and participate through interviews, project presentations and exhibitions as well as discussions of research results. ICT in the narrow sense of the term accounted for 13% of all projects, including many highly relevant topics. Those range from robotics over geoinformation software to audio study materials for blind school children. Furthermore, many of the engineering projects also rely heavily on ICT skills.

The bottom line

Sparkling Science is a funding programme for collaborative projects between research institutions, universities and schools (primary, secondary, vocational). In these projects, children make contact with the world of science in real-world settings. The initiative has been outstandingly successful in lowering thresholds between science, school and industry in Austria, and in making research – much of it directly or indirectly relying on ICT – appealing to youngsters of all ages. It has included the launch of "Children Universities" at a number of high-profile Austrian high education institutes.

Womentor, Sweden

Probably more than in other parts of Europe, the EU's Nordic Member States demonstrate a strong conviction that the ICT labour market needs a higher share of women – across all levels of hierarchy and in all parts of the sector. Already in 2006, a small but highly focused project was implemented in Sweden to address the top end of the labour spectrum, i.e. to help get more women into upper management positions within the ICT sector and media sector.

For this purpose, the then Minster of Industry Ulrica Messing commissioned a pilot project which was orchestrated by the National Post and Telecom Agency (PTS), involved 30 companies and supported by a steering committee composed of high level representatives (mostly CEOs) from the ICT industry, the trade association and government institutions in Sweden. Mentoring expertise was provided by a subcontractor, Ardida. The target audience is composed of companies seeking to develop and utilise women's skills in order to secure their future supply of managers and their future competitiveness in a world market increasingly characterised by diversity.

After the success of the pilot project, the Trade Association for the Swedish ICT sector, IT&Telekomföretagen, decided that the sector should take over ownership of the programme and thereby ensure its continuation. This has turned out to be a great success. Womentor has an annual lifecycle – at the time of writing, the 8th programme is underway.

Womentor is for women leaders in companies who have taken their first steps as managers and want to move on. Apart from training in leadership and learning from the personal mentor, the programme is strongly focussed on networking by offering possibilities for the female managers involved to broaden and develop their professional networks.

Mentors are selected from those having at least ten years experience as managers and are willing to share their experiences. The availability of bigger share of mentors than mentees ensures that mentees match up with a suitable mentor from other companies. Each participating company has to contribute at least one mentor. The programme is funded mainly from cost-based fees paid by the participating companies.

The programme includes a total of six full days and ongoing mentor calls each month. The mentees should have or have had at least one post as first line manager. Furthermore, they should wish to continue the managerial career and have a potential to achieve a higher management position.

Since 2007, over 50 companies and more than 400 women have participated in consecutive rounds of the programme. The fact that the programme has run successfully since then – without significant funding apart from the participating companies' fees – demonstrates that is has reached long-term sustainability. Key success factors have been (a) the ownership of the programme by companies rather than individual female managers who seek to get ahead in their career; and (b) companies' engagements through their own overall goal setting for increasing the share of female leaders within their organization – according to their own potential and ambition.

The bottom line

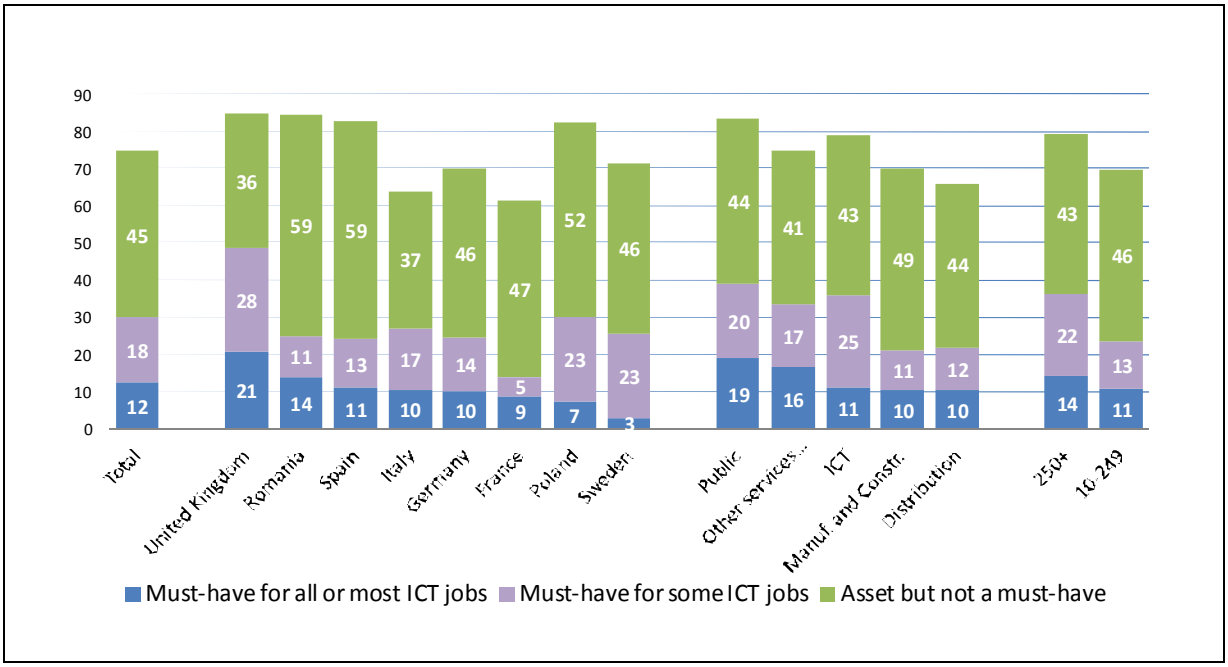
Most if not all Member States are running programmes that aim to increase the share of women among ICT students and the ICT workforce. Sweden, however, goes one step further: Womentor uses a one-year mentoring programme for helping women in first-level management positions to develop their leadership skills and to build up their professional networks. The programme has met with a very positive response from the participating ICT companies as it helps fill an important gap in efforts to promote women's position within the sector's organisations.

2.3 Cross-national initiatives by industry

ICT vendor-based initiatives and programmes aiming at closing the e-skills gap already exist for a longer period of time. These need to be mentioned since they can make a significant contribution to help closing the e-skills gap and shortages in Europe.

Certificates based on IBTC (Industry based training and certification) are a must-have selection criterion for 30% of HR/CIO respondents (weighted by employment) for at least some of their ICT vacancies or promotions. Another 45% see certification as asset for the applicant. Industry based certification is especially important in the UK, while it seems to be least important in France.

Exhibit 11: Relevance of certifications for recruitment or promotion of ICT professionals



Source: Empirica, HR/CIO survey Apr-Jun 2012. Note that figures are weighted by ICT employment, meaning percentages should be read as respondents representing x% of ICT employment.

In essence, this means 75% of CIOs see IBTC as very relevant or relevant and 25% do not see it as useful. There are also some country differences, with CIO's from the UK seeing certification most important and CIO's from Sweden or France least.

Nevertheless, despite some variance across countries there is huge recognition of IBTC across the board. The same applies for sectors where requirements are highest in the public sector, probably because personnel decisions have to be justified on easily recognisable objective proofs, but nevertheless importance is recognised across all sectors.

Some of the best known vendor programmes are presented in the present chapter. Please note that this is only a selection of ICT-vendor based training and certification programmes. At present several thousand of such programmes exist in Europe and the world making it next to impossible for stakeholders to get an overview and orientation of what could be the most suitable to follow in order to upgrade ones skills or advance the career.

Online software tools like the www.eskillslandscape.eu which has been developed as a prototype as part of a European Commission DG ENTR service contract in 2012-2013 (www.eskills-quality.eu) can be seen as a first steps towards providing the urgently needed orientation and guidance in this area.

Cisco Network Academy Program

The objective of the Cisco Networking Academy is to improve career prospects around the world, therefore addressing the growing demand for ICT professionals. With 10,000 academies in 165 countries, the Cisco Networking Academy Program helps individuals prepare for industry-recognized certifications and communication technology (ICT) careers. Students develop fundamental skills in ICT simultaneously obtaining essential up-to-date career skills in problem solving, collaboration, and critical thinking. The Academy's students gain skills needed to build, design, and maintain computer networks, therefore filling the gap of networking professionals. In order to get practical skills, students complete hands-on learning activities and network simulations.

The Networking Academy uses a public-private partnership model. Cisco partners are educational institutions, nonprofits, nongovernmental organizations, and community centres that provide classroom space, computer lab equipment, and qualified instructors. Cisco provides in its turn online curricula, instructional support, teacher training, and professional development opportunities for instructors.

Networking Academy assists students to prepare for entry-level ICT jobs, additional education or worldwide recognized certifications by giving them knowledge on maintaining networks which became basis of global economy.

The learning model combines classroom instruction with online curricula, interactive tools, hands-on activities, and online assessments that provide prompt feedback. What is more, the courses are offered in multiple languages.

CISCO's learning model includes several innovative technologies:

- Cisco Packet Tracer: a visualization and simulation tool enables users to design, build, experiment with virtual networks and to explore complex technical concepts in a safe, virtual environment.
- Cisco Passport21 to Entrepreneurship: case studies, simulations, and interactive tools to develop critical business and financial skills.
- Cisco Aspire: an educational game designed to solve business and technical challenges for projects.
- Online Assessments: provide prompt, interactive, personal feedback to students.
- Social Media Tools: resources like Facebook, Twitter, LinkedIn, and the NetAcad Instructor Community site connect students and instructors worldwide to stimulate collaboration and learning outside the classroom.

Cisco Meets APO is a cooperation initiative between the German state backed (APO IT) and the vendor backed (Cisco Networking Academy Programme, CNAP) qualification system for lifelong learning addressed to IT practitioners. It is run by the German trade union IG Metall together with the Cisco Networking Academy. It aims at skills improvement of employees in the IT industry and the achievement of both e-skills qualifications and certificates in one. In recent years, however, the initiative has ceased to be active with the exception of a smaller programme in the Saarland region.

Microsoft IT Academy

The Microsoft IT Academy (ITA) program provides leading-edge technology skills to reduce the skills gap and involves globally over 7.5 million students. ITA delivers to institutions a digital curriculum and industry-recognized certifications on crucial technology skills as well as courses essential for students to become successful in the world of technology. Educators and staff acquire professional development and a full curriculum for teaching technology courses and learning tools. Students

gain technology skills and certifications and therefore get qualified for the job market. ITA offers training not only on fundamental technology skills but also technical courses for those who are interested in pursuing a career in IT after graduation. Altogether 4.500 Academies are active in Europe, addressing a complete IT education solution that is relevant for the market demand.

Microsoft Certifications aims to broaden students' employment opportunities:

- Microsoft Office Specialist (MOS) exams enable students' productivity in school and business careers. It is the recognized standard for Microsoft Office proficiency.
- Microsoft Technology Associate (MTA) exams enable to explore diverse technical careers on entry-level.
- Microsoft Certifications Solutions Associate/Expert (MCSA/MCSE) exams validate student's competence in respect to innovative solutions across multiple technologies.

Micosoft has also started several additional programmes in the e-skills and related start-up domains described below.

Microsoft BizSpark

Microsoft established a BizSpark which is a free programme dedicated to support smaller companies and entrepreneurial start-ups. BizSpark is an international network of entrepreneurial startups and partners. Startups get an access to 900+ present, full-featured software development tools, platform technologies and server products to build software applications.

Furthermore, they also get free monthly Windows Azure benefits enabling them to quickly build, deploy, and manage Web applications. Additionally, startups become part of the BizSpark ecosystem and get access to investors, advisors, and valuable offers to help run their businesses, find expertise, and obtain financing. Startups also get access to technical, product and business training and support.

To conclude, BizSpark members receive free one-year Windows Store and Windows Phone developer accounts where they can promote and distribute their apps around the world, offer trial versions to create an interest, track sales and customer feedback in the dashboard and more.

BizSpark also helps startups gain market interest by giving a chance to promote their apps on the BizSpark website and gain further visibility through the Featured BizSpark Startup series.

All in all, BizSpark provides free software, support and visibility to help startups succeed.

Microsoft YouthSpark Hub

YouthSpark Hub is a company-wide, global initiative designed to empower 300 million young people in more than 100 countries with opportunities for education, employment and entrepreneurship by 2015.

YouthSpark Hub is an online space where young people can examine all the services, programs and resources offered by Microsoft and choose non-profit partners for education, employment and entrepreneurship. This initiative is meant to help youth gain better opportunities in education and entrepreneurship through partnerships with governments, non-profit organizations and businesses. The program intends to encourage youth by means of latest technologies as well as to give them understanding of its full potential by providing them with the access to various tools and resources.

It should be pointed out that the initiative was designed to close the "opportunity divide" between countries with the lack of resources, jobs and training to find an employment after school.

Oracle

The Oracle Certification Program (OCP) has been designed for hiring managers who want to distinguish among candidates for critical IT positions. Most certified OCPs have found that their

financial investment in training and certification is paid off over a short nine month period by gains in salary, job opportunities, or expanded roles.

Oracle Certification has become integrated into colleges and universities worldwide through the Oracle Academy and Workforce Development programs. Oracle Academy students gain entry-level skills and obtain the knowledge to go on and pursue certification on the Associate level. This is a jumping off point for higher skilled certifications.

With the Workforce Development Program, Oracle University provides education and certification programs that give students relevant job skills in an increasingly competitive work environment. In general, Oracle programs address the growing shortage of skilled employees in global technological industry. There are over 200 Oracle certifications available: **database certifications** such as database administration, security management and application development; **application certifications** in functional areas such as HR, Finance, and customer relationship management; **industry-specific certifications** in areas such as transportation, retail and utilities; java programming, operating systems, and hardware certification tracks are also available. Whatever certification path a student or professor chooses, knowledge and hands on skills with the Oracle products and technology for the path that they are pursuing is requisite. This is usually achieved through a combination of formal training and exposure to project work and/or job experience.

Certification is being offered globally, predominantly available in English. Other supported languages are Japanese, Korean and Chinese. All certifications require passing a proctored exam. Some entry-level exams are available as non-proctored/online. Testing centres are globally available to schedule and take certification exams.

SAP

SAP is an independent software manufacturer with focus on enterprise applications. It provides multi level certifications: **associate certification** which covers a fundamental knowledge for a SAP consultant and **professional certification** which implies proven project experience, business process knowledge and the more detailed understanding of SAP solutions.

SAP E-Academies represent a flexible learning program, offering comprehensive training in a user-friendly and cost effective manner. Students are provided between one (1) and five (5) months of virtual self-training which enables them to attain expertise in different SAP areas and to get ready for a certification exam. All courses are adapted to various subject-matter requirements and professional needs (e.g. needs of end users, experienced consultants, project team members, support professionals and executives).

The SAP University Initiative, which in cooperation with the Steinbeis Center of Management and Technology (SCMT), the SRH Heidelberg and the Technical University of Munich (TUM), offers training for young managers and professionals. The SAP Corporate Master Programme trains and promotes outstanding young firms and consulting companies from various business fields.

SAP also has as Bildungspartner (Training partner) programme in cooperation with Germany's Public Employment Service (BfA). This works as follows: The unemployed are eligible for receiving a voucher from the BfA which they can redeem for a training measure.

Moreover, ICT training courses are provided by SAP-certified partners, to which SAP provides training systems and materials. In 2011, almost 900 people attended SAP consultant training and 14,000 attended end user training courses. There was ~70% placement rate into jobs after completion of SAP training.

SAP launched the SAP Global Certification Program in the mid-nineties and the program has been continually enhanced to address customer needs. The SAP Global Certification Program is based on the solid foundation of a state-of-the-art certification exam development process and comprises 160 certification exams in 16 SAP Solution areas and in up to 20 languages. The program certifies

the skills of individuals (whether customer or partner employees or freelancers) involved with implementing, enhancing or running SAP solutions and is based on two levels. The primary Associate level validates the knowledge and skills of individuals gaining their first experience in a new solution. For the secondary or Professional level, exams are written by leading SAP professionals in their field and validate extensive and broad project experience, addressing integration topics.

Exams are offered at more than 4,000 locations around the world in a proctored environment. To prepare for certification, there are classroom trainings available in 40 countries at SAP Education Centers. In addition there are numerous training partners delivering SAP training. With Virtual Academies and eLearning options 300,000 individuals are trained each year. In addition to the training partners, SAP also works together with more than 1,300 universities around the world within the framework of the University Alliance program, which supports universities in getting graduates and undergraduates certified in SAP knowledge and skills.

SAP considers it a key to build up the IT-skilled workforce to support customers and partners around the world and has initiated many programs, working together with local authorities to help enable the unemployed or students. One such European initiative is the Academy Cube, which is a Job and Advanced Training Platform in collaboration with such partners as Robert Bosch, Microsoft and the German Federal Employment Agency, to help job seekers to prepare for "Industry 4.0", which is merging production, mechanical engineering and IT. The platform provides training and links them to important job opportunities in leading European companies.

HP Accredited Technical Associate (ATA) certifications

The HP Institute program was created to address the IT skills gap and lacking expertise in trending technologies, such as cloud computing as well as know-how on how to align IT with business objectives.

HP Institute, partnered with Certiport—a leader in performance-based certification program management—to help co-develop and distribute a full learning solution that includes course material, practical hands-on lab experience, practice exams, and certifications mapped to the e-Competence Framework.

To that end, the HP Accredited Technical Associate (ATA) certifications were developed specifically for academia (secondary and tertiary) to better prepare students with business acumen and architect-level skills for modern data centres, based on open standards that spans across the enterprise.

ATA validate the knowledge of HP, industry technologies and business expertise and provide with practical business and IT skills by means of learning solution composed of courseware, hands-on labs, practice tests, and certification exams. Students are being prepared for key IT job roles such as network administrator, support technician, systems engineer, solution architect, and information architect. To prepare students for employment in small and medium business environments, HP Institute delivers the industry's first architect-level certification, which insures the job-ready IT skills. This certification signifies to employers a knowledge excellence and demonstrated skills to adapt business and IT objectives. Students of this course study to use key IT solution elements in order to solve business challenges. They acquire information on how to identify business problems, opportunities and specific technologies that support those business objectives, as well as how to evaluate various solutions from a business perspective. By means of business scenarios students gain practical experience in defining business-side responsibilities in a technology project, learning where technology can go off track.

Moreover, HP offers the comprehensive HP Institute learning suite for adoption to academic, vocational and government training programs. For teachers HP Institute offers free HP Certified Educator certification, Train-the-trainer experiences, and global subject matter expert forums.

Certification Paths are made up of Technical Certification (IT Architect, Cloud, Connected Devices, Networks, Servers and Storage) and Business Certification (IT Architect, IT Business).

The IT Architect is expected to be able to successfully identify, recommend, plan, implement, and manage IT technology solutions based on proper business principles. In order to get certified as an IT Architect one should achieve the HP ATA - Cloud and the HP ATA - IT for Business certifications.

HP ATA – Cloud certifies the understanding of a customer's business objectives and of how to optimize, adjust and support a complete IT cloud deployment for small to medium size businesses.

HP ATA – IT for Business certifies the ability to identify key IT solutions and how they are used to solve business challenges.

HP ATA - Connected Devices certifies the ability of installation, replacement procedures, configuration and upgrading of client solutions. Furthermore, one should be able to perform a version control, maintenance tasks and backups.

HP ATA – Networks certifies the capability to manage, administer and optimize a network for small and medium size businesses as well as adapt these technologies to customer needs. The associated training give instructions on how to install, configure, upgrade, and troubleshoot wired and wireless networks.

HP ATA - Servers and Storage certifies the capability to administer, manage, and operate server and storage solutions. Additionally, it verifies that one is able to create appropriate server, data storage, and application hosting solution that meets small to medium size business requirements.

HP Institute is available globally and in Europe. Early academic adopters of the program consist of University Politehnica of Bucharest, De Montfort University, Universidad Politécnica de Valencia, IUT France, University of Maribor, Belfast MET, just to name a few.

Specifically in the UK, the program is also embedded in apprenticeships that combine work and training. Young people gain on-the-job technical skills and expertise to start successful ICT careers. For business, utilizing apprentices is a cost-effective way to bring on high-calibre staff. HP Institute partners with:

- Firebrand Training: IT apprentices spend 46 full weeks per year with an employer gaining the proper work experience and training spread throughout the year and ultimately achieving HP ATA certification. Firebrand has training centres in the UK; DACH (Germany, Switzerland, Austria); Nordics (Denmark, Sweden, Norway, Finland); and Benelux (Netherlands, Belgium, Luxembourg).
- QA Apprenticeships: two HP apprenticeship programs are available through QA—one for technical and the other for technical sales to build on young people who have passion for technology. The 12-month apprenticeship with training has been offered in London, the Thames and Leeds, and eventually will be offered across the UK.

In addition, the HP LIFE learning initiative for entrepreneurs helps unemployed youth gain business and IT skills through an open, cloud-enabled learning platform. Students 15 – 25 years of age can learn online at their own pace with e-Mentorship from HP employees. In 49 countries around the globe, HP LIFE works with more than 340 partner organizations. HP LIFE has reached more than 1.2 million people with online and face-to-face training and has helped create or retain almost 57,000 jobs and 25,000 businesses worldwide.

HP Institute and HP LIFE represent HP's commitment to developing the job-ready skills in demand, while also fostering the spirit of entrepreneurship. Further, HP Institute is the academic arm of HP ExpertOne, provider of a broad range of skills-based IT training, certification training and training services with over 600 courses, more than 60 certifications, and a network of 800 instructors in 90 countries with 45 languages. Students become part of the HP ExpertOne community of more than

650,000 technology experts to continued development of expertise and are encouraged to join the HP ExpertOne LinkedIn community of over 1 million members for networking opportunities.

LPI Linux Professional Institute/The LPIC Program

The LPI program in Linux and Open Source certification in Central Europe certifies the competency of IT professionals to use the Linux operating system and its associated tools. LPI's mission is to provide a global scheme, industry leadership and services to enhance and develop professional careers in Linux and Open Source technologies. Furthermore, it should meet the requirements of both, IT professionals and organizations that would employ them.

The LPI Certification Program is created by the community of Linux professionals, volunteers and vendors. It is available at thousands of test centres around the world or at special events and consists of multiple levels. Each level is designed according to the "Job Task Analysis" (JTA) survey to ensure its relevance.

LPIC-1 Junior Level Linux Certification implies the ability of working at the Linux command line, performing easy maintenance tasks, install and configure a workstation.

LPIC-2 Advanced Level Linux Certification requires the ability to administer a small to medium-sized site, plan, implement and maintain a small-scale network. Additionally, one should be able to supervise assistants and to advise management on automation and purchases.

LPIC-3 Senior Level Linux Certification represents the highest level of professional, distribution-neutral Linux certification within the industry.

LPI Approved Academic Program (LPI AAP)

Schools and Universities can profit from various noticeable advantages of the academic partner program LPI AAP. High quality training materials are made available to the partner without a special limit inside the institution. Exam prices of the LPI AAP program is considerably lower than the standard price of the LPI exam. LPI started this program in 2006 in Central Europe and it was adopted in 2008 worldwide.

Typical cooperation partners are vocational schools and universities. Cooperation partners hold a partner contract with the responsible LPI Master Affiliate institution in the region. LPI Master Affiliate institution in the region is responsible for program implementation. In some countries there exist cooperation on a national basis between national ministries or appropriate agencies and the responsible LPI Master Affiliate.

The main objective of the program was to give a better support to the appropriate courses in schools and universities as they could better combine their Linux and Open Source trainings with the globally recognized Certificate LPIC-1 from LPI's Professional Certification Track. Since LPI started the LPI Linux Essentials programme in 2012, schools can prepare classes for this globally recognized Certificate of Achievement. Currently, there are about 250 LPI Approved Academic Partners worldwide.

LPI Academy program

LPI Academy is a program for accredited degree / diploma-granting academic institutions, high schools, middle schools, as well as internal government and military training programs. The LPI Academy helps to prepare students and employees for lucrative and productive careers in Linux and Open Source. LPI started this program in North America in 2013.

The LPI Academy program allows teachers and trainers to offer their students an entry level LPI Linux Essentials course, a globally recognized Certificate of Achievement, and the opportunity to continue on a career path as a Systems Administrator via LPI's Professional Certification Track. Up to date there are about 50 LPI Academy partners in North America.

The LPI Approved Academic Program (LPI AAP) is often integrated into current and already established standard schools and university courses. These courses provide the appropriate knowledge in Linux and Open Source technologies. In addition to the established courses, LPI Approved Academic Partners extend the curricula of their courses to the objectives of the LPI Linux Essentials and the LPIC-1 certifications. In this way the LPI Approved Academic Partners prepare students for passing LPI exams and getting LPI certification.

Further LPI initiatives with the relationship to e-skills include:

- Apprenticeship programs in a number of countries.
- Participants support at the contests Skills Germany/Skills Austria in 2012; preparation for the WorldSkills 2013 and EuroSkills 2014 contests.

2.3.1 Other ICT skills certification programmes

EXIN Academic Programs

EXIN is an independent international exam institute offering ICT-related certificates and associated services (including accreditation of training providers and competency assessment of professionals) offering both examinations of third parties (e.g. ITIL®) and certification programs developed by EXIN in cooperation with partners and experts in the field.

The Foundation programme has developed out of the introductory part of the AMBI programme which was very successful in the Netherlands in the second half of the 20th century, at the time the higher education institutes hardly had their own ICT curricula.

EXIN offers two types of certification programs used in higher education institutions:

- Foundation programme
- Expert programme

The Foundation programme consists of introductions to ICT related subjects like IT Service Management, Information Security, Application Management and Business Information Management. The programme covers the subject overview, core concepts and main connections to other subjects. Some examples of EXIN Foundation certificates are: Cloud, Agile Scrum, IT Service Management, Green IT, Information Security and Learn IT, Business Information Management, Application Management, Testing (TMap Next) and IT Project Management.

The target group for the Expert programmes are professionals aiming to develop and prove their competencies in ICT-related domains. These programs use one or more Foundation modules as a starting point and add two or three levels: Practitioner, Expert/Manager and Executive. The Practitioner level certificates prove the ability to apply knowledge. The Expert level aims at the ability to create new solutions, define processes and manage them. The Expert level targets those in a position to lead or advice at a strategic level. The main Expert programmes are:

- EXIN IT Service Management
- EXIN Information Security
- EXIN TRACKS

The current EXIN portfolio consists of 37 certificates, most of them available in English and Dutch, several also in Spanish, French and German, some also in Japanese and Chinese. The EXIN programmes, except for TRACKS, are offered worldwide. Most prominent markets are Western Europe, Asia, Latin America and the USA.

EXIN's target group are ICT professionals willing to develop themselves further and prove their capabilities by obtaining a certificate. Ever since EXIN certificates became known and popular in the ICT industry, starting in the Netherlands, higher education institutes started to include parts of the

EXIN programme to provide their students with an advantage of having practice oriented recognized certificates, in addition to the diploma of the institute.

Cooperation with higher educational institutes was intensified when some of the Dutch training commercial providers responsible for preparation to the EXIN exams, obtained accreditation and started bachelor programmes. Recently, several of these commercial higher education institutes founded a platform (SPIH) for cooperation on a core curriculum for their ICT related programmes. Moreover, they decided to involve EXIN into development of independent examinations. This core programme expected to offer an opportunity for other training providers to prepare learners for these exams and thereby facilitate dual learning (combining work and study).

The core programme is planned to be developed not only for the Dutch market, but also made available in other countries, e.g. via the partners of EXIN and educational institutes. The European e-competence framework e-CF will be used to improve the transparency of the learning outcomes and the competency focus of the programme.

Development and recognition of e-skills is EXIN's mission. To facilitate this, EXIN has cooperated with partners all over the world both in developing certification programs and in improving the ecosystem supporting the improvement of e-skills. EXIN is an active member of the CEN ICT Workshop on ICT Skills, the European e-Skills Association and contributed to several national and international projects and initiatives. EXIN supports the development and dissemination of the e-CF, e.g. by talks on this subject during conferences and seminars. Furthermore, e-CF is used in the EXIN e-competence assessment of professionals.

CompTIA

CompTIA is a non-profit trade association fostering the overall interests of IT professionals and companies. It comprises more than 2,000 IT companies around the world, ranging from large organizations such as Cisco, Verizon and Symantec to small and medium-sized companies. CompTIA is focused on educating the IT channel, certifying the IT workforce, advocating on behalf of the IT industry, and giving back through philanthropy.

CompTIA is the leading provider of vendor neutral IT certifications in the world. It offers certification exams in PC support, networking, servers, Linux, security and more. CompTIA has been delivering certification exams for more than 20 years.

The focus is first of all on e-education in IT sector, including deployment of online guides, webinars, market research, business mentoring and open forums which foster the growth of its members' businesses. The courses are designed for IT professionals in project management with respect to their busyness. E-learning courses include interactive scenario-based exercises and a course assessment at the end. Among Channel Training Categories are Cloud Computing, General Business, Government IT, Healthcare IT, IT Security, Legal IT Services, Managed Services, Vendor & Distributor Education etc.

Secondly, CompTIA certifies the IT workforce. Its executive certificates enable professionals to widen their skills and knowledge to rich organizational goals as well as to enhance their businesses with best practices. These certificates have been developed by senior experts in the IT industry and transferred by CompTIA Authorized Channel Instructors. Among CompTIA Professional Series are:

- CompTIA A+®: Long acknowledged as the starting point for a career in IT, the A+ focuses on the skills required by an entry level technician. The current A+ focuses on how to manage multiple devices within a network, including the topics of virtualisation and mobility. To date over 900,000 professionals worldwide are CompTIA A+ certified.
- CompTIA Linux+™ Powered by LPI: Validates the fundamental knowledge and skills required of junior Linux administrators. The exams cover system architecture, GNU and UNIX commands, user interfaces and desktops, Linux installation and package management.

- CompTIA Network+®: Delivers the principles of networking and aligns to the following job roles: network administrator, network technician, helpdesk technician, cable installer. The curriculum covers important topics such as virtual networking and network security. Designed to help students become entry-level networking professionals.
- CompTIA Security+®: Security has been identified as the largest of the IT skills gaps. This certification, covering topics such as identity management and cryptography, represents a valuable credential to kick start a security career.

Thirdly, CompTIA brings together small- and medium-sized IT businesses and lastly its foundation supports disadvantaged groups in acquiring IT skills for employment. To CompTIA Basic Series belong CompTIA Strata™ IT Fundamentals - an introduction to technology and computing basics and allows students to test their aptitude for IT. Strata is often used as a stepping stone to A+.

CompTIA's offices are located in the United States, India, Japan, South Africa and the United Kingdom. CompTIA is currently involved in a multitude of European initiatives to promote ICT professionalism and address the ICT skills gap at EU level. Some examples of this include:

- EU e-skills strategy: participation in several on-going initiatives led by the EC
- CEN ICT Skills Workshop: participation in the creation of the e-CF 3.0
- Grand Coalition for Digital Jobs: signatory to the EeSA pledge
- e-Competence Stakeholder Platform: participation in the promotion of the e-CF 3.0

CompTIA welcomes partnerships with all educational and training entities seeking the goal of providing IT professionals with necessary skills to support the ever-evolving technology landscape. CompTIA sets forth specific guidelines for participation in the Authorized Partner Program. Any partner who fulfils all program requirements is eligible to be accepted into the program and therefore receive program benefits. As concerns country specific initiatives, CompTIA is a sponsor of the UK government backed CyberSecurity Challenge, which aims to attract more people into the information security professions. Furthermore, Armed for IT is a CompTIA led, new initiative to assist UK Forces' Service Leavers evaluates and kick-starts a second career in IT.

Authorized Partner programmes include:

- Training Delivery Partner Program: Through association with the CompTIA® Authorized Partner Program, delivery partners are offered revenue generation opportunities, supported by economic and strategic resources. This includes financial incentives as well as sales, marketing, and operational assistance that promote certification of trained IT professionals and improve partner financial performance. The goal is to work collaboratively with partners to increase market impact, customer satisfaction and revenue.
- Academy Partner Program: The CompTIA® Authorised Academy Programme offers an educational programme designed to assist academic institutions, non-profit organisation, and government retraining agencies. It is designed to extend the reach and impact of education and enhance the learning experience to prepare learners for careers in information technology (IT).

CompTIA examinations represent technology-neutral certification curricula that provide a substantial knowledge and skills foundation for students who want to pursue a career in IT. CompTIA offers baseline international standards to help prepare and identify qualified and knowledgeable IT professionals. CompTIA's certifications serve as the core for expanding to other vendor specific certifications.

Several of the certifications are mandated by the U.S. Department of Defense and recommended by top companies such as Microsoft, HP, and Cisco.

2.4 Recent developments and emerging approaches

2.4.1 Grand Coalition Pledges

About the Grand Coalition

Following the Employment Package of April 2012 VP Kroes called for the formation of a multi-stakeholder partnership, the Grand Coalition for Digital Jobs, to tackle the twin issues of a (depending on the scenario used) projected shortfall of up to 372,000 to 864,000 ICT professionals in Europe by 2015, exacerbated by a decline in computing science graduates. Hence, its aim is to increase the overall supply of digitally skilled professionals and to better match supply and demand of digital skills.

On 4-5 March 2013 the Commission launched the Grand Coalition for Digital Jobs at a Conference in Brussels, which was hosted by President José Manuel Barroso 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.

At the launch conference a number of organizations made concrete pledges to the Grand Coalition. Additional pledges were presented at the Digital Agenda Assembly on 19 and 20 June in Dublin.

Key priorities - Concrete short-term actions

The Grand Coalition for Digital Jobs is supposed to deliver concrete actions, which can be implemented in the short-term and have high local impact. It will build on on-going programmes and best practices that could be scaled-up. The following are some of the objectives of the actions:

- Improve the image and attractiveness of ICT careers

- Offer training packages co-designed with the ICT industry
- Offer more aligned degrees and curricula at vocational and university level education that will respond to the needs of the students and the industry
- Improve recognition of qualifications across countries by stimulating take-up of a European certification scheme for digital skills of ICT professionals, based on the existing e-Competence Framework
- Reduce labour market mismatches by stimulating mobility
- Stimulate digital entrepreneurship by liaising with Startup Europe, a single platform for tools and programmes supporting people wanting to set up and grow web start-ups in Europe

The Grand Coalition will help accelerate and intensify efforts initiated by European policies, such as the Digital Agenda for Europe, the e-Skills Strategy, the Employment Package, the Opening up Education Initiative, the Rethinking Education Strategy, the Youth Opportunities Initiative and the EU Skills Panorama.

Pledges of stakeholders to the Grand Coalition

During the launch conference of the Grand Coalition on 4-5 March 2013, several pledges were presented by stakeholders. The second milestone for taking stock was 31 May 2013 and further new pledges were presented at the Digital Agenda Assembly in Dublin on 19-20 June 2013.

An overview of pledges of stakeholders to the Grand Coalition submitted by late October 2013 is provided below, pledges are listed by policy theme.

Exhibit 12: Grand Coalition for Digital Jobs - Overview of pledges by late October 2013

No	*Promoter*	*Pledge*	*Reach / country*
1. Training and matching for Digital Jobs			
1	**SAP**	Create the Academy Cube, an online learning platform for ICT practitioners open to all ICT companies	EU
2	**TELEFONICA**	Create a Career Fair at Campus Party 2013; roll out across Europe a programme of teaching Digital Literacy Skills and launch a pan-European start-up internship scheme	Spain, UK, Germany, Czech Republic, Slovakia, Ireland and Peru, Mexico, Colombia, Venezuela, Argentina, Brazil, Chile
3	**CISCO_SMART GRID**	Develop education curriculum addressing smart grid networking skills and enable usage of CISCO Networking Academy programme to train smart grid professionals	EU
4	**HEWLETT PACKARD**	Scale up HP programmes to develop up to 1 million students and professionals with entrepreneurial and technology skills by the end of 2015	Multinational
5	**MICROSOFT**	Increase the number of high quality apprenticeships and internships by 50% over 3 years, from the current 9000, thus providing an early career lever to help European youth into digital jobs	EU
6	**ACER**	Offer up to 50 internship in 2013 in every EU country with interns working in ACER and touching all the aspects of ICT industry	Multinational
7	**ALTEN**	Six-month internship programme in Italy or Spain where people will be trained in ALTEN Solution Centres of Excellence; then they will transfer to countries that are	EU

No	Promoter	Pledge	Reach / country
		lacking ICT skills to work in the Alten Group.	
8	**DIGITAL SKILLS ACADEMY**	Reskill 20,000 jobseekers by 2016 in Ireland and other EU countries experiencing high youth unemployment rates, including Spain, Portugal and Greece.	Multinational
9	**TELERIK ACADEMY**	Offer a free, 1-year professional cutting-edge ICT education program. By 2015: provide online training to 500,000 to 1 million EU people in all MS; create a school training program to include 600 to 2,000 Bulgarian schools, thus increasing the scale of its school edu initiative by 80 times its current size.	EU
10	**DC PROFESSIONAL DEVELOPMENT**	Grant access to their four core online course modules to up to 500 users	EU
11	**CLOUD CREDENTIAL COUNCIL**	Professional Cloud Training and Certification Program enabling training partners and technology vendors in countries across Europe to 'Cloud-Ready' the European workforce.	EU global
12	**STICHTING VROUWEN AAN HET WERK**	1. Develop the next World Smart College to educate 100 people and match them to ICT labour market, from November 2013 to 2015. 2. Build a Creative Innovation Center at primary schools of disadvantage neighbourhoods with aim to revise curricula.	Netherlands
13	**FAST-TRACK TO IT**	Apply the FIT training and support model to secure employment for 12,000 marginalised job seekers in Spain, Portugal, Greece and Ireland by 2016.	Ireland
2. Innovative Learning and Teaching			
14	**European Schoolnet**	Create Massive Open Online Courses (MOOCs) for secondary school teachers, to support students in acquiring science and technology skills and increase the attractiveness of ICT jobs	EU and worldwide
15	**ORACLE**	Hold a pan-European roundtable among ICT vendors, Ministries of Education and other stakeholders to share best practices for training in computer science and ICT skills	Multinational
16	**THE CORPORATE IT FORUM**	Fund a programme of work in 2013 (120 000 £) that will bring together major employers in the UK to provide input on ICT curricula so as to align education and training with the needs of businesses	UK
17	**BCS, THE CHARTERED INSTITUTE FOR IT**	Digital Literacy for Life Programme: bring together an alliance of organisations that have a stake in digital literacy in the UK to promote the need for digital literacy in schools, colleges and private training organisations	UK
18	**SAMSUNG**	1. Provide equipment & solutions for underprivileged children. 2. Provide vocational ICT training designed to increase employability in unemployment hotspots, and to spur entrepreneurship.	Multinational
19	**INLEA**	1. Increase the use of ICT Industry Education and Certification programs among Vocational and Higher Education institutions. 2. Involve the ICT Instructors community in the Grand Coalition for digital jobs.	Multinational
20	**INFORMATICS EUROPE**	Platform to share educational knowledge and best practices across different countries and coordinate national initiatives to finally establish informatics as a compulsory subject in schools.	EU

No	Promoter	Pledge	Reach / country
21	**DIDASCA**	DIDASCA offer free MOOCs - Mass Open Online Courses to fight digital literacy gap in Italy.	Italy
22	**GOOGLE**	1. Reach 20,000 entrepreneurs across Europe in 2013 through partnerships under the Google for Entrepreneurs initiative. 2.Work with 6 STEM education organisations across EU, to increase their reach from 32,000 to 100,000 young people by the end of 2013(as part of the RISE programme). 3. Launch 25 MOOCs in collaboration with universities across Europe, reaching tens of thousands of people across EU.	EU
23	**University of Piraeus**	The Department of Digital Systems of the Piraeus University offers updated courses, seminars and curricula on advanced ICT topics based on the requirements of strong industrial companies. The Undergraduate Programme has two main directions: “Communication Systems and Networks” and “Electronic Services”. The Postgraduate Programmes have five main directions: “E-Learning”, “Network-Oriented Systems”, “Digital Communications and Networks”, “Techno-economic Management of Digital Systems” and “Digital Systems Security”.	Multinational
3. Certification			
24	**EUROPEAN E-SKILLS ASSOCIATION**	Set up national roundtables, push for an European standard and a European platform for the e-Competences Framework governance	EU
25	**European Computer Driving License Foundation (ECDL)**	Launch the new ECDL, a flexible certification that allows the creation of profiles matching individual or organisational needs	EU
26	**Council of European Professional Informatics Societies (CEPIS)**	Launch the CEPIS e-Competence Benchmark, a free online interactive tool for ICT professionals to identify their competences	EU, Bosnia & Herzegovina, Montenegro, Norway, Serbia, Switzerland, Turkey
27	**RETE COMPETENZE PER L’ECONOMIA DIGITALE**	Disseminate the European e-Competence Framework, e-CF, all over the national territory, and enhance the culture of competences for ICT within Italian enterprises.	Italy
28	**WePROMIS® - ECWT, PROMIS@Service, BCWT**	Offer for free the present WePROMIS solution structuring STEM knowledge to the needs of female entrepreneurs and those who want to be more competitive in the job market.	EU
4. Awareness raising			
29	**YouRock**	YouRock is a new employability platform for young people across Europe that will help them to become more employable by encouraging them to use their existing online content creation activities as evidence of their latent skills and aptitudes.	
30	**CIONET**	10,000 hours of passion for ICT: Organize CIO information tours to schools, universities or other relevant places.	EU
31	**Hellenic Professionals Informatics Society (HePIS)**	HePIS is committed to run the project Getbusy.gr with the aim of benefitting up to 65,000 young people, motivating them to improve their e-skills and employability, increasing their entrepreneurial skills and learning about new	Greece

No	Promoter	Pledge	Reach / country
		technologies.	
32	**SHEFFIELD COMMUNITY NETWORK**	Create a network of community-based Digital Media Centres across the city of Sheffield which will become hubs for digitally-enabled business and job creation.	UK
33	**UNIVERITY OF SHEFFIELD**	Establish a Computer Science Ambassador Scheme for secondary school pupils, initially for 45 pupils aged 14-15, involving 60 hours guided experience of digital opportunities.	UK
34	**EVERIS-UPF**	"Noa & Max, stuck in Electronia", a project aimed at 8 to 12 year-old students that involves the production and dissemination of cross media content designed to promote innovative talent and creative ICT and Science learning.	Spain
35	**ZEN DIGITAL**	Initiate pan-European Digital Woman of the Year Award.	EU
5. Mobility			
36	**MAKE IT IN IRELAND**	100% industry-led programme to showcase opportunities in the technology sector in Ireland and provide information for people to moving there.	Ireland
6. National & Local Initiatives			
37	**AMSTERDAM METROPOLITAN AREA (AMA)**	Invest €20-50 million to organize Amsterdam Metropolitan Solutions, a design contest for an applied technology institute in Amsterdam, to stimulate economic development and job creation in applied ICT (also open for organizations outside the Netherlands.	Netherlands
38	**TELECENTRE - EUROPE**	Lead and facilitate Local Coalitions for Digital Jobs (LC4DJ) across EU (i.e. local governments, industry, employment services, educational and social actors).	EU
39	**SPANISH GRAND COALITION**	Launch a coalition for ICT job creation in Spain with public and private actors.	Spain
40	**BASQUE EIT COALITION**	Launch a Coalition for Digital Competence in Basque region with platform of evaluation, certification and recognition of digital competence	Spain
41	**DIGITALLY SKILLED AND DIGITALLY SAFE**	Year-plan to enhance digital skills of the labour force (Digitally Skilled) and internet safety (Digitally Safe) in public-private collaboration.	Netherlands

Further descriptions of these pledges can be found here: https://ec.europa.eu/digital-agenda/en/current-pledges

2.4.2 Other new and emerging initiatives

As our country-by-country analysis shows, many Member States have shown an increased level of activity in recent years, partly triggered by widespread evidence that the challenge related to shortages in sufficiently qualified ICT practitioners has been little affected by the economic slowdown following the 2007-8 financial crisis. In the present section we are presenting initiatives which have been started recently and which already now seem to have a huge potential for helping to close the e-skills gap. These have not (yet) been included into the group of 'good practices' since they first need to demonstrate their potential in real-life and show that they can became sustainable and scalable activities with a potential for being transferred and implemented into other national contexts and countries.

Two new/emerging initiatives which promise to be of major relevance for the discussion in the present report are briefly described below.

École 42, France

42 is a free Web Developer School created in France by Xavier Niel, one of France's most famous e-entrepreneurs. He created France's major internet service provider Free. According to him, France is currently the 5th strongest economy in the world, but only on rank 20 in ICT economy. His concept argues that the country will lose its position as a major economic force if it does not invest more in its e-skilled workforce. Nowadays, young people are having difficulties finding employment while the ICT branch cannot occupy its vacancies. In this context, the initiative aims at counteracting skills gap and youth unemployment simultaneously.

It is funded by the enterprises and situated in Paris. It harshly criticizes the ICT education in national schools and offers a concept based on self-study, peer-to-peer education, projects and challenges. École 42 has the ambition to be the best Computer Science school in France and promote excellence in programming. Individuals aged 18-30 can apply, even without a school diploma. During the professional qualification pupils can also deepen their e-leadership skills, attending a two year specialization on entrepreneurship and management. Although the courses do not lead to an officially recognized degree, graduates should not encounter problems in getting employed. Recruiting company Ametix already offered a job to all first 1000 graduates.

Ècole 42 explicitly wants to tackle youth unemployment and skills gap at the same time. For this purpose, it also addresses applicants without a high school diploma. Admitting students according to their talent rather than official credentials, the schools aims at including also disadvantaged groups. Yet, the focus is clearly on sophisticated ICT practitioner skills. 42 gives everybody the chance to apply, but emphasizes that they will have to be very dedicated. This approach is unique, since it combines inclusion and high-profile training.

The school aims at guaranteeing an employment for their young participants and at supplying the labour market with highly skilled professionals. It wants to be an alternative to both public universities and expensive private schools. 1000 specialists are to be educated every year. Computer Scientist programme is going to take 3 years. A further 2 years qualification specializes interested students in ICT research or in innovation entrepreneurship. The latter focuses on developing business ideas related to ICT. In this way, the MSP is innovative in its goals: it delivers a solid ICT education which can be combined with e-leadership topics. The school was created in march of 2013 and has not acted yet.

The school was created by major entrepreneur Xavier Niel. Other companies have been expressing their support, but are not contributing financially yet. Since the campaign is heavily criticizing the national education system, there are no such stakeholders involved. Thus, since the school is operated by one entrepreneur only, it cannot be considered a MSP yet.

With its plan to supply the French labour market with young developers, the initiative actually ties in with the national Digital Roadmap. The project, however, is completely independent from government policy.

Founder and major entrepreneur Xavier Niel funds the school personally. He is reported to have invested about € 70 million private capital in the project, and has announced that he is going to invest his personnel savings over the next ten years into it.

Ècole 42 has a frequently updated a very informative website directed at candidates, parents and entrepreneurs. Students can apply to the school directly online. It is also networking on Facebook and YouTube. National and international have been intensely featuring 42's opening.

The school is led by five directors for different sectors. A further staff of 42 individuals ensures the day-to-day business.

The initiative is being met with enormous interest, since the program received more than 50,000 applications for this year. 1,000 students will start their first year in November, when the school will officially open. Two assessment centres with a 4-weeks-duration where conducted. In this intense test phase, the 42 team wants to select the final participants who will be entirely accepted. For this purpose, participants completed long rows of programming examinations.

Since the initiative is not operating yet, this point is difficult to access. The schools premises are very sophisticated and well equipped. Every student is provided his or her own Apple PC. Until now, one major critique point is that the graduates will not receive a diploma that is recognized by the French education system. Critics reflect, that graduates might be fine in the short term, but might have difficulties because of their lack of certification later.

The school is just about to enter the operational phase by the end of 2013. Xavier Niel has been emphasizing that 42 has a solid financial foundation, given his personal support. It still has to be seen whether this is enough. Yet, it is likely that the school's new concept might put pressure on the traditional education system and thus contribute to a more dynamic ICT education in France. In any case, the following years will have to show the school's impact and potential sustainability. On the long run, the lack of skilled workers only might not be enough of a pull factor to keep the school working.

Academy Cube, Germany

Academy Cube is an online platform targeting academics, young professionals and job seekers from across Europe. The platform provides job offers and information about what courses will qualify them best for their desired job. Immediately they can attend those courses online, for free. In particular, e-learning-based training courses for professionals in the ICT and engineering area are provided. The Academy-Cube initiative is an alliance of international companies, e.g. DFKI, BITKOM, EIT ICT Labs, Festo Didactic GmbH, Society for Computer Science e.V., LinkedIn Germany GmbH, Microsoft Germany, Robert Bosch GmbH, SAP AG, Software AG, ThyssenKrupp AG, University Duisburg-Essen etc. and public institutions, e.g. the Federal Employment Agency.

Academy Cube explicitly targets unemployed graduates especially from southern Europe. It wants to improve job matching on a European scale. It focuses on ICT, but addresses STEM professionals in general. Qualified applicants can register to the platform from their home countries and prepare for the needs of the job market. This approach is innovative, since it reacts to the current economic crisis in some member states. Academy Cube's target is to provide relevant qualifications to 100,000 young people. The target for 2013 is to enrol 250 students in the online courses. The e-courses are available in English and cover the following areas: 1. Big data, 2. Data management and business analytics and 3. Enterprise resource planning, logistics and production organization.

Academy-Cube involves international companies, e.g. DFKI, BITKOM, EIT ICT Labs, Festo Didactic GmbH, Society for Computer Science e.V., LinkedIn Germany GmbH, Microsoft Germany, Robert Bosch GmbH, SAP AG, Software AG, ThyssenKrupp AG. Other partners are public institutions and universities both in Germany and in southern European countries as well as chambers of commerce. Academy Cube ties in with the German policy to counteract the gap of ICT and STEM professionals. It also relates the efforts of the European Commission to reduce youth unemployment in southern Europe. SAP contributed to the program with € 3 million.

The core of Academy Cube is its online platform. It informs on the campaign and offers the job matching tool and training basis that characterize the academy. Interested job seekers can easily find vacancies and adequate training for their qualification. The initiative was also presented on CeBIT 2013 by Neelie Kroes and SAP. Furthermore, the partners in the targeted countries also promote the campaign. It has also been featured in the German and European press. Thus, Academy Cube is communicating efficiently both to the target group, industry and policy makers.

The platform has been operating since September 2013. 32 students already participated in a pilot phase. A further pilot program worked with 10 participants in Greece. Since the program commenced in March 2013, the number of partners has doubled. Further pilot projects are planned in France, Ireland and Italy. As of October 2013, the platform provides three different curricula: Big Data, Data Management and Business Analytics and IT-Base BPM, logistics and production optimization. All courses are offered in English and available for unemployed graduates only. The training is sponsored by the industry partners and offered at a reduced fee. So far, the program structure is very appealing. The fact that half of the partners joined the campaign since it was launched indicates that it relates to the actual needs of industry.

Academy Cube is supported by big group of stakeholders from industry, universities and job agencies, which is likely to ensure its long-term sustainability. However, since all courses are offered in English and enrolled students do not commit to working at one of the partner companies once they completed the course, a free rider problem might arise. Nevertheless, the initiative promises to become an excellent example of a flexible qualification and job matching programme with a truly European outlook.

3 Assessment and validation of e-skills policies in Europe – Results from a Stakeholder Survey

3.1 Objectives

In a further round of expert consultation empirica carried out an assessment and validation of different types of existing policies, initiatives and multi-stakeholder partnerships which had been derived from those identified and analysed in previous phases. Besides questions directly relating to the above expert policy assessment and validation further topics addressed included the expert's expectations as to the development of the supply of ICT practitioners and professionals from the education sector on the one hand and the industry demand of these until 2020 on the other. Finally, questions on the role of the European Commission in the future regarding e-skills and those for the national governments and other relevant stakeholders where asked.

3.2 Approach and methodology

Data gathering was carried out mainly through an online survey accompanied by telephone interview which was addressed to around 1000 experts from different types of institutions. The targeted experts included experts from national governments or governmental institutions which had already been involved as part of the activities for the identification and description of relevant e-skills policies, initiatives and multi-stakeholder partnerships in their countries, experts from higher education, research and academia, industry and ICT industry, associations of different type, consultants and other types of experts including those from social partners.

The response rate of was 17% with 171 experts getting involved and responding. From these responses 111 could actually be included in the analysis.

The experts were asked several sets of questions including the following on:

A) Appropriateness and effectiveness of different types of policies and initiatives for securing adequate supply of ICT practitioners and professionals as required by employers in the years until 2020.

Experts had to specify for each whether establishing and carrying out these types of policies and initiatives:

- has been appropriate and effective,
- will (still) be relevant in the near future,
- has revealed tangible benefits already,
- whether and to what extent they are satisfied with these policies and initiatives, as they have been executed in practice.

They were asked to respond to these questions in relation to types of policies and initiatives at

- European level (where appropriate).
- National level in their country.

Altogether responses had to be given for 18 types of policies and initiatives

- Activities for raising awareness about the opportunities offered by a career in ICT, including Europe-wide and national activities like those carried out within the European e-Skills Week activities.

- Development and provision of ICT education & training: Industry-based training and certification addressed to ICT practitioners to further develop and update their skills and / or improve their career opportunities (life-long-learning)
- Measures for mainstreaming ICT training in primary & secondary education, e.g. revision of curricula, introduction of dedicated subject "ICT", etc.
- Development and provision of ICT education & training: Higher education: (new) curricula and programmes in areas of high demand in the market at: Universities for traditional higher education programmes (Bachelor and Master programmes)
- Development and provision of ICT education & training: Higher education: (new) curricula and programmes in areas of high demand in the market at: Business schools offering dedicated (executive) (part-time) MBA and Master programmes to those in work
- Development and provision of ICT education & training: Higher education: new curricula and programmes in areas of high demand in the market at: Business schools offering condensed, short-term programmes (duration: approx. 6 weeks or several months in parallel to job)
- Development and provision of ICT education & training: Vocational education: taught as dedicated subject in vocational schools (including apprenticeships) with the aim to become an ICT practitioner.
- Development and provision of ICT education & training: Re-training and up-skilling measures for ICT practitioners with outdated skills.
- Development and provision of ICT education & training: Re-training and conversion courses for unemployed offering them a job opportunity in the ICT area.
- Career support addressed to STEM students, graduates and employees but also those from other disciplines interested in an ICT professional career
- e-Skills frameworks and associated online tools for vendor-based certifications mapping onto e-competences allowing individuals for a self assessment of their competences and match to ICT job profiles and for employers in recruitment processes to identify suitable candidates matching their competence profiles demanded to fill vacancies
- Job matching for ICT practitioners through implementing the European Vacancy Monitor, EURES etc.
- Provision of market information on current and future supply of and demand for (different types of) ICT practitioners and professionals
- Financial and fiscal incentives ranging from subsidised courses, training grants to tax incentives for employers and employees
- Programmes addressed to increase immigration of ICT practitioners from third countries
- ICT Professionalism initiatives making the ICT profession more transparent and attractive for a broader range of (potential) students at vocational schools and in higher education
- Institution building: establishment of a dedicated (possibly government funded) institution (like eSkills UK) to promote and support the ICT profession through a multitude of activities
- Dedicated policies and initiatives that aim to raise the share of women in the ICT workforce.

B) Expectations as to the development of the supply of ICT practitioners and professionals from the education sector and the industry demand of these until 2020.

Responses had to be given on a five-point Likert scale for each, demand and supply (drastically increase, increase, neither nor / remain stable, decrease, drastically decrease) for the following types of ICT professionals:

- Management, such as CIO, ICT operations managers, project managers etc.

- Planning and Strategy, such as enterprise architects, systems analysts, and ICT consultants
- Design, development, and integration such as software, web and multimedia developers and test specialists
- Design, development, and integration such as database designers and administrators
- Design, development, and integration such as hardware and network specialists and systems administrators
- Design, development, and integration such as security specialists
- Design, development, and integration such as Big Data specialists
- Design, development, and integration such as embedded system designers / developers
- Service delivery and operation, such as operations, control or equipment technicians etc.
- Any other ICT professionals (please specify below).

C) The role for the European Commission in the future regarding e-skills.

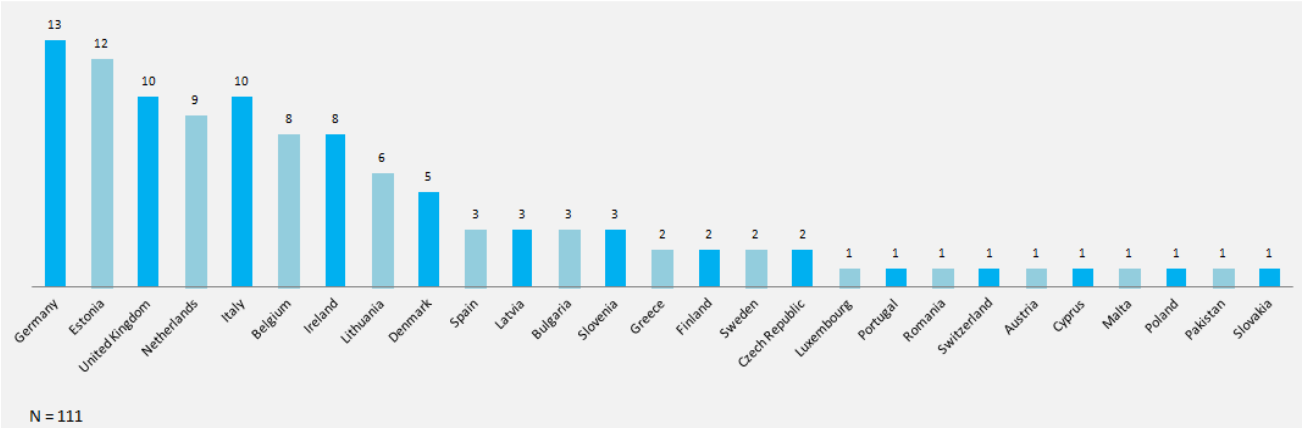
D) The role for the national government and other relevant stakeholders in your country in the future regarding e-skills.

3.3 Survey results

3.3.1 Distribution of responses by country and affiliation

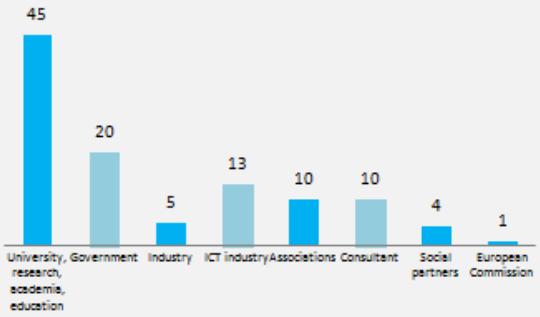
The distribution of responses by country and affiliation from which experts came can be obtained from the following figures. Altogether experts came from 27 countries including almost all major EU Member States. For Germany, the United Kingdom, Italy, the Netherlands, Estonia, Belgium and Ireland we received a sufficient number of responses which allow for an analysis at national level.

Exhibit 13: Stakeholder survey – Respondents by country



42% of the experts came from universities, academia and research, 17% from industry (incl. ICT industry), 19% from government institutions and 9% from associations. 9% can be classified as consultants and 4% as representatives from social partners.

Exhibit 14: Stakeholder survey – Respondents by affiliation



N = 108

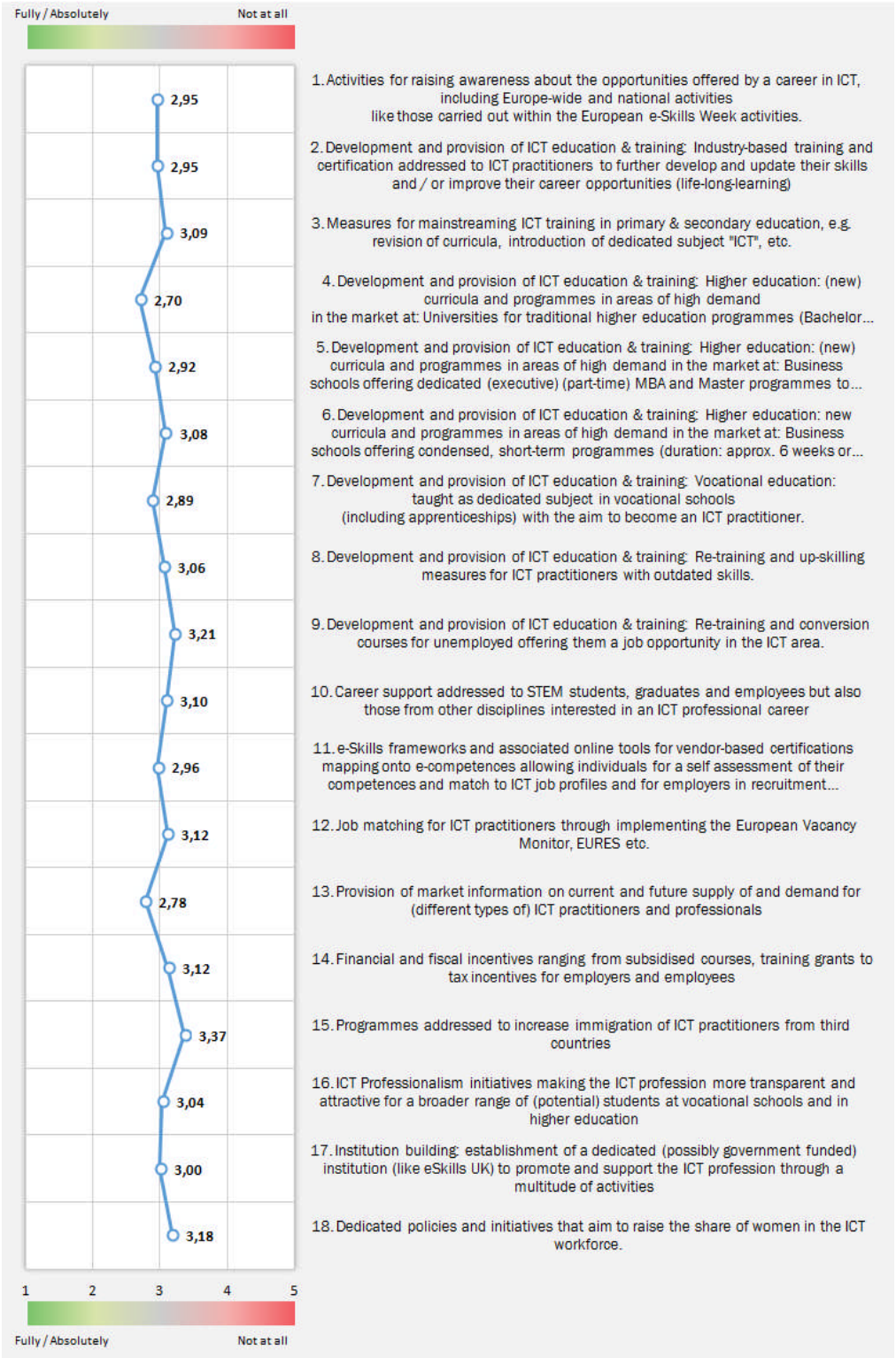
University, research, academia, education	45	41,7%
Government	20	18,5%
Industry	5	4,6%
ICT industry	13	12,0%
Associations	10	9,3%
Consultant	10	9,3%
Social partners	4	3,7%
European Commission	1	0,9%
Total	*108*	*100%*

3.3.2 Appropriateness and effectiveness of policies, initiatives and MSPs

Positive and negative expressions of experts on the appropriateness and effectiveness of e-skills policies and initiatives in Europe differ widely depending on the type of policy and initiative. Between 18% and 44% of experts expressed positive, and between 20% and 43% negative opinions on policy appropriateness and effectiveness with any of the policies and initiatives discussed. However, also between 25% and 44% do not want to take a position and respond neutrally. This shows that a substantial number of experts remain uncertain as to a final judgement on appropriateness and effectiveness of e-skills policies.

On a scale from 1 to 5 (1 = fully, 5 = not at all appropriate and effective) the values range around 3 which is an indication of a tendency of the majority of experts towards judging the current policies rather more inappropriate and not effective.

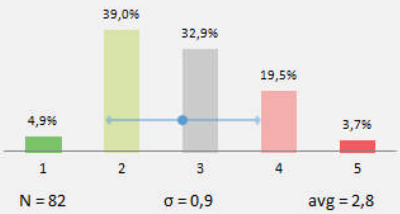
Exhibit 15: Stakeholder assessment of the appropriateness and effectiveness of e-skills policies and initiatives in Europe



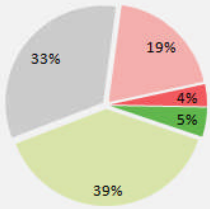
Those e-skills policies most positively perceived as appropriate and effective include the provision of market information on current and future e-skills supply and demand, activities by universities on new ICT curricula and programme development for Bachelor and Master courses (note: with around 40% of respondents coming from universities and academia, there may be a bias in these results), vocational school activities teaching dedicated subjects for students to become an ICT practitioner, the initiatives around e-skills framework and associated online tool development and

institution building: establishment of a dedicated (possibly government funded) institution (like eSkills UK) to promote and support the ICT profession through a multitude of activities.

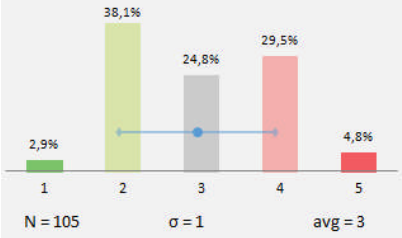
*13. Provision of **market information** on current and future supply of and demand for (different types of) ICT practitioners and professionals*



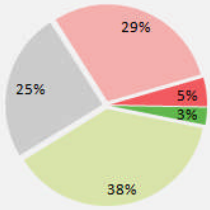
Fully / Absolutely (1)	4	4,9%
Very much (2)	32	39,0%
Neutral (3)	27	32,9%
Not much (4)	16	19,5%
Not at all (5)	3	3,7%
Total	*82*	*100%*



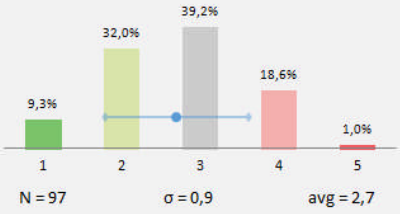
*1. Activities for **raising awareness** about the opportunities offered by a career in ICT, including Europe-wide and national activities like those carried out within the European e-Skills Week activities.*



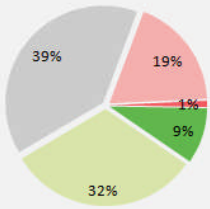
Fully / Absolutely (1)	3	2,9%
Very much (2)	40	38,1%
Neutral (3)	26	24,8%
Not much (4)	31	29,5%
Not at all (5)	5	4,8%
Total	*105*	*100%*



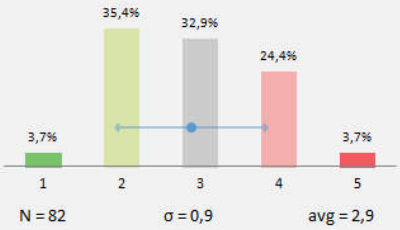
*4. Development and provision of ICT education & training: **Higher education**: (new) curricula and programmes in areas of high demand in the market at: **Universities for traditional higher education programmes** (Bachelor and Master programmes)*



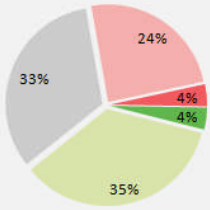
Fully / Absolutely (1)	9	9,3%
Very much (2)	31	32,0%
Neutral (3)	38	39,2%
Not much (4)	18	18,6%
Not at all (5)	1	1,0%
Total	*97*	*100%*



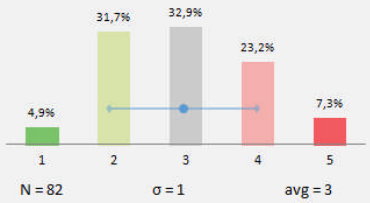
*7. Development and provision of ICT education & training: **Vocational education**: taught as dedicated subject in **vocational schools** (including apprenticeships) **with the aim to become an ICT practitioner.***



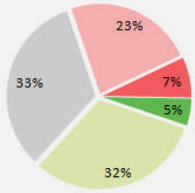
Fully / Absolutely (1)	3	3,7%
Very much (2)	29	35,4%
Neutral (3)	27	32,9%
Not much (4)	20	24,4%
Not at all (5)	3	3,7%
Total	*82*	*100%*



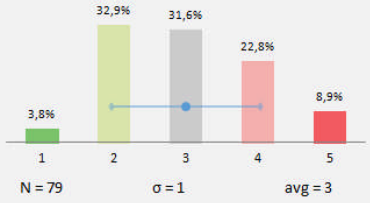
11. ***e-Skills frameworks and associated online tools*** *for v* ***endor-based certifications mapping onto e-competences*** *allowing individuals for a s* ***elf assessment of their competences*** *and* ***match to ICT job profiles*** *and for employers in* ***recruitment processes*** *to identify suitable candidates matching their competence profiles demanded to* ***fill vacancies***



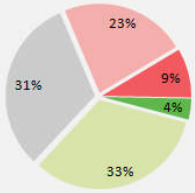
Fully / Absolutely (1)	4	4,9%
Very much (2)	26	31,7%
Neutral (3)	27	32,9%
Not much (4)	19	23,2%
Not at all (5)	6	7,3%
Total	*82*	*100%*



17. ***Institution building*** *: establishment of a dedicated (possibly government funded) institution (like eSkills UK) to promote and support the ICT profession through a multitude of activities*

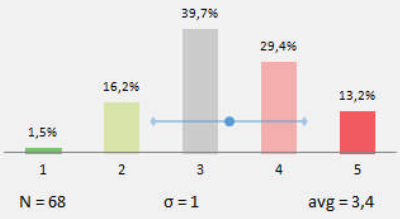


Fully / Absolutely (1)	3	3,8%
Very much (2)	26	32,9%
Neutral (3)	25	31,6%
Not much (4)	18	22,8%
Not at all (5)	7	8,9%
Total	*79*	*100%*

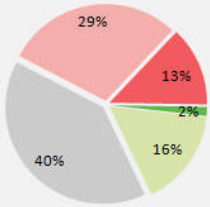


Most negative expressions concerning the appropriateness and effectiveness of policies and initiatives can be found with respect to programmes addressed to immigration of ICT practitioners from third countries and dedicated policies followed by initiatives that aim to raise the share of women in the ICT workforce and ICT re-training and conversion courses for unemployed.

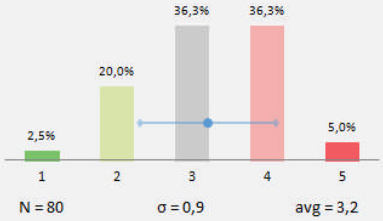
15. Programmes addressed to increase ***immigration*** *of ICT practitioners* ***from third countries***



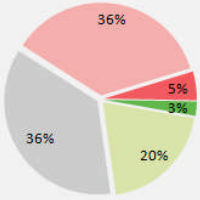
Fully / Absolutely (1)	1	1,5%
Very much (2)	11	16,2%
Neutral (3)	27	39,7%
Not much (4)	20	29,4%
Not at all (5)	9	13,2%
Total	*68*	*100%*

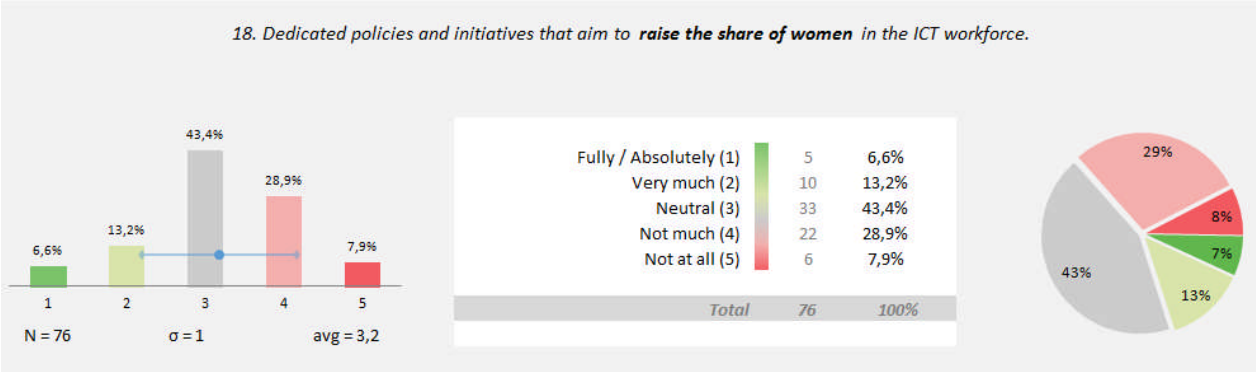


9. Development and provision of ICT education & training: ***Re-training and conversion courses*** *for unemployed offering them a job opportunity in the ICT area.*



Fully / Absolutely (1)	2	2,5%
Very much (2)	16	20,0%
Neutral (3)	29	36,3%
Not much (4)	29	36,3%
Not at all (5)	4	5,0%
Total	*80*	*100%*





A more detailed analysis is provided below.

Awareness raising policies and initiatives

When being asked about activities for raising awareness about the opportunities offered by a career in ICT, including Europe-wide and national activities like those carried out within the European e-Skills Week activities, 41% of the experts expressed these to be appropriate and effective while 35% expressed a negative opinion.

Industry-based training and certification addressed to ICT practitioners

Development and provision of ICT education & training in form of industry-based training and certification addressed to ICT practitioners to further develop and update their skills and / or improve their career opportunities (life-long-learning) as a means to help close the e-skills gap and address skills shortages mostly received neutral responses (40%). Around 33% of the experts express positive 27% negative views

Measures for mainstreaming ICT training in primary & secondary education

Measures for mainstreaming ICT training in primary & secondary education, e.g. revision of curricula, introduction of dedicated subject "ICT", etc. receive more negative responses (38%) than positive ones (31%).

(New) curricula and programmes at universities for traditional higher education programmes (Bachelor and Master programmes)

The development and provision of (new) curricula and programmes in areas of high demand in the market at universities for traditional higher education programmes (Bachelor and Master programmes) is seen as the most appropriate means for closing the e-skills gap although a high share of 39% of experts express a neutral view. Even more, 41% are of a positive opinion as opposed to just 20% expressing a negative view.

New curricula and programmes at business schools for dedicated (executive) (part-time) MBA and Master programmes to those in work

Negative views are articulated by 26% and positive expert responses are at around 34% when judging on the appropriateness and effectiveness of development and provision (new) curricula and programmes in areas of high demand in the market at business schools offering these as dedicated (executive) (part-time) MBA and Master programmes to those in work. The majority of experts remain neutral in their judgement (40%).

New curricula and programmes at business schools for condensed, short-term programmes

A similar picture – only slightly more negative - emerges when it comes to judging on new curricula and programmes at business schools for condensed, short-term programmes (duration: approx. 6 weeks or several months in parallel to job).

ICT education & training taught as dedicated subject in vocational schools (including apprenticeships)

Almost 40% of the experts see the development and provision of ICT education & training taught as dedicated subject in vocational schools (including apprenticeships) with the aim to become an ICT practitioner as an appropriate and effective means. One third of the experts express a neutral opinion.

Re-training and up-skilling measures for ICT practitioners with outdated skills

Slightly more experts express negative views as to the effectiveness of re-training and up-skilling measures for ICT practitioners with outdated skills, but most experts refrain from any judgement and express a neutral opinion.

Re-training and conversion courses for unemployed offering them a job opportunity in the ICT area

In general re-training and conversion courses for unemployed to enable them to get a job opportunity in the ICT area are seen as one of the least appropriate and effective measures for closing the e-skills gap. 41% of experts express this opinion with Irish experts being the most sceptical ones.

Career support addressed to STEM students, graduates and employees but also those from other disciplines interested in an ICT professional career

Slightly less experts (31% compared to 33%) see the career support activities addressed to STEM students, graduates and employees but also those from other disciplines interested in an ICT professional career as suitable for helping to close the e-skills gap. Again the majority (37%) does not want to express a value judgement.

e-Skills frameworks and associated online tools

Activities addressed to e-skills frameworks and associated online tools for vendor-based certifications mapping onto e-competences allowing individuals for a self assessment of their competences and matching these to ICT job profiles and for employers in recruitment processes to identify suitable candidates matching their competence profiles demanded to fill vacancies receive a much more positive feedback from experts than many other types of policies and initiatives. Interestingly in the UK and Ireland negative responses pre-dominate.

Job matching for ICT practitioners

Policies for job matching for ICT practitioners for instance through implementing the European Vacancy Monitor, EURES etc. are mostly not judged as appropriate and effective means by a majority of 33% of the experts interviewed. However, another 30% see some positive aspects with these to help closing the e-skills gap while 36% do not provide any value judgement and remain neutral

Market information provision

The provision of market information on current and future supply of and demand for (different types of) ICT practitioners and professionals is appreciated by 45% of the experts. Only 23% express reservations with around 50% of the experts in the Netherlands and Germany expressing this negative opinion. In the other countries levels of appreciation range are mostly well above 50% With this result, this policy belongs to those with highest levels of endorsement.

Financial and fiscal incentives

Financial and fiscal incentives ranging from subsidised courses, training grants to tax incentives for employers and employees receive rather low levels of approval as appropriate policies helping to close the e-skills gap. 32% disapprove of them while the majority of 44% of experts does not want to provide any judgement.

Immigration policies

Programmes addressed to increase immigration of ICT practitioners from third countries receive highest levels of resistance. More than 40% of the experts do not judge them as suitable means. Only 18% are in favour of these, while 40% remain neutral in their judgement.

ICT Professionalism initiatives

Policies addressed to ICT Professionalism making the ICT profession more transparent and attractive for a broader range of (potential) students at vocational schools and in higher education create an interest and positive responses among some experts (33%) but also negative ones (32%) with differences among the countries where a country-specific analysis is possible. This will be further elaborated on in later sections.

Institution building

Institution building, i.e. the establishment of a dedicated (possibly government funded) institution (like eSkills UK) to promote and support the ICT profession through a multitude of activities finds a good number of supporters (37%) but also opponents (32%) with 9% of all experts seriously questioning the appropriateness and effectiveness of this policy for closing the e-skills gap.

Policies and initiatives that aim to raise the share of women in the ICT workforce

Current policies and initiatives that aim to raise the share of women in the ICT workforce receive low levels of appreciation among experts. Only 20% see these as appropriate and effective while 37% object to them and 43% remaining neutral.

3.3.3 Level of satisfaction with European and national policies and initiatives

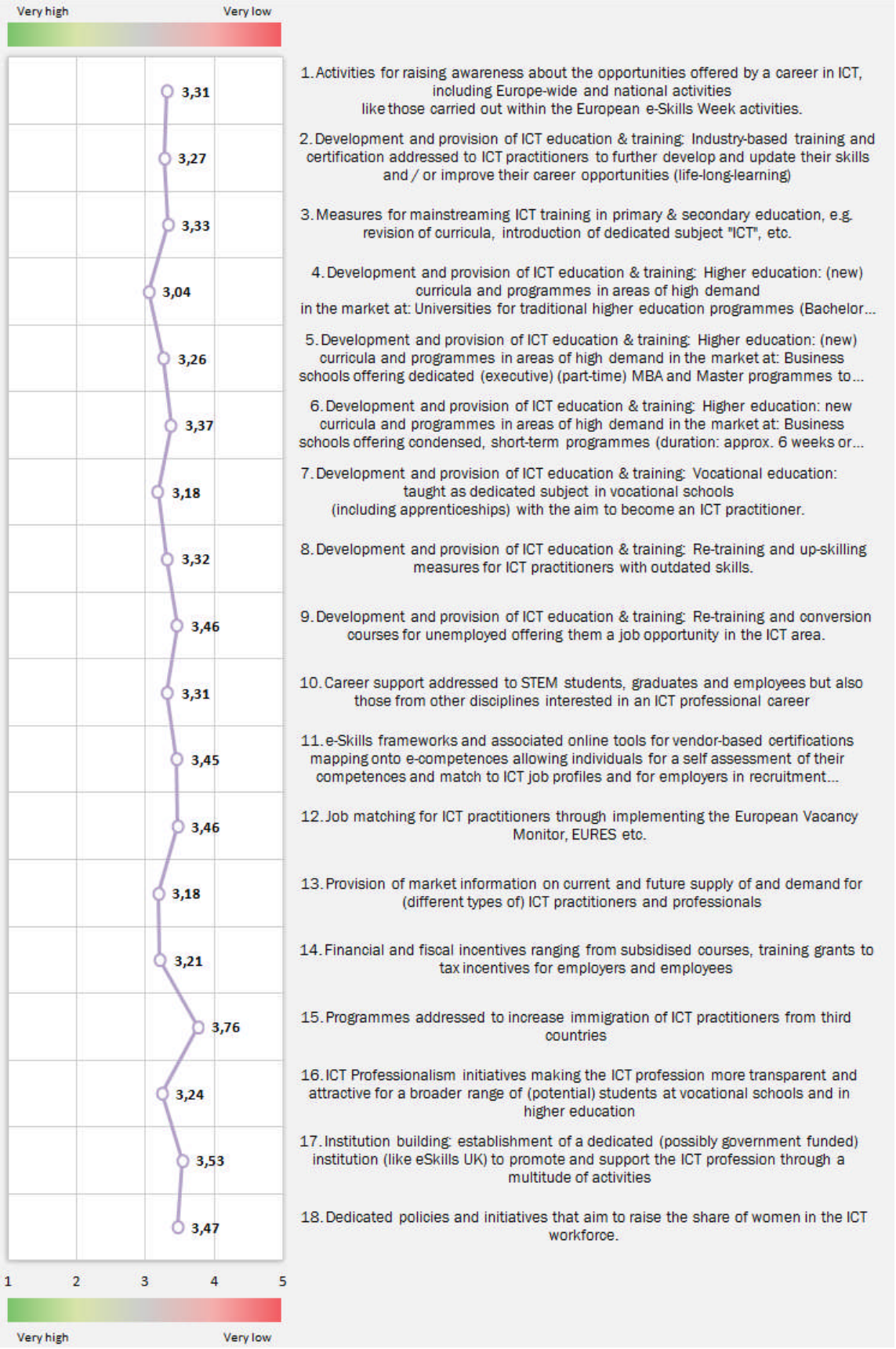
It is striking that on average between 40% to 50% of experts remains neutral in their level of satisfaction with the appropriateness and effectiveness of actual *European* e-skills policies and initiatives. The highest figure with 65% of expert expressing neutral levels of satisfaction is achieved with 65% for initiatives of business schools offering dedicated (executive) (part-time) MBA and Master programmes to those in work. The lowest 'neutral' figure is with 37% for initiatives addressed to e-skills frameworks and associated online tools.

On a scale from 1 to 5 (1 = fully, 5 = not at all satisfied) the values range around 3 which is an indication of a tendency of the majority of experts not so much satisfied with the current policies at European level. Satisfaction is even worse with respect to national policies and initiatives (see next chapter).

Exhibit 16: Stakeholder satisfaction with European e-skills policies and initiatives

1. Activities for raising awareness about the opportunities offered by a career in ICT, including Europe-wide and national activities like those carried out within the European e-Skills Week activities.
2. Development and provision of ICT education & training: Industry-based training and certification addressed to ICT practitioners to further develop and update their skills and / or improve their career opportunities (life-long-learning)
3. Measures for mainstreaming ICT training in primary & secondary education, e.g. revision of curricula, introduction of dedicated subject "ICT", etc.
4. Development and provision of ICT education & training: Higher education: (new) curricula and programmes in areas of high demand in the market at: Universities for traditional higher education programmes (Bachelor...
5. Development and provision of ICT education & training: Higher education: (new) curricula and programmes in areas of high demand in the market at: Business schools offering dedicated (executive) (part-time) MBA and Master programmes to...
6. Development and provision of ICT education & training: Higher education: new curricula and programmes in areas of high demand in the market at: Business schools offering condensed, short-term programmes (duration: approx. 6 weeks or...
7. Development and provision of ICT education & training: Vocational education: taught as dedicated subject in vocational schools (including apprenticeships) with the aim to become an ICT practitioner.
8. Development and provision of ICT education & training: Re-training and up-skilling measures for ICT practitioners with outdated skills.
9. Development and provision of ICT education & training: Re-training and conversion courses for unemployed offering them a job opportunity in the ICT area.
10. Career support addressed to STEM students, graduates and employees but also those from other disciplines interested in an ICT professional career
11. e-Skills frameworks and associated online tools for vendor-based certifications mapping onto e-competences allowing individuals for a self assessment of their competences and match to ICT job profiles and for employers in recruitment...
12. Job matching for ICT practitioners through implementing the European Vacancy Monitor, EURES etc.
13. Provision of market information on current and future supply of and demand for (different types of) ICT practitioners and professionals
14. Financial and fiscal incentives ranging from subsidised courses, training grants to tax incentives for employers and employees
15. Programmes addressed to increase immigration of ICT practitioners from third countries
16. ICT Professionalism initiatives making the ICT profession more transparent and attractive for a broader range of (potential) students at vocational schools and in higher education
17. Institution building: establishment of a dedicated (possibly government funded) institution (like eSkills UK) to promote and support the ICT profession through a multitude of activities
18. Dedicated policies and initiatives that aim to raise the share of women in the ICT workforce.

Exhibit 17: Stakeholder satisfaction with national e-skills policies and initiatives



Highest levels of satisfaction are reached with 46% for initiatives addressed to s-skills frameworks and associated online tools. 43% are satisfied with initiatives providing market information on current and future e-skills supply and demand.

Lowest levels of satisfaction can be found with initiatives for re-training and conversion courses addressed to the unemployed (38% express low or very low levels of satisfaction), re-training and up-skilling measures for ICT practitioners with outdated skills (36%) and those for mainstreaming ICT training in primary and secondary education (33%).

The situation is different when it comes to expressing satisfaction or dissatisfaction with *national* policies and initiatives. Here the picture is much clearer with experts not remaining at a neutral level when expressing levels of satisfaction but clearly expressing an opinion on almost all types of policies and initiatives. These are mostly negative and show rather low levels of satisfaction with the national e-skills policies and initiatives in the different countries reaching figures of between 40% and up to 58% of experts expressing dissatisfaction: 58% negative responses for programmes addressed to increase immigration of ICT practitioners from third countries, 52% for conversion courses for unemployed and 51% for initiatives addressed to institution building.

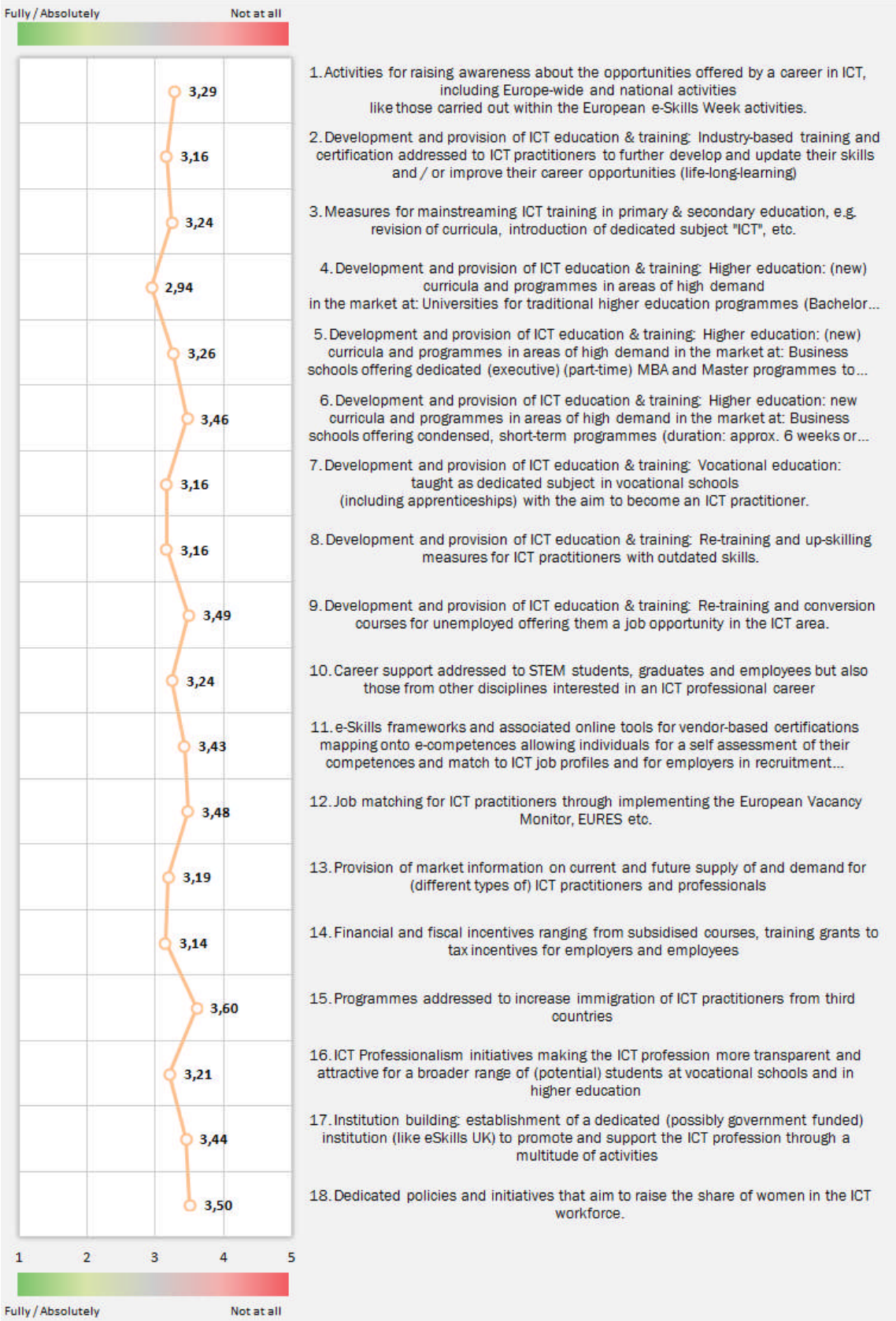
Higher levels of satisfaction expressed by around on third of the experts could only be achieved for two types of policies and initiatives: activities addressed to the development of new curricula for traditional higher education programmes (Bachelor and Master programmes) (32%) and initiatives addressed to vocational schools (30%).

3.3.4 Impact of European and national policies and initiatives at country level

The experts draw a rather negative image when it comes to the impact of European and national e-skills policies and initiatives at country level.

Depending on the policy type, negative judgements range from around one third of the experts and up to 59%. Retraining and conversion courses for unemployed are those where almost 60% argue that these did not have any or very little impact and benefit. Initiatives for job matching for ICT practitioners follow with 54%. Dedicated policies and initiatives that aim to raise the share of women in the ICT workforce come third with 48%. On average only around one third of the experts express positive views as to the impact and benefits of existing policies and initiatives at country level. With just 12% these positive judgements are lowest with respect to dedicated policies and initiatives that aim to raise the share of women in the ICT workforce and highest for initiatives providing new curricula for relevant Bachelor and Masters programmes (38%). Around a third of experts remain neutral in their judgement on impact of policies and initiatives at country level.

Exhibit 18: Stakeholder assessment of the impact of e-skills policies + initiatives at country level

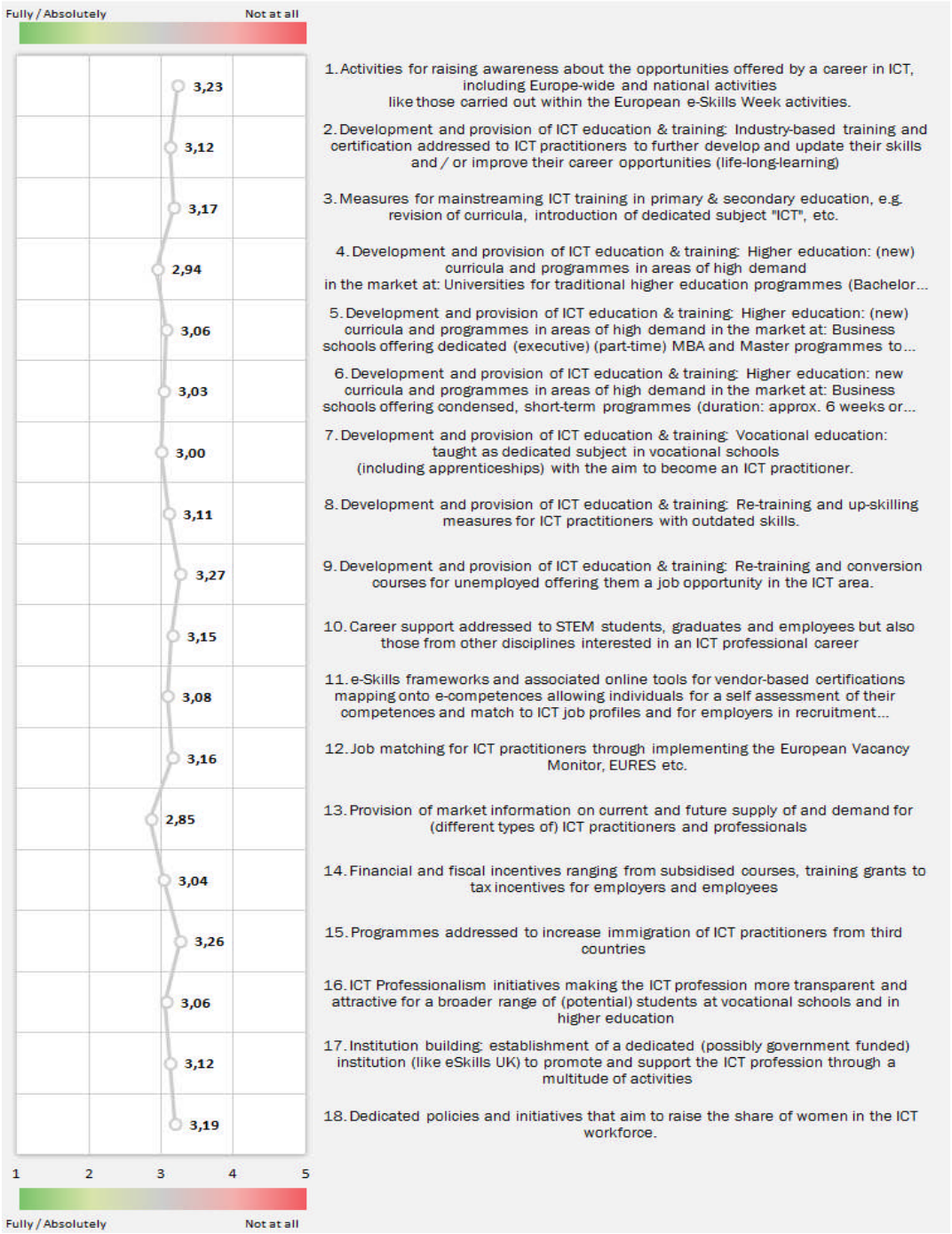


3.3.5 Tangible benefits in Europe

The vast majority of experts shy away from a judgement on whether existing policies and initiatives have revealed tangible benefits in Europe. It appears as if it is too early to ask this question since many of the policies and initiatives are still at a very early stage and have only been launched recently. This picture may become different in the incoming years.

However, those experts expressing an opinion are more negative than positive as to the visible and tangible impact of policy measure achieved. One third of the experts express negative views as opposed to one fifth being more positive. At the level of policy type the results show a high correlation to those on the impact at country level or level of satisfaction.

Exhibit 19: Stakeholder assessment of the tangible benefits of European e-skills policies and initiatives in Europe



3.3.6 Relevance of e-skills policies for the future

The experts almost unanimously state that all the types of e-skills policies and initiatives asked for will be of high or even very high relevance in the near future. The figures reached range from 80% to 90%. On average only around 10% see starting and continuation of such policies as superfluous. This is also reflected in the high scoring which is in most cases around 2 on the five-point Likert scale (1 = fully, 5 = not at all relevant) for almost all policy types.

Exhibit 20: Stakeholder assessment of the relevance of European e-skills policies and initiatives in the future

Only with respect to very few policy types a significant number experts refrain from giving a judgement and stay neutral. This applies to policies addressed to immigration from third countries (38% of experts stay neutral), those addressed to raising the share of women in the ICT workforce (27%) and others addressed to the provision of financial and fiscal incentives (27%).

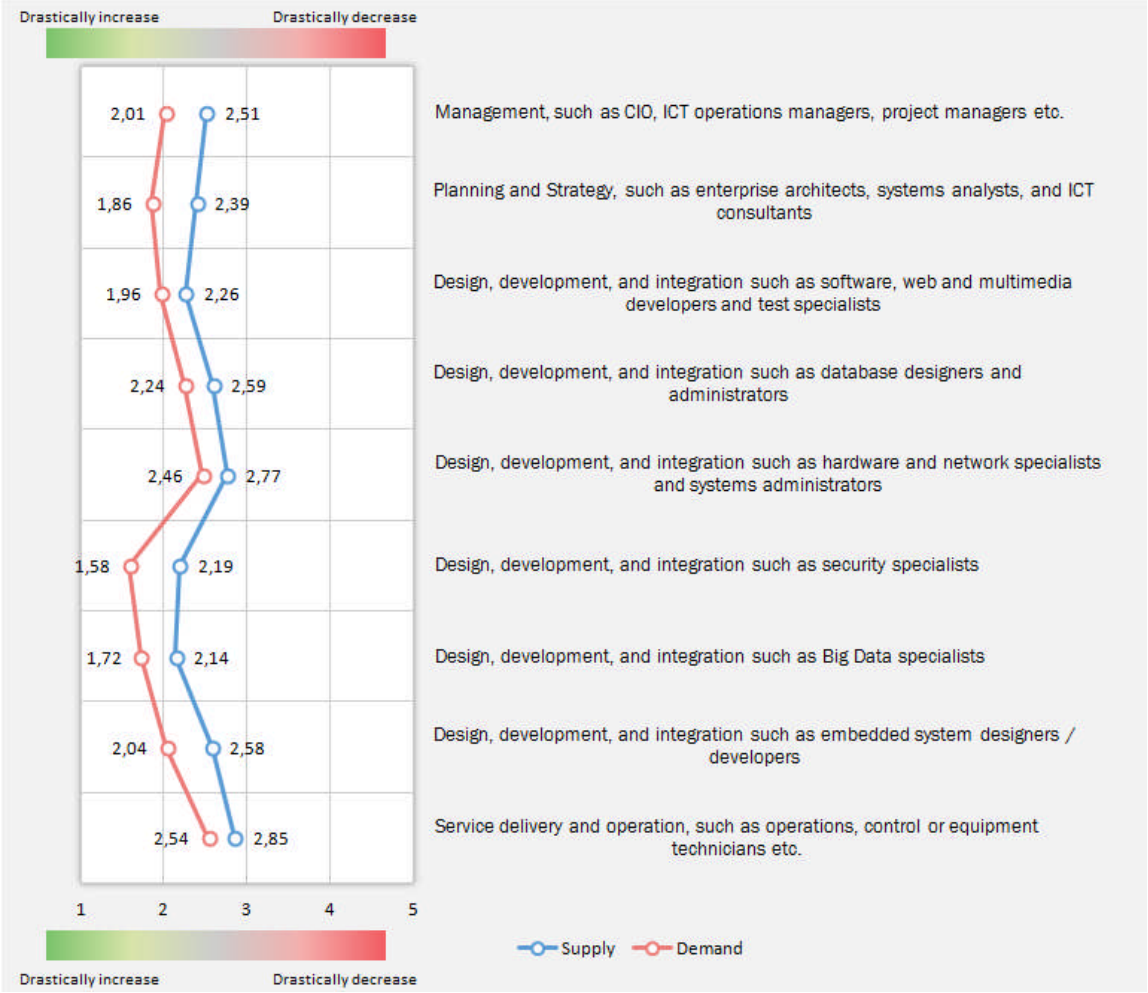
3.3.7 Development of e-skills supply and demand until 2020

The interviewed experts and stakeholders are optimistic with respect to the overall supply of ICT graduates and e-skilled individuals coming from the education systems in Europe over the coming years. Two third of the experts expect an increase or even drastic increase of suitable candidates from the national educations systems up until 2020.

Supply and demand show the same profile for each of the different job types. However, even with the expected increases of e-skills supply demand for e-skills will by far not be met since 92% expect the demand to increase beyond the supply level and many experts also believe demand to even increase very drastically.

Demand is likely to exceed supply throughout all professions and occupations asked for even at the low-end of ICT jobs including the service delivery and operation domain with operations, control and equipment technicians.

Exhibit 21: Stakeholder assessment on the e-skills supply and demand until 2020

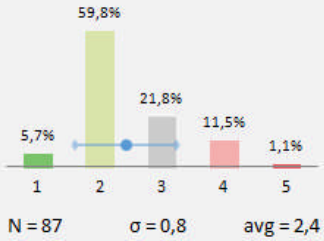


Not surprisingly, the highest discrepancy between e-skills supply and demand can be found in the following domains and occupations:

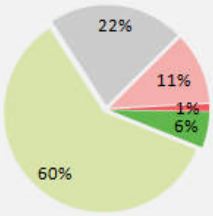
- Planning and strategy: enterprise architects, systems analysts and ICT consultants (64% expect an increase in supply but 93% an increase in demand)
- Design, development and integration: security specialists (68% increase in supply compared to 90% increase in demand, with 54% expecting a drastic increase in demand)
- Design, development and integration: Big Data specialists (72% increase in supply compared to 89% increase in demand, with 40% expecting a drastic increase in demand).

What are your expectations as to the development of the supply of ICT practitioners and professionals from the education sector and the industry demand of these until 2020?

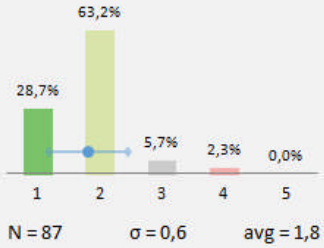
Supply from the education sector will:



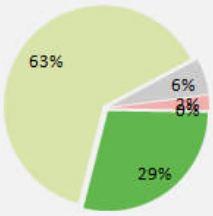
drastically increase (1)	5	5,7%
increase (2)	52	59,8%
neither nor /remain stable (3)	19	21,8%
decrease (4)	10	11,5%
drastically decrease (5)	1	1,1%
Total	*87*	*100%*



Demand by industry will:



drastically increase (1)	25	28,7%
increase (2)	55	63,2%
neither nor /remain stable (3)	5	5,7%
decrease (4)	2	2,3%
drastically decrease (5)	0	0,0%
Total	*87*	*100%*



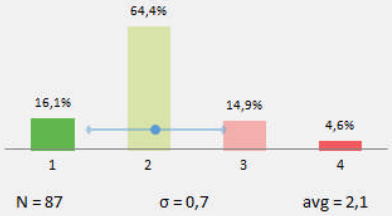
3.3.8 The role of the European Commission, national governments and other stakeholders

When it comes to the role of the European Commission and the national governments in Europe experts and stakeholders would strongly like to see both to continue in pursuing these as already started. However, the vast majority would like to see both – especially the national governments – to play a much more active role. While for the European Commission 16% argue that their policy activities should continue as before and 64% argue for a more active role, the corresponding figures for Member States governments are 5% and 74% respectively.

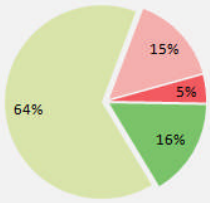
Discontinuation of activities is not at all an issue. Only a very low 5% of experts ask for this.

The message is clear: experts and stakeholders in Europe strongly expect the European Commission to continue with its activities and leading role in the development and implementation of suitable policies and initiatives in Europe and guiding national governments while national governments are expected to whole heartedly and much more strongly become active at national level.

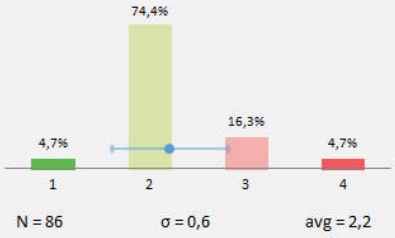
Is there a role for the European Commission in the future regarding e-skills?



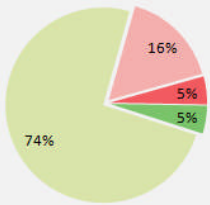
Yes, continue as before (1)	14	16,1%
Yes, but play a more active role (2)	56	64,4%
Yes, continue but change focus (3)	13	14,9%
No, discontinue activities (4)	4	4,6%
Total	*87*	*100%*



Is there a role for the national government and other relevant stakeholders in your country in the future regarding e-skills?



Yes, continue as before (1)	4	4,7%
Yes, but play a more active role (2)	64	74,4%
Yes, continue but change focus (3)	14	16,3%
No, discontinue activities (4)	4	4,7%
Total	*86*	*100%*



The future role of the European Commission

When analysing the comments made by the interviewees (see box below) and as already mentioned above, experts and stakeholders see the European Commission's role as the one of guiding and providing orientation to the national governments with a clear vision and targets and less academic discussions. The expectation is that activities move away from pure awareness raising initiatives to competence building ones with a specific focus on 'high-end' skills and those needed for innovation (e.g. e-leadership skills) and also focussing on the needs of SMEs. Experts also state that there is no 'one size fits all' approach towards national policies and initiatives. These need to consider and be developed and implemented within the different national contexts and levels of 'maturity'.

Further comments made by experts and stakeholders emphasise the necessary leading and driving role of the European Commission and the need for creating a 'learning environment' enabling different national stakeholders and actors to learn from experiences made elsewhere.

Many experts re-emphasise the urgent need for national governments and stakeholders to become more active and move away from 'talking to action'.

Expert statements on the future role of the European Commission in the area of e-skills policies and initiatives:

- The focus must change from large organisations to more support at the SME level.
- Orientation to specific projects planned for Europe, executed by country
- Move from awareness to competence building approach
- More clear vision and targets, less academically discussions and surveys
- Major focus on ICT needs, linking academic skills with professional needs
- Importance of Professionalism etc
- Further explicate the different career options in ICT
- Focus on high end skills
- Focus exclusively on awareness raising
- e-leadership skills
- Differentiated maturity per country ask for differentiated and focused roles
- Be less rigid in defining the solutions to challenges

Finally, and in order to best monitor activities and achieve a measurement of success experts asks for setting agreed targets and key performance indicators (KPIs) against which to regularly measure progress and make initiators and policy makers fully accountable for target achievement.

Further expert and stakeholder comments on the role of the European Commission:

- In my country the role of European Commission is not observed
- In convincing and stimulating the national governments to apply and integrate in the policies the results of the work of EC like e-CF, EQF, EQAVET etc.
- ICT (e-Skills) is not just about a connected world and the way citizens and administration or companies are related, but also about developing good and safe services. For such reason, it is important to emphasize the need for correct ICT skills, [...]
- I think the events are good, but somehow we lack momentum in showing real progress that is measured against some agreed KPIs and accountability.
- I have seen efforts on the "title" level but very few on the national and/or organizational level. More deeds, less talk.
- I have no clear ideas about what European Commission is doing ... and this is probably a problem (maybe on my side)
- Force national governments to take some core actions
- Focus more to linkages to the professional bodies of engineer associations like FEANI, VDI, VDE and encouraging their youth organisations as multipliers for ICT occupations
- Financing, under close scrutiny of application of funds, should be increased, allowing citizens and not the ICT skills development providers to take advantage of funding
- EC should keep on driving eSkills in order to keep the discussion neutral and not high-jacked by (USA based) vendors
- Consistency is the key to success the Commission should continue and build upon existing policies
- Be more open in your policies. Create an environment where the different countries can learn from each other. Instead of these fixed programmes with an industrial set of mind: Problem - solution - implementation.

The future role of national governments and stakeholders

Stakeholders and experts interviewed believe that national governments and other stakeholders should put a strong emphasis on vocational training and life-long-learning for teaching e-skills, an issue which has already become apparent from the analysis of the survey results above.

They also argue for the need to more intensively involve and commit national key policy makers at top policy level to such policies and activities to increase the likelihood for a long-lasting and sustainable impact.

Expert statements on the future role of national governments and other stakeholders in the area of e-skills policies and initiatives:

- To focus more on ICT skills upgrade for professionals; need specialist and practitioners
- The policies and practices are not enough research/evidence based.
- Requirements and programs content update, complement ICT programs with business and other industries content, support for vocational training and LLL.....
- Not only think for their country
- Need more senior involvement
- More focus on flexible skills and career motivation
- More attention to ICT in non-ICT sectors
- Matching supply/demand
- individual development of peoples skills
- Focus more on technical/vocational education
- Co-operation, transparency, continuity
- Changing focus from career aspects to intrinsic motivation

Further comments made by experts and stakeholders as to the role of national governments and stakeholders emphasise that a drastically increased level of activity at national level is urgently required and will have a much stronger impact in the country itself than any European policy could have.

Experts argue for a discontinuation of delegation of action to third parties and the need at national policy level show a much stronger political commitment including the need to get top government officials involved to spearhead such policies and initiatives. Experts also point to the possibilities of using Structural Funds for activities in this area.

Finally, the ask for reliable statistics as to the demand and supply of e-skills today and in the future, which requires a continuous monitoring and measurement and what one expert describes as an 'e-skills observatory' on national policies and initiatives and empirical evidence and statistics on e-skills supply and demand at Member State level.

Further expert and stakeholder comments on the role of national governments and stakeholders:

- There is a lack of a joint programme for the ministries involved.
- Their activities are the most important ones as they - in principle - are near to the needs of employees and organizations.
- The same message as for the Commission except that national policy will have an even greater effect on supply and demand through influence in national education systems and through tax incentives.

- The Italian agency for digital agenda is going to set up a multi-stakeholder national plan aimed to develop digital literacy initiatives and build up training plans on digital competencies
- The focus the government in Italy is placing on e-skills is to my opinion irrelevant
- The Agenzia Digitale Italia has to start an hopefully concrete role: 3 actions has been announced, now have to be implemented
- Short-term initiatives don't seem to make much difference - they might be expensive, loud-shouting and visually hard-punching, but are mostly one-day-wonders. Continuous efforts, including plenty of serious stakeholders seems much more sustainable.
- Right now more of the financial support goes for unemployed for basic ICT courses that doesn't match the European quality standards
- Political decisions prevail, the principle of equal opportunities is sometimes neglected.
- Need to utilise all potential levers to increase the quality and quantity of the supply of ICT talent, including through the domestic education and training system, continuing professional development of those at work, improved ICT talent retention [...]
- Need to get the top government officials to speak on the need for e-skills. At the moment, too much on operational level en too much delegation to 3rd parties.
- National governments could provide bigger support for organizing and coordination in definition of industry demands and development of policies for adequate supply of ICT professionals and practitioners.
- Most countries have no active e-skills & education policy for ICT. It is still need seen as important. I hope more EU countries will develop e-skills & education programs for ICT, linked to the EC programs.
- More programs that combine academic qualifications with industry certifications
- More joint policy planning between University and Government. No budget cuts for Universities!
- More focus on pupils outreach in ICT section
- More activities and financial support needed from government (EU programs) and stakeholders for different activities, also cooperation between government and stakeholders should be more efficient.
- Government and relevant stakeholders are doing quite a lot in the area of e-skills, but these issues should be addressed even more broadly and systematically.
- Develop national policy and strategy, use Structural Funds (RIS3, HRD, etc), stimulate private investments and cooperation academia-industry, etc.
- At country level, they should not only focus on their respective countries, but have in mind that they can benefit from also thinking "Europe".
- At a national level, more attention should be paid to obtaining better understanding of real demand so that supply can be matched appropriately. Currently much is anecdotal, rather than underpinned by real statistics.
- As at the European level, the focus must change from large organisations to more support at the SME level.
- As an example, the Experts Committee in Spain for the Digital Agenda does not include any ICT professional, just experts coming from the Telecommunications sector. Digital Society in Spain (and I-m afraid that in other countries) is intended as p [...]
- An e-skills observatory must be predicted in every country in order to coordinate better the European and National initiatives

3.3.9 Recommendations

The interviewed experts and stakeholders have articulated a large number of recommendations addressed to the European Commission, national governments and other stakeholders. A complete overview is provided in the following sections.

In the present report we can only highlight some of those which experts believe to be most urgent in terms of implementation in the short-term.

Recommendations addressed to the European Commission

Experts and stakeholders would appreciate a better or **more visible coordination of e-skills related activities of the different Directorate Generals at European Commission level**. They have recognised and are fully aware of the importance and value of the European e-Skills Strategy developed as part of the e-skills Communication and endorsed by the Council of Ministers in 2007 already. This has been the basis for the e-skill initiatives to follow and key to success in subsequent years culminating in the recently launched Grand Coalition for Digital Jobs.

Experts also demand **national policies and activities to be closely linked to and coordinated with Commission policies**. They have the vision of Europe to become a global leader in ICT training and e-skills geared towards market / industry needs, an opportunity which should be grasped and not be missed by Europe.

Experts and stakeholders argue that over the past years and initiated by the European Commission Europe has developed and implemented several prerequisites which can build the basis for the successful Europe-wide e-skills policy and initiative with implementations in each Member State. These include the development of the European e-Competence Framework (e-CF) and a series of associated online support tools (e.g. www.ecompetences.eu; www.eskillslandscape.eu). The next consequent step in order to reap the benefits of these would be a **Europe-wide promotion of the e-CF and the associated support tools** with the aim to put them to use at all levels (e.g. industry recruiting ICT staff, ICT staff further advancing their career, ICT graduates leaving universities, others interested in pursuing an ICT career, employment agencies and staffing industry matching vacancy competence profiles to those of individuals) and in all Member States.

Experts call for a **higher speed of action** in this area since the challenges are striking and ask for immediate and fast action. They ask for a European Action Plan agreed on with Member States.

Further recommendations – some of which already sketched above - address the need:

- For a European good practice learning platform
- To start initiatives already in early education (vocational schools or coder training activities in secondary schools ....)
- To develop new university / business school curricula better matching market needs
- To spend more attention on e-leadership and entrepreneurial education and
- A European guide to funding of ICT training initiatives.

Expert recommendations addressed to the European Commission:

- Try more and better to involve the EU countries in the e-skills & education programs. Grand Coalition might be a good shot to get this better settled.
- Too many programs that look alike: e-skills, e-inclusion, media literacy, film literacy, digital agenda, information literacy, digital literacy, 21th century skills, ICT skills etc. etc. What's the cohesion of all these different programs?
- More operative connection / interaction with national government
- Develop and implement better marketing policy of the competence and qualification frameworks. Support national governments in development and implementation of common European policies for supply the necessary quality and quantity of ICT [...]
- There are indications that modern technologies (particularly ICT) may be destroying more jobs than it is creating. This issue is being ignored but needs urgent attention.
- The work of the EU Commission has greatly advanced the knowledge re the impending ICT professional skill shortage across Europe. This has helped to focus national attention re what needs to be done domestically against this backdrop. The Grand [...]
- The main issue is not skills. The focus should be in ensuring high end ICT jobs in Europe by developing an European ICT cluster that aims to develop ICT solutions for European citizens and business reaping in the full benefits of a common market.
- The Government´s involvement will be critical. More commitment needed.
- The European Commission should pay more attention to the distance education and e-skills which would help citizens to become lifelong learners who flexibly respond to change, are able to pro-actively develop their competences and thrive in collaboration [...]
- The European Commission could articulate all the pro-active actors to work jointly in the design of a European plan to be implemented locally by country and region.
- The Commission needs to strengthen its policies and related programmes for Member States, to gear the EU towards becoming a leader in ICT training and industry relevant at international and global level
- Spread Digital Skills in basic education (coding, instead of using). Define clearly, at the same level than other critical professional services, ICT services that can affect security of citizens and information.
- "Raise the stakes! ICT will determine the competitiveness of our future workforce.
- More transparency and guidelines from the Commission to member states about how to make funding available to employers and commercial training companies.
- Push tools like e-skills framework out to member countries. Make sure they use it as a tool in their policy making.
- Provide frameworks which can be adopted by the market like OCG did in the past
- Perhaps a naive recommendation, but none the less, I feel that there is very little representation from national governments in the highly relevant meetings and activities that take place in Brussels. Centralized policies or activities have a mu [...]
- Need for more speed of action
- Need for an action plan with money in each measure.
- European Action Plan, specific and concrete measures to carry out. Each measure must have European funding and national governments
- Agree with national governments action plan
- More cooperation through the countries, dissemination of results, new e-skills frameworks
- More attention to the labour market of ICT professionals in small and medium-size countries
- Leave more room for stakeholders to suggest solutions, rather than having a fixed idea of what is needed, even before analysis of current situation is carried out.

- Keep raising the issue, even if solutions are at national level
- If we want more women in the ICT field there has to be a broad, good financed activity. It is very sad to see that there are some low level activities with a small group of girls and some studies without any impact at all. There is so much to do [...]
- I would increase activities on the organizational level. Most of the resources seem to go to the institutional education, though most of the learning takes place by the job.
- Focus on pupils outreach.
- Focus on business benefits / economic benefits of ICT for the business users of ICT. Too much focus on suppliers of ICT solutions. Also, get the SME market / i.e. the long tale more involved. See too much the 'usual suspects' at the table.
- European Commission should arrange special programs dedicated to educators/universities focused on faculties which educate in ICT.
- Don't change course but continue to spread good practice and collect reliable data to guide national initiatives.
- Develop recommendations for Member States, put more attention on e-leadership and entrepreneurial education, put more attention on ICT professionals in other areas - health, ecology, education, etc.
- Develop and implement coherent strategy and policies for the ICT sector.
- Continue driving forward, supporting and encouraging overall consistency of frameworks, concepts and tools to be elaborated by multi-stakeholder parties as done in the past. A currently disturbing element from my broader Consulting perspective i [...]
- Communicate more, using media and methodologies suitable to the target groups
- Collect, analyze/generalize and share best practices.
- Circulate some more structured information about action progress and results in different countries
- Monitor where, how and when available money is used
- Be more open in your policies. Create an environment where the different countries can learn from each other. Instead of these fixed programmes with an industrial set of mind: Problem - solution - implementation.
- An e-skills observatory must be predicted in a European Level and in every country in order to coordinate better the European and National initiatives.

Recommendations addressed to national governments and stakeholders

Many of the recommendations addressed to the European Commission are being re-iterated and find a counterpart in those addressed to national governments and players.

Like for the European Commission the interviewees strongly argue for an **application and use of the European e-Competence Framework (e-CF) and associated online support tools** (e.g. www.ecompetences.eu; www.eskillslandscape.eu) throughout the European Union.

Again experts call for a **higher speed of action** in this area and ask for **immediate and fast action building on national strategies and action plans** urgently needed.

Further recommendations can be found below.

Expert recommendations addressed to national governments and stakeholders:

- What is applicable at the European level must also apply at the national level. There are indications that modern technologies (particularly ICT) may be destroying more jobs than it is creating. This issue is being ignored but needs urgent attention.
- We should invest more in education. I think ICT professionals should spend some of their time in the schools preparing the ICT professionals of the future. My son in high school is studying C Language: I think this would be OK 20 years ago ...
- We hope to see applied the e-CF as official framework in job matching and more ICT education in scholastic environment.
- Use to tools developed by the Commission like e-skills framework, and integrate it in all national policy regarding supply and demand of ICT workforce
- Create unified system of distance learning for pupils.
- Focus on retraining and certification
- There is demanding need to think more about ICT education in other sectors.
- Support people and organization with incentives to standardize but also in personal development, books, college $$ is often a blocker for individuals.
- Setting up a National Commission where all stakeholders plan and take decisions together after carrying out research on the current situation at National level : University, government, social partners and NGO centres of learning to evaluate and [...]
- Need for more speed of action
- Need coordinated action - between different initiatives as well as with private sector
- National policies; integration and cooperation; e-inclusion; use of European framework
- More senior government officials should be involved, get the ministry of Education at the table to help with ICT image and schooling.
- More attention to flexible ICT skills, allowing for career variety and flexible career development
- More attention to digital literacy, not addressing to e-skills area as only dedicated to ICT professionals.
- It is not only about talking, local Governments should execute and also make "noise" about what is needed and what is done.
- Involve ALL stakeholders in policy development and implementation.
- Implement rules to support application of the recently approved national certification system -extend the system to all level of professionalism (not only for apprenticeship)
- Unify the regional policies and build up a national ICT competence [...]
- I would increase activities on the organizational level. Most of the resources seem to go to the institutional education, though most of the learning takes place by the job.
- Further develop national qualifications framework for ICT and widen the functions of ICT sector skills council to cover monitoring, analysis and forecast of the sector's skills demand both in quantitative and qualitative aspects.
- Ensure that ICT becomes embedded in education systems, not to be regarded as an industry phenomenon but as a skills issue that affect all industries from medicine through to construction and beyond.
- Develop national strategies and action plans, integrate e-skills strategies in RIS3, stimulating PPPs, etc
- Continue with the e-skills & education programs. Try more to cooperate on European level to work together with other countries on the exchange of students & ICT workers. Make the ICT labour market more mobile on European level.
- Actively support the initiatives coming out of mainland Europe, both showcasing and funding.

4 e-Skills supply and demand in Europe 2000-2020

4.1 Definitions

The ICT workforce in Europe in 2012 comprises 7.4 million workers, or 3.4% of the European workforce. 5.9 million of these can be classified as ICT practitioners and 1.5 million as ICT professionals at management level and include CIOs, ICT operations managers, project managers but also those ICT workers responsible for planning and strategy such as enterprise architects, systems analysts and ICT consultants.

Broadening up the definition further, ICT mechanics and manual workers skills would add 1.36 million ICT workers, to a European Labour Force of 8.8 million ICT workers.

The ICT workforce is here defined according to occupational categories from the ISCO – International Standard Classification of Occupations 2008 and quantifications will make use of the figures from the Labour Force Surveys (LFS) of the EU-27 Member States provided by Eurostat. We have carried out a mapping of ISCO-08 codes to the European e-Competence Framework (e-CF) based ICT job profiles since data based on e-CF definitions is not directly available.

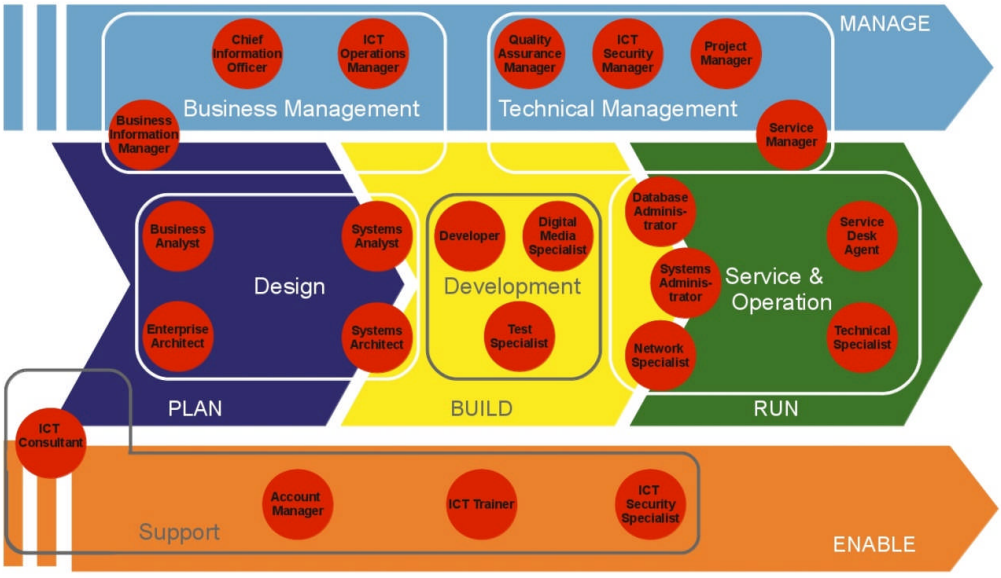
The workforce of ICT professionals as used in this report includes:

- Management, architecture and analysis level positions (ISCO level 1+2)
- ICT practitioners in professional level positions (ISCO level 2)
- ICT practitioners in associate or technician level positions (ISCO level 3)

Our usage of the term "ICT professionals" will usually not include:

- ICT mechanics and manual workers skills[11].(ISCO level 7+8)
- Non-ICT professionals working in the ICT sector.

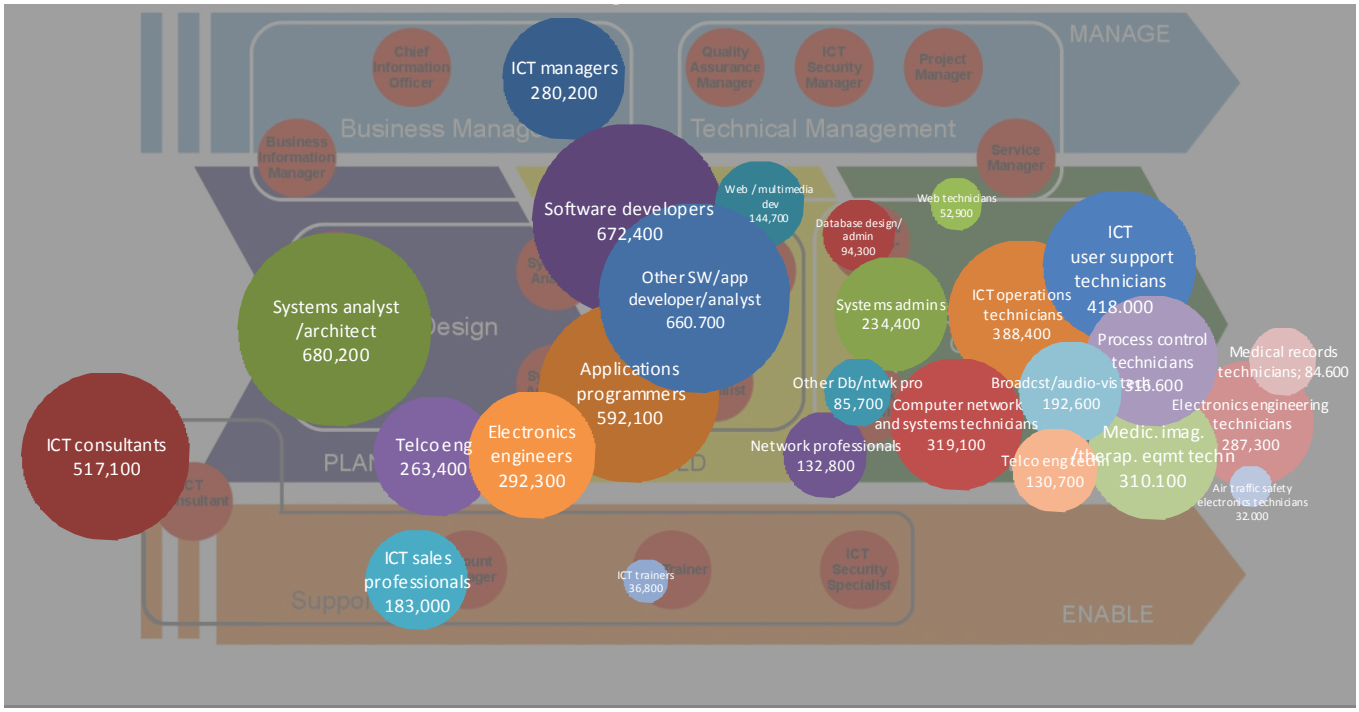
Exhibit 22: CEN ICT job profiles based on e-CF



Source: CEN

[11] ICT mechanics and manual workers skills are not included in the ICT professional category and are not included in the vacancy calculations. They comprise: 7421: Electronics mechanics and servicers; 7422: Information and communications technology installers and servicers; 8212: Electrical and electronic equipment assemblers.

Exhibit 23: ICT profiles as a definition template of the ICT profession



Source: *empirica*

The relevant ISCO codes are as follows:

Management, architecture and analysis positions		
1330	Information and communications technology service managers	
2421	Management and organization analysts [12]	
2511	**Systems analysts**	

ICT Practitioners		
ICT practitioners, professional level		ICT practitioners, technician or associate level
2152	Electronics engineers	**3511 Information and communications technology operations technicians**
2153	Telecommunications engineers	**3512 Information and communications technology user support technicians**
2356	Information technology trainers	**3513 Computer network and systems technicians**
2434	Information and communications technology sales professionals	**3514 Web technicians**
2512	**Software developers**	
2513	**Web and multimedia developers**	3114 Electronics engineering technicians
2514	**Applications programmers**	3139 Process control technicians not elsewhere classified
2519	**Software and applications developers and analysts not elsewhere classified**	3155 Air traffic safety electronics technicians
2521	**Database designers and administrators**	3211 Medical imaging and therapeutic equipment technicians
2522	**Systems administrators**	3252 Medical records and health information technicians
2523	**Computer network professionals**	3521 Broadcasting and audio-visual technicians
2529	**Database and network professionals not elsewhere classified**	3522 Telecommunications engineering technicians

Source: *empirica. Occupations in* ***bold font*** *are part of the "narrow definition" of ICT workforce used for time series analysis.*

[12] According to the ISCO code 2421 "Management and organization" includes non-ICT consultants as well as ICT consultants. Our estimation based on limited empirical evidence for Germany is that at least 50% are ICT consultants; therefore the number of jobs is multiplied with 0.5.

As far as possible a distinction will be drawn in the subsequent quantifications between the management level skills and ICT practitioner skills.

Exhibit 24: ICT workforce in Europe in 2012

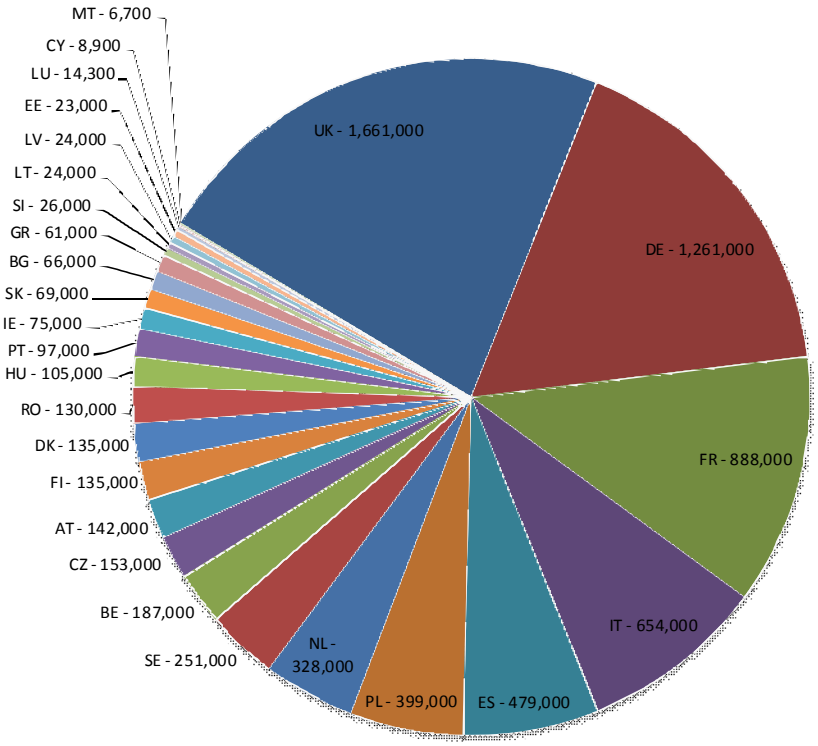
	i Management, Business Architecture and Analysis level skills	ii ICT practitioners, professional level (ISCO level 2)	iii ICT practitioners, technician and associate level (ISCO level 3)	iv Total ICT professionals (i+ii+iii)	v Total (iv) as share of workforce	vi ICT mechanics and manual workers skills (ISCO levels 7+8)	vii Total ICT workers (i+ii+iii+v)	viii Total (vii) as share of employed workforce
UK	358,000	935,000	368,000	1,661,000	5.6%	96,000	1,758,000	6.0%
DE	295,000	693,000	273,000	1,261,000	3.1%	263,000	1,524,000	3.8%
FR	130,000	365,000	393,000	888,000	3.4%	102,000	990,000	3.8%
IT	69,000	140,000	445,000	654,000	2.9%	153,000	807,000	3.5%
ES	64,000	168,000	247,000	479,000	2.8%	113,000	592,000	3.4%
PL	69,000	196,000	134,000	399,000	2.6%	123,000	522,000	3.3%
NL	130,000	151,000	47,000	328,000	3.9%	26,000	353,000	4.2%
SE	88,000	85,000	77,000	251,000	5.4%	34,000	285,000	6.1%
BE	51,000	78,000	59,000	187,000	4.1%	20,000	208,000	4.6%
CZ	10,300	56,000	87,000	153,000	3.1%	51,000	204,000	4.2%
AT	30,000	64,000	48,000	142,000	3.4%	17,500	160,000	3.8%
FI	40,000	68,000	28,000	135,000	5.5%	23,000	158,000	6.4%
DK	25,000	57,000	53,000	135,000	5.0%	7,900	143,000	5.3%
RO	25,000	59,000	46,000	130,000	1.4%	96,000	226,000	2.4%
HU	8,300	64,000	33,000	105,000	2.7%	74,000	179,000	4.6%
PT	12,000	38,000	46,000	97,000	2.1%	19,100	116,000	2.5%
IE	12,600	44,000	18,600	75,000	4.1%	17,900	93,000	5.0%
SK	6,000	22,000	41,000	69,000	2.9%	42,000	110,000	4.7%
BG	12,700	24,000	29,000	66,000	2.2%	16,800	82,000	2.8%
GR	12,200	26,000	24,000	61,000	1.6%	11,400	73,000	1.9%
SI	6,100	12,700	7,600	26,000	2.9%	12,000	38,000	4.2%
LT	6,900	11,100	6,100	24,000	1.9%	6,300	30,000	2.4%
LV	5,000	10,000	8,500	24,000	2.7%	1,400	25,000	2.8%
EE	4,600	12,000	6,700	23,000	3.7%	7,900	31,000	5.0%
LU	3,700	7,400	3,100	14,300	6.0%	800	15,000	6.3%
CY	1,900	4,500	2,400	8,900	2.3%	1,600	10,500	2.7%
MT	1,500	2,500	2,600	6,700	3.9%	1,800	8,500	4.9%
EU27	1,477,000	3,393,000	2,532,000	7,403,000	**3.4%**	1,364,000	8,766,000	4.1%

Source: *empirica calculations based on an LFS data retrieval done by Eurostat.*

ICT practitioners are working in almost all industries of the economy and not just in the ICT industry sector, and it appears reasonable to assume that almost full employment [13] of this occupational group exists in Europe.

Looking at the European ICT professional workforce as a whole, it becomes apparent that three countries already account for half of today's jobs, namely the United Kingdom, Germany and France. Adding Italy, Spain, Poland and the Netherlands already this group of seven would reflect already three quarters of the European ICT professional workforce.

Exhibit 25: ICT professional workforce 2012



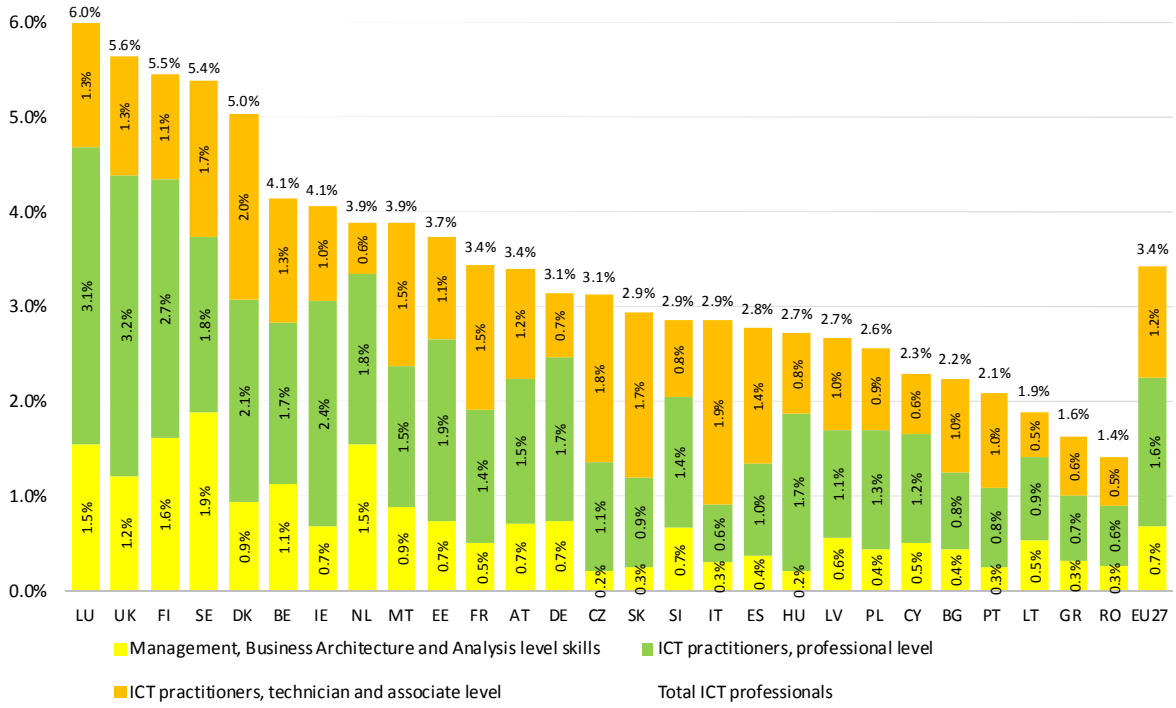
Source: *empirica*

The share of the ICT professional workforce within the total workforce is 3.4% in Europe and varies significantly across the European countries. Sixteen EU Member States show shares below the EU-27 average with Greece, Lithuania and Romania below 2% and Portugal, Cyprus and Bulgaria at levels below 2.5%. The other extreme includes the United Kingdom, Luxembourg, Sweden, Finland and Denmark with a share of above 5%.

There is a slightly positive correlation between the share of management levels skills among professionals and the share of ICT professionals in the workforce. While on average one in five (20%) ICT-professional jobs is in ICT management, architecture and analysis, countries with an overall large ICT workforce tend to have seen a trend towards higher-level skills in the ICT workforce. In the Netherlands which features the largest share of management, architecture and analysis jobs, their share is 40%, followed by Sweden (35%), Finland (30%,) Lithuania (29%), Belgium (27%) and Luxembourg (26%). Countries with a share below 15% are, in ascending order, the Czech Republic, Hungary, Slovakia, Italy, Portugal, Spain and France.

[13] As for the forecast model, we assume that full employment is reached at an unemployment rate of 2%. We model this as a natural rate of unemployment that will not be fallen short of.

Exhibit 26: ICT professional workforce as share of employed Labour Force in Europe 2012

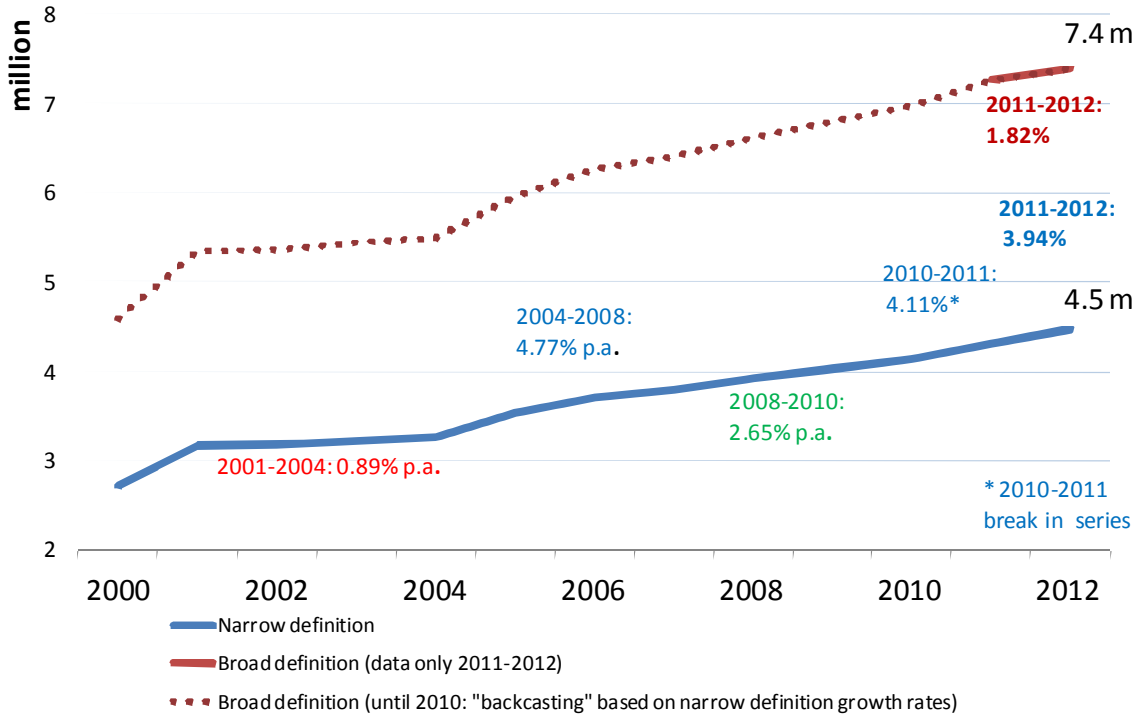


***Source**: Eurostat LFS: based on ISCO-88 codes 213, 312*

4.2 ICT workforce in Europe today and developments from 2000 - 2012

The development of the ICT workforce in Europe between 2000 and 2012 has been very dynamic. The size of "ICT workforce" naturally depends on the definition used. If using a minimum definition, that only includes a core set of practitioners, in the first decade of the millennium, from 2000-2010, we have seen an average compound growth rate of 4.26% and of 3.94% between 2011 and 2012 (with a break in series 2010/11).

Exhibit 27: Development of ICT employment and average annual growth rates in Europe 2000 – 2012



Source: Eurostat LFS. Narrow definition: 2000-2010 ISCO-88 groups 213, 312: "Computing professionals" and "Computer associate professionals". Break in series 2011: ISCO-08 groups 25 "ICT professionals", 35 "Information and communications technicians". Broad definition: see elsewhere in this document.

In a broader definition, today's ICT workforce in Europe amounts to 7.4 million workers [14], the growth of workforce according to this broader definition has however been 1.8% between 2011 and 2012[15].

A growth rate of 4.26% means a doubling of stock every 17 years. It is arguably the case that continuous percentage growth (exponential growth) cannot be taken as trend-extrapolation in the longer to very long term, but for the short term horizon it will be a good heuristic to compare to [16].

Europe and the world have seen two major economic crises in the first decade of the millennium. After the dot-com bubble burst in 2000, many firms in the ICT sector went bankrupt, were slashing employment or at least putting on the brakes in terms of new hiring. Consequently, ICT employment suffered as can be seen in the above diagram with only marginal increases for the years 2001-2004.

The banking crisis began to show in 2008, evolved into an economic crisis and sovereign debt crisis Europe is still trying to cope with today. Crass unemployment has been building up in many countries after 2009 until today. In terms of ICT employment, however, nothing similar seems to have happened. Between 2008 and 2010, ICT employment increased by on average 2.65% per

[14] See definitions in the previous chapter.

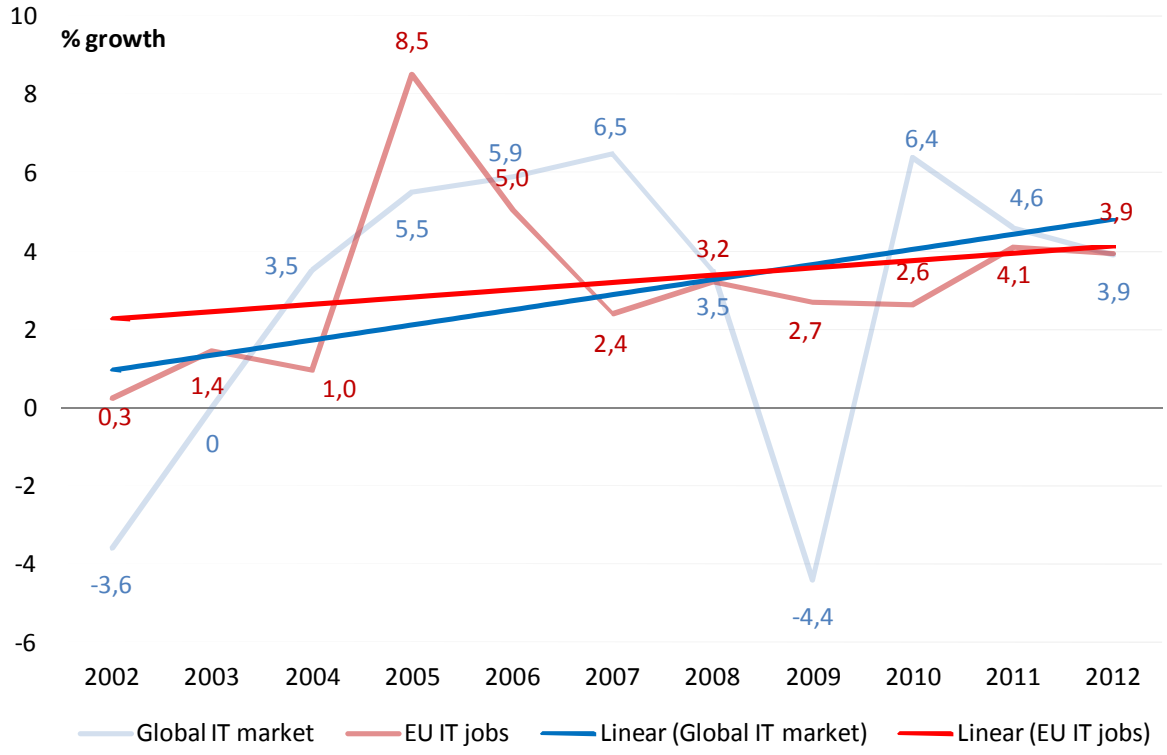
[15] There are no data available before 2011 for the broader definition; therefore the above figure uses an estimated "backcast", applying the core definition growth rate retrospectively to a 2011 baseline.

[16] As an anticipation of the next chapter: the three main scenarios developed here feature compound annual growth rates of demand (not jobs!) of 1.3% (stagnation), 1.8% (main) and 2.6% (disruptive boost). Job growth, which is obviously restricted by the assumptions about supply developments, in these cases would be 0.6, 0.8 and 1% respectively.

year. Between 2011 and 2012 we see rapid job growth, with different segments of the ICT labour market benefiting more than others.

Comparing growth rates of ICT employment with IT market growth (globally as per EITO 2013), it becomes obvious that there is a correlation between the two, but also that ICT workforce growth is more resistant to crisis than total IT spending. IT employment growth never turned negative, while the IT market did so twice in the observed period.

Exhibit 28: Global IT market and EU ICT jobs 2002-2012 (growth in %)



Source: Empirica based on EITO 2013 and Eurostat LFS data

4.3 ICT graduates in Europe 2000 - 2010

The major inflows into the ICT workforce would obviously come from the ICT graduates from Higher, and in some countries Vocational, Education. The e-skills supply in Europe in 2012 from ICT graduates from Higher Education can be estimated to sum up to 115,000 ICT graduates[17]. A closer look at the developments over the past 10 years shows a trend indicating decreasing numbers throughout Europe for the past years, but especially in the United Kingdom and Sweden. After a

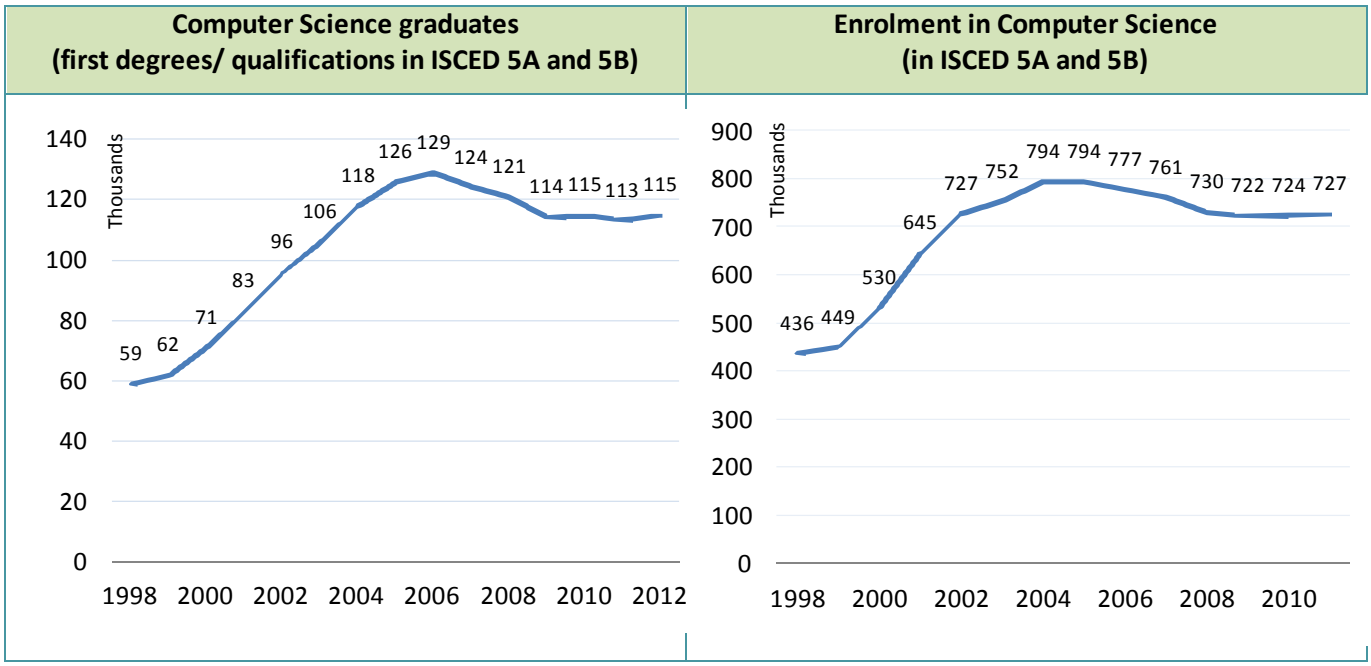
[17] This figure represents a count of first degrees in ISCED 5A and first qualifications in 5B. The number of students entering the labour force in a given year does not equal but is approximated by this number of graduates, as many will go on to second or further degrees (master, PhD). However, also counting second degrees would mean that every student is counted more than once, even if in different years.

By counting only first degrees/qualifications, every graduate will be counted only once (except the supposedly very rare cases of doing both a 5A and 5B degree), even if labour market entry may be at a later point in time. However, there may be an issue of double counting with initial vocational degrees (ISCED 3 and 4), to which individual learners may later add an ISCED level-5 degree.

Another issue with this method lies in a poor representation of those graduates who earn a second (master's) degree but switch subjects. On the one hand, ICT related bachelors may switch to other subjects and not enter the workforce as ICT professionals, while on the other hand there are numerous ICT related masters that are addressed to non-ICT bachelors.

continuous increase and a peak of 129,000 ICT graduates leaving universities in 2006 the figures went down.

Exhibit 29: Enrolment in and Graduates from Computer Science studies (ISCED 5A and 5B) in Europe (EU27)



Source: *Eurostat, some imputations and assumptions apply*

The interest in pursuing ICT careers seems to have been diminishing since the middle of the last decade, when the number of graduates had reached a peak. The number of computer science graduates grew even after the dot com bubble burst, but has been in decline in Europe since 2006.

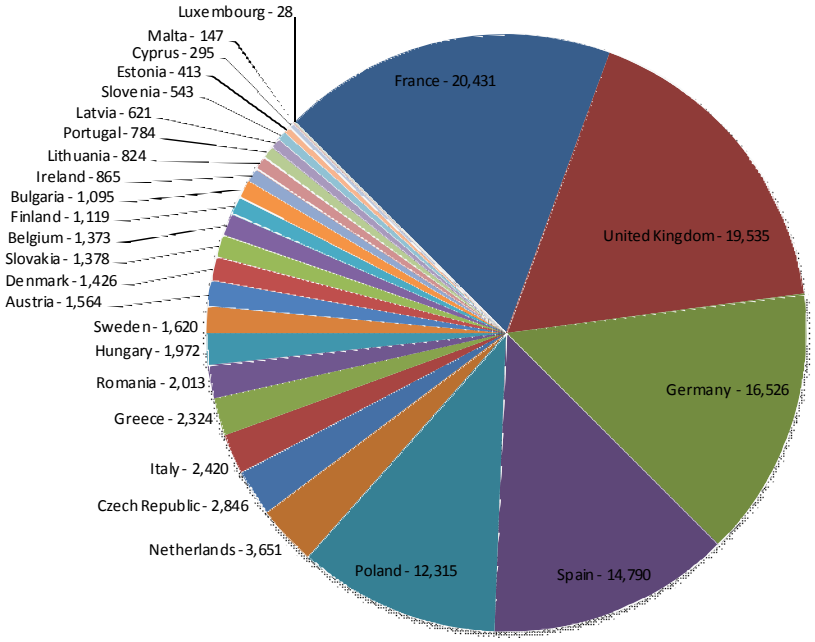
The effect of the decrease in the number of graduate entrants to the ICT workforce is intensified in Europe by an increasing number of retirements and exits, as ICT practitioners leave the workforce.

The most dramatic decrease of graduate numbers can be observed in the UK, where the number of graduates today is down to just 63% of the number it used to be in 2003. Decreases can also be observed in the other countries except Germany and France.

France has meanwhile overtaken the United Kingdom in terms of ICT graduates from university and now contributes 18% of all European graduates. The UK comes in second with 17%, and Germany third (15%) of the European computer science graduates to the labour market. The shares have changed dramatically, if compared to ten years earlier when the UK produced almost a third of Europe's Computer Scientists (30%) and Germany just 7%.

Enrolment has also reached a peak in 2004 and 2005, but figures have stabilised recently and a slight increase is visible since 2009.

Exhibit 30: ICT graduates (first degrees in ISCED 5A and first qualifications in 5B) in Europe 2011



Source: *empirica*

Exhibit 31: Tertiary level computer science graduates in European countries 2000 – 2011

Total number	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
EU-27	72,366	84,918	94,327	105,966	117,964	125,471	128,815	123,994	121,118	113,965	114,565	112,918
France	11,447	14,841	15,461	16,081	18,088	20,094	19,673	18,409	17,551	19,136	20,431	20,431
United Kingdom	21,918	24,992	27,009	30,767	27,670	29,557	28,239	25,156	23,802	19,154	19,180	19,535
Germany	5,630	5,860	6,617	8,368	11,090	12,767	14,238	16,092	16,515	17,194	16,800	16,526
Spain	10,963	13,727	16,152	19,323	19,718	18,559	17,298	15,760	14,551	15,071	15,068	14,790
Poland	1,912	3,542	4,112	5,879	10,681	13,116	14,788	14,209	13,023	12,406	12,535	12,315
Netherlands	1,308	1,454	1,645	1,754	3,611	3,969	4,650	4,385	4,083	3,928	3,858	3,651
Czech Republic	2,328	2,676	2,734	1,215	1,498	1,643	2,133	2,406	2,909	3,047	2,939	2,846
Italy	1,626	1,519	2,423	2,843	3,211	3,459	3,541	3,385	2,933	2,870	2,778	2,420
19 other Member States	16,596	18,049	20,087	22,126	24,572	24,767	25,621	25,056	25,751	21,159	20,976	20,404
Relative to peak	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
EU-27	56	66	73	82	92	97	**100**	96	94	88	89	88
France	56	73	76	79	89	98	96	90	86	94	**100**	**100**
United Kingdom	71	81	88	**100**	90	96	92	82	77	62	62	63
Germany	33	34	38	49	64	74	83	94	96	**100**	98	96
Spain	56	70	82	98	**100**	94	88	80	74	76	76	75
Poland	13	24	28	40	72	89	**100**	96	88	84	85	83
Netherlands	28	31	35	38	78	85	**100**	94	88	84	83	79
Czech Republic	76	88	90	40	49	54	70	79	95	**100**	96	93
Italy	46	43	68	80	91	98	**100**	96	83	81	78	68
19 other Member States	64	70	78	86	95	96	99	97	**100**	82	81	79

Source: *Based on Eurostat, some estimates.*

Exhibit 32: Vocational graduates in Computing in European countries - 2000 – 2011 [18]

Total number	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
EU-27	28,978	51,622	54,328	67,777	74,516	97,385	65,116	62,307	50,087	63,063	65,267	67,330
Poland	5,934	11,867	14,206	17,563	16,214	34,070	16,814	12,068	4,996	17,329	19,841	20,474
Germany	8,204	12,512	17,062	22,551	24,000	21,600	20,636	21,028	17,752	16,849	14,433	14,169
Spain	3,216	1,372	0	0	28	898	3,335	4,387	3,955	7,011	9,814	11,088
Netherlands	1,395	3,204	5,411	6,873	8,289	8,476	6,602	5,809	5,774	5,833	5,706	5,987
Hungary	0	12,086	5,180	5,134	5,131	5,156	4,761	4,378	3,942	3,136	3,278	3,494
Slovakia	3,797	2,616	2,271	1,685	2,529	2,461	2,624	2,643	2,171	2,171	2,171	2,171
Austria	619	640	831	1,022	1,213	1,403	1,594	1,785	1,797	1,636	1,858	1,911
Finland	969	1,620	2,151	2,338	2,506	2,185	2,047	1,957	1,783	1,700	1,648	1,499
Belgium	789	1,559	912	1,729	0	913	850	1,022	910	972	1,306	1,290
Greece	0	0	2,720	5,439	11,763	14,340	2,753	3,745	3,330	2,288	1,246	1,246
Bulgaria	270	225	237	245	301	403	502	596	565	712	748	756
Slovenia	244	230	175	189	334	248	373	423	604	635	608	620
Latvia	88	58	44	12	364	470	537	506	511	436	535	525
Romania	1,271	1,336	1,181	1,089	975	804	684	363	141	374	449	384
Estonia	419	842	662	650	476	491	344	285	188	212	273	383
Malta	7	13	20	27	34	40	303	564	766	554	361	363
Portugal	12	23	35	46	58	69	81	180	279	427	437	284
Sweden	44	0	0	0	19	227	55	57	89	135	194	266
France	0	0	0	0	0	35	80	325	350	410	158	158
Lithuania	0	0	0	0	0	28	46	45	46	73	77	124
Ireland	1,679	1,316	953	590	227	2,997	49	75	75	75	75	75
Luxembourg	14	0	19	37	56	70	46	66	37	50	46	58
Czech Republic	0	0	0	0	0	0	0	0	1	3	4	5
Denmark	8	103	260	557	0	0	0	0	24	43	1	0
Italy	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0
United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0

Source: *Based on Eurostat, some estimates.*

4.4 E-skills demand in Europe 2012

4.4.1 ICT skills shortages

Today, like in almost all recent years except for the aftermath of the dotcom-bubble bursting, the demand for ICT workers is outstripping supply. The results of a representative empirica survey of CIO's and HR managers in eight European countries in 2012 show that the demand for e-skills, i.e. ICT professionals and practitioners, extrapolated to the whole of Europe (EU-27) can be estimated at around 274,000 in 2012. This is based on the numbers given by CIOs and HR managers in European organisations for the number of vacancies in ICT-related occupations.

[18] Count of Computing graduates in Upper secondary education (level 3) - pre-vocational and vocational programme orientation and Post-secondary non-tertiary education (level 4) - pre-vocational and vocational programme orientation

Among these, we find a demand of about 73,000 vacancies for the EU-27 for "ICT management and business architecture" skills and about 201,000 for "Core ICT practitioners" and "Other ICT technicians" jobs.

Of these vacancies, 82,000 are reported in Germany, which exhibits the by far largest excess demand of all countries. With the economic situation currently differing as it does between Member States, differences are visible with regards to national levels of demand.

With 201,000 open posts, the number of vacancies is significantly higher for ICT Practitioners compared to the ICT management and business architect level professionals with around 73,000 vacancies. As percentage of existing workforce, there are 3.4% open positions for practitioners and 5.0% for management and architecture jobs.

4.5 ICT professional workforce forecasts 2012 – 2020

Three scenarios have been prepared in the course of the study. The main forecast scenario represents the most likely future as we foresee it, while a stagnation scenario assumes a slightly less favourable future and a disruptive boost scenario is meant to describe a future of increased demand due to ICT based disruptions of one or several industries of yet unknown kind. Scenarios are meant to span the space of likely possible futures.

4.5.1 Methods

The forecasting models differentiate between stocks and flows, or between a baseline market and dynamic entries and exits. The baseline basically consists of a number of existing jobs, number of vacancies and number of unemployed ICT practitioners. Flows are modelled as entries of graduates and exits of professionals.

Supply side model

The availability of individuals with the different types of e-skills who are either gainfully employed or seeking employment is termed e-skills supply to the labour market. As mentioned above, the e-skills supply **stock** includes individuals in ICT practitioner positions and unemployed ICT practitioners. The scope of e-skills supply depends on the scope of the e-skills definition used and is obviously not static.

The supply total for 2012 is estimated at 7.59 million, of which 7.40 million are in employment and 188,000 unemployed.

E-skills **inflows and outflows** to/from the labour market need to be identified and statistically measured and future developments modelled to gain a comprehensive and complete picture of e-skills supply in the market. To capture market dynamics, i.e. the inflows and outflows of individuals in the pertinent e-skills categories, specific approaches need to be developed.

New market entrants typically are **computer science graduates** of **tertiary education** entering the labour market. In many countries (Germany and Poland in particular) also (post-) secondary **vocational training** plays a major role as supply pool.

Anecdotal evidence supports the observation that the share of computer science graduates has increased in ICT recruitment over the last decade[19], yet **other graduates**, from mathematics,

[19] A UK study of 2001 still found that „the majority of graduates working in ICT jobs do not hold a degree in an ICT related subject. While the most common degree subject is maths or computing (40 per cent), others include engineering and technology (21 per cent), physical sciences (11 per cent) and business studies (nine per cent). Graduates employed as computer analysts/programmers display the greatest range of degree subjects. Also, female graduates working in ICT occupations are more likely to have degrees in non-ICT or non-technical subjects (e.g. social

natural sciences, engineering or social sciences who possess the IT skills demanded still today fill ICT positions that would otherwise remain vacant.

While it is relatively easy to approximate an adequately accurate annual supply of university leavers and vocational school leavers with a major in ICT, any attempt to distil a supply pool from the official statistics about natural science, maths, or social sciences graduates has to rely on evidence based assumptions and auxiliary hypotheses about the share of outsiders entering the ICT workforce.

Also **career changers** originally coming from a non-ICT background may take on ICT positions, furthermore re-entrants who had been out of the labour market previously. While recent research (e-skills QUALITY Study: www.eskills-quality.eu) shows that certification has become crucial for ICT practitioners across all backgrounds, it can be assumed that especially for "educational outsiders" certification and re-skilling programmes play a crucial role in adapting the workforce skills to the demand side requirements.

Finally, **immigration** is a source of additional supply to the market.

Certifications and re-skilling programmes play a crucial role in adapting the workforce skills to the demand side requirements.

Supply side **exits** may be due to **retirement, temporary leave** (e.g. parental leave) and **emigration** of ICT workers as well as promotion or other **career change** to non-ICT jobs (– or jobs at least not statistically captured as ICT jobs).

The necessary statistical data regarding university graduations is publicly available from Eurostat. Further inflow indicators of relevance - which could be considered subject to availability of the necessary data - include data from immigration and career changers or market re-entrants.

Outflow data would mainly include statistics on retirements, emigration, career changers or re-entrants. This kind of data is hardly available across countries and estimates have to be based on analogies.

Demand side model

Conceptually, demand given as a specific figure, i.e. not as a function of wage (as in textbook economics), is the size of the workforce that the market would absorb shortly given that the current wage level prevailed. Markets tend to adjust via the price or quantity offered of the commodity. However, certain limitations apply in the labour market in the short term as regards the availability of skills, and obviously also with regards to the wages employers are willing to pay.

While a short-term demand can be computed by adding existing and open posts, future demand will be highly path dependent. A planned demand that cannot be satisfied today and over a longer period and where prospects of filling it are meagre will eventually lead to evasion on the demand side, i.e. changes in the production structure. Therefore it is crucial to understand the concept of future "demand potential" which will be a demand given the supply available is not actually too distant from the plans of the enterprises. It should therefore be noted that an extremely high projected number of vacancies in a distant future will probably not actually be realised, but derives from a demand potential for potential jobs which could be created if Europe manages to produce the skills needed for these jobs.

Demand potential up until 2020 is calculated and estimated using the following observations:

- The long term trend of ICT workforce growth over the past decade

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sciences). (THE INSTITUTE FOR EMPLOYMENT STUDIES (2001): An Assessment of Skill Needs in Information and Communication Technology.) http://dera.ioe.ac.uk/15250/1/An%20assessment%20of%20skill%20needs%20in%20ICT.pdf)

- Annual growth of ICT employment has remained very robust throughout the crisis
- The correlation between the ICT workforce growth rates, GDP growth rates and IT investment growth rates have been disappearing somewhat during recent years
- There seems to be less influence of economic cycles and a stronger indication of a "mega-trend"
- Consequence for foresight: Heavier weighting of "trend" in favour of "economic situation"

The approach contains the following inputs:

- Market insight data on enterprise IT spending
- Market insight data on hardware, software, services: IT Budgets
- Market insight data on Consulting Budgets
- (Semi-) Official Statistics on IT spending / IT investment (EITO, Eurostat)
- An evidence based estimate on the split of IT budgets into hardware, software, services
- Estimation of Labour costs, internal and external
- Correlation with GDP growth, IT investment and IT labour market
- Scenario outputs on the assumptions of GDP growth, IT investment which leads to estimations of IT labour demand (costs)
- Assumptions on wage developments and IT labour costs result in an estimation of IT labour headcount
- Cloud computing is included to take massive effect from 2015 on, together with a beginning maturity of some markets in terms of outsourcing and offshoring. Other major markets yet are still catching up through this period.
- Scenarios furthermore deliver assumptions on the distribution of IT labour costs into a) management / business architecture level, b) core ICT practitioners and c) ICT technicians. Cloud computing mainly puts pressure on ICT practitioner demand, while lifting demand for management / business architecture type of skills.

As is inherent in the concept of demand *potential*, adjustments to supply shortage need to be made in the scenarios.

Assumptions for forecasting future e-skills developments

Several assumptions for forecasting the future e-skills developments in Europe have been developed which build the basis for the calculation of e-skills demand and supply for the period up until 2020. These relate to the:

- Entry rate of ICT graduates, both from tertiary and vocational education (ISCED 3-5) into the ICT workforce;
- Development in the numbers of ICT graduates from tertiary education from 2012 to 2015 and 2020 varying between the different scenarios;
- Development in the numbers ICT graduates from vocational education from 2012 to 2015 and 2020;
- Entry rates of STEM graduates entering the ICT workforce;
- Upgrading of skills of outsiders and career changes through IBTC (estimated number of awarded industry-based ICT training certifications);
- Replacement demand of ICT practitioners and ICT management staff leaving the workforce annually (Cedefop based);

- Expansion demand varying according to scenario with a baseline based on applying historical correlations of GDP and ICT investment and a trend component;
- ICT Management recruitment[20] (ICT managers, enterprise architects, ICT consultants) specifying a percentage of individuals from the ICT practitioner pool getting promoted to management level and those coming from the business management pool;
- Excess demand baseline 2012 based on empirica CIO / HR manager survey on ICT vacancies, 2012;
- Intra-EU migration from excess supply to excess demand countries (only in those years and from those countries where excess supply exists).

4.5.2 First scenario: "Main forecast scenario"

The first scenario features an economic growth scenario based on ECFIN forecasts until 2014 and a slow recovery afterwards. GDP growth across Europe is assumed at an average of 1.0 % compound annual growth rate between 2012 and 2015 and increases to 1.7 % on average annually between 2015-2020.

Moderate IT investments will be reflected in 2.2 % p.a. growth until 2015, with an increasing trend from 2014 on, so that the second half of the decade will see a growth rate of 3.0 % on average. IT investments will not least build upon a rapid diffusion of mobile devices and apps and of cloud services and other new IT delivery models. Big data applications and services are expected to grow considerably over the complete period of the forecasting.

SME investments in IT innovation will increase only very slowly because of the slow recovery and persistence credit crunch.

In the education domain, and this is assumed for all scenarios alike, we will see a slight increase in the number of ICT graduates (2% increase per year on average). Labour mobility increase to on average 18.000 cross border movements per year, from countries of low demand to countries with excess demand.

Data driven commercial services on the web, also driven by mobile devices, will imply some "big brother" risks. Politically we will see a continuing incremental process of building Europe step by step. Continuing negotiations between Member States will bring about gradual and cumulative progress in European cohesion.

[20] Advanced positions, especially ICT managers, can be recruited from the pool of ICT practitioners or through side entries of non-ICT practitioners (e.g. managers from other departments). In both cases, there are no statistical concepts of the pools of suitable candidates available, as is the case with university or vocational graduates for practitioner labour market entries. Seasoned practitioners are an obvious source for management jobs, but both working experience and life-long learning credentials have to match with the position. While bottlenecks are reported to exist by employers who claim to have a hard time finding good e-leaders, it is hard to model exact evidence-based parameters for these bottlenecks into our labour market model. We finally resorted to assuming external side entries to be 33% of new demand for management positions (with an unlimited pool), and 67% to be tried to recruited from the existing practitioner pool. For practitioners, a bottleneck of no more than 1.25% of existing practitioner workforce annually was introduced into the model. The breakdown of total number of vacancies into management and practitioner positions therefore has to be taken with a pinch of salt, as it is likely to underreport management vacancies and over report practitioner vacancies.

Exhibit 33: 'Main forecast scenario': Real GDP growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.0%	-0.1%	1.1%	1.4%	1.6%	1.2%	1.3%	1.5%	1.7%
Germany	0.7%	0.4%	1.8%	1.5%	1.6%	1.3%	1.4%	1.6%	1.8%
Italy	-2.4%	-1.3%	0.7%	1.0%	0.8%	0.8%	0.9%	1.1%	1.3%
Poland	1.9%	1.1%	2.2%	3.8%	3.6%	3.5%	3.6%	3.8%	4.0%
Spain	-1.4%	-1.5%	0.9%	1.5%	1.9%	1.2%	1.3%	1.5%	1.7%
UK	0.3%	0.6%	1.7%	1.9%	1.5%	1.3%	1.4%	1.6%	1.8%
EU21	-0.6%	-0.1%	1.5%	2.0%	2.1%	1.8%	1.9%	2.1%	2.3%
EU 27	**-0.3%**	**-0.1%**	**1.4%**	**1.7%**	**1.7%**	**1.4%**	**1.5%**	**1.7%**	**1.9%**

Source: *IDC Europe*

Exhibit 34: 'Main forecast scenario': IT spending growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.1%	1.0%	2.5%	2.8%	3.0%	3.4%	3.8%	4.2%	3.8%
Germany	2.1%	2.2%	2.6%	2.7%	2.8%	3.3%	3.6%	3.7%	3.7%
Italy	-2.1%	-2.9%	1.1%	1.7%	2.2%	2.1%	2.8%	5.1%	5.1%
Poland	1.0%	2.5%	2.6%	4.7%	4.9%	5.1%	5.2%	5.3%	4.6%
Spain	-4.0%	-8.4%	1.0%	1.5%	1.9%	2.7%	4.3%	4.1%	3.1%
UK	1.6%	1.6%	2.2%	2.3%	2.7%	2.5%	2.1%	1.7%	1.2%
EU21	1.2%	1.8%	4.0%	4.4%	3.4%	2.9%	2.3%	2.3%	2.1%
Total	**0.8%**	**0.9%**	**2.7%**	**3.0%**	**2.9%**	**3.0%**	**2.9%**	**3.1%**	**2.9%**

Source: *IDC Europe*

The following analysis is courtesy of IDC Europe:

IDC surveys of 2012 in France, Germany, France, Italy, Spain, the Nordic countries and the United Kingdom in December 2012 see 42% of West European organizations expecting to increase their total external IT spend in 2013, slightly more than the 40% said they increased their spend in 2012. On the other hand, 23.1% are budgeting for a decrease in their total IT spend in 2013 - some three percentage points lower than the percentage of organizations that actually reduced their spend in 2012.

So, compared to actual 2012 spending outcomes, organizations in Western Europe are a little more bullish in 2013, both in terms of the increased number planning to expand their external IT spend and the decreased number planning to reduce it. However, if we compare the external IT spend budgets set for 2013 with the budgets previously set for 2012, there is a more mixed picture. For while IDC sees a higher percentage of organizations budgeting for external IT spend growth in 2013 than was the case in 2012 (42% versus 40%), they also see a higher percentage of organizations budgeting for a reduction of spend in 2013 than was the case in 2012 (23% versus 17%). The difference of course comes from the middle - those organizations expecting to hold total external IT spend steady, which declined as a percentage from 43% of 2012 budget respondents to 35% of 2013 budget respondents. So, with a "two speed Europe" comes a "squeezed middle".

If we look at the level of IT spend expansion, we find that 20% of organizations are planning to increase their total IT spend by more than 5% in 2013. That is just under half a percentage point

less than the percentage of organizations that actually increased their spend in 2012. Interestingly, however, it is double the percentage (9.8%) that budgeted for total IT spend increases of more than 5% for 2012. Meanwhile, the percentage of organizations planning smaller budget increases of 1-5% this year is down by eight percentage points (at 22%, versus 30%) compared to this time last year.

So among those organizations planning to increase total IT spend, we see an apparent core of organizations significantly more bullish about relatively rapid (>5% growth) expansion of IT spend now than in early 2012, but with other organizations planning growth being more cautiously expansionary than they were this time last year.

We then did our European Enterprise Services Survey at end of February 2013. These are some of the results:

A majority of IT services spend in Western Europe remains focused on supporting the existing IT infrastructure, but almost half of all IT services spend is around technologies and services that drive new value for the organization. Some 45% of IT services spend in 2013 in Western Europe will go to projects or technologies that drive revenue growth, increase customer-citizen satisfaction, or otherwise help the organization to meet its business goals, while 55% of IT services spend will be allocated to running and maintaining existing IT systems.

The main finding in strategic terms is that "business is back": using IT to support the business (rather than to cut costs) is now the strategic priority for a clear majority of organizations. 60% of organizations say that their strategic IT priority for 2013 is either to improve overall IT service levels to the business or to improving the alignment of IT with business needs. That is an improvement from last year's survey, when 52% or organizations said their top strategic priority was one of these two business-oriented priorities.

Cost control nevertheless remains important as a strategic driver of IT spending and is still cited as the main strategic driver by two fifths of respondents. But support for cost-oriented strategic priorities declined (by seven percentage points) since 2012. It appears that some organizations that focused heavily on using IT to cut running costs in 2012 have now shifted their focus on driving revenue growth for the organization, or at least to supporting it better by (for example) driving up customer/citizen satisfaction or making the business more agile and efficient.

Forecasting results

In the 'Main Forecast Scenario', the ICT workforce in Europe will grow from 7.4 million in 2012 to 7.9 million in 2020, of which 5.9 million will be ICT practitioners and 2 million ICT management level employees.

Exhibit 35: e-Skills Jobs – 'Main forecast scenario':
Development ICT Professional e-skills Jobs in Europe 2011 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.477	1.475	1.519	1.574	1.638	1.712	1.791	1.876	1.964
ICT Practitioners	5.925	5.944	5.932	5.929	5.933	5.945	5.961	5.971	5.986
Total	7.403	7.419	7.451	7.503	7.571	7.657	7.752	7.848	7.950

Source: empirica model forecast.

Demand is increasing despite the modest economic circumstances, to over 8 million in 2015 and 8.9 million in 2020.

Exhibit 36: e-Skills Demand Potential - 'Main forecast scenario': Development of ICT Professional e-skills Demand Potential in Europe 2011 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.551	1.617	1.694	1.778	1.869	1.961	2.059	2.155	2.247
ICT Practitioners	6.126	6.140	6.179	6.235	6.300	6.382	6.473	6.548	6.616
Total	7.677	7.757	7.873	8.013	8.169	8.343	8.532	8.703	8.863

Source: *IDC Europe*

The **excess demand** or shortage (calculated as the number of open posts)[21] amounts to **509,000 in 2015** and **913,000 in 2020**. This figure can best be described as **'demand potential' or 'job potential' for ICT jobs**. It should be seen as a (theoretical) figure describing the demand potential for new ICT jobs which – under the above assumptions – could theoretically and additionally be created in Europe due to an e-skills demand likely to occur especially in the years closer to 2020.

Recalling the definition of demand potential, in 2020 the labour market would be able to absorb 630,000 potential additional jobs which could be created in ICT practitioner occupations and around 283,000 at ICT management level.

Exhibit 37: e-Skills Vacancies Estimate- 'Main forecast scenario': Summing-up of National ICT Professional Excess Demand in Europe 2011 – 2020

EU27	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	73,000	142,000	174,000	204,000	231,000	249,000	268,000	279,000	283,000
ICT Practitioners	201,000	196,000	247,000	306,000	367,000	437,000	512,000	577,000	630,000
Total	274,000	338,000	422,000	509,000	598,000	686,000	780,000	855,000	913,000

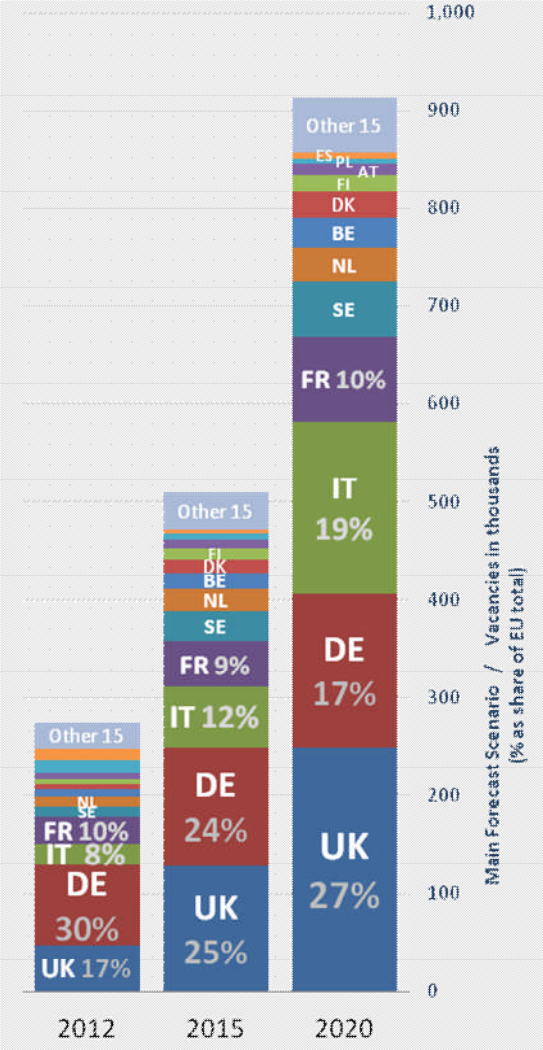
Source*: empirica model forecast.* ***Note:*** *this is a summing up of national excess demand figures,* ***not*** *balanced with oversupply in other countries, but after migration.*

While currently a relative majority of vacancies exists in Germany, the comparably lower graduate figures in the United Kingdom and in Italy suggest that the problem of skills shortages will severely aggravate in these countries. While in absolute figures increasing from 80,000 to over 150,000, the share of German vacancies in the European total decreases from 30% in 2012 to 17% in 2020. By contrast, the number of vacancies grows immensely in the UK from 47,000 to almost 250,000. In Italy, the number of vacancies is expected to rise from 22,000 to almost 180,000.

This figure of course strongly depends (of course among other factors) on the cross border mobility of IT workers into countries of highest demand.

[21] This model simply adds up the national balances of supply and demand, but only where they reveal an excess demand. It should be noted that this is still a very conservative estimate, as within countries a perfect geographical match is assumed. Mismatches thus only occur between countries. Migration, which alleviates the geographical mismatch, is already built into the model, as described in the assumptions section. Apart from geographical mismatches, skills mismatches only exist between management and practitioner level skills, but the assumptions on management level recruitment out of the pool of practitioners are also conservatively estimated, rather overestimating the mobility between these categories.

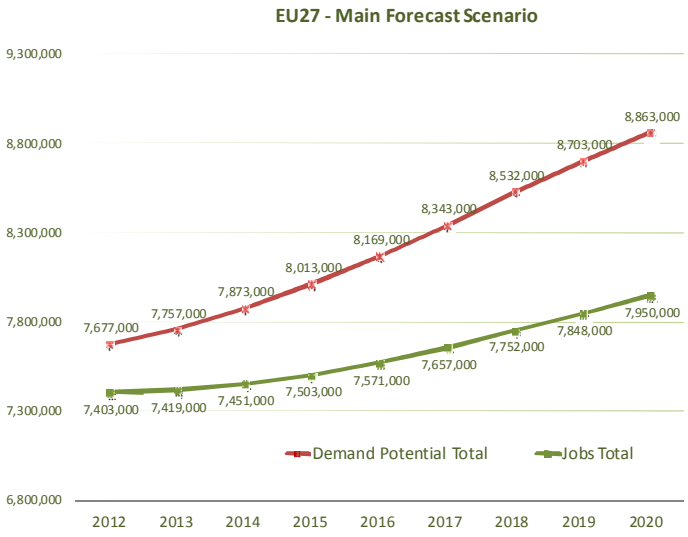
Exhibit 38: e-Skills Vacancies Estimate- 'Main forecast scenario': Distribution of vacancies per country

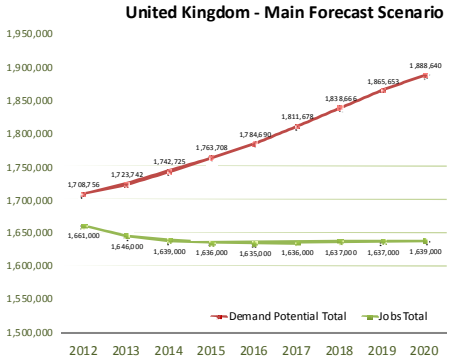


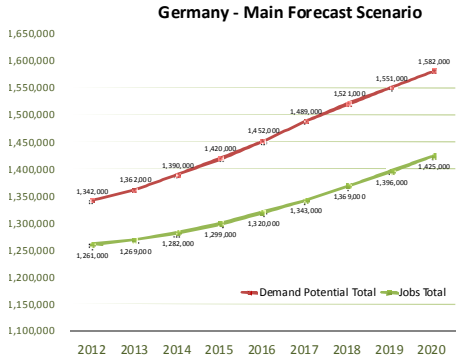
Source: *empirica model forecast.*

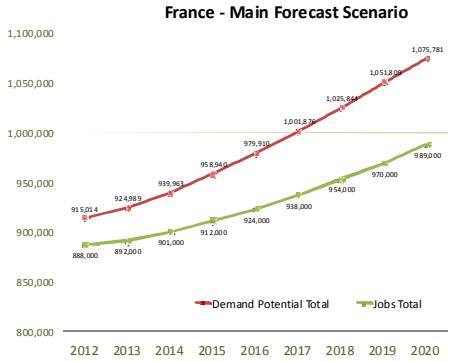
The model has been built cautiously to include some migration, but figures by no means contribute strongly to alleviation of shortages. We foresee a net immigration of ICT workers into the UK in the order of magnitude of 43,000 over eight years and 19,000 to Italy. Poland and Spain are the main countries of origin, the reason being that the supply outstrips demand in these countries. While in Poland the reason is a comparatively strong supply, in Spain it is rather a very cautious new demand as the country slowly experiences recovery from the economic crisis.

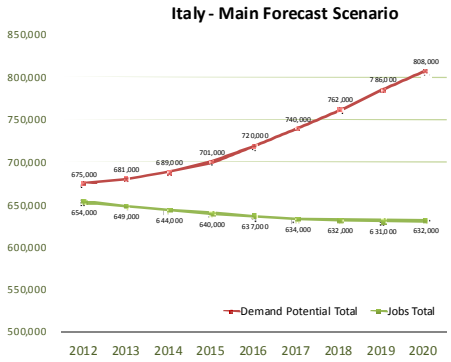
Exhibit 39: Main Forecast Scenario: ICT Professional Jobs and Demand in Europe (EU-27) 2012 – 2020

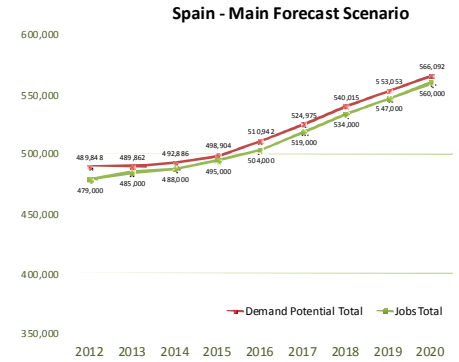


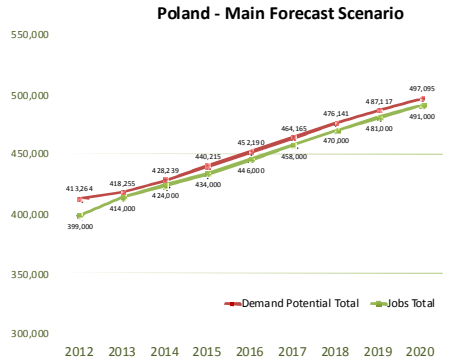


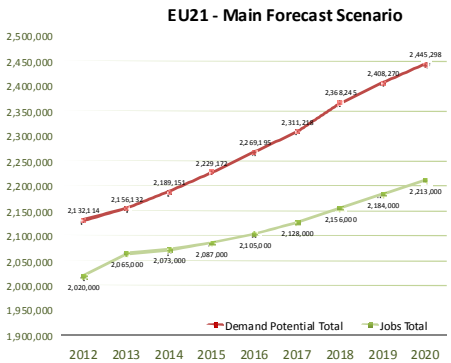


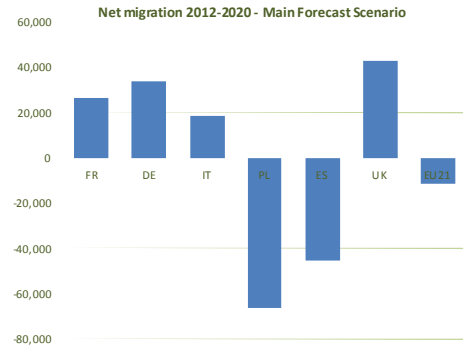


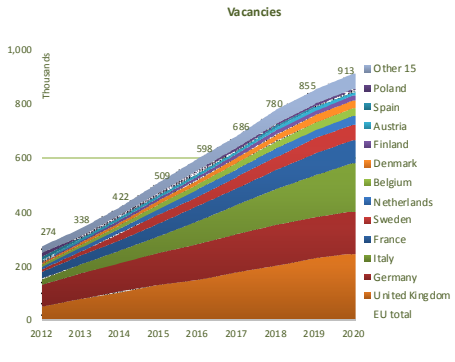












***Source**: empirica model forecast*

Bottom line

The Main Forecast Scenario features a modest job growth of 100,000 until 2015, a figure which is heavily restricted by supply. 509,000 more jobs could be created if the skills were available. The bottlenecks are largest in the UK and Germany, but also Italy. Taken together, these three countries will account for more than 60% of all vacancies in Europe.

4.5.3 Second scenario: "Stagnation"

The second synthesis scenario called "Stagnation Scenario" features a stalling economic recovery: Southern European economies remain in recession – with high taxes and continued austerity policies. The US budget fight might repeat itself, constraining available spending and thus giving little IT investment impetus. The impact is also felt in the rest of the world.

Growth in China and other emerging markets slows down, with effects felt in Germany and many European countries which relied on increasing business from emerging economies as a strategy of recovery.

As a consequence of the continued economic mire, IT budgets and investments are once again under pressure - new projects once again put on hold. Again, the focus of IT expenditure is on "keeping the lights on". A vicious cycle entails as lack of investments stops innovation, increases technical glitches and security breaches which in turn makes it difficult for companies to focus on top line growth. This will mean that ICT investments will continue to hover around the 2% mark.

Exhibit 40: 'Stagnation' scenario: Real GDP growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.0%	-0.1%	0.5%	0.8%	1.0%	0.8%	0.9%	1.1%	1.3%
Germany	0.7%	0.4%	1.2%	0.9%	1.0%	0.9%	1.0%	1.2%	1.4%
Italy	-2.4%	-1.3%	-0.3%	0.0%	-0.2%	0.0%	0.1%	0.3%	0.5%
Poland	1.9%	1.1%	1.6%	3.2%	3.0%	3.1%	3.2%	3.4%	3.6%
Spain	-1.4%	-1.5%	-0.1%	0.5%	0.9%	0.4%	0.5%	0.7%	0.9%
UK	0.3%	0.6%	1.1%	1.3%	0.9%	0.9%	1.0%	1.2%	1.4%
EU21	-0.6%	-0.1%	0.9%	1.4%	1.5%	1.4%	1.5%	1.7%	1.9%
Total	-0.3%	-0.1%	0.7%	1.0%	1.0%	0.9%	1.0%	1.2%	1.5%

Source: *IDC Europe*

Exhibit 41: 'Stagnation' scenario: IT spending growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.1%	1.0%	1.2%	2.1%	2.4%	2.6%	3.2%	3.5%	3.6%
Germany	2.1%	2.2%	1.5%	2.0%	2.2%	2.6%	3.0%	3.2%	3.5%
Italy	-2.1%	-2.9%	0.1%	0.5%	1.0%	0.9%	0.3%	0.2%	0.4%
Poland	1.0%	2.5%	1.9%	3.4%	3.7%	5.7%	5.3%	4.7%	4.0%
Spain	-4.0%	-8.4%	-0.1%	0.1%	0.5%	2.6%	3.8%	3.1%	2.1%
UK	1.6%	1.6%	1.5%	1.9%	2.1%	2.1%	2.0%	2.1%	2.0%
EU21	1.2%	1.8%	1.7%	3.7%	2.7%	2.6%	1.6%	1.7%	1.9%
Total	0.8%	0.9%	1.3%	2.3%	2.2%	2.5%	2.3%	2.4%	2.5%

Source: *IDC Europe*

Forecasting results

In the stagnation scenario, Europe sees little job creation in ICT occupations, with the number of jobs increasing only by 80,000 until 2015, afterwards the labour market is gaining traction slowly and will create up to a 400,000 additional jobs in 2020 compared to the 2012 baseline.

Exhibit 42: e-Skills Jobs – 'Stagnation' scenario:
Development ICT Professional e-skills Jobs in Europe 2012 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.477	1.475	1.516	1.561	1.610	1.659	1.711	1.766	1.823
ICT Practitioners	5.925	5.943	5.924	5.921	5.926	5.934	5.948	5.965	5.983
Total	7.403	7.418	7.440	7.482	7.537	7.594	7.659	7.732	7.807

***Source**: empirica.*

Still, even in the stagnation scenario, demand is evolving faster than supply. By 2016, the European economy would be able to offer jobs to 8 million ICT workers, increasing to 8.5 million in 2020.

Exhibit 43: e-Skills Demand Potential - 'Stagnation' scenario:
Development of ICT Professional e-skills Demand Potential in Europe 2012 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.551	1.613	1.676	1.733	1.783	1.837	1.896	1.960	2.025
ICT Practitioners	6.126	6.146	6.163	6.198	6.257	6.312	6.374	6.444	6.512
Total	7.677	7.759	7.839	7.931	8.040	8.149	8.270	8.404	8.537

***Source:** IDC Europe*

Consequently, we see an increase in the number of vacancies to 450,000 in 2015 and 750,000 in 2020. Also here, the United Kingdom, Germany and Italy together account for 60% of all vacancies.

Exhibit 44: e-Skills Vacancies Estimate- 'Stagnation' scenario:
Summing-up of National ICT Professional Excess Demand in Europe 2012 – 2020

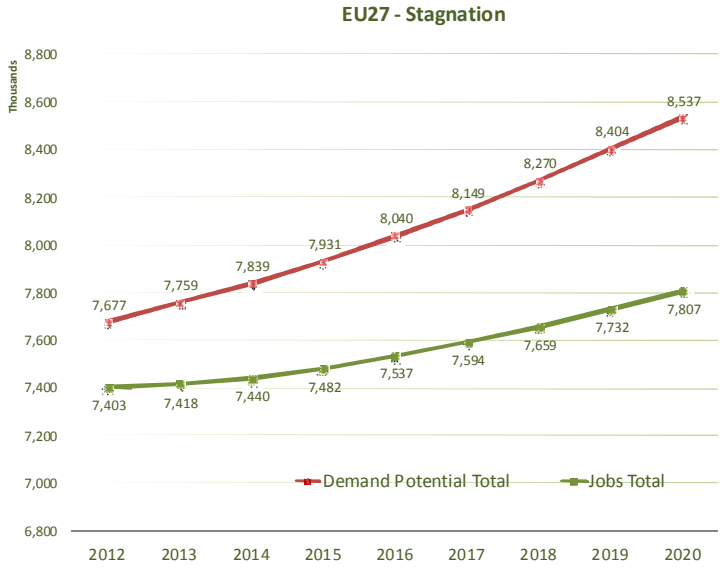
EU27	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	73,000	133,000	149,000	155,000	152,000	156,000	162,000	169,000	176,000
ICT Practitioners	201,000	208,000	249,000	295,000	356,000	409,000	462,000	520,000	574,000
Total	274,000	341,000	398,000	450,000	508,000	565,000	624,000	689,000	750,000

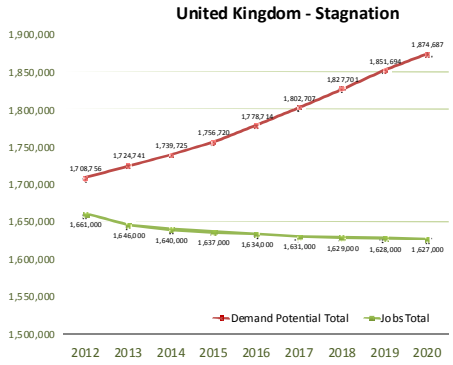
***Source**: empirica. **Note:** this is a summing up of national excess demand figures, **not** balanced with oversupply in other countries, but after migration.*

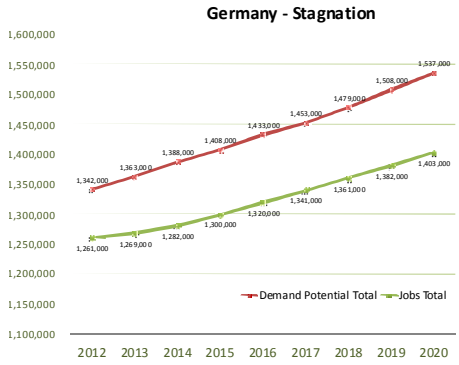
Bottom line

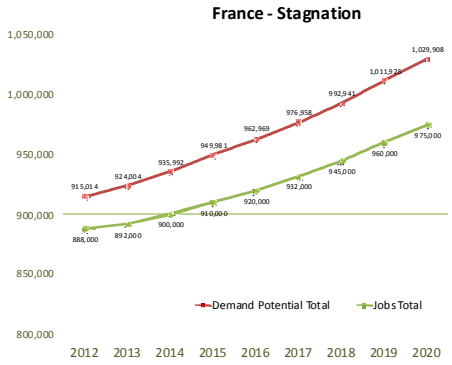
Even in a very modest economic situation, Europe is faced with skills shortages and could employ many more ICT practitioners. The supply of ICT graduates from universities and vocational schools is just sufficient in numbers to maintain the status quo of workforce, given the replacement demand due to retirements and other workforce exits.

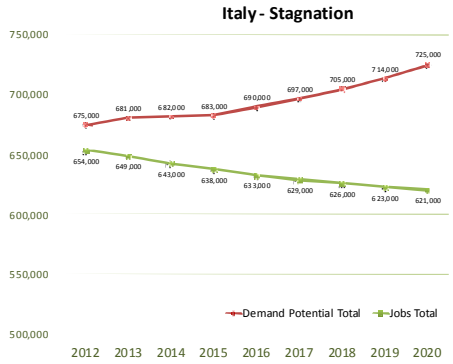
Exhibit 45: Stagnation Scenario: ICT Professional Jobs and Demand in Europe (EU-27) 2012 – 2020

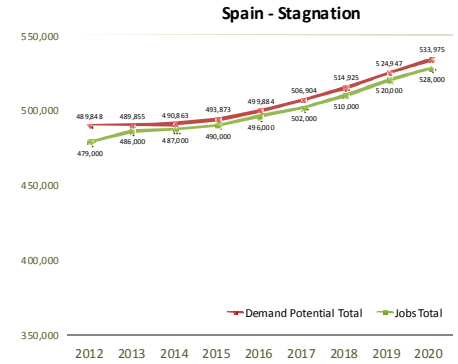


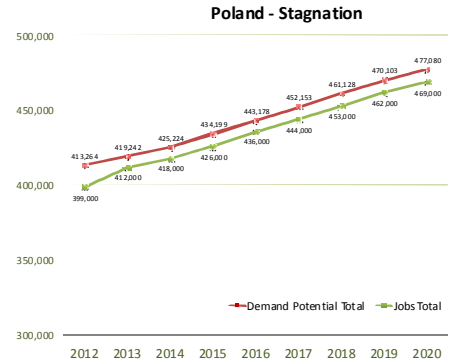


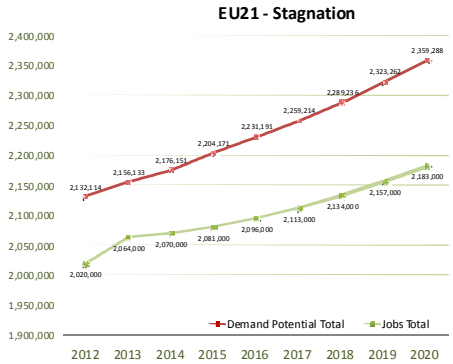


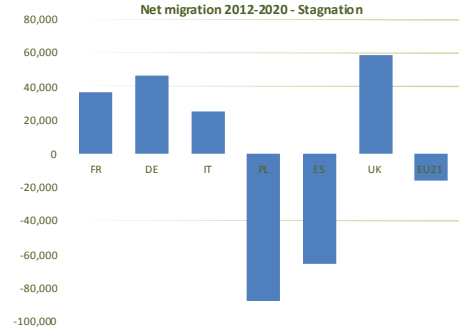


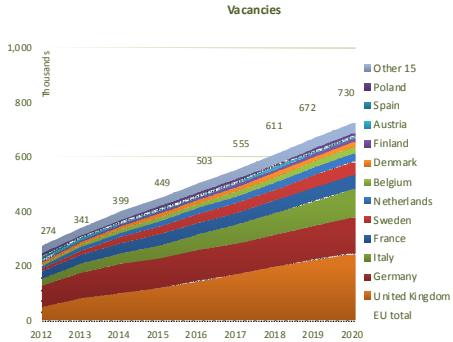












***Source**: empirica model forecast*

4.5.4 Third scenario: "Disruptive boost"

The third synthesis scenario called "Disruptive boost" features some disruptive innovations taking effect in some industries, exactly which is – naturally - yet unknown. The drive towards adopting 3rd platform technologies (mobility, social, big data, cloud) increases dramatically as a new "killer app" emerges. This could for example be from the Internet of Things applications, where Line of Business budgets get released to fund ICT investments to a much higher degree; it could be the use of 3D printers where again investments may be channelled from production budgets to ICT investments; it could be a major security breach that pushes mass adoption of virtualised (or cloud) based workplace environments to control data access; or it could be faster adoption of big data/social in dealing with customers, which again lets ICT spending tap into other parts of the organisation's budget. This will produce ICT investment growth back to the rates seen at the end of the 1990s - a phenomenon that would not have been expected.

The increased innovation leads to higher economic growth from 2017 onwards. We have assumed that there is a general improvement in economic conditions from 2014 onwards to open up for the new "investment spree".

Exhibit 46: 'Disruptive boost': Real GDP growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.0%	-0.1%	1.3%	1.8%	2.0%	1.8%	1.9%	2.3%	2.5%
Germany	0.7%	0.4%	2.0%	1.9%	2.0%	1.9%	2.0%	2.4%	2.6%
Italy	-2.4%	-1.3%	0.9%	1.4%	1.2%	1.4%	1.5%	1.9%	2.1%
Poland	1.9%	1.1%	2.4%	4.2%	4.0%	4.1%	4.2%	4.6%	4.8%
Spain	-1.4%	-1.5%	1.1%	1.9%	2.3%	1.8%	1.9%	2.3%	2.5%
UK	0.3%	0.6%	1.9%	2.3%	1.9%	1.9%	2.0%	2.4%	2.6%
EU21	-0.6%	-0.1%	1.7%	2.4%	2.5%	2.4%	2.5%	2.9%	3.1%
Total	**-0.3%**	**-0.1%**	**1.6%**	**2.1%**	**2.1%**	**2.0%**	**2.1%**	**2.5%**	**2.7%**

Source: *IDC Europe*

Since we do not know what the event will be, there is some growth in hardware (increased corporate adoption of tablets, smartphones etc. to replace traditional desktops, 3D printers or storage investments for Big Data could be explanations), but more growth will be seen in software and service budgets.

Software grows most rapidly as most of the innovation in 3rd platform and the intelligent industry solutions etc. will be software development driven. Services budgets also grow but with a lag following software budgets – a pattern to be typically observed.

Exhibit 47: 'Disruptive boost': IT spending growth

	2012	2013	2014	2015	2016	2017	2018	2019	2020
France	0.1%	1.0%	2.7%	3.2%	3.4%	10.4%	4.4%	5.1%	4.0%
Germany	2.1%	2.2%	2.8%	3.1%	3.2%	10.7%	5.0%	4.4%	3.5%
Italy	-2.1%	-2.9%	4.3%	2.1%	2.6%	6.5%	7.9%	6.5%	3.4%
Poland	1.0%	2.5%	2.8%	5.2%	5.3%	12.6%	6.0%	6.0%	5.4%
Spain	-4.0%	-8.4%	1.2%	1.9%	2.3%	8.8%	5.6%	5.2%	3.8%
UK	1.6%	1.6%	2.4%	2.7%	3.1%	10.5%	5.1%	4.1%	3.0%
EU21	1.2%	1.8%	2.5%	4.8%	3.8%	10.1%	5.4%	4.4%	4.1%
Total	**0.8%**	**0.9%**	**2.7%**	**3.4%**	**3.3%**	**10.1%**	**5.3%**	**4.7%**	**3.7%**

Source: *IDC Europe*

The reason why high growth rates of the late 1990s do not make a comeback lies especially in changed market maturity: increased standardisation and automation, cloud, price pressures, offshoring, lower hardware prices, and cloud delivery models to name the most obvious. This maturity is furthermore represented in the simple scale of the market: the size of the three IT markets (hardware, software, services) was much smaller in mid 1990; for example, an 11% growth in 1997 in services in France meant €1.3 million incremental spending. To have the same incremental spending in 2013 in France, today would require just a 5.7% growth rate. With this positive scenario, in terms of incremental ICT spending growth, we are not very far away compared to what happened in mid/late 1990s, while the denominator effect diminishes growth *rates*.

Forecasting results

The disruptive boost scenario sees 110,000 new jobs, by 2015, hardly different from the other scenarios. This is of course due to the bottleneck being supply, which only very gradually changes between scenarios. The shortage of workers will be at 558,000 in 2015 and be growing extremely afterwards towards more than 1.3 million in 2020.

Exhibit 48: e-Skills Jobs – 'Disruptive boost scenario':
Development ICT Professional e-skills Jobs in Europe 2012 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.477	1.475	1.520	1.578	1.647	1.726	1.817	1.918	2.027
ICT Practitioners	5.925	5.945	5.934	5.936	5.947	5.964	5.978	6.002	6.028
Total	7.403	7.420	7.454	7.514	7.594	7.690	7.795	7.920	8.055

Source: empirica

Exhibit 49: e-Skills Demand Potential - 'Disruptive boost scenario': Development of ICT Professional e-skills Demand Potential in Europe 2012 – 2020

EU27 (millions)	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	1.551	1.619	1.701	1.794	1.896	2.011	2.134	2.262	2.384
ICT Practitioners	6.126	6.141	6.195	6.278	6.378	6.526	6.693	6.865	7.017
Total	7.677	7.760	7.896	8.072	8.274	8.537	8.827	9.127	9.401

Source: *IDC Europe*

Exhibit 50: e-Skills Vacancies Estimate- 'Disruptive boost scenario': Summing-up of National ICT Professional Excess Demand in Europe 2012 – 2020

EU27	2012	2013	2014	2015	2016	2017	2018	2019	2020
ICT Management	73,000	144,000	181,000	216,000	249,000	285,000	317,000	344,000	357,000
ICT Practitioners	201,000	196,000	261,000	342,000	431,000	562,000	715,000	863,000	989,000
Total	274,000	340,000	441,000	558,000	680,000	847,000	1,032,000	1,207,000	1,346,000

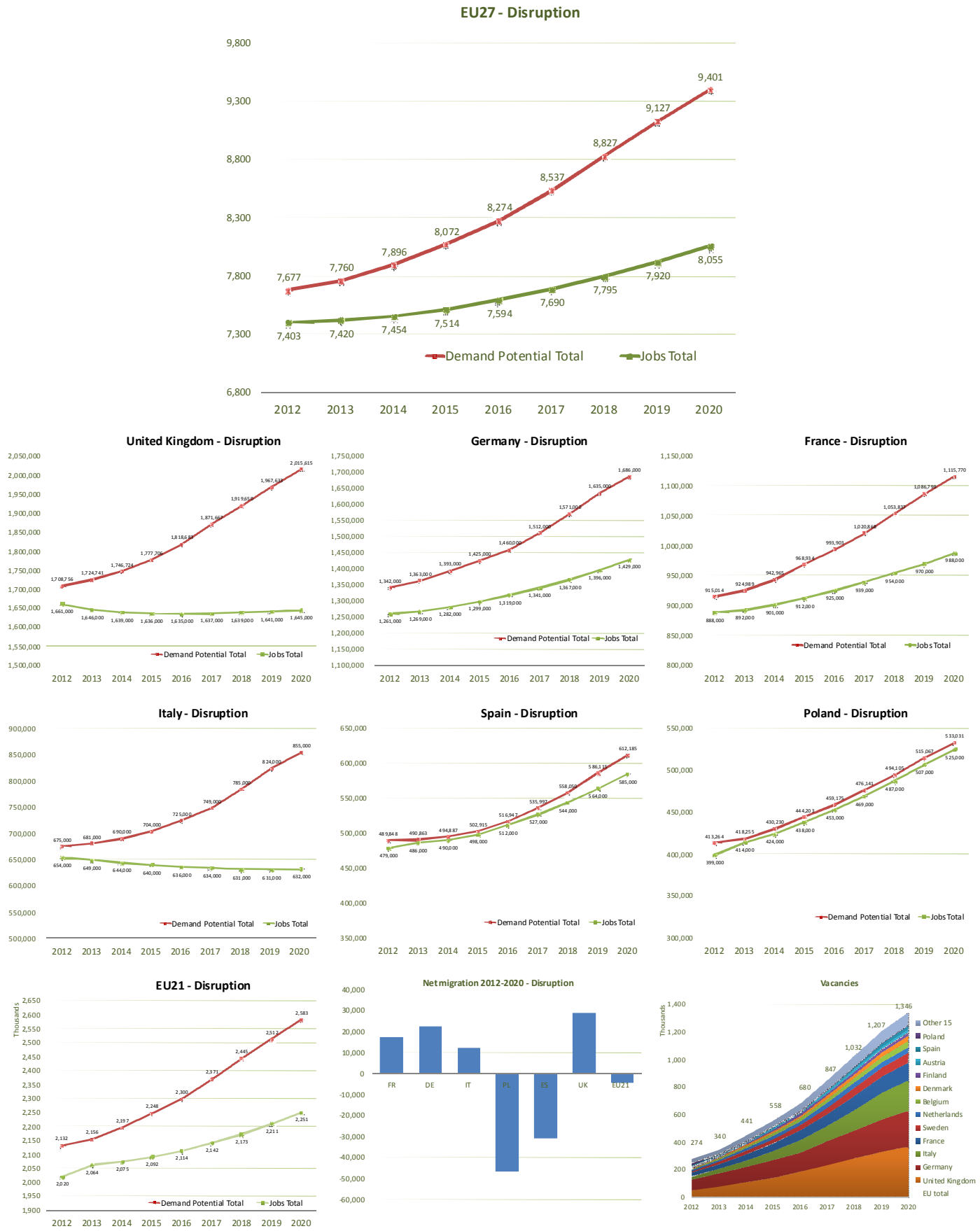
Source*: empirica.* ***Note:*** *this is a summing up of national excess demand figures,* ***not*** *balanced with oversupply in other countries, but after migration.*

Bottom line

The disruptive boost scenario features the most severe skills shortages where Europe is severely hampered in its potential to harness the opportunities by a growing ICT sector and ICT deployment across sectors. The failure to fill more the 1 million additional posts will be a dramatic setback of Europe's competitiveness.

This has to be seen against the *caveats* presented in the next paragraph. Shortage of IT workers is not a new phenomenon, and workarounds have been established. It may well be that more than the forecasted 650,000 new jobs will be created by 2020, pushing down the forecasted shortage of twice that size (1.3 million) somewhat. If it is not possible to fill these posts with ICT graduates, other graduates and side entries will to some degree take over, and have done so continuously in the past. Given the more and more business critical character of ICT in many enterprises and industries, this lack of professionalism has to be looked at with some concern, however.

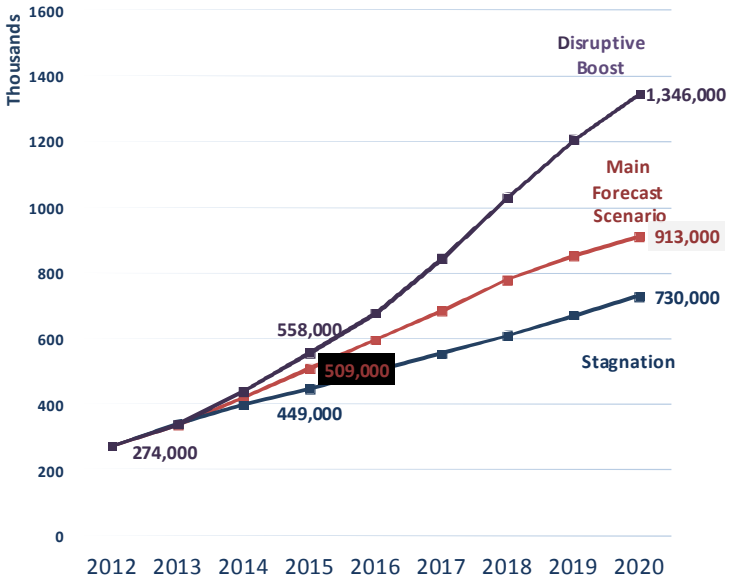
Exhibit 51: ICT Professional Jobs and Demand in Europe (EU-27) 2012 – 2020



***Source**: empirica model forecast*

Comparing the three scenarios, there will be a range of 449,000 to 558,000 vacancies in 2015 and a range of 730,000 to 1.3 million in 2020.

Exhibit 52: Comparison of the three scenarios: Vacancies



Source: empirica

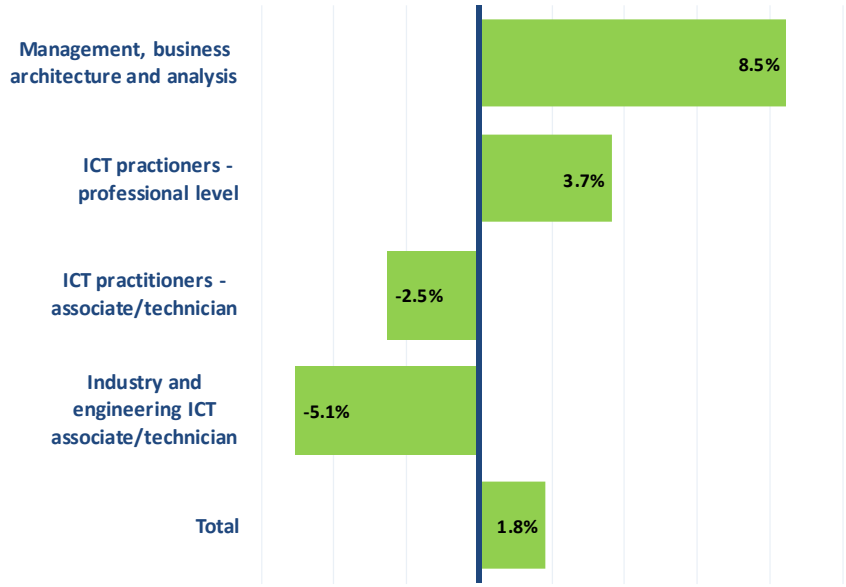
4.6 The changing profile of the ICT workforce

The change of occupation classification to ISCO-08 in 2011 allows for the first time to track employment in a finer grained breakdown of occupations. Between 2011 and 2012 we see some dramatic changes in the overall profile of the ICT workforce, which confirm our hypothesis of structural change towards higher skilled jobs, especially those in management, architecture and analysis.

As already mentioned, the ICT workforce grew by 1.8% between 2011 and 2012. This percentage change is of course the aggregation of many changes of individual occupations. It turns out, that the structural change behind the 1.8% figure is much more profound:

- Management, business architecture and analysis level jobs gained 8.5%
- ICT practitioners at professional level (ISCO level 2) gained 3.7%
- ICT practitioners at technician or associate level lost 3.9% among which the core technician groups (ISCO 35) lost 2.5% and industry and engineering ICT technicians lost 5.1%.

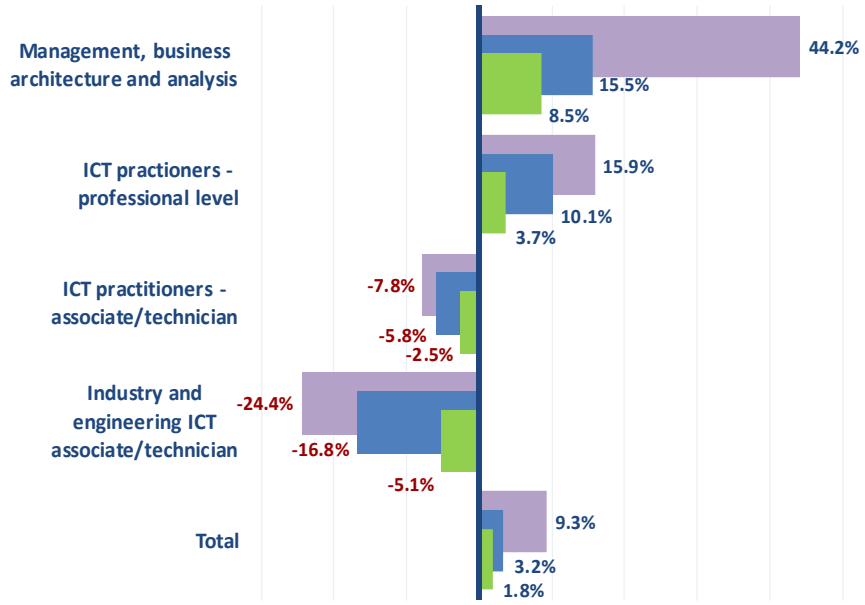
Exhibit 53: ICT workforce profile changes 2011-2012



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

We expect this trend to continue at large, even if we refrain from extrapolating the tremendous one-year changes of 2011/2012 further – future structural changes are expected to be considerably smaller. Based on the main forecast scenario, however, management, architecture and analysis jobs are still expected to grow by 44% compared to 2011. Professional level jobs (ISCO level 2) are expected to grow by 16%, where as technicians jobs will continue to be made redundant as a consequence of automation, offshoring and productivity gains.

Exhibit 54: Expected ICT workforce profile changes 2011-2020 –Main forecast scenario



Source: empirica forecast based on Eurostat LFS data.

4.7 Interpreting the results

Some caveats need to be formulated when interpreting these results. The **first one** concerns the notion of **demand *potential*** again. It should be stressed that we do not expect anything like over 1 million vacancies to actually realize. The projection is a demand potential and as such is to be seen as a fragile construct. Vacancies that cannot be filled year after year will go away – projects cannot be realised, tenders not submitted, innovations will simply not be made. The effects of a persisting skills shortage will probably include

- increased outsourcing and offshoring
- untapped innovation potential
- unwanted/enforced productivity gains but also
- wage increases
- changes of the production structure

The **second caveat** concerns the workarounds that have existed in IT as long the sector and occupations exist. Our approach is prudent insofar as that it accounts for **a limited number of side entries & non-ICT graduates**. In the Main Forecast Scenario, about 1 million side entries and non-ICT graduates over the eight years enter the workforce, compared to 1.4 million graduates.

Over the past five years, however, the number of new jobs was up to more than twice as high as the number of available graduates. Assuming this ratio to pertain, the number of vacancies would be considerably lower. However, CIOs we have talked to in the process of modelling have told us that side entries at the entry level happen much less recently than it used to be for example in the Nineties.

This caveat that sees excess demand potentially significantly lower contrasts with the **third caveat** that would entail a much higher shortage: our **demand estimate is in fact very conservative.** The model still relies on a relation of ICT workforce growth and GDP/It spending growth of the 1990's and the first decade of the 2000's. Nevertheless, we have seen the workforce increase significantly even through the crisis years 2008-2012. The level of ICT workforce growth in 2011-12 has been much stronger than expected. Therefore we assume that we still underestimate the long term trend in favour of the independent variables GDP and IT spending.

A **fourth caveat** concerns new and emerging jobs which are not part of the forecasting model yet. There are and will be numerous jobs around third platform technologies that have not yet appeared in job statistics – or if they have, as people on these jobs will for sure be counted in the statistical systems, it is not yet clear where in the existing categorisations they would appear. Big Data, cloud computing, social media, mobile platforms and other megatrends will deliver new capabilities and jobs – and taken together this "3rd technology platform" will require new skills.

Many third platform jobs that are not genuinely IT jobs will be at professional level, for instance in finance, marketing, or consulting. New business processes need to be defined and implemented as the third platform is adopted, and many people engaged in these tasks will never appear in statistics as ICT workers.

A **fifth caveat** finally is about the impact of the Grand Coalition for Digital Jobs. Being a huge joint effort of industry, policy and other stakeholders, the Grand Coalition and the entirety of its pledges aggregated is certainly going to have some effect on the statistical picture across Europe.

4.8 Outlook

Demand for ICT skills keeps growing at a tremendous pace. The trend in core IT jobs has been up to 4% growth p.a., the growth in management jobs up to 8% growth p.a. However, demand for medium level skilled associate and technician jobs is declining. In total, despite the crisis, we have seen new jobs being created in Europe continuously. There is thus a need to continuously increase the quality and the relevance of e-skills. At the same time, although graduate figures seem to stabilise, supply from universities does not seem to keep pace.

Job growth is largest in highly skilled jobs, such as management, architecture and analytics positions, and this reinforces the need for more and better e-Leadership skills. The fact that these positions are usually recruited from pool of seasoned practitioners and other (non-ICT) managers, together with a presumed lack of entry level jobs at medium level skills may evolve into recruitment bottlenecks in the longer term.

However, at the same time the pace of change seems to be still increasing in ICT jobs, and new job profiles pop up which naturally cannot yet be fully covered in statistical classification, such as Big Data and Cloud computing specialists. Many of these jobs are not genuinely ICT jobs but will be at a professional level, for instance in finance, marketing, or consulting – helping new business processes be defined and implemented.

This is a huge opportunity for creation of new jobs generated 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.

ICT has traditionally been a field in which outsiders – in terms of formal education or career trajectory – play a crucial role. However, recently increased endeavours are made to reach a higher level of professionalisation of the profession, which increasingly includes formal education requirements. These are not necessarily to be sought in a traditional first university or vocational education, but may still be acquired later in the career, a workaround that the ICT profession has maintained like perhaps no other profession for decades. Nevertheless, increasing requirements of formal education make continuous professional education, lifelong learning and executive education even more important. There is an immense opportunity today for new education approaches, new modes of delivery, better curricula and learning outcomes.

5 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.

5.1 First recommendation: Launch initiatives in countries lagging behind

Monitoring policy progress and activity levels on e-skills for competitiveness, growth and jobs throughout Europe in 2013 revealed a significant increase of the overall activity levels since the last evaluation in 2010. This is encouraging news although it still does not apply to all EU Member States. The demand for e-skills and highly-skilled digital jobs vacancies are forecasted to grow as the transition to a knowledge-based and digital economy is accelerating. For many years the debate was mainly focused on digital inclusion. The crisis contributed to change this.

As documented in this report, 40% of EU Member States are showing strong policy activity on e-skills for competitiveness, growth and jobs, 10% are on the way to join them, while 50% still exhibit only modest level of commitment. While the first and second groups appear well prepared for addressing the e-skills challenge, the third group needs urgently to step up efforts. Our report provides a very detailed analysis of e-skills approaches followed by national governments [22] and stakeholder initiatives in the different EU Member States. The country reports and the large number multi-stakeholder partnerships including around twenty initiatives presented as good practice examples provide a valuable pool of policies and initiatives from which to learn.

To prevent them from losing even further ground, it is recommended to national governments in countries with low level of e-skills activity levels to establish comprehensive national e-skills strategies, foster multi-stakeholder partnerships and get engaged in a carefully designed set of e-skills related measures and initiatives. The right time to approach this challenge is now.

The European Commission's "Grand Coalition for Digital Jobs" launched on 4th March 2013 at the conference "e-Skills and Education for Digital Jobs" has built momentum across Europe. Within few months this initiative has resulted in the launch of national e-skills coalitions in two European countries, Poland and Lithuania. More than 10 Member States are lined up including countries identified as low performing with respect to e-skills. The European Council Conclusions from 25 October 2013 also mention 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”.[23]

National e-skills initiatives need to be based on a long-term strategic approach. Best practice cases to learn from include the well-known example, e-Skills UK, which as the national Skills Sector Council for the ICT sector has benefitted from significant public funding as well as from strong commitment from industry. Another example is P@scaline, which enjoys support of stakeholders from academia, industry and unions, although it is not clearly embedded in the French government's policy agenda.

[22] National policy frameworks need to include a wide spectrum of activities and will have to range from: (a) 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; (b) 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; (c) 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.

[23] http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/139197.pdf

In order to reap the benefits in terms of economic and social progress, it is recommended to leverage funding from the European Structural and Social Funds to implement e-skills initiatives where these types of funding are eligible. It is necessary to provide advice to public authorities at national and regional level on how best to proceed for considering e-skills as part of their Research and Innovation Strategies for Smart Specialisation[24]. It is recommended to include this topic of e-skills on the Smart Specialisation Platform[25]. The Commission together with national and regional governments should support sensitisation activities (e.g. based on the pan-European "e-Skills for Jobs" campaign in 2014). It is recommended to strengthen the coordination of these activities. A measure deserving particular attention is work placements and internships. Member States should boost the capacity of employers (especially SMEs) to offer such work placements and provide better guidance and support to students. New sources of funding should be identified, e.g. from industry associations, CSR activities, and social partners etc. at EU, national and sub-national levels.

The implementation of this recommendation rests mainly with Member States in launching relevant initiatives at national level, supporting the scaling up the "Grand Coalition for Digital Jobs" and mobilising efficiently national and European funding instruments, including the European Structural and Social Funds. E-skills should be an integral part of innovation strategies for national and regional development. The thematic network launched in February 2014 by the European Commission to support the Grand Coalition activities should facilitate this. It should support the development of activities at national and regional level which bear the potential for learning from existing pledges and initiatives and motivate local stakeholders to replicate them in a format suited to their needs.

5.2 Second recommendation: Scale up efforts through longer term policy commitment

Among the group of top performing countries based on our e-skills activity index (UK, Ireland, the Netherlands, Germany, France, Sweden, Denmark, Austria, Belgium, Malta and Estonia) there are several countries with well-defined e-skills policies like in the U.K. and Ireland which are the most elaborated to date. However although it has no specific Federal e-skills strategy, Germany has been successful in avoiding a decline of the supply of IT graduates, although not yet to the extent needed to close the e-skills gap. The German dual education system and stakeholders dialogue compensated for this lack.

Experience also suggests that activities that are not embedded in a coherent national policy in a longer term perspective struggle to survive after initial funding – whether through national sources or European Structural Funds – came to an end. Initiatives driven by individual or a small number of industry players can be very sensitive to changes in business strategies.

It is recommended to national governments lacking an overall national e-skills policy to put in place a carefully crafted long term strategy with clear definition and setting of goals and measures for the implementation of activities. This will help ensure sustainability of successful activities and partnerships – a necessary condition for addressing the e-skills challenge. In order to strengthen the vital link between e-skills development, promotion of entrepreneurship and innovation leading to growth and employment, it is recommended that every effort is taken to fully incorporate e-skills in EU, Member State and regional/local education, training, innovation and entrepreneurship policies.

[24] http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_en.pdf
[25] http://s3platform.jrc.ec.europa.eu/home

Since 2007, the Commission[26] has provided a solid knowledge base of information on Member States e-skills policies and multi-stakeholder partnerships for national policy decision making as part of the above e-skills policy and partnership monitoring exercise and the several precursor activities. Within this continuous and thorough stock taking, monitoring and benchmarking exercise a progress monitoring and reporting was regularly carried out the measure progress. It is now in the hands of the national governments to agree on and implement necessary policies and actions as outlined above.

5.3 Third recommendation: Adapt education and training to the digital age

The European Council conclusions of 25 October 2013 invite to undertake concrete steps aimed at a "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". Member States[27] have been engaged in updating and modernising school curricula and ICT infrastructure to fit the rapid pace of technical innovation as well as the evolving needs of industry and society. Success has been variable. Some countries subjected their complete system of primary and secondary education to scrutiny and developed ways to mainstream pupils' exposure to science, technology and engineering (STEM) related subjects, as a means to increase interest in technological subjects. Curricula have been overhauled with the purpose of embedding ICT use and media literacy within all segments of the learning process. In most Member States, though, this process is still in its infancy.

Furthermore, the development and provision of education and training offers corresponding to the needs of the labour market is one of the most important areas for multi-stakeholder partnerships identified. In the face of, on the one hand, increasing rates of unemployment and, on the other hand, hard-to-fill vacancies for ICT jobs, many EU Member States have attempted to channel graduates and jobseekers towards particular ICT jobs for which there is strong demand. Ireland has made major efforts in this area. New approaches 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". Several best practice examples[28], which are described in details in this report, may lend themselves to 'localised' replication.

It is recommended to further develop and refine primary and secondary curricula to embed ICT use and media literacy within all segments of the learning process moving the focus from mere ICT user skills to creative ICT applications for real-world challenges. Furthermore, it is recommended to national governments and stakeholders to dedicate significant 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 and may think of emulating the approach of the German and Austrian VET dual and apprenticeship system. This system excels on offering career paths to those not intending (or not meeting the entry requirements) to pursue a university career in ICT but who are interested in a more practical vocational job in this field and demanding skills which are much better related to their potential and at the same time properly responding to industry demand. The same holds true for further education and training activities

[26] As a contribution to the implementation of its Communication on "e-Skills for the 21st Century: Fostering Competitiveness, Growth and Jobs", COM (2007) 496

[27] 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.

[28] 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.

where related approaches need not be developed from scratch but one can build on past experiences.

Responsibility for further developing and refining primary and secondary school curricula with the purpose of embedding ICT use and media literacy within all segments of the learning process rests with the national (or regional) authorities responsible for primary and secondary school curricula development. Responsibility for the development of new approaches to VET and the provision of specific e-skills education and training rests with national (regional) governments and the different actors in the vocational and higher education system and where appropriate in cooperation with employment agencies and staffing industry to ensure placement of graduates from these schemes and programmes. Implementation should also be aimed at via the adaptation or integration of renowned industry-based training and certification schemes. Stakeholders to become active include leading ICT companies offering industry-based certification courses, international certification and examination providers, industry representatives, associations and unions for the specification of the requirements for such programmes in cooperation with employment agencies and staffing industry to help graduates to find a job.

5.4 Fourth recommendation: foster ICT professionalism and quality

The fact that the ICT profession is not clearly defined internationally means that employees seeking to make career choices are often faced with the opacity of the ICT education and training market. Initiatives for career support of ICT practitioners have been set up to help improve this situation. Often such programmes provide users with market information tailored to their individual needs. They also intend to help individuals who look for (re)training in professional e-skills by supplying advice for finding appropriate training offers on the market. The development of e-skills frameworks and definitions[29] has been taken place at the national level in the 1990s. It received a strong push since 2008 with the adoption of a pan-European approach in the context of the European Standardisation Committee (CEN) and the development of the European e-Competence Framework (e-CF). An increasing number of schemes for education and certification in Europe make use of, or are closely aligned with, the e-CF. It should become a European standard by 2015.

There is increasing activity at sub-national level to establish coherent systems to steer relevant professional skills to where there is demand for ICT practitioners, and to counsel job seekers in issues concerning re-skilling and certification. Facilitating geographical workforce mobility across regions and countries is an important element in this. Related measures include the implementation of user-centred Internet portals and knowledge databases plus campaigns for raising awareness. Several best practice examples have been identified as documented in this report.

It is recommended to foster initiatives at national and EU level to strengthen ICT professionalism through the use the e-Competence Framework (e-CF) and online tools for career support and lifelong learning to help steer relevant professional skills to where there is demand for ICT practitioners and to counsel job seekers in issues concerning re-skilling and certification. Several activities and best practice examples as outlined in the report can illustrate recent activities in this domain. The related activities would highly benefit from a coordinated approach at EU level.

The selection of relevant actors for implementation of these activities in each Member State depends on the national situations in each Member State but need to include different types of stakeholders from industry, certification institutions, national or regional government, associations of different type but representing ICT professionals, and employment agencies. From the industry

[29] For example AITTS in Germany; SFIA in the UK; "Les Métiers des Systèmes d'Information dans les Grandes entreprises – Nomenclature RH" in France etc.

side, Europe-wide promotion activities of ICT professionalism has been initiated by the Council of European Professional Informatics Societies (CEPIS) and the European e-Skills Association together with several other stakeholders. They joined the "Grand Coalition for Digital Jobs" in March 2013 by making a pledge in this area. These activities will need to be closely coordinated with those of CEN and of the European Commission.

5.5 Fifth recommendation: Build bridges for all students, graduates and workers

An insufficient number of students pursue a career in STEM (Science, Technology, Engineering and Mathematics) subjects although these offer very promising job and career opportunities irrespective of whether the skills are obtained through a university study or as part of an apprenticeship and vocational school career with work placements. What is currently lacking [30] is the provision of and access to unbiased and high quality future education and career information and support services for young people and their parents providing the relevant advice on existing and future job opportunities etc. demonstrating that people with such skills will quickly find a job after their studies are completed.

Depending on the subject studied and the country, employment opportunities vary dramatically and consequently also the interest and motivation of individuals in pursuing a career in ICT. Companies – not successful in directly recruiting ICT professionals to fill related vacancies – also seem to regard them as a suitable pool for recruiting staff to enter into ICT-related jobs after some further training. Promoting the use of ICT industry certification and dedicated courses and certifications[31] for non-ICT STEM graduates and employees can be seen as a relevant policy towards increasing the number ICT professionals urgently needed by industry.

Since 2010 the European Commission has conducted two Europe-wide awareness raising campaigns which are seen by stakeholders as a success and in need to be continued over a longer period to maximise their impact. This was confirmed by the fact that 80% of experts interviewed in a European stakeholder survey in October 2013 are in favour of such activities for raising awareness about the opportunities offered by a career in ICT. At national level there have been various interesting awareness raising approaches and experiences on which one may want to build.

It is recommended to national governments to offer access to high quality information and career-support services for young people providing the necessary advice on existing and future job opportunities, industry demand etc. demonstrating that they could find quickly find a job. As part of such a career support service, governments have a very critical role and responsibility in collecting efficiently the data needed to determine which skills are in demand and what kind of education and training is effective. This could take the format of an observatory which provides relevant labour-market data to allow students to make better-informed choices, tracks students' progress – including where they attended university or a vocational programme, what they studied, when and where they were first employed, and what their starting salaries were etc. Prospective students can use this information to gain a far more accurate picture of their future prospects.

Promising initiatives such as the "Academy Cube" should be thoroughly evaluated for their appropriateness and effectiveness for ICT career development for students and lessons drawn with

[30] 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).

[31] A very prominent activity in this area is the creation of the 'Academy Cube', 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.

respect to necessary issues for consideration when aiming at scaling up, replication and roll-out. Based on the results of this evaluation decisions as to the scaling up, further roll out, localization and replication in other countries should be undertaken.

The responsibility for the implementation of quality career-support services at postsecondary and university institutions providing the necessary advise on job opportunities, industry demand etc. rest with national governments and their related ministries and employment institutions. For activities relating to motivating towards widespread use of ICT industry certification and dedicated courses and certifications attended and followed by non-ICT STEM graduates and employees, ICT industry players, user industry, universities and education institutions as well as employment agencies and staffing industry for job placement need to take responsibility for action.

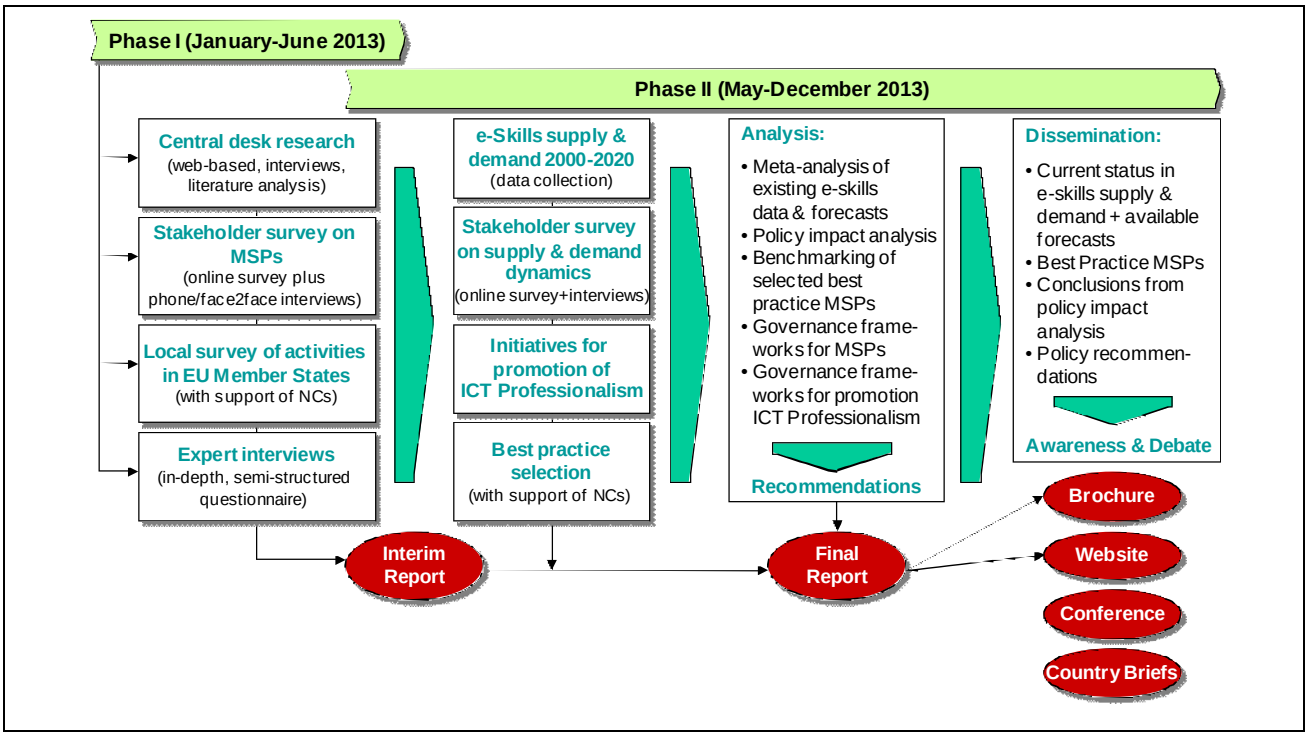
6 Annex A: Methodology

6.1 Research design

This service contract builds on previous work on supply and demand of e-skills at EU, namely **e-skills Vision, Roadmap and Foresight Scenarios 2012-2020 (2011-2012)** and **e-Skills Monitor – Monitoring the Supply and Demand of e-Skills in Europe (2009-2010**), and national levels as well as on a report on multi-stakeholder partnerships drafted by empirica and released in 2008 entitled **Benchmarking policies on multi-stakeholder partnerships for e-skills in Europe (2006-2008).** As part of this service contract, such partnerships for e-skills development and related policies were identified using a network of National Correspondents[32]. It also builds on the evaluation (2010) of the implementation of the EC's Communication on "e-Skills for the 21st Century" for the period 2007-2010.

The service contract is organised in two phases with the components and elated outputs depicted in the following figure.

Exhibit 55: Overview of the service contract's components and related outputs



6.2 Assessment of e-skills policies and stakeholder initiatives

Data capture for the various analytical components of the service contract are integrated to exploit synergies and to ensure that the service contract's objectives can be achieved within the timeframe given. In Phase I of the service contract the study team developed a data gathering guide and template for use by NCs to gather information on (a) national e-skills policies and initiatives, (b) up- and running MSPs and related national policies and stakeholder initiatives, (c) national level data

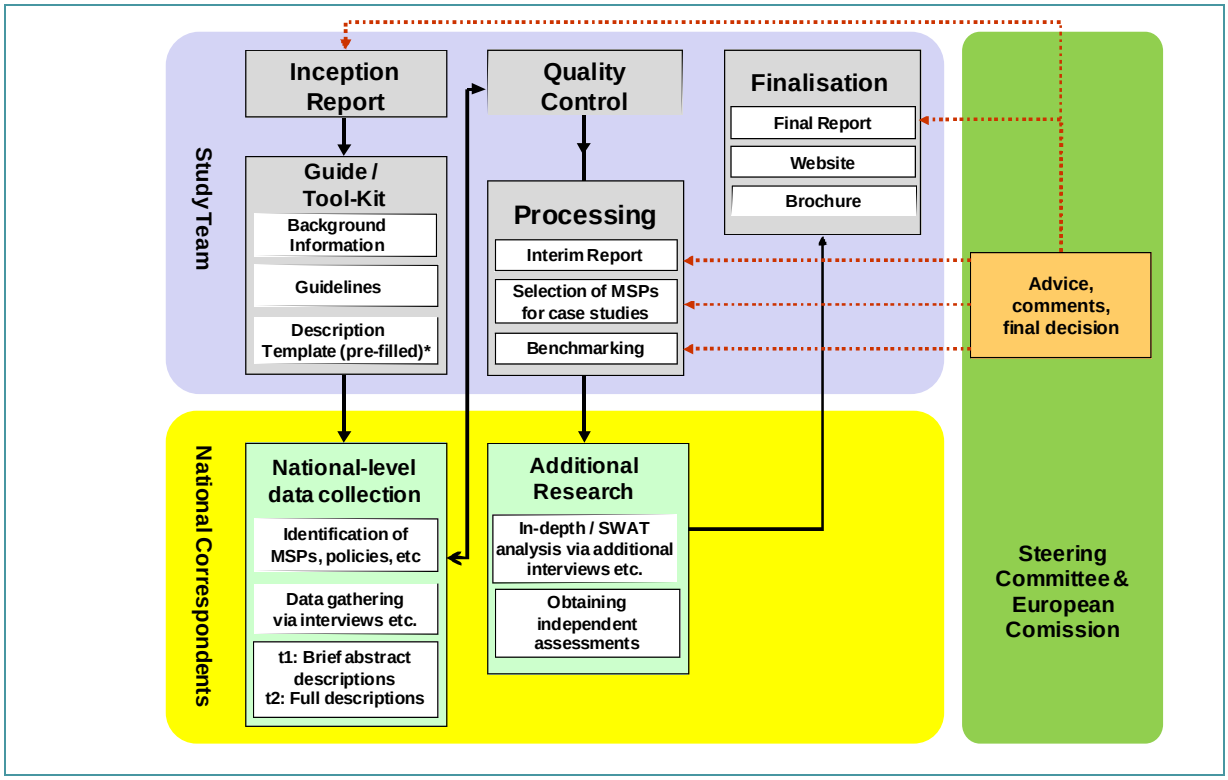
[32] See Korte, W.B. et al. (2007) "Benchmarking Policies on Multi-stakeholder Partnerships for e-skills in Europe", URL: http://www.eskillspolicy-europe.org/downloads/documents/Benchmarking%20MSPs%20final_report_final.pdf

sources on e-skills supply and demand since 2000 and including forecasts, and (d) activities for the promotion of ICT professionalism.

This was followed by contacting National Correspondents and providing them with a Guide / Toolkit containing background information, guidelines and instructions for how to conduct the research, and the data capture instruments (description templates and questionnaires, as applicable). NCs in each Member State were asked to identify key actors and experts in the fields of e-skills and to interview them, as well as to undertake desk research. They were supplied with the translation of a letter addressed to these key actors in the different official EU languages to ease their work for gathering and compiling relevant information in their respective countries.

In order to avoid work duplication and to achieve best value for money, NCs were supplied with **pre-filled data templates** wherever available based on the instruments used for precursor studies, which they were asked to validate, update and complement as appropriate.

Exhibit 56: The study approach – Data capture and validation with support of ENIR network



Interaction with NCs also included three online conference calls organised by empirica for discussion of working schedules, clarifying questions and ensuring a common understanding of the practical approach to the Member States level research.

Analysis of the data for each country has been carried out centrally by empirica. More than 100 e-skills MSPs and initiatives could be identified, of which about 50 are addressing ICT practitioner or e-Leadership skills (the core focus of the study) and appear suitable for further analysis. These are listed in

The National Correspondents have been closely coordinated and monitored by empirica. Day-to-day management of NCs is an essential component of the study's quality control process. The study team has pro-actively contacted NCs whenever there are indications of problems in data capture.

All NCs were asked to provide in their reports in addition to all the data and information gathered and evaluations carried out a detailed overview of the sources used, list of contacts and expert interviews carried out and a bibliography of documents and literature used.

The process of information gathering, quality checking and processing is shown in Exhibit 56.

6.2.1 Data sources

empirica has inserted existing data from our precursor studies and from readily available web sources into the template sent to NCs wherever available. These texts were corrected/modified in case the content was not any more up-to-date, incorrect or unclear.

Published sources (mainly from the Web)

These have included:

- National web sites and newspapers / magazines;
- National policy papers, publications, reports;
- Academic research (published or ongoing).

Personal enquiries and interviews via e-mail, telephone or face-to-face

If sufficient data/information is not readily available from published sources, NCs were asked to find a national expert who can provide them with information on the phone or via e-mail. Domain experts should also be consulted to obtain expert opinions about the progress that has been made in recent years in the e-skills domain. Experts may come:

- from the research field (e.g. academics);
- from the relevant ministries/government agencies at national level;
- from relevant ministries/government agencies at regional or local level (if applicable to your country);
- ICT industry associations;
- individual ICT industry companies;
- trade unions.

Contact information of recommended experts from ministries/governments in the different countries were provided by empirica. NCs were advised to contact these individuals right at the start of their work to receive their recommendations as to further experts to approach and contact for the purpose of the present study.

6.2.2 Assessment

Indices for Member States' level of policy activity

National policy activity was explored through an investigation on national policy and stakeholder initiatives that have a bearing to e-skills as understood in the context of the resent service contract. Findings are summarised in the form of three indexes for policies on digital literacy, e-skills/ICT practitioners and e-leadership, respectively. Index values have not been mechanistically derived using checklists but rather through a qualitative assessment of the significance and importance of each policy and activity. The results have been validated through a major online survey using a sample of >800 stakeholder representatives and experts across all EU Member States.

Index values are to be interpreted as follows:

Exhibit 57: Presentation format for findings of national policy assessment

Score	National policy and stakeholder initiatives on ICT Practitioner Skills	National policy and stakeholder initiatives on Digital Literacy	National policy and stakeholder initiatives on e-Leadership skills and Digital Entrepreneurship
●	No relevant policy or stake-holder activities of significant scope and size have been identified. Policy debate is non-existent or sketchy.	No relevant policy or stake-holder activities of significant scope and size have been identified. Policy debate is non-existent or sketchy.	No relevant policy or stake-holder activities of significant scope and size have been identified. Policy debate is non-existent or sketchy.
●●	There are some relevant policy or stakeholder activities, but these are limited in size and scope and poorly integrated. Links with mainstream policy-making are weak, and the success of measures taken is not evaluated properly.	There are some relevant policy or stakeholder activities, typically focusing on disadvantaged parts of the population. Actions are typically of limited size and duration, and their success is not evaluated properly.	There are little policy or stakeholder activities which *explicitly* deal with e-leadership skills, but related topics have entered the policy debate, e.g. in the context of efforts to boost entrepreneurial skills and attitudes. Education providers show clear signs of awareness.
●●●	Some major policy and stakeholder activities, but coordination/integration and sustainability are limited. Policy debate is well developed but still limited to insiders rather than the main target groups.	Some major policy and stakeholder activities, but coordination/integration and sustainability are limited. Policy debate is well developed but still limited to insiders rather than the main target groups. Infrastructure	Some major policy and stakeholder activities, but coordination/integration and sustainability are limited. Policy debate is well developed but still limited to insiders rather than the main target groups. Education providers have clear plans to offer relevant courses/programmes.
●●●●	A master strategy on e-skills/ ICT practitioners is in place *or* policies and stakeholder activities are well integrated in spite of the lack of a master strategy. The policy debate is well developed and involves all key target groups. Some shortcomings e.g. in terms of sustainability, evaluation, scalability, coverage.	A master strategy on digital literacy (or similar, such as e-inclusion) is in place *or* policies and stakeholder activities are well integrated in spite of the lack of a master strategy. The policy debate is well developed and involves all key target groups. Some shortcomings e.g. in terms of sustainability, evaluation, scalability, coverage.	A master strategy on e-leadership is in place *or* policies and stakeholder activities are well integrated in spite of the lack of a master strategy. The policy debate is well developed and involves all key target groups. Demand for education offers is met by supply. Some shortcomings e.g. in terms of sustainability, evaluation, scalability, coverage.
●●●●●	A master strategy is in place. A large number of relevant policies and initiatives is in evidence involving all main stakeholders. In addition to the national level, policy action is also strong at sectoral and regional level. Policies take a medium- to long-term view of the actions to be pursued, and are properly evaluated.	A master strategy is in place. A large number of relevant policies and initiatives is in evidence involving all main stakeholders, and these are well integrated at national, regional and local level. Progress in outcomes is evaluated and results are positive. Strong emphasis on long-term sustainability and mainstreaming of digital literacy education.	A master strategy is in place and there are not only various relevant policies and stakeholder initiatives, but these are also well integrated at national and sectoral level. Macro level data indicate that good progress is being made.

Selection and benchmarking of Good Practice cases of multi-stakeholder partnerships

Our approach of identifying best practices (among and within the MSPs studied) is based in **SWOT analysis** methodology (investigating strengths – weaknesses – opportunities – threats).

A SWOT analysis combines the assessment of *external developments* that cannot be directly influenced by the organisation in focus (e.g. the overall market development) with an analysis of its *internal specific situation* (e.g. its capabilities, product quality and price, market position). Factors specific to the firm are classified as strengths (S) or weaknesses (W), depending on how the situation is in comparison to key competitors with regard to the selected evaluation criteria. *External* developments (e.g. market trends) are then matched with the organisation's specific strengths and weaknesses, which leads to conclusions on opportunities (O) or threats (T). A SWOT analysis helps organisations allocating their resources and capabilities to the competitive environment in which they operate. As such, the instrument is often used for (longer-term) strategy formulation.

The **unit of observation** in the present study is **multi-stakeholder partnership (MSP)** together with the policy context it is embedded in. This requires some adaptations of the instrument, as the policy environment can often not be modelled as an external development but rather can be influenced by the stakeholders participating in the MSP. Moreover, "opportunities" and "threats" should in this study be analysed, in particular, with reference to the way scalability and sustainability issues can be addressed.

The analysis of strengths and weaknesses will be conducted in **multi-step process** for which various sets of criteria has been applied.

First step: In order to arrive at a shortlist of candidates from the initial total set of up-and-running MSPs identified by the National Correspondents, an evaluation scheme based on the following preliminary model has been used:

Exhibit 58: Criteria for selecting MSPs for a good practice MSP candidate short-list

Selection criteria	Evaluation scheme	
MSP characteristics ("MSP fit")	**To what extent does the initiative comply with the definition of a "multi-stakeholder partnership (MSP) for e-skills"?** Each MSP is given a score on a scale of 3 values:	
	HIGH (2)	The MSP fully complies with the MSP definition, i.e. it involves a larger number of key stakeholders which are of relevance for a certain e-skills related issue and is operated and driven through a broad partnership, involving all or most of the following: government (at national, regional and/or local level), business, education providers, and trade unions and the civic sector (e.g. NGOs).
	MEDIUM (1)	The MSP has some involvement of several partners from the government, business, NGO/unions and/or education sector, but not all main stakeholders which are of relevance for a certain e-skills related issue are engaged.
	LOW (0)	The action is initiated and operated mainly by one / only a few partners from only one, at most two sectors (government, business, NGO/unions, education) and it appears that some key stakeholders who are of relevance for the e-skills related issue in question are not involved.
MSP target and approach	**To what extent does the MSP target ICT practitioner skills and/or eLeadership skills (rather than digital literacy in general)?** Each initiative is given a score on a scale of 3 values:	

("Target fit")	**HIGH (2)**	The MSP has a clear focus on ICT practitioner skills and/or eLeadership skills
	MEDIUM (1)	The MSP addresses ICT practitioner skills and/or eLeadership skills, but its main focus is on general digital literacy or other issues.
	LOW (0)	The MSP deals with "digital literacy" of the general population or subgroups hereof (e.g. unemployed, disabled people), but does not address ICT practitioner skills and/or eLeadership skills.
MSP embedded in policy context ("Policy fit")	**To what extent is the MSP embedded in a broader policy context?** Each initiative is given a score on a scale of 3 values:	
	HIGH (2)	The MSP is strongly embedded in a relevant national or regional e-skills policy context (such as a related strategy or action plan).
	MEDIUM (1)	There are some links of the MSP to e-skills-related policy programmes.
	LOW (0)	The MSP is not really embedded in a policy context, i.e. links to policy-making are very limited. It is likely to remain a one-off activity of limited duration.
MSP has sufficient size and scope ("Scope and continuity")	**To what extent has the MSP a size and scope with makes it relevant to the country's e-skills related development?** Each initiative is given a score on a scale of 3 values:	
	HIGH (2)	MSP has a size (in terms of budget, number of stakeholders involved, target group reach, or similar) and scope (e.g. sectors and occupations covered) which makes it highly relevant to the country's e-skills related development. Its duration is not limited to a one-off project, but there is (planned to be) a continuity of activities over many years.
	MEDIUM (1)	MSP has a size and scope which means it is of some relevance to the country's e-skills related development, Its duration may be limited to a one-off project, but its goals are continued through other means.
	LOW (0)	MSP has a too limited size and scope to make it relevant to the country's e-skills related development, or its duration is limited to a one-off project without any continuation or follow-on activities.
MSP has operated for a sufficient time ("Maturity")	**Has the MSP been in operation for long enough to make it possible to assess its experience?** Each initiative is given a score on a scale of 2 values:	
	YES (1)	MSP has achieved a major part of its operational goals already, i.e. it has been in operation for long enough to allow foe independent assessment.
	NO (0)	MSP is at the planning stage or at early stage of implementation, i.e. experience is not sufficient for independent assessment.

Second step: The selection of good practice cases from the shortlist requires a more extensive list of criteria. This had been developed at an early stage of the study, in close cooperation with the Steering Committee and Commission Services. The methodology used for the 2007 empirica study on MSPs, which proved its reliability and feasibility in that research, acted as the basis for the design of the set of selection criteria.

Exhibit 59: Benchmarking criteria for selecting good practice MSPs

	Benchmarking criteria and indicators		The statement applies … to the MSP.					
			5	4	3	2	1	3
			exactly	largely	somewhat	rather not	not at all	unknown
1	**Relevance**	**15%**						
1.1	"The rationale and objectives are explicitly and precisely specified."	5%						
1.2	"The objectives reflect issues that are of specific relevance in the area of e-skills development and certification."	5%						
1.3	"The expected results and benefits of the MSP are particularly relevant for the purpose of e-skills development and clearly described."	5%						
2	**MSP concept**	**10%**						
2.1	"The MSP stakeholders involved demonstrate a long-term commitment to driving and operating the in initiative."	5%						
2.2	"The MSP goes beyond awareness raising etc. and has become an operational service aimed at e-skills certification."	5						
3	**Concrete targets**	**25**						
3.1	"The MSP has specified quantitative, measurable targets that were/are to be achieved."	20%						
3.2	"The MSP implementation is in a mature enough status to assess the achievement of targets."	5%						
4	**Implementation & communication strategy**	**45%**						
4.1	"The MSP has a clearly structured implementation plan, describing tasks, schedule and responsibilities of actors involved."	15%						
4.2	"The resources budgeted are adequate to achieve the proposed objectives and targets."	5%						
4.3	"The MSP is implemented in a broad partnership of stakeholders from the public, private and civic sector, i.e. the MSP demonstrates a high degree of stakeholder involvement."	10%						
4.4	"The MSP is actively addressing its target groups in order to inform them about the services."	10%						
4.5	"The chosen means of communication and dissemination are adequate for the target groups, and the MSP has achieved a political relevance and visibility in the country at stake."	5%						
5	**Evaluation**	**5%**						
5.1	"The results of the MSP have been evaluated / will be thoroughly evaluated. To this end, an evaluation scheme has been defined."	3%						
5.2	"The evaluation scheme is based on quantitative indicators related to the policy targets."	1%						
5.3	(if applicable) "The evaluation results are mostly positive – the policy is considered successful."	1%						

Third step: The main objective of the final phase of analysis of MSPs was to benchmark the 10 -20 good practice MSPs against a set of defined criteria (evaluation criteria), in order to identify good practice elements and lessons learned. The results are documented in section 7.2 or the present report. The adopted approach comprised application of a set of qualitative evaluation criteria as well as the analysis of factual information about the MSP's features and performance, where available. This allowed for:

- a comprehensive overview and evaluation of each single good practice MSP;
- identification of specific benchmarks in the various dimensions and areas analysed;
- the possibility to map good practice MSPs against selected variables.

The list of evaluation criteria applied focuses on:

- Innovativeness
- Networking (involvement of stakeholders)
- Effectiveness of communication
- Efficiency and flexibility
- Policy reach (outputs, outcomes and impacts)

For each of these criteria, indicators will be specified and agreed upon with the Stakeholder Group. See the following example from the 2007 study on MSPs.

Exhibit 60: Good practice MSP evaluation criteria

Evaluation criteria		The statement applies … to the MSP.				
			(4) exactly	(3) largely	(2) rather not	(1) not at all
1	**Innovativeness**	**10%**				
1.1	"The MSP is innovative in its approach."	5%				
1.2	"The MSP is innovative in terms of its objectives and targets."	5%				
2	**Networking – involvement of stakeholders**	**30%**				
2.1	"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP."	10%				
2.2	"The MSP is embedded in an overall (national) policy context."	15%				
2.3	"The MSP has been able to benefit from specific (national) funding programmes in the initial phase of implementation and piloting and/or from (substantial) financial investments of (a) vendor(s) whose certification is used."	5%				
3	**Effectiveness of communication**	**20%**				
3.1	"The internal communication and cooperation is/has been effective."	5%				
3.2	"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)."	15%				
4	**Efficiency and flexibility**	**10%**				
4.1	"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility."	5%				

4.2	"The MSP has been flexible in adapting to changing needs"	5%				
5	**Degree of MSP reach: outputs**	**10%**				
5.1	"The expected outputs have been achieved"	5%				
5.2	"The quality of the outputs is in line with the expectations."	5%				
6	**Degree of MSP reach: outcomes**	**10%**				
6.1	"The MSP positively affected e-skills development in participating companies"	5%				
6.2	"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship."	5%				
7	**Degree of MSP reach: impact**	**10%**				
7.1	"There is a long -term commitment of the stakeholders involved in the MSP."	5%				
7.2	"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project."	5%				

The purpose of this evaluation exercise has been to provide an overall ranking of good practice MSPs but to highlight those MSPs that perform best towards specific dimensions.

Good Practices are **not** understood in the present study as practices which indicate best performance and which should act as yardsticks by others who should strive to emulate them as closely as possible. Rather, they are defined as examples of practice in MSP design and implementation, i.e. methods, tools, types of organisation, stakeholders involved and governance model used, type of integration with policy contexts that were used to achieve the excellent performance observed. Such examples might **imply ease of transfer** to other situations where users have similar objectives; mainly, however, good practice examples should facilitate others to learn and to adapt such lessons learned to their own specific implementation context and their own policy goals.

Validation: The following measures have been applied to validate the study methodology (selection, benchmarking and evaluation criteria, benchmarking approach):

- Validation with Steering Committee: Steering Committee experts are asked to offer comments and suggestions on the overall approach and benchmarking methodology as described in this document and presented at the first Steering Committee meeting.
- Validation with DG ENTR: DG Enterprise and Industry provide comments on the draft Benchmarking Framework, reports, the executive summary and brochure text.
- Validation with the Stakeholder Group through the Stakeholder Survey on MSPs.

7 Annex B: Analysis of multi-stakeholder partnerships for e-skills

7.1 List of candidates for good practice

The table in Exhibit 61 below lists all MSPs which have been identified in the first phase of the research, together with some basic information about starting date and duration and type of stakeholders.

Exhibit 61: Major MSPs in the field of e-skills development

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
AT-1	Future Learning	2007	2011	Federal Ministry of Education, Arts and Culture	✓			✓	✓	little	little
AT-3	Frauen in die Technik (FIT) / Women into Technology	2006	ongoing	The Office for Gender Equality and Advancement of Women of the TU Graz	✓	✓	✓	✓		✓	
AT-5	FIT-IT programme	2003	ongoing	Federal Ministry for Transport, Innovation and Technology (BMVIT)	✓	✓		✓		little	little
AT-6	IT-Offensive 2020	2009	ongoing	Professional Association of Management Consulting & IT (UBIT)		✓		✓		✓	
AT-7	Research Programme Sparkling Science	2007	2017	Federal Ministry for Science and Research	✓			✓	✓	✓	
BE-2	CompeTIC	2009	2013	Technofutur TIC and PRN	✓	✓	✓	✓		✓	
BE-3	EVOLIRIS (ICT reference centre of the Brussels Region)	2009	ongoing	Regional government of Brussels; PES and vocational training agencies of Brussels Region; Agoria; Microsoft Innovation Centre; Trade unions (CSC, FGTB, CGSLB) and others	✓	✓	✓	✓		✓	
BE-4	FORMATIC (Wallonie)	2005	ongoing	CEFORA; FOREM Formation; Talenteo (union CNE SETCA and ICT industry association Agoria) ; local ICT competence centres in Charleroi Ciney, Liège, and Mons	✓	✓	✓	✓	✓	✓	
BG-1	Training of teachers in ICT	2008	2010	CIST (Centre for Information Society Technologies) at University of Sofia; Ministry of Education, Youth and Science	✓			✓	✓	little	
BG-2	Development of Workforce Competence Assessment System by Sectors and Regions	2009	2013	Bulgarian Industrial Association – Union of the Bulgarian Business (BIA)	✓	✓	✓	✓		✓	
BG-3	Software Industry Strategic Requirements for	2011	2013	Bulgarian Association of Software Companies; Bulgarian Association of IT; ICT Cluster		✓	✓	✓		✓	✓

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
	Educational System Reform			Foundation							
BG-4	Software Engineering Management Programme (SEMP)	2011	2013	ESI (European Software Institute) CEE		✓	✓	✓		✓	✓
CY-2	Implementation of a Learning Management System	2007	2010	Ministry of Education and Culture and Pedagogical Institute	✓	✓		✓	✓	little	
CY-3	Cyprus School Net - ΔΙΑδικτυακό Σχολείο	2009	ongoing	The Ministry of Education and Culture	✓	✓		✓	✓	little	
CY-4	The Design-Practice project	2009	2011	Cyprus Ministry of Education and Culture	✓			✓	✓	little	
CY-5	e-Volve (Δικτυωθείτε και Εξελιχθείτε)	2009	2013	Cyprus Productivity Centre, European Social Fund	✓				✓		✓
CZ-1	ICT Professional (Comprehensive support for ICT coordinators in primary and secondary schools)	2011	2014	National Institute for Further Education (NIFE); Ministry of Education	✓			✓		✓	
CZ-2	ICT and Strategic Services	2009	2012	Czechinvest; Ministry of Trade and Industry	✓	✓		✓		✓	✓
CZ-4	Increasing computer literacy of employees of administrative authorities (offices)	2010	2013	Administrative offices of the Czech Republic	✓			✓	✓		
DE-1	Qualification Offensive Lower Saxony	2009	2013	Federal State of Lower Saxony with Entrepreneurs' Association Lower Saxony (UVN), Chemistry North, Lower Saxony-Metall, Federal Employment Agency, Chamber of Industry and Commerce, UHN, Chambers of Craft Lower Saxony	✓	✓	✓	✓		✓	
DE-2	Skilled Workers Offensive /STEM	2012	ongoing	Federal Ministry of Economics and Technology; Federal Ministry of Labour and Social Affairs;	✓	✓	✓	✓		✓	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
				Federal Employment Agency							
DE-3	Software Campus (Leadership qualification)	2011	ongoing	Major companies, education providers, Federal Ministry of Education and Research (BMBF)	✓	✓	✓	✓		✓	✓
DE-4	Girls' Day	2001	ongoing	Federal Ministry of Education and Research; Federal Ministry for Family Affairs	✓	✓	✓	✓		✓	
DE-6	Academy Cube	2012	ongoing	BITKOM, Federal Labour Office, DFKI, EIT ICT Labs, Festo Didactic, German Informatics Society, LinkedIn Germany, Microsoft Deutschland, Robert Bosch GmbH, SAP AG, Software AG, Thyssen-Krupp AG, University Duisburg-Essen	✓	✓		✓		✓	
DE-7	e-Skills in SMEs	2008	2012	BestPractice-IT; SAP; Deutsche Messe AG	✓	✓	✓	✓	✓	✓	
DE-9	'Cisco meets APO'	2008	ongoing	APO IT & Cisco Networking Academy Programme, CNAP		✓	✓	✓		✓	
DE-10	'IT 50 plus'	2008	ongoing	IG Metall & BITKOM	✓	✓	✓			✓	
DE-11	Finish IT	2011	ongoing	CyberForum e.V., Chamber of Industry and Commerce	✓	✓	✓	✓		✓	
DE-12	The Software-Cluster: Qualification programme	2013	ongoing	Software-Cluster	✓	✓		✓		✓	
DE-13	Smart Business IT: IT Excellence for Baden-Württemberg	tbc	ongoing	CyberForum e.V.	✓	✓		✓		✓	
DE-15	Educate oneself – Initiative for extra-occupational education	2012	2014	Vereinte Dienstleistungsgewerkschaft ver.di (United Services Union)		✓	✓	✓	✓	✓	
DE-18	Strategic cooperation between GI and eco	2013	ongoing	The Society for Computer Science (GI) and Association of Internet Industry (eco)		✓		✓		✓	little
DE-20	"IT for Work"	tbc	ongoing	Chamber of Industry and Commerce, Darmstadt		✓		✓		✓	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
DE-21	Go MINT!, the National Pact for Women in STEM Careers	2008	ongoing	Federal Government, Business, Stakeholder from the higher education system, Research organisations , Employers' and employees' associations, Media, Associations, Federal States	✓	✓	✓	✓		✓	✓
DE-21	STEM Initiative – MINT Zukunft schaffen	2008	ongoing	Major employers and business associations	✓	✓		✓	✓	✓	
DK-1	"Make A Good School Better" Strategy	2012	2015	Ministry of Education	✓		✓	✓	✓		
DK-2	Computational thinking and practice – new high school subject	2011	2014	Ministry of Education	✓	✓	✓	✓	✓	✓	
DK-5	Future People	2006	ongoing	it-invest		✓		✓		✓	✓
EE-1	Ole kaasas - Be included	2009	2011	Look@World Foundation	✓	✓	✓	✓	✓		
EE-2	Awareness raising for the Information Society	2007	2013	Estonian Information System´s Authority	✓	✓	✓	✓	✓		
EE-3	E-Learning program BeST	2008	2013	Estonian Information Technology Foundation (EITF)	✓			✓	✓	little	
EE-4	E-Learning program VANKeR	2008	2013	Estonian Information Technology Foundation (EITF)	✓			✓	✓	little	
EE-5	Tiigriülikool + - TIGER University+ - educational support program	2009	2012	Estonian Information Technology Foundation (EITF)	✓			✓	✓	little	
EE-6	ICT Programme 2011-2015	2011	2015	Information Technology Foundation for Education (ITFE, formerly: Estonian Technology Foundation, EITF)	✓	✓		✓		✓	little
EE-7	IT Academy Programme	2012	2015	Information Technology Foundation for Education (ITFE, formerly: Estonian Technology Foundation, EITF)	✓	✓		✓		✓	✓

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
EE-8	StartSmart	2007	2013	BDA Consulting OÜ, Enterprise Estonia, AS Technopolis Ülemiste, Estonian Development Fund, School of Economics Small Business Center of Aalto University	✓	✓		✓		✓	✓
EL-1	An Integrated Framework for Design Specifications of the Learning Process in Primary and Secondary Education	2010	2013	Greek Language Centre	✓			✓	✓		
EL-3	Highly specialised training to ICT practitioners	tbc	ongoing	Oteacademy & Oktabit		✓		✓		✓	
EL-4	GetBusy.gr	2012	ongoing	Hellenic Professionals Informatics Society (HePIS), Federation of Hellenic ICT Enterprises (SEPE), Microsoft Greece, Peoplecert		✓	✓	✓	✓	little	little
ES-3	"Soy mayor y me gusta navegar"	2011	ongoing	Cibervoluntarios-NGO		✓	✓	✓	✓		
ES-4	CENATIC – Training with and within free software	2010	ongoing	Spanish Ministry for Industry, Energy and Tourism; Regional Governments; Telefónica	✓	✓	✓		✓	little	
ES-5	Plan Avanza 2 National Plan (Action area "ICT Training: enterprises")	2011	2015	Spanish Government	✓	✓	✓	✓	✓	✓	
FI-1	Various examinations for different groups on ICT skills (update)	2005	ongoing	Finnish Information Society Development Centre (TIEKE)	✓	✓	✓	✓	✓	✓	little
FI-2	Competence evaluation tool implementation	2011	2013	Finnish Information Society Development Centre (TIEKE)	✓	✓	✓	✓	✓	little	little
FI-4	INFORTE	2012	ongoing	Universities of Finland	✓	✓		✓		✓	
FI-5	Rails Girls	2010	ongoing	Rails Girls (a volunteer group) with funding from local industry sponsors (e.g. Kisko Labs)		✓	✓		✓	✓	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
FI-6	NOKIA Bridge Program	2011	ongoing	Nokia	✓	✓	✓	✓		✓	✓
FR-1	C2i – certificate	2006	ongoing	Conservatoire National des Arts et Métiers	✓	✓	✓	✓	✓	✓	
FR-2	Portal of Internet Jobs	2009	ongoing	Ministry of the Economy (through Delegation of Internet Uses, DUI); School of Higher Studies in Information and Communication Science (CELSA); National Information Office for Training and Professions (ONISEP)		✓	✓	✓		✓	
FR-3	Pasc@line Association	2006	ongoing	75 higher education institutions, 2 unions (Syntec Numérique and CICF Informatique) & 1,200 companies	✓	✓	✓	✓		✓	✓
FR-4	Commission Femmes du Numérique (Women of the Digital Sector Commission)	2011	ongoing	The Syntec Numérique (Syntec Numérique)		✓	✓	✓		✓	✓
FR-5	Ècole "42"	2013	ongoing	Xavier Niel		✓	✓			✓	
HU-1	e-Hungary programme’	2007	2010	eHungary Centre	✓		✓	✓	✓	little	
HU-2	TÁMOP 2.1.2. project	2012	2014	Executive and Justice Office (KIH) and National Development Ministry	✓			✓	✓		
HU-4	Miskolc and its agglomeration digital community	2013	2014	Miskolc Government	✓			✓	✓		
IE-1	Level 8 Conversion Programme	2012	2013	Higher Education Authority	✓	✓		✓		✓	
IE-2	Springboard	2011	ongoing	Higher Education Authority	✓	✓		✓		✓	
IE-3	ICT Ireland Skillnets	2011	2013	Irish Government (Department of Training & Skills); ICT Ireland	✓	✓		✓		✓	
IE-5	Smart Futures	2012	ongoing	Science Foundation Ireland; Irish Government (Department of Jobs, Enterprise and Innovation)	✓	✓		✓		✓	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
IE-6	Fast Track to IT	1999	ongoing	FIT Ltd., itself a partnership between a large number of companies and FAS, VECs, Third Level Institutions, Leargas, Leader Companies, Rapid Coordinators, Local Authorities and Employment Pacts and others.	✓	✓	✓	✓		✓	
IT-1	RETE Competenze per l'EconomiaDigitale - Italian Competence Network for the Digital Economy	2012	2014	Assintel, Assinter Italia, CNA Comunicazioni, Confindustria Digitale, and Unimatica		✓		✓	✓	✓	✓
IT-2	UNI national standard for ICT Professions based on the e-CF	2012	2013	UNINFO Technical Committee	✓	✓	✓	✓		✓	✓
IT-3	JobICT: a new web portal for the offer and demand of ICT practitioners	2013	2013	Italian service sector trade unions		✓	✓		✓	✓	
IT-4	Future IT Leaders	2012	2013	CIO AICA Forum		✓				✓	✓
IT-5	Seminars and communication campaigns on e-commerce	2013	2013	Ministry of the Economic Development	✓	✓	✓		✓		
IT-6	Adopt An Enterprise	2012	2013	Ministry of Education		✓		✓	✓	✓	little
IT-7	GenerazioniDigitali - DIGITAL GENERATIONS	2011	2013	Fondazione Mondo Digitale		✓	✓	✓	✓		
IT-8	Piano Nazionale Scuola Digitale - DIGITAL SCHOOL-NATIONAL PLAN	2010	2014	Ministry of Education	✓			✓	✓		
LT-1	Lithuanian national computer literacy primers	2007	2008	Ministry of Internal Affairs, Information Society Development Committee of the Government; Lithuanian Association of Municipalities; SEB Bank	✓	✓		✓	✓		

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
LT-2	Online Services for a Lithuanian e-Citizen	2010	2012	Langas į ateitį (Window to the Future Foundation) and others	✓	✓	✓	✓	✓		
LT-3	Population computer literacy project	2010	2013	Infobalt, local stakeholders in Kaunas region	✓			✓	✓		
LT-4	ICT implementation in everyday activities skill training for population of Kaunas and the surrounding districts	2010	2013	Kaunas Communication School	✓			✓	✓		
LT-5	Enhancement of the competitiveness of SMEs by strengthening of employees specific skills	2009	2012	INFOBALT	✓	✓		✓	✓	✓	
LT-6	Window to the Future	2012	ongoing	OMNITEL, TEO L, Swedbank, SEB, ALNA, ATEA		✓	✓	✓	✓		
LU-3	Luxembourg Engineering Trainee Days	tbc	ongoing	Ministry for Education	✓	✓				✓	
LU-4	NEXT LEVEL.LU	2011	tbc	Media and Communications Department of the Ministry of State (SMC)	✓	✓		✓		✓	
LU-5	eSkills in School Population	tbc	tbc	Ministry of Education and Vocational Training	✓			✓	✓		
LU-6	ICT skills through the use of structured training and ECDL certification	tbc	tbc	Luxembourg Chamber of Employees; Luxembourg Engineers Association	✓	✓		✓	✓		
LU-10	PROMISLingua (eCompetence & eSkills Module)	2011	2013	UEAPME – Union Européenne des Petites et Moyennes		✓		✓	✓	✓	
LV-1	Information technology training for small and micro-enterprises to promote competitiveness and	2012	2015	LIKTA, JSC DZC, FMS, Lattelekom, Microsoft Latvia, LatInSoft, BDA, Swedbank, Infinitum 8, Lursoft, Tilde, Mailige, plus a number of SMEs	✓	✓			✓	little	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
	productivity										
LV-2	Boosting theoretical knowledge and practical competences of teachers in vocational education	2010	2013	National Centre for Education, University of Latvia, Riga Technical University, Employers' Confederation of Latvia, Free Trade Union Confederation of Latvia, 54 Latvian vocational education institutions	✓	✓	✓	✓	✓	little	
LV-3	Microsoft Partners in Learning mentors programme in Latvia	2012	ongoing	Microsoft		✓		✓	✓	little	
MT-1	Get Qualified Scheme (formerly MyPotential programme)	2006	ongoing	Malta Enterprise	✓	✓		✓		✓	
MT-2	EPITOME Empowerment Programme for IT Use Outreach for Micro Entrepreneurship	2010	2013	Malta Communications Authority (MCA)	✓	✓		✓	✓	✓	✓
MT-3	First Step and Second Step ICT Training Programmes	2006-2008	2009-2012	Ministry for ICT	✓			✓	✓	✓	
MT-4	eSkills Alliance Malta	2010	2013	Government of Malta	✓	✓		✓		✓	
MT-5	Technology Entrepreneurship Training Programme	2012	2014	University of Malta – Centre for Entrepreneurship and Business Incubation (CEBI)	✓			✓		✓	✓
MT-6	Standards for ITalent	2011	onging	National Government, MITA, ICT Solutions, Bank of Valletta, Computime, Exigy, Crimsonwing, University of Malta, MCAST	✓	✓		✓		✓	little
NL-1	Expertisecentrum Mediawijzer.net	2011	2014	ECP - National Information Society Platform and many others	✓	✓	✓	✓	✓	little	
NL-2	Digivaardig & Digiveilig - Digitally Skilled & Digitally	2009	2015	ECP - National Information Society Platform	✓	✓	✓	✓	✓	✓	little

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
	Safe										
NL-3	Brainport Talent Region – Let's Connect	2011	2014	Brainport Development NV	✓	✓	✓	✓	✓	✓	
NL-4	TaskForce e-Skills Nederland	2009	2012	Ministry of Economic Affairs, Agriculture and Innovation in collaboration with ECP	✓	✓	✓	✓		✓	little
NL-5	ECF-NL Working Group	2011	2013	Companies in ICT and other industries	✓	✓		✓		✓	✓
PL-2	North-East Cluster of Digital Education	2010	2015	Science and Technology Park for Eastern Poland in Suwałki	✓	✓	✓	✓	✓	✓	
PL-3	PARP HR e-Skills Manager	2013	2015	CompSecur sp. z o.o		✓			✓	✓	
PL-5	Modern ICT specialists in public administration	2013	2015	Ministry of Administration and Digitization	✓					✓	little
PL-6	Modular training for Public Employment Services staff	2008	2012	Centre of Human Resources Development (under Ministry of Labour and Social Policy)	✓			✓	✓	little	
PT-1	Internet Segura	2005	ongoing	Science and Technology Foundation (FCT)	✓	✓		✓	✓	little	
PT-2	PME Digital (Digital SMEs)	2012	2015	Ministry of Economy and Employment, ACEPI, IAPMEI, and private companies	✓	✓	✓		✓	✓	✓
PT-3	Vale Empreendedorismo (Entrepreneurship voucher)	2012	2013	Portuguese Government	✓	✓		✓	✓	little	little
RO-1	Education for the Information Society	2011	2015	ECDL ROMANIA together with the Education Ministry	✓			✓	✓	little	
RO-2	Educational Process Optimised in View of the Knowledge Society Competences	2011	2013	The Ministry of Education, Research, Youth and Sport (MECTS)	✓	✓		✓	✓		
RO-3	Knowledge Based Economy Project (KEP)	2006	2023	Ministry of Communications and Information Society	✓			✓	✓		
SE-1	VäljIT – Choose IT	2009/ 2011	ongoing	IT&Telekomföretagen	✓	✓	✓	✓		✓	

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
SE-2	e-Skills Council (IT-Kompetens-rådet)	2012	2015	IT&Telekomföretagen	✓	✓	✓	✓		✓	✓
SE-3	Gendered IT Development for Increased Growth	2007	2012	Swedish Government	✓	✓	✓	✓		✓	little
SE-4	Digidel 2013	2011	2013	Many stakeholders from all segments of society, coordinated by Internet Infrastructure Foundation	✓	✓	✓	✓	✓		
SE-5	Womentor	2007	ongoing	IT&Telekomföretagen, several ICT companies; Ministry for Economy, Transport and Communication	✓	✓	✓				✓
SI-1	E-education	2008	2013	Ministry of Education, Science and Sport	✓	✓		✓	✓		
SI-2	Simbioz@	2011	ongoing	A group of volunteers, in cooperation with the Slovenian Public Libraries Association and other partners	✓	✓	✓	✓	✓		
SI-3	E-school bag	2013	2015	Slovenian Government	✓			✓	✓	✓	
SK-1	ICT Strategy for Primary and Secondary Education	2008	2011	Ministry of Education	✓			✓	✓	little	
SK-3	Mind Your Future	2011	ongoing	IT company PosAm		✓		✓		✓	
UK-1	Behind the Screen	2011	ongoing	e-Skills UK in public private partnership with various national stakeholders	✓	✓	✓	✓		✓	✓
UK-2	National Skills Academy for IT	2009	ongoing	The National Skills Academy for IT		✓	✓	✓		✓	✓
UK-3	GO ON UK	2011	ongoing	Broad range of stakeholders including UK Government	✓	✓	✓	✓	✓	little	little
UK-4	National Apprenticeships Service (NAS)	2009	ongoing	National Apprenticeship Service (NAS)	✓	✓		✓		✓	
UK-5	e-Skills UK	2003	ongoing	Large number of U.K. employers	✓	✓	✓	✓		✓	✓

No	Title of initiative	Duration		Main stakeholder(s)	MSP: Stakeholders from:				Focus on:		
		from	to		Government	Business	Unions/ NGOs	Education	Digital literacy	ICT Pro-fessionals	eLeadership
UK-6	ITMB Degree	2005	ongoing	e-skills UK in collaboration with 60+ employers from the UK economy		✓		✓		✓	

7.2 Selected good practice cases: Results of the benchmarking analysis

In the following, the multi-stakeholder partnerships (MSPs) which were selected as good practices in the e-skills area are described in more depth in tabular format. The tables summarise the results of the benachmarking analysis conducted for the present study. For the methodology employed, see section 6.2.

7.2.1 Coder Dojo

Coder Dojo, Ireland & worldwide		
Coder Dojos is a worldwide network of free coding clubs originated in Ireland that teaches children aged 8-18 how to code. It is a social enterprise in which volunteers run the clubs on a regular basis, with a special emphasis on open source and free software. Coder Dojos was created in 2011 by James Whelton, who set up a coding club for younger students at his school after hacking the iPod Nano. Rapidly, other venues in the community became interested in setting up a similar coding club. Co-operating with Angel Investor Bill Liao, he managed to spread the initiative nationally and worldwide. From 2011 to 2013, the Coder Dojos grew from coding lessons in Cork to involving thousands of children. Currently, there are clubs in 29 countries. Ireland alone counts 100 groups. The meetings occur in various kinds of venues, such as libraries, cafés, museums, co-working spaces or vendors' head quarters (CODER DOJO WEBSITE, 2013).		
Duration	**from**	2011
	to	ongoing
Main stakeholder(s)	NGO, companies in ICT and other industries	
MSP: Stakeholders from:	**Government**	
	Business	✔
	Unions / NGOs	✔
	Education	
Focus on:	**Digital literacy**	✔
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	
	Vendors/ ICT industry	
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	✔
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	✔
Main target group	**In primary/ secondary education**	✔
	In tertiary education	
	Girls/ women	
	Education providers	

	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	✔
	medium-term	
	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	Coder Dojos is a grass root movement that approaches children and teenagers who want to learn programming in an informal context. It focuses on the young participants' own ideas for software. Furthermore, a strong emphasize on community-based work characterizes the approach. This combination is innovative.	
"The MSP is innovative in terms of its objectives and targets"	Coder Dojos aim at introducing school children to building websites, apps, programmes, games and more. Furthermore, they want to create a network of young coders. Their scope is clearly beyond digital literacy and the traditional ICT school curricula. The initiative wants to spread free and enjoyable computer science activities to as many children as possible and also promote ICT as a possible career choice. Another emphasize is on community work.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	Coder Dojos funders themselves are stakeholders from different parts of society. James Whelton was high school student by the time the project started and Bill Liao is a co-founder of Xing. The initiative is a social enterprise that is supported by a number of industry stakeholders, such as Hays Consulting, Intel, Plunkett Communication and Enterprise Ireland. Public stakeholders include the Lumingh Institute of Technology and the President's Award Gaisce. Furthermore, the dojos are supported by partners on the local level.	
"The MSP is embedded in an overall (national) policy context"	The initiative is not embedded in Irish policy making on e-skills. Yet, it ties in with the goals of the Action Plan for Jobs, which include making Ireland the most attractive location in the world for ICT Skills availability. It has also received support from the Gaisce President's Award, Ireland's National Challenge Award for young people.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its	There is not much information on how Coder Dojos is funded. It can be assumed that the international, national and local partners support the initiative financially.	

ambitions"	
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	Coder Dojos is making extensive use of word-of-mouth through social networking media. This is a key component of the initiative's strategy for extending its reach beyond the immediate sphere of influence of its founders.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Coder Dojos is communicating with teenagers and possible mentors through its website, as well as social media including Twitter and Facebook. Local Dojos receive a free domain by Digiweb. The initiative has been intensely featured first in the Irish and then the international press.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	There is not much information on Coder Dojos management structure. On the local scale, dojos are set up by individual volunteers who receive support by the organization and local partners.
"The MSP has been flexible in adapting to changing needs"	Since the initiative grew rapidly in 29 countries within only two years, it must have been flexible in adapting to these new dimensions.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Coder Dojo is currently acting in 29 countries on five continents. More than 16,000 children are being reached. Guest Lecturers from ICT are being invited to speak at the different dojos. The website provides a pool of teaching materials that is constantly growing. Some of the former mentees developed successful apps for the App Store.
"The quality of the outputs is in line with the expectations"	The Dojos offer high quality coding lessons, covering a wide range of programming languages and skills. Different belts certify the degree of knowledge the kids acquired. The founders and the campaign itself have won a number of awards, such as a placement on the 30 under 30 Forbes list for social entrepreneurship and Ben and Jerry's Join the Core Social Enterprise Award. The feedback in the press articles is also very satisfying.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	The fact that some of the children taught by the initiative have already developed marketable apps reveals that the initiative probably has a huge impact on the e-skills of its participants. Furthermore, Coder Dojos is said to take an important step in tackling the gap of ICT practitioners. Furthermore, participants younger than 12 years are required to be accompanied by a parent during the sessions. Thus, spill-over effects outside the target group are also likely to occur through impact on family and volunteers.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	In April 2013 a Coder Dojo Conference united some of the stakeholders as well as speakers from similar organizations. Current topics about coding, technology and social entrepreneurship were discussed. This indicates a strong and growing social partner relationship.
"There is a long -term	There is not much information on this point. However, judging from

commitment of the stakeholders involved in the MSP"	the rising interest in the initiative by different stakeholders in and outside Ireland, the long-term sustainability of the initiative does not appear to rest on certain individuals, as the network has become increasingly self-sustaining.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Although acting for only 2 years, Coder Dojos have grown very rapidly. They managed to attract a lot of partners and registered remarkable success with its former mentees. The campaign is strongly embedded in the respective communities, offering different ways to support the idea: volunteering, supplying a venue or sponsoring. It has not run a sufficient amount of time to be considered mature. However, its wide range, good reputation and number of supporters of different scale strongly suggest that the initiative is sustainable.
C o n t a c t	
Website / contact	http://coderdojo.com enquiries@coderdojo.com

7.2.2 New High School Subject 'Computational Thinking'

New High School Subject 'Computational Thinking', Denmark		
Beginning in August 2011, a new subject "Computational Thinking" has been implemented in high school curricula for providing relevant, ICT skills, predominantly developmental (creative) skills and innovative capabilities, and which can inspire high school students to choose a career in ICT or a related area. Six ICT courses in nine variations had already been introduced before in high schools across the country, which come in four types: STX, HF, HTX and HHX schools. The large variety has proven problematic since the discipline's profile is not well developed. On top of that, high school students have an unclear or no idea about the ICT industry as an employer – regarding strategies, skills required, job content and which type of secondary education is a good basis for a career in ICT. These issues are seen as problematic not only for ICT skills development among high school students, but also for recruitment of students to ICT secondary education and to supply an adequate number of skilled employees to the ICT industry and ICT positions in other sectors. For these reasons, a new, consolidated subject was to be developed. A taskforce issues its recommendations in 2008, after which preparation of the course implementation began. The subject was approved for pilot testing over the period 2011-14. Within the first year, more than 50 high schools (of a total of about 250) have taught one or more classes the new subject. An evaluation of the teaching resources has been published and results publically discussed. To support the rapid establishment of the new subject, a multi-stakeholder partnership was set up in 2011 to take charge of two activities deemed necessary but for which no government funds where available: (a) development of new learning resources and (b) teacher training. The MSP consisted of the Centre for Science Education at Aarhus University; it-vest – Networking Universities; Egaa Gymnasium; Organisation of IT teachers at High Schools in Denmark; and the Region Midtjylland, , plus the association of technical colleges high school department, the association of private high schools, the organisation of principals in high schools and two industry organisations, ITB and ITEK.	
Duration	**from**	2008
	to	2014
Main stakeholder(s)	Ministry of Children and Education	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	✔
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	✔
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	

	Girls/ women	
	Education providers	✔
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	✔
	medium-term	
	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The initiative approaches high school students with a new ICT school subject. A revised curriculum focussing on the innovative side of ICT. The sub-project 'Create IT' focuses on qualifying teachers that are offering this subject. This double approach on students and teachers is innovative. A third dimension is the effort to connect university academics and high school teacher through theoretical articles, lectures and networking opportunites. The learning materials developed for the subject is offered on the website of the Danish Association of High School Teachers in Computing in the format of "learning activity packages", for which an open source approach is being applied. Teachers are encouraged to develop and share their own learning activity packages. Using Wiki methodologies, the content can continuously updated and improved by teaching staff as well as by students and other involved parties. This innovative, bottom-up approach to material development encourages diversity and multiplicity, which appears highly appropriate for this subject area.	
"The MSP is innovative in terms of its objectives and targets"	The initiative reacted to the declining number of teenagers choosing computing as a high school subject. With the new curriculum, it aims at showing the variety of ICT and making it more attractive for students. All needs of computational thingking should be covered in this programme. For this aim, teachers' education and networking is considered as crucial. The project "Create IT" therefore wants to supply teaching resources and help staff networking. These objectives are innovative as they valorise permanent teachers' education. This is not common in other similar projects.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design	The new subject was introduced by the Danish Ministry of Education. Another main partner in "Create IT" is It-vest, a network of three Danish universities. Further Stakeholders include Egaa Gymnasium;	

and implementation of the MSP"	Organisation of IT teachers at High Schools in Denmark; Region Midtjylland, plus the Association of Technical Colleges' High School Department, the Association of Private High Schools, the Organisation of Principals in High Schools and two industry organisations, ITB and ITEK. Thus, the initiative involves partners from the government, the educational sector and industry.
"The MSP is embedded in an overall (national) policy context"	Denmark has been focussing on adapting the education system to the demands of economy and society. Thus the new subject ties in with the goal to introduce more ICT-related education and attract students to a broad range of ICT subjects in higher education.
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The regulatory effort for the establishment of a new subject is funded from the Ministry of Education's running budget. Funding for development of learning resources and teacher training has come from it-vest (a network run by three public-sector universities in Denmark) and the Region of Midtjylland. Contributions in kind (personnel) came from all those who jointly developed the learning resources, including individual high schools, universities and industry partners. No budget is available for continuous updating of the learning packages or continuous educaton of teachers. The Danish Association of High School Teachers in Computing will be responsible for this task, they manage the online repository holding the content. Because of the co-creation approach to the further development of the learning material (use of Wiki structure etc.), the expectation is that users (teachers as well as students) will continuously update and improve the material as they use it.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	It-vest seems to be co-operating successfully with the schools within their project "Create IT".
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	The initiative supplies a large amount of tutorials and teaching tools on a special website. With this interactive tool, users can download or upload materials and comment on existing resources. It can be used both by teachers and pupils. In 2012 it had 56,285 accesses. Thus, the external communication is being effective.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	It-vest is coordinating the initiative "Create IT". University and high school teachers developed the curricula and the teaching resources. Consequently, government structures seem to be quite clear. Furthermore, there was a steering committee for the project, including industry and high school associations.
"The MSP has been flexible in adapting to changing needs"	The initiative supplies a large amount of tutorials and teaching tools on a special website. With this interactive tool, users can download or upload materials and comment on existing resources. It can be used both by teachers and pupils. In 2012 it had 56,285 accesses. Anyone interested in the project and join a mailinglist administrated by It-vest, and all members of the projects steering committee has contributed by communication to own members in newsletters etc. Thus, the external communication is being effective.

Degree of MSP reach: outputs	
"The expected outputs have been achieved"	A new curriculum was developed, focussing on 6 main topics: 1. Importance of computing and influence on human behaviour, 2. The architecture of IT systems, 3. Representation and manipulation of data, 4. Programming, 5. Modelling and structuring of data, processes and systems and 6. Interaction design. Innovation is a central aspect of all topics,and the curriculum seems to work as expected. The ministry is planning an evaluation of the subject in first half of 2014. The teaching material platform was used by 82% of teachers and 56% of students. It-vest has conducted a public evaluation of the teaching material after the first year of excistence.
"The quality of the outputs is in line with the expectations"	Most pupils and teachers considered the material well designed and comprehensible. The website was found easy to navigate. First evaluation of the material led to re-arrangement of the presentation, which proved the platform to be flexible for adjustments.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	18% of the high schools taught the new subject; the number increased to 26% in the second year, which is a very high figure given that this is still the test phase.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	The teaching platform IFTEK seems to be an important tool for linking the different agents. Through the project's steering committee a broad range of stakeholders, including industry, have been engaged.
"There is a long -term commitment of the stakeholders involved in the MSP"	it-vest is going to support the schools that introduced the subject until 2014. The subject itself is planned to be a long-term initiative. It-vest will keep monitoring the situation and keep stakeholders informed.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The curriculum and teaching material appear very well developed. The recent evaluation indicates the initiative to go beyond the pilot phase. Until now, the new subject seems to have been well received, as it has been offered by about 26% of high schools during the second year already. It will ultimately be the Ministry's decision whether the subject will be mainstreamed within the country's curricula for secondary education. According to the national experts interviewed for the study, this is highly likely. The teachers organisation and It-vest are ready, willing and able to support the subject, having invested considerably in designing it for sustainability in focus, flexibility and approach.
Contact	
Website / name of contact person	http://www.it-vest.dk/en/activities/ict-in-high-school/ Dr Michael E. Caspersen, Aarhus University Ms Marianne Mikkelsen, It-vest

7.2.3 ECF-NL Working Group

ECF-NL Working Group, The Netherlands		
The e-CF NL workgroup was set up in 2011 to adapt the European e-Cometence Framework to the Dutch situation. It is hosted by Digivaardig & Digiveilig. The framewas developed by EXIN, a Dutch ICT certification initiative. From 2003 to 2011, several stakeholders had already applied the e-CF in some way or the other, but there was no national strategy for this topic. The group focussing on the framework emerged from the Task Force ICT Skills NL. The initiative is expected to result in a standardised library consisting of ICT competences. In 2013 an adoption plan will be finalised and the main stakeholders are expected to sign an agreement to fully adopt the framework in the following three years.		
Duration	**from**	2011
	to	2013
Main stakeholder(s)	Companies in ICT and other industries	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	
	In tertiary education	✔
	Girls/ women	
	Education providers	✔
	Employers	✔
	Employed (ICT prof.)	✔
	Other employed	✔
	Job-seekers	✔
Scale	**comprehensive**	
	medium	✔
	small	
Duration	**long-term**	
	medium-term	✔

	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	
	Career support	
	e-Skills certification	✔
	Job matching	✔
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The e-CF is an important tool to match demand and supply on the ICT labour market. Forecasts predict a considerable ICT practitioners shortage for the Netherlands in 2015.The approach to focus not only on training, but also on certification is an important step.	
"The MSP is innovative in terms of its objectives and targets"	The working group aims at improving transparency in supply and demand of ICT professionals and their services. To achieve this, it wants to establish the e-CF as standard framework to which different stakeholders refer, namely government, HR managers, ICT professionals, the staffing industry and educational providers.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The MSP is part of the Digivaardig & Digiveilig program for digital skills and safety and cooperates with the Dutch standardization body NEM. The team involves a total of 21 representatives from the government, industry and education. Among others it includes the Ministries of Interior and Economic affairs, EXIN, IBM Netherlands, Eneco and Utrecht University of Applied Sciences.	
"The MSP is embedded in an overall (national) policy context"	The initiative ties directly in with the Dutch strategy concerning e-skills, which offers a wide range of measures. In this segment, the e-CF working group represents the efforts towards standardisation. Government is directly involved in this progress.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The initiative is funded by Digivaardig & Digiveilig.	
Effectiveness of communication		
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	The MSP created a website addressing employers and professionals. It informs about the advantages of the certification and offers further material for download. Since the framework was translated in early 2013, it has been featured in different events and publications by Digivaardig & Digiveilig	
Efficiency (flexibility)		
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The Working Group comes together to every two months. Chairman of the Working Group on e-CF NL is Jose de Leeuwe (Dir. IT Operations, Eneco).	
Degree of MSP reach: outputs		
"The expected outputs have been achieved"	The Dutch Norm Committee for ICT Skills delivered the translation of the framework from English into Dutch in February 2013, led by Dutch Standardisation Institute (NEN). In addition, the Working	

	Group approximates the various e-CF groups in order to raise awareness for the framework. In November 2013, 21 different organisations signed an e-CF covenant. By doing so, they declared that the framework is being or will be used in their organizations. 11 Dutch ministries, the national Police as well as companies such as Capgemini and Pink Elephant, already use the framework in their job descriptions. Institutions and universities, such as the HBO-I foundation, use it as a reference. Furthermore, a website for ICT professionals and enterprises was created to promote the framework.
"The quality of the outputs is in line with the expectations"	In two years, the working group passed from the translation and adaptation of the framework to having the first stakeholders adapting it. The presence of big players, such as the government, is likely to lead to spill-over effects- In this way, the first results are in line with the qualitative expectations.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	At least eleven major stakeholders are already using the framework on a large scale. Thus, the initiative has started to give important impulses in e-skill development.
"There is a long -term commitment of the stakeholders involved in the MSP"	The initiative is scheduled to last from 2012 to 2013.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The program is still growing and entering the operational phase. It successfully nationalized the framework and already won major stakeholders as supporters. With government and industry participating and also with e-CF implementation in other member states, it can be assumed that the program will reach sustainability.
Contact	
Website / name of contact person	http://e-cf.nl/ Dr Anneke Hacquebard

7.2.4 e-skills UK

e-skills UK		
This is a not-for profit, employer-led organisation, licensed by government as the Sector Skills Council for the IT, Telecoms and Contact Centres sector. e-skills UK is dedicated to the needs of business, improving competitiveness and productivity through action on skills. e-skills UK's role is to bring together employers, educators and government, and unite them on a common, employer-lead agenda for action on skills. Established in 2003 as the first UK Sector Skills Council, e-skills UK is part of the Skills for Business network of a series of employer-led Sector Skills Councils. e-skills UK is a strategically focused organisation with an ongoing government remit operating to a five year rolling plan. E-Skills UK is continuing its activities and active in several new areas since our last investigations. An example is the IT Professional Profile which is a free, online tool that allows evaluation of a person's ICT professional skills against an agreed industry benchmark – the IT Professional Standards. The Profile is part of the National Skills Academy for IT offering.		
Duration	**from**	2003
	to	ongoing
Main stakeholder(s)	A large number of UK employers	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔
	Girls/ women	✔
	Education providers	✔
	Employers	✔
	Employed (ICT prof.)	✔
	Other employed	
	Job-seekers	
Scale	**comprehensive**	✔
	medium	
	small	

Duration	**long-term**	✔
	medium-term	
	short-term	
Main focus/objective	**Awareness raising**	✔
	Education & training	✔
	Career support	✔
	e-Skills certification	✔
	Job matching	
	Market information	✔
Innovativeness		
"The MSP is innovative in its approach"	E-skills UK is the Sector Skills Council for Business and Information technology. It approaches a broad target group, ranging from young teenagers to ICT professionals, developing a wide variety of actions. The initiative combines these concrete actions with expertise and influence/ networking for employers. This differentiates the approach from other MSPs.	
"The MSP is innovative in terms of its objectives and targets"	The MSP has three main targets: making ICT careers more attractive to young people, support ICT professionals and increasing digital capability of users and businesses. The focus is clearly beyond digital literacy. There are strategic plans (2009/2010 – 2013/2014) for each England, Wales, Scotland and Northern Ireland, which are embedded in the overall ICT strategy for the UK. Core activities are employer engagement, standard and qualifications, partnerships and research about ICT and society. There are no clear figures mentioned as targets.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	E-skills UK resulted from the merger between e-business National Training Organisation and IT National Training Organisation and the inclusion of National Training Organisation Telecom. E-skills UK involves a large number of companies who are employers in the ICT sector. Big enterprises are represented as well as SMEs. The Business and Information Technology sector is a major contributor to the UK. Therefore, e-skills UK is said to take time to engage with trade unions and facilitate a constant contact with Awarding Bodies. It chairs the skills sub-group of the Scottish Government ICT forum. Furthermore, it also includes Developed Administration, research institutes, trade unions and education providers.	
"The MSP is embedded in an overall (national) policy context"	The UK has been emphasizing the importance of e-skills in building an internationally competitive economy. E-skills UK is embedded in this context and has been partially publicly funded. Sector Skills Councils operate under licence from the UK Government.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	E-skills UK has funded by its member companies and partially publicly. As to 2009, annual e-skills UK income was around £7.4 Mio, the core funding came to £2.4 Mio. e-skills UK runs a clearly set performance management system. There is an explicit linking between the strategic goals, targeted outcomes, impact measures and its individual programmes, clarified in its strategic and business plans. However, in 2012 the way of public	

	funding for Sector Skills Councils was modified. Direct funding moved to contestable financial support. E-skills UK can now apply for support for individual projects that will be funded by the Employer Investment Fund and the UK Commission for Employment and Skills. In 2012, one of the projects funded by the Employer Investment Fund was IT Industry Readiness, which received £ 420,300 (~ 44% of total project budget). In 2013, the Growth and Innovation Fund financed, among others, Cyber Security Learning Pathways (£560,043) and Sector Managed Apprenticeships (£ 1,773,708). Thus, the regular projects continue as before with the new funding. In order to address future possible decline of income, effected from major funded programmes coming to an end, e-skills UK rather consider options in regards to future new sources of income and sustainability. It regards to have a financially reliable business with secure reserves and visibility of future income, e.x. building on models like ITMB and IT Professional Development Programme to provide fees services that belong to its strategy, but fall outside of core funding and / or funded projects. Furthermore, e-skills UK has a risk management strategy which includes business risk and project risk. The risks identified are held up in a risk register which is maintained by the Head of Business Services.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	The is governed by the employers themselves in order to keep its actions synchronized with the industry's needs. To the key areas of strength identified in this regard count: a "very high level of commitment from the Boards and their members to developing and driving forward the strategic objectives; highly motivated staff committed to provide high quality service; development of a clear and concise performance reporting system. The Strategic Plans are based on very extensive research and were developed in consultation with employers and stakeholders" Therefore, the internal communication appears to be effective.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	E-Skills UK provides a detailed website, informing about its work, objectives and strategy. It clearly communicates how individuals and companies can benefit from and participate in their programs. The initiative is also staying in touch with the target group via LinkedIN. According to the Sector Skills Council Assessment Report, the feedback of e-skills UK's engagement with stakeholders turned to be positive. Considering its broad approach, the external communication is well designed.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The MSP is managed through different boards and steering committees, occupied by industry representatives. A different strategy plan is developed for each nation.
"The MSP has been flexible in adapting to changing needs"	Since the initiative is tailored according to the needs of the market, it can be assumed that it has been flexible in adapting to new demands. It could be also confirmed by e-skills' strengths - very clear vision, strategic objectives and very clear linkage between the strategic

	plans, business plan and operating plan. For instance, a number of the products and services developed by e-skills UK meet the needs of individual nations and are appropriate for use across the nations, for example the IT Business Guide.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Since its foundation in 2000, E-Skills UK has been developing a number of measures: reports on different ICT-related topics, internship and apprenticeship programs for students. The Computer Club for Girls (CC4G) and the BigAmbition program act in awareness raising for digital careers and target high school students. The National Skills Academy IT provides assistance to ICT professionals and the ITMB degree focuses directly on e-leadership competences.
"The quality of the outputs is in line with the expectations"	According to the campaign, a large number of participants profited from the initiative's programs. CC4G has reached 150,000 girls in over 4,500 schools and the program has been very popular with teachers and students. 84% of participants state they became more interested in an ICT career. 9,000 users are registered in BigAmbitions. The Apprenticeship program was completed by 6,500 people in 2011. Thus, the ICT practitioner shortage has been tackled in many different ways. Yet, there is no information on the effect on enrolment in ICT studies. Whilst e-skill's UK relicensing, NAO (2009) has identified very strong performance, particularly in regard to employer engagement; leadership; strategic planning; research; standards and qualification development; and the development of sector specific solutions.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Given its broad field of action, E-skills UK has been Britain's major agent in networking companies, students and education providers. The success of the different programs implies that participants have successfully been improving their e-skills or benefitting from new ICT professionals.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	E-skills UK manages to link employers of different levels to their activities. SMEs can get involved by sponsoring an CC4G club for only £500 per year, while bigger companies can offer more sophisticated schemes. This is a big advantage and enables a fertile involvement of different kind of stakeholders.
"There is a long -term commitment of the stakeholders involved in the MSP"	The initiative has been acting since 2000, with an involvement of a large number of companies and other stakeholders. Given the variety of projects offered, a long-term involvement of the stakeholders can be assumed.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Since E-skills UK has been operating for more than a decade now, it has already reached a critical mass of participants. In 2009 it was re-licensed as 'outstanding' as the Sector Skills Council for Business and Information Technology. With a big amount of industry stakeholders involved, funding is likely to be sustainable. The wide range of activity indicates that the initiative has by far reached a mature operational phase. Thus, it cannot be compared to most of the other MSPs, which are considerably smaller and more recent.

C o n t a c t	
Website / name of contact person	http://www.e-skills.com/ Mr Mark Underwoood

7.2.5 EVOLIRIS

Evoliris ICT Reference Centre of the Brussels Region, Belgium		
Today's ICT Reference Centre EVOLIRIS resulted from the merger in 2009 of former ICT training centres and the addition of a new function, i.e. observation of the labour market and job matching. Its main objectives are: a) Improve matching between ICT training supply and the needs of employers in the Brussels Region; b) Act as interface between all actors involved in ICT employment policies: education, training and labour market institutions; c) Coordinate the training supply from the various regional stakeholders; d) Support the training suppliers (project design, training organisation, follow-up of trainees, development of the training infrastructure). Main achievements so far have included: a) Identification of a set of "intermediate e-skills" demanded by employers: PC-network technician, network administrator, ICT help desk, web support, web developer; b) Organisation and coordination of vocational training activities (about 2,000 trainees/year in 2012, increase of 12% compared to 2011) for both employed workers and the unemployed; c) Job screening and job matching in ICT jobs; d) Serious online game 'Infinity" (awareness raising about ICT jobs among the youth); e) Reporting on supply and demand dynamics on ICT labour market in Brussels (last issue: 2011). Despite the complexity of the institutional system of the Brussels Region (overlapping institutional competences of the Region and the French/Flemish communities), EVOLIRIS has established itself as a major player and helped improve labour market transparency and tailoring of training measures to employer needs in the ICT sector.		
Duration	**from**	2009
	to	ongoing
Main stakeholder(s)	Regional government of Brussels; PES and vocational training agencies of Brussels Region; Agoria; Microsoft Innovation Centre; Trade unions (CSC, FGTB, CGSLB) and others	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	
	Vendors/ ICT industry	
	SMEs	
	Other industry	
	Unions	✔
	NGOs, grassroots	
Scope	**National**	
	Regional	✔
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔
	Girls/ women	
	Education providers	✔

	Employers	✔
	Employed (ICT prof.)	✔
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	
	medium-term	✔
	short-term	
Main focus/objective	Awareness raising	
	Education & training	✔
	Career support	✔
	e-Skills certification	
	Job matching	✔
	Market information	✔
Innovativeness		
"The MSP is innovative in its approach"	Evoliris approaches four target groups: employees, unemployed, students and teachers. Thus, it tackles the lack of ICT practitioners on different fronts. The initiatives approach is also innovative for relating to a region where the French and Flemish speaking communities overlap. This is a unique challenge.	
"The MSP is innovative in terms of its objectives and targets"	Evoliris is focussing on creating a more dynamic ICT labour market. On the one hand, its objective is to supervise new professions and technologies and raise awareness for ICT careers. On the other, it offers ICT training courses and works on improving their quality. There is no information about concrete targets the initiative wants to achieve.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The initiative is a non-profit organization that was created in 2006, following the initiative of the Minister of the Government of the Brussels Region. It involves stakeholders from companies, trade unions, the government and the educational sector. Partners include Microsoft, Bruxelles Formation, Innovation Center Brussels, the employment agency ACTIRIS and the region of Brussels. In this way, a balanced participation of all sectors of relevance for the ICT labour market is secured.	
"The MSP is embedded in an overall (national) policy context"	Throughout the last decade, Belgium has been addressing its gap of ICT labour force, above all on a regional level. The Brussels region, that counts approximately 20,000 ICT employees, has been receiving special funds for ICT formation. Evoliris is embedded in this regional policy.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	There is no information about how Evoliris is funded. At least ACTIRIS, the employment office of the Brussels Region, has been investing in the initiative (2010).	
Effectiveness of communication		

"The internal communication and cooperation is/has been effective"	Since Evoliris is constantly developing activities in co-operation with different stakeholders, it can be assumed that there is an effective internal communication. Likewise, all important member organizations are represented on the administrative board.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Evoliris explicitly addresses the different target groups on its website. The information about careers in ICT is easily accessible and bilingual. However, it is striking that the Flemish information is less comprehensive and updated than the French. Possible industry partners are not addressed on the website, even not in the French part. Research results are also not presented.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The steering committees include participants from all sectors of stakeholders. The annual report (2010) reveals details on the organization of the projects. The initiative reaches out to its single members to match them to their individual projects.
"The MSP has been flexible in adapting to changing needs"	Since its foundation, Evoliris already modified its structure and objectives. It started in 2006 as an ICT Reference Centre for the Brussels region. Back then, the focus was on e-skills formation for unemployed. During the last years, the objectives have also been including awareness-raising for ICT careers, support to the labour market and improvement of training. The 2010 report reveals that the initiative has also been adapting to changing interests of its target groups by revising their methods.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Evoliris has been developing a great variety of activities to meet its goals. They have developed a data bank for ICT professions and courses in the Brussels region. They set up a free certification exam for e-skills. In 2012, the serious online game "Infinity" was launched to introduce teenagers to the ICT industry. The workshop "Informaticien-ne d'un jour" [ICT professional for a day] reached 1072 pupils in 2012. Thanks to co-operation with its partners, a large number of e-skill formations are organized or promoted every year. For example, there are more than 50 short-term courses offered in 2013. In 2010, 1417 people participated in an activity only on Evoliris premises.
"The quality of the outputs is in line with the expectations"	Evoliris informs about ICT course reaching from technical to academic level. The training it organizes on its own is available for many different ICT subjects and is constantly revised. Hence, the target groups can be certain to find a formation that is adequate for their needs. An unsatisfactory aspect is that less training is offered in Flemish. Likewise, the biggest share of participants on Evoliris premises where unemployed, with university students providing the smallest share. Thus, it seems as if e-leadership is not a focus yet.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	The large number of courses offered and promoted suggests that a lot of participants improved their e-skills with the help of Evoliris. For example, 60% of the students who participated in the ICT professional workshop since 2009 changed their negative opinion about this career.

"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Given the variety of activities and the change of focus towards the needs of the industry, it can be assumed that the stakeholders strengthened their relationship.
"There is a long -term commitment of the stakeholders involved in the MSP"	Since the initiative has been operating since 2006 and committee members represent different types of stakeholders, it can be assumed that the partners are participating on a permanent basis.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Evoliris has been operating since 2006 by now. Its training courses are popular and a large number of teenagers have been participating in its school programs. Thus, a critical mass has been reached. However, it seems as if the initiative is less successful in the Flemish regions, especially due to problems in finding funds and partners. In addition, the 2010 report reveals certain financial mismatches on the short term. In this way, Evolirirs seems to have reached a lot of its objectives, but there are still some unanswered questions.
C o n t a c t	
Website / name of contact person	http://www.evoliris.be Mr Jean-Pierre Rucci

7.2.6 **Finish IT**

Finish IT, Germany		
Finish IT is a project that supports university dropouts, career changers, immigrants whose ICT education is not recognised in Germany, and ICT interested individuals who want to obtain a vocational qualification in ICT in the fastest possible way. A one-year programme combines ICT skills qualification modules with a placement at a company. The project was initially sponsored by the Federal Ministry of Education and Research as part of their initiative supporting modular professional certification training programs ("Abschlussorientierte modulare Nachqualifizierung"). It is run by CyberForum e.V., a networking forum of the ICT industry in the Karlsruhe region, in cooperation with the local Chamber of Industry and Commerce (IHK). The City of Karlsruhe and a large number of local companies provide valuable support. At operative level, key partners include the Federal Employment Agency and Lutz & Grub, a private provider of education & training measures. In addition, public sector education providers such as the city's two universities are increasingly cooperating with Finish IT, e.g. when trying to provide practical advice to university dropouts and immigrants who lack a recognised certification.		
Duration	**from**	2011
	to	ongoing
Main stakeholder(s)	CyberForum e.V., Chamber of Industry and Commerce	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	
	Vendors/ ICT industry	
	SMEs	✔
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	✔
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	
	In tertiary education	✔
	Girls/ women	
	Education providers	
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	**comprehensive**	

	medium	
	small	✔
Duration	**long-term**	
	medium-term	✔
	short-term	
Main focus/objective	**Awareness raising**	
	Education & training	✔
	Career support	✔
	e-Skills certification	✔
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	Finish IT focuses on former university students who dropped out in their final years and immigrants, who do not have their diplomas recognized in Germany. The aim is to certify their potential in an official way. The initiative offers a 12-months vocational in-service-training. In this way, it is attractive to individuals who did not adapt to the university system or want a faster qualification. A win-win situation is created for both parts: participants achieve an appropriate degree while receiving a full salary; companies benefit from candidates with previous ICT knowledge. This approach is innovative since a lot of skilled people are being excluded from sophisticated careers due to a lack of formal qualification	
"The MSP is innovative in terms of its objectives and targets"	Finish IT is the only initiative featured in this study that explicitly targets ICT dropouts. Since the rate of those who do not graduate is considered too high (~30% in Germany), this is a very innovative and necessary focus. Also career changers and foreigners, whose qualifications are often not recognized in Germany, get a chance to achieve a formal degree in this program. It is outstanding that the initiative aims at retaining the potential of these particular ICT practitioners, rather than attracting students to ICT subjects.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The initiative was initiated by CyberForum, which is a network of around 1,000 ICT companies in the region of Karlsruhe, in cooperation with the Chamber of Commerce. It is part of the program "Perspektive Berufsabschluss" by the German Ministry of Education and Research. The City of Karlsruhe has the patronage. Training is offered by the private education provider Lutz und Grub. Further stakeholders are the local public employment service, Karlsruhe University (KIT) and the Karlsruhe University of Applied Sciences.	
"The MSP is embedded in an overall (national) policy context"	The German government made it a priority to tackle the lack of ICT practitioners in the economy. At the same time, it invests in counteracting school dropouts at all educational levels. In Finish IT, both policy goals perfectly overlap.	
"The initiative has been able to	Perspektive Berufsabschluss, the project in which Finish IT is	

secure continuous funding, appropriate to the scope of its ambitions"	involved, received a total of 67 Mio € of funding from the Ministry of Education and Research, the European Social Fund and the EU. In 2013, this financial support ended. The project is now financed through premiums the companies pay CyberForum for the recruiting service and CyberForum's own funds.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	Beate Scheuermann, project manager of Finish IT, emphasizes that the stakeholders have been co-operating very effectively and that all partners have been acting in concert. Now that the project is in its operational phase, stakeholders communicate directly with one another. During the application process, candidates are selected by CyberForum and then presented to the companies, e.g. in matching events.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Finish IT is reaching out to the target group through its website, facebook and advertisement, especially in the Karlsruhe region. Local universities inform dropouts about Finish IT. The initiative has also been featured in online and print press. As a result, it is receiving applications from all over the country. Through connections to similar projects, Finish IT also introduces applicants from similar MINT areas to other programmes.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	CyberForum provides tailored advice to candidates and companies; in addition, the Chamber of Commerce and the local employment agency support the participants. The individual enterprises employ participants, at least during the time of the programme. Lutz & Grub conducts the training, the fees of which are paid either by the German employment agency or the respective partner companies and in some cases by the participants.
"The MSP has been flexible in adapting to changing needs"	After being able to benefit from financial support by the government and the EU in its initial stage, Finish IT has just entered a new stage during which no such funding is available anymore. Since it was decided that the program will be continued, it has had to adapt to this new situation, which it managed to do successfully.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Finish IT participants can choose between two different degrees: IT Application Specialist and System Integration Specialist. Since it was launched, the program has received more than 200 applications, 30% of which came from immigrants. In 2013, 31 of 40 participants had already graduated the program. There are approximately two courses starting per year. The next course starts in early 2014. Classes prepare the participants for vocational examination in their degree and also include vendor-based certification. Apart from its education programme, the initiative also conducts motivation trainings for students in ICT. It aims at helping them in finishing their degree and also presents Finish IT as an alternative path.
"The quality of the outputs is in line with the expectations"	Finish IT has been offering exactly the kind of qualification many enterprises and participants needed. To begin with, the selection of participants is already quite demanding. Candidates have to prove at

	least one year of experience in the ICT sector in order to be accepted. Also, dropouts must have several terms of study completed. In this way, a high quality of the programme is guaranteed. This also manifests itself in the programme's graduates. Most of alumni received a contract of employment at their partner companies. In addition, compared to university degrees, Finish IT contributes more ICT practitioners to the economy in a shorter time. Participating companies praise the candidates' qualification and state that Finish IT allows them to broaden their panel of employees' profiles.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Rather than improving the participants' e-skills, the initiative gives a formal training and certification for individuals who are already ICT practitioners. This is a crucial achievement.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	As mentioned above, the co-operation between the stakeholders is said to be working out very well. This success is also due to the fact that the campaign is strongly embedded in the Karlsruhe community.
"There is a long -term commitment of the stakeholders involved in the MSP"	Even after the end of the official funding phase, the stakeholders decided to continue Finish IT. There is no deadline.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The project has been operating in the Karlsruhe area only until now, since this region presents an agglomeration of ICT business and technical universities. In this scale, it has reached a critical mass of participants and companies. Yet, it is adaptable to the rest of Germany. David Herrmanns, CyberForum's manager, emphasized that the whole German ICT branch would benefit from a nationwide version of Finish IT for it cannot afford to waste the potential of dropouts. Plans to expand the scheme nationwide were postponed due to a lack of funding. However, Finish IT is in contact with a similar project in Aachen.
Contact	
Website / name of contact person	http://www.finish-it.info/ Ms Beate Scheuermann, CyberForum e.V.

7.2.7 Frauen in die Technik (FIT)

Frauen in die Technik (Women Into Technology, FIT), Austria		
FIT is an initiative for gaining young women's interest in studying technical subjects. For this purpose education opportunities and professional perspectives are being demonstrated to students at secondary schools. Much use is made of role models (called "ambassadors"), who are university students or graduates who explain their choice of a technical subject of study in direct interaction with pupils. The initiative has its roots in Austria's Public Employment Service's Women Employment Policy Programme 2006-2010, which introduced the topic as a key area for policy intervention. FIT is run as a multi-stakeholder partnership between technical universities, local STEM employers, industry associations, Public Employment Services and school authorities, and is organised at regional level (FIT Vienna – Lower Austria – North Burgenland, FIT Styria – Carinthia – South Burgenland, FIT Upper Austria).		
Duration	**from**	2006
	to	ongoing
Main stakeholder(s)	The Office for Gender Equality and Advancement of Women of the TU Graz	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	X
	Educational system	✔
	Vendors/ ICT industry	
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	✔
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	
	Girls/ women	✔
	Education providers	✔
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	**comprehensive**	
	medium	✔
	small	

Duration	**long-term**	
	medium-term	✔
	short-term	
Main focus/objective	**Awareness raising**	✔
	Education & training	✔
	Career support	✔
	e-Skills certification	
	Job matching	
	Market information	✔
Evaluation	**publically available**	✔
	planned	✔
Innovativeness		
"The MSP is innovative in its approach"	FIT is approaching girls in high school, promoting STEM-related studies	
"The MSP is innovative in terms of its objectives and targets"	The objective to enhance the share of female STEM-students and graduates is particularly common for the German speaking countries. ICT is only one focus among other subjects that are being promoted. Therefore, e-leadership is not explicitly mentioned.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The Styrian initiative is organized by the Office for Gender Equality of the Technical University in Graz in cooperation and with support of Federal Ministry for Science and Research, Federal Ministry for Traffic, Innovation and Technology and Federal Ministry for Instruction, Arts and Culture (BMWF BMVIT, BMUKK), the State Governments of Styria and Burgenland, universities and polytechnics, the Styrian Federation of Industry and industrial companies such as Siemens, the umbrella association TechWomen. Thus, it covers different relevant areas in managing the ICT supply.	
"The MSP is embedded in an overall (national) policy context"	FIT is part of the national strategy for closing the ICT practitioners gap and eliminating the gender inequality in this field.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	In Styrian initiative is funded by the region's universities (TU Graz, Universität Graz, Montanuniversität Leoben, FH Joanneum, FH Campus 02, FH Burgenland), the province (Bundesland) Styria/Steiermark, a regional industry association and trade unions. Additional support comes from individual companies. The annual budget is modest at € 60,000.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	FIT's activities suggest that there is an effective communication between the initiative and the education system. However, it is striking that the events do not involve the industrial partners.	
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	FIT is communicating through ambassadors and information days at universities. The former are female STEM students who promote technical subjects to girls in secondary schools. This peer-group approach seems to have been quite effective in the past, since students pass on their own experiences. The initiative is actively advertising on facebook and their website, where current role models present themselves.	

Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	FIT is organized at a regional level. University staff contributes in on campus information days. Female role-models talk to girls at their high schools. However, there is not much documented activity form the part of the stakeholders in industry.
"The MSP has been flexible in adapting to changing needs"	Since FIT is constantly recruiting new young women as role models, representing a wide variety of disciplines, it has good conditions to react flexibly to changing needs.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	The number of female ICT students has risen since FIT started operating in 1991. This is probably due to the initiative's activities.
"The quality of the outputs is in line with the expectations"	Some of the role models working for ICT were themselves encouraged by the campaign to opt for a technical degree. Thus, the initiative seems to address the target group in the right way.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Approximately one fifth of the participating role models are ICT students. Although this share could be higher, it guarantees a continuous contact of high school girls with female ICT practitioners.
"There is a long -term commitment of the stakeholders involved in the MSP"	Since the initiative has been going on since 1991, a further long-term commitment of the stakeholders can be assumed. FIT role models have participated in a study on gender inequality in technical subjects.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	FIT has been operating for over 20 years now. Started as a countrywide initiative, today FIT operates in the larger provinces (*Länder*) only after the federal government stopped its funding in 2010 because of budgetary pressures. In the Steiermark, Upper Austria and Vienna regions, regional stakeholders pushed for a continuation of activities as FIT was considered to play a vital role for further increasing the share of young women in STEM. The project is sufficiently sustainable. It can be assumed that the pool of former and current role models and students can serve as a career network for Austrian women in ICT. The project has also proved to be scalable.
Contact	
Website / name of contact person	https://www.fit.tugraz.at/ Ms Verena Rexeis

7.2.8 Get Qualified Scheme (Former MyPotential)

Get Qualified Scheme (Former MyPotential), Malta		
The aim of this incentive scheme is to support the personal development of individuals who aim to achieve qualifications and certifications required by industry. The incentive is applicable to students following a course of studies leading to a certification, diploma, degree or post-graduate degree courses. This incentive is mainly intended to support persons who have completed formal education and who are seeking to further their education in areas that are relevant to Maltese Industries – including the ICT industry. This programme has proved to be an extremely important action that contributed to an increase in the number of ICT professional skills in Malta. The number of providers enrolling their ICT courses under the scheme has increased on a yearly basis. The courses available today as part of the scheme are varied and provide various options for professional development, including; industry-based training and certification courses, vocational courses and academic degrees.		
Duration	**from**	2006
	to	2013 (extension expected)
Main stakeholder(s)	Malta Enterprise	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔
	Girls/ women	
	Education providers	✔
	Employers	
	Employed (ICT prof.)	
	Other employed	✔
	Job-seekers	✔
Scale	**comprehensive**	
	medium	✔
	small	

Duration	**long-term**	✔
	medium-term	
	short-term	
Main focus/objective	**Awareness raising**	
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach."	The initiative gives incentives to individuals wishing to achieve qualifications required by industry. Incentives are granted for certification, diploma, degree or post-graduate degree courses. ICT is one of the supported areas. When successfully completing the program, students receive a tax credit covering 80% of the costs occurred, totalling from € 2,000 to € 20,000. With this approach, individuals can choose on their own which qualification they want to get. Thus, it allows a relatively wide range of studies that can be chosen individually.	
"The MSP is innovative in terms of its objectives and targets."	Get Qualified aims at enhancing and maintaining the pool of high skilled individuals to improve Malta's attractiveness for international investments. Especially for a small country that has a lot of competition when it comes to international investments, this is an innovative target.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP."	Get Qualified is administered by Malta Enterprise, a national development agency for international investment on the Maltese Islands and national enterprises. It is funded by MITA, the IT Agency of the government. A growing number of private and public education providers offer the qualification courses. Remarkably, the scheme also involves universities in other European countries. Furthermore, vendors also participate through education. Consequently, there is a solid alliance of stakeholders relevant to education.	
"The MSP is embedded in an overall (national) policy context."	Get Qualified is embedded in Malta's official e-skills policy which focuses on ICT education. Although there is no significant gap of demand and supply of ICT practitioners, the policy aims at keeping up the nation's talent pool.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	Get Qualified is funded by the Maltese government. The total budget depends on the number of eligible participants. Courses are supported with up to € 20,000.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective."	Since new educational partners have constantly been won throughout the last years, it can be assumed that the initiative is effectively communicating internally. However, there is not much information on this topic.	

"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)."	Get Qualified is communicating mainly through the Malta Enterprise website. Its online presentation is quite concise, but contains all necessary information needed to directly apply for the incentive.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility."	The incentive system is managed by Malta Enterprises, who also decides which courses are approved. The education bodies offer the courses and certify that the candidates concluded the program. The participants themselves apply for the scheme when starting their course and request the grant after their graduation. In this way, a lot of responsibility is given to the students themselves, which boosts their own initiative and economizes resources.
"The MSP has been flexible in adapting to changing needs"	The initiative has already been adapting to changing needs in the past. It is the successor of the MyPotential program which had been launched in 2006. By now, it broadened its range of courses, including other areas than ICT. In 2012, the government expanded the scheme to five more areas of study to benefit more students and industries.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	From 2006 to 2012, more than 3,300 students have been granted over 13€ million in tax credits. In September 2013, over 200 courses from more than 30 providers where eligible for incentives. The scheme sponsors academic courses from universities in 4 countries.
"The quality of the outputs is in line with the expectations."	There is not much evidence on the quality of outputs, apart from the figures mentioned above. It would be interesting to know the share of scholars who completed an ICT course as well as the share of university graduates benefitting from the program.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	It must be emphasized that incentives are only granted to students after they completed the course. Thus, the number of students sponsored automatically corresponds to the number of individuals who graduated at least a short-term program. This is an important point, since there is not the risk of sponsoring possible dropouts. Furthermore, grants are paid in the form of tax incentives. This ensures that only graduates actually working in Malta receive the grant. Consequently, the strategy reduces risks and sunk costs, increasing the campaign's impact on national economy.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship."	Since the government expanded the scheme last year, it can be assumed that the stakeholders have been cooperating successfully and that the scheme is highly welcomed by the industry.
"There is a long -term commitment of the stakeholders involved in the MSP."	There is not much information on this point. However, a lot of university courses of several years are involved and there is a delay between application to the program and the reception of the grant. Thus, it can be concluded that the stakeholders are committed for at least a couple years.
"The MSP has reached a critical	Counting its predecessor, the initiative has been operating since

mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project."	2006. Considering Malta's small population, it reached a significant number of students. Since also university courses of several years are incentivised, the number of eligible graduates should rise within the next years. The financial basis of the grants is guaranteed through a subsidiary law. However, In October 2013, applications where accepted only for courses starting in the same year. This approach is likely to be transferable especially to small countries. It shows how to efficiently set education incentives that benefit the national economy.
C o n t a c t	
Website / name of contact person	http://www.maltaenterprise.com/en/support/get-qualified Dr Karl Herrera, Malta Enterprise

7.2.9 IT Academy Program

IT Academy Program, Estonia		
This is a joint initiative by the Estonian Information Technology Foundation (EITF), the country's main universities and the ICT industry with the goal to "take Estonian ICT education to the next qualitative level". The Programme is funded by Ministry of Education. The IT Academy is to improve cooperation and brand-building with the goal to increase the quality of ICT education and to promote ICT course programmes on offer from Estonia's higher education system. IT Academy has the objective to: boost attractiveness, quality and outcomes (in terms of success of graduates on the labour market of ICT studies); result in more and better qualified ICT professionals entering the country's labour market; foster ICT-based entrepreneurship; strengthen recognition of Estonia as a destination country for ICT studies; boost the country's output in terms of international level academic and research expertise. The total annual budget of the initiative is € 2.7 million (2013/14), to be increased in subsequent years.		
Duration	**from**	2012
	to	2015
Main stakeholder(s)	Estonian Technology Foundation (EITF)	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔
	Girls/ women	
	Education providers	✔
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	**comprehensive**	
	medium	✔

	small	
Duration	long-term	
	medium-term	✔
	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The approach to engage stakeholders from a non-governmental foundation and the ICT industry to improve Estonian ICT education is innovative in the national and European context. Likewise, turning the country into a preferred destination for ICT studies as well as supporting local students combines different levels of scope.	
"The MSP is innovative in terms of its objectives and targets"	The initiative's target is mainly to boost quality of tertiary education ICT programmes in Estonia, and then brand and promote them. Furthermore, the initiative aims at doubling the number of Computer Science Graduates in Estonia. Additionally, it wants to build closer links between university and industry. By 2015, the number of graduates from IT Academy curricula should increase by 100 compared to 2011. Another target is to reduce the drop-out rate by 30% until 2015. 30% of Master's participants are meant to be foreign students. Including more foreign participants, IT Academy wants to introduce more international flair in their universities and become mor attractive to foreign lecturers.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The initiative involves stakeholders from three different areas: First, the universities of Tallinn and Tartu; second the Estonian Information Technology Foundation (EITF); third Skype Technologies and recently LHV Bank. Four different degrees are part of the programme, with an emphasis on masters studies.	
"The MSP is embedded in an overall (national) policy context"	Estonia has a well developed digital culture, making e-skills activities a priority in its growth strategy. IT Academy is an example of cooperation between the government and multi-stakeholder initiatives.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	In 2012, the Estonian State invested € 1.5 million in the initiative while Skype Technologies contributes € 100,000 per year until 2015. LHV bank also contributed to a scholarship programme together with Skype Technologies which has a total value of € 780,000.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	Internal agreements and contracts between the different stakeholders ensure an effective cooperation. On a day-to-day business there are regular meetings were all stakeholders discuss the further strategy. EITF regularly visits the universities.	
"The external communication	The IT Academy has been promoted through national and	

is/has been effective (especially towards the target groups to which the MSP is addressed)"	international press. Contact with international students is achieved through special websites and Facebook. It also participates in education fairs.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The IT Academy is managed by a steering committee with representatives from the government, the universities and EITF. While the Ministry of Education funds the programme, the universities work on the courses. Skype and LHV Bank contribute financially and also offer internships for selected students.
"The MSP has been flexible in adapting to changing needs"	At first, the programme was intended to include only international master courses in English. Then, the focus was widened to other schemes as well. There are also new considerations to modify the structure of funding: until now, it is designated for single courses rather than whole ICT institutes at the universities.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Applications for ICT courses that are part of the Academy sharply increased in the last two years. Nearly half of the students enrolled in the international masters degrees are from abroad. Every year, the IT Academy provides € 680,000 for scholarships for Bachelor, Master and PhD students in Computer Science. Skype Technologies provided € 100,000 for 15 scholarships in 2013/2014. In the same year, LHV Bank gives away 3,000€ in to promote ICT-related Bachelor's theses. In the academic year of 2012/2013 four curricula at different universities were part of IT Academy, receiving a total of 400 students. One main condition for Master's and Doctorate's courses is that at least part of the lessons is held in English or another foreign language and that the studies are internationally competitive. The universities themselves benefitted from the biggest part of the funding. ICT was applied in different ways, e.g. new equipment or recruitment of foreign lecturers.
"The quality of the outputs is in line with the expectations"	The scholarships provide € 300-400 monthly for ICT students, which is a decent sum, compared to the average monthly wage in Estonia. The online information on the initiative is easy to access, very detailed and available in English. Thus, until now excellent conditions have been created to reach the main target. Also, information on current scholars suggest that e-leadership issues are also part of the programme. One recipient of the Skype grant is working on a project aimed at predicting possible bankruptcy of a firm. Until now, most of the foreign students still return to their home countries after graduating the programme. There are initiatives to incentivise them to continue working or pursuing a PhD in Estonia.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	The programme is already attracting a significant number of (future) ICT students on a national and international scale. Also, the initiative raises awareness for studying Computer Science in Estonia for foreign students.

	Furthermore, the intense campaigning is spreading Estonia's reputation as an economy with a structural advantage in ICT. Therefore, the initiative might create spill over-effects.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Through the EITF foundation, government, universities and companies tied an intense cooperation in the project. Stakeholders agree on the common priorities of IT Academy.
"There is a long -term commitment of the stakeholders involved in the MSP"	EITF is engaging in the issue on a long term. One point of uncertainty is the government funding, which is not yet secued beyond 2014. Skype Technology committed themselves for three years to the programme. LHV Bank did not set a timeframe yet.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Involving a number of influent bodies from different areas, the IT Academy has a sustainable foundation to continue. Since the concept is well designed, it can be assumed that further stakeholders from the ITC industry might be interested in joining the initiative in the future. Also, the Academy is only one of many aspects in EITF's programme to boost Estonia's ICT landscape. Thus, a critical mass is reached not only by IT Academy itself.
C o n t a c t	
Website / name of contact person	http://studyitin.ee/ Mr Erki Urva, Information Technology Foundation for Education

7.2.10 **ITMB Degree**

ITMB Degree, UK		
The ITMB degree was created by e-skills UK in collaboration with over 60 employers from different sectors of the UK economy. It is specifically designed to develop graduates who have the variety of technical, business and interpersonal skills that organisations need to compete in today's global market. The ITMB degree was designed as an option for students interested in reading for a Bachelors degree in ICT and business. The degree is currently offered in 19 universities in the UK. It provides students with the sophisticated ICT skills they need to get ahead in the ICT industry giving them the chance to regularly meet and network with industry leaders from over 60 leading organisations. An ITMB degree can help get jobs in ICT management, business strategy and planning, system design or ICT consultancy. ITMB has been running since 2005 and currently has over 1,000 students on the programme. Since it was developed, the number of applications to the programme has risen on average by 24% every year. Awareness of the ITMB degree is rising with nearly 50% of current ITMB students stating that they applied to ITMB at more than one university. What is more, 33% of the current students are female – more than double the number of females across all computing degree courses. Student satisfaction amongst ITMB is much higher than the national average, with 99% of ITMB students stating they were satisfied with their course compared with 83% across all other courses. 98% also believe that the ITMB course if preparing them well for their future career, and 93% believe that the course has made them more employable than other students. 100% of 2011 ITMB graduates were found to be employed (85%) or in further education one year later.		
Duration	**from**	2005
	to	ongoing
Main stakeholder(s)	e-skills UK in collaboration with 60+ employers from the UK economy	
MSP: Stakeholders from:	**Government**	?
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔
	Girls/ women	
	Education providers	✔
	Employers	

	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	
	medium-term	✔
	short-term	
Main focus/objective	Awareness raising	
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The ITMB Degree is starting from the assumption that ICT skills alone are not enough for the needs of the industry. Highly skilled graduates must be able to manage people and business as well as system. It does not only merge existing vendor education with public education curricula but establishes a new course plan based upon industry needs. Thus, this explicitly interdisciplinary approach is innovative.	
"The MSP is innovative in terms of its objectives and targets"	The degree aims at equipping graduates with exactly the kind of qualification companies require. There are no explicit figures expressed as a target. However, the degree is offered in 19 universities. With this concept the degree relates directly to e-leadership competences. The objective to promote this combination of skills on a large scale, not only as a niche product, is quite innovative.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The degree was created by the company association E-Skills UK. It was elaborated in co-operation with over 60 major UK employers. These represent different industry branches related to ICT. It acts in concert with the universities to implement the degree. Consequently, the degree involves mainly stakeholders in industry and reaches out to the education system.	
"The MSP is embedded in an overall (national) policy context"	The UK has been emphasizing the importance of e-skills in building an internationally competitive economy. ITMB Degree ties in with this policy.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The programme is funded by e-skills UK's members with additional contributions from the participating universities.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	All stakeholders involved are represented on the initiative's website. There are company contact events taking place regularly. Thus, internal communication seems to be effective.	

"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	ITMB has a very updated homepage. It informs about the course itself, possible career options, participating companies and universities. A number of online publications give more details on structure and impact of the programme. Likewise, the individual universities inform on their ITMB participation on their websites. The initiative is also represented with videos on youtube and a facebook page. Furthermore, it is featured in the nation ICT relevant press.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	E-Skills UK elaborates the framework for the programme and helps organize close co-operation with the companies. The universities offer the respective courses that are integrated in ITMB. Thus, there are clear government structures.
"The MSP has been flexible in adapting to changing needs"	It is interesting to note that the different educational institutions offer slightly different degrees, like Computing for Business or Management and Information Technology. In this way, individual specializations fit in well with the overall concept while giving room for individual needs. The co-operation with the industry ensures that real business requirements are considered.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	The number of ITMB enrolments, graduation and participating universities has constantly been rising since the creation in 2005. In 2012, around 1,000 students were enrolled. Applications for the programme are rising around 24% per year on average. In 2013, four new universities started offering the degree. Apart from the usual classes, the degree offers special career training and exclusive events and internships. Examples are an annual series of 'Guru Lectures' with at least 10 employers, team-based work overseen by business mentors and project work. Furthermore, there is a wide range of recruiting events, such as mock interview sessions, selection days and employer location visits. Thus, the initiative successfully disseminated the degree and has been met with considerable interest.
"The quality of the outputs is in line with the expectations"	98% of all ITMB students belief that the degree will prepare them well for their future career. In 2011, 100% of ITMB graduates where employed or in further education. With 34%, the share of female students is much higher in this programme than in usual ICT courses. Likewise, companies have been praising ITMB graduates for showing extraordinary competences, such as knowledge, determination and team-work skills. Consequently, the outputs are of excellent quality.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Both graduates and companies are very satisfied with the programme. Stakeholders and students emphasize, that it conveys exactly the right skills required by the industry.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Since the programme involves a lot of exclusive company events, challenges and internships it can be assumed that there is a strong social partnership between the stakeholders.

"There is a long -term commitment of the stakeholders involved in the MSP"	The stakeholders' overall satisfaction indicates that there is a stable long-term commitment of partners. Given the steeply growing applications for the courses, it is very improbable that the program might lose its attractively in the near future. Likewise, the number of participating companies has been rising.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The initiative has been acting since 2005. It has constantly been increasing in size. A solid funding is assured through E-Skills UK. Consequently, the degree has both reached a critical mass and sustainability. It could expand geographically, offering ITMB as well in more locations in Wales and Scotland.
C o n t a c t	
Website / name of contact person	ITMB@e-skills.com Ms Sue Stevens, e-skills UK

7.2.11 **Level 8 Conversion Programme**

Level 8 Conversion Programme, Ireland		
This is a short / medium term measure of the Higher Education Authority, within the ICT Action Plan, to develop a sustainable domestic supply of high quality ICT graduates. It offers an intensive NFQ level 8 higher diploma ICT skills conversion programmes by higher education providers in partnership with industry. Level 8 is the Irish Honours Bachelor Degree. The 15 courses on offer will be for NFQ Level 8 jobseekers with cognate/numerical skills and underlying aptitude for programming and there will be 769 places offered countrywide. The 6-months work placements will be provided by a variety of business organisations. Importantly, the initiative is focused at graduates of disciplines with high numeracy proficiency such as construction engineering. An ICT-related Higher Diploma is awarded to each student who completes a one year + internship. 800 students graduated and entered the workforce in 2012, and 760 places are committed for 2013 (by September that year). The Concersion Programme has grown out of the 2012 Joint Government-Industry ICT Action Plan which provided a collaborative system-wide response, across Departments, agencies and the education and enterprise sectors aimed at increasing the domestic supply of high-level ICT graduates (e.g. upskilling programmes, national campaigns promoting ICT as a career choice and measures to increase the uptake of higher level maths subjects in schools). The plan recognised that as increased undergraduate ICT enrolments would take time to feed through to increased national output the immediate roll-out of targeted reskilling and conversion opportunity could be very useful. The ICT skills conversion programme was developed as a result.		
Duration	**from**	2012
	to	2013
Main stakeholder(s)	Higher Education Authority	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	
	In tertiary education	✔
	Girls/ women	
	Education providers	

	Employers	✔
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	
	medium-term	
	short-term	✔
Main focus/objective	Awareness raising	
	Education & training	✔
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The programme makes use of short-term up-skilling in order to tackle the skills shortage in the Irish ICT industry. It focuses on honours bachelor graduates with interest in numeric thought. By focussing on academics from other areas, it addresses individuals with a high learning curve. The collaborative approach to the design and launch of the ICT Skills conversion programme was essential. It might have been possible to have education providers alone launch the programme but this would have reduced the impact of the precise targeting effect – industry work with academia to identify and address very specific skills gaps. As a result participants are selected and supported so as to provide the maximum opportunity for reskilling and the realisation of subsequent employment outcomes. The combination of a focus on tackling the e-skills shortage in the short term and strong employer involvement in designing the related education offers is highly innovative.	
"The MSP is innovative in terms of its objectives and targets"	By enhancing the number of ICT graduates on a short term, the programme aims at supplying professionals the labour market urgently needs. The target of Ireland's ICT Action Plan (2011) is to double the annual output from undergraduate honours degree ICT programmes to 2000 in 2018. The conversion scheme is an important tool to achieve this target. Some of the courses offered also include business qualifications. Thus, the initiative also relates to e-leadership qualifications.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The programme was initiated by the Higher Education Authority within the ICT Action Plan. Key stakeholders have been 14 Irish universities and a range of major ICT companies offering job placements. The key steps in establishing the programme were early and frequent consultation with industry and higher education	

	through the establishment of a working group to specify the types of responses needed. Thus, the programme enjoys full support from all key stakeholders in the area.
"The MSP is embedded in an overall (national) policy context"	The scheme is part of the ICT Action Plan, which is an integrated effort by government agencies, professional bodies, academia and employers to address the perceived ICT skill gap up to 2018. It also relates to the 2013 Action Plan for Jobs, which aims at providing further 2000 ICT graduate level professionals in 2013. Thus, it is strongly embedded in a favourable policy context. Moreover the ICT Skills Conversion programme, while being predicated on addressing skills needs of employers, is linked to other national activities which support people back to work as part of an 'all of government approach'.
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The Level 8 Conversion Programme is funded by the Higher Education Authority and the Department of Education and Skills, with a budget of €5 million. Thus, courses can be offered free of charge for the participants. This allocation is negotiated by the Department of Education and Skills. While securing funding is bound to remain a challenge in the coming years, the specific targeting of skills gaps and the labour market activation aspects of the programme means that the programme enjoys high priority among policy-makers: both intentions are nationally relevant and supported by various ministries and agencies.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	The development process has been based on consultation and inclusivity. Industry representative groups, relevant government ministries, providers have all been engaged at various stages in the process. The consultation process consists of an annual call for proposals; at the same time, input is sought from representative groups, education providers and state agencies. Keeping the programme relevant and up to date has sustained interest among stakeholders.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	The initiative maintains a website where applicants can inform themselves on the programme. Conditions and courses are outlined so that students can apply directly online. Furthermore, the campaign has been featured in the national and ICT press. Thus, communication is effective and to-the-point.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The initiative is managed by the Higher Education Authority. Education providers have responsibility for developing and providing the courses. Companies have participated extensively in elaborating the curricula. The action is reviewed annually in advance of any funding allocation. There is some tension on the balance between labour market activation and the need for high skills – but the programme has so far managed to negotiate that reasonably well.
"The MSP has been flexible in adapting to changing needs"	While the key concepts have remained the same, there has been a honing of the target skills areas (the inclusion of Data analytics in the 2012/13 round for example) and the increasing targeting of longer term unemployed (through the extension of the qualifying period for

	income support). In response to the findings from the interim evaluation, a work placement was made mandatory in the second phase.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	The programme started in 2012, when 800 participants graduated and entered the workforce. It was prolonged for a second phase in 2013. That year 14 higher education providers were offering 15 Level 8 Conversion Programmes. The one year full time education is being conducted in core computing/programming, software and data analysis. The 15 programmes accept 769 Level 8 jobseekers. The participants do not pay tuition fees. In 2013, 17 programmes were offered.
"The quality of the outputs is in line with the expectations"	All courses offered relate to the skills currently needed on the labour market and require intense study. The working placements are offered in high-profile companies. Due to the programme's short duration, it supplies the market with new ICT practitioners in a short term. Although the participants do not have the same knowledge as full ICT graduates, they have excellent skills in their area of specialization. Thus, the achievements seem to have been of high quality so far.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Since the programme involves classroom lessons as well as job training, it can be assumed that both participants and companies benefit from a new supply of ICT skills. Furthermore, the initiative signals to potential international investors that Ireland is actively addressing the industry's urgent demands, as industry insiders have pointed out.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	The programme has created awareness of the fact that, given the right supports and opportunities, people will take advantage of them in ways which create a true win-win situation. For example, education providers have repeatedly noted that the students on these programmes are a highly motivated and a pleasure to work with.
"There is a long -term commitment of the stakeholders involved in the MSP"	Until now, it is not decided yet whether the scheme will continue in 2014. The further development depends on the evaluation of the current programme. Yet, there are clear plans to expand the scheme. Ultimately the decision to proceed or not lies with the Department of Education and Skills which funds the measure.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Until now, the programme is designed to be a short-term measure. However, Level 8 Conversion Programme shows a well defined policy with solid stakeholder co-operation. The choice to support graduates from non-ICT fields has shown to result in fast and effective qualification. In this way, the initiative presents an interesting approach within a larger portfolio of e-skills policy measures.
Contact	
Website / name of contact person	www.ictskills.ie/

	Mr Gerard Doyle, ICT Ireland Skillnet

7.2.12 **NOKIA Bridge Program**

Nokia Bridge Program, Finland & worldwide		
Bridge is a programme for supporting employees dismissed by Nokia following a major wave of restructuring since the start of this decade. Nokia downsized its workforce in Finland by 5.000 employees between 2011 and 2013. The company expressed a strong feeling of responsibility for its employees and thus chose to set up a scheme assisting those who had been laid off. Launched in April 2011, Bridge has been applied at 20 different R&D and manufacturing locations in 13 different countries, but most intensely in Finland. The programme offers outplacement services such as career coaching and CV clinics as well as skill specific training and university collaboration for learning opportunities for increasing chances for re-employment. Most importantly for the topic of the present study, however, Bridge also offers start-up funding, exposure to angel investors and venture capitalists, and entrepreneurship training to those with a new business idea in need of backing. The programme has resulted in over 1,000 business start-ups worldwide, more than 400 of which in Finland alone. This is of special relevance given the country's traditional lack of enthusiasm for entrepreneurship, particularly when compared to the United States but also many European countries. National experts report that it is increasingly becoming 'cool' in Finland to set up a business; a lot of excitement has been generated around the topic. The entrepreneurship programme comprised generous grants normally in the range of 10.000 – 25.000 € (subject to income tax) being awarded to former employees who were found to have a strong potential for successful starting a business. Of an overall budget of several tens of millions Euros, between one third and one half has been spent on entrepreneurship grants. Extensive education packages have been designed in cooperation with different educational institutions, and offered to laid-off employees free of charge (eg in Finland co-funded with the state). For example, a training programme (LIKE) at Tampere University of Technology and the University of Tampere has been offered to help former Nokia employees develop their leadership and business skills as they pursue other career options or entrepreneurship.		
Duration	**from**	2011
	to	ongoing
Main stakeholder(s)	Nokia	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	?
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	✔
	Sectoral	
	Trans-national	

Main target group	**In primary/ secondary education**	
	In tertiary education	
	Girls/ women	
	Education providers	
	Employers	
	Employed (ICT prof.)	✔
	Other employed	
	Job-seekers	✔
Scale	**comprehensive**	
	medium	✔
	small	
Duration	**long-term**	
	medium-term	
	short-term	✔
Main focus/objective	**Awareness raising**	
	Education & training	✔
	Career support	✔
	e-Skills certification	
	Job matching	✔
	Market information	
I n n o v a t i v e n e s s		
"The MSP is innovative in its approach"	In Bridge Nokia co-operates with national and local public bodies, other employers, education providers and other stakeholders. Nokia takes full responsibility for the programme and its outcomes. Although only former are eligible for the supports made available through Bridge, the target group is big in size: 17,000 employees participated in the programme all over the world. The programme offers a range of options that range from support for start-ups to new jobs within Nokia or other and retraining. As part of the entrepreneurship programme, financial support is provided to new start-up companies set up by former Nokia employees to the amount of up to €25,000 each; up to four ex-employees can band together in order to obtain up to €100,000. Reportedly[33], the aim was that about 1.0 – 1.5 year's pay was to be given to Bridge participants who chose self-employment, and the company support would be exclusively for running the company. Bridge is highly innovative as it demonstrates how a process of corporate restructuring involving large numbers of employees can be utilised for boosting entrepreneurial activity in a way which promises to be sustainable and contribute significantly to a country's capability of generating new sources for employment and competitiveness.	
"The MSP is innovative in terms of its objectives and targets"	Although the Bridge programne is not conceived as an e-leadership initiative; the original objectives have been: 1. Assist ex-employees throughout their dismissal; 2. Support the local economies most affected by the Nokia lay-offs; 3. Support Nokia's new strategy. Yet,	

[33] http://www.aalto.fi/en/current/news/view/2013-11-27/

	the scheme has arguably had significant indirect impacts on e-leadership skills in Finland. Through entrepreneurship training and start-up grants for former employees, Nokia has invested in those competences which are generally deemed crucial for e-leadership.
Networking – Engagement of stakeholders	
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	Nokia has been involving stakeholders form education, government and other businesses. In Finland, training programs were elaborated together with local employment offices and funded by the Finnish government. Bridge also established contact with local companies to facilitate further employment opportunities. Thus, the initiative created a well-designed support network.
"The MSP is embedded in an overall (national) policy context"	Nokia's programme is under the sole responsibility of the company. It does tie in, however, with Finland's innovation policy and helps to create new opportunities for the national economy after Nokia's decline. Bridge's education packages fit into the Finnish emphasis on lifelong learning and flexible career paths.
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	Bridge has been funded by Nokia itself, with partial support from the EU Globalization Fund. The start-up strand of the programme has been funded by Nokia alone.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	When Nokia started communicating details about the layoffs expected for 2012, it at the same time launched the Bridge programme as a support infrastructure for the affected employees. Internal communication appears to have been appropriate and effective, as evidence collected via exit interviews confirms. The Nokia programme was designed to offer easy-to-understand decision support e.g. to those with an interest in starting a business. Close collaboration was sought with local stakeholders such as start-up incubators, city authorities, public employment services and providers of business education to supply every candidate with a support package tailored to her or his needs and the local context.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Nokia has provided details about the Bridge program in its 2012 "People and Planet Report". There have also been various articles in the international press focussing on the initiative. In 2012, the initiative won the European Excellence Award for clear communication to employees and stakeholders. Activities have been stepped up for spreading awareness of the programme and its impacts to the wider public in 2013, when first results of two external evaluation studies became available (see below).
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	Nokia installed Bridge Centres at many locations all over the world, four of which at the company's major sites in Finland. The programme is governed centrally by Nokia, but decisions about the practical supports to be offered are taken mainly at local level in close cooperation with other stakeholders involved. Local leaders were selected from the impacted people, i.e. those who have been made redundant because of the restructuring. One of the selection criteria was sufficient seniority.

	Nokia stresses that it is taking full responsibility for the programme and its outcomes.
"The MSP has been flexible in adapting to changing needs"	At operational level, the Bridge programme has adapted very flexibly to local conditions and changing requirements, guided by the overall objective of helping all former employees to gain a foothold as entrepreneuer, in a new employment relationship, in further education or an other arrangement chosen by the persons concerned.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	The first results of the independent evaluation suggest that the programme has indeed achieved its expected outcomes as far as the start-up strand of the the programme is concerned. A total of around 1,000 new businesses were set up as a direct result of the Bridge Programme in 2011-2013. 400 of these are in Finland, and of these 40% are ICT companies, 30% offer expert services and 30% operate in other fields. 91% of start-ups created were still active in mid-2013. Exit interviews have confirmed that the large majority of all employees were satisfied with the support from the Bridge programme (85% stated to be satisfied or very satisfied overall).
"The quality of the outputs is in line with the expectations"	An independent evaluation by the Aalto University's Small Business Centre[34] found that about 500 individuals who were laid off from Nokia between June 2011 and March 2013 took part in the start-up path of Bridge programme. Those taking part in the programme were given guidance in the distribution of information, developing a business plan, cooperation with local business incubators and start-up funding. 10% had a prior entrepreneurial background. About half started their companies on their own and the other half as part of a team. These newly created companies employed an average of 2.1 people in mid-2013; they expect to employ 2.8 persons on average by the end of 2013 and 7 persons by 2015, which would translate into a total of 2,500 employees.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	There are some indications that the initiative and Nokia's restrucuting in general have created a more dynamic start-up scene in Finland, partly because a significant surplus of ICT practitioners is now available for the national economy. Nokia itself sees benefits in terms of support for the lager Nokia ecosystem. 18% of newly created start-ups in the period 2011-13 have made a technology licensing/idea release agreement with Nokia. The results of the survey conducted by the Aalto University's Small Business Centre suggest that these new start ups will create a significant number of jobs in the near future.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner	There are signs that the Bridge initiative has intensified Nokia's links with other companies in the wider Nokia ecosystem. Some Bridge-funded start-ups in Finland have attracted additional financial support from other institutions. Thus, it appears that the importance of Nokia for the Finnish economy contributed to a productive

[34] http://www.aalto.fi/en/current/news/view/2013-11-27/

relationship"	cooperation between stakeholders. Also, it is assumed that the experience of Nokia-sponsored entrepreneurs will act as a boost to e-leadership not only in the start-ups directly affected, but also in the wider economy.
"There is a long -term commitment of the stakeholders involved in the MSP"	The Bridge programme is part of the restructuring effort of Nokia and as such has not been intended to remain in place for more than a few years. The start-up strand of the programme, however, has reportedly strengthened trust and willingness for cooperation witin the wider Nokia ecosystem.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Bridge was started in 2011 and is still being continued. However, it will probably finish within the next few years, as soon as Nokia's restructuring is completed. With an overall budget of several tens of millions Euros (between one third and one half is spent on entrepreneurship grants), the design of the Bridge programme has ensured critical mass at all of the locations that have participated.
C o n t a c t	
Website / name of contact person	http://press.nokia.com/2013/05/10/nokia-people-planet-report-2012-published/ Mr Matti Vanska, Nokia

7.2.13 **Pasc@line Association**

Pasc@line Association, France		
The association was set up in 2006 as a multi-stakeholder partnership between over 75 higher education institutions – mainly engineering and management schools – and over 1,200 companies plus two sector-specific trade unions (Syntec Numérique and CICF Informatique) with the goal to promote dialogue between academia and the ICT business sector. Its most important aim is to promote higher education in ICT and define the core competences needed-by the industry. Pasc@line works in collaboration with the Ministry of Education, the Ministry of Higher Education, INRIA and other public institutions. The association openly refers to the European e-skills framework and wishes to strengthen its collaboration with the European Commission. Most objectives of the association seek to promote the attractiveness of ICT jobs amongst the youth in order to: raise numbers of ICT graduates; help develop high standards for ICT in secondary and higher education; and ultimately to promote ICT as a growth driver for the national economy. Completed projects include a reflection and campaign on competencies in higher education institutions, very much inspired by the works of the European Commission, and an information campaign "You'll be an engineer, my daughter !", to entice girls to choose engineering education and careers. In 2013 the association prioritizes the following three projects: (a) development of "ISN" course, i.e. ICT as an optional subject for final A level pupils (in cooperation with Ministry of Education and the National Institute for ICT and Automation Research); (b) Master level "Sandwich courses" and (c) e-leadership. The association also advocates for an extension of sandwich training to master's level. Finally, Pasc@line is carrying out research on e-Leadership through its Observatory and wishes to develop its collaboration with the main actors on this topic: the European Commission, CIGREF and the Montaigne Institute.		
Duration	**from**	2006
	to	ongoing
Main stakeholder(s)	75 higher education institutions, 2 unions (Syntec Numérique and CICF Informatique) & 1,200 companies	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	✔
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	✔
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	✔

	Girls/ women	
	Education providers	✔
	Employers	✔
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	comprehensive	✔
	medium	
	small	
Duration	long-term	✔
	medium-term	
	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	✔
	Career support	
	e-Skills certification	✔
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	Pasc@line reaches out to (prospective) ICT students on different levels. High school students are addressed with information campaigns, competitions and multimedia offers. Another target group are students in higher education for ICT engineering. It also establishes a definition of the required ICT competences with its members.	
"The MSP is innovative in terms of its objectives and targets"	The initiative's main goal is to enhance the attractiveness of ICT careers for the young generation. Apart from this, it wants to introduce an ICT methodology to higher education that relates to the needs of industry. Furthermore, Pasc@line is recently targeting e-leadership. The focus is on developing three different approaches to e-leadership: technology, process and management.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	Pasc@line involves more than 75 institutions of higher education and two ICT trade unions. Thus, it reaches more than 1,200 companies.	
"The MSP is embedded in an overall (national) policy context"	The initiative relates to the targets outlined by the French government in its Roadmap on Digital Policy. Focussing on the young generation and including ICT in school curricula are two important aspects addressed in this context. On the operational level, it has a direct connection to national ICT policy through the organism for engineer certification (CTI) and through the association of universities.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	In 2013 Pasc@line had a budget of approximately 223,000€. It is entirely financed through membership fees. Pasc@line does not receive any national or European funds. Overall, even more funding would be needed for the initiative to be appropriate for its scope.	

Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	The initiative is communicating internally in meetings, giving public access to the reports. There is an overall consensus about the initiative's priorities.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Pasc@line intensely uses social media to reach the target group. It is also featured in the national press. This communication strategy is appropriate for the young generation.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	Pasc@line has a well-defined organisation structure, with one observatory and four commissions. There is one responsible committee for each of the following tasks: communication, ICT culture, partnerships and ICT pedagogic. Commission members do not receive any payments for this activity. Thus, stakeholders are free to engage in different parts of the initiative on a voluntary basis.
"The MSP has been flexible in adapting to changing needs"	Pasc@line is characterized through a close link to the industry. Therefore, its campaigns are flexible in adapting to employer requirements. The frequent meetings of the organization committees ensure flexibility.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	An important success was reached in 2012, when 700 French high schools introduced the option of an ICT subject in A-Level courses. In 2012, 15,000 students chose this option. Pasc@line assisted in this project. Furthermore, the initiative has constantly been developing new measures to promote ICT careers. Examples are the campaign "You will be an engineer, my daughter!" (since 2011) and the ICT competition for high school students "Concours Castor". In 2012, it produced 26 youtube videos featuring ICT professionals. As to e-leadership, Pasc@line recognized the importance to invest more in these competences. In one of its reports it considers a co-operation with management schools as well as the creation of e-leadership MBAs. Recently, it is planning a study on existing education programmes which are relevant to e-leadership. It also wants to interview current e-leaders about the competences that are essential to them. It is investigating how ICT changed modern business. Furthermore, it plans a conference on e-leadership with researchers from different areas. On this basis, Pasc@line wants to propose education schemes for e-leaders.
"The quality of the outputs is in line with the expectations"	The material is up to date, comprehensible and is designed to reach young generations not only at school. Introducing advanced ICT as a high school subject is an important step to attract more pupils to Computer Science. Its recent plans on e-leadership are quite well-structured. Furthermore, the method for competences in higher education was evaluated by Pasc@line. The evaluation emphasized aspects that needed more consideration. One example is the difference between participants performance in examination and on the job. Thus, there is a need for a more holistic competence framework, which also ties in with e-leadership issues. The competence method was adapted

	after the evaluation.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	During the last years, the participating universities noticed an increase in the number of students applying for an ICT-related subject. Thus, it can be assumed that the initiative has a positive effect on the future labour supply of ICT practitioners in France. Yet, there is no clear evidence. Pasc@line probably contributed to promote the image of ICT careers.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	The initiative's different stakeholders cooperate in the organization structure and offer activities together. Universities and unions are represented in equal parts. The stakeholders are motivated because they both initiated and benefit from the initiative. Apart from its active members, Pasc@line has a good connection to other companies and higher education institutions.
"There is a long -term commitment of the stakeholders involved in the MSP"	Pasc@line has been operating since 2006 and counts with a growing number of members.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Operating for seven years, the initiative gained experience and further members. The participation of two trade unions ensures a big pool of companies of different scale. Since Pasc@line is financed by members' fees, it does not depend on government support Concerning its methods for e-skills in higher education, a critical mass has not yet been reached. However, by 2016 all engineering schools in France should have adapted Pasc@line's competence approach in order to obtain certification for their courses.
Contact	
Website / name of contact person	http://www.assopascaline.fr/pascaline Mr Christian Colmant

7.2.14 RETE Competenze per l'EconomiaDigitale (Italian Competence Network for the Digital Economy)

Rete Competenze per l'Economia Digitale (Italian Competence Network for the Digital Economy)		
The network aims to raise awareness about e-competences and disseminate the e-CF. It also aims to develop and supply training programmes focused on the 36 e-competences to create e-leadership based culture within the ICT SMEs. ICT SMEs and ICT professionals in general need support to grow and be competitive internationally. E-Leadership skills are the basis for driving the change and support clients' requirements. The Network believes that the e-CF is a good lever to disseminate this culture and an effective guidance for training. Stakeholders are Fondazione Politicnico di Milano (FPM) and the main company associations in Italy: ASSINTEL, ASSINTER ITALIA, CNA COMUNICAZIONI, CONFINDUSTRIA DIGITALE, and UNIMATICA. The Network operates throughout the national territory and targets ICT and end-user companies, as well as policy makers and public administration. Main achievements so far have included: three workshops realized with participation of about 150 SMEs on the key role of e-competences; the decision of the service sector trade unions to develop a job matching web tool based on the e-CF (see below); and the draft of the general e-CF-based national standard for the ICT professionals (UNINFO Technical Committee), which is under public consultation at the time of writing.		
Duration	**from**	2012
	to	2014
Main stakeholder(s)	Fondazione Politecnico di Milano, Assintel, Assinter Italia, CNA Comunicazioni, Confindustria Digitale, and Unimatica	
MSP: Stakeholders from:	**Government**	
	Business	✔
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	✔
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	
	Educational system	✔
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	
	In tertiary education	
	Girls/ women	
	Education providers	
	Employers	✔
	Employed (ICT prof.)	✔

	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	✔
	small	
Duration	long-term	✔
	medium-term	
	short-term	
Main focus/objective	Awareness raising	✔
	Education & training	✔
	Career support	
	e-Skills certification	✔
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	In the Italian context, Rete is a highly innovative project. Since the country does not have a general digital and innovation culture, the Competence Network is a new approach to counteract this situation. By focusing on SMEs and ICT professionals, it works with a target group that until now did not have much assistance in developing international competiveness.	
"The MSP is innovative in terms of its objectives and targets"	The goal to distribute the e-CF based standard in Italy is quite new. The introduction of the e-CF might facilitate the match between demand and supply of ICT practitioners. The other objective is to enhance the professionals' mobility and employability.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The network consists of a total of five major employer associations in Italy, from the branches of ICT and communication. Another current associate is the Fondazione Politecnico de Milano. This University of Milan research foundation FPN participated in the development of the e-CF. Thus, the project involves various stakeholders in the ICT and other industry.	
"The MSP is embedded in an overall (national) policy context"	RETE is not embedded in a direct governmental initiative. However, it receives national and regional policy support.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	RETE is entirely financed through its own funds. This consists mainly of man days so far. The initiative is facing problems in financing due to the budgetary crisis in Europe.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	The stakeholders are communicating in meetings and defined their priorities together.	
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	Rete has a website with a brief introduction of the initiative. Articles in national press covered the network's creation in 2012. The network is communicating directly with their target group in different initiatives. These are mainly addressed to the company associations' members.	

Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	Clementina Marinoni from Fondazione Politecnico de Milano is the coordinator of the project. Workshops are organized by member associations.
"The MSP has been flexible in adapting to changing needs"	RETE adapted its approach towards a strategy that works from two different angles. First, a bottom-up approach that consists in communicating the e-CF to SMEs. Second a top-down strategy with policy actions to boost the e-cultural development.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Since its foundation July 2012, Rete organized four workshops to promote the e-CF, reaching 500 companies. However, four workshops seem quite few for over one year of activity. A free job matching tool (JobICT) has been designed and is due to be introduced this year. Meetings in different regions in northern Italy took place.
"The quality of the outputs is in line with the expectations"	There is a clear focus on ICT practitioner e-skills. Rete-Workshops reached a considerable number of SMEs, creating appropriate material for the dissemination of the e-CF. The cooperation with the service sector trade unions for developing the JobICT-tool seems to be a major achievement.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	The workshops have raised awareness as to the e-CF in participating SMEs. The outcome of the JobICT-tool is still to be observed.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Cooperation between the ITC-Industry and Fondazione Politecnico de Milano strengthened the initiative's link to academic research on new entrepreneurship. It joined stakeholders who otherwise are competitors.
"There is a long -term commitment of the stakeholders involved in the MSP"	The initiative only started in 2012. Stakeholders engaged to make a lasting impact on the Italian ICT culture. RETE is planned until 2014. If sustainable, it will continue.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The initiative has reached a sufficient mass to slowly change the e-skills landscape in Italy. The e-CF is being increasingly accepted in the market. Rete has potential to spread all over Italy. It also wants to reach out to other players in education, public administration and policy. The unsure financial situation might be a critical issue. Yet, since it involves important associations of ICT companies, there should be enough contributors to continue. Rete is constantly internally evaluation its activities and strategy.
Contact	
Website / name of contact person	http://www.retecompetenzedigitali.it/ Ms Clementina Marinoni, Fondazione Politecnico di Milano

7.2.15 **Software Campus**

Software-Campus, Germany		
Software Campus is aimed at outstanding Master's and PhD students of information technology and other disciplines with the relevant ICT knowledge. Software Campus brings together the most successful leadership trainings provided by the industry partners involved. Six modules enable participants to develop leadership, method, social and personal competences. All Software Campus participants will be personally supported by a top executive from an industry partner with strong leadership qualities – a mentor. The young ICT professionals are to benefit from advice and insight into the daily work of ICT leaders. All participants immediately become part of the active network of top managers of leading German ICT companies and outstanding scholars and researchers. In addition, Software Campus alumni create their own network of ICT industry decision-makers. Industry partners include major names such as Bosch, DATEV, DHL, Deutsche Telekom, SAP, Siemens, Software AG, Scheer Group and Holtzbrinck. Academic partners are TH Berlin, TH Darmstadt, KIT, TU München, Universität des Saarlands, DFKI, Fraunhofer, Max-Planck-Institut für Informatik.		
Duration	**from**	2011
	to	ongoing
Main stakeholder(s)	Federal Ministry of Education and Research (BMBF)	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	✔
Focus on:	**Digital literacy**	
	ICT Professionals	✔
	eLeadership	✔
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	
	SMEs	
	Other industry	✔
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	
	Sectoral	(X)
	Trans-national	
Main target group	**In primary/ secondary education**	
	In tertiary education	✔
	Girls/ women	(X)
	Education providers	
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	**comprehensive**	
	medium	✔

	small	
Duration	long-term	
	medium-term	✔
	short-term	
Main focus/objective	Awareness raising	
	Education & training	✔
	Career support	✔
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The idea to join ICT-related research and industry in a mentoring and scholarship programme is inedited in Germany and even internationally. Participants are receiving a management training as well as financial and academic support for their own ICT projects. Thus, the initiative creates a network focusing on e-leadership.	
"The MSP is innovative in terms of its objectives and targets"	Software Campus is one of the first European initiatives which deal explicitly with e-leadership skills. The creators recognized the need to focus not only on ICT practitioners, but also on business competences. Thus, the aim is to support high profile ICT practitioners with management qualities. SAP CEO Jim Hagemann Snabe stated another target: half of the Software Campus graduates should be working in leading positions in German ICT companies by 2020.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The initiative involves 18 different universities, companies and research institutions.	
"The MSP is embedded in an overall (national) policy context"	Software Campus is officially part of the German policy to counteract the lack of ICT practitioners. Annette Schavan, former minister of education, considered the initiative an important step to boost the German ICT branch.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	Each research project is supported with up to € 100,000. The total budget amounts to € 10 million, funded by the Federal Ministry of Education and Research. Grants are organized according to the number of candidates and the projects' schedules. PhD students are more frequent to reach the maximum threshold.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	Software Campus' internal communication is organized by its management partner EIT ICT Labs Germany. Single topics are discussed in IT Summit working groups.	
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	The initiative regularly communicates its activities via its official website and facebook. The Ministry of Education and Research has been publishing press releases on Software Campus and there have also been several articles in the national press.	
Efficiency and flexibility		

"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The initiative is coordinated by the EIT ICT Labs Germany (European Institute of Innovation and Technology) in Berlin. The German government provides the funding. Students elaborate their projects with one academic and one industrial partner. While the university supervises the master's or doctor's theses, the company supports the practical development of the project and provides a mentor and management skills training. Further research institutions offer more academic support.
"The MSP has been flexible in adapting to changing needs"	Software Campus' grant system can support each project individually with up to € 100,000. Thus, it can adapt flexibly to different research needs. Also, the initiative has already been flexible in welcoming new stakeholders, as in late 2012. During its first two years of operation, the initiative relocated its emphasis towards more practical involvement of participants in the firms.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	The initial target of including around 100 students in the project by the end of 2012 was fulfilled. In September 2013, 123 Master's and PhD students were enrolled in Software Campus. In the same year, five workshops where conducted at cooperating enterprises. Scholars have been participating regularly in national and international conferences. Around half of the candidates who apply already have a special company partner in mind for their project.
"The quality of the outputs is in line with the expectations"	Several Software Campus scholars have been awarded external prizes for their research. Company-based management training seems to have been successful. Participants praise the program for several reasons: Firstly, the grant enables them to concentrate intensely on their research. Secondly, the industry partnerships give them unique insights into the structure of major ICT companies. Students also enjoy the exclusive management trainings provided by the firms.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	Since the initiative involves companies from a wide range of areas, the students' projects can be individually matched to the stakeholders needs. The participants' profiles on the website reveal that the students found the perfect match to apply their software to the companies. Thus, it can be assumed that both participants and industry benefit in their e-leadership development.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Through its scholars, Software Campus is successfully fostering the cooperation between research and industry. However, initiators were also pleased by the good co-operation of companies that, in other contexts, are competitors. Furthermore, the programme ties in with the candidates' potential beyond e-skills. A lot of candidates actually are experienced in leadership before and only learn the methodological background in the programme. Software Campus is connected to national PhD programmes, ICT initiatives like Software Cluster and the German academic exchange service DAAD.
"There is a long -term	Government funding is secured until 2016. Stakeholders are willing to

commitment of the stakeholders involved in the MSP"	engage beyond this date.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	Software Campus is currently involving a total of 18 stakeholders, all of them major institutions and companies. It also involves a satisfying number of students. Thus, the initiative seems to be on a good path towards sustainability. Stakeholders as well as students declare to be satisfied with the programme. It relates to the very core of e-leadership competences that are missing in Germany. So far, the initiative has been working with an appropriate scale, but could still be expanded in the future.
C o n t a c t	
Website / name of contact person	http://www.softwarecampus.de Mr Erik Neumann, EIT ICT Labs Germany GmbH

7.2.16 **Research Programme Sparkling Science**

Research Programme Sparkling Science, Austria		
Sparkling Science is a research programme of the Federal Ministry for Science and Research, introduced in 2007 as an unconventional way of promoting young talent. School research projects are carried out through long-term cooperation between schools and universities as well as research institutions. By 2013, scientists have been working side by side with youngsters in a total of 211 projects, 156 of which have already been completed. Since 2008 € 18.5 million have been invested in the programme in the form of subsidies to individual projects which have successfully applied for funding, from which 60,000 children and adolescents have benefitted. The scheme will run until 2017.		
Duration	**from**	2007
	to	2017
Main stakeholder(s)	Federal Ministry for Science and Research	
MSP: Stakeholders from:	**Government**	✔
	Business	
	Unions / NGOs	
	Education	✔
Focus on:	**Digital literacy**	✔
	ICT Professionals	✔
	eLeadership	
Main driver/initiator	**Government**	✔
	Educational system	✔
	Vendors/ ICT industry	
	SMEs	
	Other industry	
	Unions	
	NGOs, grassroots	
Scope	**National**	✔
	Regional	✔
	Sectoral	
	Trans-national	
Main target group	**In primary/ secondary education**	✔
	In tertiary education	
	Girls/ women	✔
	Education providers	✔
	Employers	
	Employed (ICT prof.)	
	Other employed	
	Job-seekers	
Scale	**comprehensive**	
	medium	✔
	small	
Duration	**long-term**	
	medium-term	✔
	short-term	

Main focus/objective	**Awareness raising**	✔
	Education & training	
	Career support	
	e-Skills certification	
	Job matching	
	Market information	
Evaluation	**publically available**	✔
	planned	
Innovativeness		
"The MSP is innovative in its approach"	The initiative aims at offering a combination of high-quality research and development of young potentials. In this way, a common working space between schools and universities is created. This approach is very innovative, since in other projects contact with universities is usually only short term.	
"The MSP is innovative in terms of its objectives and targets"	Building a lasting institutional partnership between schools and universities is Sparkling Science's long term objective. In the first years after its implementation, the objective was to promote as much joint projects as possible. Research topics refer to different areas, but there is a focus on STEM. Grants of up to 187,000€ are given to each project. Furthermore, the cooperation should improve the PR of research projects in society. The initiative sees teenagers as excellent promoters for science. This set of objectives is innovative.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The cooperation involves a total of 151 academic institutions, 102 industry and society partners and 356 schools. It also included international institutions and companies in eight countries. More than half of the participating schools were secondary schools. Actions took place all over the country. Thus, Sparkling Science created a large union of stakeholders engaged in the project.	
"The MSP is embedded in an overall (national) policy context"	Sparkling science ties in with Austria's policies towards high quality STEM education in schools.	
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The initiative is funded by the Austrian Ministry for Science and Research, with an annual budget of € 3 million.	
Effectiveness of communication		
"The internal communication and cooperation is/has been effective"	Projects are selected carefully in order to ensure a productive participation of the pupils. The main condition is that students can widen their knowledge from the project. This requires an effective internal communication.	
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	On its website, Sparkling Science provides detailed, up-to-date information on the campaign. These include detailed statistics on the projects. There is also an extensive list of publications originated by the projects. Single research co-operations have also been reported on by the national and local press. The initiative further communicates with its target group via facebook.	
Efficiency and flexibility		

"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	The initiative is supervised by a scientific board assembling highly experienced university professors. Universities or research institutions apply with their projects; the administration selects the initiatives and assists institutes in finding partner schools and companies.
"The MSP has been flexible in adapting to changing needs"	
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	A total of 211 projects have been conducted up to May 2013. 157 of these were research projects, 54 were school projects. 55 are currently running now. Altogether, 763 scientists cooperated with 60,000 pupils – either directly by engaging them in the research process or indirectly by letting them contribute and participate through interviews, project presentations and exhibitions as well as discussions of research results. ICT accounted for 13% of all projects. For example, in 2012the two-year-project AAS Endurance finished to build a robotic sailing boat for research on marine mammals. A Vienna school, an Austrian institute and a US university developed a multi-sensor platform that completed a several-day-mission in the Baltic Sea. The projects resulted in a large number of scientific publications and pupils' final papers.
"The quality of the outputs is in line with the expectations"	The list of ICT research projects involves 16 funded projects (as in 2013) referring to highly relevant topics. Those range from robotics over geo information software to audio study materials for blind pupils. A lot of the projects involve co-operations with companies Furthermore, some of the technical projects also involve ICT-related aspects. Thus, only high quality projects are involved, allowing experiences that go far beyond what is offered in schools. Through co-operations with industry partners, e-leadership competence might also be developed.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	In any case, Sparkling Science goes far beyond digital literacy. It lowers thresholds between science, school and industry and makes research attractive to pupils.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	Institutions, companies and pupils have been thoroughly praising the cooperation in the projects. Senior researchers acknowledged the fresh perspective the pupils added to their work. Students enjoyed applying their potential to practical projects instead of sticking to theory.
"There is a long -term commitment of the stakeholders involved in the MSP"	The project will end in 2017. Yet, the explicit goal is to create a long-term research partnership.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or	The project has been acting since 2007. The number of projects developed in 2013 reveals intense operation. Co-operations include stakeholders in other countries, even beyond Europe. In Austria, Sparkling Science is operating all over the country. Consequently, this broad co-operation based on demanding research seems to have reached a high level of maturity. An early evaluation in 2009 considered the impact of Sparkling Science to go beyond the

even to grow and not only act as a pilot or demonstrator project"	stakeholders and reach a broader public. Spill-over effects are likely to continue occuring between the disciplines and also between institutions. Co-operations with industry might inspire e-leadership skills. In this way, Sparkling Science surely has the potential to continue after the funding ends.
C o n t a c t	
Website / name of contact person	http://www.sparklingscience.at/en/ Dr Marie Céline Loibl, Federal Ministry of Science and Research

7.2.17 **Womentor**

Womentor, Sweden		
In 2007, 30 major Swedish ICT companies came together to launch this mentoring programme with the objectove to raise Sweden's competitiveness through getting more women into leadership positions in the ICT and media sector. The programme is for companies seeking to develop and utilize women's skills in order to secure their future supply of managers and their future competitiveness. Official launch of the programme was preceded by a pilot project commissioned in 2006 by the then Minster of Industry Ulrica Messing. More than 30 companies participated in the pilot project, which was lead by the National Post and Telecom Agency (PTS) and supported by a steering committee composed of high level representatives (mostly CEOs) from the ICT industry in Sweden, the trade association and government institutions. Mentoring expertise was provided by a subcontractor, Ardida. The pilot project was scientifically evaluated and shown to have been very successful [35]. Subsequently the Trade Association for the Swedish ICT sector, IT&Telekomföretagen, decided that the ICT sector itself should take over ownership of the programme and thereby ensure its continuation. Womentor has an annual lifecycle – at the time of writing, the 8th programme is underway. Ardida is still involved as a subcontractor to plan and oversee the actual mentoring process. Womentor targets companies in the ICT industry. It is a one-year leadership development and mentoring programme for women leaders in companies who have taken their first steps as managers and want to move on. Mentors expected to have at least ten years experience as managers and have a willingness to share their experiences. The availability of bigger share of mentors than mentees ensures that mentees match up with a suitable mentor from other companies. The programme includes a total of six full days and ongoing mentor calls each month. The mentees should have or have had at least one post as first line manager. Furthermore, they should wish to continue the managerial career and have a potential to achieve a higher management position. Since 2007, over 50 companies and more than 400 female managers have participated in consecutive rounds of the programme. Womentor is supported by the Ministry for Economy, Transport and Communication, as well as major ICT companies in the country.		
Duration	**from**	2006
	to	ongoing
Main stakeholder(s)	IT&Telekomföretagen (Trade Association for the Swedish ICT sector), several ICT companies; Ministry for Economy, Transport and Communication	
MSP: Stakeholders from:	**Government**	✔
	Business	✔
	Unions / NGOs	✔
	Education	
Focus on:	**Digital literacy**	
	ICT Professionals	
	eLeadership	✔
Main driver/initiator	**Government**	✔
	Educational system	
	Vendors/ ICT industry	✔
	SMEs	
	Other industry	
	Unions	

[35] http://www.pts.se/upload/Documents/SE/Womentor_PTS_ER_2007_21.pdf

	NGOs, grassroots	
Scope	National	✔
	Regional	
	Sectoral	
	Trans-national	
Main target group	In primary/ secondary education	
	In tertiary education	
	Girls/ women	✔
	Education providers	
	Employers	
	Employed (ICT prof.)	✔
	Other employed	
	Job-seekers	
Scale	comprehensive	
	medium	
	small	✔
Duration	long-term	
	medium-term	✔
	short-term	
Main focus/objective	Awareness raising	
	Education & training	✔
	Career support	✔
	e-Skills certification	
	Job matching	
	Market information	
Innovativeness		
"The MSP is innovative in its approach"	The programme appears to be the first of its kind, i.e. the first to use of mentoring for promotion of women with management potential in the ICT industry. Based on the findings of research on gender mainstreaming, the programme stresses the role of networking for enabling women to take a bigger share among top managers.	
"The MSP is innovative in terms of its objectives and targets"	The basic aim of the project is to raise Sweden's competitiveness through getting more girls and women into a leadership position in the ICT, telecom and media sector. The programme is innovative as it focuses explicitly on promoting women's chare among managers in the ICT industry, rather than the ICT workforce in general. The target group is composed of women who are in the first tier of management and have excellent career prospects.	
Networking – Engagement of stakeholders		
"A large number of relevant stakeholders from different areas have been involved in the design and implementation of the MSP"	The programme has full support from the Ministry for Economy, Transport and Communication as well as all major ICT companies in the country and the sector association (IT&Telekomföretagen). No education providers are involved as key stakeholders – the scheme focuses on mentoring and networking rather than acquisition of skills through training measures. A provider of mentoring expertise is involved as sub-contractor.	

"The MSP is embedded in an overall (national) policy context"	Womentor has its roots in an initiative by the then Ministry of Industry, and still enjoys full backing by the government. Policy-makers in Sweden agree that there is still a great lack of female leaders in the industry, especially so in the STEM sectors. The politicial agenda in Sweden is very clear about the goal to get more women into leadership positions, even though the means for it are still being disputed (i.e. necessity of quota legislation).
"The initiative has been able to secure continuous funding, appropriate to the scope of its ambitions"	The Womentor approach was piloted in 2006 in the National Post and Telecom Agency (PTS), for which the government provided financial backing. Since then, Womentor has been funded by the companies involved who pay a fee for each participating female manager. Some additional support comes from IT&Telekomföretagen, the business association of the Swedish ICT sector. The fee is entirely cost-based and therefore inexpensive compared to other e-skills programmes.
Effectiveness of communication	
"The internal communication and cooperation is/has been effective"	Internal communication has been essential for maintaining commitment from the participating companies to participate actively and to build momentum for the topic within their own organisations. Participating companies are expected to set up their own concrete goals needed for women in leadership positions within the organization). Internal communucation has apparently worked very well, as the long-standing engagement of major ICT sector companies in Womentor shows.
"The external communication is/has been effective (especially towards the target groups to which the MSP is addressed)"	External communication has been essential for (a) securing commitment from a number of companies within the Swedish ICT sector to participate and (b) establishing the programme's brand to raise awareness about the topic and to maximise the wider impact. A strategic and tactical communications plan has been a core component of Womentor's activities since its official launch in 2007. Internationally, some confusion is generated by the fact that there are other initiatives also called "Womentor" and operating in related areas, but in no ways related to the Swedish initiative.
Efficiency and flexibility	
"The MSP managed to develop well defined governance and control structures with clear allocations of responsibility"	After a successful pilot project in 2006, Womentor has been managed by the Trade Association for the Swedish ICT sector, IT&Telekomföretagen, who decided that the ICT sector itself should take over ownership of the programme and thereby ensure its continuation. Womentor has an annual lifecycle – at the time of writing, the 8th programme is underway. A specialist provider of mentoring expertise, Ardida, has been involved since the beginning as a subcontractor to plan and oversee the actual mentoring process. The straightforward governance structure of Womentor, based on programme ownership by the participating companies according to their own strategic needs and capabilities, has proven to be highly effective.
"The MSP has been flexible in adapting to changing needs"	Womentor proved able to maintain the achievements of the pilot project, which had been funded by the government, by shifting

	ownership to IT&Telekomföretagen, the Trade Association for the Swedish ICT sector, and some of its member companies. Since then, the programme has not faced any major external challenges, partly due to the lack of a need for continued funding from public sector sources. The overall focus of the programme has been extended somewhat in recent years, as greater emphasis is placed on promoting and increasing visibility of female managers as role models within Swedish society, and on supporting them in their networking efforts.
Degree of MSP reach: outputs	
"The expected outputs have been achieved"	Annual targets in terms of the number of companies participating and the number of mentees and mentors have been in line with expectations. The programme
"The quality of the outputs is in line with the expectations"	Participating companies have reported a high level of satisfaction with the mentoring services provided.
Degree of MSP reach: outcomes & impact	
"The MSP positively affected e-skills development in participating companies"	No exact data are available about the extent to which the companies participating in Womentor have achieved increases in the share of female leaders within their own organisation.
"The MSP positively affected cooperation and networking of the key stakeholders involved in the MSP and had a positive impact on the social partner relationship"	An increasing share of women in leadership positions within the ICT sector are pushing for further progress, in combination with media and political pressure and the fact that more and more male CEOs are coming to realize the importance and revenue implications of a balanced gender mix throughout the company. Thus, Womentor has contributed to a broad consensus within Sweden about the need for increasing the share of female leaders in the ICT and other STEM sectors.
"There is a long -term commitment of the stakeholders involved in the MSP"	Most of the companies participating in Womentor have done so for many years already, if not from the very beginning (the pilot phase in 2006). The government has continuously voiced their support for the initiative.
"The MSP has reached a critical mass and the stage of sustainability. At least there are clear plans in terms of scalability and who to achieve sustainability, i.e. the MSP has the capability to continue with service provision or even to grow and not only act as a pilot or demonstrator project"	The fact that the programme has run successfully since 2007 without significant funding apart from the participating companies' fees demonstrates that is has reached long-term sustainability. The 8th version (Womentor 8.0) is currently under preparation. Key success factors have been (a) the ownership of the programme by companies rather than individual managers who seek to get ahead in their career; and (b) companies' engagements through their own overall goal setting for increasing the share of female leaders within their organization – according to their own potential and ambition.
Contact	
Website / name of contact person	http://www.womentor.se/ Ms Ulrika Strömqvist

7.3 Evolution of Best Practice cases from 2006

Best Practice cases on multi-stakeholder partnerships for e-skills have already been identified in the precursor study to the present one which was carried out in 2006-2007. Those best practices identified at that time are the following ones (colour coding has been used to indicate the current status).

Country	Best Practice in 2006
BE	Technofutur competence centre (Walloon region)
BG	CIST Centre for Information Society Technologies
DE	APO-IT and AITTS - Advanced IT Training System in Germany
DE	IT Fitness
DE	KIBNET
DE	Cisco meets APO
DE	Cisco Networking Academy Program Thuringia
FI	ChangePro
FR	CIGREF: La nomenclature des métiers du système d'information dans les grandes entreprises
IE	FIT - Fast Track to IT
NL	LOKET MBO-ICT
PL	E-Pracownik – E-Employee
PT	Technology, Innovation and Initiative Programme (Programa Tecnologia, Inovação e Iniciativa)
UK	eSkills UK
UK	SFIA
EU	EUCIP – European Certification of Informatics Professionals

These best practice cases have been re-visited in mid-2013 as part of the present study with the aim to identify whether these are still operational, whether and how they have changed or been terminated, i.e. discontinued operation.

In the analysis it became apparent that half (50%) of best practices are still operational and running, some of which even scaled up significantly (e.g. EUCIP, FIT and regional training and certification programmes established and run by vocational school together with Cisco). One best practice (AITTS) is still operational but showing little visible progress or further developments since 2007. A rather significant number of former best practices (44%) has discontinued operation and been terminated.

Those schemes which have been successful in the past and at present, have been scaled up over the past years and showing clear indication of sustainability are training and certification schemes with a

- long track record of experience addressed to specific target groups in the labour market to provide these with skills enlarging their chances of success in the labour market (FIT in operation since 1999),
- a large ICT vendor (Cisco) scheme addressed to vocational schools in Germany,

- a Europe-wide certification scheme for ICT professionals (EUCIP) offered by CEPIS, the well recognised European association of informatics professionals, in several European countries,
- further development and expansion activities of two e-skills competence framework schemes from France (CIGREF) and SFIA in the United Kingdom, and
- an ICT competence centre in Belgium (Technofutur TIC) continuing to be operational in the market with new innovative initiatives (e.g. CompeTIC) which have also been classified as best practice in the present study.

Most of the best practice schemes which have been terminated are typically project-based schemes of a fixed duration. Although some of these (e.g. E-Prakownik, KIBNET) managed to extend funding beyond a single project duration – and in one case even for a period of almost 10 years -, they did not achieve sustainability in the market. Others include a policy initiative of a fixed duration which is being continued by other policies and an ICT vendor campaign initiative (IT Fitness by Microsoft in Germany) which achieved its goals and then got terminated. Another one offering dual certification possibilities of a vendor-based certificate in combination with a non-vendor based certificate (APO-IT) has been replaced by an activity of the ICT vendor proposed as a pledge to the Grand Coalition for Digital Jobs.

More details on the current status of each of the former best practice cases are provided below.

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
BE	Technofutur competence centre (Walloon region)	Continued	The Technofutur Competence Centre develops and offers training courses for workers, job seekers, trainers and students alike. Technofutur is a Competence Centre certified by the Walloon Region. It is part of the INFOPOLE Cluster TIC which is the network that brings together and unites professionals in Information and Communication Technologies to promote business and innovation through partnership. The network is composed of over 170 members and it focuses on the implementation of the ICT Master Plan of Wallonia Creative Program which defines the main axes of the digital transformation of Wallonia in 2025. It sets ten priorities for infrastructure, regulation, practices and ICT skills of Wallonia (http://clusters.wallonie.be/infopole-en/index.html?IDC=1645).
BG	CIST Centre for Information Society Technologies	Terminated	The Centre for Information Society Technologies (CIST) is an interdisciplinary research and training institution of Sofia University, motivated by the challenge of supporting the development, introduction and wide use of Information Society Technologies (IST). CIST has cooperated with a number of local partners, such as the Ministry of Transport and Communication, the Ministry of Economics, the Ministry of Finance, the Agency of SMEs, Bulgarian Association of Regional Development Agencies and business centres, Bulgarian Telework Association, ARC Fund, Bulgarian Industrial Association, Rila Solutions, Virtech Ltd and many others. The cooperation resulted in several IT training-related activities and international projects. However, activities seem to have come to an end in 2008/9 (http://www-it.fmi.uni-sofia.bg/cist/).

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
DE	APO-IT and AITTS - Advanced IT Training System in Germany	Continued with little visible activities	APO IT has after project completion in 2004 become fully operational as the ICT practitioner certification methodology operated as part of the German AITTS (Advanced IT Training System). A central element is the close association of advanced training to the real life job situation. By way of using reference projects and the associated work processes as a central part of the learning activities the participants learn what is needed for their jobs and are thereby closing existing knowledge gaps. The learning process is accompanied by a learning process facilitator ("Lernprozessbegleitung") and an expert advisor ("fachlicher Berater"). The aim is to support and achieve a self organised learning of the learners. The proof of the qualifications achieved is documented through the documentation of the training results achieved in working on a real life project. This documentation builds an important basis for the certification. There have been very little visible further development and maintenance activities of the AITTS - Advanced IT Training System in Germany since 2009 (http://www.it-weiterbildung.info). CERT-IT is no longer acting as a certifier due to lack of demand leaving DEKRA as the only remaining APO-IT certification organization. Certifications are mainly done for German army (Bundeswehr) personnel and for several further education institutes in the Federal state of Saarland. The project FUTEX has developed an eLearning platform using APO-IT profiles for which it received an e-learning award (more information: http://www.exirius-gmbh.de).
DE	IT Fitness	Terminated	The 'IT fitness initiative' was the German contribution to the European Alliance on Skills for Employability (http://www.employabilityalliance.eu) which shows rather little activity at present. Alliance partners include Cisco, Microsoft, State Street and Adecco. The IT fitness initiative was initiated by Microsoft in March 2007 and was running until 2010 when it reached its objectives of 4 million citizens having used the online platform to profile their ICT skills. The platform is still accessible at: http://www.fit-fuer-den-aufschwung.de.
DE	KIBNET	Terminated	KIBNET – (Competence Centre IT training networks) addressed different types of education and training in the eSkills process ranging from market information gathering, analysis and provision, to career pathing and lifelong learning support to workers but also specific services to other groups and stakeholders through the very comprehensive KIBNET portal constituting a virtual competence centre in the area of eSkills supporting education and training networks and other actors in this field. The KIBNET initiative ran as a joint project of the trade union IG Metall and BITKOM - funded by the Federal German ministry of education, research and technology since 2001 to support further education and training in the ICT area - seized to exist. It had originally been planned for a fixed duration of seven years and finished on 30 April 2008.
DE	Cisco meets APO	Terminated	Cisco meets APO combines the certification systems for networking specialists from the Cisco Networking Academy Program and APO IT and promotes a common training scheme. The co-ordinated qualification scheme was launched by the Cisco Networking Academy Program and the German Metal Workers' trade union IG Metall in 2006. The training courses are provided by a Network of already existing local Networking Academies. The first events took place in winter 2006. This cooperation opens up a new dimension of learning (as part of the working process) for ICT practitioners resulting in two internationally recognised certificates. The duration of the

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
			combined training is approximately one year. At the end two certificates can be achieved: The Cisco CCNA and APO IT certificate. The initiative leverages the potential of more than 380 training partners of the Cisco Networking Academy in Germany. Several courses have been completed successfully with a number of dual certifications having been awarded to course participants. However, in the meantime cooperation of Cisco with IG Metall is no longer active. Given the fact that Cisco made a Grand Coalition for Digital Jobs pledge to align its certification family with the European e-CF the necessity does no longer exist to find a work around to combine industry backed certifications and government backed certifications. More details on the pledge related to the Networking Academy program can be obtained at: https://ec.europa.eu/digital-agenda/node/51276.
DE	Cisco Networking Academy Program Thuringia	Continued	The Cisco Networking Academy Program Thuringia is based on a tri-partite contract between the Ministry of Education and Science of the State of Thuringia, the Thuringian State Institute for Teacher Training and Cisco. It includes the recognition of the learning content for the use at public schools and the commitment of all parties to join forces in disseminating the program and to keep the quality of teaching high. The partnership covers the state of Thuringia. The cooperation started in 2002. A formal memorandum of understanding was signed in December 2005 and in 2010. The majority of students 70% in the Networking Academy program in Germany are apprentices in the period of vocational training following the German dual system. The Networking Academies have been established at the public vocational schools where apprentices attend classes 1-2 days a week. The academies teach the CCNA curriculum as an integrated part of the technical schooling. The number of registrations to this MSP are as follows: No. of Registrations 2005: 374 No. of Registrations 2006: 408 No. of Registrations 2007: 549 No. of Registrations 2010: 746 No. of Registrations 2011: 663 No. of Registrations 2012: 547 Note: There are shrinking age cohorts in the State of Thuringia who have entered the age of vocational education since 2010. Thuringia belonged to a group of pilot regions. In the meantime the scheme has been expanded throughout Germany including all other Federal States and many vocational schools in the country.
FI	ChangePro	Terminated	ChangePro was a vendor-independent small and medium-sized (>250 employees) business development training project coordinated by Helsinki University of Technology Lifelong Learning Institute TKK Dipoli. It focused on increasing the competitive factors of small and medium-sized businesses and long-term development on working skills of ICT practitioners in southern Finland. ChangePro was set up as a project to run from 2004 - 2007 and was funded by the ESF. It seized to exist afterwards and did not manage to become sustainably with ESF funding.
FR	CIGREF: La nomenclature des métiers du système	Continued	CIGREF is a non-profit association of French companies represented by Chief Information Officers of large organisations that share best practice, experience and exchange of knowledge. CIGREF was responsible for the “Nomenclature 2005” project which had the objective

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
	d'information dans les grandes entreprises		"to respond to a need to clarify the management of human resources in ICT work". The "Nomenclature 2005" framework provided a tool to help CIGREF companies to build their own HR reference arrangements. CIGREF continued with updating its ICT competence framework 'La nomenclature des métiers du système d'information dans les grandes entreprises' in 2009 and the last time in 2011. http://www.cigref.fr/cigref_publications/RapportsContainer/Parus2011/2011_Metiers_des_SI_dans_Grandes_entreprises_Nomenclature_RH_CIGREF_FR.pdf
IE	FIT - Fast Track to IT	Continued	FIT is an industry-led initiative which works in close collaboration with government departments and national education and training agencies, local development organisations and a host of community based organisations. Our primary partners in education and training include FAS, VECs, Third Level Institutions, Leargas, Leader Companies, Rapid Coordinators, Local Authorities and Employment Pacts. FIT's mission is to promote an inclusive Smart Economy by creating a fast track to marketable technical skills for those at risk of unemployment long term. It is the primary industry skills development initiative facilitating collaboration with government, education & training providers and disadvantaged communities to enable greater access to employment for marginalised job seekers. FIT Ltd, a registered charity and not for profit organisation, was established in 1999. The Initiative develops and promotes technology-based programmes and career development opportunities for job seekers who have become detached from the labour market in an increasingly knowledge-based economy. Since it started in Dublin in 1999, FIT has expanded substantially and now operates across the Republic of Ireland. More recently FIT has commenced programmes in Northern Ireland under the banner FIT-NI. To date, over 13,000 job seekers have completed FIT skills development programmes of which over 9,500 progressed into employment. 2,500 job seekers are currently participating in FIT programmes. Recently the EU Commission cited FIT as one of the most effective employability initiatives in Europe. There are also examples of innovative projects FIT has partnered with different organisations, both in Ireland and abroad also aimed at implementing FIT in other countries (http://www.fit.ie/).
NL	LOKET MBO-ICT	Continued	Loket MBO ICT is a collaboration platform of excellence for vocational and business education in the ICT domain, set up by ECABO and Kenteq (Kenteq has in the meantime left the platform). ECABO is the knowledge centre of the economic-administrative ICT and security professions. The common denominator is ICT. Loket MBO ICT has the main objective to ensure that education offers meet the needs of business as much as possible. LOKET MBO-ICT is continuing its activities after some reorganisation.
PL	E-Pracownik – E-Employee	Terminated	E-Prakownik was set up as a project which then was turned into a series of projects following and building on each other. The objective was to provide interactive training addressed to employees and managers of the Small and Medium Enterprise (SME) sector on the practical and efficient use of Information and Communication Technologies (ICT) in their everyday's work. The project was realised on the basis of international Cisco Networking Academy Program experiences and partly on the training modules used by CNAP (even though a number of other courses was additionally included in e-Pracownik). The project was co-financed by the European Social Fund (ESF) and managed to achieve funding from 2005 - 2013. The last

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
			project finished on 31 March 2013.
PT	Technology, Innovation and Initiative Programme (Programa Tecnologia, Inovação e Iniciativa)	Terminated	When it comes to ICT training and education, the Technology, Innovation and Initiative Programme has, along with other digital literacy measures, been incorporated into a national Technological Plan for Education. This plan mainly addresses the improvement of ICT user skills in teachers and students, but also includes some e-skills elements, which aim to train staff of universities and schools, and internships for students from ICT professional courses. National policies in Portugal, including the "Digital Agenda for Portugal" (Agenda Portugal Digital) which started in 2012, are mainly concerned with ICT infrastructure development and - when it comes to ICT skills - the focus is primarily on ICT user skills.
UK	eSkills UK	Continued	e-skills UK is a not-for profit, employer-led organisation, licensed by government as the Sector Skills Council for IT, Telecoms and Contact Centres. e-skills UK is dedicated to the needs of business, improving competitiveness and productivity through action on skills. e-skills UK role is to bring together employers, educators and government, and unite them on a common, employer-lead agenda for action on skills. Established in 2003 as the first UK Sector Skills Council, e-skills UK is part of the Skills for Business network of a series of employer-led Sector Skills Councils. e-skills UK is a strategically focused organisation with an ongoing government remit operating to a five year rolling plan. E-Skills UK is continuing its activities and active in several new areas since our last investigations. An example is the IT Professional Profile which is a free, online tool that allows evaluation of a person's ICT professional skills against an agreed industry benchmark - the IT Professional Standards. The Profile is part of the National Skills Academy for IT offering (http://www.itskillsacademy.ac.uk/).
UK	SFIA	Continued	The Skills Framework for the Information Age (SFIA) was established in July 2003 as a system for ICT Professionals to match the skills of the workforce to the requirements of the business. It is a logical two-dimensional skills framework defined by areas of work on one axis and levels of responsibility on the other. The past 10 years has seen SFIA establish itself as a definition of ICT skills which has implementations in organisations in over 100 countries. In order to maintain relevance to users' needs SFIA is regularly updated. The framework is available in English, Spanish and German (http://www.sfia-online.org/about-sfia/introducing-sfia/).

Country	Best Practice in 2006	Status	Description of status in 2013 and changes since 2006
EU	EUCIP – European Certification of Informatics Professionals	Continued	The EUCIP (European Certification of Informatics Professionals) certification programme is a professional certification and competency development scheme, aimed at informatics professionals and practitioners. It consists of a core certification as well as specialised certifications for a range of competences which are set out in an array of job-specific profiles. In addition, there is a standalone certification for ICT Administrators. The overall goals of the EUCIP programme are to: - define an industry-driven vocational structure and standards for the informatics profession - establish a sustainable European services network for informatics competence development - contribute to closing the ICT professional skills gap in Europe - offer a vehicle for life-long learning and competency enhancement for the ICT profession Since 2006 the EUCIP certification programme is continually revised and updated to reflect rapidly changing technologies and practices in the ICT industry. EUCIP is moving to Version 3 to better meet the needs of those working within the ICT sector. EUCIP application and use has been expanded to several countries since 2006. It is currently available in: Croatia, Ireland, Italy, Norway, Poland, Romania, Spain (http://www.eucip.com/index.jsp?p=640&n=1116).

8 Annex C: List of national level stakeholders and experts who provided input to the study

8.1 First phase – Initial data collection

The following persons have been involved in the initial data collection phase for the present study – as informants, interviewees or in other ways contributing input to the analysis at Member State level. We are greatful for their contributions. The full responsibility for the statements made and data presented in the document remains, however, with the authors.

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8.2 Second phase – Validation

The following persons have been involved in the validation phase of the present study. They have reviewed draft versions of the country sections of the report and provided corrections, additions and comments to the views expressed by the authors, e.g. about the country scores on the indices presented. We are very greatful for all feedback we have received.

The full responsibility for the statements made and data presented in the document remains, however, with the authors.

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