

e-SKILLS IN EUROPE

PORTUGAL

COUNTRY REPORT

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1 Overview

The situation in the last years indicates positive progress in the ICT sector in Portugal. Employment in the ICT sector has continuously been growing, even during the period of recent financial crisis, but with a diminishing growth rate from 2008 onwards. Salaries in the sector are high and still keep rising above inflation, thus making ICT sector more attractive. Expansion into new markets is on the way, mainly into Portuguese speaking countries such as Angola and Brazil, what further increases potentials of ICT market in Portugal. Furthermore, incorporation of ICT solutions into non-technology firms has increased.

The continuous improvements in the robustness and usability of technological solutions are making technology accessible to a broader public, making specific e-competences less necessary in many functions. There is a recent tendency to hire more human resources with formal education in ICT, compared to the former habit of adapting human resources from other areas which had over time acquired some ICT skills.

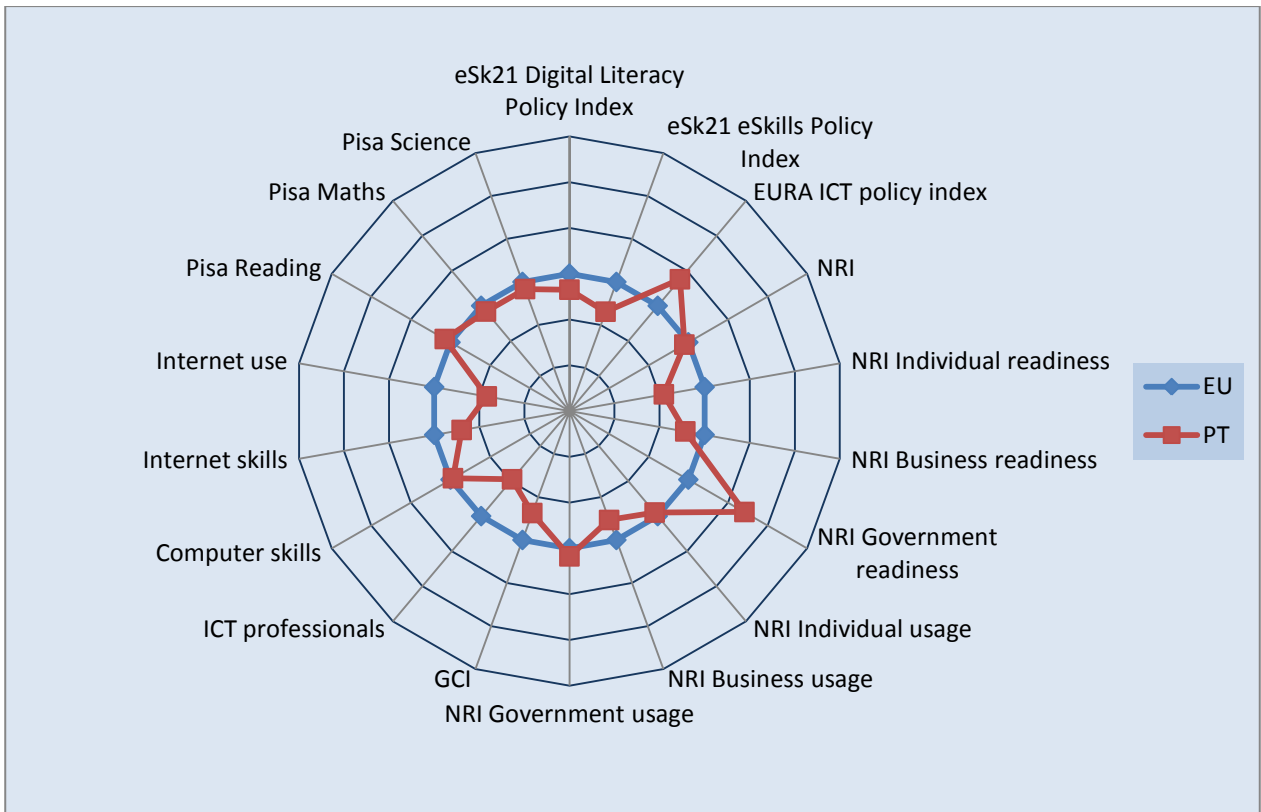
Demand for ICT practitioners is mainly located in the two largest metropolitan areas of the country, (Lisbon and Porto) due to a strong polarization of ICT enterprises and employment in these areas. This influences the labour market which is expected to be less mobile in the future. Salaries in the sectors are expected to increase, but with a slower rate relative to the previous years. Open source solutions are expected to increase together with the opportunities in developing e-commerce solutions for SME.

Since 2004 / 2005, the number of graduates in ICT, mainly from the public sector education, is constantly rising. However ICT programs offered in higher education do not attract many students. A decline in the amount of study places as well as the number of students enrolled for the first time in ICT programs is observed. The education system put a greater emphasis on the 'hard' areas (such as computing science) which are not easily absorbed by the national economy. On the other hand, more 'soft' areas (such as business management systems) are not being provided in line with the market needs. Overall, more emphasises should be put on software development skills, as for instance, java still keeps on being written by hand instead of automatic modelling and code generation.

Development of e-Skills and digital literacy in the country are topical themes of the national political agenda, however not pivotal. The financial crisis had a crucial impact on the public projects in this area. Nevertheless, e-skills development is still present in recent public initiatives and will be translated into new projects as soon as new funding schemes are available. Former projects had important outcomes with regard to skills developments, which are still active and promote the integration of ICT in everyday life (at school, in the relation with government institutions, in the relation with private firms). As concerns to e-leadership skills, programs in this direction are still very limited.

2 Indicators on innovation, competitiveness and ICT skills

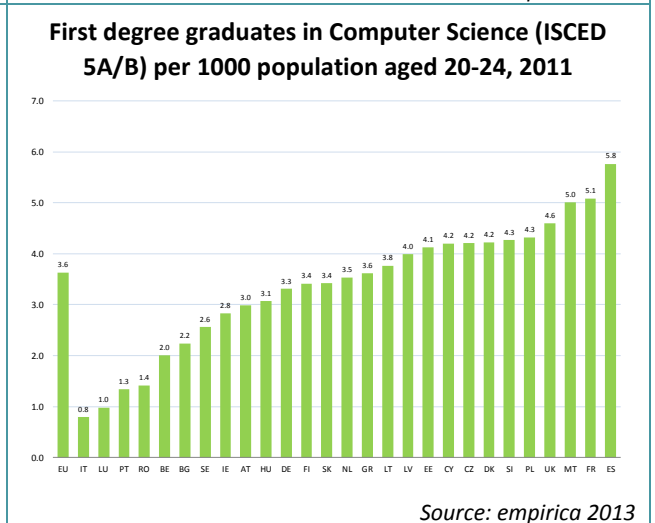
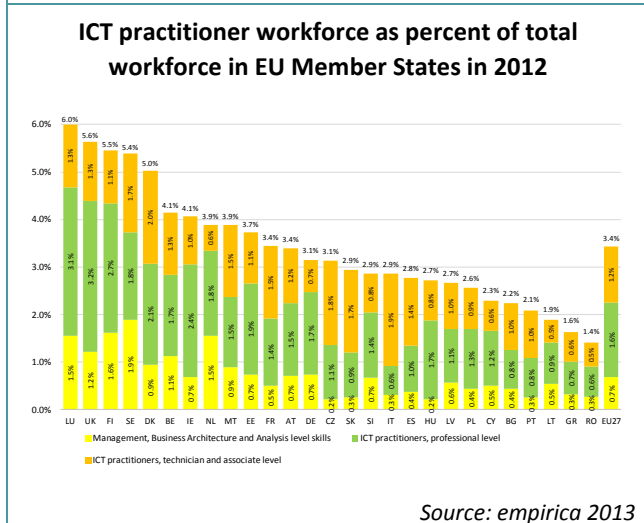
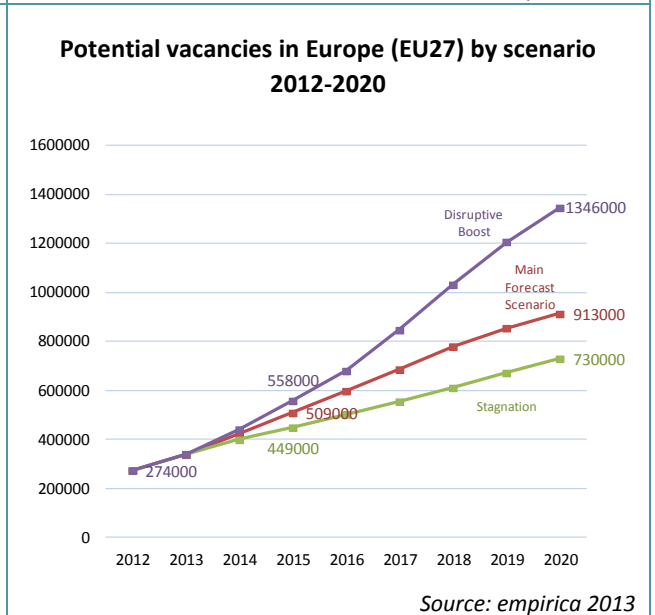
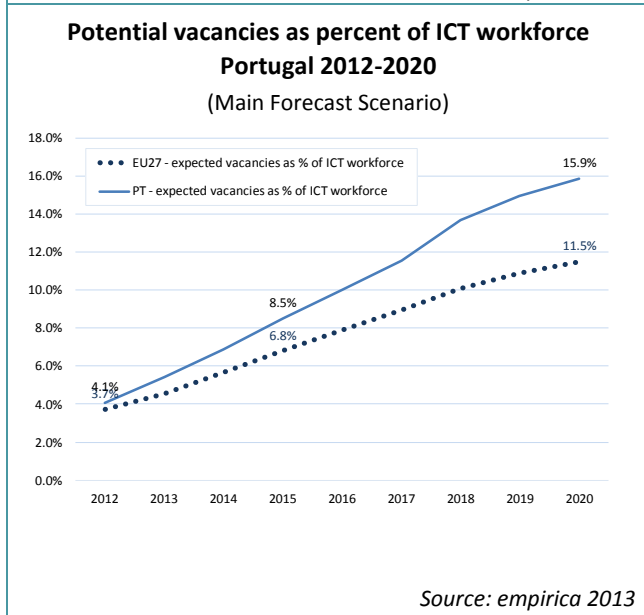
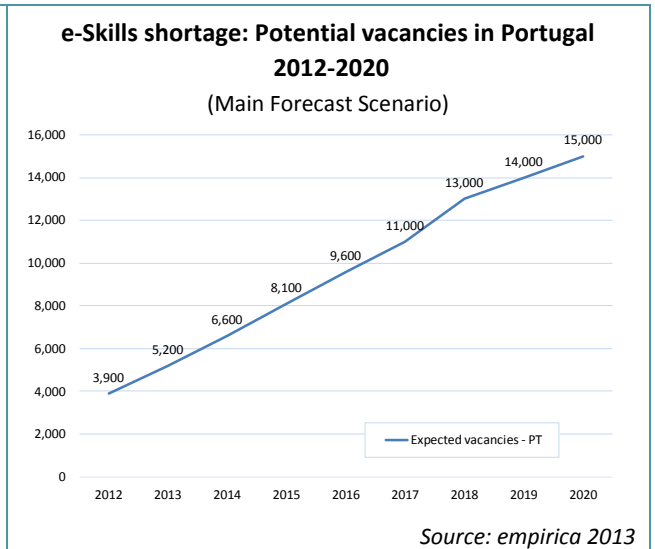
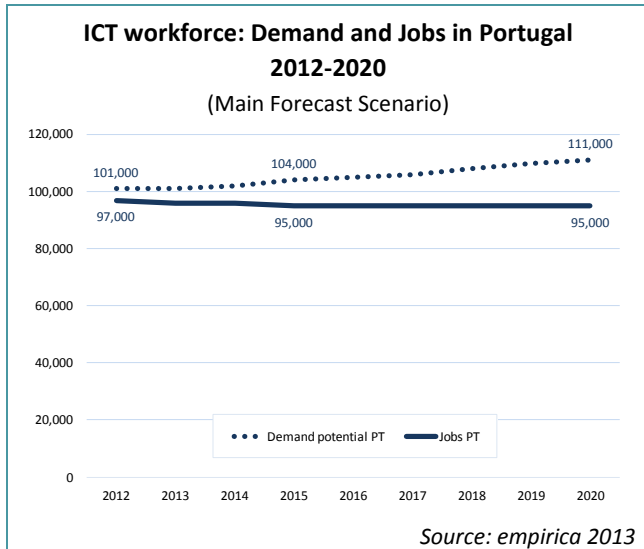
Portugal						
	Score 2009/2010	Rank 2009/2010	Score 2011/2012	EU27 Rank 2011/2012	Change (Rank)	Comment
eSkills21 study: 'e-skills' index 2010	1.5	14				Max.: 5.0
eSkills21 study: 'Digital literacy' index 2010	2.5	15				Max.: 9.0
EuRA e-skills index	4.1	7				Max.: 5.0
ICT practitioners in % of total employment 2012			2.08%	24		EU average: 3.43%
Digital literacy skills of the population 2009/11:						
• Individuals with high level of computer skills	27%	14	28%	14	↔	EU average: 28.52%
• Individuals with high level of Internet skills	8%	16	10%	18	↓	EU average: 13.67%
• Individuals using the Internet (last three months)	46%	23	55%	18	↑	EU average: 71.33%
Global Competitiveness Index (GCI) 2010/12	4.4	17	4.4	18	↓	Max.: 5.61 EU median: 4.52
Networked Readiness Index (NRI) 2010/12	4.6	14	4.5	14	↔	Max.: 5.6. EU median: 4.5
• Individual readiness	5.55	22	4.68	23	↓	
• Business readiness	4.72	18	4.3	17	↑	
• Government readiness	5.16	6	5.27	4	↑	
• Individual usage	3.07	24	4.95	12	↑	
• Business usage	5.17	13	3.49	18	↓	
• Government usage	5.16	6	4.29	13	↓	
PISA scores (2009) in:						
• Mathematics	487	17				EU median: 493
• Science	493	17				EU median: 498
• Reading	489	13				EU median: 489



3 E-skills demand and supply forecasts 2012 – 2015 - 2020

Portugal			
	PT	Rank EU27	EU27
ICT practitioner workforce 2012	97,000	16	7,403,000
ICT practitioner workforce 2012 as percent of total workforce	2.1%	24	3.4%
Assumed excess demand 2012	3,900	15	274,000
Forecast excess demand 2015	8,100	12	509,000
Forecast excess demand 2020	15,000	10	913,000
Forecast ICT practitioner jobs 2015	95,000	16	7,503,000
Forecast ICT practitioner jobs 2020	95,000	16	7,950,000
Workers 2012 - Management, business architecture and analysis level	12,000	16	1,477,000
... as percent of total workforce	0.3%	24	0.7%
Workers 2012 - ICT practitioners, professional level	38,000	17	3,393,000
... as percent of total workforce	0.8%	23	1.6%
Workers 2012 - ICT practitioners, technician and associate level	46,000	13	2,532,000
... as percent of total workforce	1.0%	16	1.2%
Growth core ICT workforce 2001-2010	2.5%	19	3.0%
Growth core ICT workforce 2008-2010	2.4%	13	2.6%
Growth core ICT workforce 2011-2012	12.6%	5	3.9%
Growth broad ICT workforce 2011-2012	5.5%	11	1.8%
ISCED 5A/B first degree graduates in Computer Science, 2011	784	21	113,000
... graduates per 1000 population aged 20-24	1.3	25	3.6
... graduates 2011 as percent of 2006 (= peak EU)	86%	13	88%
Vocational training graduates in Computer Science, 2011	284	15	67,000

Sources and notes: see annex.



4 Policy and major stakeholders initiatives

Currently, the key government policy and initiatives on digital literacy and e-skills in Portugal are framed by the Resolution of the Council of Ministers 112/2012, under the designation '**Digital Agenda for Portugal**'. The main objectives of this agenda include: (a) development of the broadband infrastructure in order to enable access to broadband, with connection speeds equal or higher than 30 Mbps, to all citizens until 2020; (b) simulation of the broadband infrastructure development in order to allow for at least 50% of the households to have broadband access with a connection speed equal to or greater than 100 Mbps, by 2020; (c) increase by 50% of the number of businesses using e-commerce in Portugal (compared to 2011 levels), by 2016; (d) promotion of the use of online public services, ensuring that they are used by at least 50% of the population until 2016; (e) increase by 20% of exports in Information and Communication Technologies (ICT) (in accumulated values, compared to 2011 levels), until 2016; (e) promotion of new technologies use, so that to reduce the number of people who have never used internet in 2016 to at least by 30%.

Generally speaking, e-skills and digital literacy are perceived as competitive tools, necessary for the individuals', firms' as well as the country' development. With this regard, many of the Portuguese policies comprise strategies which aim to foster ICT skills in the country. As stated in government document following the 2013 budget discussion, the strategic importance of ICTs is pointed out especially in the following areas: public administration management (improvement of management tools in human resources and acquisitions); fiscal policy (citizen communication and the control of economic agents); social security policy (inclusion of persons with special needs but also in what concerns minorities and groups with less economic resources); economic and employment policy (promotion of entrepreneurship and innovation based on ICT services and products; development of the communication infrastructures).

However, despite the above outlined strategies, there are only a few initiatives (besides those in the education sector) which consider development of e-skills as their main aim. Due to some recent financial constraints Portugal is facing with, some of the measures have been interrupted.

Nevertheless, there exist various other initiatives which are presently active in the country, and some new ones to be following soon.

Development of **entrepreneurship skills** is part of the **Strategic Program for Entrepreneurship and Innovation (+e+i)** (Programa Estratégico para Empreendedorismo e a Inovação) as one of the active initiatives in the country. Even though promotion of e-skills is not explicitly mentioned in the program's goals, it is included among its objectives. **Entrepreneurship voucher (+E) (Vale Empreendedorismo)** is an integrated initiative of the Strategic Programme for Entrepreneurship and Innovation available only for firms that have less than a year of existence. It aims at aiming at creating better conditions for start-ups and allows firms to acquire consultancy services in the areas such as business plan development and digital economy services. This initiative was initiated in 2012 October and will last until November 2013. **The digital small and medium-sized enterprises (SME) Programme** is another initiative in line with the country's objective for fostering ICT skills, promoted by the ACEPI (Portuguese Association of Electronic Commerce and Interactive Advertising) and the IAPMEI (Institute for Supporting Small and Medium Enterprises and Innovation), integrated in the Strategic Programme for Entrepreneurship and Innovation and in the Digital Agenda for Portugal.

Currently, implementation of e-government and e-management initiatives and programs which aim to develop new skills to the users (public servants and citizens in general) and also promote the development of ICT firms is driven by the **Agency for the Administrative Modernization** (Agência para a Modernização Administrativa). This governmental body is responsible for developing, coordinating and evaluating the measures, programs and projects in the areas of modernization and simplification of the administrative and regulatory procedures, electronic management and

availability of public services in the country. The Global strategic plan for rationalization and cost reduction in ICT in the Public Administration is one of the agency's initiatives. The objective of this plan is to centralize and harmonize the different ICT systems in the Public Administration, while simultaneously improving management mechanisms, achieving cost reduction, implementing common ICT solutions, enhancing administrative change and modernization, and stimulating economic growth. The plan underlines the importance of e-skills development at different levels, and for this five strategic objectives has been defined: (1) increase civil society's capacity to generate wealth, namely the ICT industry, creating business opportunities for the national ICT SMEs; (2) increase the number of business processes completely performed through ICTs, demonstrating its potential for high quality service delivery; (3) ensure effective and efficient ICT services delivery; (4) improve the ICT competences, ensuring the necessary specialization of human resources and skills that will enable the implementation of this strategic plan; (5) adopt ICT and organizational solutions that contribute to economic growth, either by creating business opportunities or by providing information.

The Portuguese government constantly updates strategies and develops new tactics in order to develop skills and digital literacy of the society. The **Citizen's card (CC)**, the new identification document provided to citizens, is simultaneously a physical and an electronic card, simplifying the relation of the citizen with the public administration and promoting the use of electronic public services. In addition to the initiatives for fostering digital competences and e-skills, **iAP – Public Administration Interoperability**, is a central interoperability platform oriented towards services with the objective to provide the public administration entities a shared tool for linking their systems, developing and providing multichannel electronic services that closer to the citizens' and businesses' needs. It is based on open standards and provides four basic macro services: (1) integration platform; (2) authentication provider; (3) platform for payments to the public administration and (4) SMS Gateway.

Concerning ICT in education the **Technological Plan for Education** launched in 2007, aimed at: (i) the modernisation and qualification of the technological infrastructures and services, mainly at schools; and (ii) distribution of equipment (PCs and laptops, interactive boards, etc.) to students, teachers and other education support staff. Besides ensuring the necessary infrastructure for ICT integration in the teaching and learning processes, the plan also comprehended e-skills development initiatives. Currently, this plan is no longer active, although some of its accomplishments are still in use. As part of its main achievements, can be mentioned:

- High-speed broadband Internet connection with at least 64Mbps (optical fibre) in 100% of the lower and upper secondary schools; 100% of the primary schools are equipped with a high-speed broadband Internet connection (finished in 2011).
- 75% of the lower and upper secondary schools are equipped with local area networks (cable and wireless access points); in these schools 100% of the classrooms have internet access (finished in 2010).
- e.escola; e.professor; e.oportunidades (e-school, e-professor, e-opportunities) - More than 1,350,000 computers delivered to students, professors and students new programme opportunities (finished in 2011).
- e.escolinha (e-primary school) - More than 600,000 computers (with educational contents) delivered to students of primary schools (finished in 2010).
- Technological kit – 111,486 new computers delivered; 28,711 new video projectors delivered; 5,613 new interactive whiteboards delivered (finished in 2010).
- School card - Contract approved by Court of Auditors in October of 2009; New card in every school by 2010

- Schools portal - Website for sharing digital learning resources, e-learning, communication, collaborative work and access to school management tools (the portal is fully operational, the online enrolments process is currently being implemented).
- Simplex School – Set of initiatives aimed at developing an integrated information system that is characterized by being robust, modular, based on web platform and with an infrastructure oriented towards services, which allows dematerializing and streamlining processes related to management (e.g. a communication and collaborative platform for education, a management application “e.escolinha” an information system for ICT skills certification, and another information system allowing electronic enrolment).
- ICT skills (training and certification programme) - by 2011, 456 trainers had completed their training, 44,945 teachers had received training in ICT applied to teaching (30% of the teachers in all levels of education) and 44,000 teachers had their ICT skills certified (level 1).
- ICT internships - Protocols with more than 40 referenced technological companies, originating 37 internships for students from professional courses (secondary level) in the ICT domain.
- ICT Academies – These academies aimed at enhancing the interface school-firm-community, thus improving students’ employment opportunities; professors have been trained by Microsoft, Cisco, Sun, Apple, Linux, Oracle.

Team Resources and Educational Technologies (ERTE – Equipa Recursos e Tecnologias Educativas), is a multidisciplinary team of the Ministry of Education, dedicated to management of all initiatives concerning ICT in schools (from basic to secondary level). Some of its general goals include: (a) to propose ways of integrating effective use of ICT in curricula and teaching guidelines, at all levels of education and training; (b) to promote research and disseminate studies on the educational use of ICT in schools; (c) to design, develop, monitor and evaluate innovative initiatives that promote educational success that include and make use of ICT in schools; (d) to design, develop, certify and disseminate digital educational resources for different grade levels, subject areas and disciplines; (e) to manage, expand and improve a repository of digital educational resources.

ICT in education is further promoted by the **ICT Competence Centres (ICT CC)**, supported by ERTE through the establishment of protocols between the Ministry of Education and the entities in which these centres are located in, most of them institutions of higher education. These centres aim to support ICT use in schools and promote an innovative education leading to the improvement of learning processes. Overall, there are nine ICT CCs linked to the following institutions, each one with activities of their own as well as joint initiatives: Portuguese Association of Educational Telematics – EDUCOM, Polytechnic Institute of Santarém, Polytechnic Institute of Setúbal, University of Aveiro, University of Coimbra, University of Évora, University of Lisbon, University of Minho and Entre o Mar e a Serra.

‘Talent with fibre’ (2011/2012) was a program developed by Portugal Telecom, establishing a contest for university students to make proposals for new products for the company. The aim was to bring the university students closer to the business reality and to get new ideas for the company.

Among non-governmental stakeholder initiatives, **ANETIE**, the Portuguese Association of the Information Technology (IT) Business Sector also focuses its actions in the domain of internalisation, aiding the firms that are part of this association in promoting their products and services through identification of new potential areas of business in the ICT sector. Within this framework, the association has taken the following main lines of action: i) to improve and increment the supply of the IT national business sector; ii) to promote the access to the public procurement by national IT enterprises; iii) to promote research on the IT sector; and iv) to organise an annual conference to disseminate results and to raise awareness about the IT national sector.

Summary Assessment of Portuguese e-Skills Activities: ●●

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.

Summary Assessment of Portuguese Digital Literacy Activities: ●●●

Portugal focuses on educational infrastructure and indirect effects through e-Government and infrastructure measures.

Summary Assessment of Portuguese e-Leadership & Digital Entrepreneurship Activities: ●●

Development of (digital) entrepreneurship skills is part of the Strategic Program for Entrepreneurship and Innovation.

Like in the precursor study¹ 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)² for each of the 27 Member States.

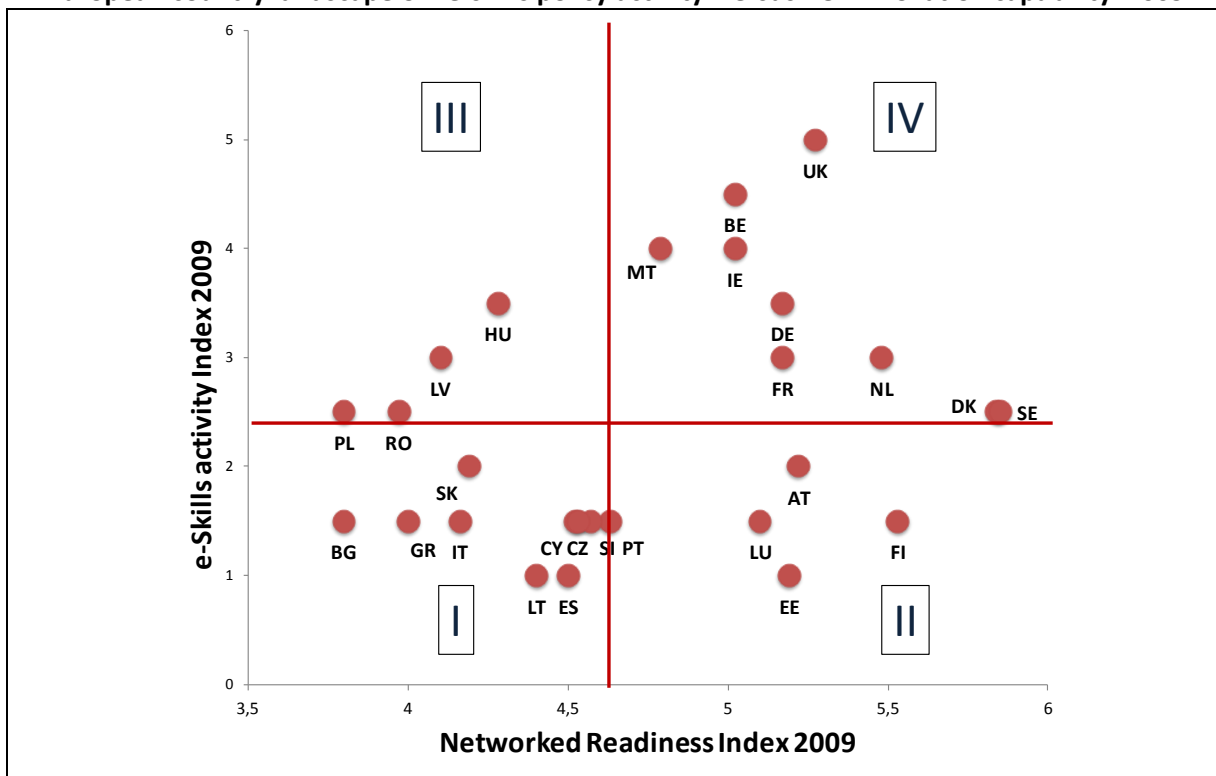
This allows for putting the results of the e-skills policy and activity analysis in the different countries in the wider context of each country's propensity to exploit the opportunities offered by ICT using data which can be obtained from the country values on the Networked Readiness Index (NRI).

The following figure 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.

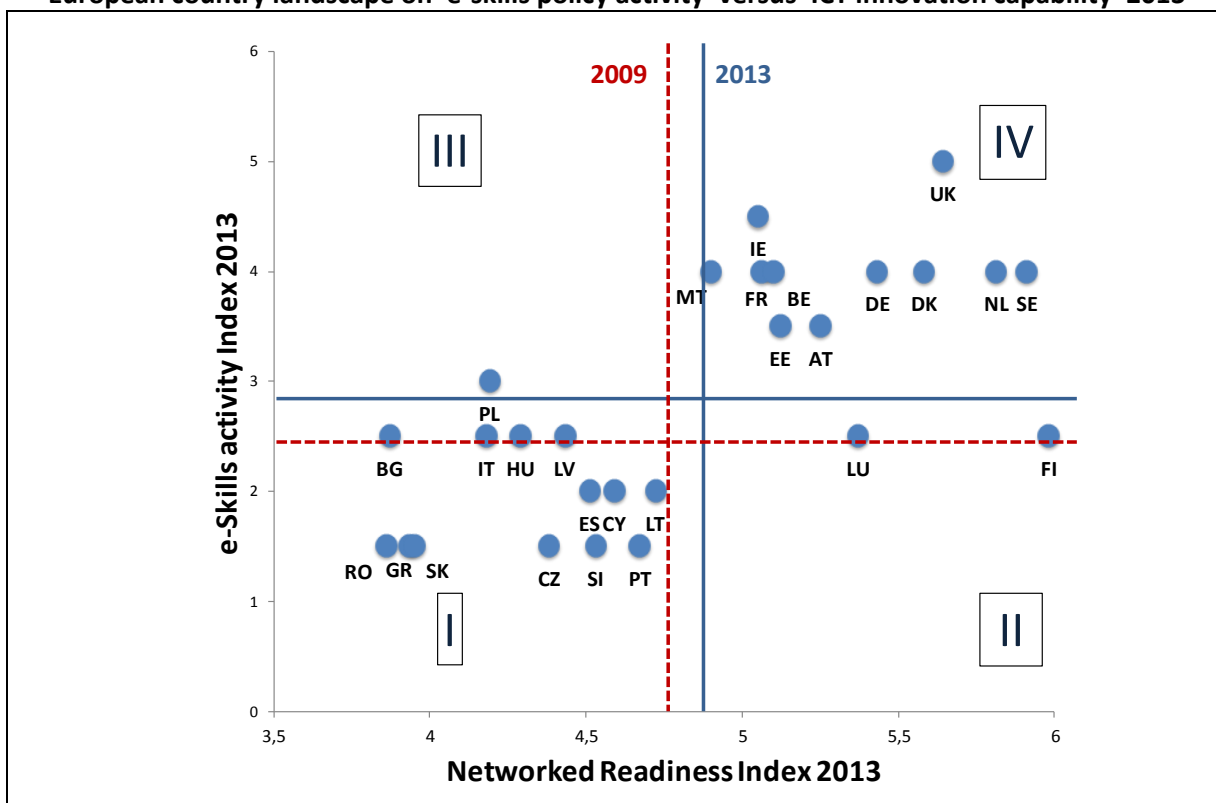
¹ Hüsing, T. and Korte, W.B. (2010) "Evaluation of the Implementation of the Communication of the European Commission 'e-Skills for the 21st Century'", URL: http://ec.europa.eu/enterprise/sectors/ict/files/reports/eskills21_final_report_en.pdf

² 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.

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



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.

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

5 Selected multi-stakeholder partnerships

The following is a list of multi-stakeholder partnerships of major relevance to the e-skills issue:

- **Internet Segura:** The Safe Internet initiative has run since 2005 with the following strategic objectives: i) to fight illegal online content; ii) to minimize the effects of illegal and harmful content on citizens; iii) to promoting safe uses of the Internet; and to iv) to create awareness of the risks associated with using the Internet. These objectives are pursued through two types of initiatives: dissemination and awareness activities, mainly directed towards school communities; and development and maintenance of four interfaces with the general public. Safe Internet activities in the area of e-skills building are: dissemination of information on the main dangers associated with internet use (using different media resources) and development of contents (static and interactive) relevant for raising awareness on the safe use of the Internet. Internet Segura is managed by the Science and Technology Foundation (FCT). The total budget for the period 2007 to 2012 was € 1,980,000, 61% of which was funded by the EU programmes INSAFE, Safer Internet and Safer Internet Plus.
- **PME Digital (Digital SMEs):** PME Digital (2012-15) aims to help micro, small and medium-sized Portuguese firms to be more competitive by using ICT tools to increase the number of online services, to improve communication and collaboration between firms, and between firms and their clients and suppliers. Its goal is to enhance Portuguese SMEs' competitiveness through the increase of the number of firms in the digital economy, e-commerce and management efficiency, e-skills level, firms' productivity and promoting young people's employability. SMEs can acquire sets of services to answers their specific necessities, at lower prices, that include: i) communication tools oriented either for costumers either for suppliers, ii) e-commerce structure and iii) e-management. Alongside with the access to services, SME can profit from the consulting and training given by services providers, and also from the guidance given by the associations involved. With this objective, several events are being promoted country wide in order to better demonstrate the benefits of the e-economy and discuss the strategy for its development, counting with the participation of firms with experience in this area. A manual on how to start a digital firm will be developed and there's an online tool to help on choosing the more adequate services for each SME. The initiative was set up by the Ministry of Economy and Employment, but responsibility for implementation lies with private institutions, mainly industry associations including ACEPI (Portuguese Association of Electronic Commerce and Interactive Advertising) and IAPMEI (Institute for Supporting Small and Medium Enterprises and Innovation) and a number of private companies (ZON; Vortal; VODAFONE; Portugal Telecom; Microsoft; Primavera; Caixa Mágica; PHC; Optimus; IOL; GLOBAZ; GATEWIT; AMEN; CTT; Unicre)..
- **Vale Empreendedorismo (Entrepreneurship voucher):** Support to entrepreneurs is provided in the form of vouchers for purchase of specialised consultancy services such as business plan development and digital economy services. Vouchers are available only to firms which have less than a year of existence. The programme seeks to create better conditions for business start-ups. This initiative is integrated in the Portuguese Government's Strategic Programme for Entrepreneurship and Innovation, which has four general strands: (a) Entrepreneurial society - to encourage an intergenerational cultural change, favouring self-initiative and entrepreneurship as an engine of innovation. This innovative culture must be rooted in the educational system as well as in professional training throughout the professional life, encouraging self-learning and skill development; (b) Innovative companies with strong international activities – to promote networking between firms and the scientific and technological system and thus creating better conditions for innovation, based on the assumption that this is a necessary step towards increasing exports; (c) Entrepreneurship, knowledge and innovation networks (national and international) – to create a favourable

environment and financing solutions in order to promote entrepreneurship and innovation, as a way to strengthen the economic fabric and to create products and services with strong economic value. It is also essential to increase the integration of national entrepreneurs in global networks, allowing for experiences and skill sharing; (d) Effective investment – to concentrate efforts on innovative firms with greatest potential to create competitive advantages in the international markets. Investment is also essential in innovation adjacent areas which are crucial for the development of successful products and services (marketing, quality management, internationalization, etc.).

6 Success of e-skills policies and activities in meeting the objectives of the EU e-skills agenda and other relevant European initiatives

The extent to which policies, initiatives and multi-stakeholder partnerships have been successful in helping meet the objectives of the EU e-Skills agenda and other relevant European e-Skills initiatives as seen by national experts is further described below along key actions and action lines of the EU e-Skills strategy and other relevant EU initiatives.

“Longer term cooperation”

The interviewed experts were not able to identify any significant initiatives in this area.

“Human resources investment”

During the last years, investments in the educational system have been more performance oriented. This has contributed to a more selective investment in human resources, favouring areas with higher growth potential.

“Attractiveness of ICT jobs”

ICT jobs continue to have higher salaries and the sector as a whole keeps expanding. Nevertheless, this is more a consequence of the general market realities than a result of concrete initiatives.

“Employability and e-inclusion”

Although it's difficult to assess the general trend, it is possible to identify several small scale projects that have contributed in fostering employability and e-inclusion (e.g. the 'talent with fibre' for youth employment developed by the Portugal Telekom). Further, there are some signs of a growing concern with e-inclusion by the private sector actors (e.g. one of the major Portuguese food retailer has developed an initiative for making its websites accessible for the blind people).

“Lifelong acquisition of e-skills”

The establishment of a highly developed information system by the Portuguese tax agency (e.g. online tax declaration) was seen as one of the major contributions to familiarize the broader public with the use of e-services. In addition, only some small scale initiatives in fostering e-skills were identified, such as the 'PME digital program' or the 'computation Olympics'.

“Closing the e-Skills gap”

Digital agendas developed by the government contributed to close the 'digital divide' and improve ICT skills in the country. The broad scope of these kinds of initiatives lies under the objective of reaching different type of publics and to generate e greater e-readiness in the whole society. Also the e-campus initiative established some years ago was very important for opening the way for broad public and universal internet access, which was later extended to the lower educational levels as well.

Trends on the supply side are indicative of the stronger efforts taken to make a career in ICT more attractive to students. Statistics indicate an increase in number of graduates in ICT programs from 2,543 in 1997/98 to 4,088 in 2004/05, most of who graduated from public institutions. However, the number of students enrolled for the first time in ICT programs has decreased from 8,014 in 2002/2003 to 6382 in 2005/2006. The number of study places has also slightly decreased between

2002/2003 and 2005/2006. In 2005/2006 only 70% of the study places in ICT programs were taken, showing a difficulty of these programs to attract students.³

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³ See <http://www.aps.pt/cms/imagens/ficheiros/FCH4b11c496e5802.pdf#page=5>

Annex: data sources

	Source
eSkills21 study: 'e-skills' index 2010	eSkills21 study carried out by empirica. Report available at http://goo.gl/WKV7r
eSkills21 study: 'Digital literacy' index 2010	
EuRA e-skills index	EU-RA 2009: Financial and fiscal incentives for e-Skills: State of play in Europe. Synthesis report. http://www.e-skills-funding.com/images/stories/PDF/synthesisreport.pdf
ICT practitioners in % of total employment 2012	LFS data made available by Eurostat
Digital literacy skills of the population 2009/11:	Eurostat, database "isoc_ski"
• Individuals with high level of computer skills	
• Individuals with high level of Internet skills	
• Individuals using the Internet (last three months)	
Global Competitiveness Index (GCI) 2010/12	The Global Competitiveness Report 2011-2012: http://www.weforum.org/reports/global-competitiveness-report-2011-2012
Networked Readiness Index (NRI) 2010/12	The Global Information Technology Report 2011-2012: www.weforum.org/issues/global-information-technology
• Individual readiness	
• Business readiness	
• Government readiness	
• Individual usage	
• Business usage	
• Government usage	
PISA scores (2009) in:	OECD, http://www.oecd.org/pisa/
• Mathematics	
• Science	
• Reading	

Indicator	Source	Further remarks
ICT practitioner workforce 2012	Eurostat Labour Force Survey. Some imputations and assumptions not in the original data but done by empirica apply	The definition can be looked up in the final report, Gareis et al. 2014: E-SKILLS: MONITORING AND BENCHMARKING POLICIES AND PARTNERSHIPS IN EUROPE.
ICT practitioner workforce 2012 as percent of total workforce		LFS based, number of ICT practitioners / number of workers in all occupations
Assumed excess demand 2012	Empirica, IDC	This is calculated using the percentage of vacancies per existing job and is based on a survey carried out in 2012. As some countries were not covered, several assumptions apply
Forecast excess demand 2015		Forecasts are scenario based and the methodology can be found in the final report (see above). Forecast of demand in the six largest countries (DE, UK, FR, IT, ES, PL) is based on country specific economic scenarios, for the 21 smaller countries only an aggregate scenario was developed and figures allocated according to ICT employment shares.
Forecast excess demand 2020		
Forecast ICT practitioner jobs 2015		
Forecast ICT practitioner jobs 2020		
Workers 2012 - Management,	Based on Eurostat Labour Force	LFS based, definitions can be looked up in the final

business architecture and analysis level	Survey, some definitions and calculation by empirica. Some imputations and assumptions not in the original data but done by empirica apply.	report.
... as percent of total workforce		
Workers 2012 - ICT practitioners, professional level		
... as percent of total workforce		
Workers 2012 - ICT practitioners, technician and associate level		
... as percent of total workforce	Based on Eurostat Labour Force Survey, some definitions and calculation by empirica. Some imputations and assumptions not in the original data but done by empirica apply.	ISCO-88 groups 213 and 312. Due to the break in series in 2010/11 only partly comparable to later data.
Growth core ICT workforce 2001-2010		
Growth core ICT workforce 2008-2010		
Growth core ICT workforce 2011-2012		ISCO-08 groups 25 "ICT professionals", 35 "Information and communications technicians".
Growth broad ICT workforce 2011-2012		Equals the "ICT practitioner workforce"
ISCED 5A/B first degree graduates in Computer Science, 2011	Eurostat, database "educgrad_5"	This figure represents a count of first degrees in ISCED 5A and first qualifications in 5B. See discussion of this indicator in the final report.
... graduates per 1000 population aged 20-24	Eurostat, databases "educ_grad5" and „demo_pjangroup"	Graduates as above. The denominator is used to make data comparable but there is no age restriction in the number of graduates. Some imputations and assumptions may apply.
... graduates 2011 as percent of 2006 (= peak EU)		
Vocational training graduates in Computer Science, 2011	Eurostat, database "educ_grad5"	Number 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. Some imputations and assumptions may apply.