e-SKILLS IN EUROPE

LUXEMBOURG

COUNTRY REPORT

JANUARY 2014

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1 Overview

Luxembourg is undergoing a very positive development with respect to the demand for ICT practitioner skills in particular because the country's strategy in the next decade/s is to become the European hub for ICT services. This explains also the increasing activities in educational fields at different skills, competence and entrepreneurial levels.

According to the data gathered in a school survey conducted by the European Schoolnet in 2012[1], high percentages of students in Luxembourg are in schools with relatively high levels of infrastructure, connectivity and 'connectedness' compared to other countries. However, teachers' use of it is well below EU averages (particularly at grade 4), even though their confidence in using ICT is higher than the EU mean (and despite levels of training being on the low side). Students' use is higher than teachers' at grade 8 but still below EU means, and it is above at grade 11 vocational. A noticeable feature is grade 8s' relatively frequent use of their own laptop and mobile phone in class for learning (even so, their confidence levels in using ICT are lower than or close to the EU average). Levels of in-school support for ICT appear to be relatively low, "although most grade 4 students are in schools with an ICT coordinator".

National experts, while agreeing with the general conclusion drawn by the European Schoolnet in the study, have pointed out that ICT uptake in Luxembourg schools is not as developed as it should be. They note some inconsistency between the fact that Luxembourg has 96% of its households (with children involved in compulsory education) equipped with ICT devices and internet connectivity, and teachers report to be self-confident in ICT use, many teachers do not consider ICT competence in the list of their work plan. Some critics claim that policy does not yet care enough about ICT in education both for primary and secondary schools.

Anecdotal evidence suggests that only very few secondary schools provide students with laptops from the initial class on upwards, and use of mobile technologies for teaching is not prominent yet in secondary schools. Computers continue to be used as stationary devices in specific computer rooms only.

Some experimentation is taking place in using iPads and cloud-based learning in primary schools. A first difficulty to overcome appears to be weak Internet connectivity in primary schools (they are administered at local and not state level as secondary schools do), which does not allow to use the tablets' sensing features and multimedia potential. Such poor connectivity might hamper the work even of teachers who are skilled in ICT and would like to use ICT in their classes.

Experts believe that, as soon as research shows how mobile devices can support inquiry-based learning in classrooms (at primary and secondary level) and as local schools become fully equipped with appropriate infrastructure and connectivity, take up and development of ICT competences will improve.

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[1] European Schoolnet - Survey of Schools: ICT in Education – Country Profile: Luxembourg, November 2012, p.24

2 Indicators on innovation, competitiveness and ICT skills

Luxembourg						
	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	**1.5**	**24**				Max.: 9.0
EuRA e-skills index	**0**	**27**				Max.: 5.0
ICT practitioners in % of total employment 2012			**6%**	**1**		EU average: 3.43%
Digital literacy skills of the population 2009/11:						
• Individuals with high level of computer skills	**42%**	**1**	**43%**	**1**	⮕	EU average: 28.52%
• Individuals with high level of Internet skills	**14%**	**2**	**13%**	**11**	🔻	EU average: 13.67%
• Individuals using the Internet (last three months)	**86%**	**3**	**90%**	**11**	🔻	EU average: 71.33%
Global Competitiveness Index (GCI) 2010/12	**5.0**	**10**	**5.03**	**10**	⮕	Max.: 5.61 EU median: 4.52
Networked Readiness Index (NRI) 2010/12	**5.1**	**10**	**5.14**	**5**	🎧	Max.: 5.6. EU median: 4.5
• Individual readiness	**5.96**	**14**	**5.44**	**4**	🎧	
• Business readiness	**4.78**	**15**	**4.76**	**10**	🎧	
• Government readiness	**5.05**	**7**	**5.32**	**2**	🎧	
• Individual usage	**5.69**	**4**	**6.05**	**3**	🎧	
• Business usage	**5.29**	**11**	**4.16**	**8**	🎧	
• Government usage	**5.05**	**7**	**4**	**18**	🔻	
PISA scores (2009) in:						
• Mathematics	**489**	**16**				EU median: 493
• Science	**484**	**22**				EU median: 498
• Reading	**472**	**21**				EU median: 489
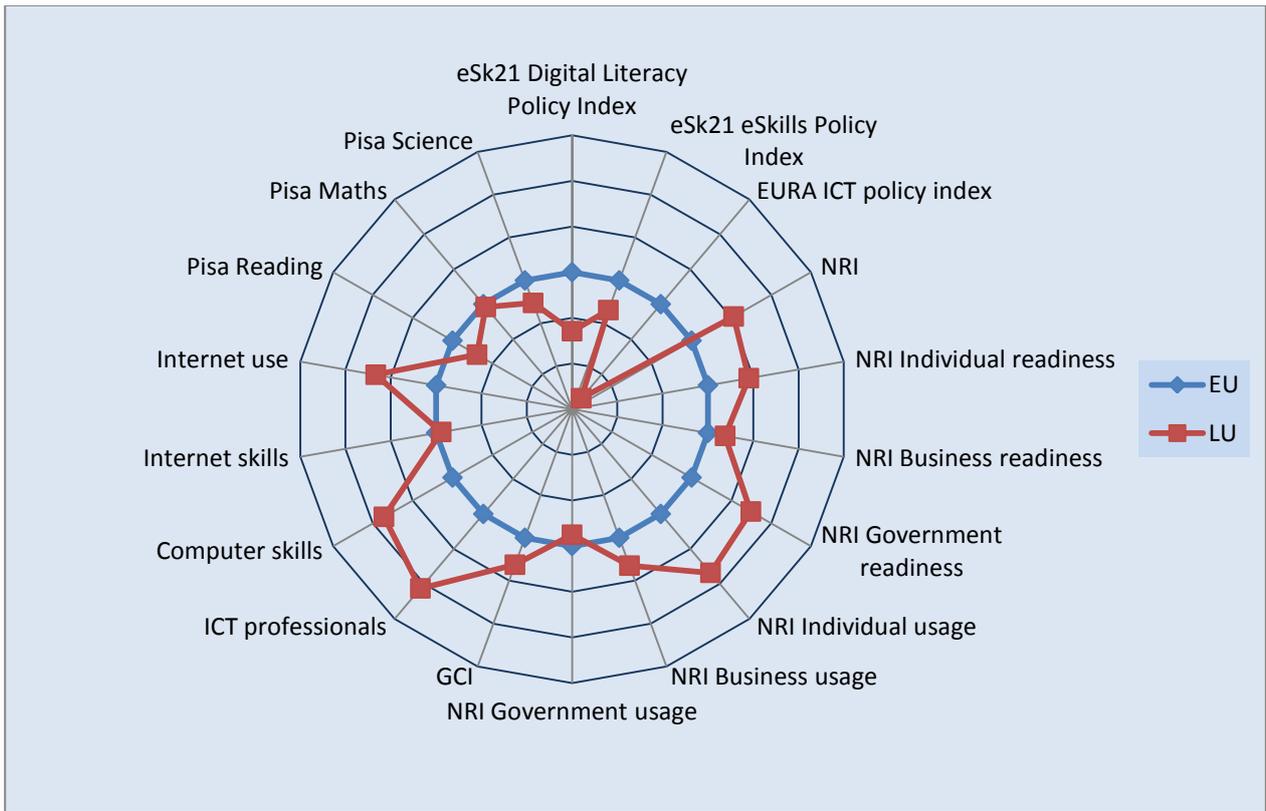
3   E-skills demand and supply forecasts 2012 – 2015 - 2020

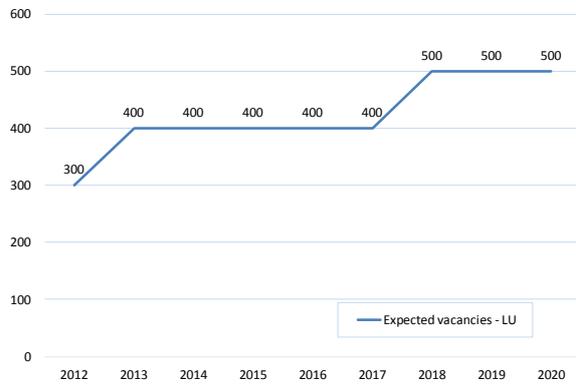| Luxembourg			
	LU	**Rank EU27**	**EU27**
ICT practitioner workforce 2012	14,000	25	7,403,000
ICT practitioner workforce 2012 as percent of total workforce	6.0%	1	3.4%
Assumed excess demand 2012	300	25	274,000
Forecast excess demand 2015	400	25	509,000
Forecast excess demand 2020	500	25	913,000
Forecast ICT practitioner jobs 2015	15,000	25	7,503,000
Forecast ICT practitioner jobs 2020	16,000	25	7,950,000
Workers 2012 - Management, business architecture and analysis level	3,700	25	1,477,000
... as percent of total workforce	1.5%	4	0.7%
Workers 2012 - ICT practitioners, professional level	7,400	25	3,393,000
... as percent of total workforce	3.1%	2	1.6%
Workers 2012 - ICT practitioners, technician and associate level	3,100	25	2,532,000
... as percent of total workforce	1.3%	9	1.2%
Growth core ICT workforce 2001-2010	6.7%	7	3.0%
Growth core ICT workforce 2008-2010	6.4%	4	2.6%
Growth core ICT workforce 2011-2012	21.6%	1	3.9%
Growth broad ICT workforce 2011-2012	21.9%	1	1.8%
ISCED 5A/B first degree graduates in Computer Science, 2011	30	27	113,000
... graduates per 1000 population aged 20-24	1.0	26	3.6
... graduates 2011 as percent of 2006 (= peak EU)	94%	12	88%
Vocational training graduates in Computer Science, 2011	58	22	67,000

Sources and notes: see annex.

ICT workforce: Demand and Jobs in Luxembourg 2012-2020
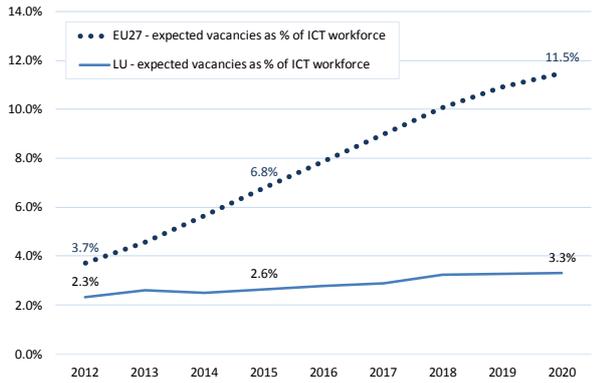
(Main Forecast Scenario)
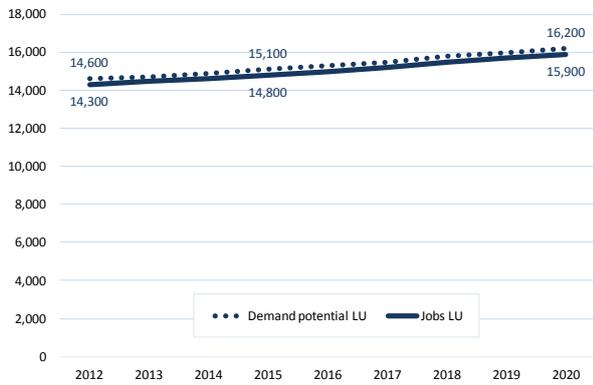
Source: empirica 2013

e-Skills shortage: Potential vacancies in Luxembourg 2012-2020
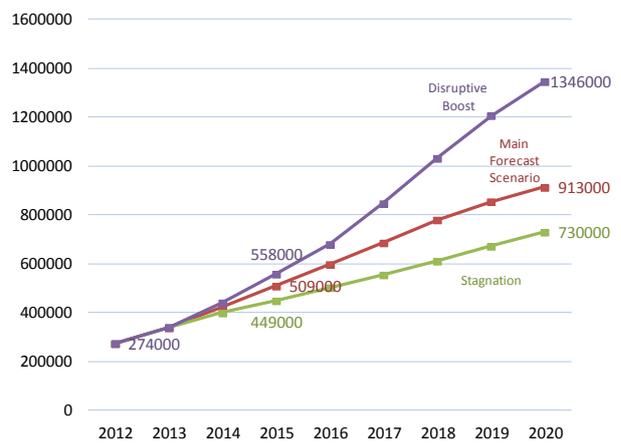
(Main Forecast Scenario)

Source: empirica 2013

Potential vacancies as percent of ICT workforce Luxembourg 2012-2020
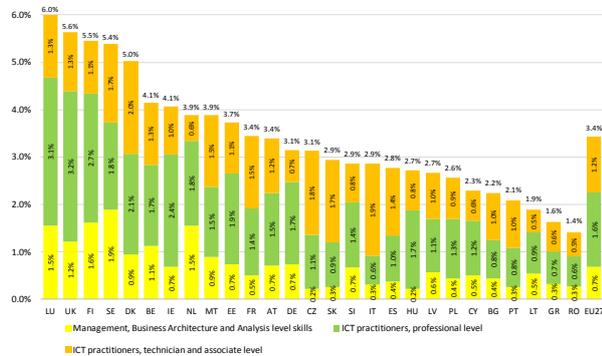
(Main Forecast Scenario)

Source: empirica 2013

Potential vacancies in Europe (EU27) by scenario 2012-2020

Source: empirica 2013

ICT practitioner workforce as percent of total workforce in EU Member States in 2012

Source: empirica 2013

First degree graduates in Computer Science (ISCED 5A/B) per 1000 population aged 20-24, 2011

Source: empirica 2013

4   Policy and major stakeholders initiatives

The relative success of Luxemburg's ICT related policies is based on several factors. In part due to the finance sector, Luxembourg has one of the highest shares of ICT related occupations in the economy, compared to the EU member countries. Moreover, the small size of the country allows for easy coverage with broadband and wireless internet access. 100% broadband availability and the Luxembourg's Government and professional chambers strong focus on eLearning and lifelong learning approaches widely develop ICT skills of practitioners.

The governmental body and the University of Luxemburg with its research centres are the two most important actors which dominate the shaping of ICT development in the country, by interacting very intensively and coordinating their work in a successful way. For instance, University of Luxembourg largely collaborates on research projects in the technologies, telecommunications and media sectors. The guidelines of Luxemburg policies are quickly and effectively implemented by the university's sub-units. A good example for this fruitful partnership is the eLuxembourg action plan resulting in numerous innovations, such as the "Luxembourg e-commerce Certified" programme, a quality seal for e-commerce, which has been established as the first one in Europe.

Several platforms have been created offering businesses and researchers to interact and to foster networks. One of them is the website LuxInnovation[2] by the National Agency for Innovation and Research, running under the slogan "business meets research".

E-Skills are one of the key elements of Luxembourg's Digital Agenda and more generally of the Luxembourg Government ICT program for 2009-2014, with a special focus on ICT practitioners' skills, eBusiness skills, as well as digital literacy for all citizens. The 2012 annual Student's Fair (November, 15&16, 2012, Luxexpo) was dedicated to ICT studies and jobs and aimed at informing students about possible job opportunities in the related fields and at the same time spread the message that IT training and qualifications are a key factor for the economy as a whole. The slogan "Be Cool, Be Geek!" aimed to help improve the image of IT professions in order to motivate 16-20years old make a solid training and consider IT as their future professional choice.

The social aspect of e-Skills and ICT use is covered by the CASES-LU[3] project. CASES is short for Cyberworld Awareness Security Enhancement Structure and campaigns for a safer and responsible handling of the internet. Especially children and the youth are among the target groups, but also parents are being trained and informed. In the frame of CASES a special schoolbook has been published, introducing e-skills and the responsible use of the internet to every Luxembourgian child at the age of 12.

LUSI – Luxembourg Safer Internet network is also cooperating with CASES and its lead partners are the National Youth Centre (CNJ) and the European Commission financing the project and its internet platform. LUSI is also member of the international INSAFE initiative, which is present in the 27 EU member states. The number of local partners of the LUSI network is especially impressive: Public institutions, educational establishments, companies and non-profit organisations are among the project partners.

The University of Luxembourg has also undertaken substantial actions in promoting e-learning tools to the staff and students by integrating e-skill in the educational system and ensuring a competitive labour market. A budget of 2.5 million euro has been assigned in order to make students and staff familiar with the current IT tools and platforms for e-learning, by increasing integration of media into a more interesting learning process. For this purpose, an e-learning platform has been set up.

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[2] http://www.luxinnovation.lu
[3] https://www.cases.lu

Furthermore, various private public partnerships (i.e. lecturers) allow the University to develop IT related research projects, and knowledge exchange, necessary to strengthen the e-Skills of its economy.

The most important public-private partnership in Luxemburg is probably the Public Research Centre (PRC) Henry Tudor. Its activities include ICT, Materials Technologies, Business Organisation and Management, Environmental Technologies and Health Care Technologies. IBM and DATEC are among its 392 national and international partners. Recently, PRC research area focuses on the quality of ICT-based services, management of ICT-based services and ICT-based management of human capital, as well as the organisation of different training courses on e-learning and e-skills.

Summary Assessment of Luxembourg's e-Skills Activities: ●●◐

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.

Summary Assessment of Luxembourg's Digital Literacy Activities: ●●

The country's activities are concentrating on promoting public awareness and providing basic education in e-commerce and e-security.

Summary Assessment of Luxembourg's e-Leadership & Digital Entrepreneurship Activities: ●◐

Little reference is being made in policy-making to specific e-leadership skills or digital entrepreneurship. Education providers have started to offer related training courses, however.

Like in the precursor study4 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)5 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.

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

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[4] 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

[5] 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.
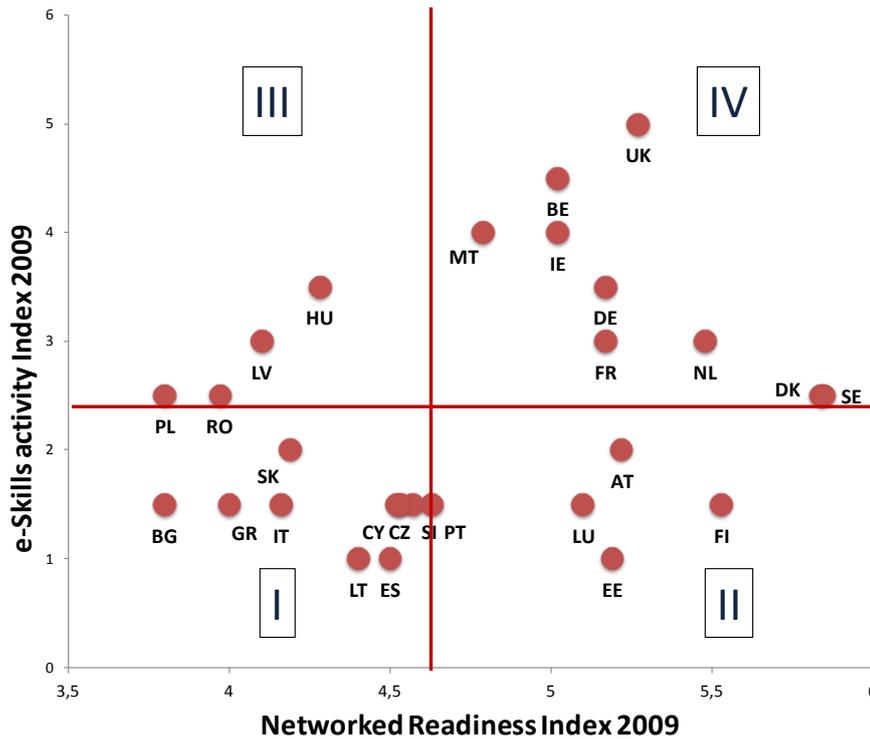
European country landscape on 'e-skills policy activity' versus 'ICT innovation capability' 2013
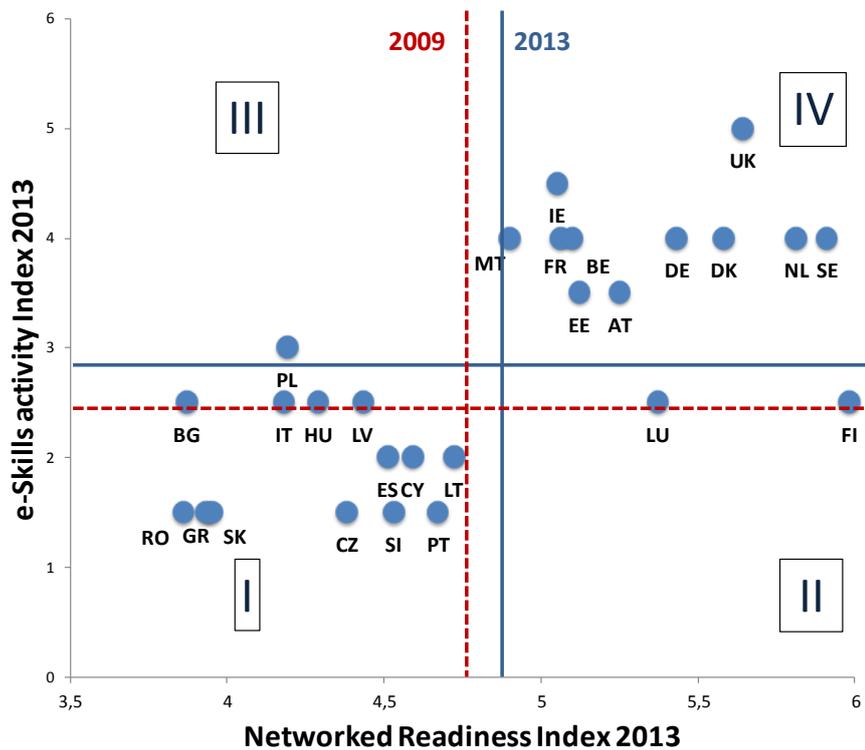
Overall and for e-skills related policies and initiatives a strong increase of activity levels over the five-year time span can be identified. The unweighted average e-skills policy index score increased from 2.4 to 2.9 between 2009 and 2013. This is encouraging news.

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:

- **Luxembourg Engineering Trainee Days**: This initiative by the Ministry for Education in cooperation with the Luxembourg Engineers Association seeks to raise awareness among technical students (2-3 years prior to Bachelor degree) about the impact of IT and informatics on employment and career options. A key focus lies on the importance of e-competences in the daily working live of engineers.

- **NEXTLEVEL.LU**: Awareness rising about the career opportunities in the IT industry is part of the government's broader strategy to develop the digital economy in Luxembourg. In line with this objective, the Media and Communications Department of the Government (SMC), together with Fedil-ICT, the government's ICT promotion entity ("Luxembourg for Business Proud to Promote ICT") and key stakeholders from the private sector operate the NEXTLEVEL.LU online platform as a tool for spreading information about careers in IT, job profiles, local employers, etc. The online activity is complemented by face-to-face events such as presence at the annual student's fair in Luxembourg (targeting students aged 17-20), where a booth was organised to inform students about IT jobs and the dynamic IT sector in Luxembourg. Students who become interested at the event could later find a list containing potential internship opportunities and contact persons of businesses from the local IT sector on the online platform.

- **eSkills in School Population**: Since the late 1990s the Ministry of Education and Vocational Training in Luxembourg has implemented its strategy for developing e-skills amongst the schools. This implementation focuses mainly on integrating the promotion of e-skills into the national curricula / syllabi: a) at fundamental school level (ages 8-11): competence descriptors for the cycles 3-4 have been put together; they are being trialled and finalised in the 2012/2013 term; b) at secondary school level (ages 13 upwards): a draft of competence descriptors for the lower levels of secondary school has been completed in 2012 and for the upper levels in early 2013. In both cases, a trialling period of 12 months has been scheduled before finally embedding the descriptors into the national curricula/syllabi. A media portal for all kinds of electronic needs within the school fields was set up already in 2000 (myschool.lu). This portal gives teachers and students access to educational and general information as well as allowing them to perform a number of actions electronically (including online learning, online testing and evaluation).

- **ICT skills through the use of structured training and ECDL certification**: The Luxembourg Chamber of Employees together with Luxembourg Engineers Association provides structured training and certification programmes for continuous development of ICT skills, following the ECDL (European Computer Driving Licence) Foundation guidelines.

- **PROMIS Lingua eCompetence & eSkills Module**: PROMIS (PeRformance Operational and Multilingual Interactive Services to support Compliance for SMEs in Europe) is a EU-cofounded CIP-PSP project (2011-13, total budget: € 5.3 million) which has set up and operates a Cloud platform of interactive services that allows organisations and their consultants to: a) become fully knowledgeable and remain up-to-date in all compliance issues of relevance to their organisation; b) train and support their staff to always keep updated on qualification requirements, thus being in a position to show evidence-based compliance. The eCompetence and eSkills Module in PROMIS manages the entrepreneurial as well as technical knowledge and / or qualifications that are required to enable personnel to perform certain jobs and functions within the company, such as: (i) working on specific machines, or the handling of hazardous substances or (ii) prepare the staff for management responsibilities and in particular compliance related issues. The records of people who perform these functions are linked to events which alert management that re-qualification is required before it lapses. The training is

performed in a virtual training room, and is organised by a teacher / tutor using the specific learning material needed to achieve the competence e.g. operating instructions. When the training has been performed, the employee undergoes online test(s) which are controlled and examined by the teacher / tutor. The project is coordinated by UEAPME (Union Européenne des Petites et Moyennes Enterprises) in cooperation with the Chambre de Commerce, Luxembourg and partners in Germany and Romania.

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"

Promotion of IT skills is one of the Luxembourg Government long term goals. Given the proximity of administrations, ongoing cooperation between the governmental departments, University of Luxembourg, Research Centres and private actors is facilitated.

Connectedness of schools is also a key priority for the Luxembourg Government, as well as equipment of students in the higher grades with the necessary ICT tools. Overall, Luxembourg ranks on a positive level compared to EU average regarding schools having virtual learning environments.

In addition, Luxembourg's focus on eLeadership qualifications is reflected by the implementation of four new IT related masters by the research centres in cooperation with national and regional universities.

"Attractiveness of ICT jobs"

Raising awareness among young people about the career opportunities in the IT industry is part of the Government's broader strategy to develop the digital economy in Luxembourg. In line with this objective, the Media and Communications Department of the Government (SMC), together with Fedil-ICT, ICTLuxembourg (Government ICT promotion entity) and the private sector, regularly implement a stand at the annual Student's fair with the objective to inform students about IT jobs and the dynamic IT sector in Luxembourg. Interested students may also be provided with a list containing potential internship opportunities and contact persons of businesses from the local IT sector, which students can contact at any time and opportunity. The student's fair is mainly visited by students aged 17-20, who do not yet attend the university. Both, the 2011 and 2012 Student Fairs contained a major focus on IT jobs.

"Employability and e-inclusion"

Luxembourg is one of the European countries with the highest e-inclusion coverage rate with about 76% coverage of disadvantaged groups. This ranks the country well above the EU average of 53%.[6]

"Lifelong acquisition of e-skills"

The lifelong-learning platform[7], implemented in 2003, provided ICT practitioners from the private sector with opportunity to improve their skills offering a large scale of IT courses corresponding to various job profiles. The platform provides comprehensive information about offered courses as well as training providers' teaching methods, areas of training, etc.

Jointly, the public sector came up with the ICT practitioner curricula and since 2010, the Center for Information Technology of the state also offers a sample of joint training course designed to

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[6] Source: http://cordis.europa.eu/fetch?CALLER=OFFR_TM_EN&ACTION=D&RCN=10898

[7] www.lifelong-learning.lu

familiarize adults with e-government and especially the administrative portal Guichet.lu. At the end of training, citizens are able to fully realize their paperwork via Internet.

"Closing the e-Skills gap"

In spite of the high level of infrastructure in the country, integration of ICT in education is in its first steps towards development. There exist no concrete policy measures for implementing ICT in both, primary and secondary school education and computers are still not considered as necessary tools to be used at schools. However, signs of positive developments are already visible. Some technical schools (8th and 9th classes) have already some ICT courses integrated as part of their curriculum.

In order to foster skills of ICT practitioners, municipalities or various partner organizations offer training courses from basic computer and Internet control software such as Photoshop, to Word, Excel and PowerPoint for beginners.

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DG Enterprise and Industry

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		
Growth core ICT workforce 2001-2010	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 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.